2021 Ski-Doo Freeride Series

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

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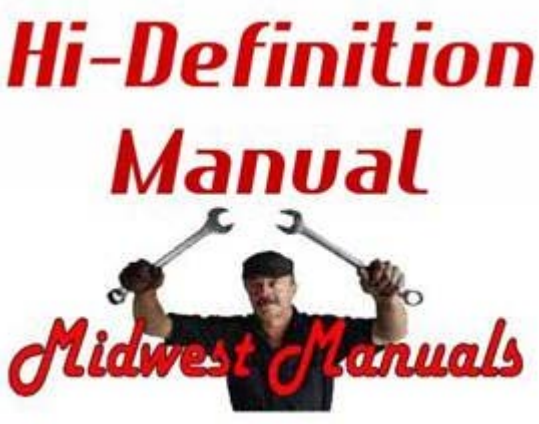

SAFETY NOTICE

This manual has been prepared as a guide to servicing and repair the Ski-Doo® snowmobile from the REV™ Gen4 platform.

This edition was primarily published to be used by mechanical 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 in this manual will apply only if proper hand tools and special service tools are used.

The contents of this manual depicts parts and/or procedures applicable to a 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 vehicle illegal under existing federal, provincial and state regulations.

This manual emphasizes particular information which, is 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 provided 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.

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 CATALOGS*.

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

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

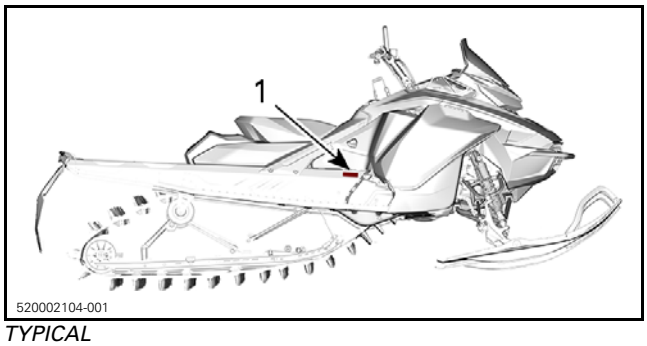
The information and component/system descriptions contained in this manual are correct at time of writing. BRP however, maintains a policy of continuous improvement of its products without imposing upon itself any obligation to install them on products previously manufactured.

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.

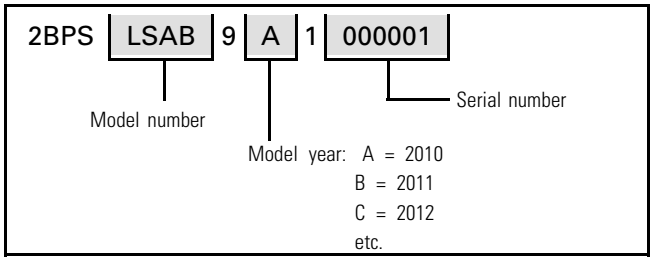
VEHICLE INFORMATION

VEHICLE IDENTIFICATION NUMBER (VIN)

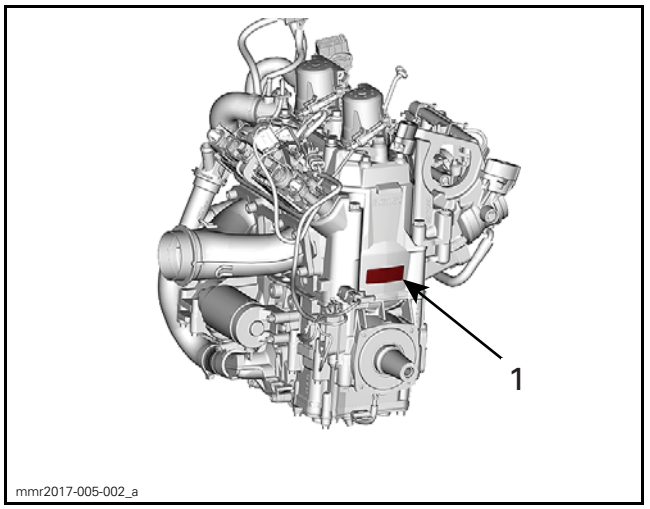


TYPICAL
1. Vehicle description decal

Identification Number Description



ENGINE IDENTIFICATION NUMBER (EIN)

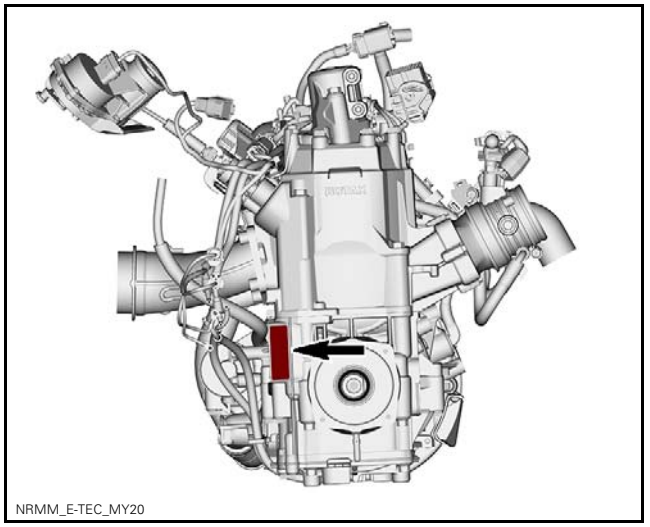


TYPICAL
1. Engine serial number

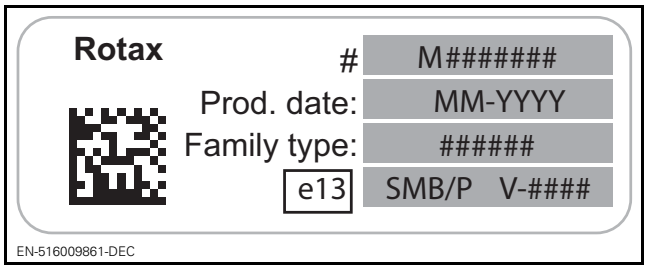
COMPLIANCE LABEL

Regulation (EU) 2016/1628 applicable for Non-Road Mobile Machineries

Vehicles who comply to Regulation (EU) 2016/1628 (NRMM) are identified on the engine.

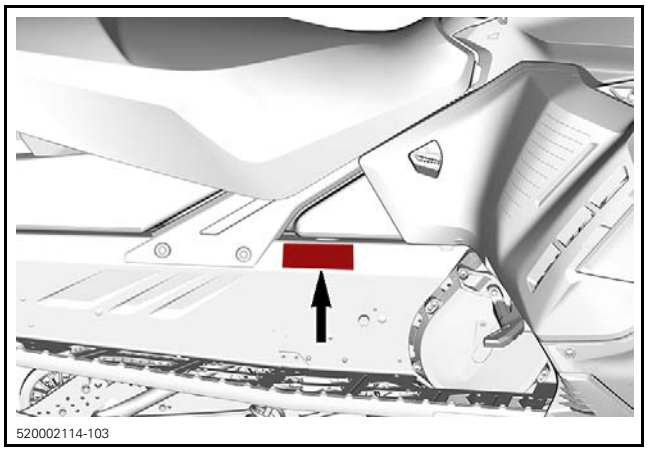


TYPICAL

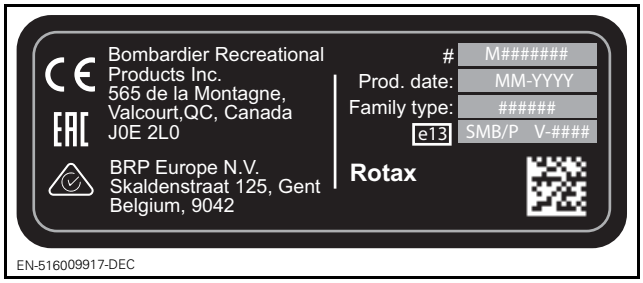


TYPICAL NRMM IDENTIFICATION

Depending on your particular vehicle configuration, an additional NRMM identification decal may be installed on the tunnel, near the chaincase.



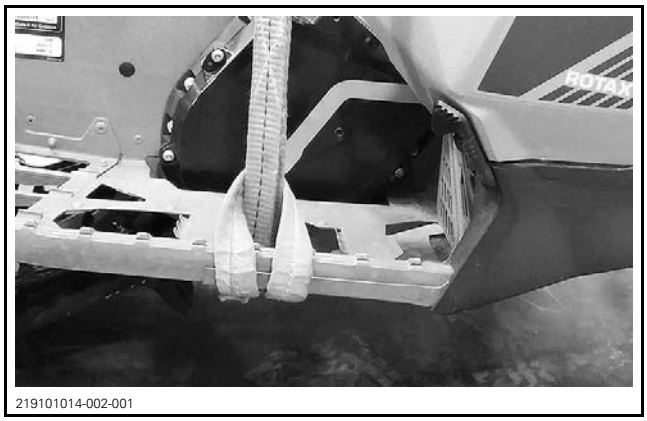
TYPICAL - ON RH SIDE OF TUNNEL



TYPICAL NRMM IDENTIFICATION ON VEHICLE

SNOWMOBILE LIFTING

To lift the snowmobile securely, place the loops of the lifting tool around the rollers at the front of the footrests.



NOTICE Do not use other footrest openings or steering column to lift the snowmobile. Frame or steering system could be seriously damaged.

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 manufacturer's prescribed changes.

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

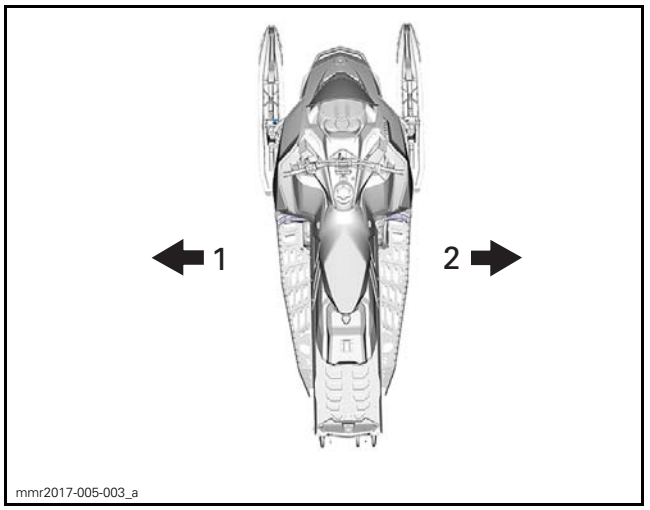
Many of the procedures in this manual are interrelated. Before undertaking any task, you should read and thoroughly understand the entire section or subsection in which the procedure is contained.

⚠ WARNING

Unless otherwise specified, the engine should be turned OFF and cold for all maintenance and repair procedures.

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

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



1. Left
2. Right

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

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

NOTICE **Most fasteners are metric, and most components are built with parts dimensioned using the metric system. Consult the appropriate *PARTS CATALOG* to obtain and use the correct parts and fasteners. Mismatched or incorrect fasteners could cause damage to the vehicle.**

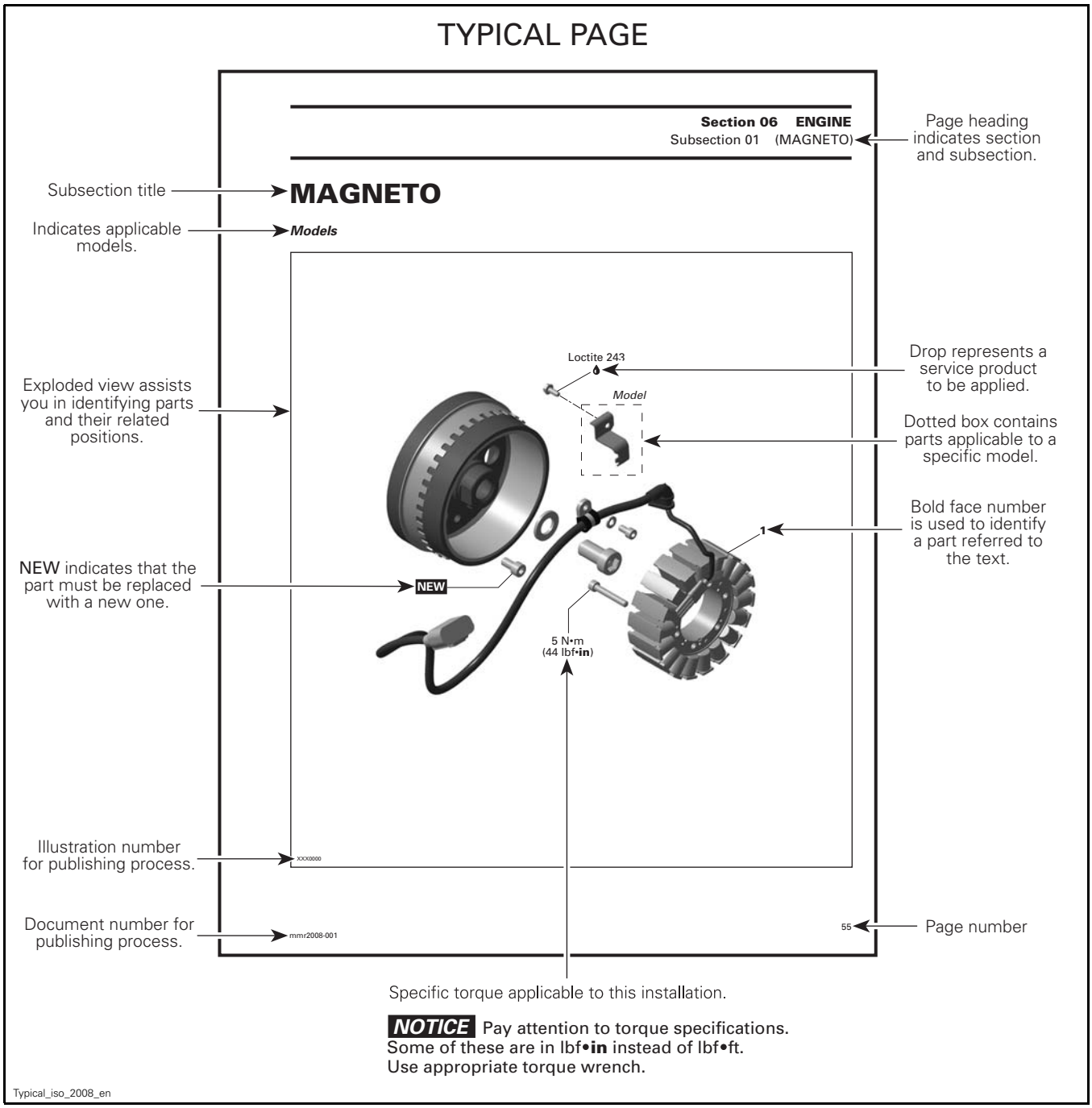
MANUAL LAYOUT

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

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

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

TYPICAL PAGE



TYPICAL PAGE

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

GENERAL

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

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

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

Reference to a specific section or subsection.

⚠ 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

Indicates component procedures apply to.

MAGNETO FLYWHEEL

Magneto Flywheel Cleaning

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

CAUTION: Clean magneto flywheel using only a clean cloth.

Indicates specific procedure to be carried out.

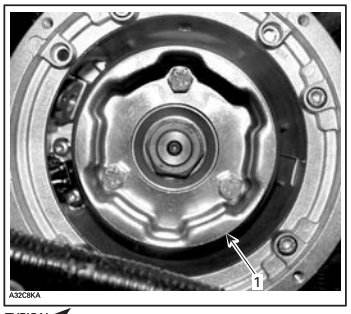
Magneto Flywheel Removal

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

Remove acoustic panel.

Remove rewind starter.

Remove starting pulley **no. 2**.



TYPICAL
1. Starting pulley

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

Call-outs pertaining to above illustration.

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

TYPICAL

Illustration always follows text to which it applies.

Models

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

Italic bold face typesetting indicates a procedure applicable to a specific model(s).

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

typical_txt_2008_en

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, refer to the following table.

⚠ 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.

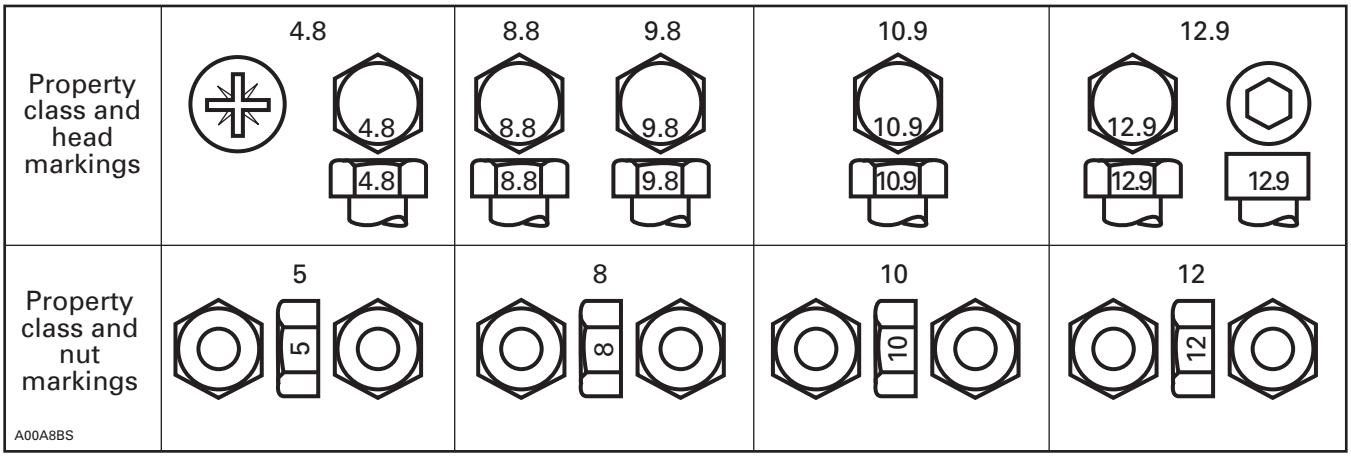
In order to avoid a poor assembly, tighten screws, bolts, or nuts in accordance with the following procedure:

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

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

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

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



FASTENER SIZE	FASTENER GRADE/TORQUE			
	5.8 Grade	8.8 Grade	10.9 Grade	12.9 Grade
M4	1.5 – 2 N•m (13 – 18 lbf•**in**)	2.5 – 3 N•m (22 – 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 – 15 N•m (93 – 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 components in the vehicles are built with parts dimensioned in the metric system. Most fasteners are metric and must not be replaced by customary fasteners or vice-versa. Mismatched or incorrect fasteners could cause damage to the vehicle or possible personal injury.

SELF-LOCKING FASTENERS PROCEDURE

TYPICAL — SELF-LOCKING FASTENER

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

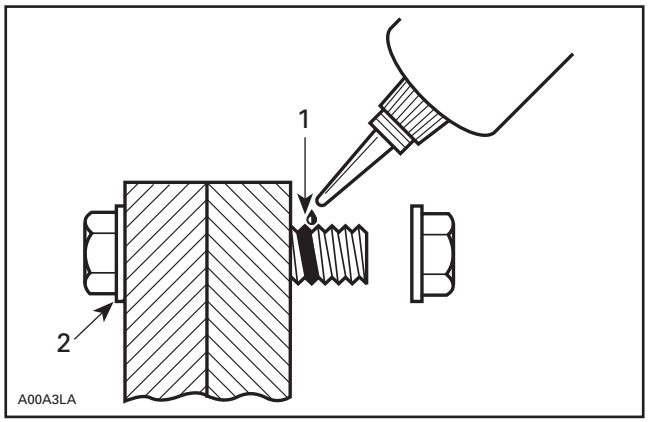
Use a metal brush or a tap to properly clean a threaded hole, then use a solvent. Allow the solvent time to act, approximately 30 minutes, then wipe off. Solvent utilization is to ensure proper adhesion of the product used for locking the fastener.

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.

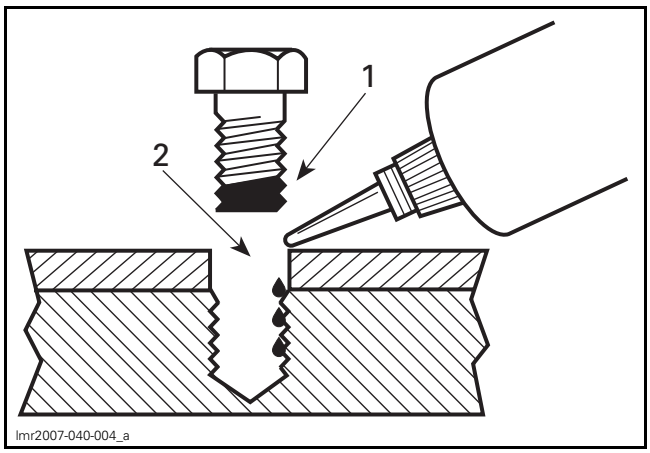
Threadlocker Application for Uncovered Holes (Bolts and Nuts)



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

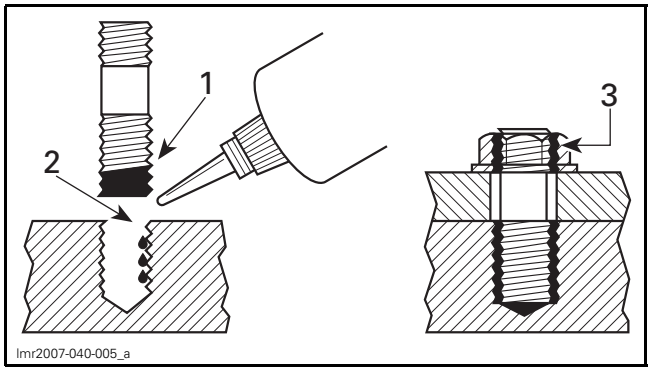


1. On fastener threads
2. On threads and at the bottom of hole

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.

Threadlocker Application for Stud Installation in Blind Holes



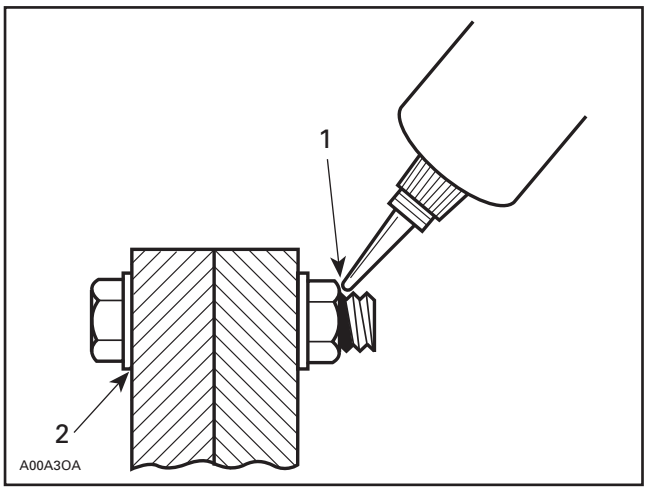
1. On stud threads
2. On threads and in the hole
3. On retaining nut threads

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

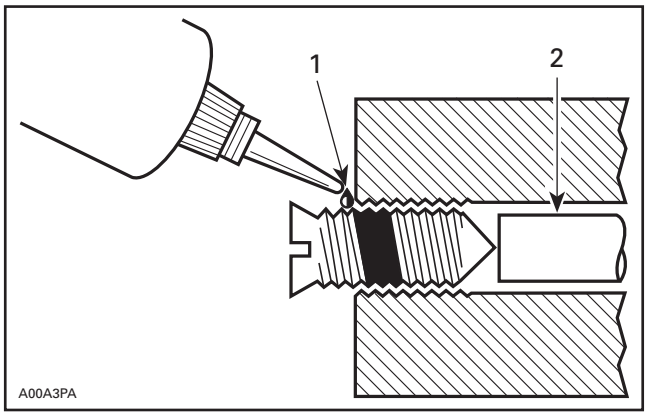


1. Apply here
2. Do not apply

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

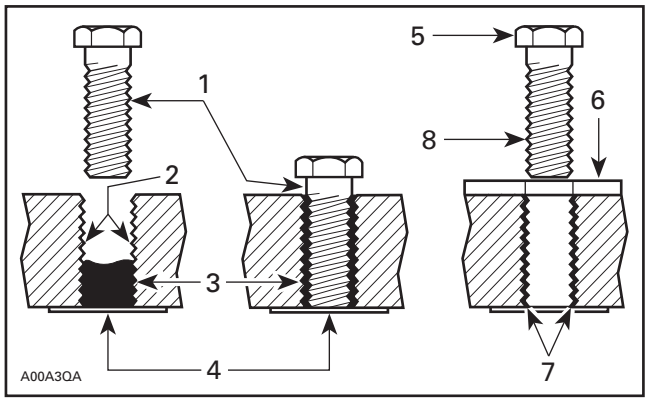


1. Apply here
2. Plunger

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

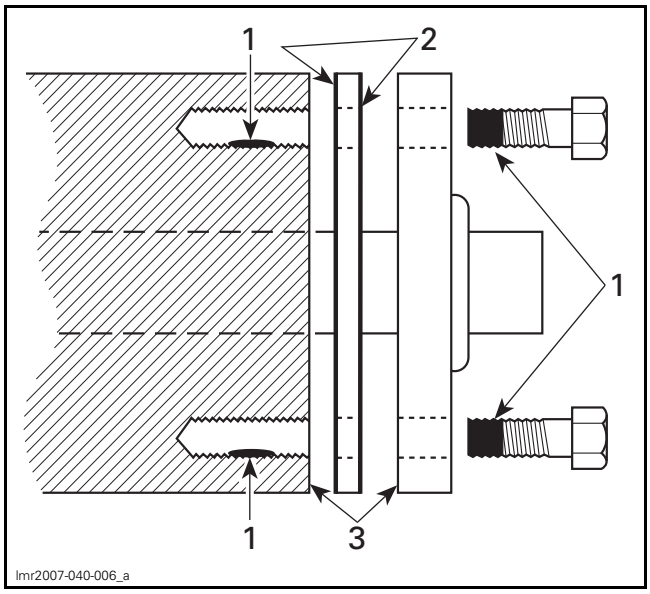
Option 1: Enlarge damaged hole, then follow *STANDARD THREAD REPAIR* procedure.

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 (P/N 293 800 041) and Gasket Eliminator 518 (P/N 293 800 038) on both sides of gasket
3. Loctite Primer N only

1. Remove old gasket and other contaminants using Loctite chisel (gasket remover). Use a mechanical means only if necessary.

NOTE: Avoid grinding.

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

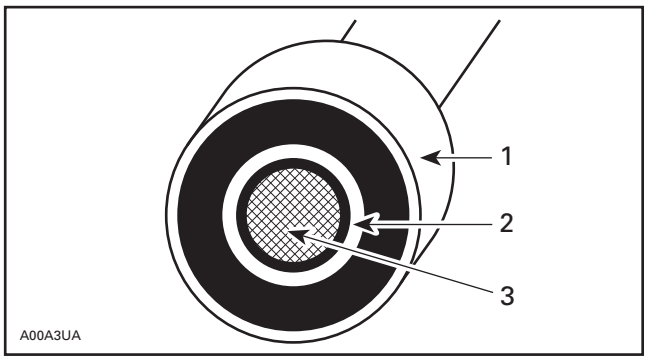
NOTE: If the cover is bolted to blind holes, apply proper strength Loctite in the hole and on threads. Tighten fastener.

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

6. Tighten as usual.

Threadlocker Application for Mounting on a Shaft

Mounting with a Press



1. Bearing
2. Proper strength Loctite
3. Shaft

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

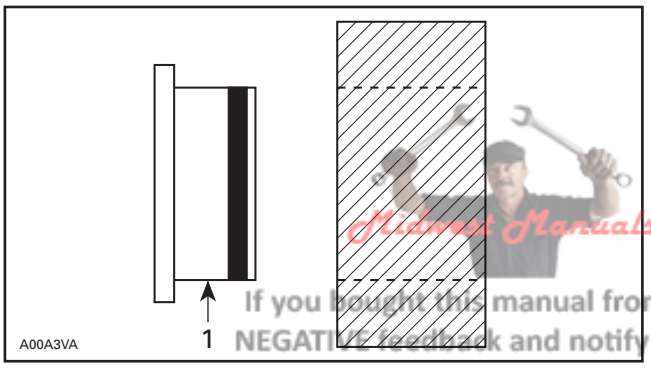
NOTE: Retaining compound is always forced out when applied on shaft.

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

Mounting in Tandem

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

Threadlocker Application for Case-In Components (Metallic Gaskets)



1. Proper strength Loctite

1. Clean inner housing diameter and outer gasket diameter.
2. Spray housing and gasket with Loctite 7649 (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.

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PERIODIC MAINTENANCE SCHEDULE

Procedures are detailed in appropriate subsections.

PRE RIDE INSPECTION	
Body including seat, footrests, lights, air filter, controls and instruments	Check condition and remove snow or ice
Skis and steering actions	Check for free movement and proper operation
Fuel and injection oil	Check for proper level and no leaks
Coolant	Check for proper level and no leaks
Brake fluid	Check for proper level and no leaks
Storage compartment	Check for proper latching and no heavy or breakable objects
Throttle lever	Check for proper action
Track	Check condition and remove snow or ice
Slider shoes	Check for proper operation
Brake lever	Check for proper operation
Parking brake, brake	Check for proper operation
Emergency engine stop switch and engine cut-off switch (tether cord cap)	Check for proper action. Tether cord must be attached to operator clothing eyelet
Lights	Check for proper operation
Skis and runners	Check for proper condition (and operation if adjustable)
Drive belt	Check condition for cracks, fraying or abnormal wear

DURING THE FIRST 1 500 KM (1,000 MI)
Adjust drive chain **after the first 75 km (50 mi)**
Adjust drive chain **every 500 km (300 mi)**
Adjust and align track **after the first 75 km (50 mi)**
Verify track tension and alignment **every 500 km (300 mi)** adjust if required

EVERY 1 500 KM (1,000 MI)
Adjust drive chain
Verify track tension and alignment. Adjust if required

EVERY YEAR AT PRESEASON OR 3 000 KM (2,000 MI) (WHICHEVER COMES FIRST)
Perform pre-ride inspection
Check fault codes
Charge battery (if equipped)
Adjust drive chain
Verify track tension. Adjust and align if required
Inspect brake hose, pads and disk
Check coolant density

EVERY YEAR AT PRESEASON OR 3 000 KM (2,000 MI) (WHICHEVER COMES FIRST)
Inspect drive belt
Visually inspect and clean drive pulley
Inspect and clean driven pulley
Lubricate rear suspension. Lubricate whenever the vehicle is used in wet conditions (rain, puddles)
Inspect exhaust system and check for leaks
Tighten exhaust manifold screws to specified torque
Inspect fuel lines, oil lines and connections
Inspect front suspension
Inspect rear suspension (including stopper straps and slider shoes)
Inspect tie-rod ends and alignment
Adjust headlight beam aiming

EVERY 2 YEARS OR 6 000 KM (4,000 MI) (WHICHEVER COMES FIRST)
Replace brake fluid
Inspect throttle cable
Clean and lubricate rewind starter (manual start models)
Replace chaincase oil
Inspect engine rubber mounts

EVERY 3 YEARS OR 10 000 KM (6,000 MI) (WHICHEVER COMES FIRST)
Replace spark plugs
Inspect oil injection pump strainer and clean if needed
Clean Rave valves

EVERY 5 YEARS
Replace engine coolant
Replace in-line fuel filter

PERIODIC MAINTENANCE PROCEDURES

SERVICE TOOLS

Description	Part Number	Page
OETIKER PLIER	295 000 070	5
TENSIOMETER	414 348 200	7

SERVICE PRODUCTS

Description	Part Number	Page
CLUTCH AND PULLEY FLANGE CLEANER PRO S1	779244	5, 7
MOLYKOTE PG 54	420 899 763	1
SYNTHETIC GREASE SUSPENSION	779163	12
SYNTHETIC GREASE	779162	11

GENERAL

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

PROCEDURES

ENGINE

Cleaning and Lubricating the Rewind Starter

Refer to *REWIND STARTER ASSEMBLY* in *REWIND STARTER* subsection.

NOTICE It is of the utmost importance that the rewind starter spring be lubricated periodically using MOLYKOTE PG 54 (P/N 420 899 763). The use of standard multipurpose grease could result in rewind starter malfunction under very cold temperatures and component life will be shortened.

Cleaning the 3D RAVE Valve

NOTICE It is very important to perform *3D RAVE VALVE SYNCHRONIZATION* whenever link bar is removed. Refer to *RAVE* subsection.

Clean carbon deposits as required.

Thoroughly clean all *RAVE VALVES* components and cylinder slots.

Use a clean rag when cleaning the valve.

NOTE: Do not use any solvents or cleaners for cleaning the cylinder slots. Fluids can cause corrosion of the cylinder bore which may result in severe engine damage.

Inspecting the Rubber Mount

Check rubber mounts for cracks or other damages.

EXHAUST SYSTEM

Inspecting the Exhaust System

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

- Springs and retainers
- Exhaust system mounts
- Muffler
- Tuned pipe
- Donut gaskets
- Shields
- Manifold.

LUBRICATION SYSTEM

Inspecting and Cleaning the Oil Injection Pump Strainer

Refer to *OIL INJECTION PUMP* in *LUBRICATION SYSTEM* subsection.

Lubricating the Engine

Engine Storage Mode (Summerization Function)

Refer to *STORAGE PROCEDURE* subsection.

COOLING SYSTEM

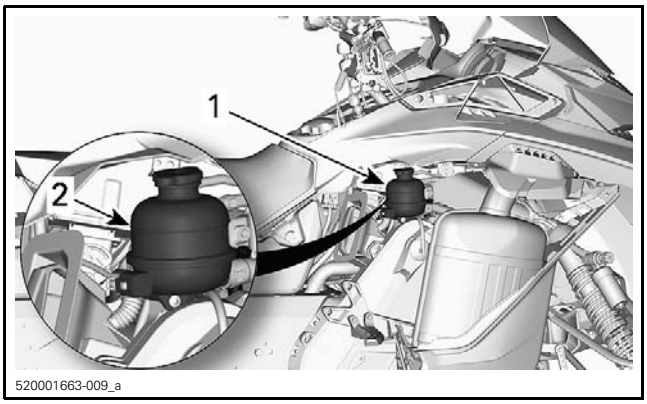
⚠ WARNING

Never open coolant tank cap when engine is hot.

Verifying the Engine Coolant Level

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

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



TYPICAL
1. Coolant tank
2. COLD LEVEL line

Verifying the Engine Coolant Strength

Remove pressure cap.

Use an antifreeze tester to test coolant strength.

MINIMUM RECOMMENDED COOLANT STRENGTH
-30°C (-22°F)

Replacing the Engine Coolant

Recommended Engine Coolant

RECOMMENDED SERVICE PRODUCT	ACCEPTABLE
(P/N 779150)	A blend of 50% distilled water with 50% antifreeze (especially formulated for aluminum engines

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

NOTICE To prevent rust formation or freezing condition, always replenish the system with the BRP premixed coolant or with 50% antifreeze and 50% distilled water. 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. During cold weather, straight water causes the system to freeze while straight antifreeze thickens (like slush ice) and does not have the same efficiency. Always use ethylene glycol antifreeze containing corrosion inhibitors specifically recommended for aluminum engines.

Draining the Cooling System

⚠ WARNING

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

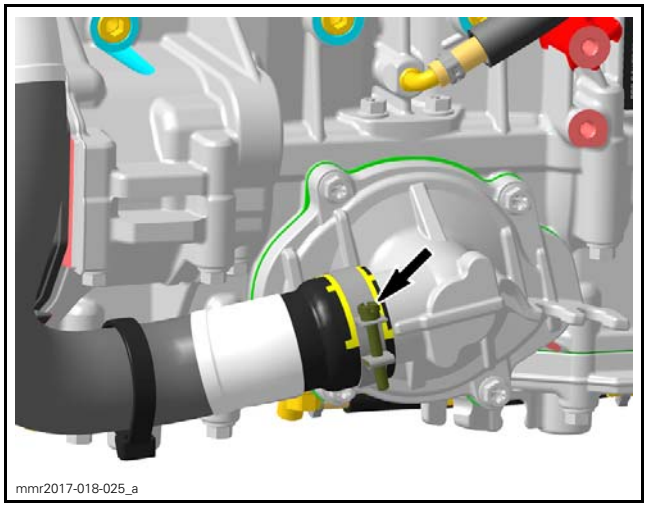
Remove RH side panel and hood. Refer to *BODY* subsection.

Remove muffler and tuned pipe. Refer to *EXHAUST SYSTEM* subsection.

Place a large drain pan under the vehicle bottom pan.

Remove clamp. Discard original installed gear clamp.

Unplug coolant hose from water pump to drain coolant.



REMOVE CLAMP (DISCARD ORIGINAL INSTALLED 1–EAR CLAMP)

When coolant level is low enough, lift the rear of vehicle to drain the heat exchangers.

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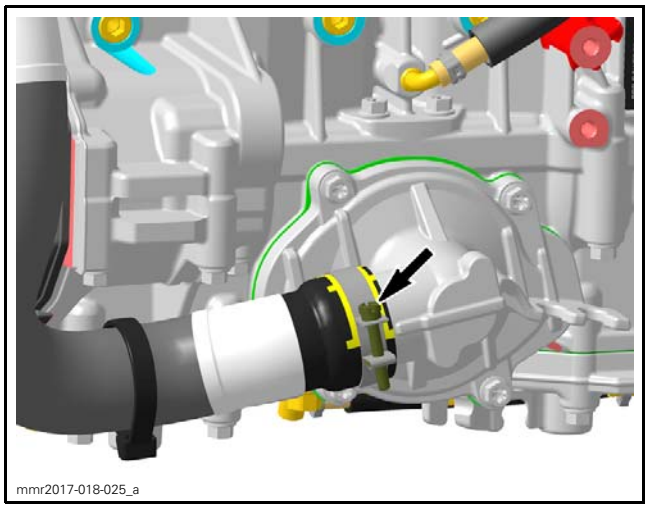
Install and tighten coolant hose clamp on water pump.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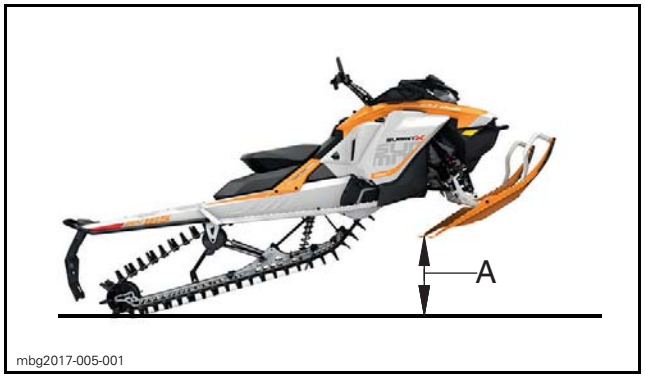
TIGHTENING TORQUE	
Coolant hose clamp	3 N•m ± 0.4 N•m (27 lbf•**in** ± 4 lbf•**in**)

Refilling and Bleeding the Cooling System

1. Apply parking brake.
2. Lift front of vehicle as shown and support it safely.



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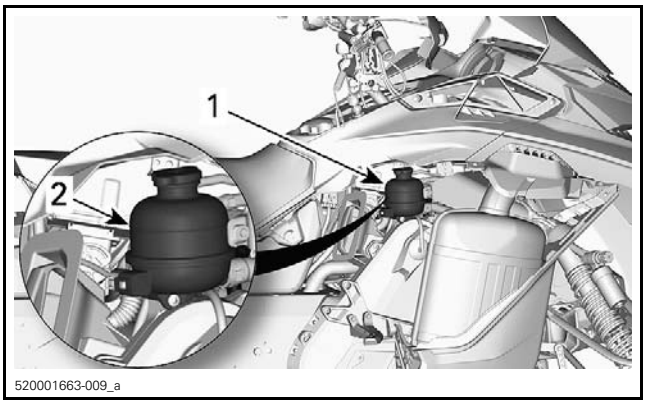
TYPICAL
A. 66 cm (26 in)

3. With engine cold, slowly fill coolant tank up to COLD LEVEL line allowing time for the air in the cooling system to seep out.



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TYPICAL
1. Coolant tank
2. COLD LEVEL line

4. Start engine.
5. Refill coolant tank up to COLD LEVEL line while engine is idling until rear heat exchangers are warm to the touch (about 4 to 5 minutes).

NOTE: Always monitor coolant level while filling coolant tank to avoid emptying and thus allowing air to enter the system.

6. Install pressure cap.
7. Lower vehicle back to the ground.

219100897-007-002

8. Lift rear of vehicle and support it safely.

219100897-007-003

⚠ WARNING

Before revving engine, ensure that the track is free of particles which could be thrown out while track is rotating. Keep hands, tools, feet and clothing clear of track. Always lift the snowmobile on a wide-base stand with a rear deflector panel. Ensure no one is standing in close proximity to the snowmobile, especially at the rear of the track. Centrifugal force could cause debris, damaged or loose studs, pieces of torn track, or an entire track to be violently thrown backwards out of the frame with tremendous force, possibly resulting in the loss of a leg or other serious injury.

9. Remove parking brake.
10. Activate throttle lever 3 - 4 times to bring engine speed to 7000 RPM.
11. Apply the brake.
12. Lower vehicle back to ground.
13. Stop engine.

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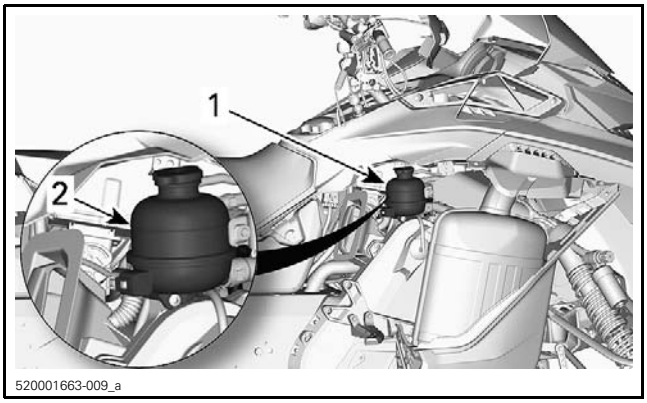
14. Add coolant up to 15 mm (1/2 in) above the COLD LEVEL line.



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TYPICAL
1. *Coolant tank*
2. *Coolant 15 mm (1/2 in) above COLD LEVEL line*

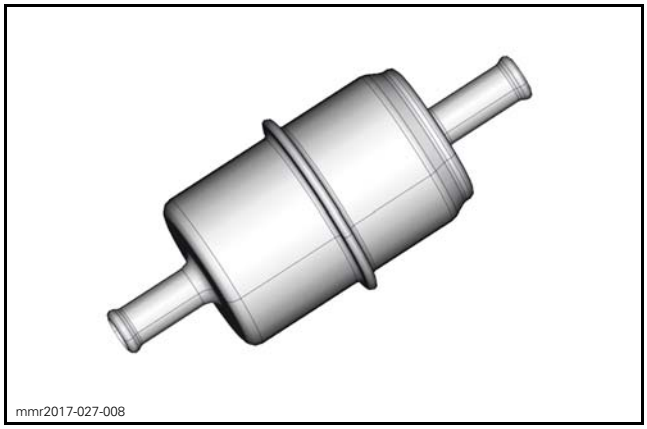
15. When engine has completely cooled down, recheck coolant level in coolant tank and refill up to line if needed.
16. Visual check for any leakages.
17. Perform *VERIFYING THE ENGINE COOLANT STRENGTH*. See procedure in this subsection.
18. Adjust mixture as necessary.
19. Reinstall removed parts.

FUEL SYSTEM

Inspecting the Fuel Lines and Connections

Visually inspect fuel lines and connections for cracks or leaks.

Replacing the In-Line Fuel Filter



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Removing the In-line Fuel Filter

⚠ WARNING

Work in a well ventilated area. Wipe up all spilled fuel.

1. Release fuel pressure in the system. Refer to *FUEL TANK AND FUEL PUMP* subsection.
2. Remove the upper body module. Refer to *BODY* subsection.
3. Disconnect magneto connector.

⚠ WARNING

The magneto connector must be disconnected to prevent any spark in the engine compartment and to remove power from the fuel pump. Otherwise, if the engine is cranked, fuel vapors may ignite in presence of a spark creating a fire hazard.

4. Place a rag between fuel filter and oil injection tank.
5. Cut both Oetiker clamps securing the fuel filter.
6. Remove fuel filter from vehicle.

Dispose fuel filter as per your local environmental regulations.

Installing the In-Line Fuel Filter

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

Insert new Oetiker clamps on both hoses.

Install the new filter. Make sure printed arrow pointed towards the ECM.

Using OETIKER PLIER (P/N 295 000 070), close Oetiker clamps to secure the fuel filter.

⚠ WARNING

Ensure hose clamp is tight and that hose cannot turn on the fitting.

When installation is complete, carry out a fuel system leak test, refer to *FUEL SYSTEM PRESSURIZATION* in *FUEL TANK AND FUEL PUMP* subsection.

⚠ WARNING

After working on the fuel system, carry out a fuel system pressurization test to check for leaks. Failure to carry out a fuel system leak test could result in severe injury or a life threatening situation should a leak occur.

Reinstall all removed parts.

Inspecting and Cleaning the Throttle Body

Clean throttle plates and throttle body bores.

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

Inspecting the Throttle Cable

Visually inspect cable sheath for kinks, wear or other damage.

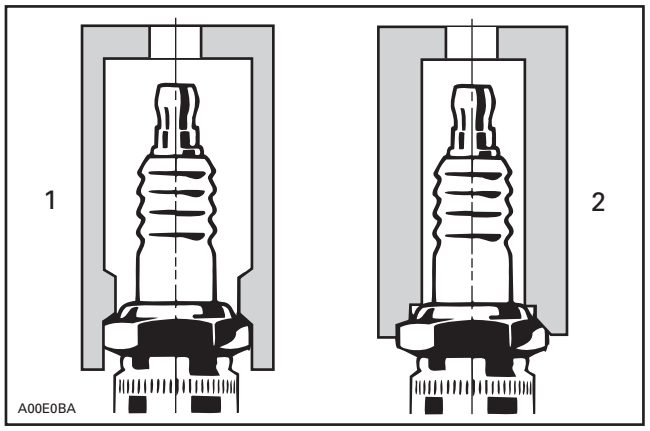
Visually inspect cable at throttle body/carburetor and at throttle lever for fraying or other damage.

Make sure the throttle cable operates smoothly.

SPARK PLUGS

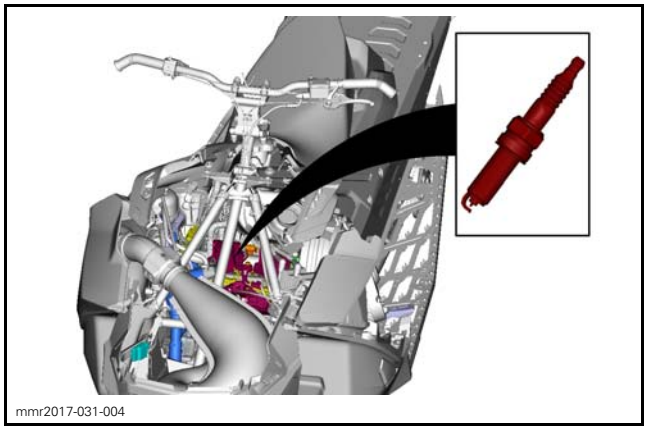
Replacing the Spark Plug

NOTE: Use only an approved spark plug socket for removal and installation. Extra care should be taken to avoid side resses which could result in a broken spark plug.



TYPICAL
1. *Approved socket*
2. *Improper socket*

Removing the Spark Plugs

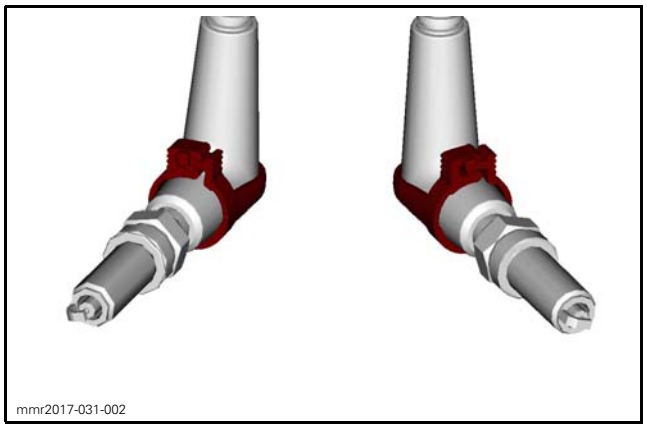


1. Disconnect the stator connector. Refer to *STATOR CONNECTOR ACCESS* in the *MAGNETO AND STARTER* subsection.
2. Remove the upper body module. For procedure, refer to *BODY* subsection.
3. Remove cover, refer to *TOP END* subsection.
4. Clean the spark plug and cylinder head with pressurized air.

⚠ WARNING

Whenever using compressed air, always wear protective eye wear.

5. Remove lock securing spark plug wire to spark plug.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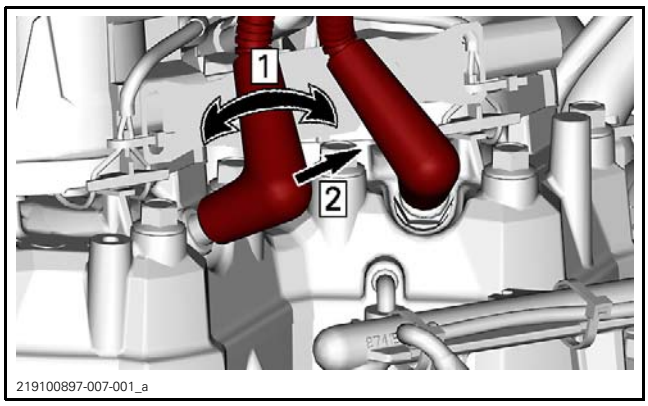
6. Remove spark plug cables as shown.



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Step 1: Gently rotate
Step 2: Pull off

7. Unscrew the spark plug sufficiently to break the applied torque using the appropriate tools.

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8. Remove spark plugs by hand.

Installing the Spark Plugs (OEM)

1. Prior to installation, ensure the contact surfaces of the cylinder head and spark plug are free of grime.
2. Using a wire gauge, confirm electrode gap is as specified. Refer to *TECHNICAL SPECIFICATIONS*.

NOTE: If spark plug gap is incorrect, use another spark plug.

3. Hand screw spark plug into cylinder head until it bottoms out.
4. Apply specific torque using a torque wrench and approved spark plug socket.

NOTE: Spark plug tightening torque is particularly important on this engine as it contributes to the proper positioning of the negative electrode.

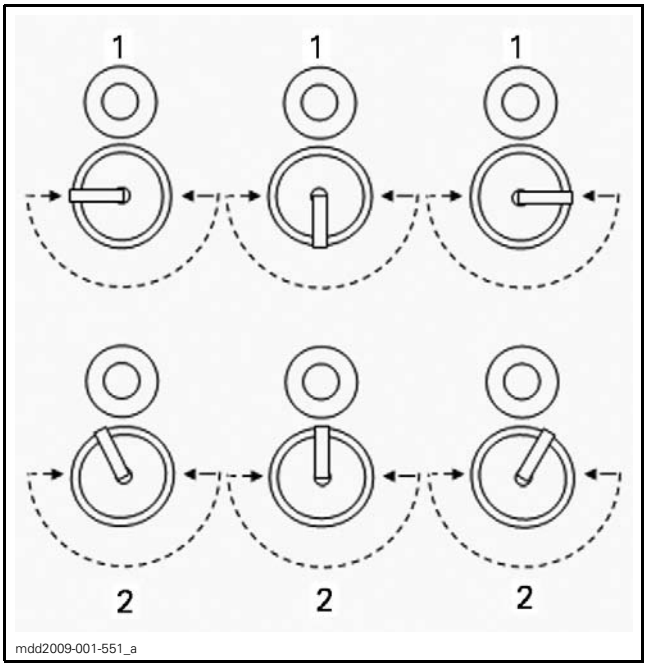
TIGHTENING TORQUE	
Spark plug	18 N•m ± 0.7 N•m (159 lbf•**in** ± 6 lbf•**in**)

Installing the Spark Plugs (Non-OEM)

NOTE: When using a non-OEM spark plug , it must be correctly indexed or engine may experience rough idling and higher emissions.

1. Using a marker, mark the open end of the negative electrode on the plug shell (above threads).
2. Ensure the contact surfaces of the cylinder head and spark plug are free of grime.
3. Install and torque the spark plug, refer to previous table for specific torque.
4. Visually check to ensure the open end of the negative electrode is facing the injector nozzle within 90° each side of nozzle.

NOTE: The following illustration uses the point of attachment of the negative electrode to depict the angle. The injector is illustrated above the spark plug.



SPARK PLUG INDEXING
1. Acceptable installation
2. Unacceptable installation

If the plug indexing angle is not within specification, repeat procedure with another spark plug until correct indexing is achieved.

LIGHTS

Adjusting the Headlights Beam Aiming

Refer to *LIGHTS* subsection.

DRIVE SYSTEM

Inspecting the Drive Belt

Refer to *DRIVE BELT* subsection.

Inspecting and Cleaning the Drive Pulley

Refer to *DRIVE PULLEY* subsection.

Drive Pulley Retaining Screw Tightening

Refer to appropriate *DRIVE PULLEY* subsection.

Inspection and Cleaning the Driven Pulley

Inspect pulley sheave for dirt, marks or scratches.

Test sliding sheave operation.

Use cleaner and a clean rag to clean pulley sheaves as necessary.

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

CHAINCASE

Refer to *CHAINCASE* subsection for information and procedures regarding

– Chaincase oil
– Drive chain adjustment
– Tensioner replacement.

TRACK

Adjusting and Aligning the Track

Track tension and alignment are interrelated. Do not adjust one without checking the other. Track tension procedure must be carried out prior to track alignment.

Verifying the Track Tension

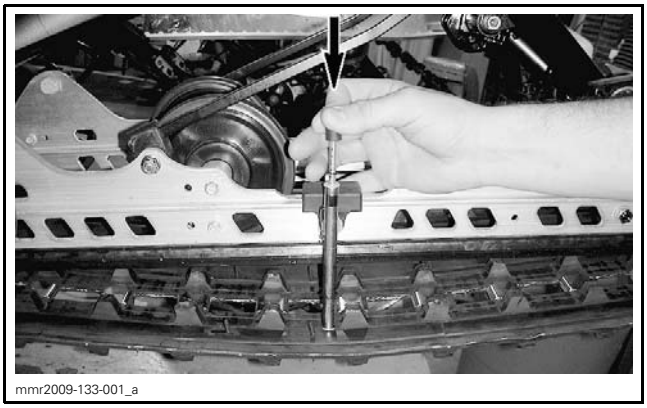
1. Lift rear of vehicle and support it off the ground.
2. Allow rear suspension to fully extend.
3. Use a tensiometer.

REQUIRED TOOL	
TENSIOMETER (P/N 414 348 200)	

4. Set deflection to 3.2 cm (1.26 in) using bottom O-ring.

DEFLECTION SETTING
1. Bottom O-ring

5. Place upper O-ring to 0 kgf (0 lbf).
6. Position the tensiometer on track, halfway between runner ends.
7. Push the tensiometer downwards until bottom O-ring (deflection) is aligned with the bottom of slider shoe.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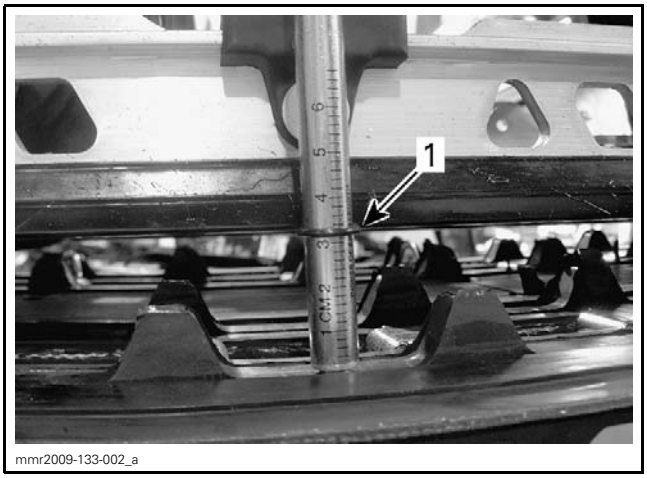
TYPICAL



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1. Deflection O-ring aligned with slider shoe

8. Read load recorded by the upper O-ring on the tensiometer.

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LOAD READING
1. Upper O-ring

Load reading must be as per the following table.

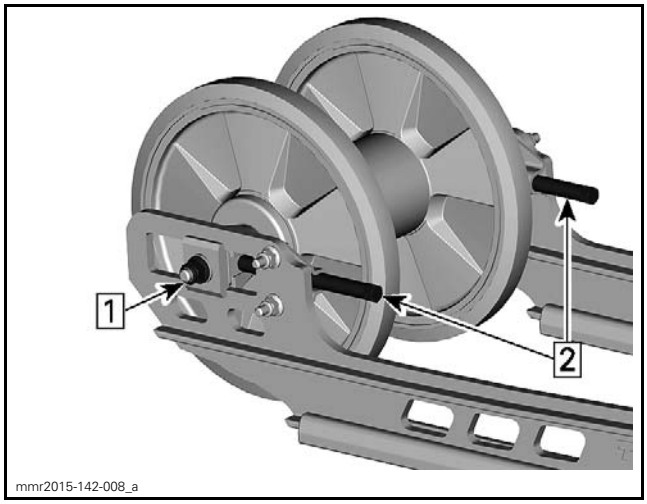
TRACK ADJUSTMENT SPECIFICATION	
Track deflection setting	3.2 cm (1.26 in)
Track load reading	6.0 kgf to 8.5 kgf (13 lbf to 19 lbf)

9. If load reading is not in accordance with the specification, adjust track tension. Refer to *ADJUSTING THE TRACK TENSION*.

NOTICE Too much tension will result in power loss and excessive stresses on suspension components.

Adjusting the Track Tension

1. Lift rear of vehicle and support it off the ground.
2. Loosen rear axle
   2.1 Loosen nut on 2 wheel idler system
   2.2 Loosen screw on 3 or 4 wheel idler system
3. Tighten or loosen both adjustment screws to increase or decrease track tension.



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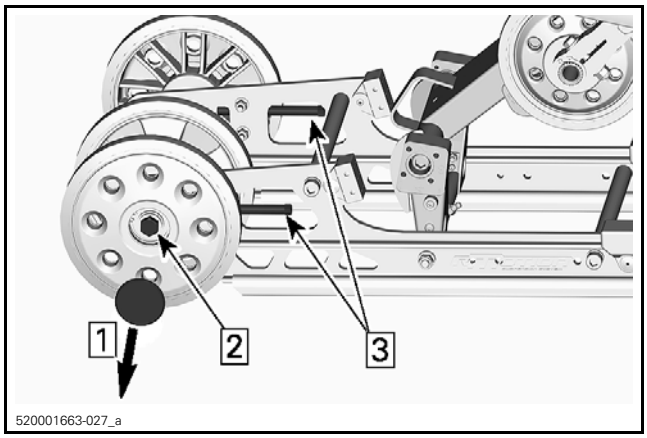
TYPICAL - 2 IDLER WHEELS MODELS
Step 1: Loosen axle nut
Step 2: Tighten or loosen adjustment screws



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TYPICAL - 3 OR 4 IDLER WHEELS MODELS
Step 1: Remove caps
Step 2: Loosen one the axle screw
Step 3: Tighten or loosen adjustment screws

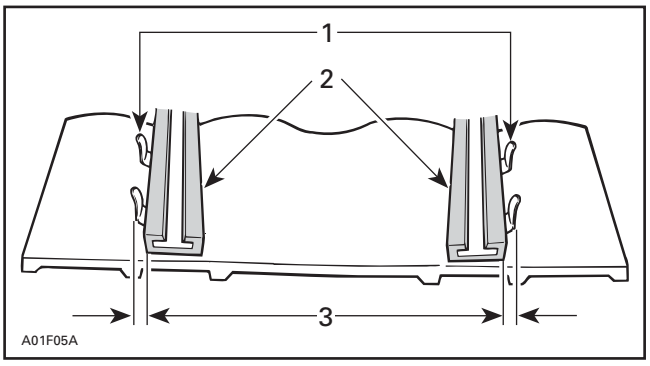
4. Verify track tension, refer to *VERIFYING THE TRACK TENSION*.
5. Ensure track is properly aligned, refer to *ALIGNING THE TRACK*.

Aligning the Track

⚠ WARNING

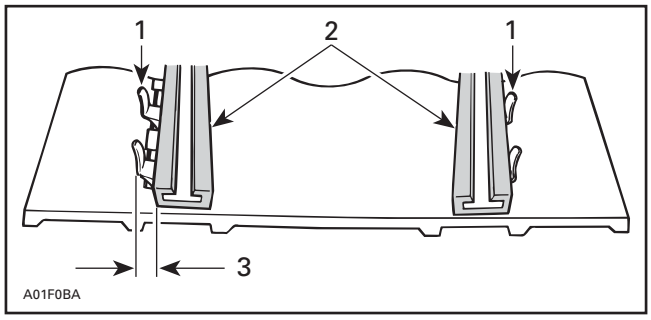
Before checking track alignment, ensure that the track is free of all particles which could be thrown out while track is rotating. Keep hands, tools, feet and clothing clear of track. Ensure no one is standing in close proximity to the vehicle. Never rotate at high speed.

1. Lift rear of vehicle and support it off the ground.
2. Start engine and accelerate slightly so that track barely turns. This must be done in a short period of time (10 seconds).
3. Check that the track is well centered; equal distance on both sides between edges of track guides and slider shoes.



1. Guides
2. Slider shoes
3. Equal distance

4. To correct track alignment:
   - 4.1 Stop engine.
   - 4.2 Loosen rear wheel nut.
   - 4.3 Tighten adjustment screw on side where the slider shoe is the farthest from the track insert guides.



1. Guides
2. Slider shoes
3. Tighten on this side

5. Restart engine.
6. Rotate track slowly and recheck alignment.
7. If satisfactory track alignment is achieved tighten idler wheels axle nut to specification:

TIGHTENING TORQUE	
Rear idler wheel retaining screws **(3 and 4 idler wheels system)**	48 N•m ± 6 N•m (35 lbf•ft ± 4 lbf•ft)
Rear idler wheel retaining nut and screw **(2 idler wheels system)**	24.5 N•m ± 3.5 N•m (18 lbf•ft ± 3 lbf•ft)

BRAKE

Recommended Brake Fluid

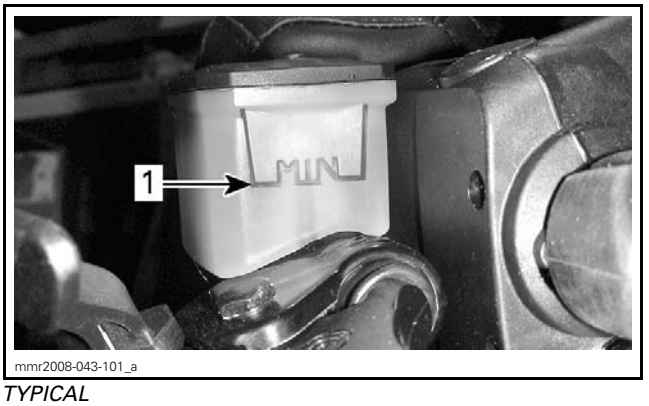
Always use brake fluid meeting the DOT 4 specification.

RECOMMENDED SERVICE PRODUCT
(P/N 779151)

Verifying the Brake Fluid Level

With the vehicle on a level surface, position steering in the straight-ahead position to ensure reservoir is level.

Brake fluid must always be above the MIN. line when brake lever is squeezed.



TYPICAL
1. MINIMUM line

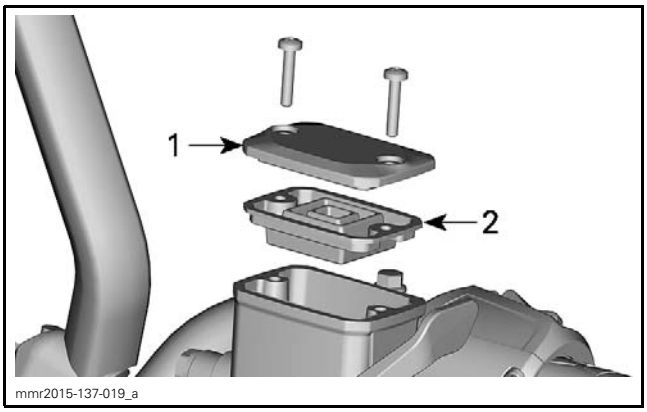
Add fluid as required. Do not overfill.

NOTE: A low level may indicate leaks or worn brake pads.

Replacing the Brake Fluid

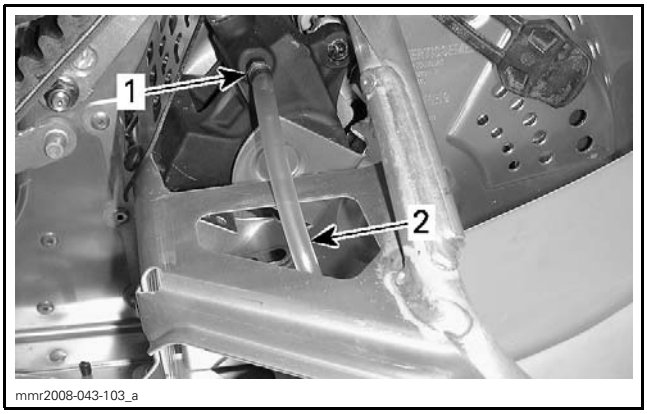
Draining the Brake Fluid

1. Place vehicle on a level surface.
2. Remove reservoir cover with its diaphragm.



1. Reservoir cover
2. Diaphragm

3. Connect a clear hose to caliper bleeder.
4. Place the other end of hose in a container.
5. Loosen bleeder and pump brake lever until no more fluid flows out of bleeder.



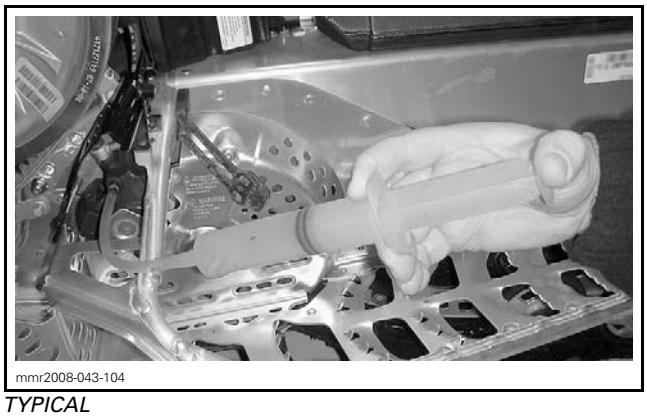
TYPICAL
1. Bleeder
2. Clear hose to catch used brake fluid

NOTE: To drain the fluid trapped in the caliper, push the pistons in.

Filling the Brake Fluid

To fill brake circuit when it is empty do the following:

1. Ensure reservoir cover is removed.
2. Using a large syringe and a suitable tube, push brake fluid slowly into the caliper.



TYPICAL

3. Continue to push brake fluid until master cylinder reservoir is half full.
4. Close bleeder.
5. Fill up reservoir and install diaphragm and cover.
6. Squeeze brake lever.
   6.1 If brake lever is firm, the brake system does not require bleeding. Torque bleeder as specified.

TIGHTENING TORQUE	
Brake caliper bleeder	8.5 N•m ± 1.5 N•m (75 lbf•**in** ± 13 lbf•**in**)

   6.2 If brake lever is spongy, bleed brake system as per following procedure.

Bleeding the Brake System

1. Install a clear hose on bleeder.
2. Place the other end in a container partially filled with clean brake fluid.
3. Remove reservoir cover and diaphragm.
4. Pump up circuit pressure with brake lever until lever resistance is felt.
5. Squeeze brake lever and open bleeder. When lever touches the handlebar, do not release lever and close bleeder.
6. Release brake lever slowly.
7. Repeat the procedure until no more air bubbles appear in hose.

NOTE: Check fluid level often to prevent air from being pumped into the circuit.

8. Install cover and diaphragm on reservoir.
9. Squeeze brake lever.
   9.1 If brake lever is firm, bleeding procedure is completed. Torque bleeder as specified.
   9.2 If brake lever is still spongy, repeat step 2 to step 6.

10. Torque bleeder as specified.

TIGHTENING TORQUE	
Brake caliper bleeder	8.5 N•m ± 1.5 N•m (75 lbf•**in** ± 13 lbf•**in**)

11. Refill reservoir.
12. Install diaphragm and cover on reservoir.

Inspecting the Brake Hose, Pads and Disc

Break-In Inspection

Visually inspect the brake hose for leaks or any damage.

Visually inspect pads and disc for abnormal wear or any damage.

Scheduled Maintenance and Preseason

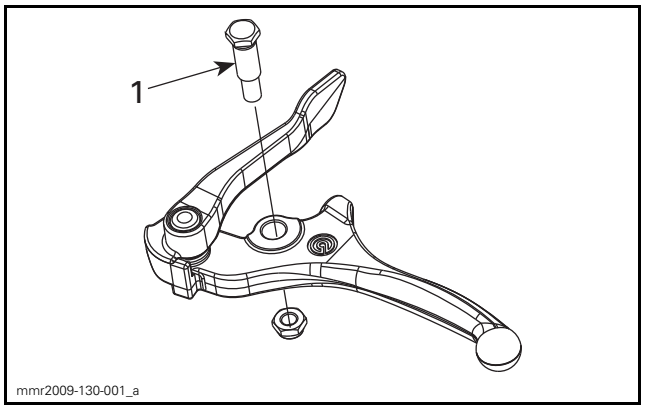
Visually inspect the brake hose for leaks or any damage.

Refer to *BRAKE* subsection and carry out:
– *INSPECTING THE BRAKE PAD*
– *INSPECTING THE BRAKE DISC*.

Lubricating the Brake Lever Pivot

1. Remove brake lever pivot.
2. Lubricate brake lever pivot using recommended product.

SERVICE PRODUCT
SYNTHETIC GREASE (P/N 779162)



1. Lubricate this surface

3. Install brake lever pivot.
4. Torque pivot nut of brake lever as specified.

TIGHTENING TORQUE	
Brake lever pivot nut	6 N•m ± 1 N•m (53 lbf•**in** ± 9 lbf•**in**)

SUSPENSION

Inspecting the Front Suspension

Visually inspect front suspension for tightness of components:
– Arms
– Stabilizer bar
– Shock absorbers
– Ball joints.

Rear Suspension, Stopper Strap and Slider Shoes

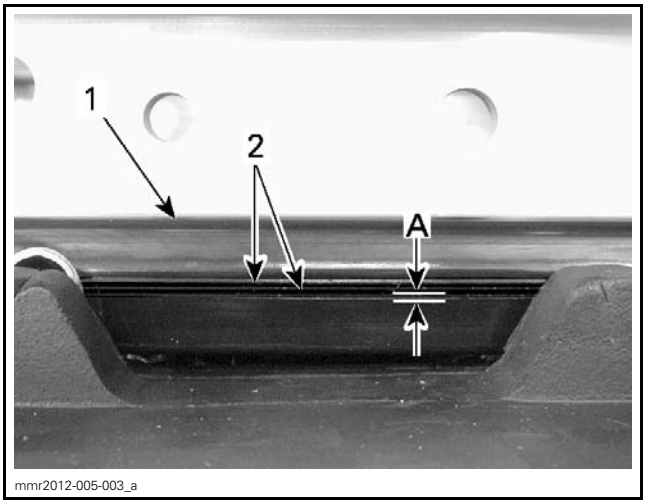
Inspecting the Rear Suspension Mechanism and Stopper Strap

1. Inspect rear suspension components for wear, deterioration or damage, replace defective parts if necessary.
2. Inspect stopper strap(s) for wear or cracks.
3. Check bolt and nut securing strap(s) for tightness. If loose, inspect strap holes for deformation. Replace strap if necessary.

Inspecting the Slider Shoes

Slider shoes are worn out and must be replaced when remaining material exceeding the 2 molding lines is as specified.

MINIMUM SLIDER SHOE THICKNESS
1 mm (.04 in) material remaining exceeding the 2 molding lines



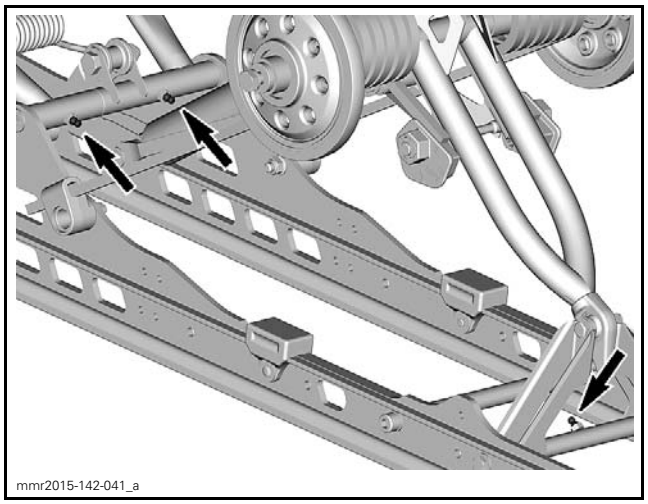
1. Slider shoe
2. Molding lines
A. Minimum thickness: 1 mm (.04 in)

NOTICE Slider shoes must always be replaced in pairs.

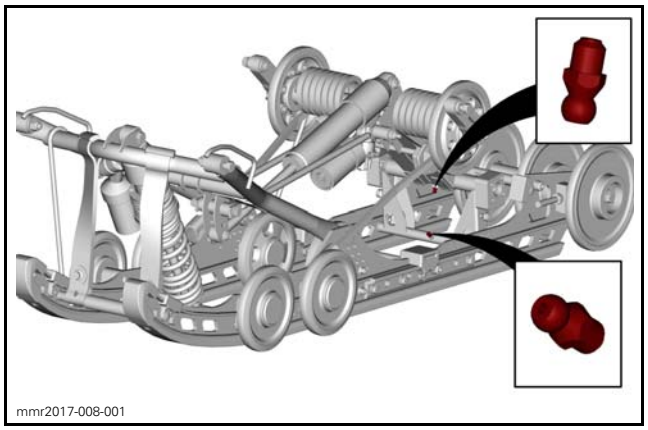
Lubricating the Rear Suspension

Lubricate the following suspension pivots at grease fittings.

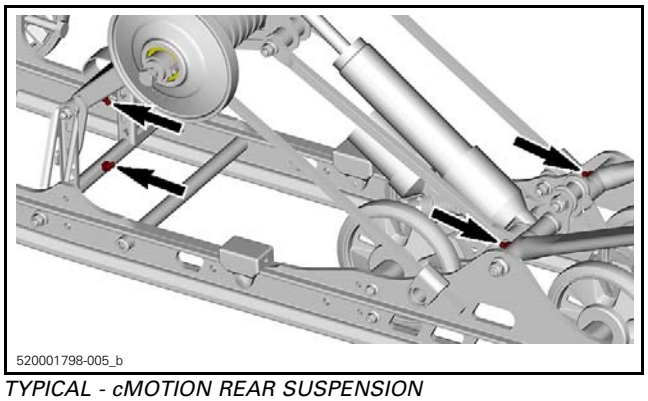
SERVICE PRODUCT
SYNTHETIC GREASE SUSPENSION (P/N 779163)



TYPICAL - tMOTION REAR SUSPENSION



TYPICAL - rMOTION REAR SUSPENSION



TYPICAL - cMOTION REAR SUSPENSION

STEERING

Inspecting the Ski and Runner

Lift the front of vehicle and check ski runners for wear or damage (missing or broken carbide). Replace if necessary.

Inspect ski for excessive wear or other damage. Replace if necessary.

Refer to *STEERING SYSTEM* subsection for adjustable ski mechanism inspection.

Inspecting the Steering Mechanism

Visually inspect steering mechanism for tightness of components (steering arms, tie rods, ski bolts, ski legs, etc.).

STORAGE PROCEDURE

During summer, or when a snowmobile is not in use for more than three months, proper storage is necessary.

For detailed procedure refer to appropriate *SHOP MANUAL* subsections.

STORAGE	
VEHICLE	Clean the vehicle
ENGINE	Lubricate engine. Refer to *ENGINE LUBRICATION* procedure.
	Block muffler with rags
	Add fuel stabilizer to fuel following the product manufacturer recommendations Run the engine after adding the product to the fuel
DRIVE SYSTEM AND BRAKE	Lubricate brake lever pivot
	Lift rear of vehicle until track is clear of the ground. Do not release track tension
SUSPENSION	Inspect and lubricate rear suspension
	Lubricate front and rear suspension
ELECTRICAL SYSTEM	Charge battery monthly to keep it fully charged during storage

⚠ CAUTION Use appropriate lifting device or have assistance to share lifting stress. If a lifting device is not used, use proper lifting techniques, notably using your legs force. Do not attempt to lift the rear of vehicle if it is above your limits.

NOTICE The snowmobile has to be stored in a cool and dry place and covered with an opaque but ventilated tarpaulin. This will prevent sun rays and grime from affecting plastic components and vehicle finish.

PROCEDURES

ENGINE LUBRICATION

Engine Storage Mode Using BUDS2

Connect the vehicle to the BRP diagnostic software (BUDS2). Refer to *COMMUNICATION TOOLS AND B.U.D.S.* subsection.

Select:
– **Functions** page
– **Vehicle** or **ECM** button
– **Routines** tab.

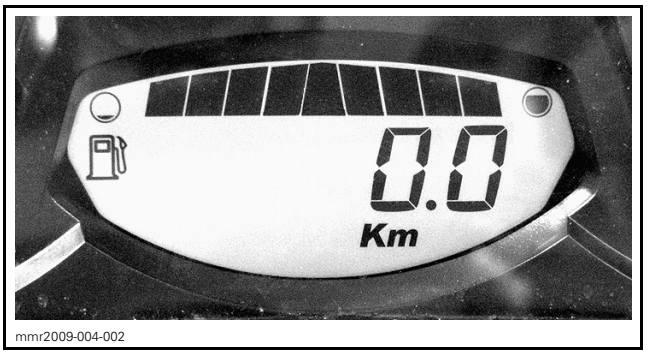
Click on the **Activate Storage** button.

Engine Storage Mode Using Multi-Function Gauge

Like other engines, the E-TEC has to be properly lubricated at storage for internal parts protection. The E-TEC system offers a built-in engine storage lubrication function (summerization) that can be initiated by the operator.

To engage procedure, do the following:

1. Place the vehicle in a well ventilated area.
2. Start the engine and let it run at idle speed until it reaches its operating temperature (watch the coolant temperature on the display or verify that the rear heat exchanger becomes warm).
3. Push the SET (S) button to select odometer mode.



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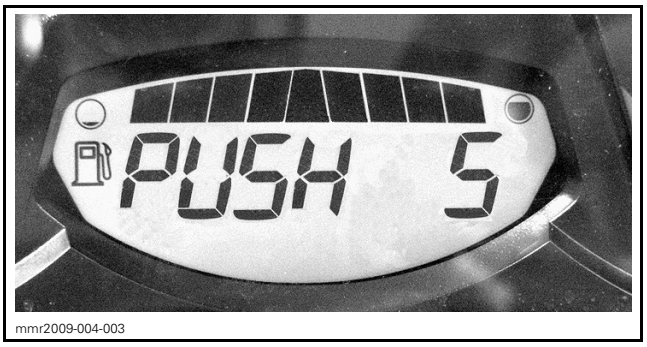
NOTE: The storage mode does not function in other modes (trip A, trip B and hr trip).

4. Repeatedly depress the HI/LOW beam switch rapidly, then, **while doing this**, press and hold the **SET button** until PUSH S appears on the display.



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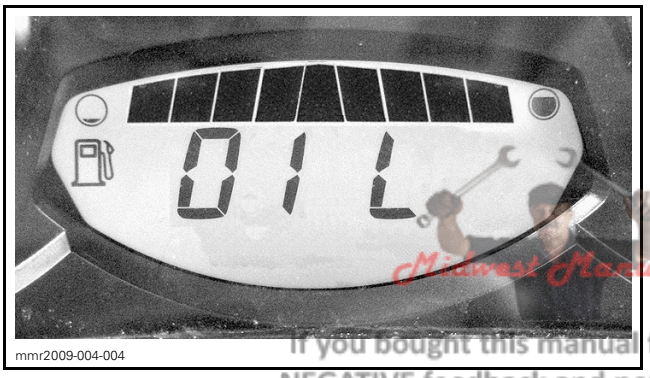
5. Release all buttons when gauge displays **PUSH "S"** appears.

6. Again, press and hold the SET (S) button for 2 - 3 seconds.

NOTE: The gauge will display OIL when the storage procedure is initiated.

7. When gauge displays **OIL**, release button and wait for the lubrication function to end.



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Do not touch anything during engine lubrication cycle.

The engine lubrication function takes approximately 1 minute. During this time, engine RPM will increase slightly to approximately 1600 RPM and the oil pump will "oil flood" the engine.

At the end of engine lubrication function, the ECM will stop the engine.

8. Remove tether cord cap from engine cut-off switch.

NOTICE **Do not start the engine during storage period.**

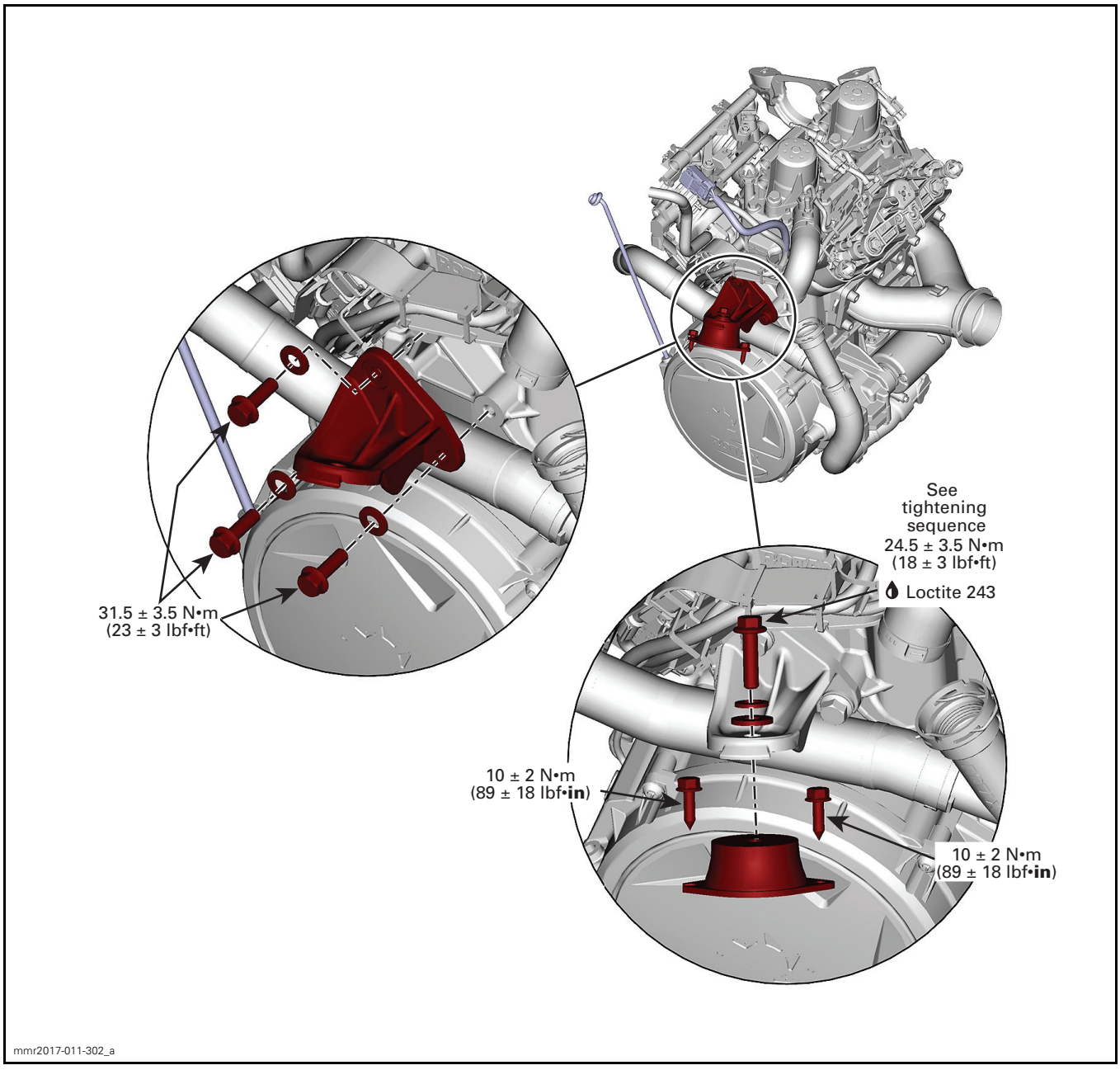
PRESEASON PREPARATION

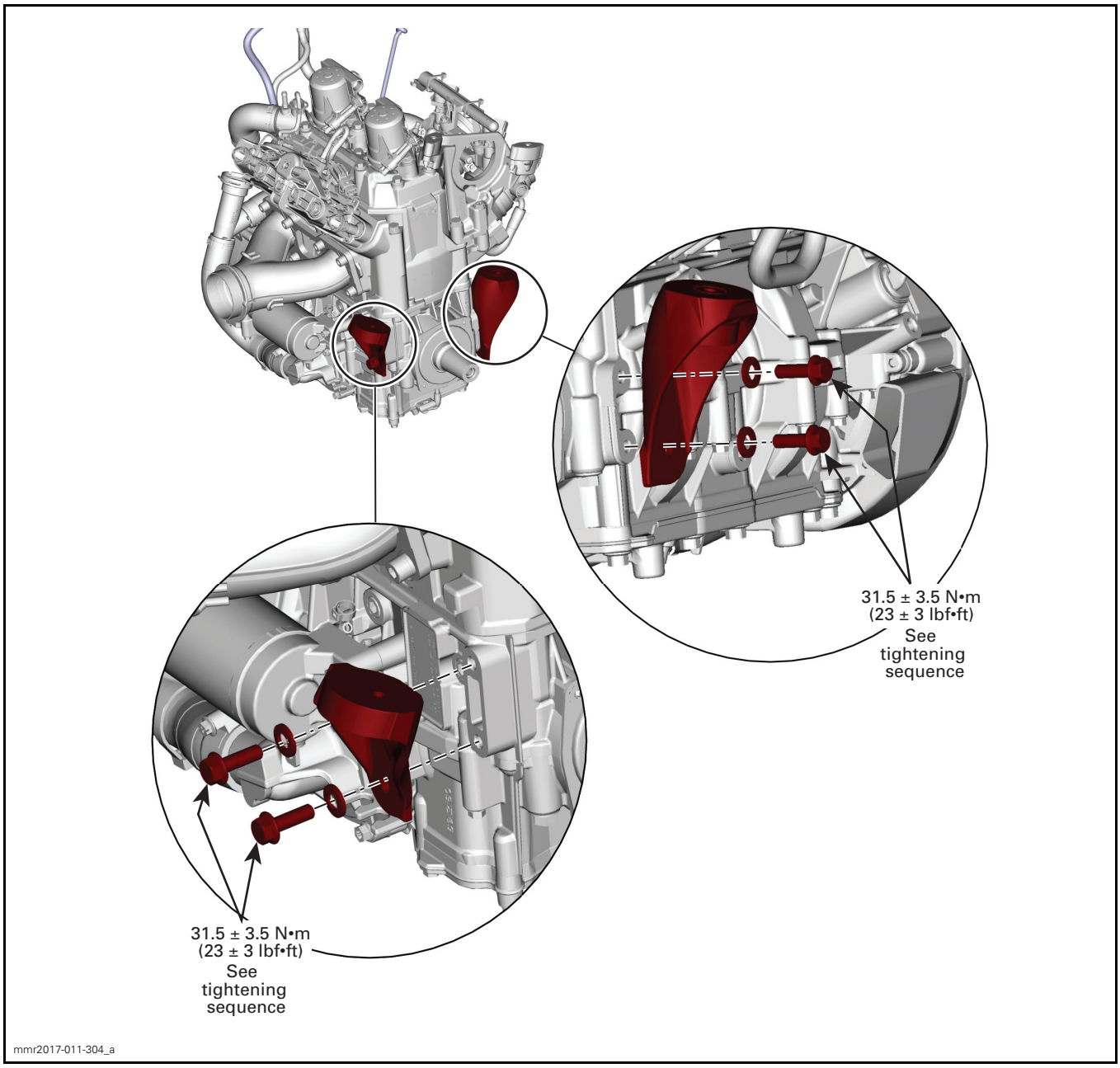
Proper vehicle preparation is necessary when a vehicle has not been used for more than three months. Using the *MAINTENANCE SCHEDULE*, perform the items titled *EVERY YEAR AT PRESEASON*.

ENGINE REMOVAL AND INSTALLATION

SERVICE TOOLS

Description	Part Number	Page
ENGINE LIFTING HOOK	529 035 829	9
ENGINE LIFTING TOOL	529 036 402	9
UPPER GEAR RETAINING TOOL	529 036 110	7




31.5 ± 3.5 N•m
(23 ± 3 lbf•ft)
See
tightening
sequence
31.5 ± 3.5 N•m
(23 ± 3 lbf•ft)
See
tightening
sequence
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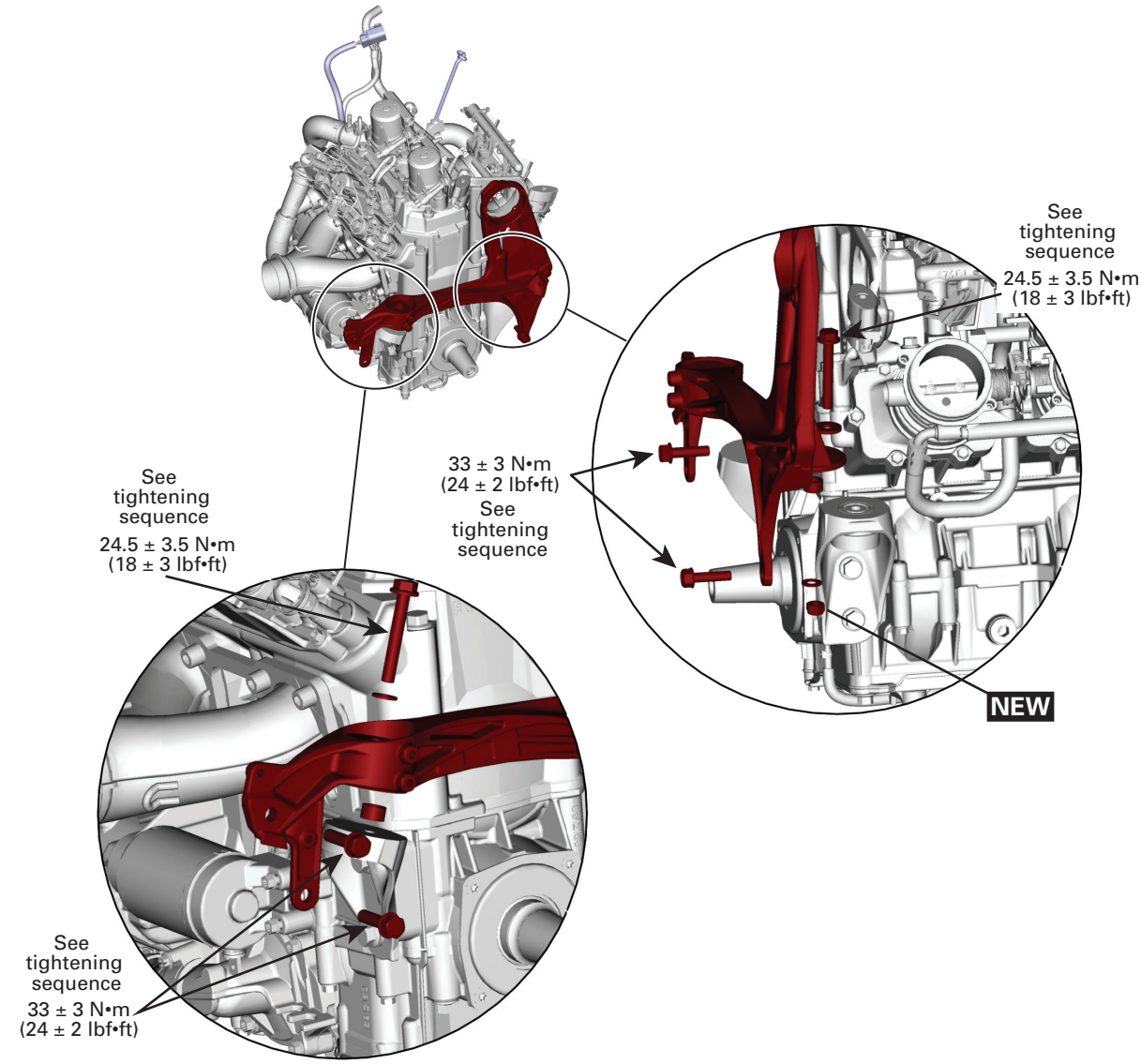

NEW = Component must be replaced when removed.

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GENERAL

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

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

⚠ WARNING

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

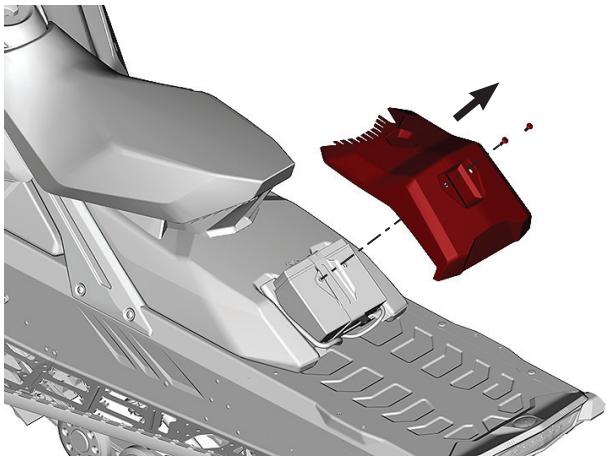
NOTICE **Hoses, cables and locking ties removed during a procedure must be reinstalled as per factory standards.**

PROCEDURES

ENGINE

Removing the Engine

1. Place vehicle at workstation that will have access to an engine-lifting hoist.
2. Remove fuel pressure. Refer to *ELECTRIC FUEL PUMP* in *FUEL TANK AND FUEL PUMP* subsection.
3. Disconnect the battery.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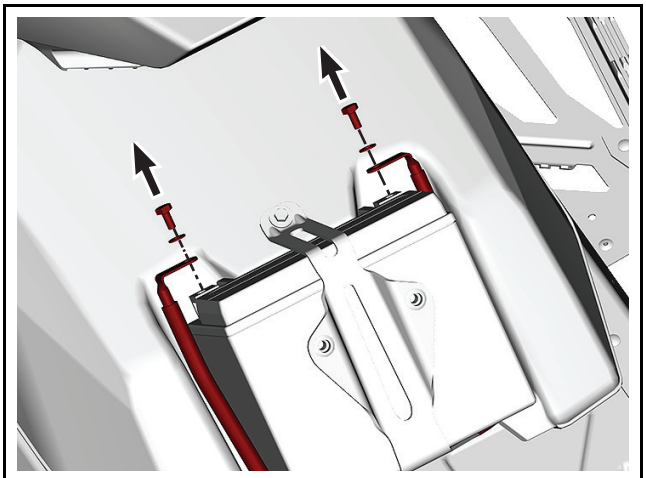
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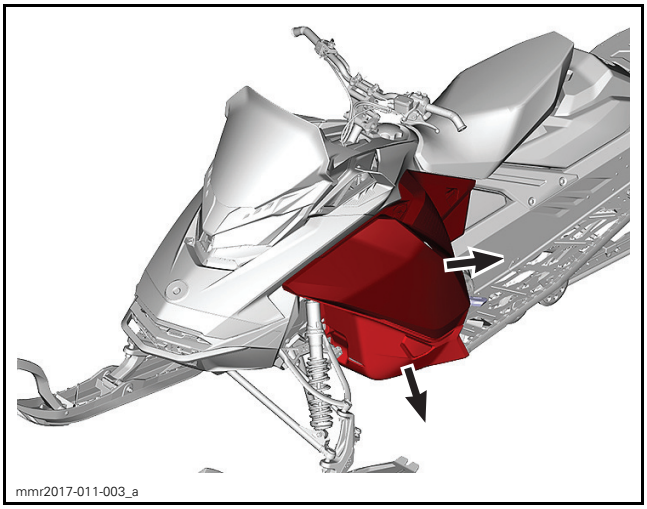
4. Remove the following parts. If required, refer to *BODY* subsection.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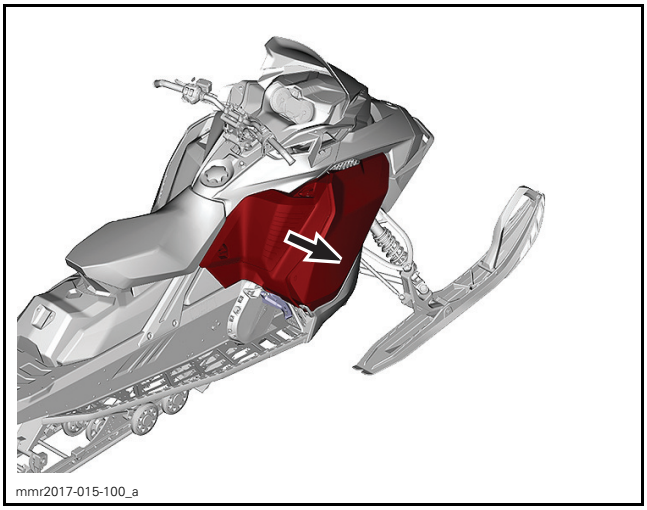
LH SIDE PANEL AND LH BOTTOM PAN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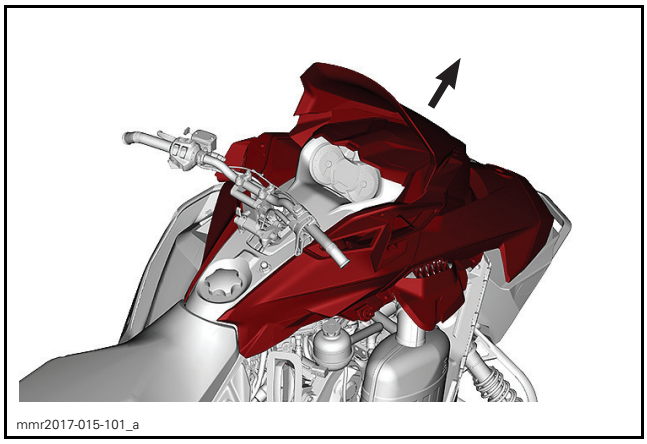
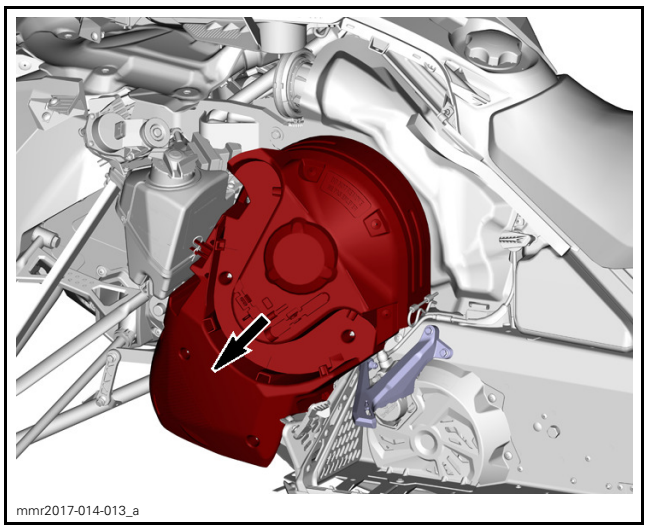
RH SIDE PANEL

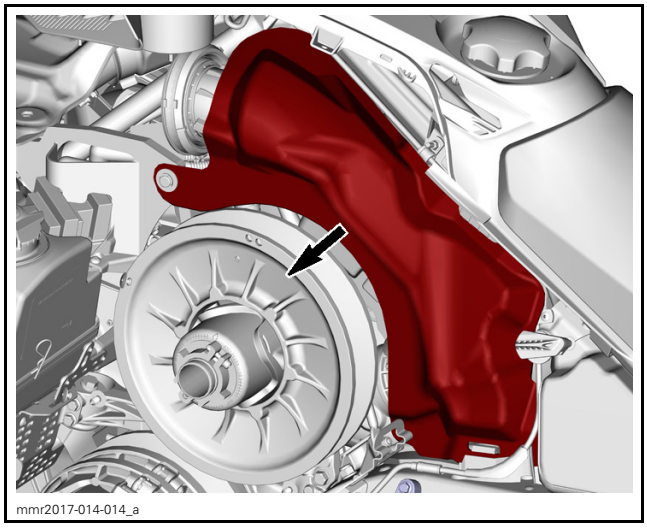


UPPER BODY MODULE

5. Remove the drive belt guard and acoustic panel.

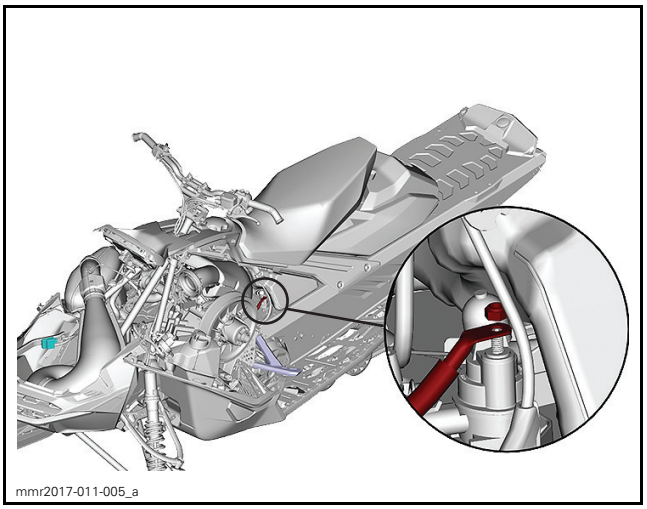


DRIVE BELT GUARD

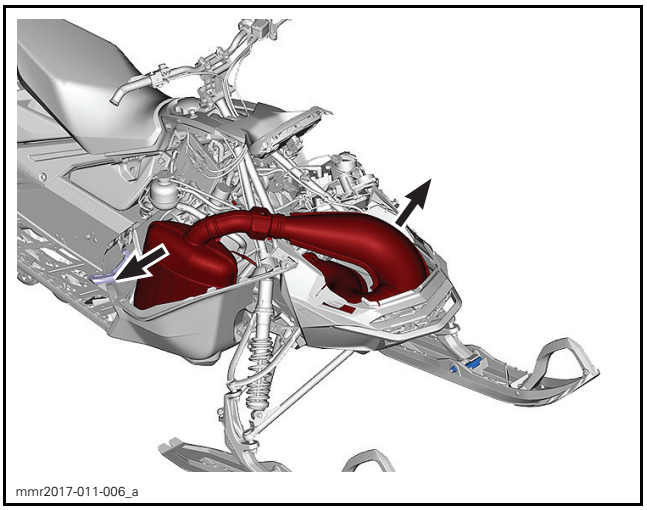


ACOUSTIC PANEL

6. Disconnect the BLACK wire from the starter solenoid.

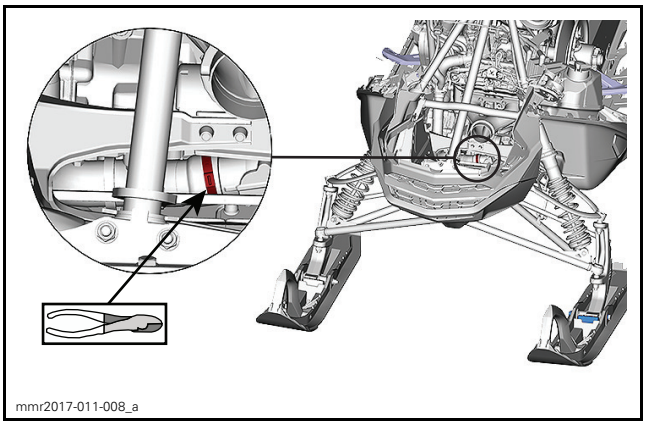


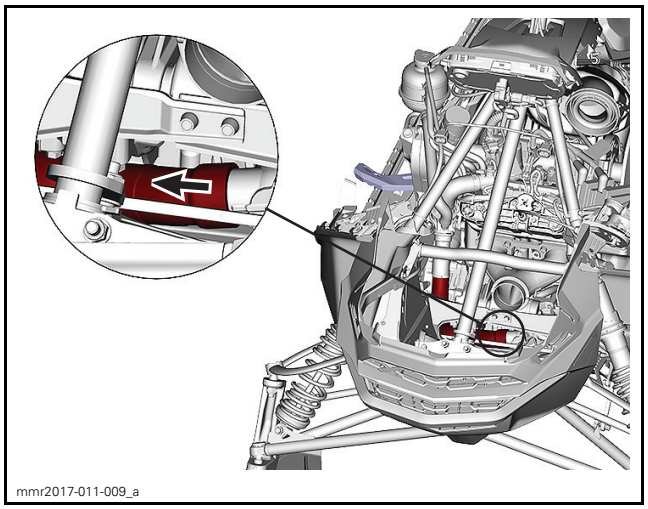
7. Remove the muffler and the tuned pipe. If required, refer to *EXHAUST SYSTEM* subsection.



8. Place a drain pan under the front of the vehicle.
9. Drain the coolant by detaching the front cooling hose from the engine then lift the rear of the vehicle

NOTE: At the installation, replace the ear clamp by an hose clamp.

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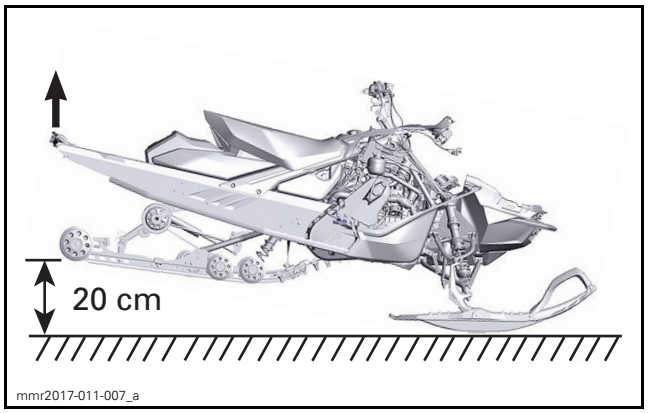

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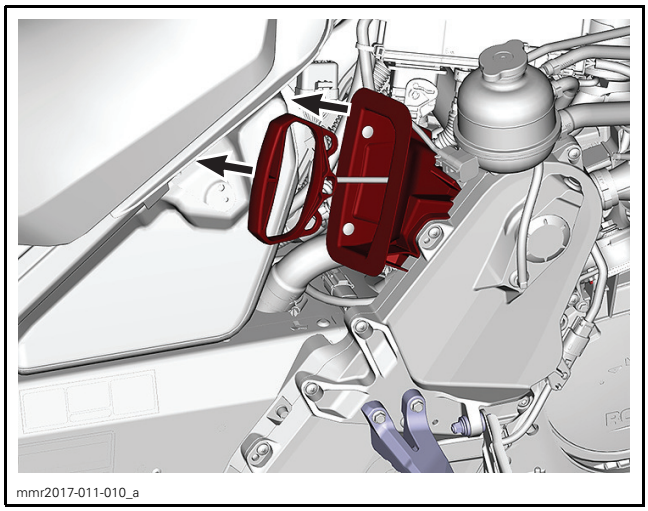
10. If equipped, remove the rewind starter handle and its housing.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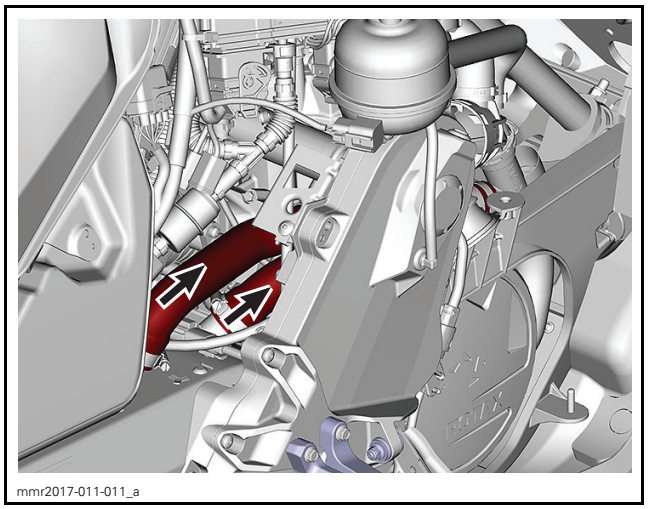
11. Unplug the inlet and outlet cooling hoses from the tunnel.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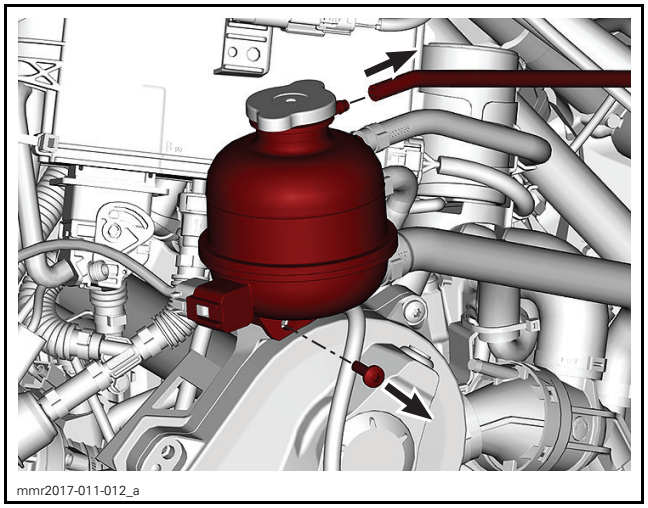
12. Detach the coolant tank from the top of the chaincase and unplug the vent hose from the tank.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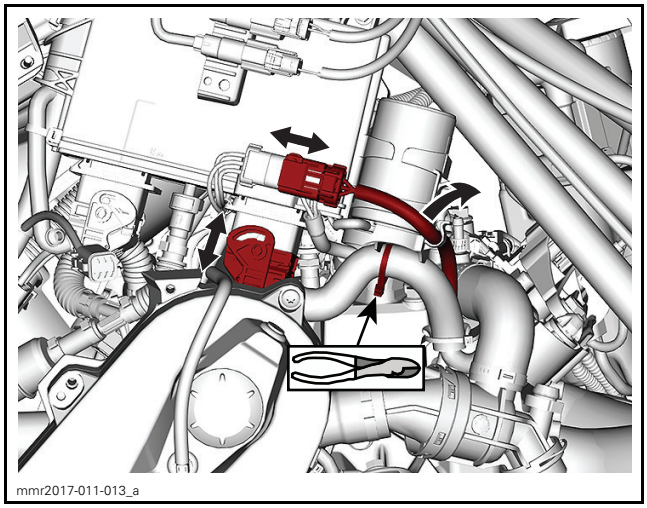
13. Disconnect the ECM connector A and the magneto connector.
14. Cut the locking tie retaining the engine harness to the capacitor support.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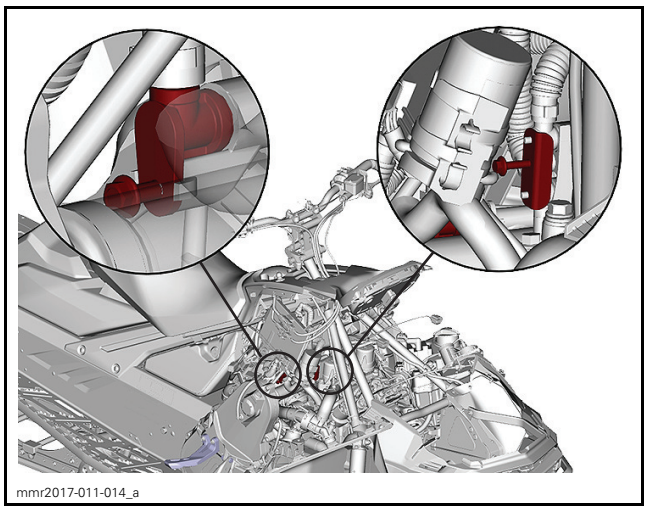
15. Unscrew fuel hoses from fuel rails.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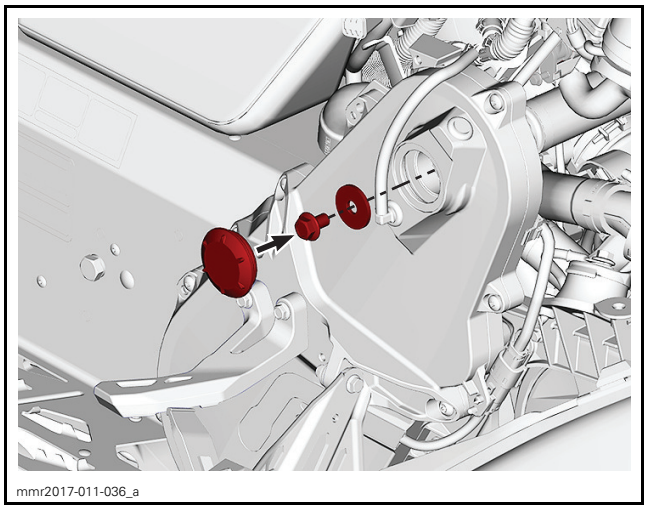
16. Apply parking brake and remove the upper gear screw and the conical spring washer.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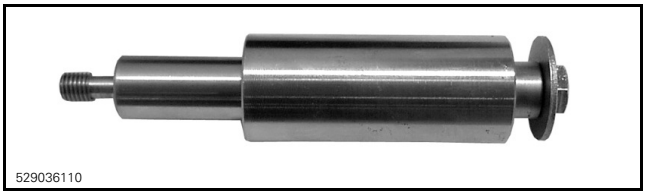
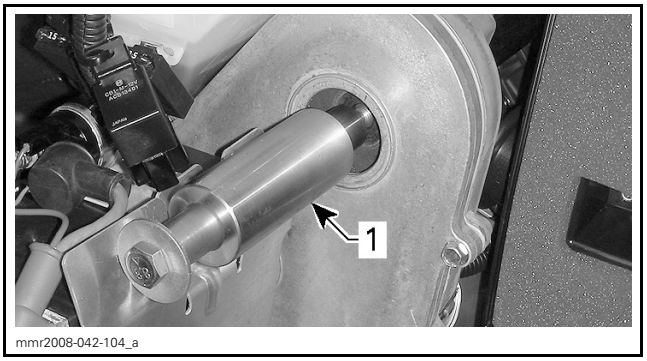
17. Install the UPPER GEAR RETAINING TOOL (P/N 529 036 110) on countershaft end.


529036110



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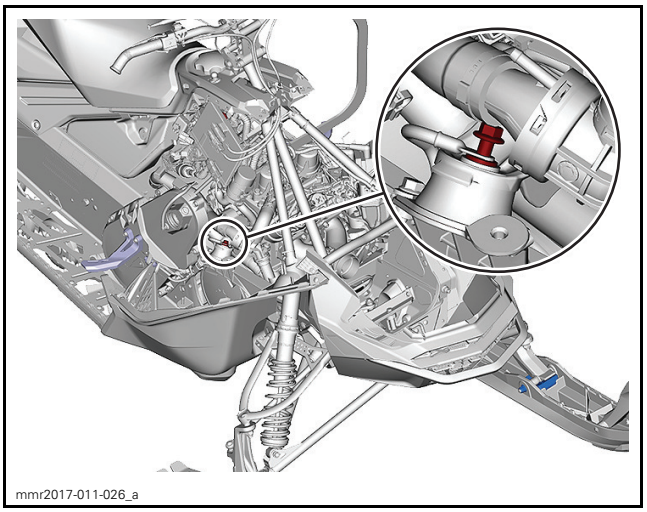
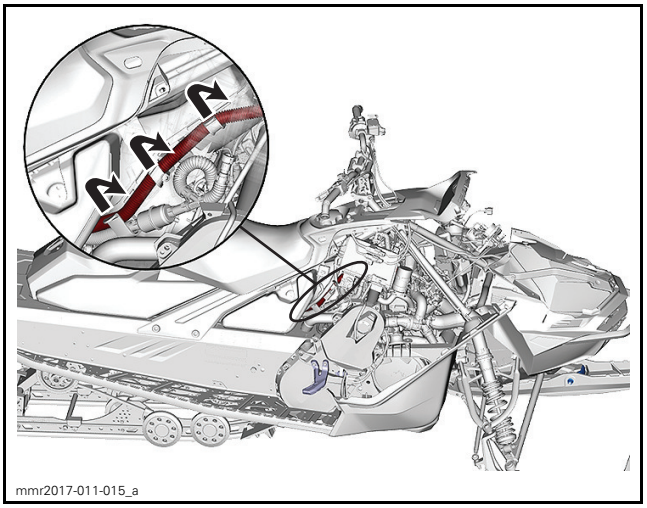
TYPICAL
1. Upper gear retaining tool

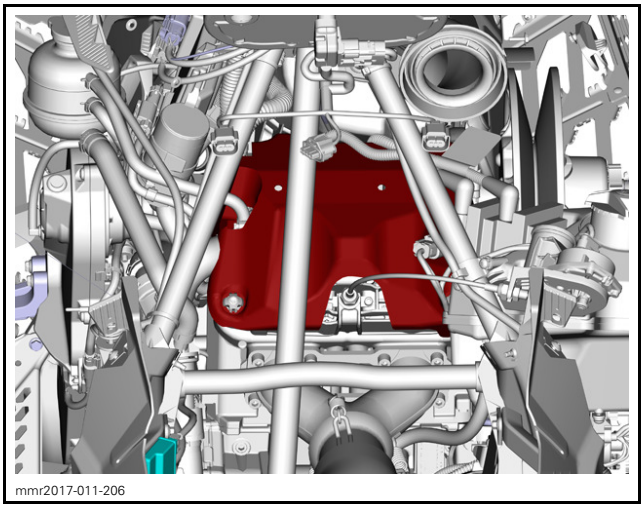
18. Remove the engine support screw.


mmr2017-011-026_a

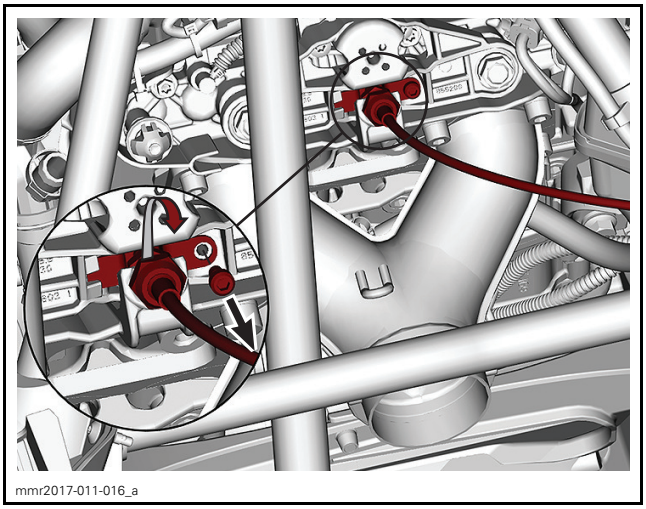
19. Unclip the fuel hose from the primary air silencer.


mmr2017-011-015_a

20. Remove engine cover.
    20.1 Remove the 3 screws.
    20.2 Pull on both halves of cover to remove.


mmr2017-011-206

21. Detach the RAVE cable from the RAVE valve. Refer to *RAVE* subsection for proper procedure.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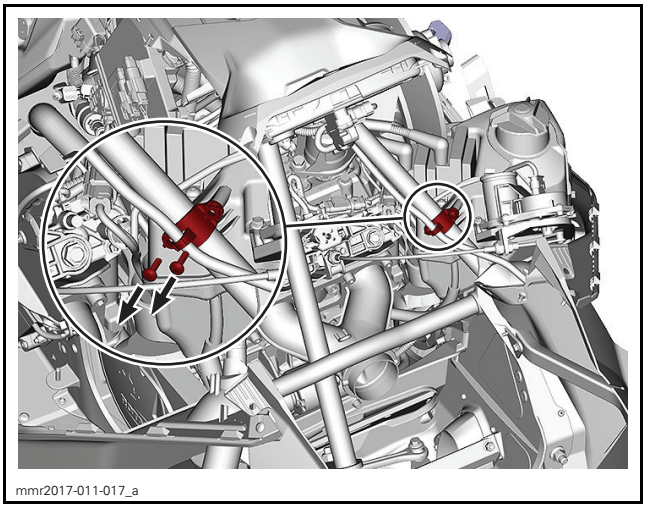
22. Unscrew the oil tank support.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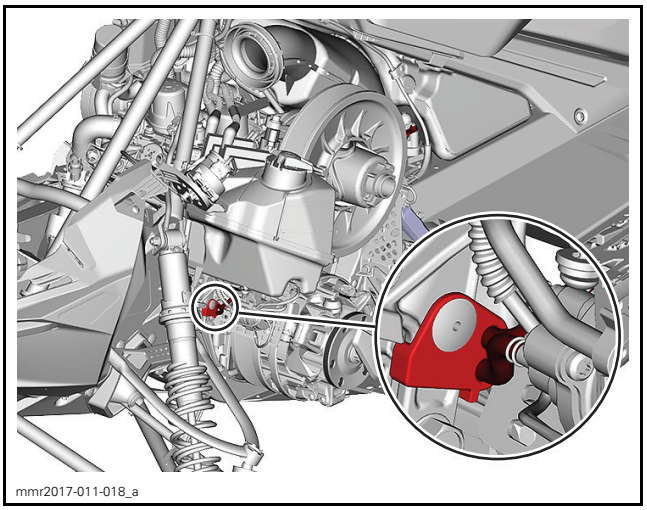
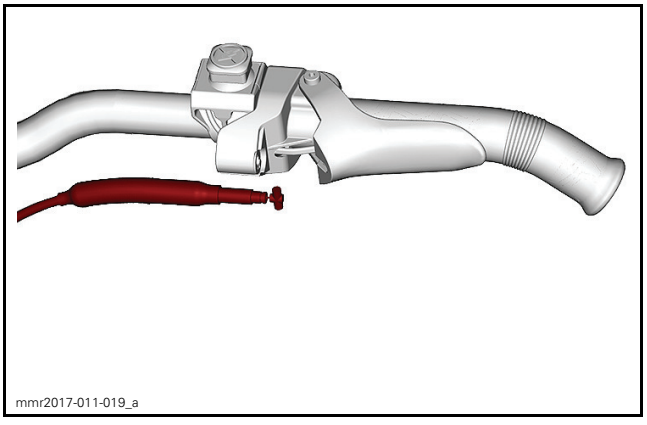
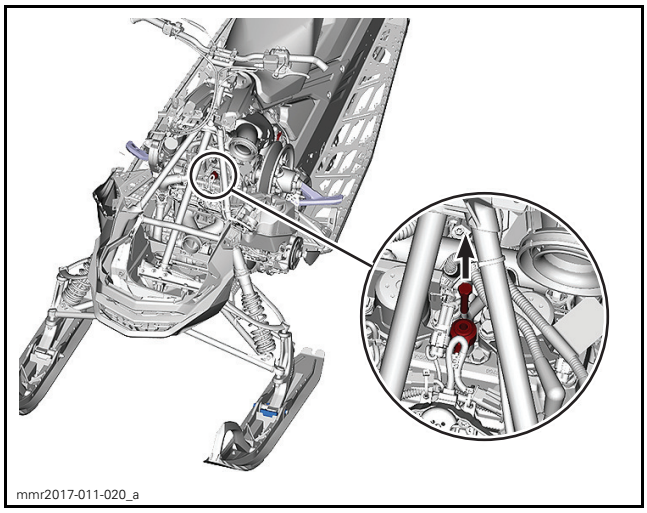
23. From underneath of the oil tank, detach both injection oil hoses from their support.


mmr2017-011-018_a

24. Detach the throttle cable from the throttle housing.

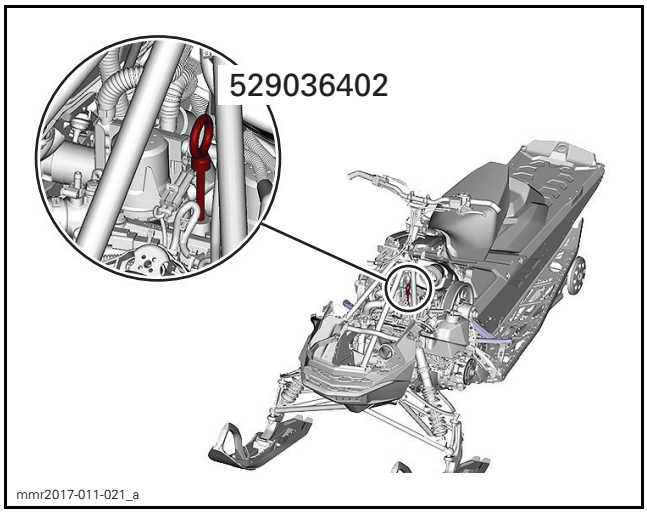

mmr2017-011-019_a

25. Remove the knock sensor from cylinder head cover.



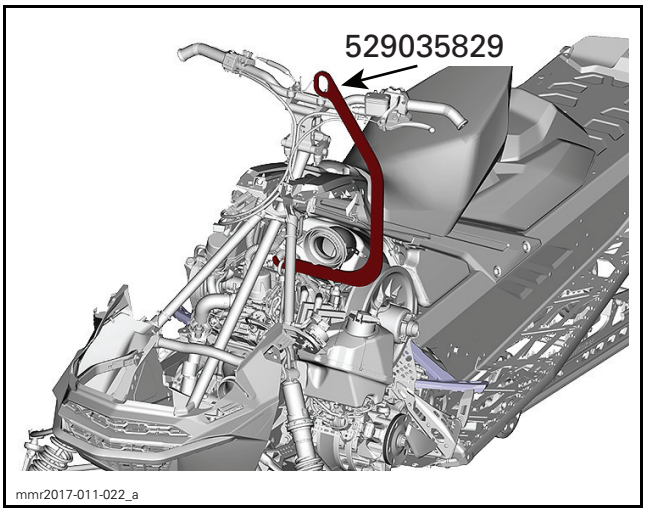
26. Install the engine lifting tool instead of knock sensor.

REQUIRED TOOL	
ENGINE LIFTING TOOL (P/N 529 036 402)	



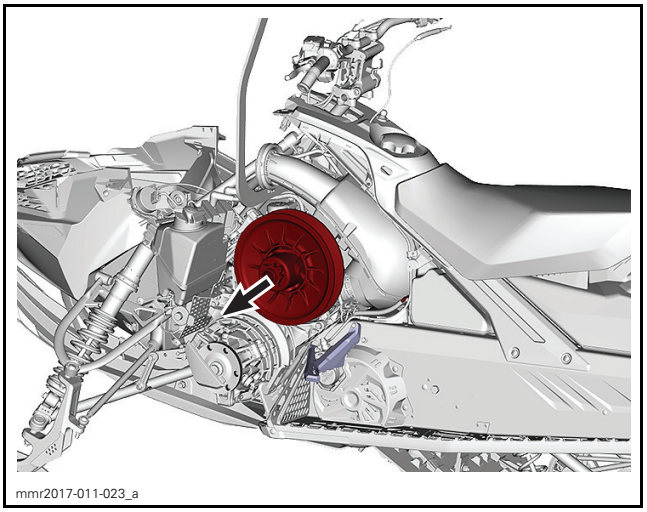
27. Install the engine lifting hook.

REQUIRED TOOL	
ENGINE LIFTING HOOK (P/N 529 035 829)	



28. Remove the driven pulley. Refer to appropriate *DRIVEN PULLEY AND COUNTERSHAFT* subsection.

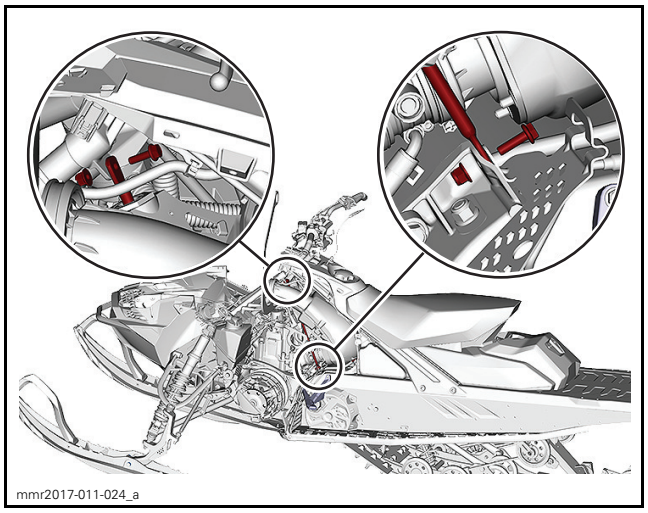
NOTE: If necessary, tap the upper gear retaining tool with a plastic hammer.



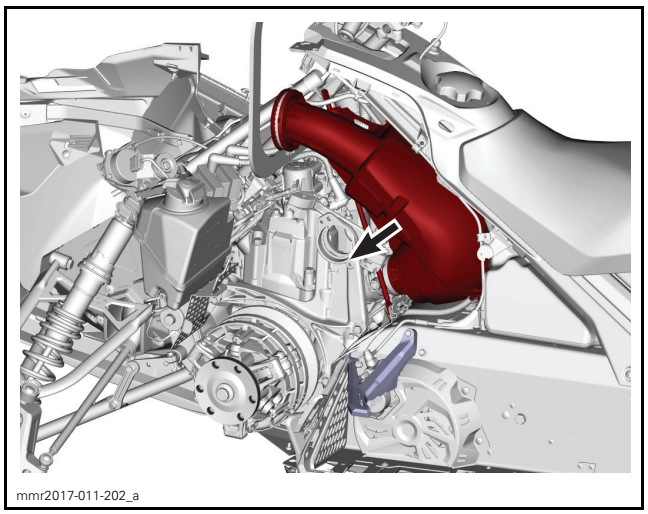
29. Unscrew countershaft from the upper gear retaining tool. **Do not** remove tool.

NOTE: While countershaft is removed from vehicle, the upper gear retaining tool maintains the drive chain and the upper gear in position inside chaincase.

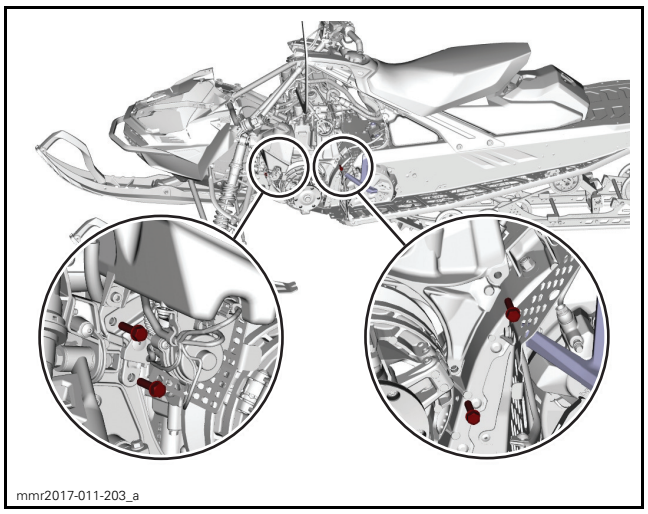
30. On LH side, remove the steering brace.



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



32. Remove engine support screws.



33. Lift engine and slide it out of vehicle.

Installing the Engine

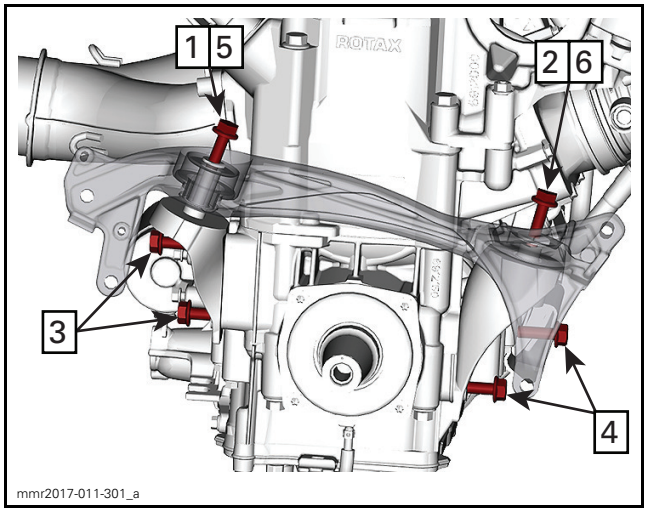
The installation is the reverse of the removal procedure. However, pay attention to the following details.

Install **NEW** self-locking fasteners (screw or nut) where required. Refer to exploded views at the beginning of this subsection.

When installing countershaft bearing support, refer to *FRAME* subsection for proper procedure.

Install and tighten engine support bolts as per the following sequence.

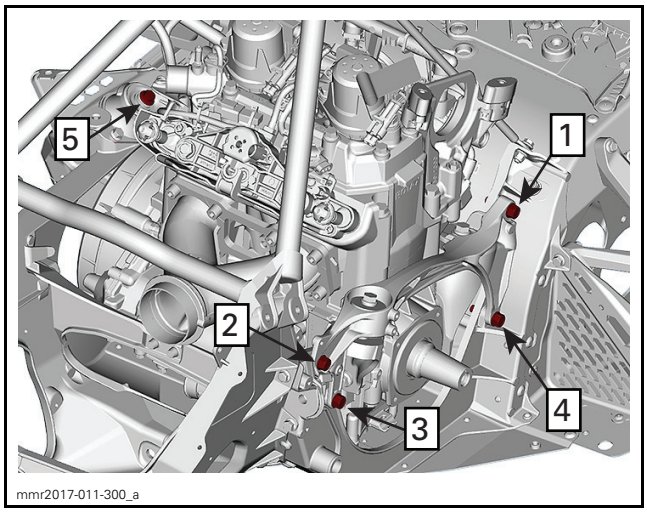
TIGHTENING TORQUE	
Step 1 and Step 2	Install the bolt loosely
Step 3 and Step 4	31.5 N•m ± 3.5 N•m (23 lbf•ft ± 3 lbf•ft)
Step 5 and Step 6	24.5 N•m ± 3.5 N•m (18 lbf•ft ± 3 lbf•ft)



Secure the engine to the frame as per the following sequence.

NOTE: Snug all bolts then tighten to specification.

TIGHTENING TORQUE	
Step 1 to Step 4	33 N•m ± 3 N•m (24 lbf•ft ± 2 lbf•ft)
Step 5	24.5 N•m ± 3.5 N•m (18 lbf•ft ± 3 lbf•ft)



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If a new engine is installed or the engine was repaired, restart the break-in procedure using BUDS2.

ENGINE SUPPORT

Inspecting the Engine Support

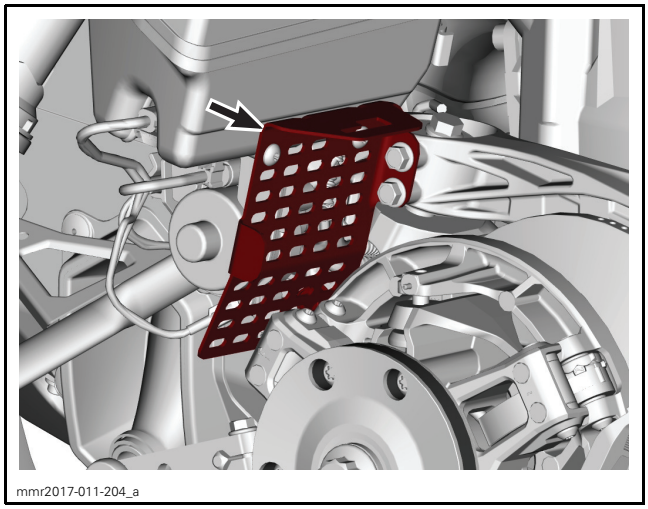
Check if engine supports are cracked, bent or damaged. Replace if necessary.

Replacing the PTO Side Engine Support

Remove the LH bottom pan. Refer to *BODY* subsection.

Remove driven pulley. Refer to appropriate *DRIVEN PULLEY AND COUNTERSHAFT* subsection.

Remove the injection oil tank support.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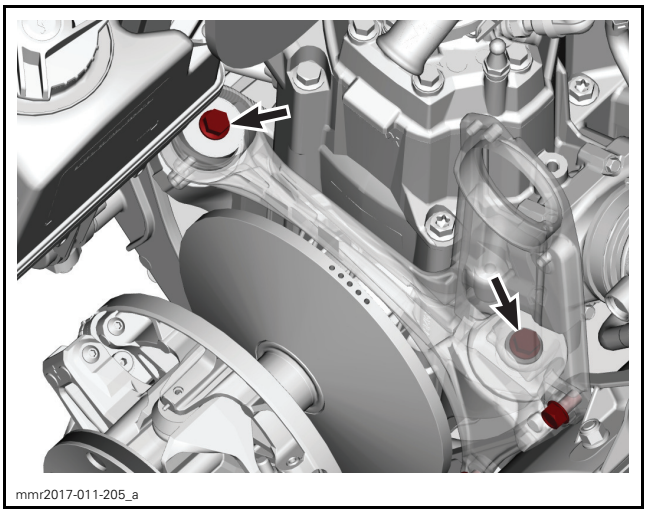
Place a piece of wood or any other appropriate tool under the engine to support it during engine support removal.

Remove screws securing engine support to rubber mount adapters.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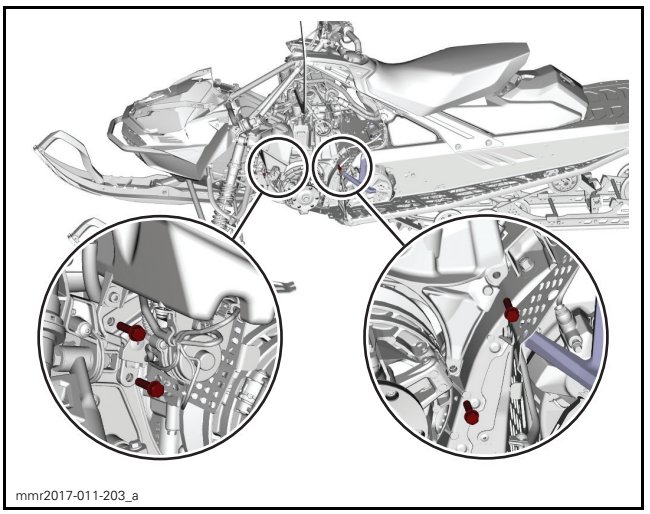
Remove engine support screws.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Remove engine support.

To install the engine support, reverse the removal procedure.

Tighten screws as per the specifications indicated in the exploded views.

Replacing the MAG Side Engine Support

Remove muffler and tuned pipe. Refer to *EXHAUST SYSTEM* subsection.

Place a piece of wood or any other appropriate tool under the engine to support it during engine support removal.

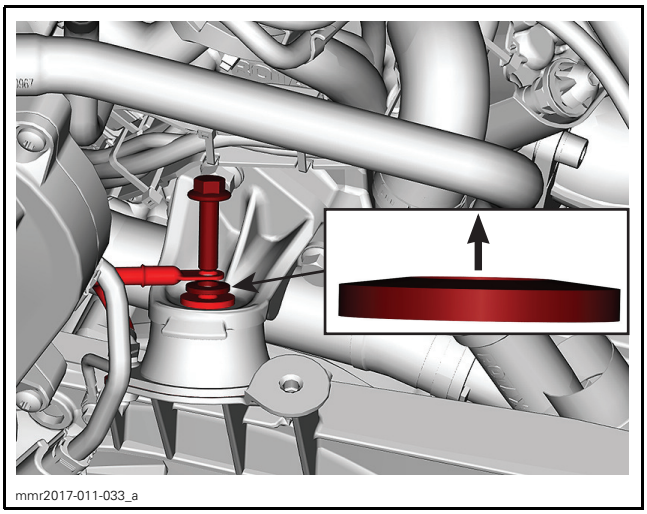
Remove screw securing engine support to rubber mount adapter.

Remove screw retaining engine support to engine.

Remove engine support.

To install the engine support, reverse the removal procedure.

Position the concave washer as shown.



SOME PARTS REMOVED FOR CLARITY

Tighten screws as per the specifications indicated in the exploded views.

ENGINE RUBBER MOUNTS

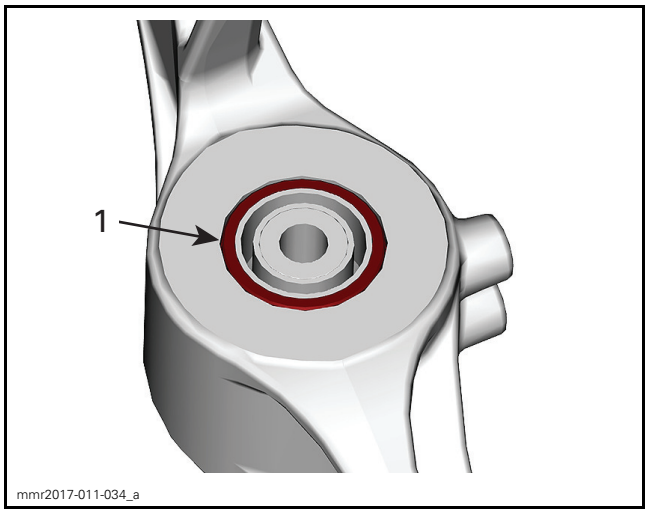
Inspecting the Engine Rubber Mount

Check rubber mounts. Replace them if brittle, cracked or damaged.

Replacing the PTO Side Engine Rubber Mount

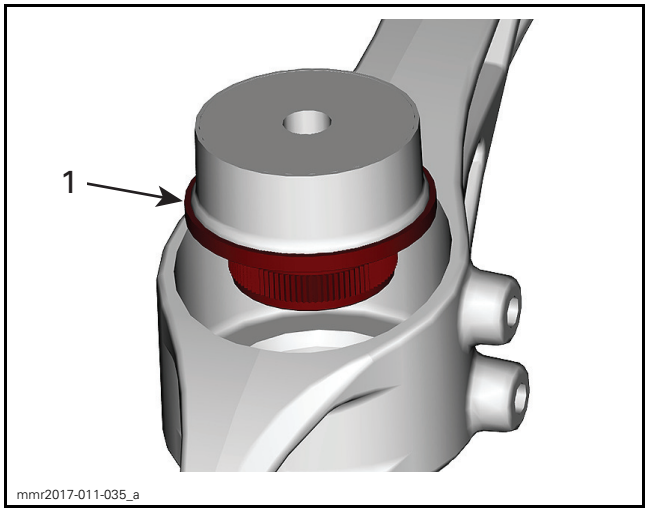
Remove the PTO side engine support. See procedure in this subsection.

Using a press, extract the engine rubber mount from the engine support.



1. Press on this ring

Install the new engine rubber mount by pressing on the external metallic ring.



1. Press on this metallic ring

Replacing the MAG Side Engine Rubber Mount

Remove muffler and tuned pipe. Refer to *EXHAUST SYSTEM* subsection.

Place a piece of wood or any other appropriate tool under the engine to support it during engine support removal.

Remove screw securing engine support to rubber mount adapter.

Remove screw retaining rubber mount adapter to frame.

Remove rubber mount adapter.

To install the rubber mount adapter, reverse the removal procedure.

Tighten screws as per the specifications indicated in the exploded views.

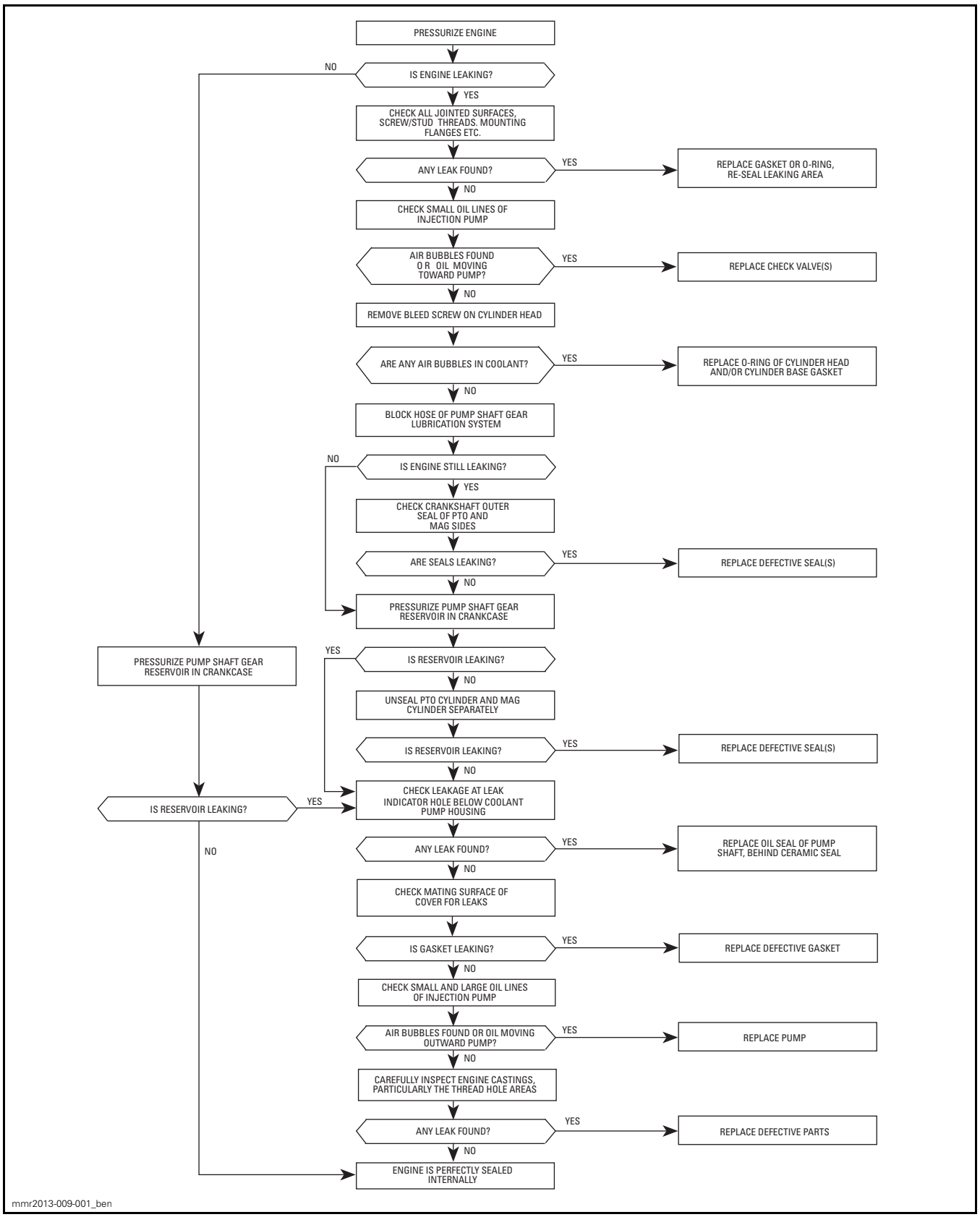
ENGINE LEAK TEST (850)

SERVICE TOOLS

Description	Part Number	Page
INTAKE PLUGS	529 036 421	3
MANIFOLD PLUG 63 MM (2-1/2")	529 035 961	3
SMALL HOSE PINCHER	295 000 076	3
VACUUM/PRESSURE PUMP	529 021 800	4

PROCEDURES

NOTE: This flow chart must be used as a visual reference during the engine leak test procedure.

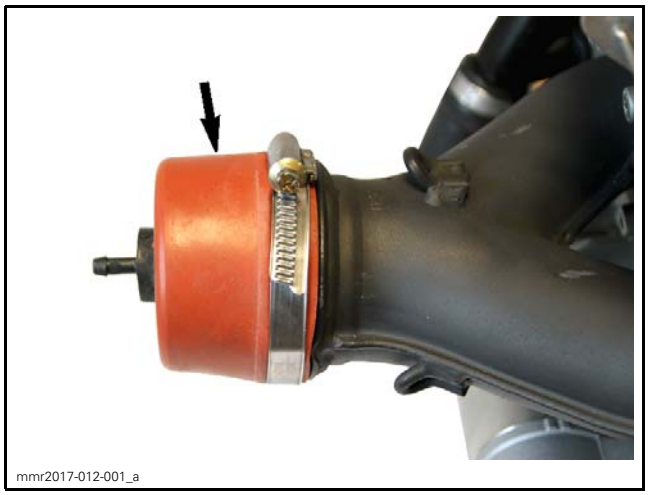


ENGINE LEAK TEST

Prior to take apart an engine, it is important to proceed with a leak test to diagnose engine problems. Whenever the engine is disassembled, a leak test should be performed after reassembly.

1. Remove engine. Do not remove the exhaust manifold. Refer to *ENGINE REMOVAL AND INSTALLATION* subsection.
2. Remove throttle body, refer to *E-TEC DIRECT FUEL INJECTION* subsection.
3. Install appropriate plug over exhaust manifold and secure with a clamp.

REQUIRED TOOL	
MANIFOLD PLUG 63 MM (2-1/2") (P/N 529 035 961)	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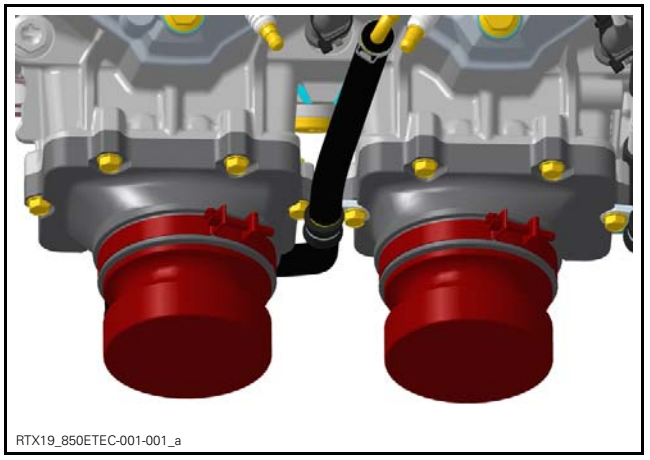
4. Insert an intake plug in each intake adapters.

REQUIRED TOOL	
INTAKE PLUGS (P/N 529 036 421)	

5. Tighten with existing clamps.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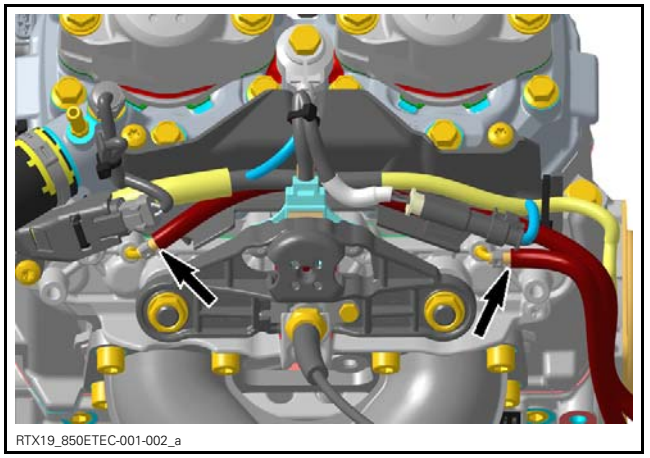
6. Block oil hoses connected to the oil pump:
   - 6.1 Partially remove corrugated tube from oil hoses.
   - 6.2 Install hose pincher right after check valve.

REQUIRED TOOL	
SMALL HOSE PINCHER (P/N 295 000 076)	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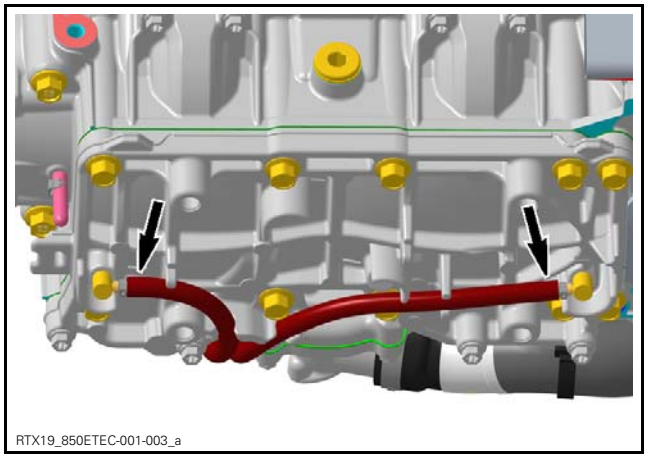
BLOCK OIL HOSES HERE

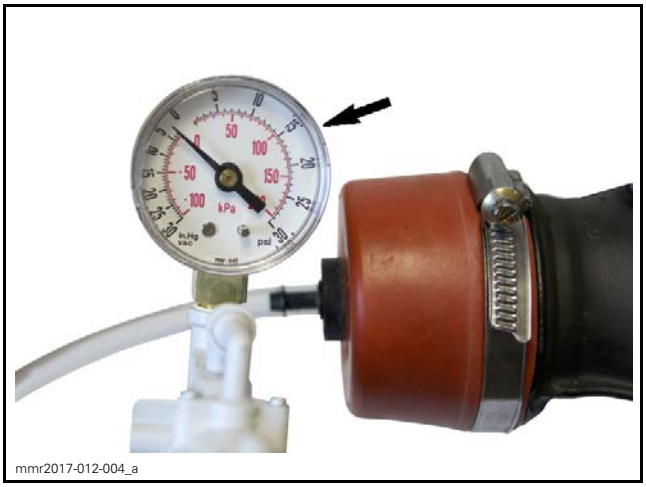

RTX19_850ETEC-001-003_a

BLOCK OIL HOSES HERE

NOTICE Pay attention not to squeeze hose nipples.

7. Pressurize engine.

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



ENGINE LEAK TEST	
PRESSURE	TIME (WITHOUT PRESSURE DROP)
30 kPa (4.35 PSI)	3 minutes

NOTICE Do not exceed the specified pressure.

8. If pressure drops before 3 minutes, spray a soapy solution on tester kit (manifold and intake plugs, vacuum/pressure pump and its hose).
   8.1 If tester kit (manifold and intake plugs, hoses and pump) is leaking, bubbles will indicate where leak comes from.
   8.2 If tester kit is not leaking, check engine, see *ENGINE COMPONENTS TO BE VERIFIED*.

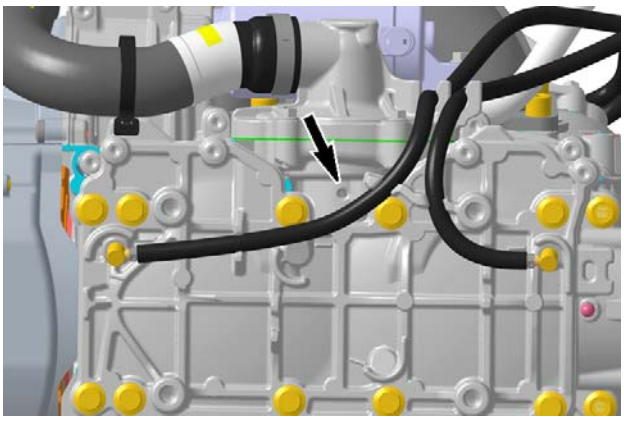
Engine Components to be Verified

If air is escaping from engine check all jointed surfaces and screw or stud threads of engine:
- Spark plug base, insulator
- Cylinder head
- RAVE valve oil seals and housing
- Cylinder block
- Crankcase halves (joint)
- Crankshaft outer seals (PTO and MAG)
- Fuel injector gaskets
- Base plate gasket and base plate.

Troubleshooting Tips

Air bubbles in cooling system indicate a defective cylinder head O-ring or cylinder base gasket.

Check leak indicator hole for oil or coolant.



Leaking coolant indicates:
- A defective ceramic seal (on water pump side)
- Defective O-ring on bearing carrier, see *COOLING SYSTEM* subsection.

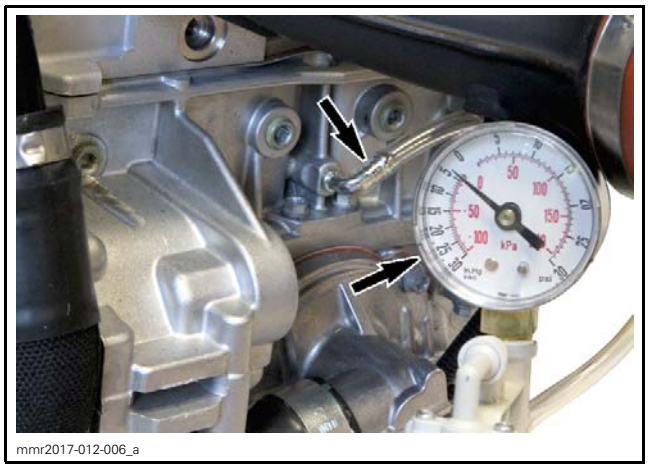
Leaking oil indicates:
- A defective oil seal (behind ceramic seal)
- Defective O-ring on bearing carrier, see *COOLING SYSTEM* subsection.

PUMP SHAFT OIL GEAR RESERVOIR LEAK TEST

Install air pump on reservoir fitting and pressurize engine.

PUMP SHAFT OIL GEAR RESERVOIR LEAK TEST	
PRESSURE	TIME (WITHOUT PRESSURE DROP)
30 kPa (4.35 PSI)	3 minutes

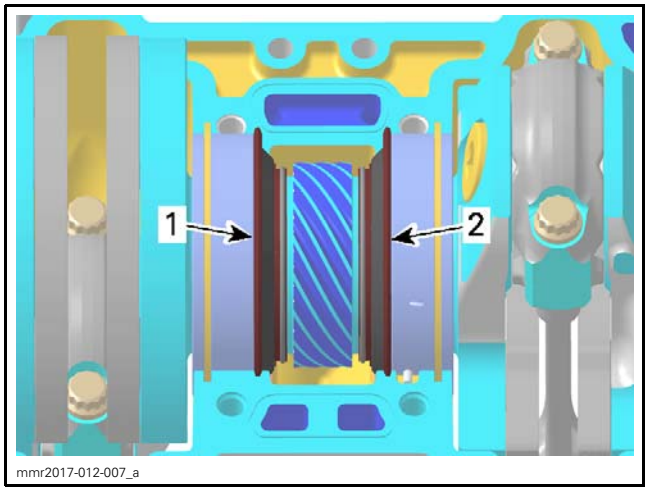
NOTICE Do not exceed the specified pressure.



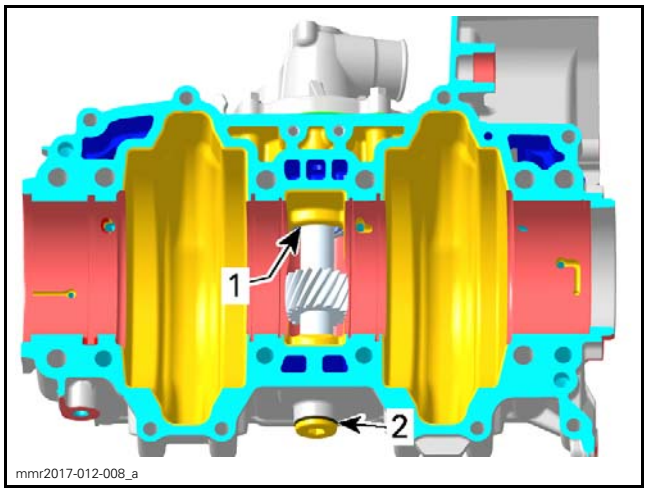
TYPICAL

If pressure drops check for:

– Leaking plug screw gasket
– Defective O-ring on bearing carrier (see *COOLING SYSTEM* subsection)
– Defective oil seal on water pump side
– Defective crankshaft inner seal.

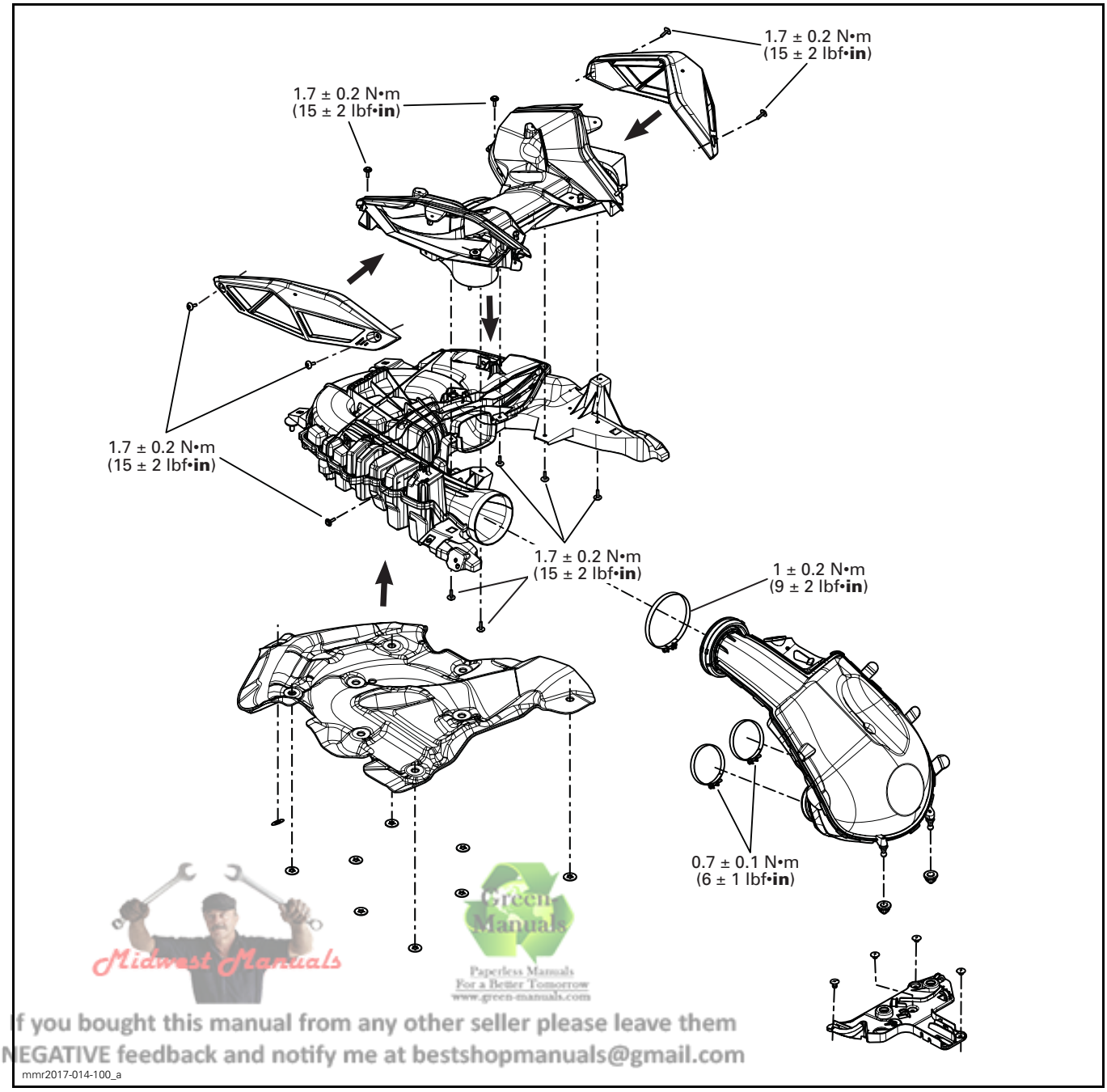


CRANKCASE INSIDE VIEW
1. *Leakage through inner seal on MAG side*
2. *Leakage through inner seal on PTO side*



TYPICAL - CRANKCASE INSIDE VIEW
1. *Leakage through water pump oil seal (reservoir side)*
2. *Leakage on plug screw side (gasket)*

AIR INTAKE SYSTEM



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GENERAL

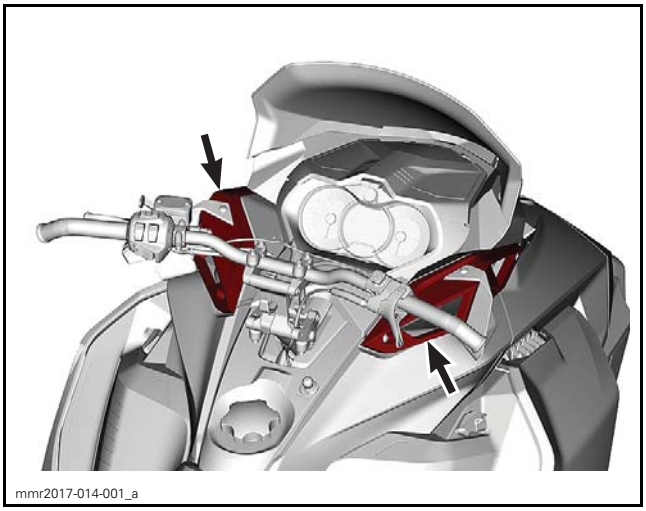
⚠ WARNING

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

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

PROCEDURES

AIR FILTER (MESH)



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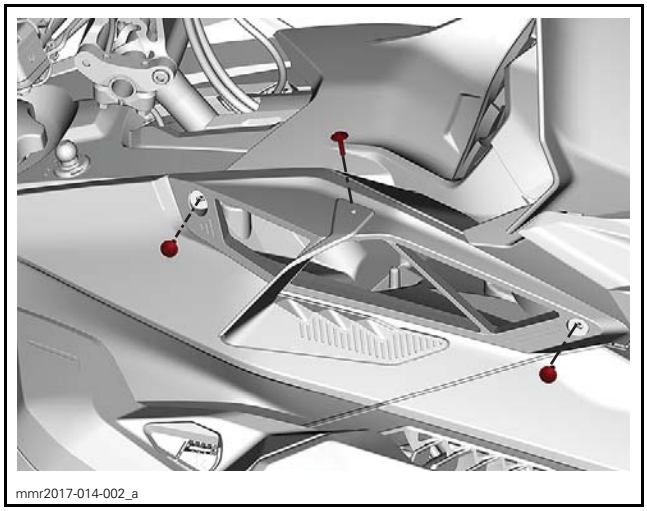
The same procedure applies for RH and LH side. Only one side is described in this procedure.

Removing the Air Filter

Remove screws from mesh filter housing.



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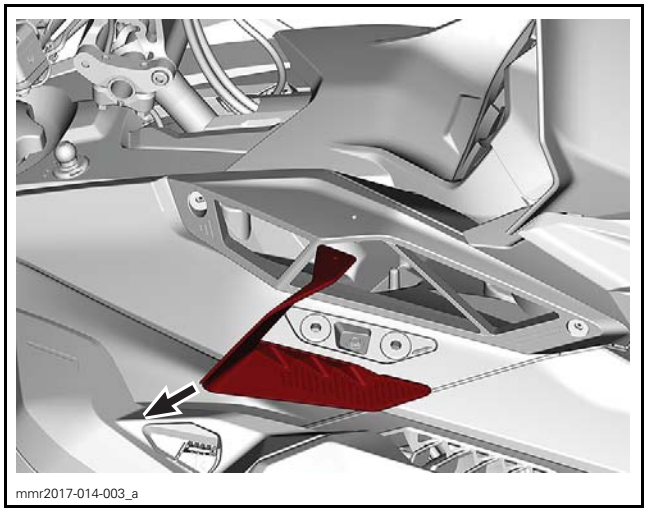
On some models, remove the air deflector.



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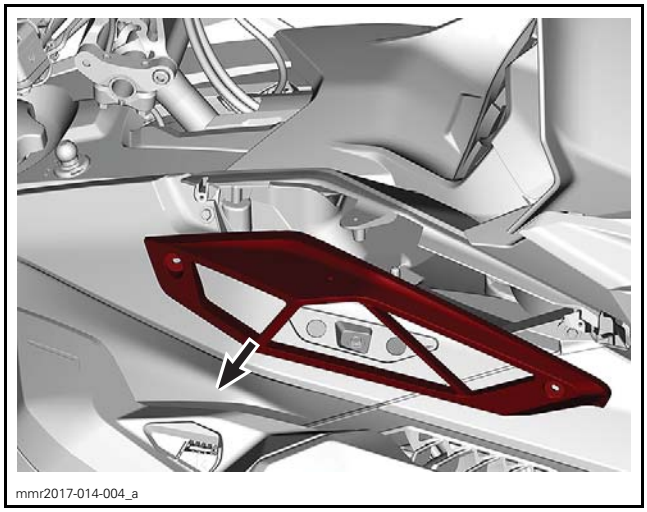
Remove the mesh filter housing from the upper body module.



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Cleaning the Air Filter

Clean with fresh water and mild soap.

Replace air filter if required.

NOTE: If the filter is very dirty, clean the interior of secondary air intake silencer at the same time.

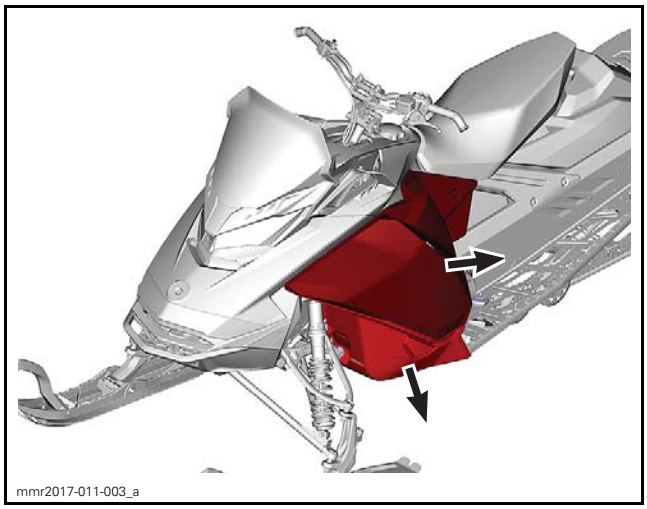
Installing the Air Filter

The installation is the reverse of the removal procedure.

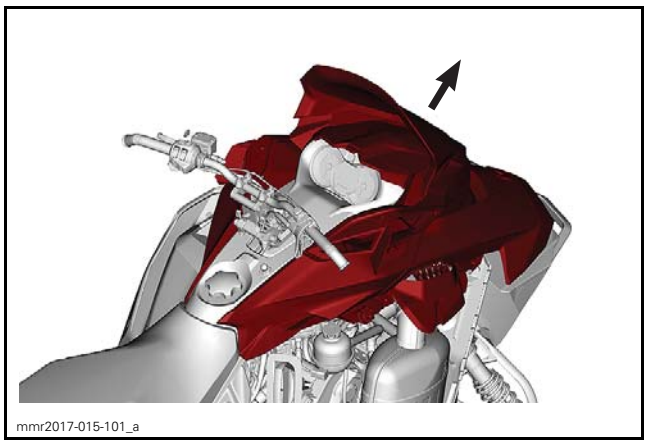
PRIMARY AIR INTAKE SILENCER

Removing the Primary Air Intake Silencer

1. Remove the following parts. If required, refer to *BODY* subsection.

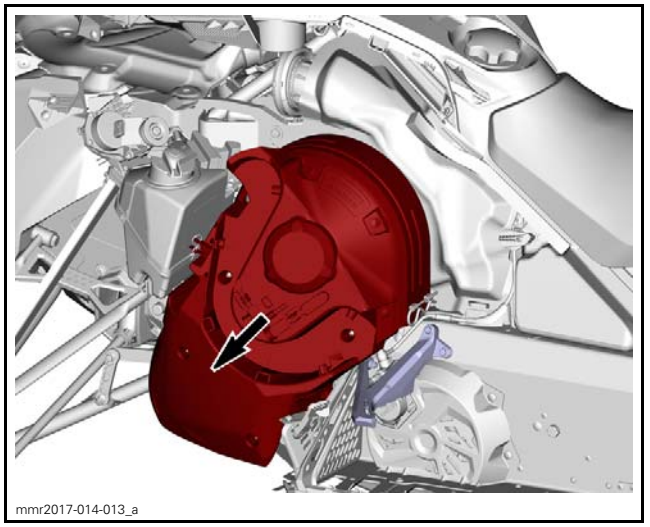


LH SIDE PANEL AND LH BOTTOM PAN

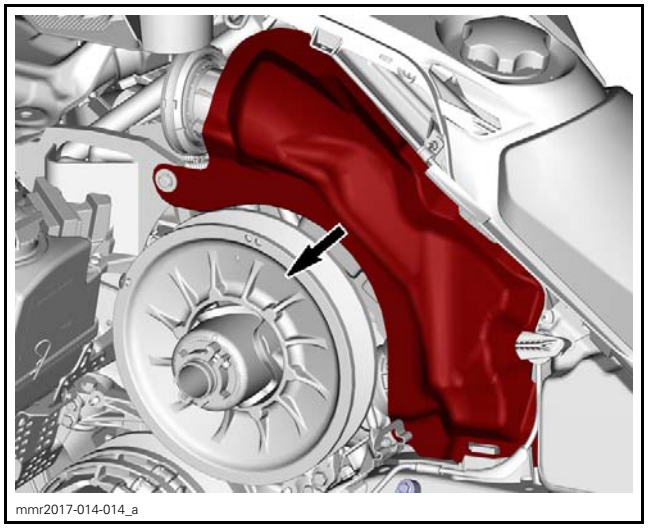


UPPER BODY MODULE

2. Remove the drive belt guard and acoustic panels.

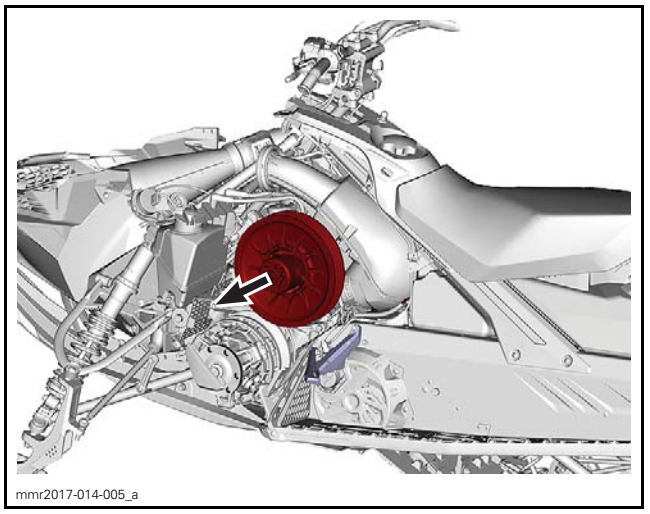


REMOVE DRIVE BELT GUARD

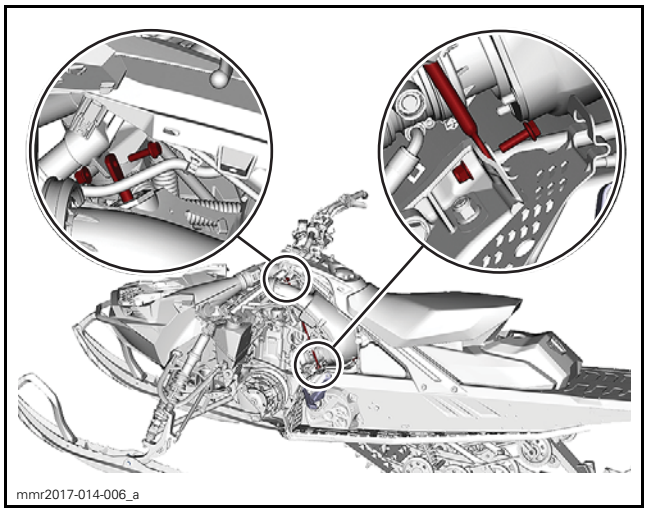


REMOVE ACOUSTIC PANEL

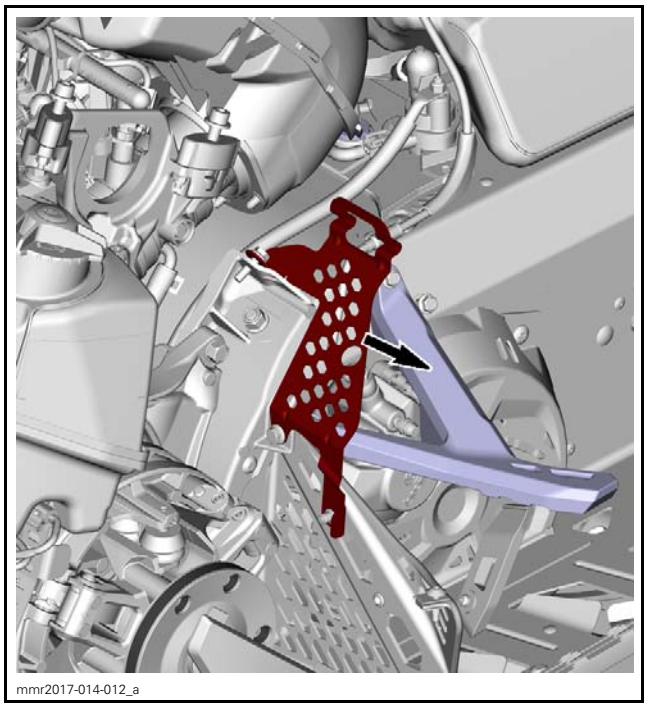
3. Remove the driven pulley. Refer to appropriate *DRIVEN PULLEY AND COUNTERSHAFT* subsection.



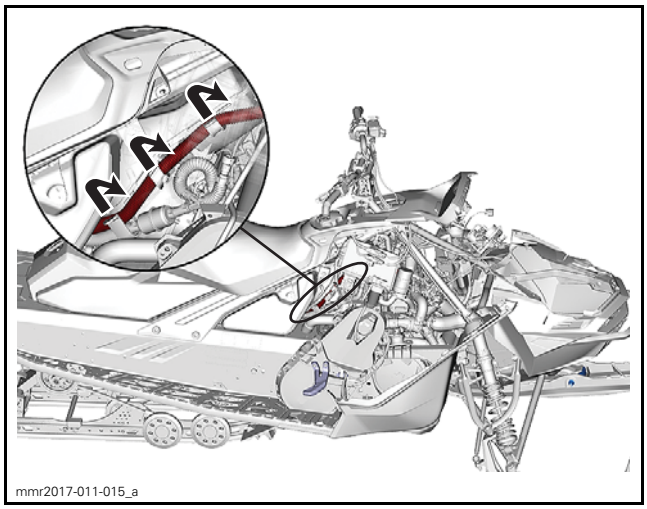
4. On LH side, remove the steering brace.


mmr2017-014-006_a

5. Remove the drive belt guard support.

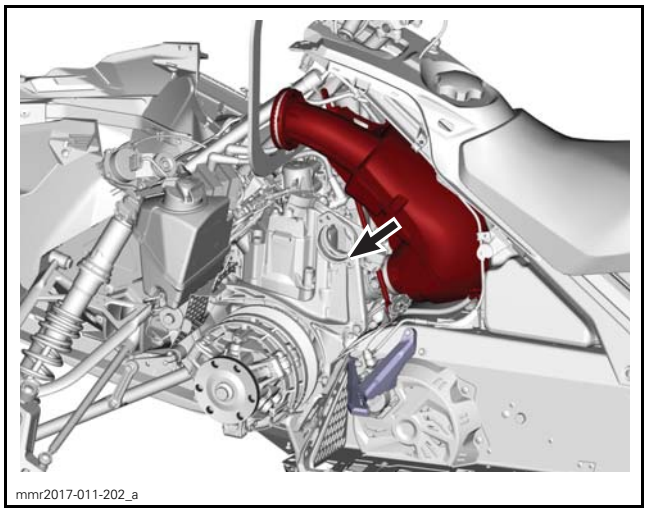

mmr2017-014-012_a

6. Unclip the fuel hose from the primary air silencer.


mmr2017-011-015_a

7. Remove the primary air silencer.
   - 7.1 Loosen clamps securing primary air silencer to intake adapters.
   - 7.2 Carefully pull out the primary air intake silencer with the steering brace.

NOTICE Make sure not touching the secondary injectors or their harnesses when removing the primary air intake silencer .

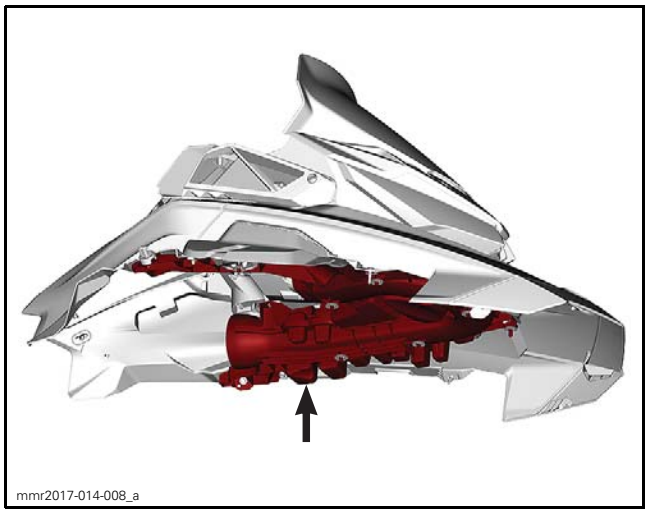

mmr2017-011-202_a

Installing the Primary Air Intake Silencer

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

Make sure primary air intake is properly insert in the intake adapters before applying the tightening torque.

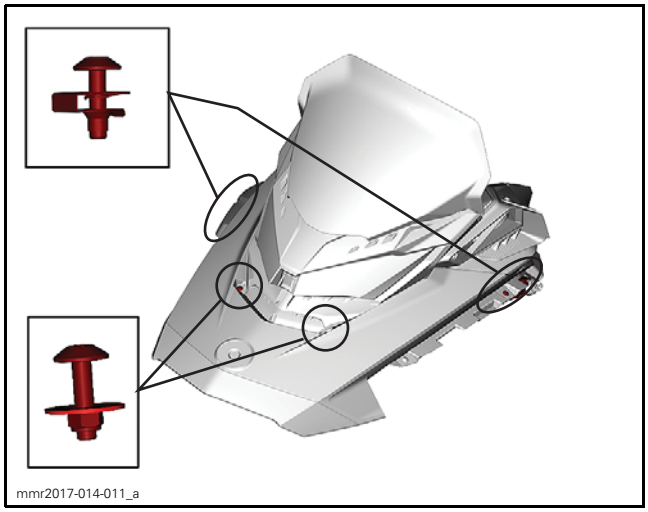
SECONDARY AIR INTAKE SILENCER



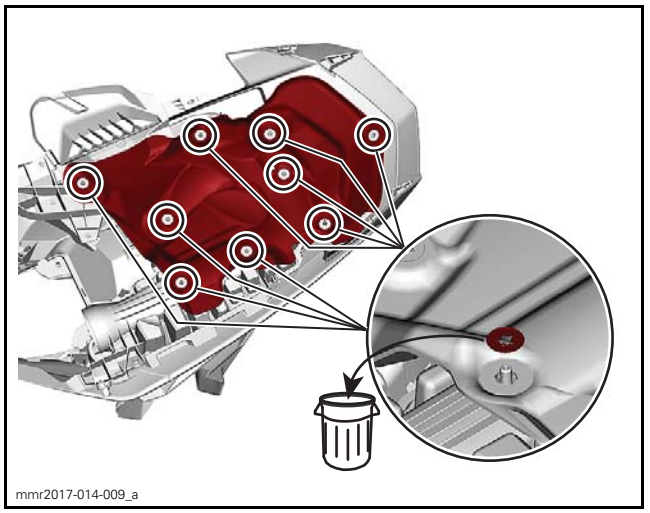
Removing the Secondary Air Intake Silencer

Referring to the *BODY* subsection, remove the upper body module.

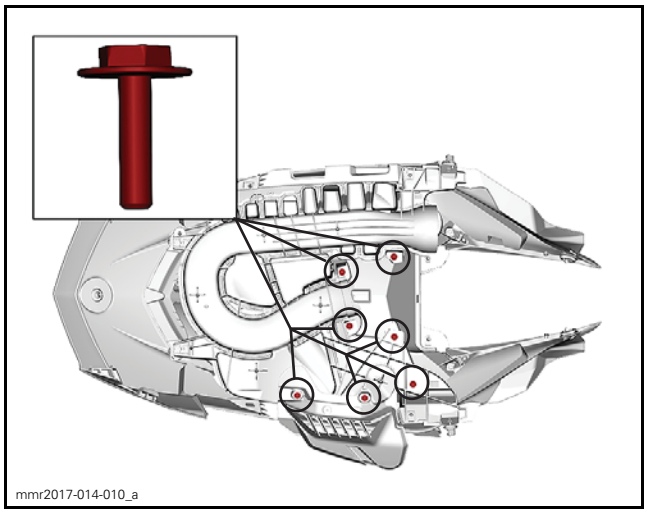
Remove the following screws.



Turn the upper body module upside down and remove the soundproofing panel.



Remove fasteners retaining secondary air intake silencer to upper body module.



Installing the Secondary Air Intake Silencer

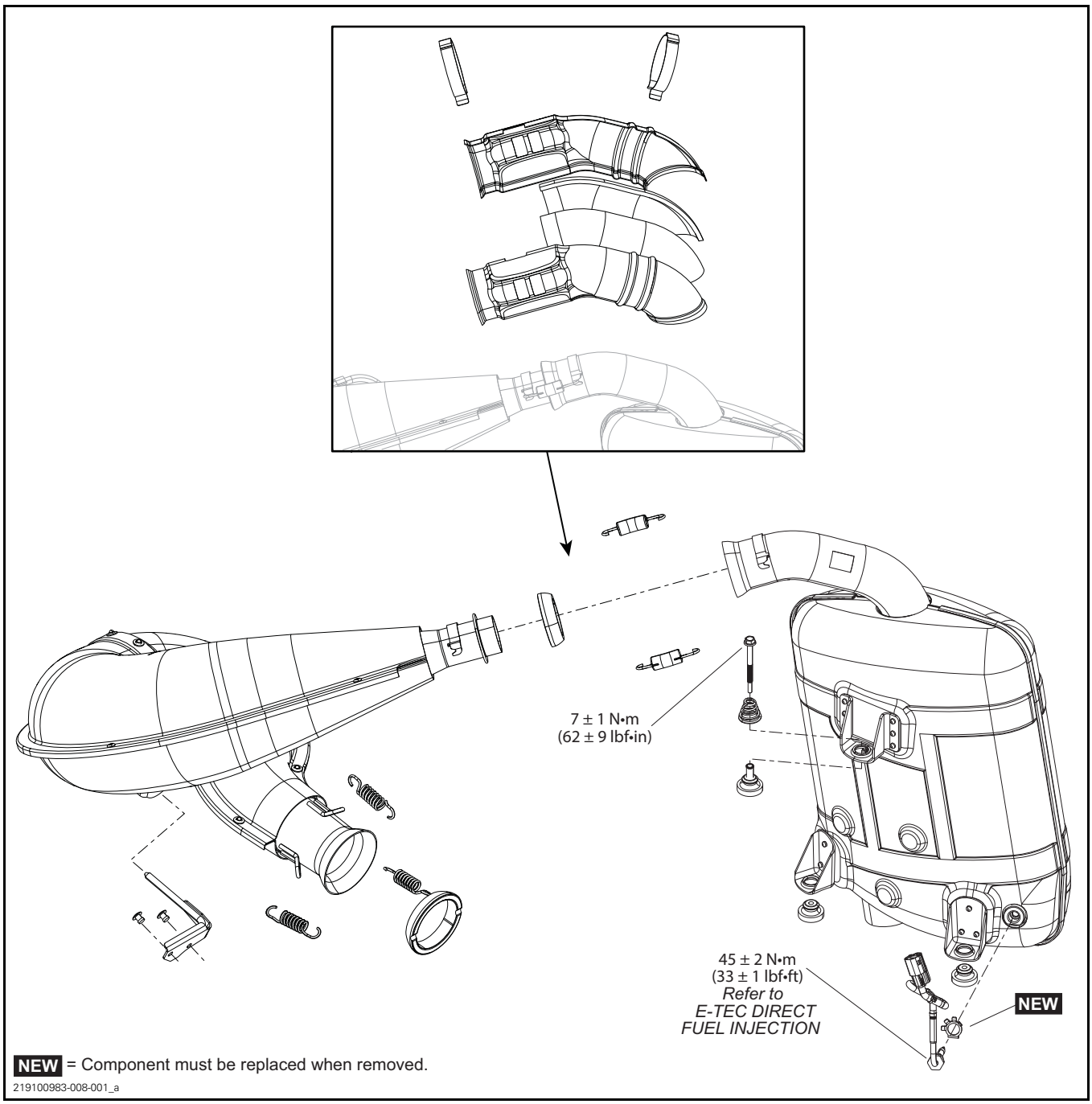
The installation is the reverse of the removal procedure.

EXHAUST SYSTEM

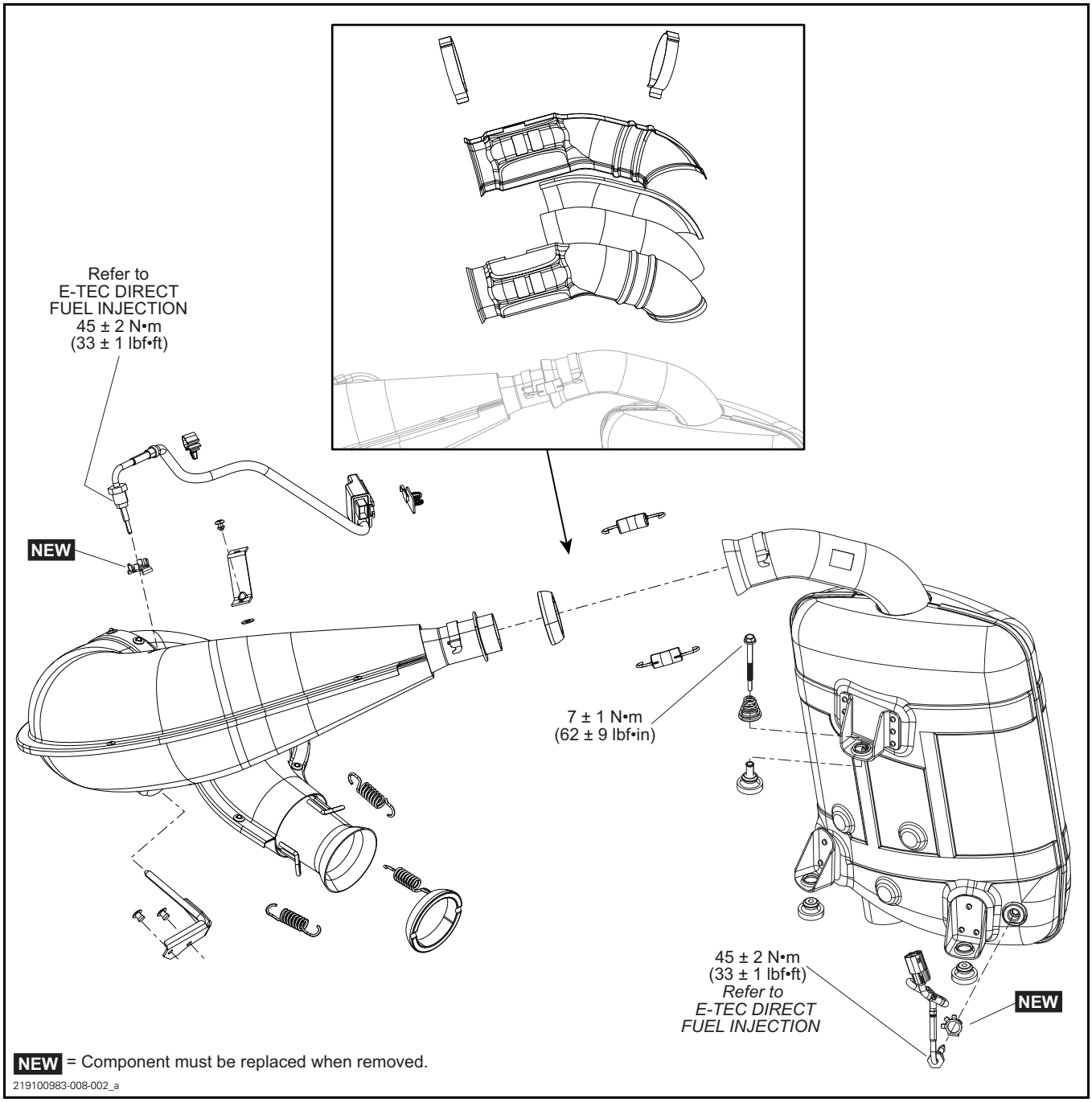
SERVICE TOOLS

Description	Part Number	Page
SPRING INSTALLER/REMOVER	529 035 983	3, 8

Models With One Exhaust Gas Temperature Sensor (EGTS)



Models With Two Exhaust Gas Temperature Sensors (EGTS)



GENERAL

⚠ WARNING

To avoid potential burns, never touch exhaust system components immediately after the engine has been running because these components are very hot. Let engine and exhaust system cool down before performing any servicing.

During assembly/installation, use the torque value and service products as in the exploded view.

⚠ 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.

MAINTENANCE

INSPECTING THE EXHAUST SYSTEM

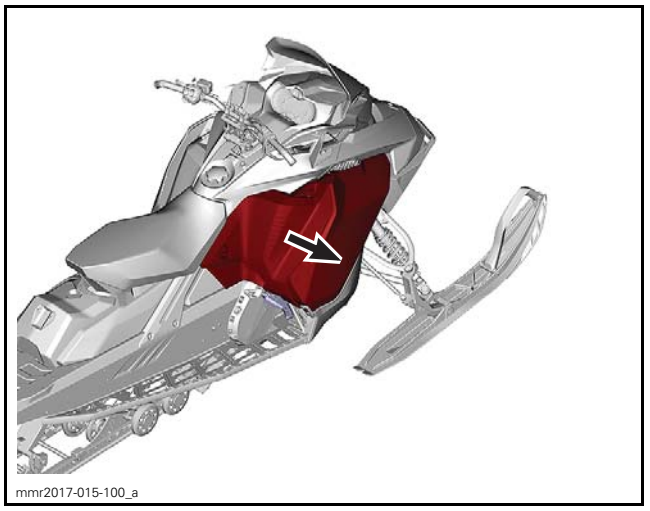
Check the following components for leaks, cracks, or other damages:
- Springs and retainers
- Exhaust system mounts
- Muffler
- Tuned pipe
- Donut gaskets
- Shields
- Manifold.

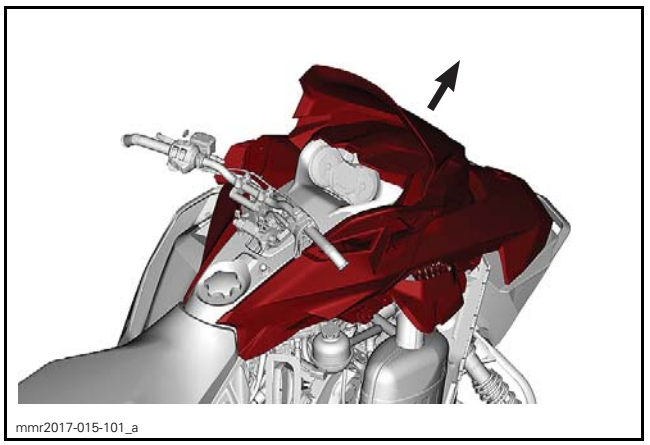
PROCEDURES

MUFFLER

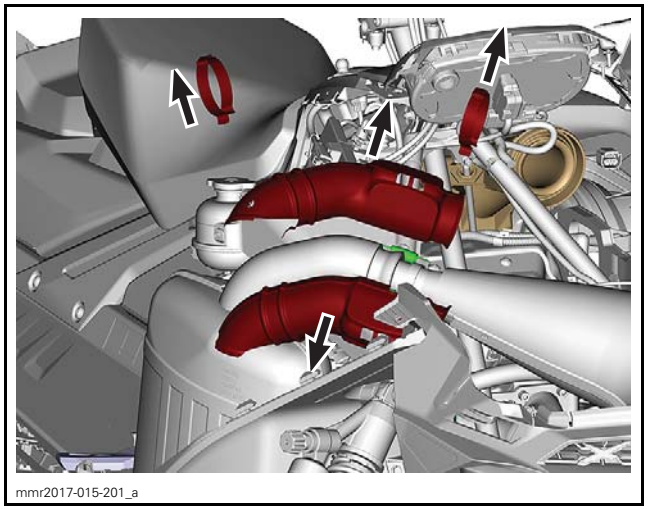
Removing the Muffler

1. Refer to *BODY* subsection and remove the following parts.


mmr2017-015-100_a

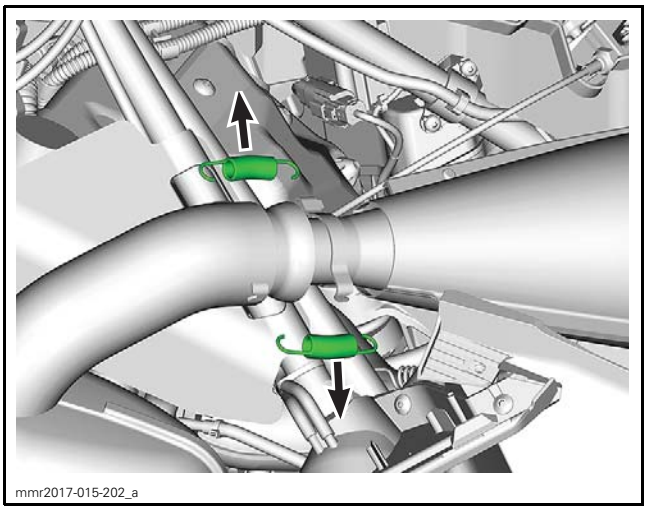

mmr2017-015-101_a

2. Remove heat shields from the muffler pipe.

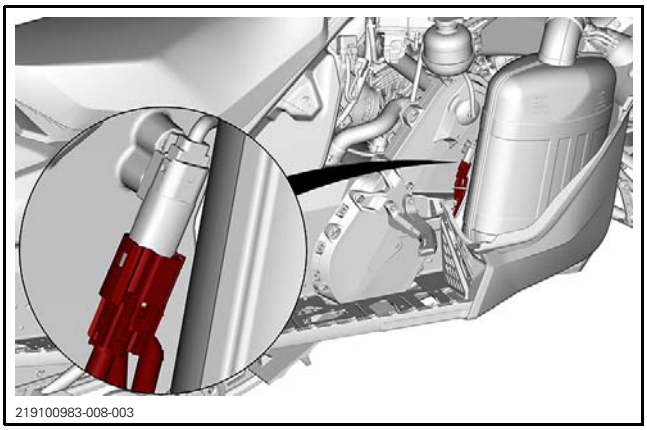

mmr2017-015-201_a

3. Remove exhaust springs retaining the tuned pipe to the muffler.

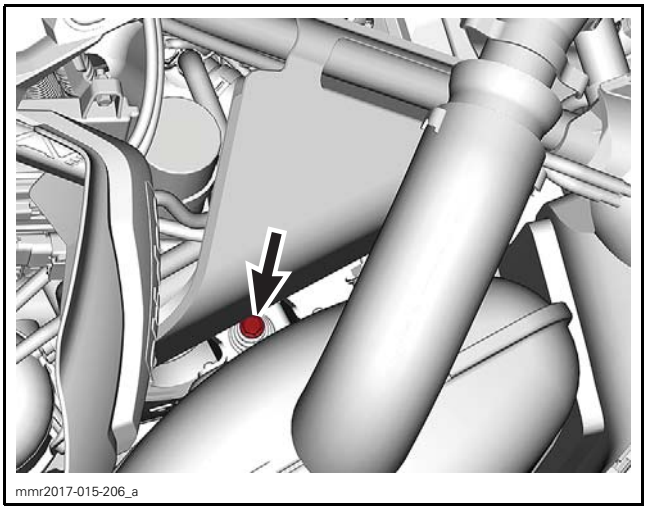
REQUIRED TOOL	
SPRING INSTALLER/REMOVER (P/N 529 035 983)	


mmr2017-015-202_a

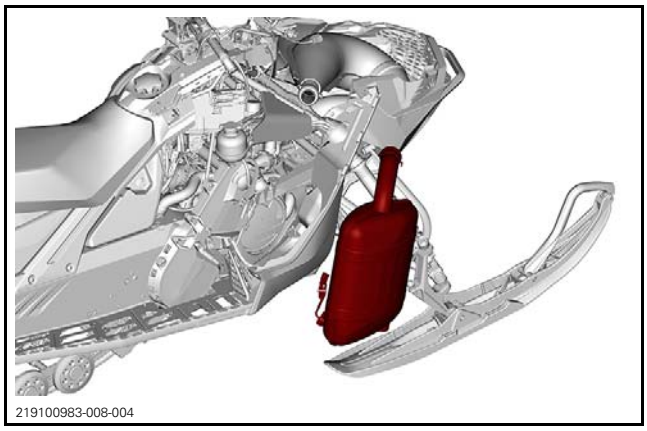
4. Disconnect the power harness from the muffler EGTS.


219100983-008-003

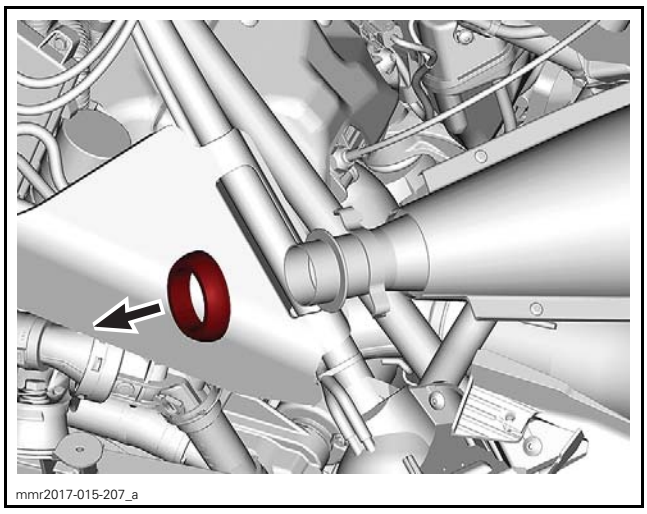
5. Behind the muffler, remove the retaining screw and its spring.


mmr2017-015-206_a

6. Remove the muffler.


219100983-008-004

7. Remove exhaust gasket.


mmr2017-015-207_a

Inspecting the Muffler

Check the muffler for cracks or other damages.

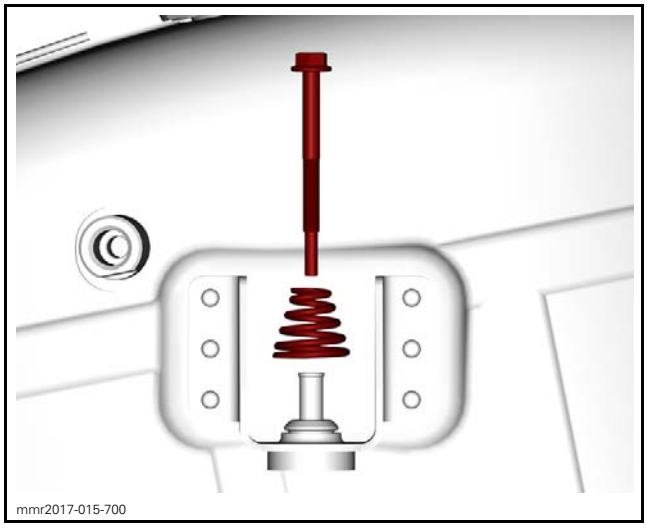
Check grommet condition.

Inspect exhaust gasket condition. Replace as required.

Installing the Muffler

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

Muffler Retaining Screw

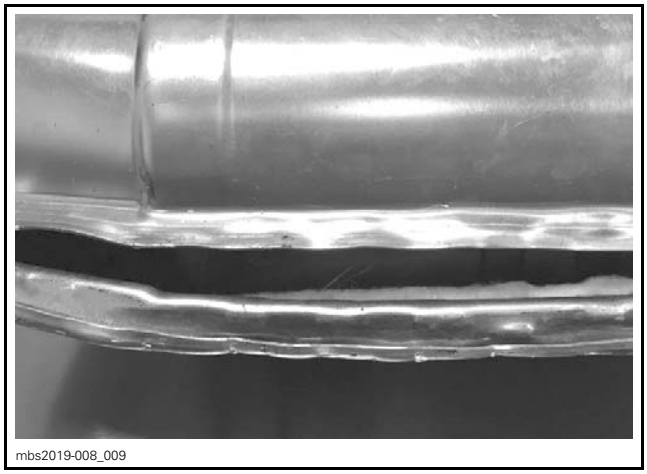

mmr2017-015-700

TIGHTENING TORQUE	
Muffler retaining screw	7 N•m ± 1 N•m (62 lbf•**in** ± 9 lbf•**in**)

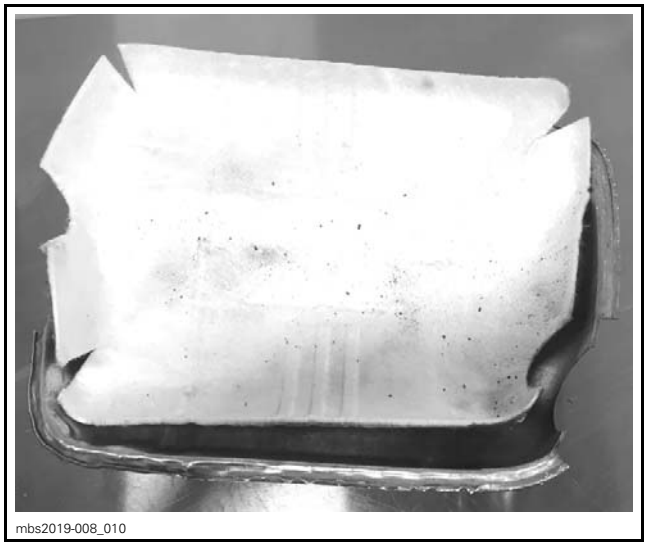
Replacing the Muffler Shell

1. Remove muffler.
2. Place muffler flat on a work bench.
3. Using a pair of adjustable channel lock pliers, unfold the deflectors lip/edges all around the muffler perimeter as depicted below.

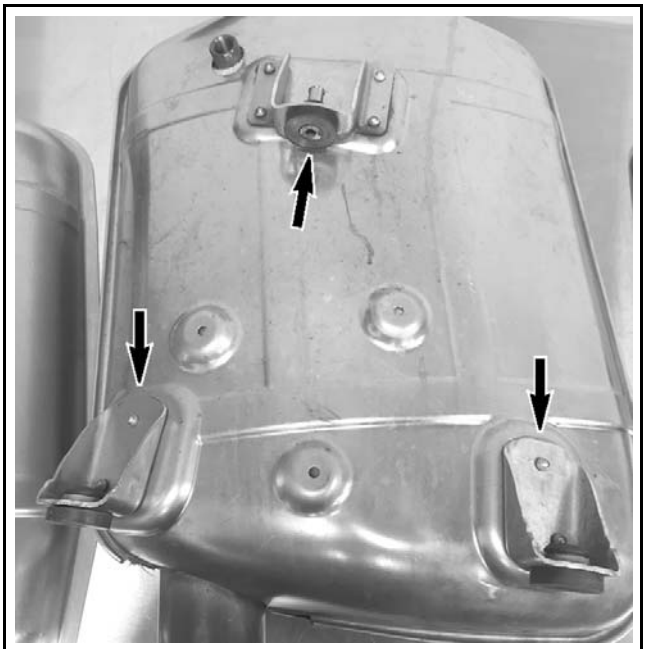
mbs2019-008_004


mbs2019-008_009

4. Remove and discard the two deflectors, keeping both insulating wool for reuse.


mbs2019-008_010

5. Using a 5 mm (3/16 in) drill bit, drill the rivets that hold the three brackets. Keep all three brackets for reuse.


mbs2019-008_012

3 brackets

mbs2019-008_011

6. Put a clean rag on your work bench for protection, reinstall all three brackets on LH deflector using new rivets.

mbs2019-008_030

Upper center bracket

mbs2019-008_031

Lower bracket

7. Place the new LH deflector face down and insert insulating wool previously removed.

mbs2019-008_018

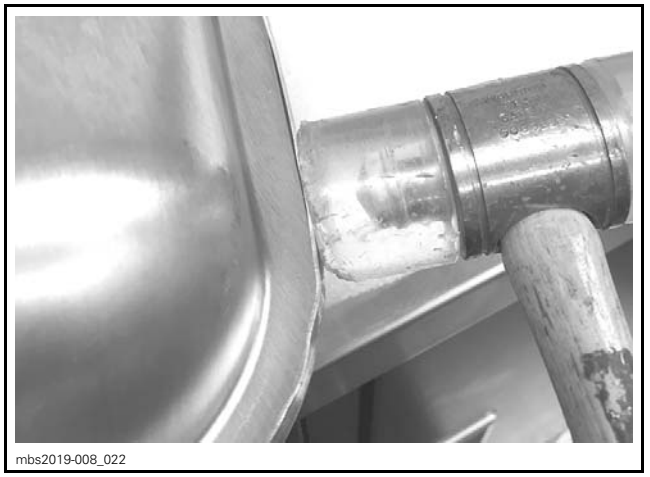
8. Place muffler into LH deflector.

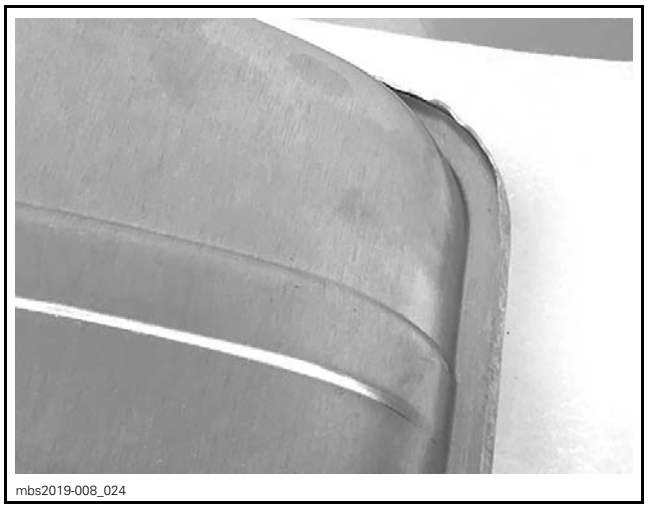
mbs2019-008_019

9. Place insulating wool previously removed onto muffler and install the new RH deflector.

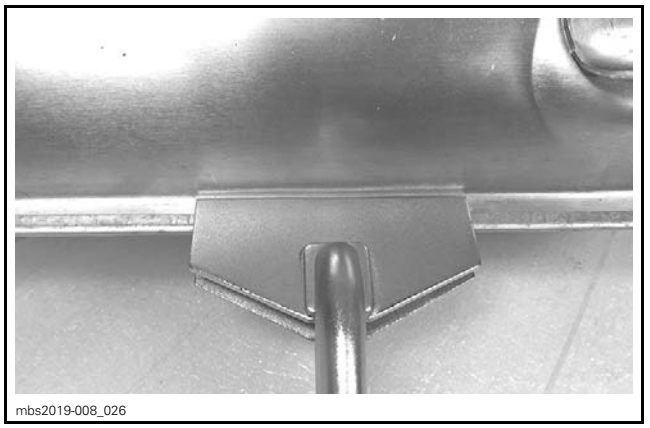
mbs2019-008_020

10. Start by folding the RH deflector edge onto LH deflector edge at an approximate 60° angle using a nylon head hammer all around the muffler perimeter.


mbs2019-008_022


mbs2019-008_024

11. Using a pair of flat nose pliers, fold down flat and squeeze tight the RH deflector edge onto LH deflector edge all around the muffler perimeter.

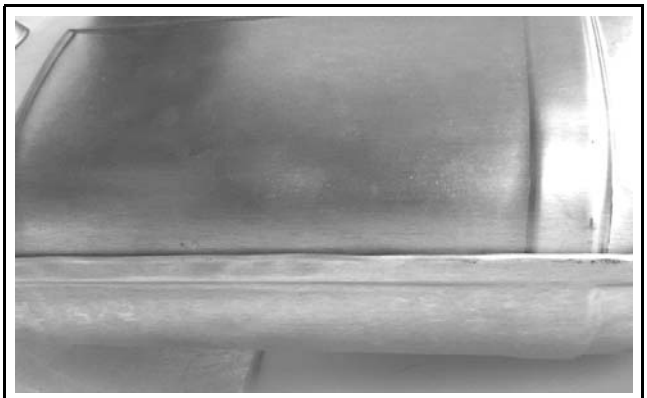

mbs2019-008_026

12. Using a cloth type protective tape, put a few layers of tape around deflectors edge for protection.

mbs2019-008_027

13. Using a steel head hammer, fold up deflector edges up against LH deflector sides, after working around the muffler perimeter, remove the protective tape.

mbs2019-008_028


mbs2019-008_029

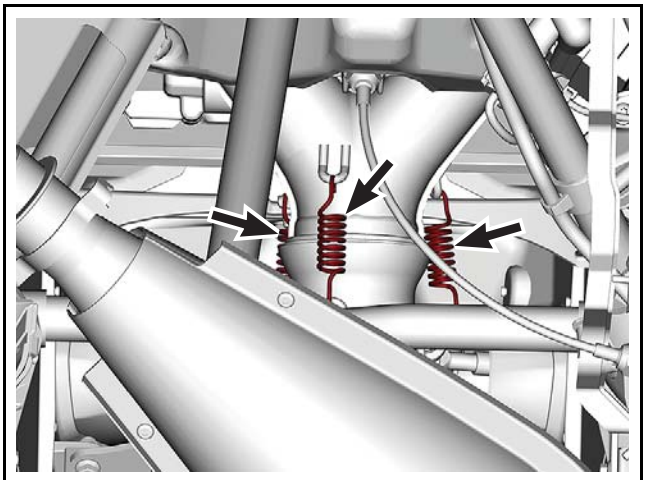
14. Reinstall muffler.

TUNED PIPE

Removing the Tuned Pipe

1. Remove the muffler.
2. Remove exhaust springs retaining the tuned pipe to the exhaust manifold.

REQUIRED TOOL	
SPRING INSTALLER/REMOVER (P/N 529 035 983)	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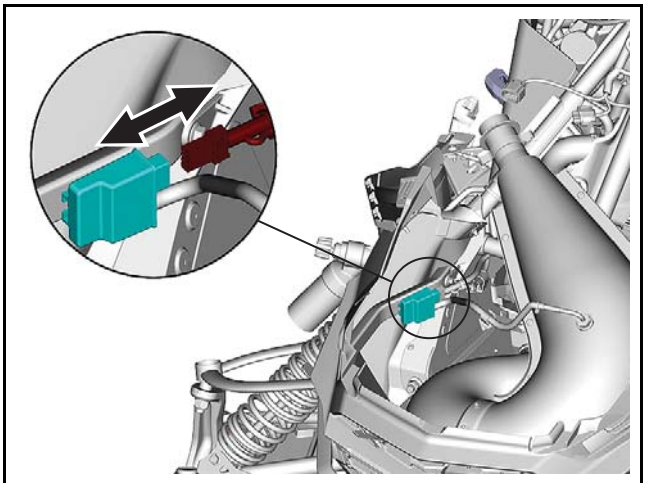
Models With 2 EGTS

3. Disconnect the THCM harness from the THCM module.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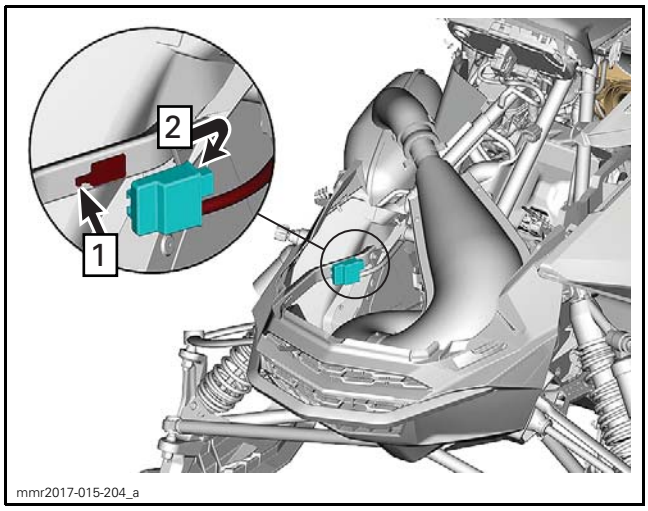
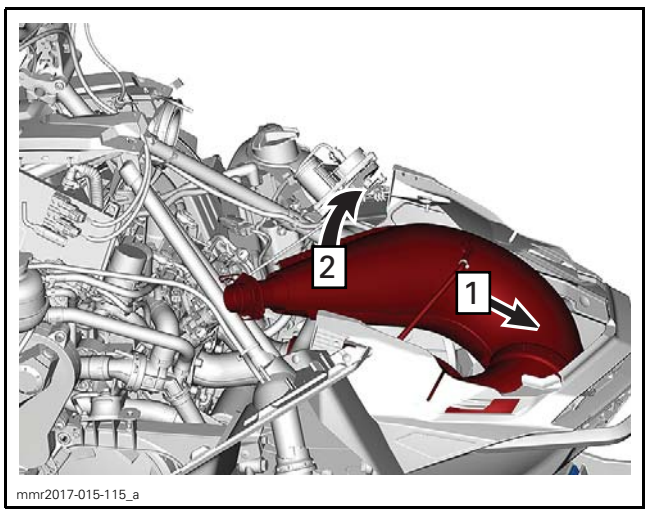
4. Detach the THCM from the vehicle side member.

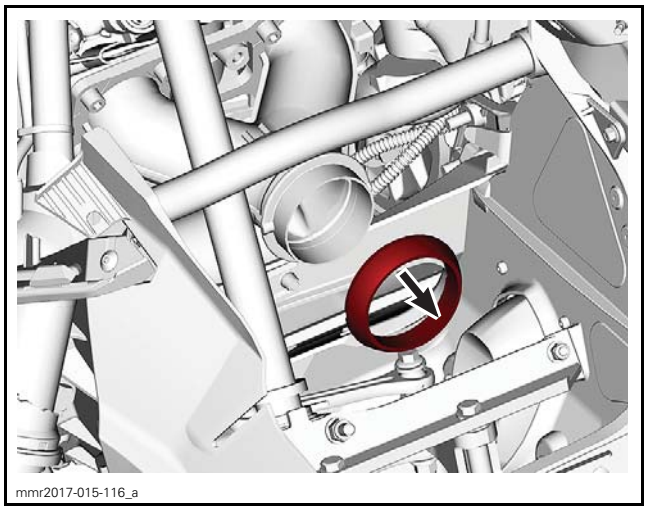


All Models

5. Remove tuned pipe.
   5.1 Move tuned pipe forwards until the hook gets out of the anti vibration rubber mount.
   5.2 Remove the tuned pipe by tilting it (engine side).



6. Remove exhaust gasket.



Inspecting the Tuned Pipe

Check exhaust pipe for:
– Damages
– Cracks.

Inspect exhaust gasket condition. Replace as required.

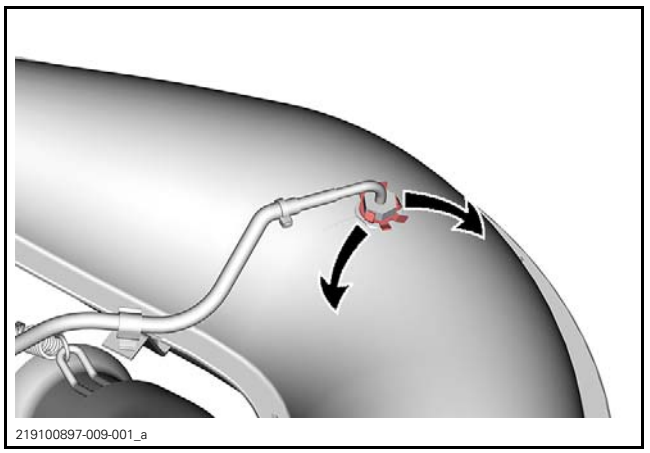
Installing the Tuned Pipe

The installation is the reverse of the removal procedure.

EXHAUST GAS TEMPERATURE SENSOR (EGTS)

Removing the EGTS

Unfold all tabs.



TYPICAL

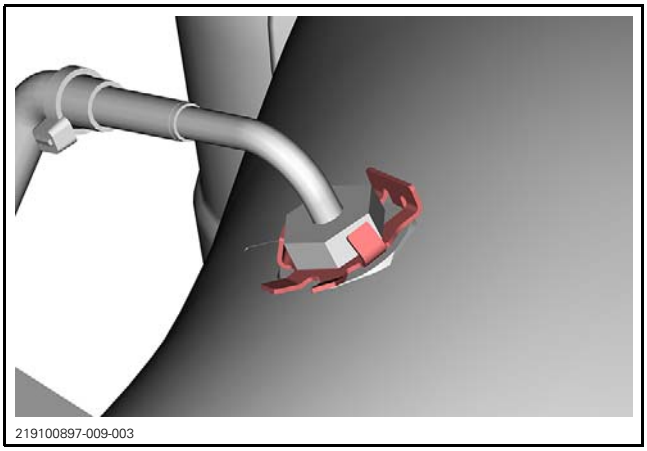
Remove sensor.

Installing the EGTS

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

Install a new locking tab as shown and tighten sensor to specification.

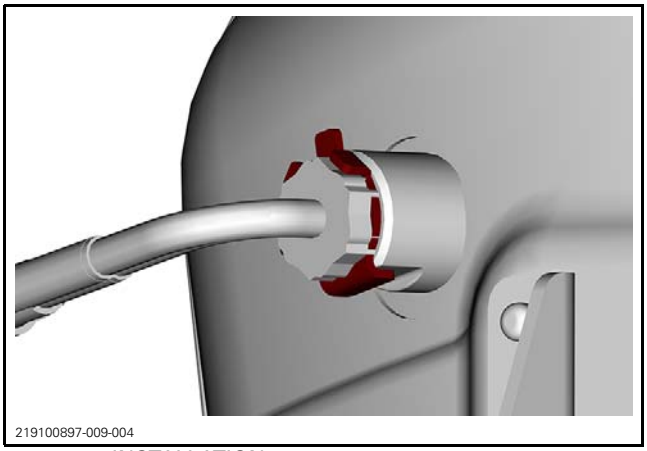
On the tuned pipe, fold two (2) tabs on sensor.



219100897-009-003

TUNED PIPE INSTALLATION

On the muffler, fold one (1) tab on sensor.



219100897-009-004

MUFFLER INSTALLATION

TIGHTENING TORQUE	
Exhaust Gas Temperature Sensor	45 N•m ± 2 N•m (33 lbf•ft ± 1 lbf•ft)

EXHAUST MANIFOLD

SERVICE PRODUCTS

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

Midwest Manuals
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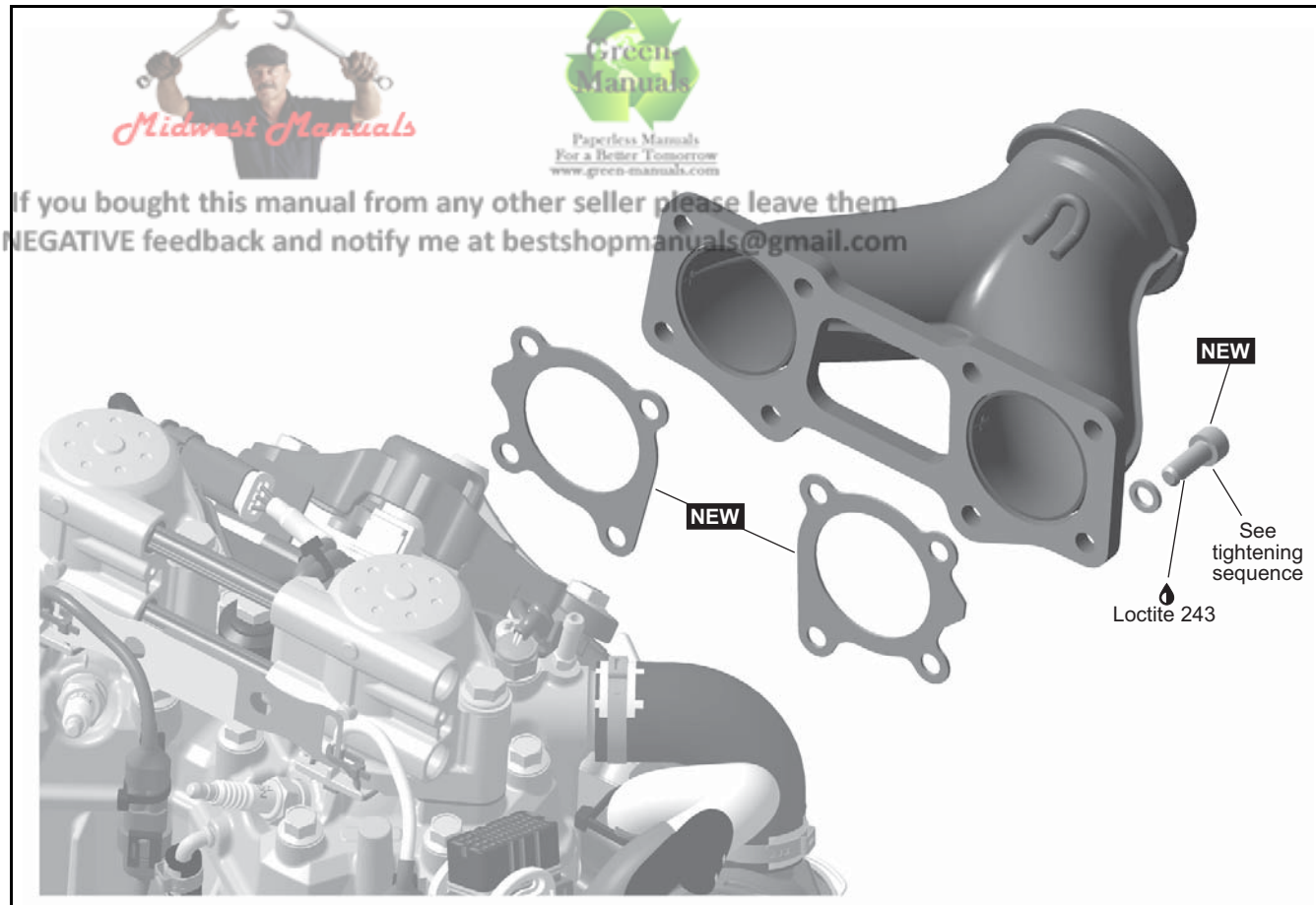
Paperless Manuals
For a Better Tomorrow
www.green-manuals.com
If you bought this manual from any other seller please leave them
NEGATIVE feedback and notify me at bestshopmanuals@gmail.com



NEW = Component must be replaced when removed.

RTX19_850ETEC-002-001_a

GENERAL

⚠ WARNING

To avoid potential burns, never touch exhaust system components immediately after the engine has been running because these components are very hot. Let engine and exhaust system cool down before performing any servicing.

During assembly/installation, use the torque value and service products as in the exploded view.

⚠ 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.

PROCEDURES

EXHAUST MANIFOLD

Removing the Exhaust Manifold

1. Remove tuned pipe. Refer to *EXHAUST SYSTEM* subsection.
2. Remove and discard the exhaust manifold screws. Keep washers for reinstallation.

REQUIRED TOOL	
Allen spherical socket	

3. Remove the exhaust manifold and discard gaskets.

Inspecting the Exhaust Manifold

Check if manifold is cracked or damaged. Replace if necessary.

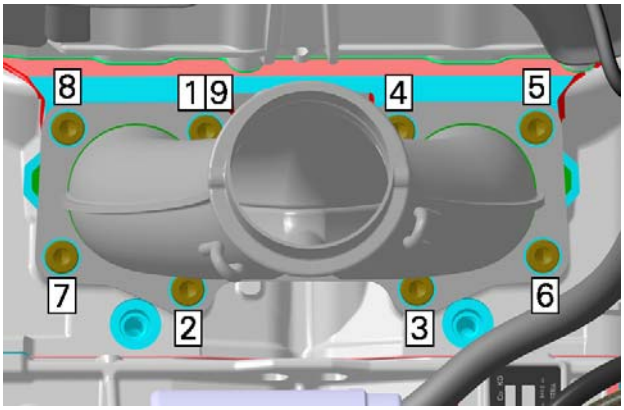
Installing the Exhaust Manifold

1. Install manifold with NEW gaskets.
2. Apply a drop of threadlocker on threads of each NEWscrew.

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

3. Install exhaust manifold screws with washers and tighten to specification as per the following tightening sequence.

NOTICE Do not use an impact wrench to tighten exhaust manifold screws.



TIGHTENING SEQUENCE

TIGHTENING TORQUE	
Exhaust manifold screws	34 N•m ± 4 N•m (25 lbf•ft ± 3 lbf•ft)

4. Install tuned pipe. Refer to *EXHAUST SYSTEM* subsection.

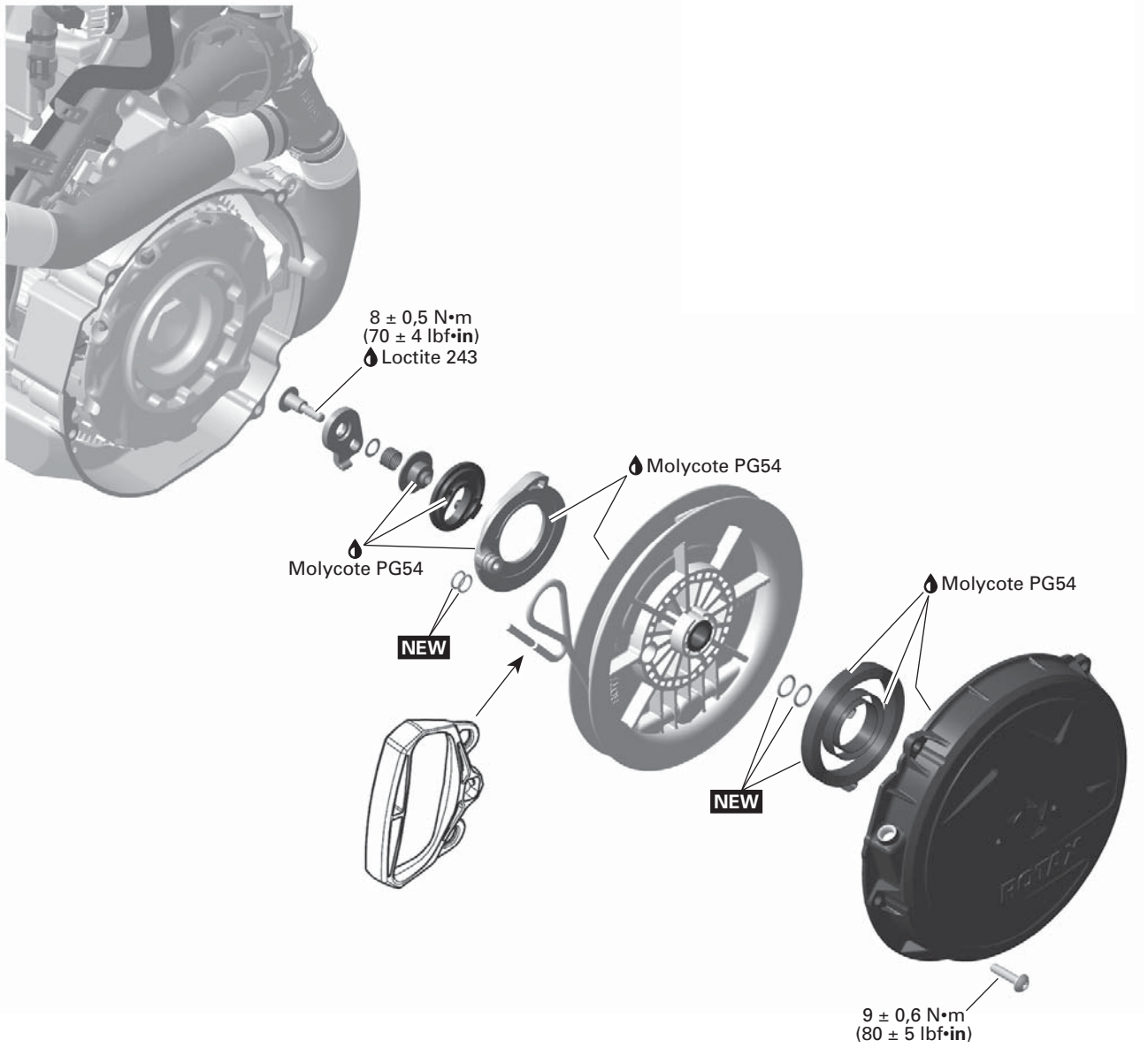
REWIND STARTER

SERVICE TOOLS

Description	Part Number	Page
SMALL HOSE PINCHER	295 000 076	3, 9

SERVICE PRODUCTS

Description	Part Number	Page
LOCTITE 243 (BLUE)	293 800 060	8
MOLYKOTE PG 54	420 899 763	3, 6



NEW = Component must be replaced when removed.

RTX21_600EFI-003-001_a

MAINTENANCE

CLEANING AND LUBRICATING THE REWIND STARTER

Refer to *ASSEMBLING THE REWIND STARTER* in this subsection.

NOTICE It is of the utmost importance that the rewind starter spring be lubricated periodically using the recommended grease. The use of standard multipurpose grease could result in rewind starter malfunction under very cold temperatures and component life will be shortened.

RECOMMENDED SERVICE PRODUCT
MOLYKOTE PG 54 (P/N 420 899 763)

INSPECTION

Due to dust accumulation, rewind starter must be periodically cleaned, inspected and lubricated.

NOTICE It is of the utmost importance that the rewind starter spring is lubricated periodically using specific lubricant. Otherwise, rewind starter component life will be shortened and/or rewind starter will not operate properly under very cold temperatures.

Check if starter rope is fraying, replace if necessary.

When pulling starter handle, starter mechanism must engage within 10 cm (3.94 in) of rope pull length. If not, disassemble rewind starter, clean and check for damaged plastic parts. Replace as required, lubricate, reassemble and recheck.

When releasing starter handle, it must return to its stopper and stay against it. If not, check for proper spring preload or damage. Readjust or replace as required.

When pulling starter handle 10 times in a row, it must return freely. If not, check for damaged parts or lack of lubrication. Replace parts or lubricate accordingly.

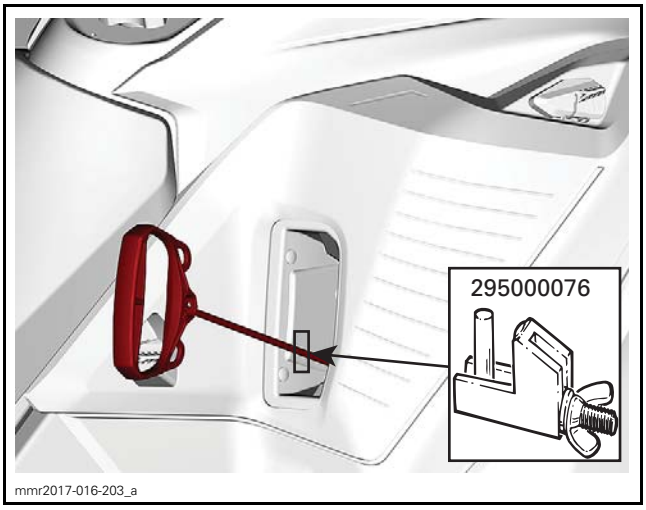
PROCEDURES

REWIND STARTER HANDLE

Removing the Rewind Starter Handle

1. Pull out starter handle/rope for 50 cm (20 in) approximately and lock rope near rewind starter.

REQUIRED TOOL
SMALL HOSE PINCHER (P/N 295 000 076)



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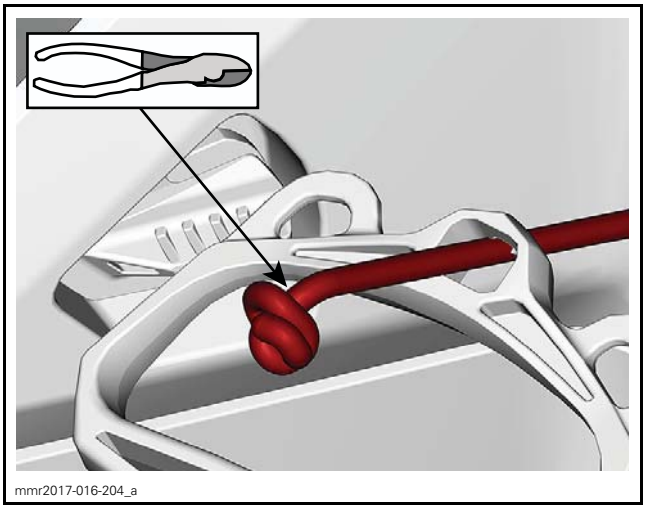
2. Using a small screwdriver, extract rope knot from stater handle.
3. Cut rope close to knot.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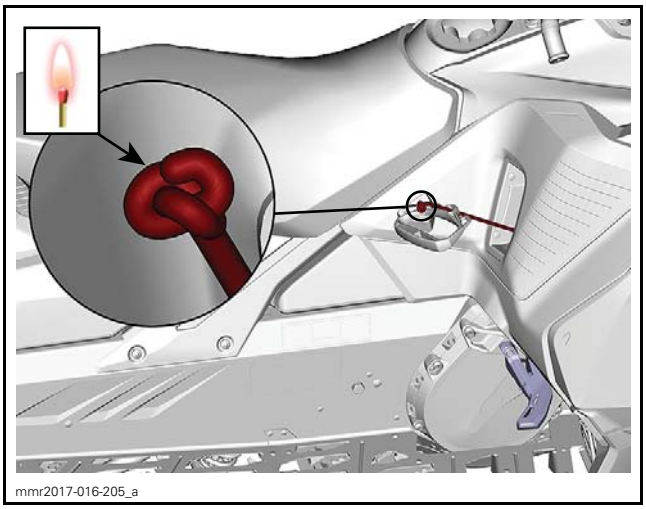
Installing the Rewind Starter Handle

Before installing starter handle on the rope, it is necessary to fuse the rope end with a lit match. Pass rope through starter handle and tie a knot on the rope end.

Fuse the knot with a lit match then insert rope end down and pull the starter handle over the knot.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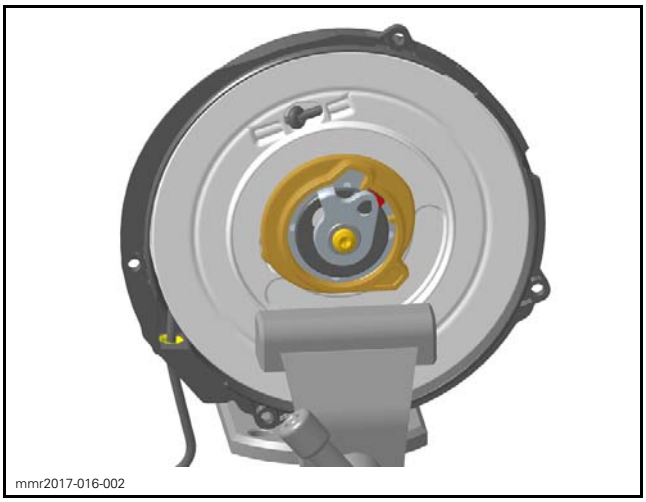
REWIND STARTER ROPE

Rewind Starter Rope Replacement

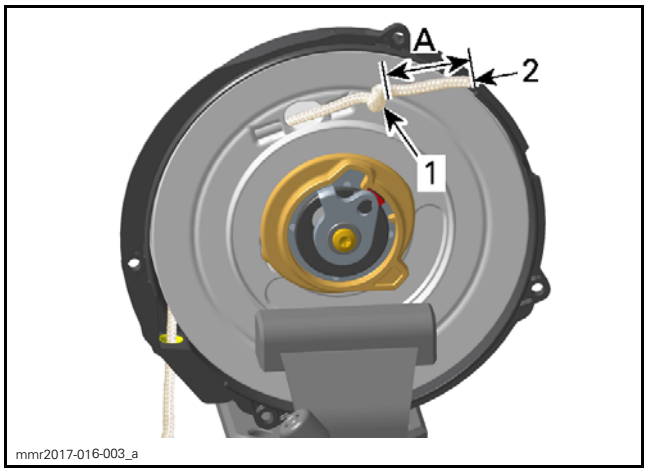
1. Remove rewind starter, refer to *REWIND STARTER* in this subsection.
2. Completely pull out rope. Hold rewind starter in a vise.


mmr2017-016-002

3. Slide rope and untie the knot.
4. Remove rope from rope sheave.

NOTE: A new rope must have a overall length of 200 cm (78.74 in).

5. Insert rope end in rope sheave orifice and lock it by making a knot, leaving behind a free portion of 30 mm to 35 mm (1.2 in to 1.4 in) in length.
6. Fuse rope end with a lit match



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A. 30 mm to 35 mm (1.2 in to 1.4 in)
1. Knot
2. Fused rope end

7. Insert rope end into rope sheave.

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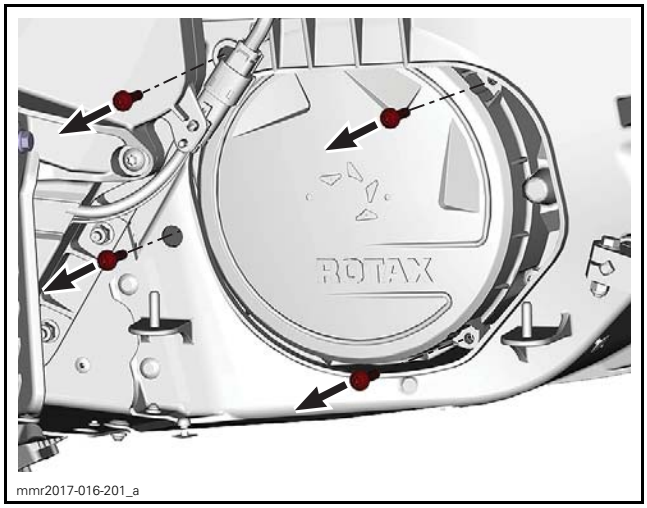
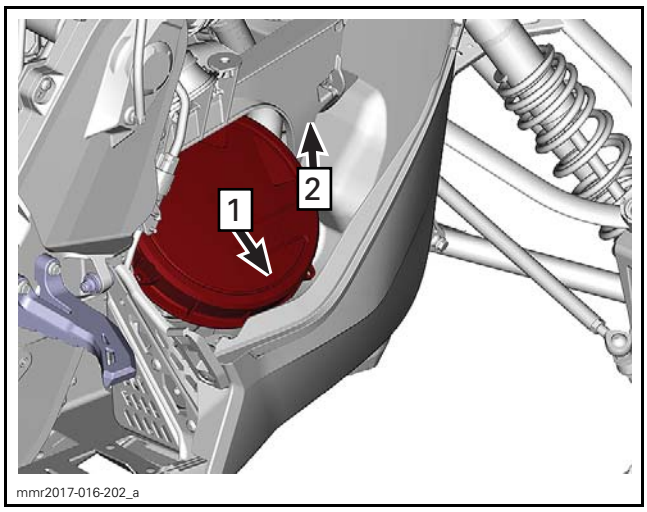
REWIND STARTER

Removing the Rewind Starter

1. Remove starter handle.
2. Remove the rewind starter.

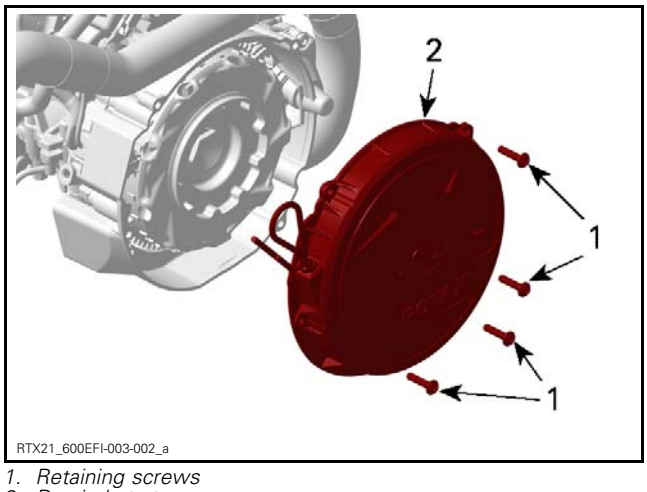
Engine Inside the Vehicle





Step 1: Slide the bottom of the rewind starter out of frame
Step 2: Remove rewind starter from engine

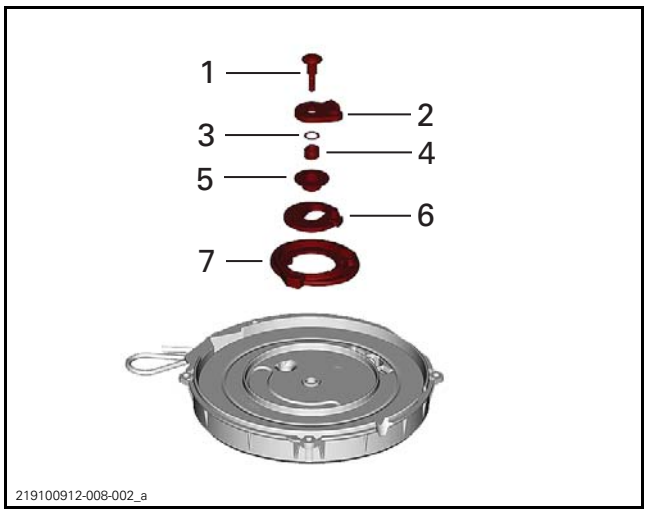
Engine Out of the Vehicle



1. *Retaining screws*
2. *Rewind starter*

Disassembling the Rewind Starter

1. Remove the hose pincher previously installed on rope at rewind starter handle removal. Let rope sheave get free to release spring preload.
2. Remove the following parts:



1. *Bearing screw*
2. *Lock lever*
3. *Thrust washer*
4. *Compression spring*
5. *Step collar*
6. *Pawl lock*
7. *Pawl*

3. Remove rope sheave from starter housing. Hold spring in starter housing using a screwdriver.

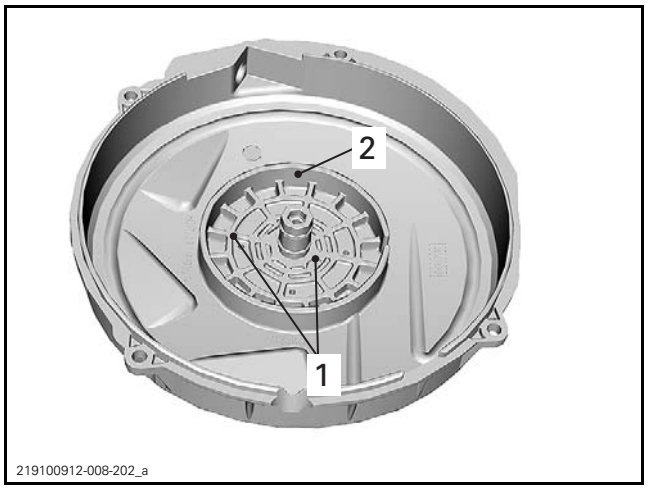
⚠ WARNING

Since the spring is tightly wound inside the guide it may jump out when rewind is handled. Always handle with care.

4. For removing the spring, it is of best practice to take the starter housing with the spring showing to the floor and than let the starter housing fall plane to the ground.
5. Discard spring.
6. Remove and discard O-rings.
7. Check sleeve for wear or any other damage. Replace rope sheave if necessary.

Assembling the Rewind Starter

1. Install new O-rings.
2. Apply the lubricant at these locations:



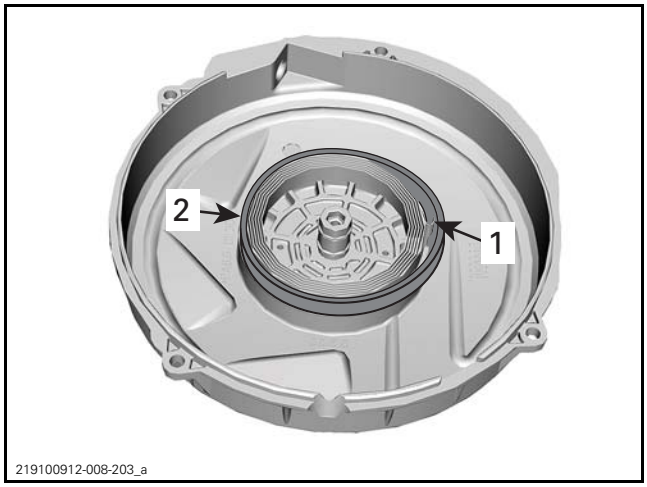
1. Spring contact area
2. Spring guide inside housing

NOTICE For rewind starter parts lubrication use following specified service product. The use of standard multipurpose grease could result in rewind starter malfunction under very cold temperatures and component life will be shortened.

SERVICE PRODUCT
MOLYKOTE PG 54 (P/N 420 899 763)

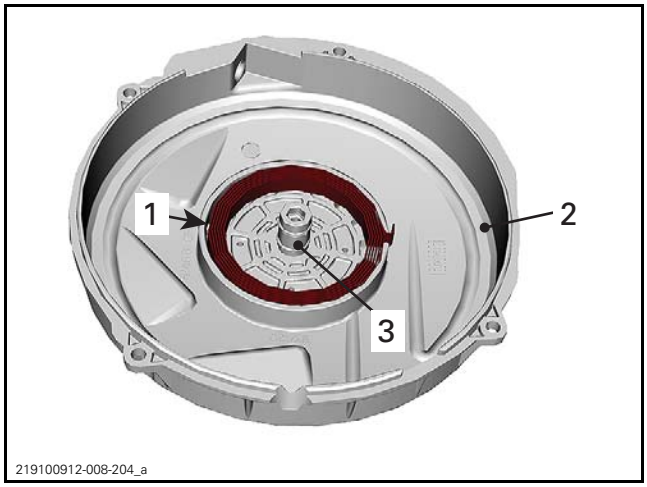
3. Install the new spring.
   - 3.1 Position the cardboard carrier and the spring, over the spring guide wall.
   - 3.2 Align the spring outer end in the spring guide notch. The spring end must pointed counterclockwise.
   - 3.3 Using your both thumbs, and carefully press the spring evenly in its location.
   - 3.4 Discard the cardboard carrier.

⚠ CAUTION Since the spring is tightly wound inside the guide it may jump out when rewind is handled. Always handle with care.



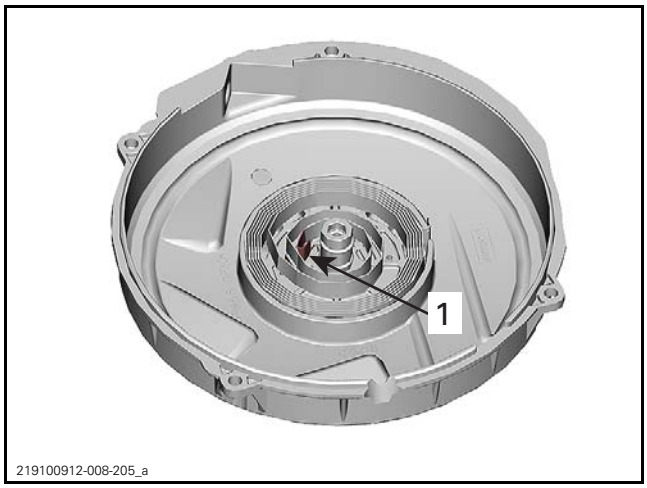
1. Outer spring end
2. Cardboard carrier (discard it)

4. Apply the lubricant at these locations:



1. Spring
2. 1 cm (1/2 in) wide on bottom of housing
3. Housing post

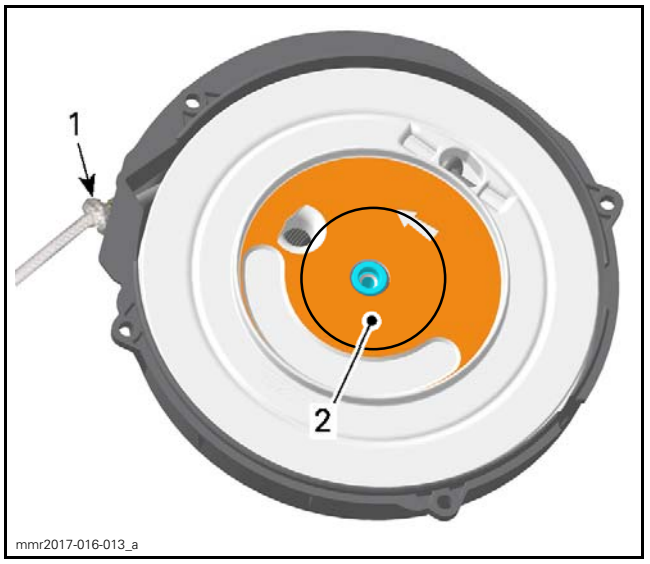
5. Wind rope on rope sheave
6. Place rope sheave in starter housing making sure the sheave hub notch engages in the rewind spring hook.



1. Rewind spring hook

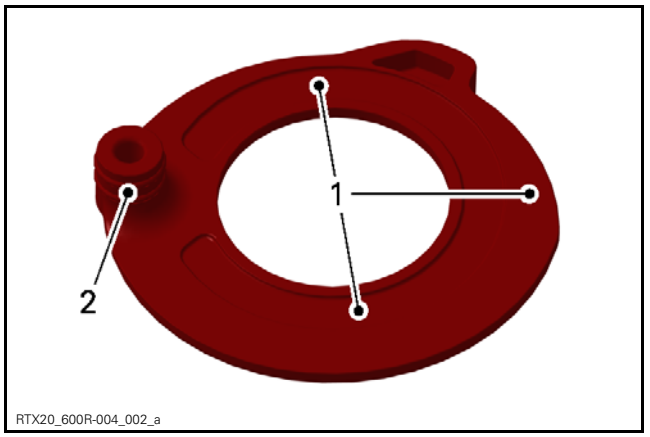
SHEAVE HUB NOTCH

7. Rotate the rope sheave counterclockwise by about 1/2 turn until rope end is accessible through rope exit hole.
8. Pull rope out of starter housing.
9. Rotate the rope sheave counterclockwise 1 full turn.
10. Temporarily make a knot to hold it.
11. Lubricate rope sheave at the contact surface of the pawl.



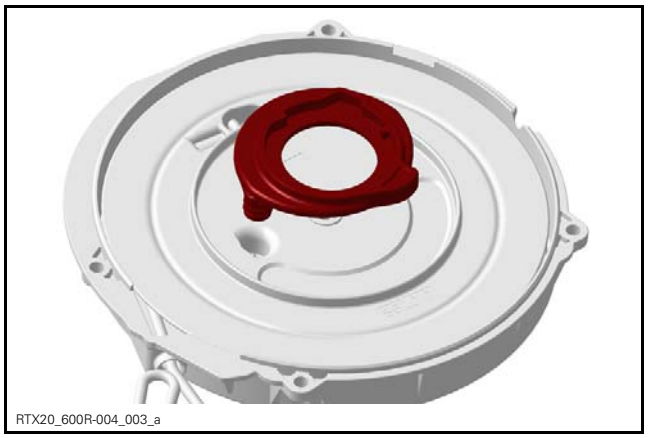
1. Knot
2. Lubricate contact surface of the pawl

12. Lubricate pawl at the contact surface and emboss.

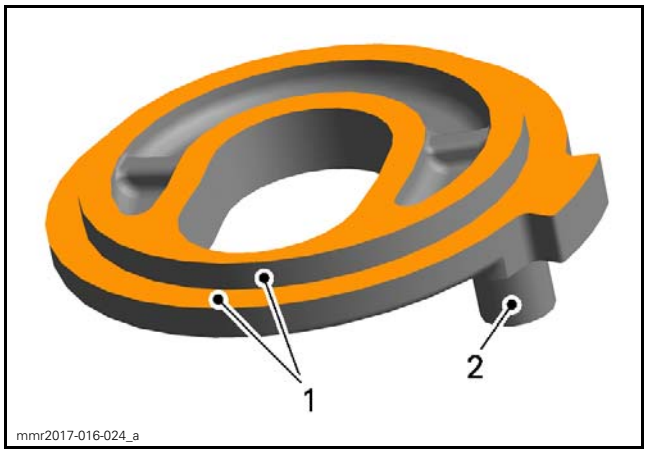


1. Contact surface
2. Emboss

13. Install pawl on rope sheave.



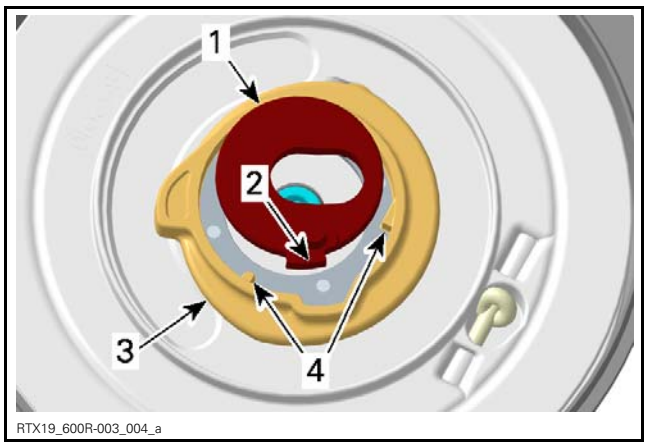
14. Lubricate pawl lock at the contact surfaces and emboss.



1. *Contact surfaces*
2. *Emboss*

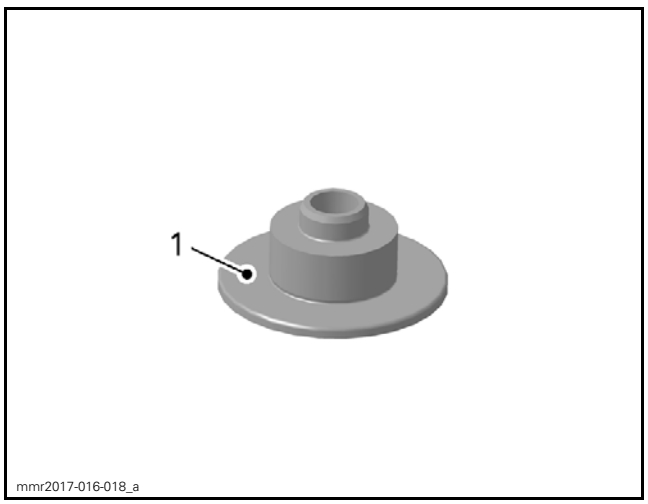
15. Install pawl lock on pawl.

NOTE: Pawl lock nose must engage between the pawl lock stoppers.



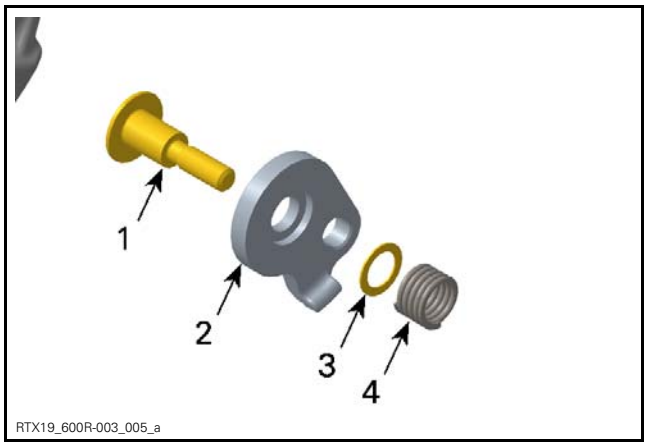
1. *Pawl lock*
2. *Pawl lock nose*
3. *Pawl*
4. *Pawl lock stoppers*

16. Lubricate step collar and install it on pawl lock.



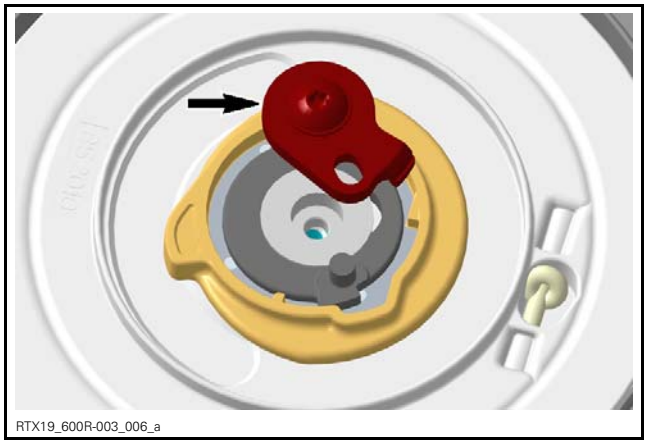
1. *Contact surface*

17. Preassemble as shown:



1. *Bearing screw*
2. *Lock lever*
3. *Thrust washer*
4. *Compression spring*

18. Install preassembled unit on rewind starter.



19. Tighten the bearing screw to specification.

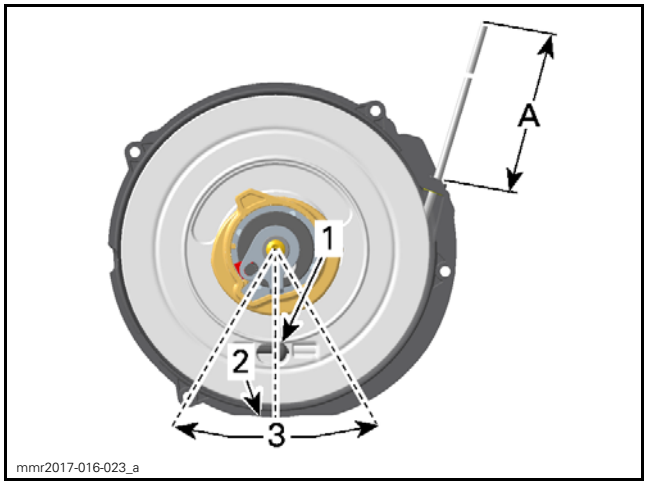
TIGHTENING TORQUE	
Bearing screw	8 N•m ± 0.5 N•m (71 lbf•**in** ± 4 lbf•**in**) + LOCTITE 243 (BLUE) (P/N 293 800 060)

20. After completion, check if the pawl lock engages and the rope is pulled back completely after releasing the rope.

Installing the Rewind Starter

1. Loosen the temporary knot.
2. Check correct rope length:
   - 2.1 Pull out rope until recess for knot in the rope sheave is within the specified range.
   - 2.2 Measure rope length.

MINIMUM ROPE LENGTH
275 mm (10.8 in)

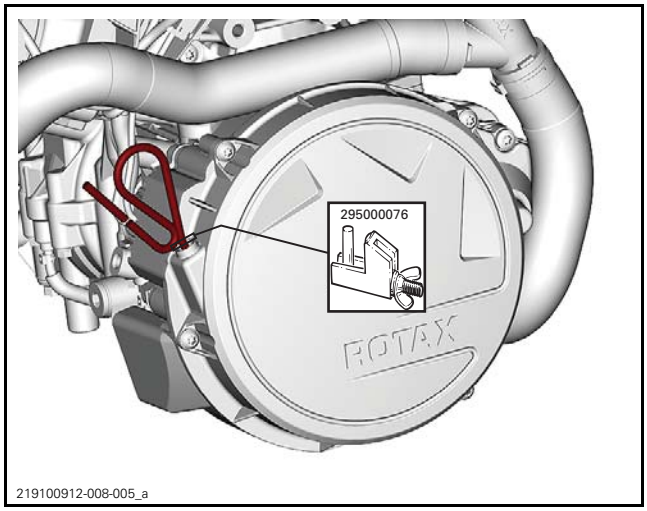


1. *Knot*
2. *Bottom side of rewind starter*
3. *Range of ± 30°*

If rope is too short replace rope, refer to *REWIND STARTER ROPE REPLACEMENT* in this subsection.

3. Lock rope near rewind starter housing.

REQUIRED TOOL	
SMALL HOSE PINCHER (P/N 295 000 076)	



TYPICAL

4. Reinstall rewind starter assembly on engine.

TIGHTENING TORQUE	
Rewind starter retaining screws	9 N•m ± 0.6 N•m (80 lbf•**in** ± 5 lbf•**in**)

5. Thread starter rope through console.

6. Install handle, refer to *INSTALLING THE STARTER HANDLE* in this subsection.

LUBRICATION SYSTEM

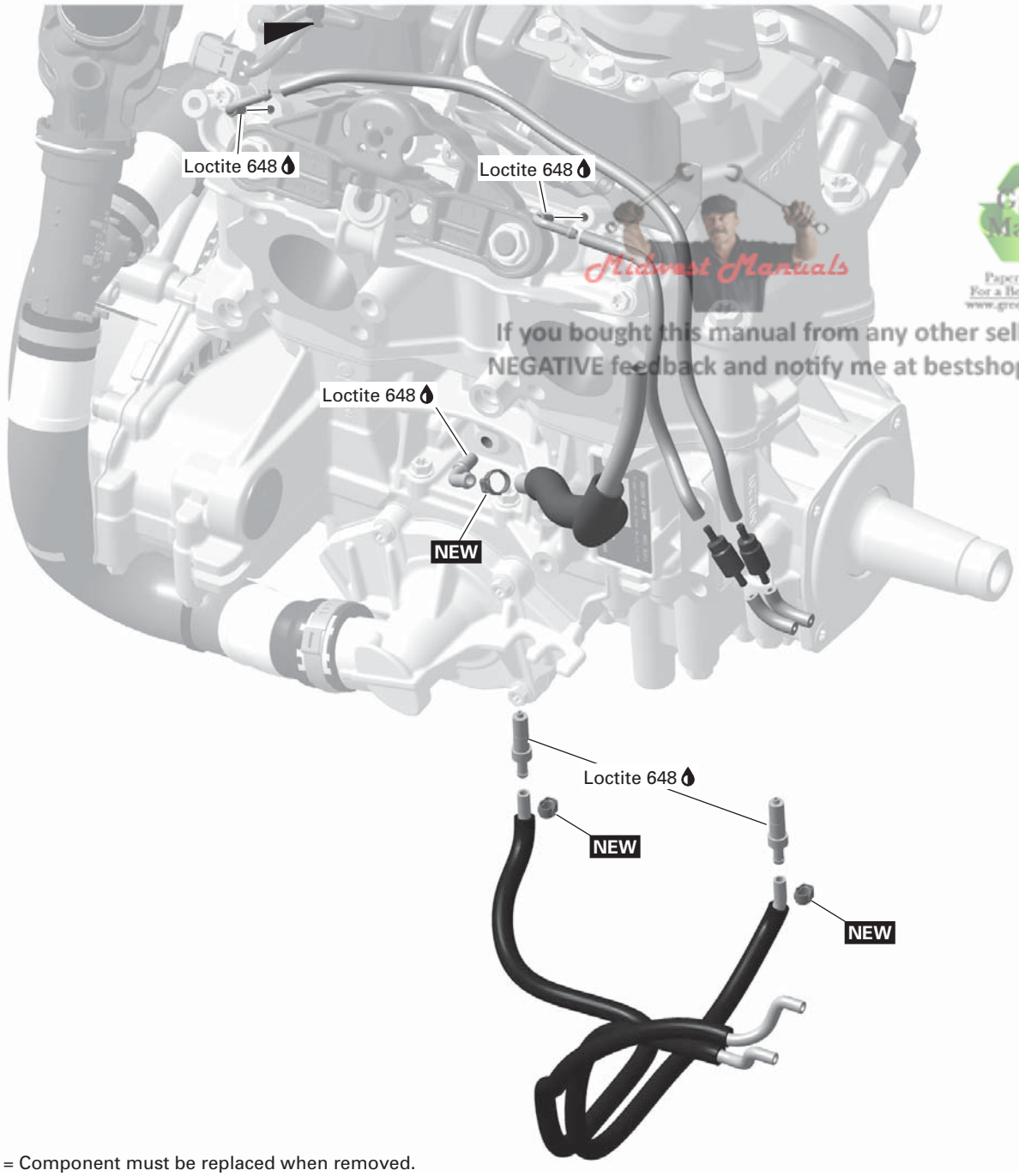
SERVICE TOOLS

Description	Part Number	Page
FLUKE 115 MULTIMETER	529 035 868	14
IMPULSE FITTING PUNCH (BIG)	529 036 412	18
IMPULSE FITTING PUNCH (SMALL)	529 036 413	18
LEAK TEST KIT	529 033 100	9
VACUUM/PRESSURE PUMP	529 021 800	9, 15, 18

SERVICE PRODUCTS

Description	Part Number	Page
2T E-TEC SYNTHETIC OIL (EUR)	779281	8
2T E-TEC SYNTHETIC OIL	779126	8
BRAKE AND PARTS CLEANER PRO S2	779245	17
LOCTITE 648 (GREEN) (F)	619 600 012	17
LOCTITE 648 (GREEN)	413 711 400	17
PULLEY FLANGE CLEANER (F)	619 600 022	17

600R E-TEC ENGINE



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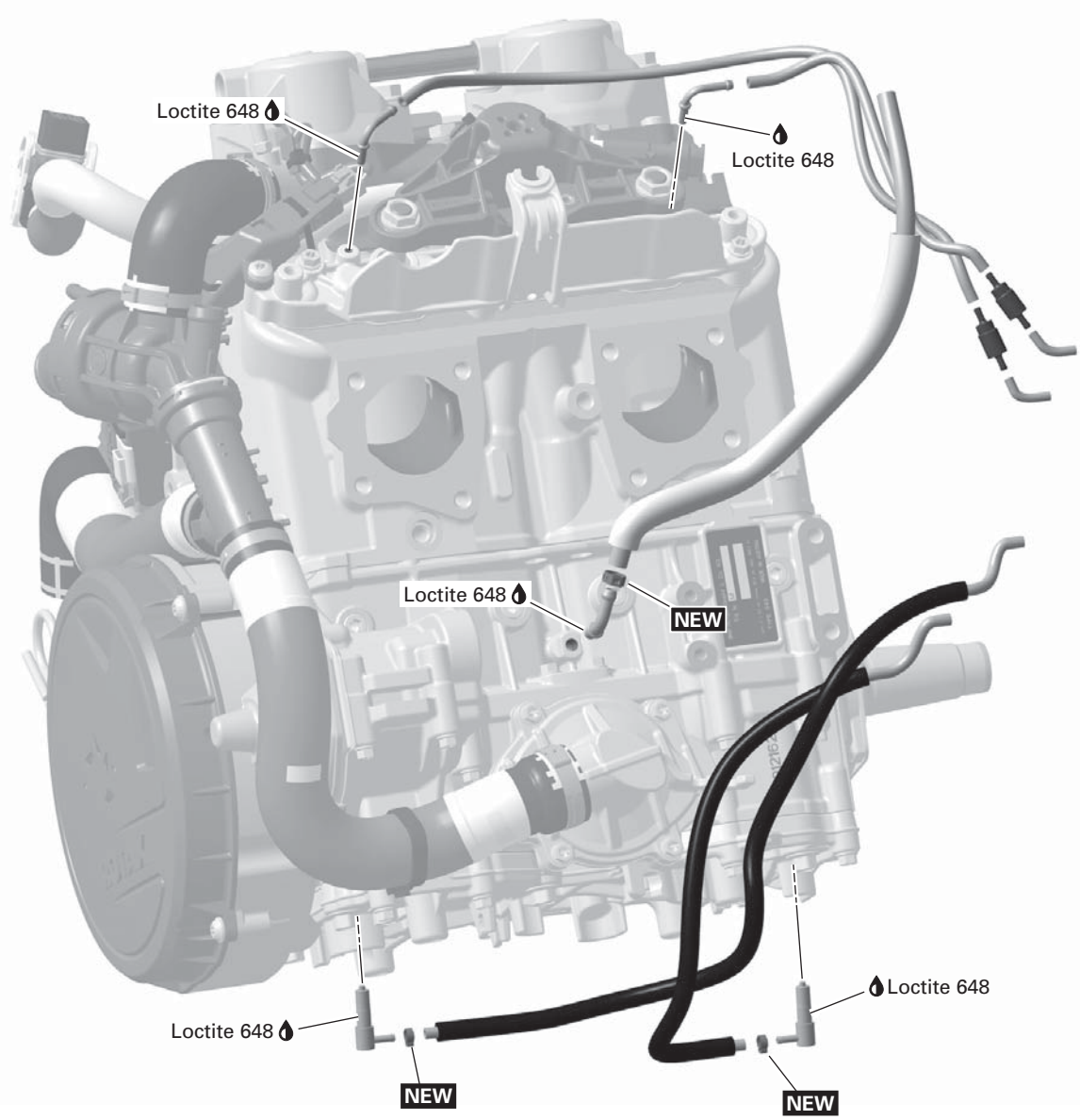
NEW = Component must be replaced when removed.

RTX20_600R-005-001_a

850 E-TEC ENGINE



NEW = Component must be replaced when removed.

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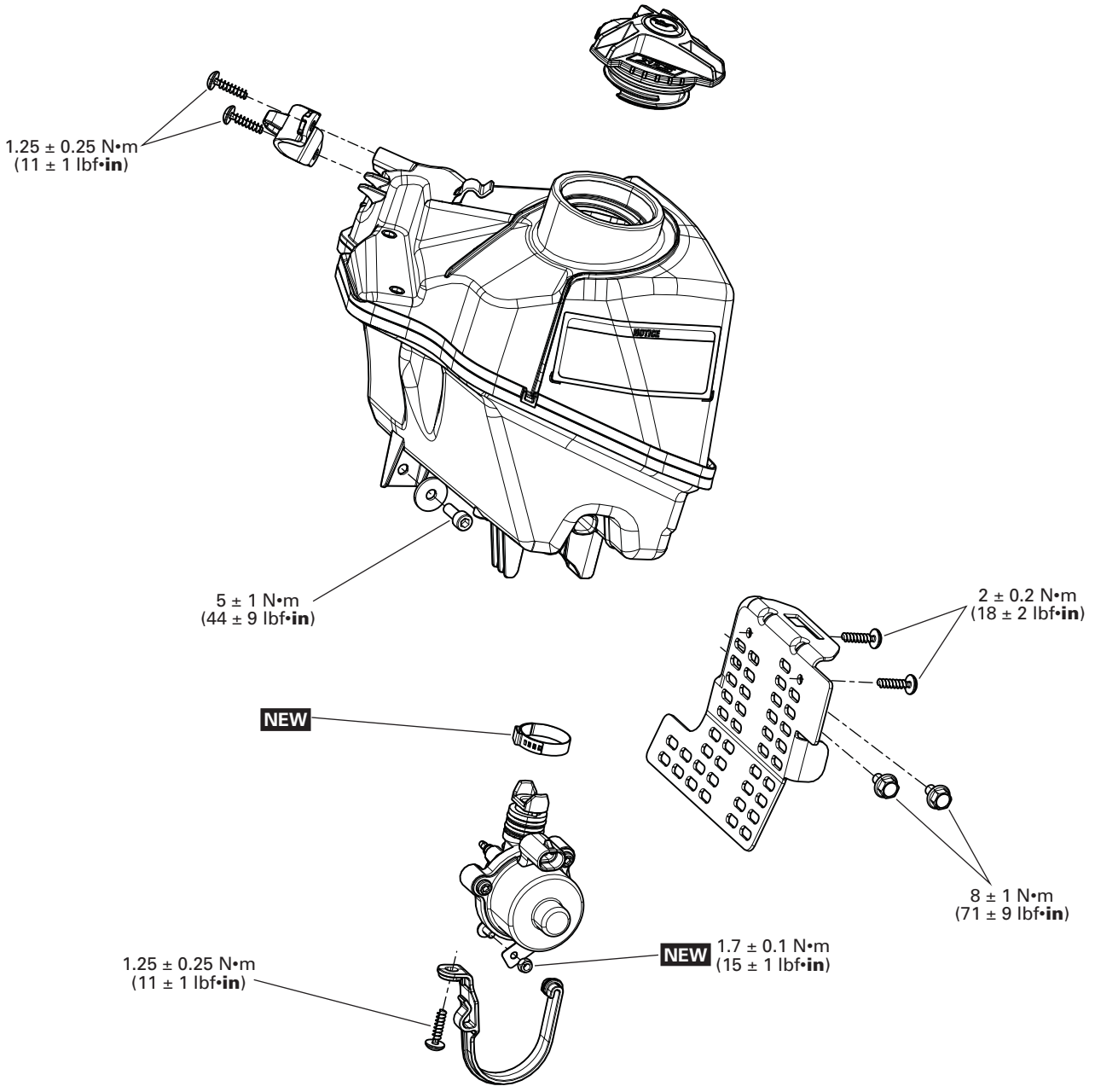
OIL INJECTION TANK AND OIL INJECTION PUMP



NEW = Component must be replaced when removed.

RTX600ETECMY18-004-100

GENERAL

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

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

⚠ WARNING

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

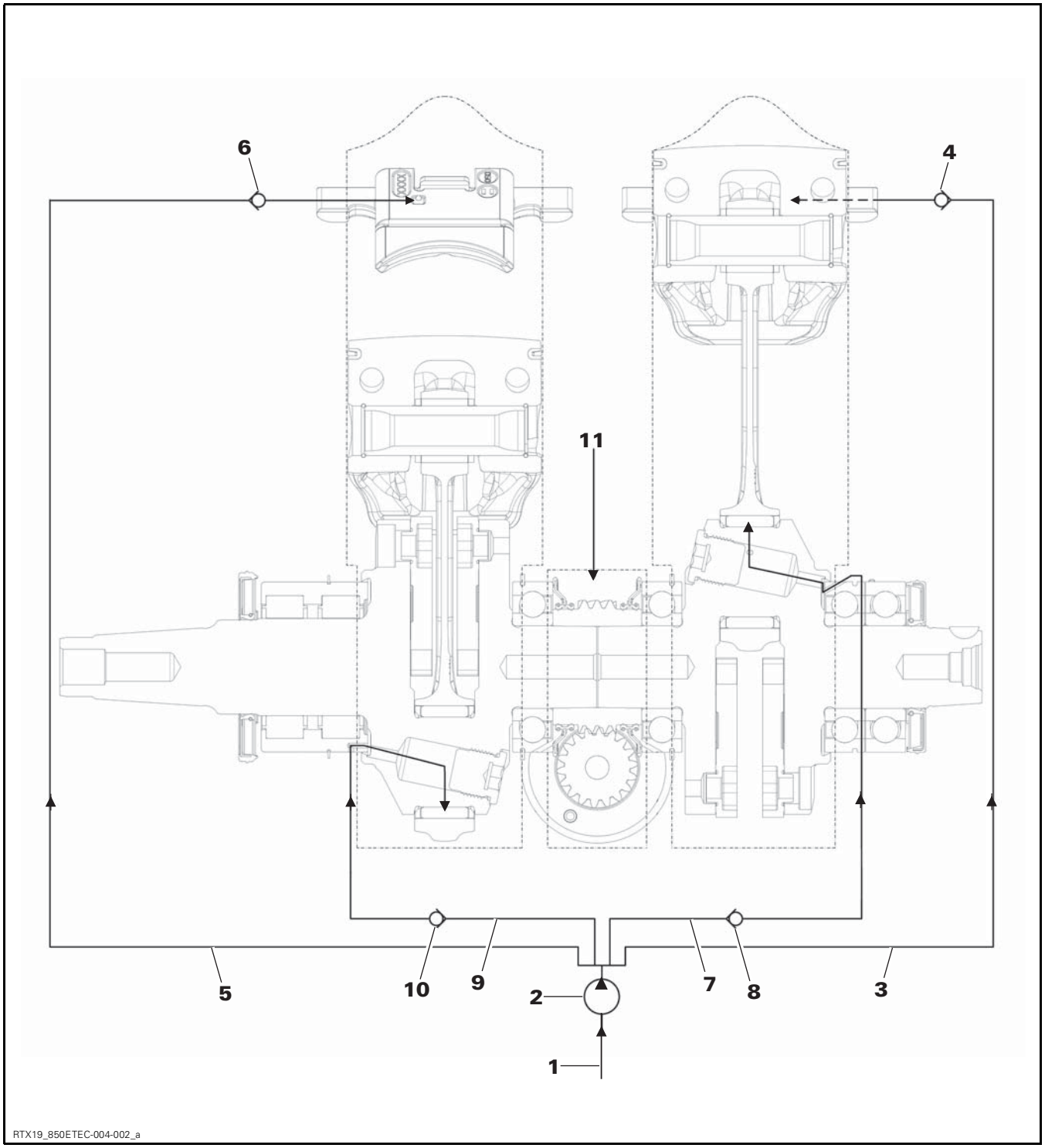
⚠ WARNING

Wipe off any oil spills. Oil is highly flammable.

NOTICE Do not use a hose pincher on outlet hose. This would damage the spring inside hose.

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

ENGINE LUBRICATION SYSTEM DESCRIPTION (850 E-TEC ENGINE)



1. *Oil supply from oil tank*
2. *Oil pump*
3. *To 3D RAVE valve MAG side*
4. *Check valve RAVE MAG side*
5. *To 3D RAVE valve PTO side*
6. *Check valve RAVE PTO side*
7. *To engine MAG side*
8. *Check valve MAG side main bearing*
9. *To engine PTO side*
10. *Check valve PTO side main bearing*
11. *Oil supply from oil tank*

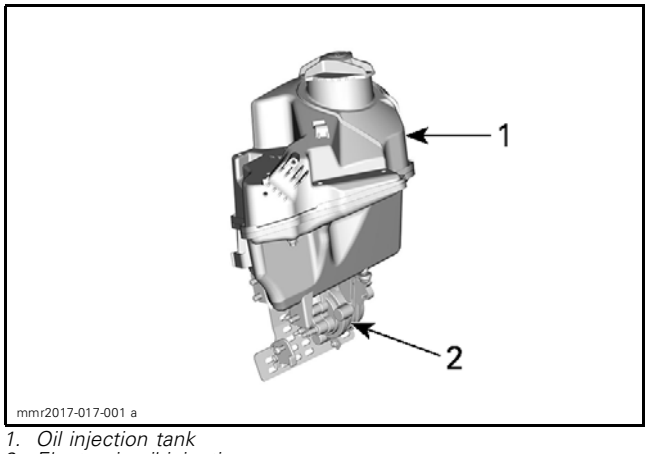
The engine oil supplied by the oil pump is going through check valves to the outer main bearings. Through oil collecting grooves in the outer crank webs, the oil is going through the crank webs and by centrifugal force, the oil is directly transferred to the crank pins to lubricate the big end bearings. After this oil exits the big end bearings it lubricates the small ends, cylinder liners and pistons.

RAVE valves are lubricated by the electronic oil injection pump.

SYSTEM DESCRIPTION

An electronic oil injection pump with a mechanical positive displacement type is used. An electronic pump is more accurate and injection rate can be changed according to engine requirements. This results in a greatly reduced oil consumption.

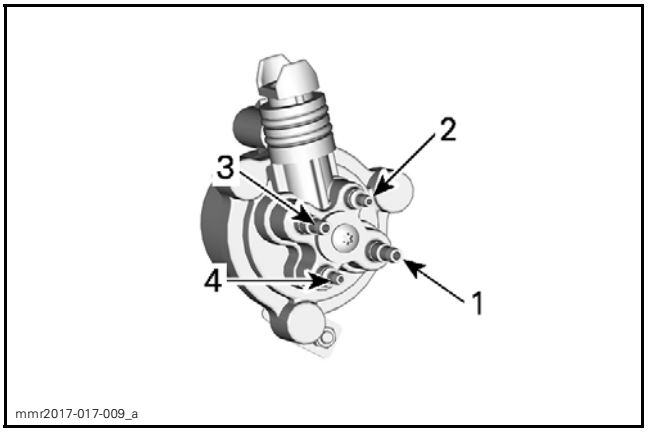
The electronic oil injection pump is directly attached under the oil injection tank.



1. Oil injection tank
2. Electronic oil injection pump

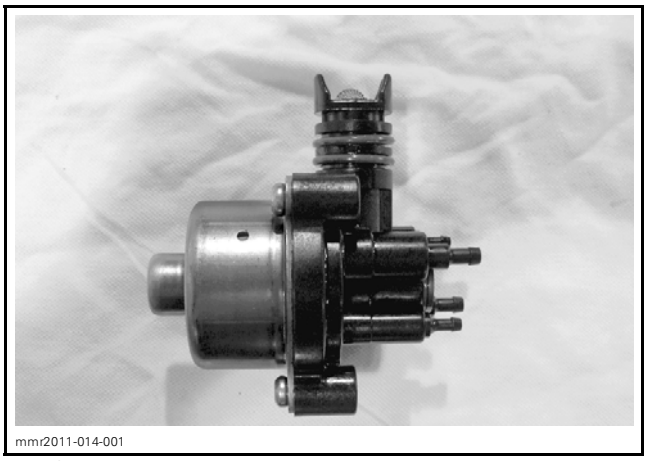
The E-TEC pump features a total of 4 outlets:

– 2 large outlets to the crankcase to lubricate engine internal parts.
– 2 small outlets to the 3D RAVE valves to lubricate valves to prevent carbon deposits.



1. To engine PTO side
2. To 3D RAVE valve PTO side
3. To engine MAG side
4. To 3D RAVE valve MAG side

The 4 plungers in the pump work synchronized. They pump all at the same time.



TYPICAL

The ECM controls the pump to inject a variable amount of oil through the entire engine operating range and conditions.

Oil Injection Pump Operation

For the first 6 hours of engine break-in period, oil delivery is increased.

After the break-in period, the oil/fuel ratio will return to its predetermined operating ratio.

ENGINE	OPERATING RATIO
600R	100:1
850	70:1

At idle, pump works at approximately less than 1 pulse per minute. A very low quantity of oil is injected to reduce engine smoke and to reduce engine emissions.

As engine speed increases, oil flow increases but not proportionally. It varies according to the specific engine requirements.

ENGINE	RPM	PULSES PER MINUTE
600R	8000	100
850		180

When operating vehicle in high altitude area, oil flow is reduced proportionally as altitude increases.

Oil Warm-Up Mode

When injection oil is very cold and engine is above idle speed, the oil warm-up mode is active.

To warm-up the oil, the oil injection pump is kept ON after the oil delivery stroke, as long as possible, to then turn OFF for the return stroke. The extra time the pump is ON generates more heat that is dissipated through the oil.

NOTE: The premium gauge displays WARM UP whenever the oil warm-up or engine warm-up modes are active.

To determine if injection oil is cold, the ECM uses a feedback switch, located in oil injection pump, that closes at the end of the oil delivery stroke and opens when the oil injection pump coil is de-energized. Thus, the ECM can calculate the time it takes to deliver the oil which is related to the oil viscosity.

The ECM uses a complex algorithm to vary the warm-up time and the rev limiter according to oil pump requirements based on engine speed and TPS position. Therefore, the rev limiter is set dynamically as per the driver inputs.

NOTE: If a fault code related to the feedback switch is active (P1233, P1234), the oil injection warm-up mode uses data from the ATS but it uses the following parameter values. Engine lubrication does not change, only the warm-up time may be longer than usual.

OIL WARM-UP MODE STRATEGY WHEN FEEDBACK SWITCH IS FAULTY		
AIR TEMPERATURE	WARM-UP TIME	ENGINE SPEED LIMITATION
Warm-up starts below -20°C (-4°F)	Within approximately 8 and 11 minutes	Within approximately 4000 - 6000 RPM

Automated Engine Oil Fogging

An automated engine oil fogging has been implemented to automatically inject the required oil to protect the engine during vehicle storage. Engine speed will be increased to approximately 1600 RPM and excess oil will be injected for approximately 30 seconds then, the engine will automatically be stopped.

The storage mode can be activated either by using the BRP diagnostic software (BUDS2) or the multifunction gauge on the vehicle. Refer to *STORAGE PROCEDURE* subsection.

RECOMMENDED INJECTION OIL

Rotax® engines were developed and validated using the XPS™ oil. BRP recommends the use of its XPS injection oil or an equivalent at all time. Damages caused by the use of an injection oil not suitable for this 2-stroke direct fuel injection engine may not be covered by the BRP Limited Warranty.

XPS RECOMMENDED ENGINE OIL	
Scandinavia	2T E-TEC SYNTHETIC OIL (EUR) (P/N 779281)
Other Countries	2T E-TEC SYNTHETIC OIL (P/N 779126)
IF THE RECOMMENDED XPS ENGINE OIL IS NOT AVAILABLE	
Use a 2-stroke lubricant designed for snowmobiles meeting or exceeding the following lubricant industry specifications: – JASO FD (M345-2004) – SAE Grade 4 (F / M 4)	

MAINTENANCE

INSPECTING AND CLEANING THE OIL INJECTION PUMP STRAINER

Refer to *OIL INJECTION PUMP*.

LUBRICATING THE ENGINE

Engine Storage Mode (Summerization Function)

Refer to *STORAGE PROCEDURE* subsection.

INSPECTION

OIL SYSTEM LEAK TEST

1. Install the test cap on oil tank.

REQUIRED TOOL	
LEAK TEST KIT (P/N 529 033 100)	

TYPICAL
1. Test cap on tank

2. Connect the pressure pump to test cap.

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

3. Pressurize oil system as follows.

PRESSURE	TIME TO HOLD PRESSURE
18 kPa (2.6 PSI)	3 minutes

If pressure drops, locate leak(s) and repair or replace leaking component(s).

If pressure does not drop, this validate the oil injection tank and the oil pump for leakage.

TROUBLESHOOTING

SYMPTOM	CAUSE	ACTION
	Damaged or disconnected oil injection pump.	Check oil injection pump wires and connectors on oil injection pump.
	Circuit wires, connectors or ECM output pins.	Check WHITE/RED wire on oil injection pump connector for 55 volts.
		Check system circuit to connector A.
		Repair or replace defective part(s).
Engine seizure (PTO or MAG side)	Damaged, kinked or obstructed inlet hose.	Repair or replace hose and test oil injection pump (oil outflow).
	Damaged oil injection pump inner piston.	Replace oil injection pump.
	Mechanical engine problem.	Repair or replace engine defective part(s).

PROCEDURES

OIL INJECTION PUMP

Oil Injection Pump Identification

Every pump is bench tested. Its electrical and flow characteristics are registered throughout all its operating range and are associated to a compensation number.

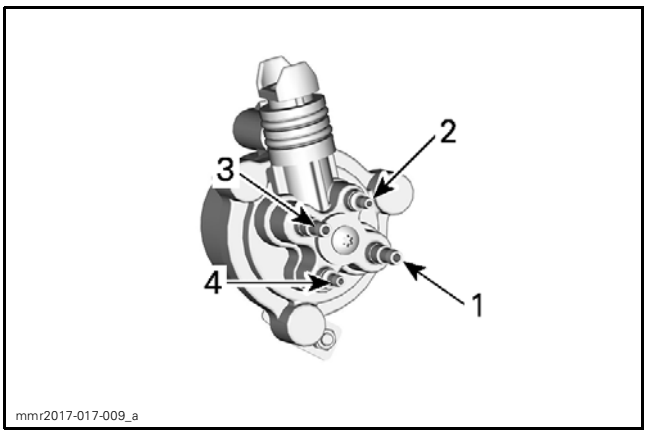
When a pump is replaced, the compensation number must be entered in the BRP diagnostic software (BUDS2). so that the ECM properly controls the pump according to its optimized characteristics.

The compensation number is located on a label on the pump as shown.

mmr2009-014-034_a

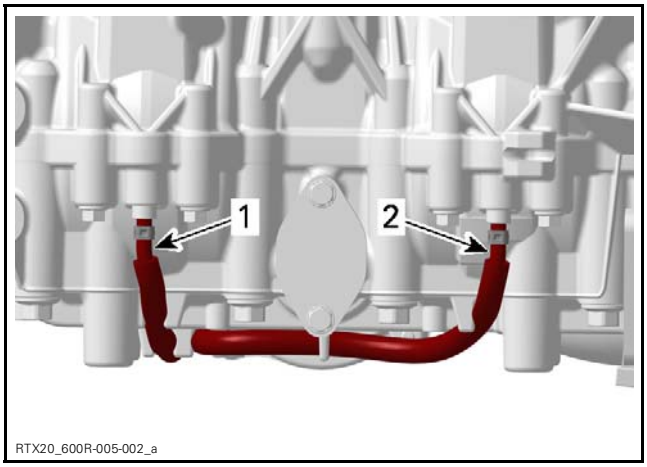
Oil injection pump bleeding is done with BUDS2. Refer to *BLEEDING OIL INJECTION PUMP* in this subsection.

Oil Injection Pump Hoses Connection



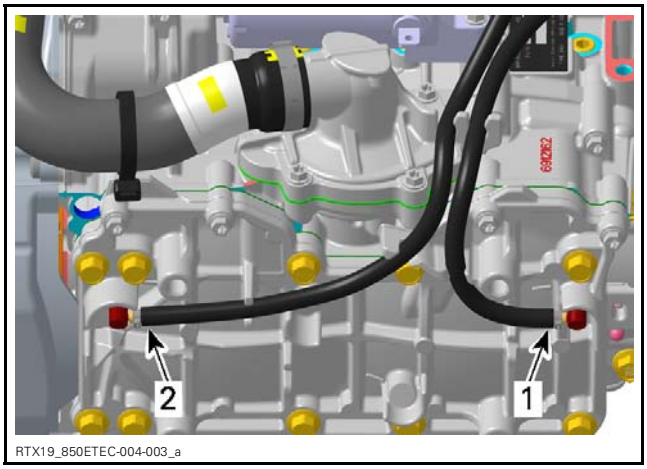
mmr2017-017-009_a

1. *To engine PTO side*
2. *To 3D RAVE valve PTO side*
3. *To engine MAG side*
4. *To 3D RAVE valve MAG side*



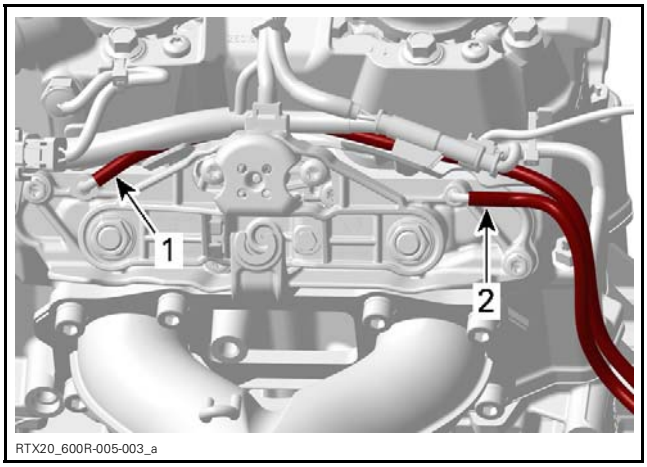
RTX20_600R-005-002_a

600R E.TEC ENGINE
1. *Oil hose PTO side*
2. *Oil hose MAG side*



RTX19_850ETEC-004-003_a

850 E-TEC ENGINE
1. *Oil hose PTO side*
2. *Oil hose MAG side*



RTX20_600R-005-003_a

TYPICAL
1. *Oil hose 3D RAVE valve MAG side*
2. *Oil hose 3D RAVE valve PTO side*

Testing Oil Injection Pump with BUDS2

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

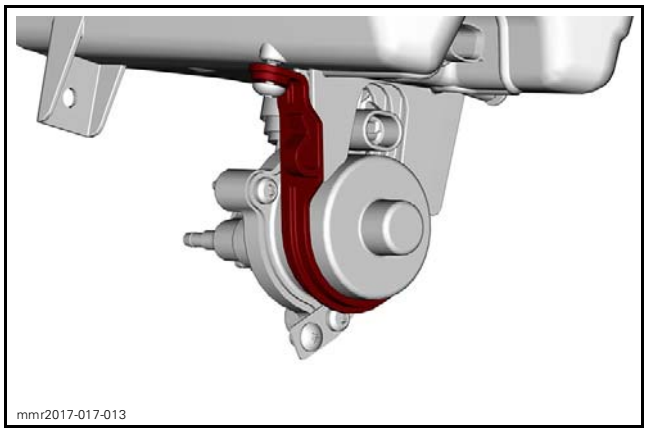
2. In BUDS2, go to:
   – **Functions** page
   – **Vehicle** or **ECM** button.
3. Start engine.
4. Select **Routine _ Activate Storage** and follow information displayed.
5. Listen if oil injection pump is activated.

NOTE: Touching the oil injection pump may help to feel if pump is activated.

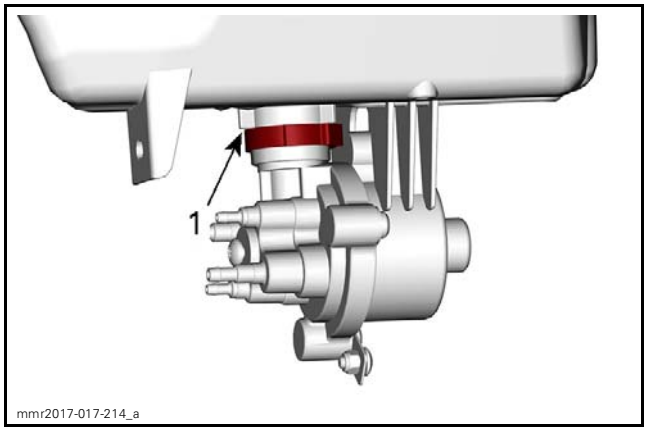
If test fails, check wires and connector.

Removing the Oil Injection Pump

1. Detach the oil injection pump hoses.
2. Unplug electrical connectors.
3. Remove the pump bracket.


mmr2017-017-013

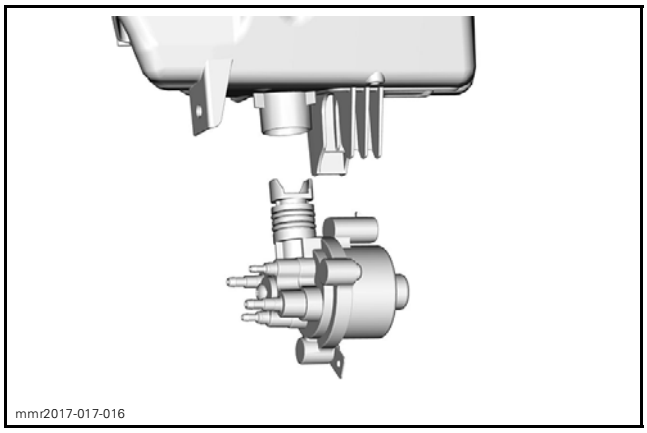
4. Remove and discard Oetiker clamp securing oil injection pump to oil tank.



mmr2017-017-214_a

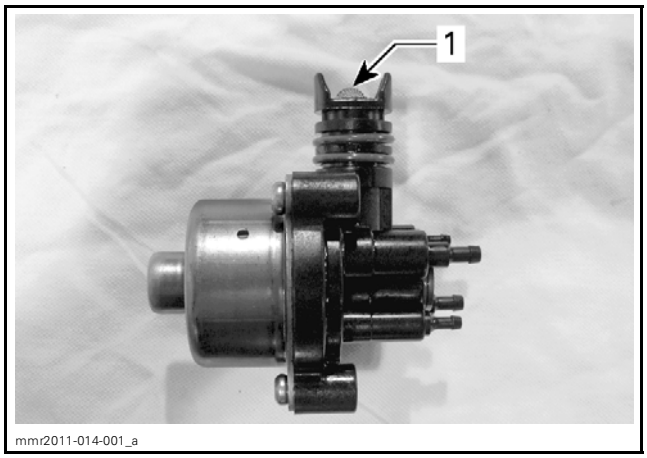
1. Oetiker clamp

5. Move oil injection pump downward to remove it from oil tank.


mmr2017-017-016

Inspecting the Oil Injection Pump

1. Check the strainer on the top of oil injection pump. Replace oil injection pump if the strainer is clogged.



mmr2011-014-001_a

1. Oil injection pump strainer

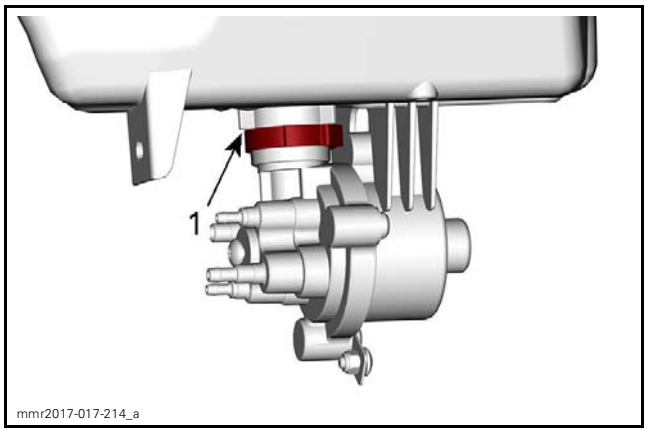
NOTE: Do not replace oil injection pump needlessly. If strainer is slightly dented, oil injection pump is still functional.

Installing the Oil Injection Pump

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

Install **NEW** Oetiker clamp to secure oil injection pump.

Ensure Oetiker clamp makes contact with oil tank ribs.



1. Oil tank rib

Refer to *INSTALLING THE OIL TANK* to properly reinstall oil tank.

Bleeding Oil Injection Pump

1. Connect the vehicle to the BRP diagnostic software (BUDS2). Refer to *COMMUNICATION TOOLS AND B.U.D.S.* subsection.
2. In BUDS2, go to:
   - **Settings** page
   - **ECM** button
   - **Settings** tab
   - **Configuration - Change oil compensation settings**
3. Compare oil pump codes and on oil injection pump sticker.

BACK OF OIL INJECTION PUMP
1. Oil injection pump code (0 to 9)

4. Correct oil injection pump code if required.

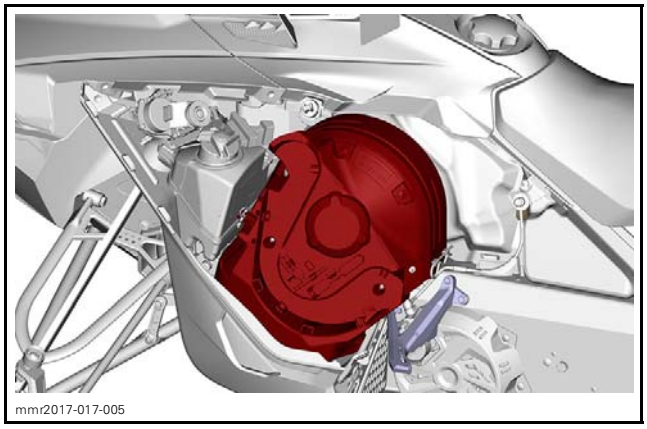
Write any changes.

5. Navigate to the **Functions** page.
6. Activate the oil pump.
7. Start engine.
8. Check for air into hoses. If so, the bleeding procedure must be repeated as often as needed until all air is pumped through entire system.

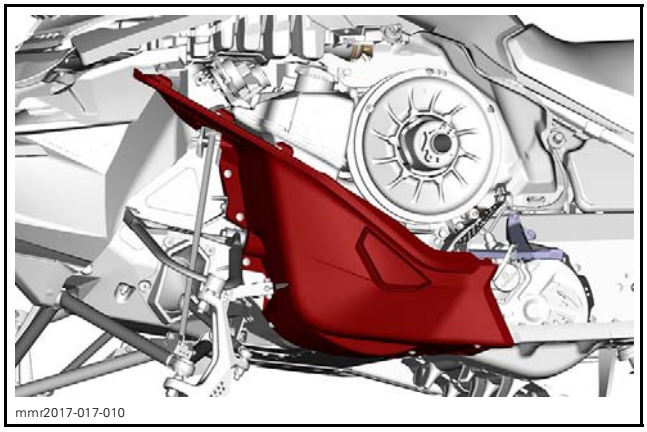
OIL INJECTION TANK

Removing the Oil Injection Tank

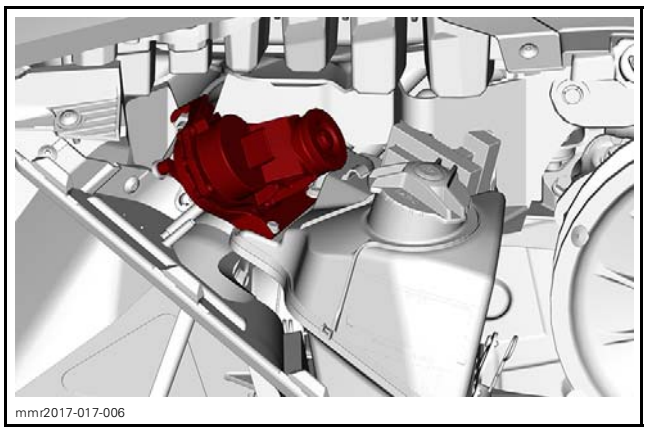
1. Remove upper body module. Refer to *BODY* subsection.
2. Remove side panel.
3. Empty oil injection tank completely by siphoning injection oil.
4. Remove belt guard.



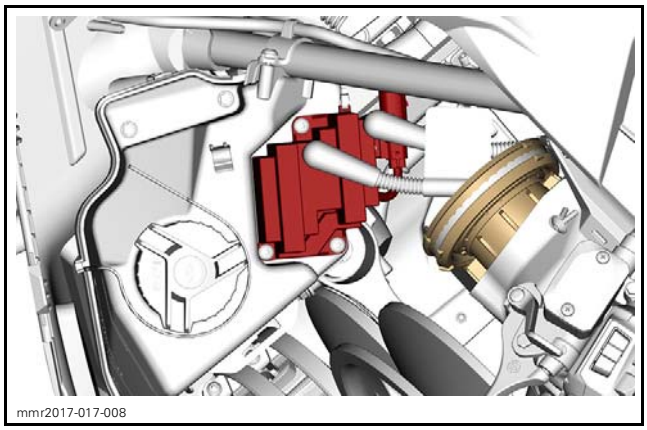
5. Remove bottom pan.



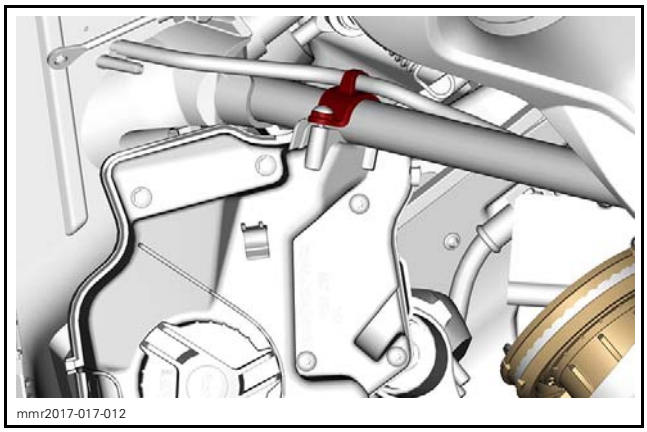
6. Unbolt Rave Valve actuator and set aside.



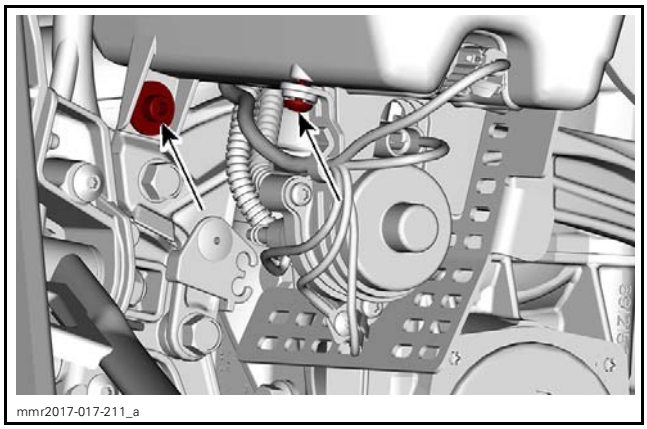
7. Remove the ignition coil.


mmr2017-017-008

8. Remove bracket.


mmr2017-017-012

9. Remove screws.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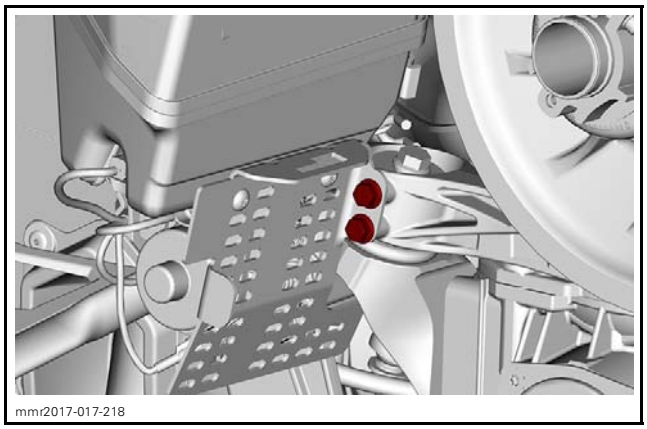
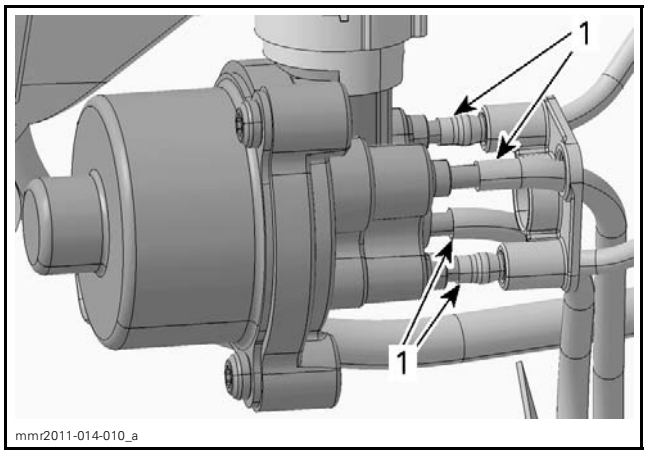
10. Remove oil tank support screws.


mmr2017-017-218

11. Disconnect crankcase vent hose on oil injection tank side.
12. Disconnect oil level sensor connector.
13. Place a rag under oil injection pump to catch oil spillage.
14. Carefully disconnect hoses from oil injection pump using a small screwdriver.



mmr2011-014-010_a

SOME PARTS REMOVED FOR CLARITY PURPOSE
1. Oil hoses (4x)

NOTICE **Oil injection pump fittings are very fragile, care must be taken when removing hoses from oil injection pump.**

15. Disconnect oil injection pump electrical connectors.
16. Slide out oil tank.
17. Remove oil injection pump from oil injection tank. Refer to *REMOVING THE OIL INJECTION PUMP* in this subsection.

Installing the Oil Injection Tank

Before tightening oil injection tank on vehicle, proceed as follows.

1. Install oil injection pump on oil injection tank. Refer to *INSTALLING THE OIL INJECTION PUMP*.

2. Apply injection oil on oil injection pump hoses.
3. Properly route and connect oil hoses into oil injection pump. Refer to *OIL INJECTION PUMP HOSES CONNECTION* in this subsection.

NOTICE **Oil injection pump fittings are very fragile, care must be taken when installing hoses on oil injection pump.**

Position oil injection tank on vehicle.

Tighten oil injection tank screws to specification. Refer to exploded view.

Reinstall all remaining components as the reverse of removal procedure.

Fill up oil injection tank using recommended oil. See *RECOMMENDED INJECTION OIL* in this subsection.

Bleed oil injection system. Refer to *BLEEDING OIL INJECTION PUMP* in this subsection.

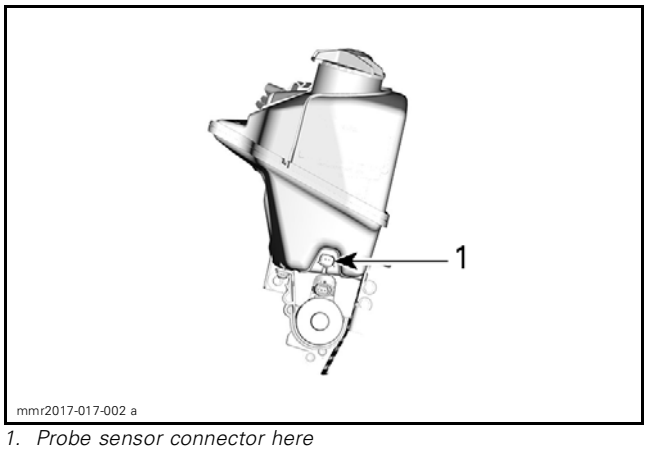
OIL LEVEL SENSOR

Testing the Oil Level Sensor

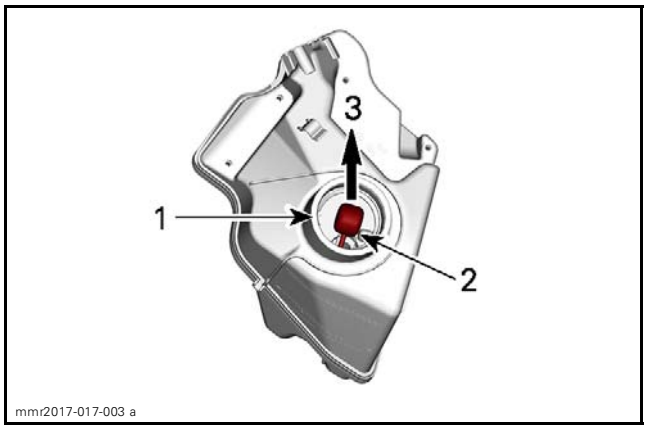
1. Measure resistance by probing sensor connector.

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

SENSOR TEST CONDITION		RESISTANCE
Empty oil tank	LOW float position	Closed circuit (close to 0 Ω)
	HIGH float position	Open circuit infinite (OL)



1. Probe sensor connector here



MEASURING RESISTANCE WITH FLOAT HELD IN HIGH POSITION
1. Oil tank cap removed
2. Float
3. Use a locking tie to lift float

If test fails, replace oil tank.

If test succeeds check float condition in oil tank.

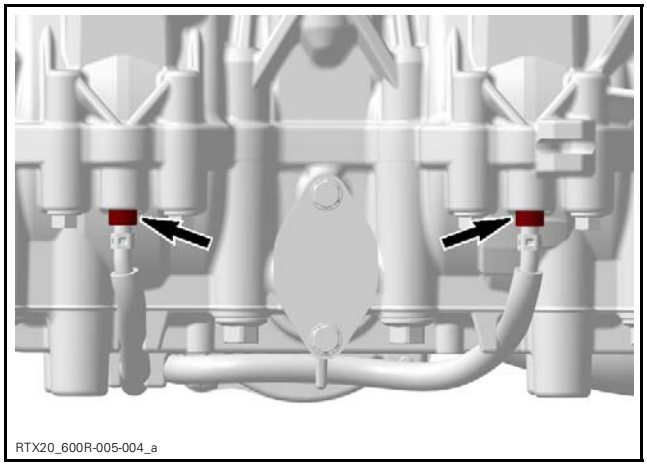
Removing the Oil Level Sensor

Oil level sensor is part of the oil tank and is not removable.

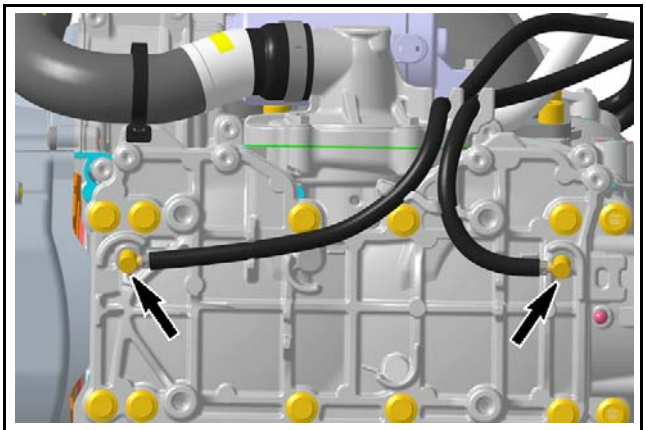
CHECK VALVES AND FITTINGS

Check Valves and Fittings Location

Check Valves and Fittings (Engine)

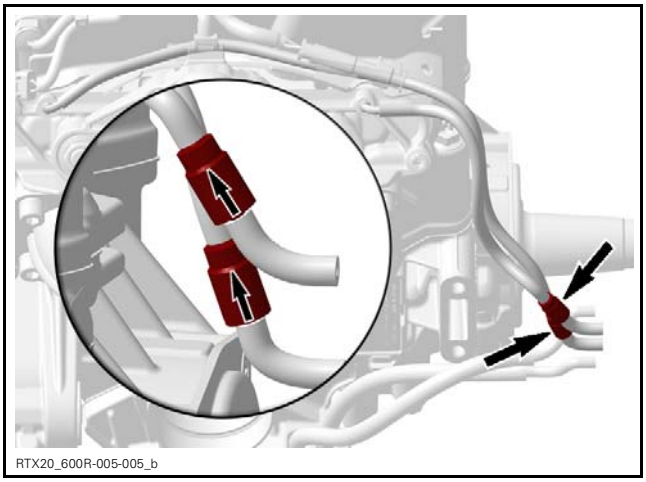


600R E-TEC ENGINE


RTX19_850ETEC-001-004_b

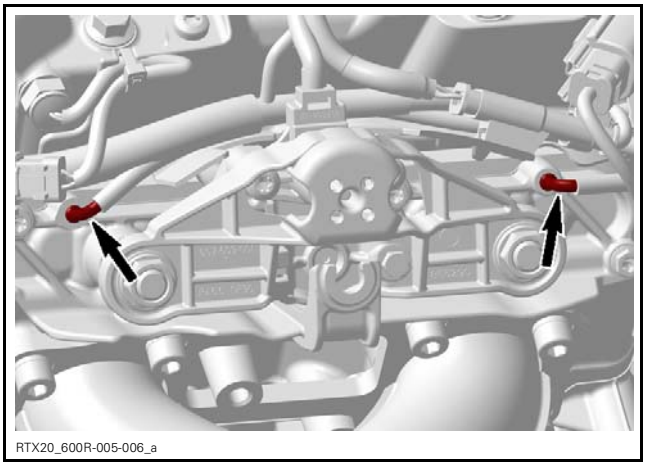
850 E-TEC ENGINE

Check Valves and Fittings (RAVE)


RTX20_600R-005-005_b

TYPICAL - RAVE CHECK VALVES

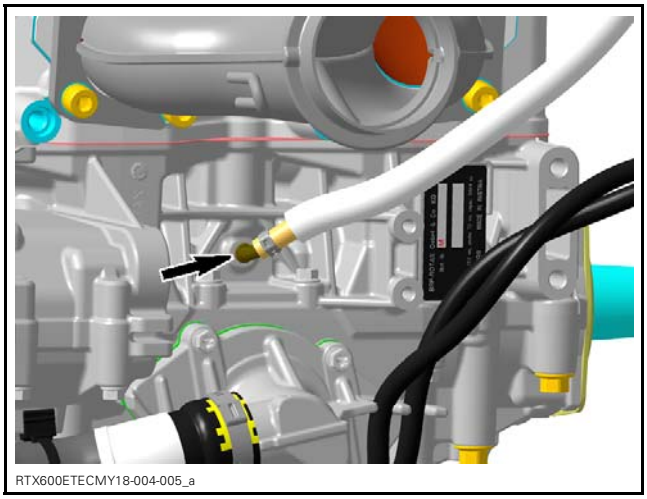
NOTE: Always take care that the arrows on the check valves are pointing towards the engine.


RTX20_600R-005-006_a

TYPICAL - RAVE FITTINGS

Fitting (Water Pump Drive)

Remove starter, refer to *MAGNETO AND STARTER* subsection.


RTX600ETECMY18-004-005_a

TYPICAL

Inspecting the Check Valves

Pressurize check valves at inlet side.

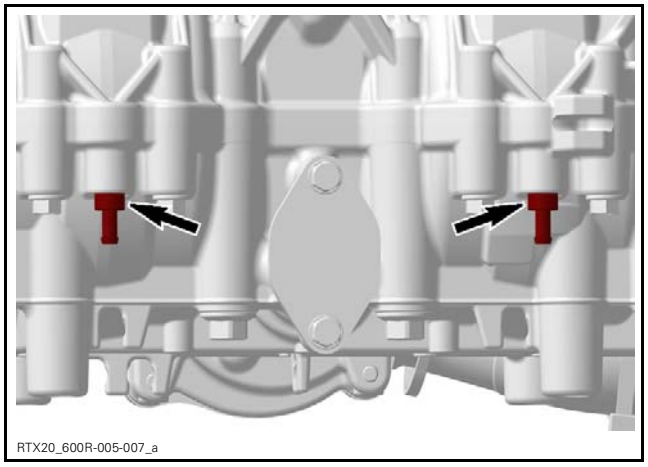
REQUIRED TOOL	
VACUUM/PRESSURE PUMP (P/N 529 021 800)	

PUMP SETTING	SET TO **VACUUM**	SET TO **PRESSURE**
TO DO	Activate pump several times	Slowly activate pump and listen to check valve
RESULT	Air must **NOT** flow through check valve	You should hear it release pressure at approximately 20.7 kPa (3 PSI)
ACTION	**Success:** Perform next test	**Success:** Check valve is good
	Failed: Replace check valve	**Failed:** Replace check valve

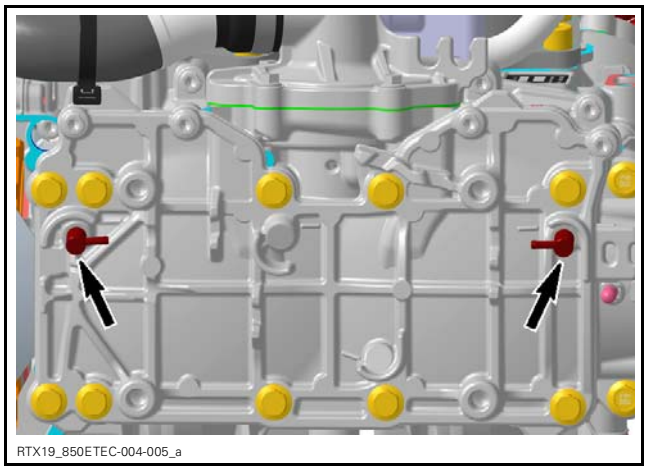
Removing the Check Valves and Fittings

NOTICE Do not remove check valve needlessly. It is likely to be damaged.

Check Valves (Engine)



600R E-TEC ENGINE

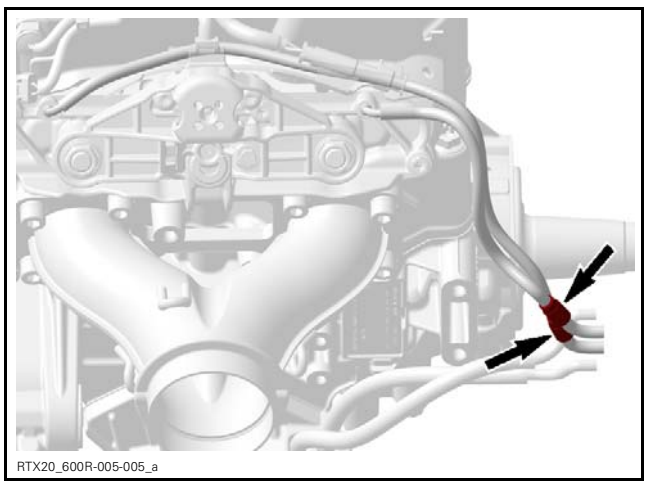


850 E-TEC ENGINE

1. Clean area around check valve or fitting to remove oil or dirt.
2. Heat check valve then pull it out of crankcase.

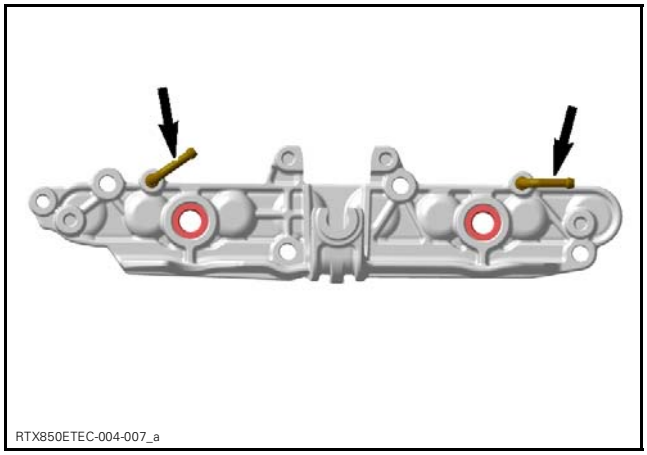
Check Valves (RAVE)

1. Remove oil hoses from check valve.



TYPICAL

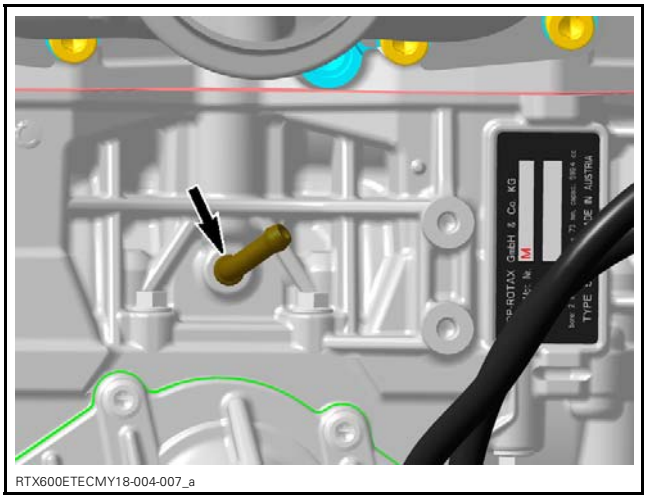
Fittings (RAVE)



RAVE FITTINGS

1. Remove RAVE valve housing. Refer to *RAVE* subsection.
2. Clean area around fittings to remove oil or dirt.
3. Heat fitting then pull it out of RAVE valve housing.

Fitting (Water Pump Drive)



TYPICAL

1. Clean area around fitting to remove oil or dirt.
2. Heat crankcase around fitting seat area then pull fitting out of crankcase.

Installing the Check Valves and Fittings

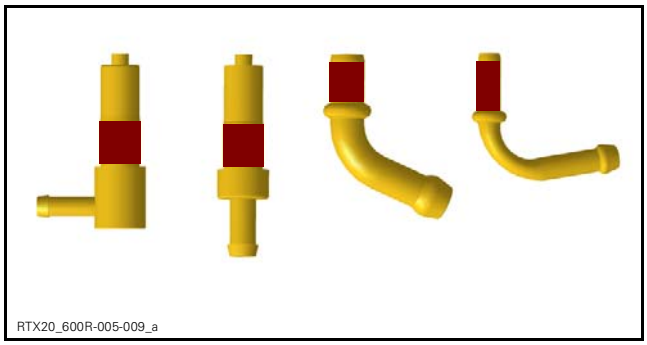
The installation is the reverse of the removal procedure. However, pay attention to the following.

1. Ensure check valve bodies and fittings are clean from dirt or oil and dry.

SERVICE PRODUCT	
Scandinavia	PULLEY FLANGE CLEANER (F) (P/N 619 600 022)
Other countries	BRAKE AND PARTS CLEANER PRO S2 (P/N 779245)

2. Apply sealant on the outer diameter of the check valve (machined section) or fitting. Apply sealant ONLY in the specified area.

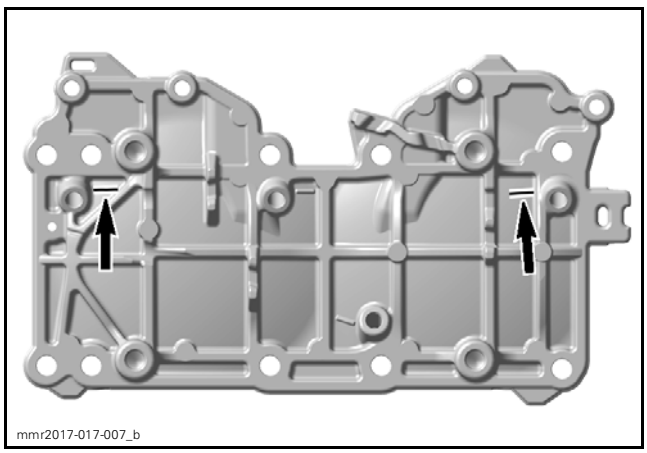
SERVICE PRODUCT	
Scandinavia	LOCTITE 648 (GREEN) (F) (P/N 619 600 012)
Other countries	LOCTITE 648 (GREEN) (P/N 413 711 400)



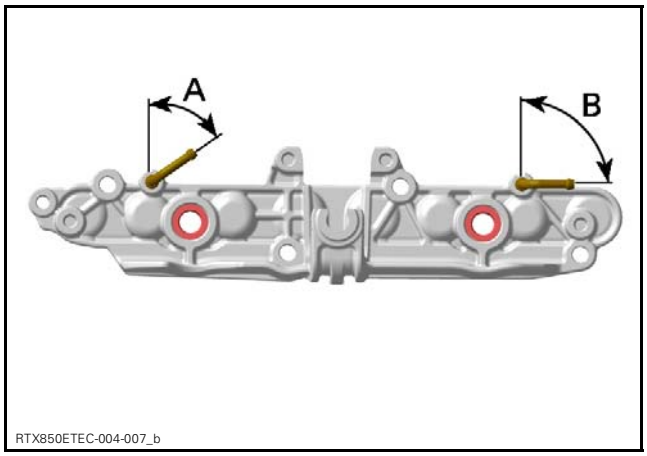
TYPICAL - APPLY SEALANT ON INDICATED AREA ONLY

3. Punch in the check valves and fittings carefully with a plastic hammer by using a suitable punch.

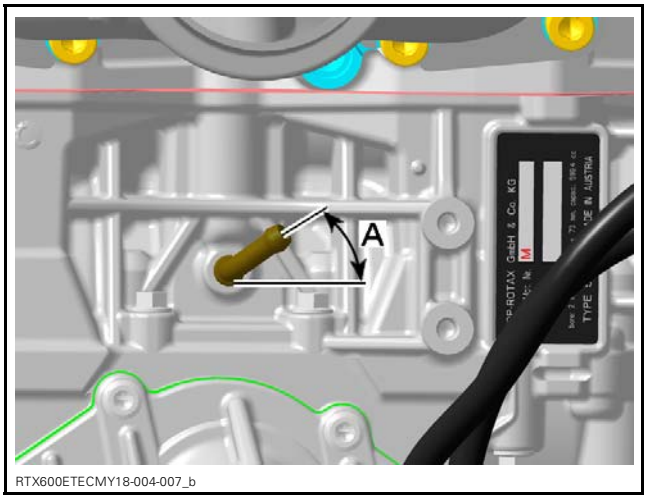
For correct orientation of the fittings refer to the next illustrations.



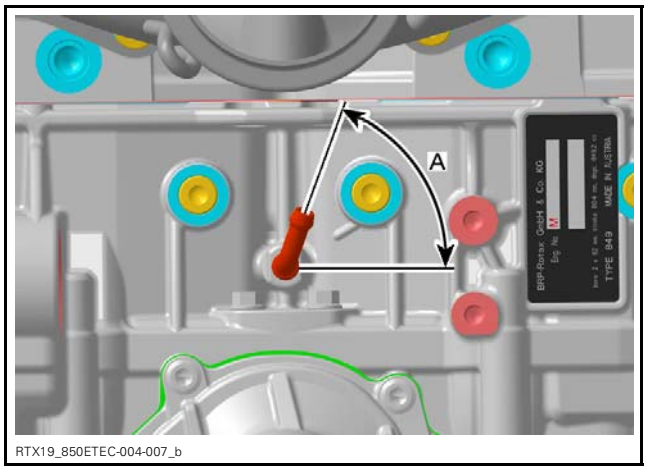
850 E-TEC ENGINE - CAST MARKS FOR CHECK VALVES AND FITTING ORIENTATION



A. 55°
B. 90



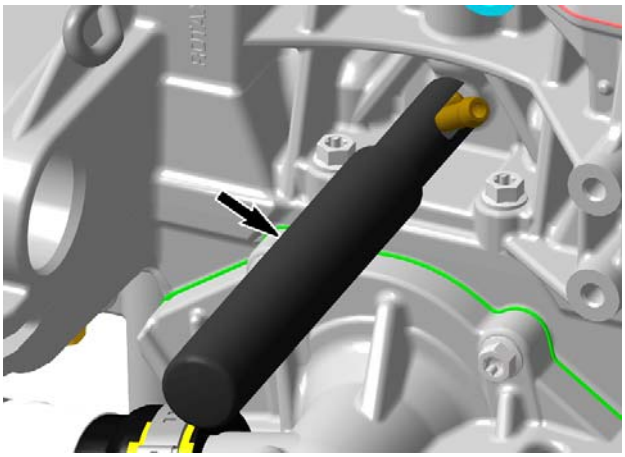
600R E-TEC ENGINE
A. 37°



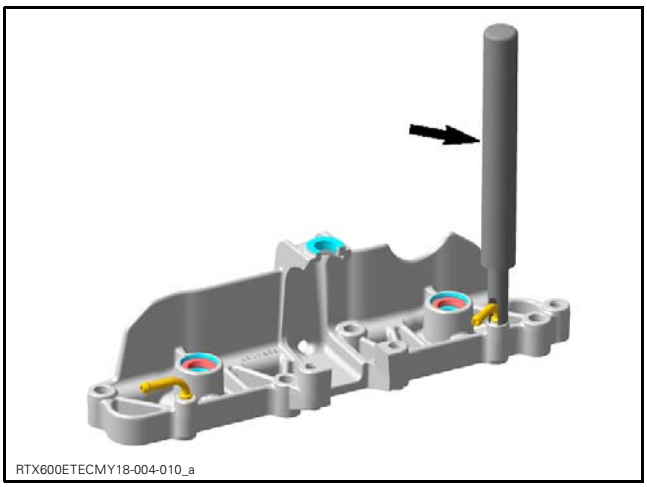
850 E-TEC ENGINE
A. 70°

For bent fitting use following service tool for installation:

REQUIRED TOOL	
IMPULSE FITTING PUNCH (BIG) (P/N 529 036 412)	
IMPULSE FITTING PUNCH (SMALL) (P/N 529 036 413)	



TYPICAL - FITTING (WATER PUMP DRIVE) - IMPULSE FITTING PUNCH (BIG) (P/N 529 036 412)



FITTING (ENGINE) - IMPULSE FITTING PUNCH (SMALL) (P/N 529 036 413)

4. Clean area around check valve from surplus sealant with a rag.
5. Connect pressure pump and check if check valves and fittings are not blocked with glue after installation.

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

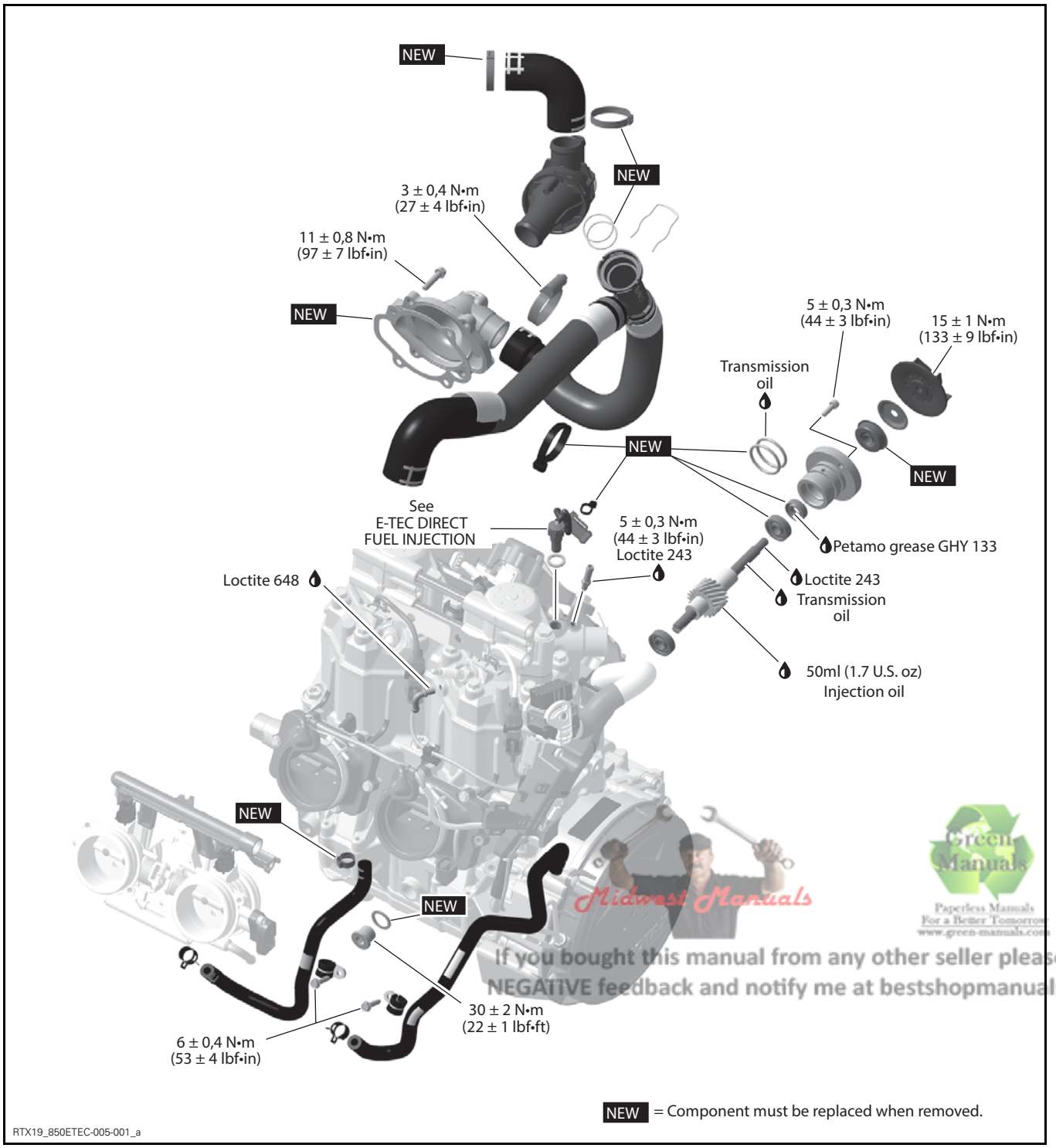
COOLING SYSTEM

SERVICE TOOLS

Description	Part Number	Page
CERAMIC SEAL INSTALLER	529 036 014	11
HANDLE	420 877 650	10
IMPULSE FITTING PUNCH (BIG)	529 036 412	6
LARGE HOSE PINCHER	529 032 500	4–5
OIL SEAL PUSHER	529 035 757	10
PROTECTOR SLEEVE	529 036 406	11
SMALL HOSE PINCHER	295 000 076	5
TEST CAP	529 035 991	4
VACUUM/PRESSURE PUMP	529 021 800	4–5
WATER PUMP IMPELLER TOOL	529 036 444	7

SERVICE PRODUCTS

Description	Part Number	Page
BRAKE AND PARTS CLEANER PRO S2	779245	5, 7, 12
LOCTITE 243 (BLUE)	293 800 060	7
LOCTITE 648 (GREEN)	413 711 400	5
PETAMO GREASE GHY 133N	420 899 271	11



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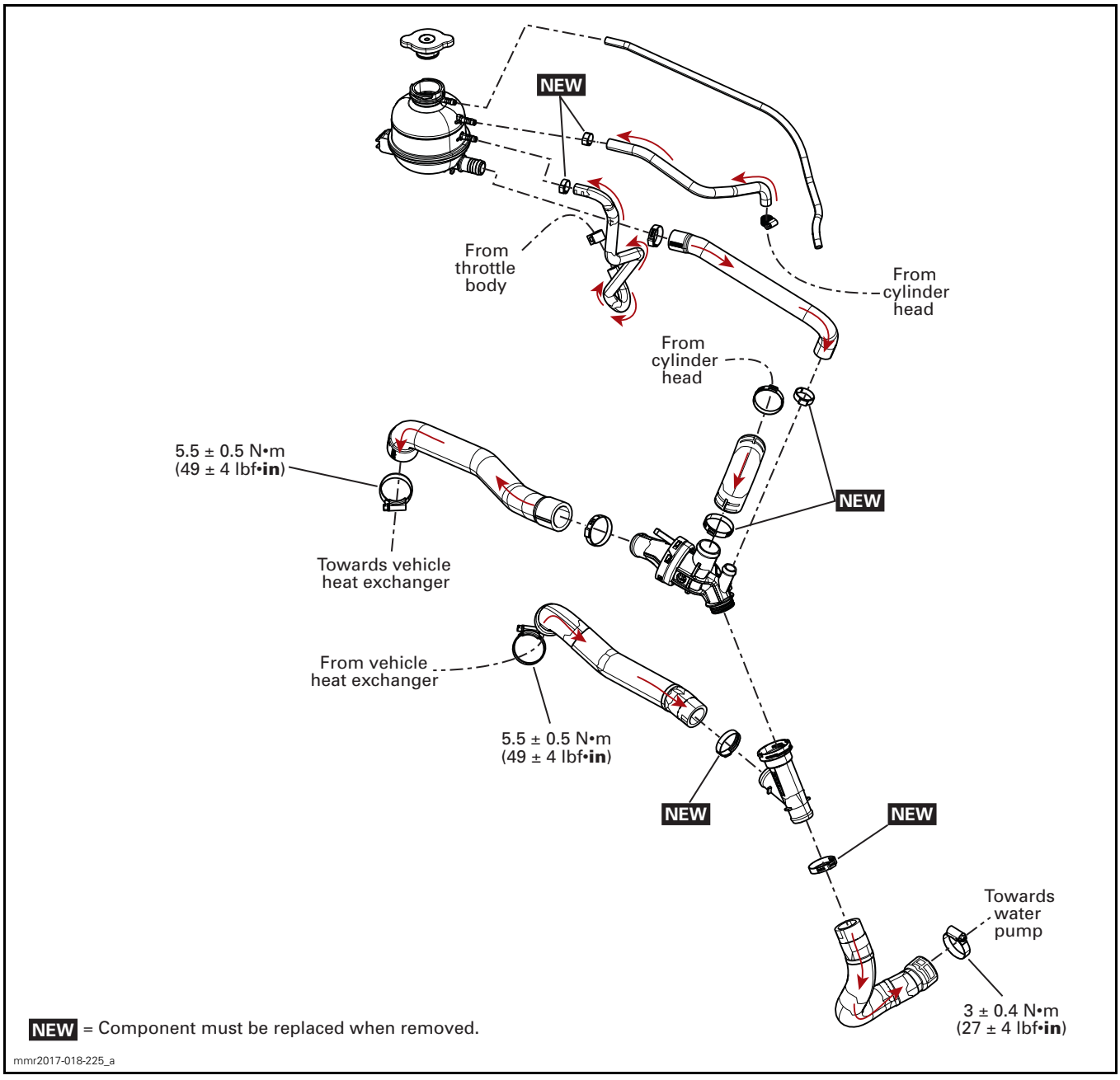

NEW
From throttle body
From cylinder head
From cylinder head
5.5 ± 0.5 N•m (49 ± 4 lbf•in)
NEW
Towards vehicle heat exchanger
From vehicle heat exchanger
5.5 ± 0.5 N•m (49 ± 4 lbf•in)
NEW
NEW
Towards water pump
3 ± 0.4 N•m (27 ± 4 lbf•in)
NEW = Component must be replaced when removed.
mmr2017-018-225_a

GENERAL

It is a good practice to check for fault codes using the BRP diagnostic software (BUDS2) as a first troubleshooting step.

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

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

⚠ WARNING

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

INSPECTION

COOLING SYSTEM LEAK TEST

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

⚠ WARNING

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

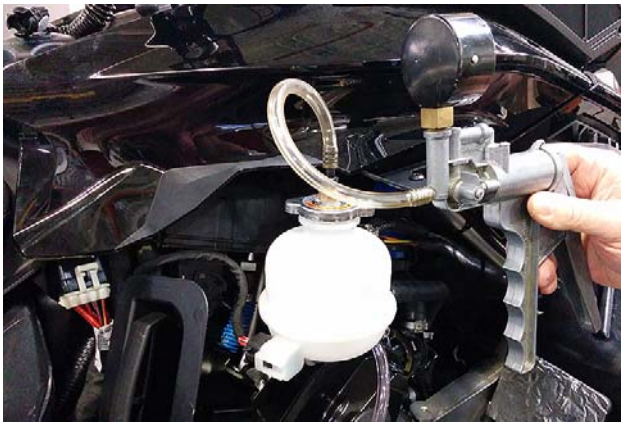
Remove the RH side panel.

Remove coolant tank cap.

Pressurize system through coolant tank.

REQUIRED TOOL	
TEST CAP (P/N 529 035 991)	
VACUUM/PRESSURE PUMP (P/N 529 021 800)	

TEST PRESSURE
100 kPa (15 PSI)



mmr2017-018-200

TYPICAL

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

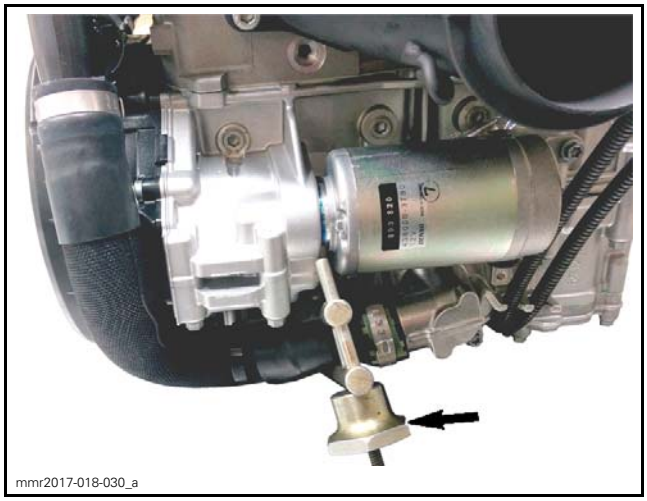
If no external leak is found and pressure drops, carry out the *ENGINE COOLING CIRCUIT LEAK TEST* to find a potential engine internal leak.

ENGINE COOLING CIRCUIT LEAK TEST

NOTE: An engine leak test should be performed prior to installing engine in vehicle each time the engine is disassembled.

Install a suitable hose on the water pump cover and block it.

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



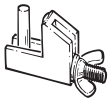
mmr2017-018-030_a

TYPICAL

Install a suitable hose on the cylinder head and block it.

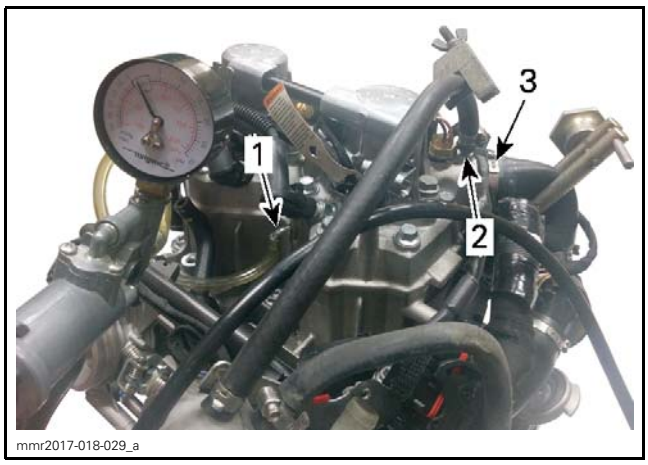
REQUIRED TOOL	
LARGE HOSE PINCHER (P/N 529 032 500)	

Install a suitable hose on the bleeder nipple and block it

REQUIRED TOOL	
SMALL HOSE PINCHER (P/N 295 000 076)	

Install the pressure pump on the bent fitting for throttle body heating.

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



mmr2017-018-029_a

TYPICAL
1. *Bent fitting for throttle body heating*
2. *Bleeder nipple*
3. *Cylinder head hose*

Pressurize the engine.

TEST PRESSURE
100 kPa (15 PSI)

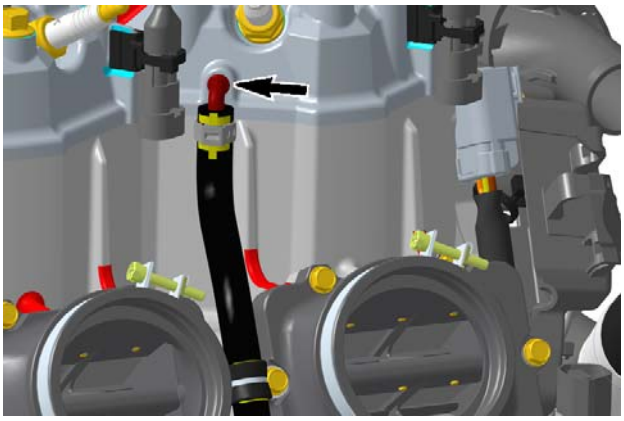
If pressure drops, spray a soap/water solution onto engine jointed surfaces and look for air bubbles.

PROCEDURES

FITTING (THROTTLE BODY HEATING)

Fitting Replacement

1. Remove throttle body from intake manifolds and put it aside.


RTX19_850ETEC-005-007_a

PARTS REMOVED FOR CLARITY

2. Clean area around fitting to remove oil or dirt.
3. Heat cylinder head around fitting seat area then pull fitting out of cylinder head. Discard fitting.
4. Ensure NEW fitting and fitting bore in cylinder head is clean from dirt or oil and dry.

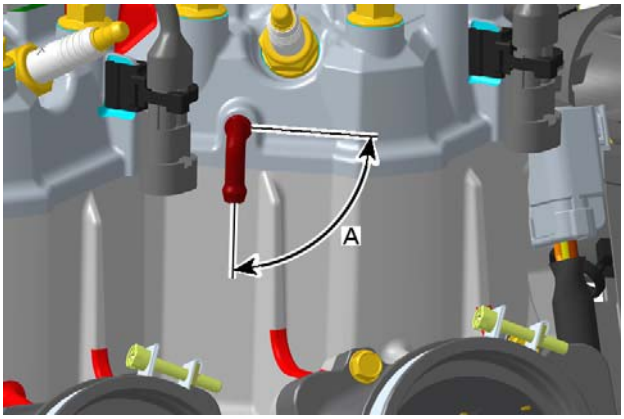
FITTING CLEANING	
Service product	BRAKE AND PARTS CLEANER PRO S2 (P/N 779245)

5. Apply sealant on the outer diameter of fitting.

CHECK VALVE AND FITTING SEALANT	
Service product	LOCTITE 648 (GREEN) (P/N 413 711 400)

6. Punch in fitting.

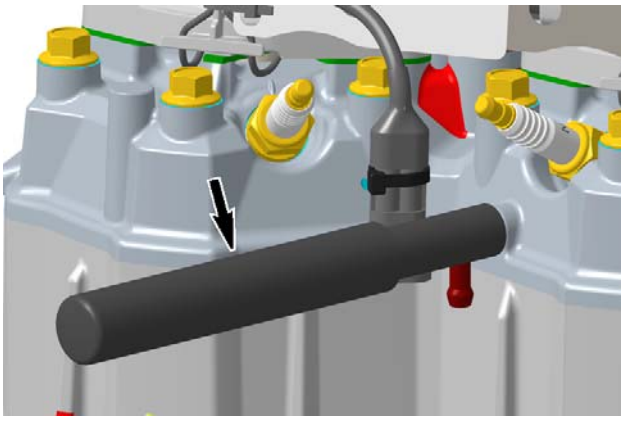
For correct orientation of the fitting refer to the next illustration.



RTX19_850ETEC-005-008_a

A. 90°

REQUIRED TOOL	
IMPULSE FITTING PUNCH (BIG) (P/N 529 036 412)	


RTX19_850ETEC-005-009_a

FITTING - IMPULSE FITTING PUNCH (BIG) (P/N 529 036 412)

WATER PUMP

Water Pump Location

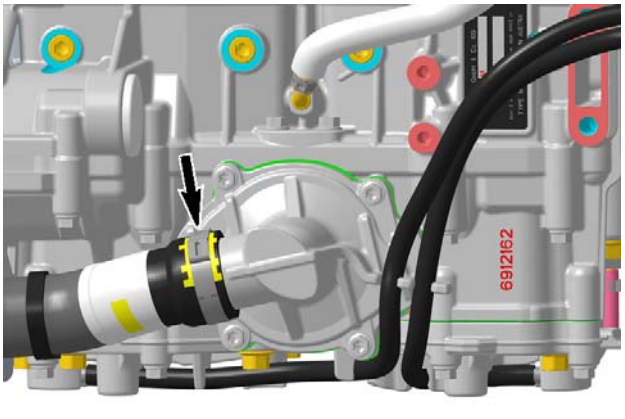
The water pump is located on the front of the engine, below the intake manifold.

Removing the Water Pump

Drain cooling system, refer to *COOLING SYSTEM - VEHICLE* subsection.

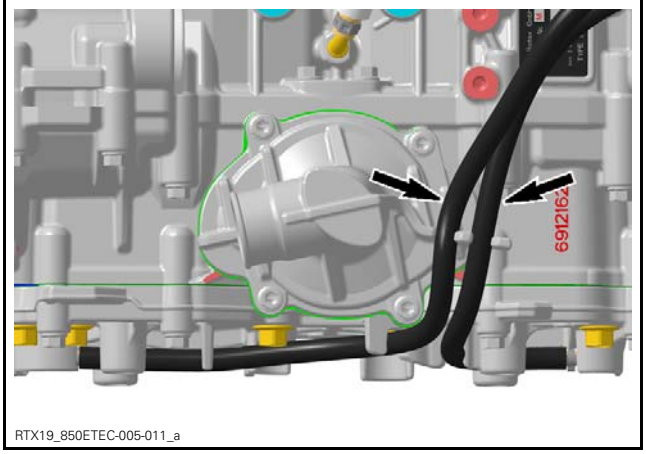
Remove starter, refer to *MAGNETO AND STARTER* subsection.

Remove coolant hose (only if necessary).



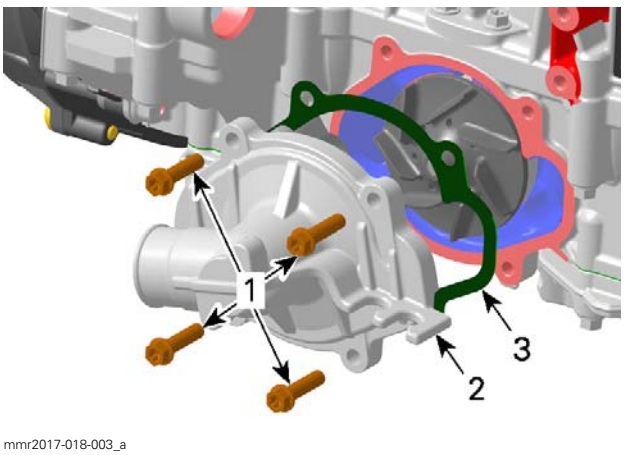
RTX19_850ETEC-005-010_a

Remove oil lines.



RTX19_850ETEC-005-011_a

Remove the following parts.



mmr2017-018-003_a

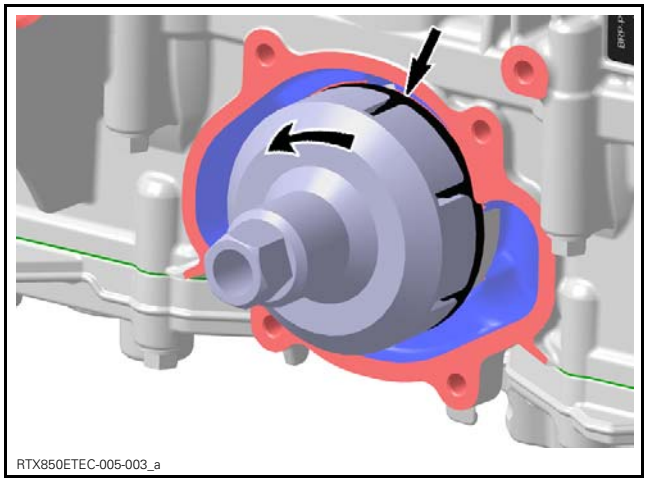
TYPICAL
1. *Screws*
2. *Water pump cover*
3. *Gasket*

Block engine:
- **Engine installed in the vehicle** - block the drive pulley, refer to *DRIVE SYSTEM AND BRAKE* subsection.
- **Engine removed from vehicle** - block magneto flywheel, refer to *MAGNETO AND STARTER* subsection.

Unscrew impeller counterclockwise.

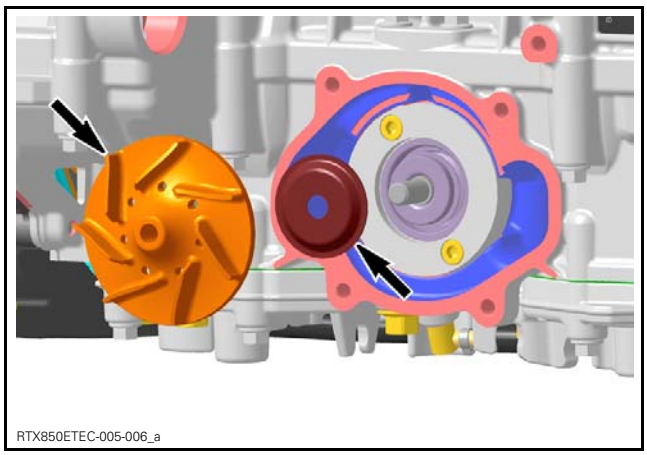
NOTICE **Be careful not to damage impeller fins.**

REQUIRED TOOL	
WATER PUMP IMPELLER TOOL (P/N 529 036 444)	



RTX850ETEC-005-003_a

Remove:
- Impeller
- Cover washer.



RTX850ETEC-005-006_a

Clean gasket surfaces of water pump cover and crankcase.

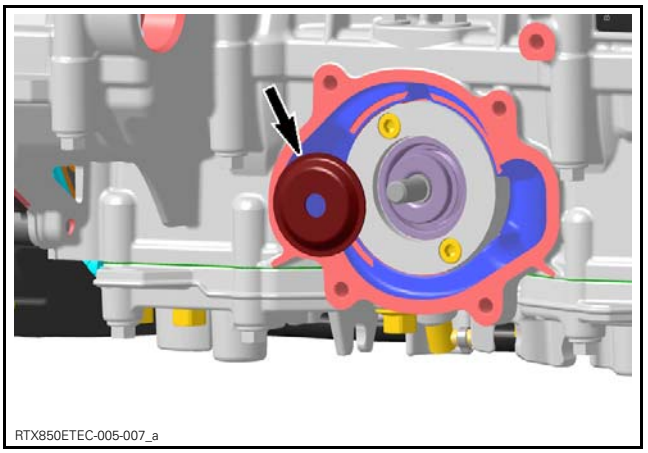
Installing the Water Pump

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

Clean water pump shaft thread using a part cleaner and compressed air.

WATER PUMP SHAFT THREAD CLEANING	
Service product	BRAKE AND PARTS CLEANER PRO S2 (P/N 779245)

Install cover washer with convex side facing to the impeller.

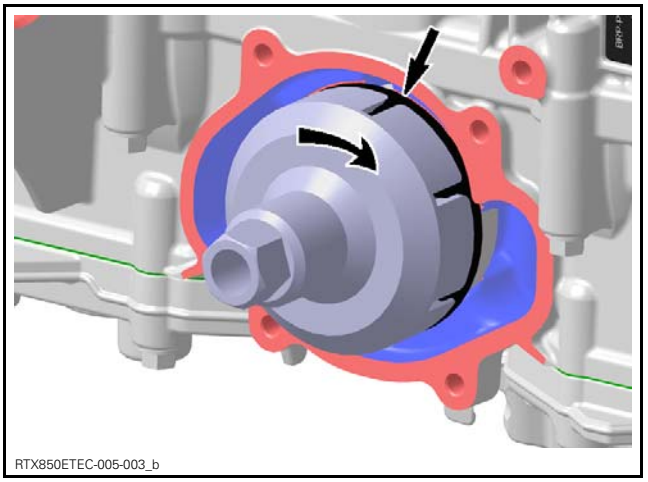


RTX850ETEC-005-007_a

Apply thread locker on water pump shaft thread.

WATER PUMP SHAFT THREAD	
Service product	LOCTITE 243 (BLUE) (P/N 293 800 060)

Tighten impeller to specification.



RTX850ETEC-005-003_b

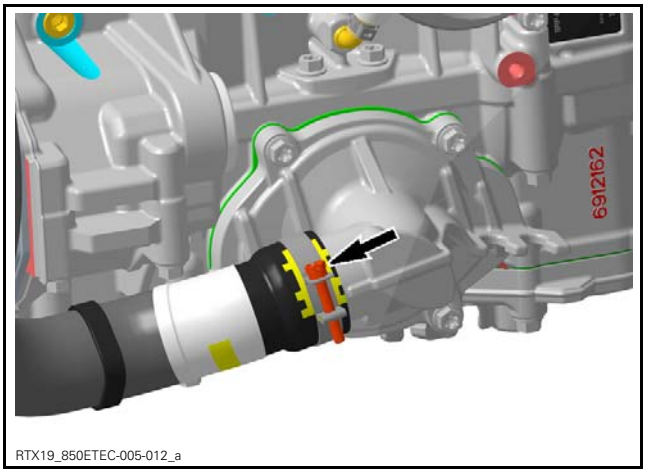
TIGHTENING TORQUE	
Impeller	15 N•m ± 1 N•m (133 lbf•**in** ± 9 lbf•**in**)

Install a **NEW** water pump cover gasket.

Tighten screws of water pump cover to specification in a crisscross sequence.

TIGHTENING TORQUE	
Water pump cover screws	11 N•m ± 0.8 N•m (97 lbf•**in** ± 7 lbf•**in**)

Install and tighten coolant hose clamp on water pump.



RTX19_850ETEC-005-012_a

TIGHTENING TORQUE	
Coolant hose clamp	3 N•m ± 0.4 N•m (27 lbf•**in** ± 4 lbf•**in**)

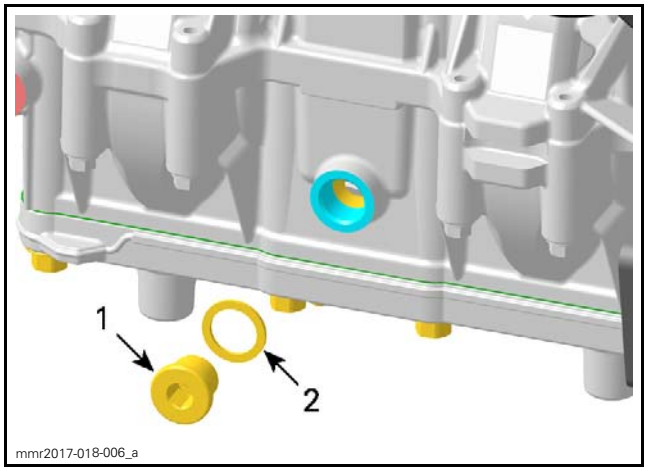
Properly refill and bleed cooling system, refer to *COOLING SYSTEM - VEHICLE* subsection.

BEARING CARRIER AND PUMP SHAFT

Removing the Bearing Carrier and Pump Shaft

Place a bin underneath the plug screw to catch spilling injection oil.

Remove plug screw and discard sealing ring.

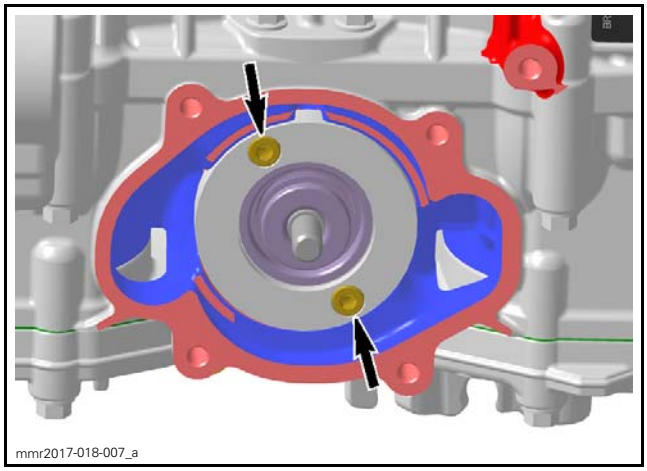


mmr2017-018-006_a

1. Plug screw
2. Sealing ring

Remove *WATER PUMP*. See procedure in this subsection.

Remove bearing carrier retaining screws.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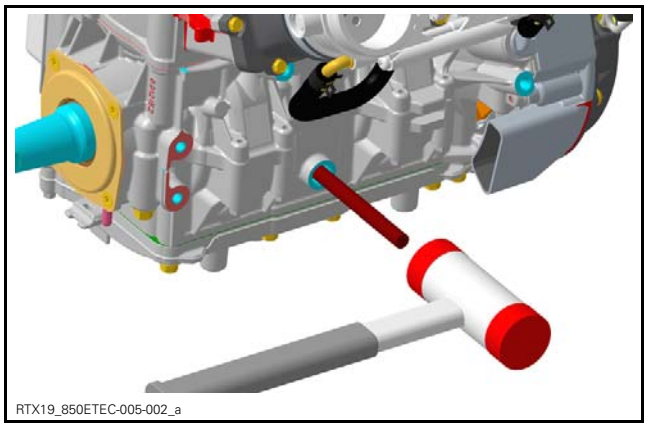
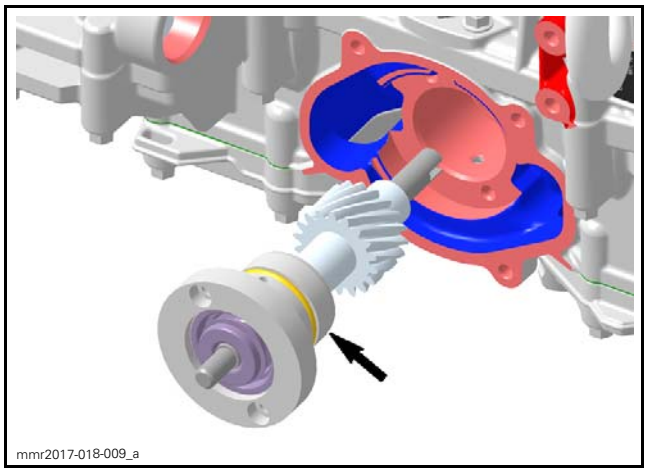
Push pump shaft out with a suitable drift punch and a hammer.


RTX19_850ETEC-005-002_a

PUSH OUT SHAFT HERE

Extract bearing carrier and pump shaft.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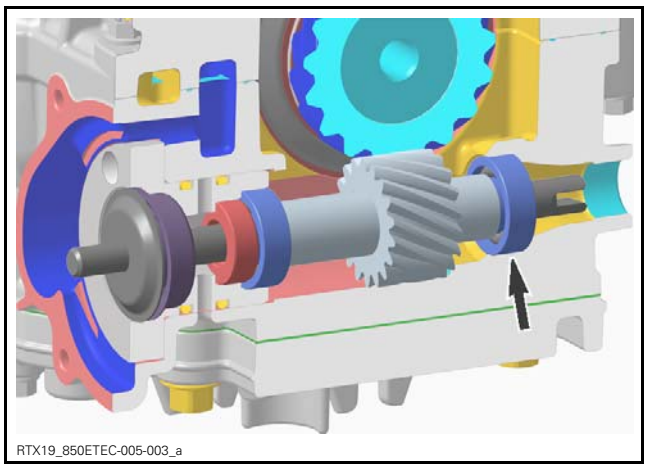
For water pump shaft ball bearing replacement refer to *BOTTOM END* subsection.


RTX19_850ETEC-005-003_a

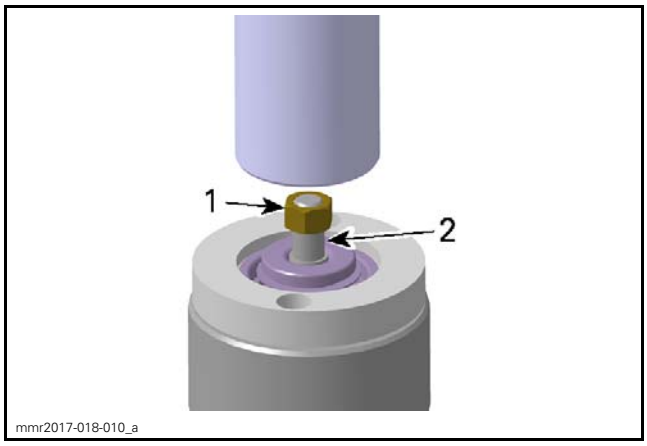
Disassembling the Bearing Carrier and Pump Shaft

NOTE: The pump shaft cannot be disassembled without damaging the ceramic seal and oil seal.

Protect the threads of shaft with a suitable M8 nut.

Properly support bearing carrier.

Push pump shaft out using a press.

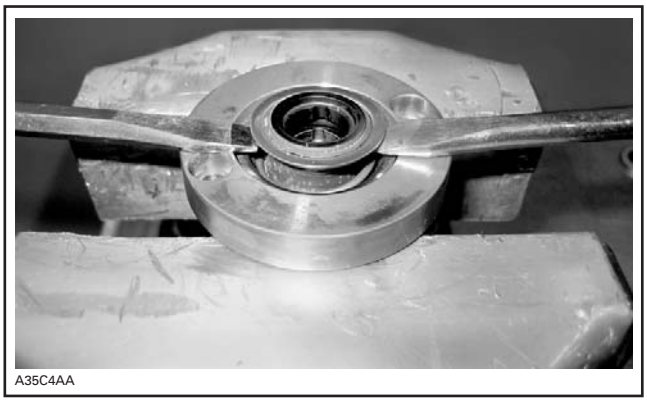


mmr2017-018-010_a

1. M8 nut
2. Shaft

NOTICE **Pay attention not to damage the bearing carrier during disassembly. Marks or other damages will lead to coolant or oil leakage.**

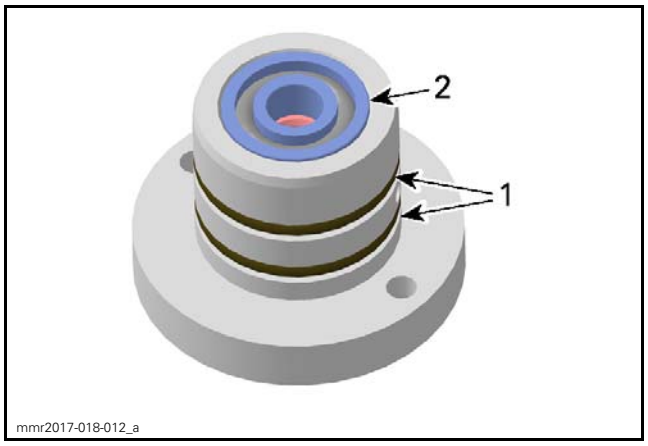
Pry inner part of ceramic seal out.


A35C4AA

Remove O-rings and discard them.

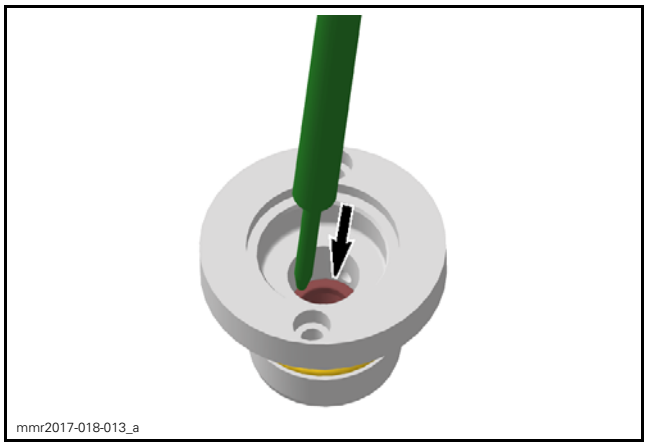
Remove bearing.

REQUIRED TOOL
Blind hole bearing puller



1. *O-rings*
2. *Ball bearing*

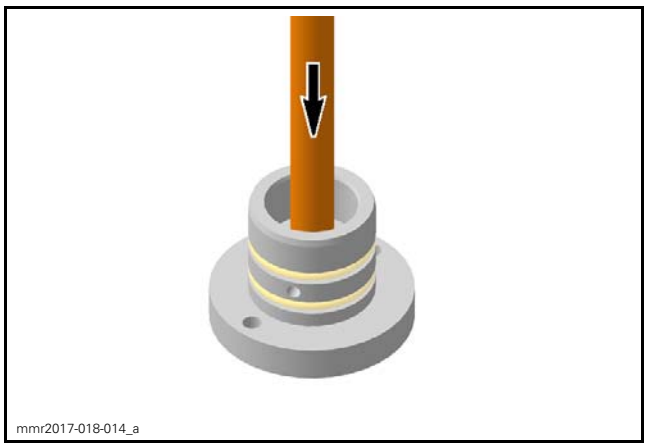
Remove oil seal using as appropriate punch.

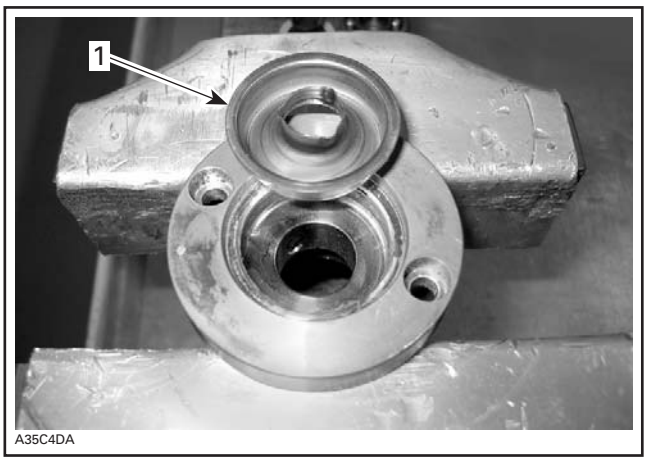


FOR CLARITY OUTER PART OF CERAMIC SEAL REMOVED

Carefully press the outer part of ceramic seal out.

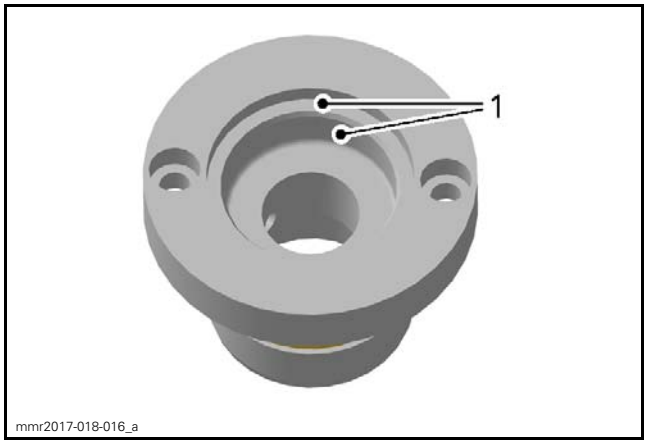
NOTE: Use a mandrel with a diameter of approximately 16 mm (.63 in).





1. *Outer part of ceramic seal*

Remove sealant from bearing carrier with sand paper no. 180.



1. *Remove sealant*

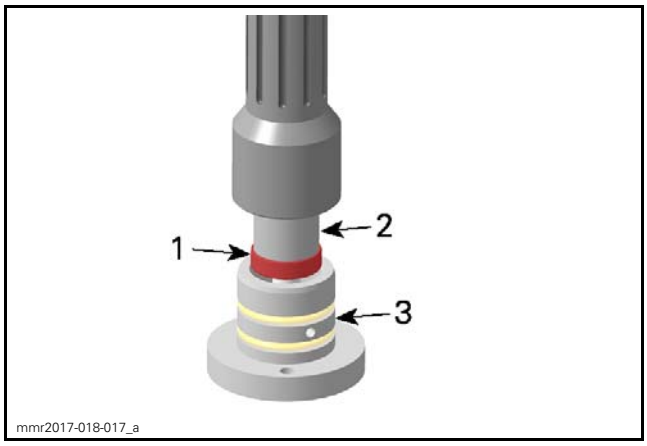
Reassembling the Bearing Carrier and Pump Shaft

Reverse disassembly procedure and pay attention to the following.

NOTE: Never put oil in the press fit area of the oil seal and ceramic seal.

Push the NEW oil seal in bearing carrier with the sealing lip facing to the ball bearing.

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

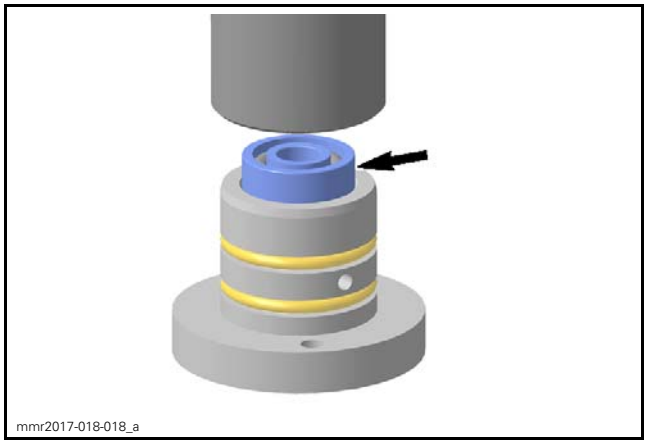


1. *Oil seal*
2. *Oil seal pusher*
3. *Bearing carrier*

Lubricate sealing lip of the oil seal.

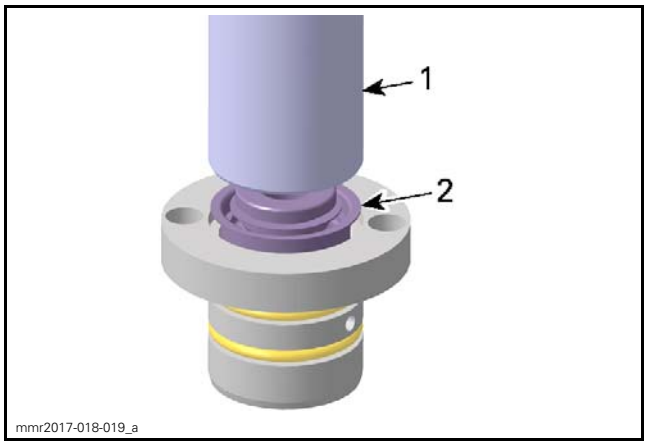
SEALING LIP OF OIL SEAL	
Service product	PETAMO GREASE GHY 133N (P/N 420 899 271)

Press bearing into bearing carrier.



Push the NEW ceramic seal in bearing carrier.

REQUIRED TOOL	
CERAMIC SEAL INSTALLER (P/N 529 036 014)	

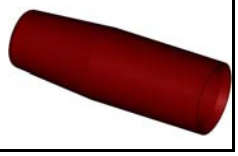


1. *Ceramic seal installer*
2. *Ceramic seal*

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

Install protector sleeve on pump shaft.

NOTE: Apply some grease inside the protector sleeve to prevent the protector sleeve fall off the pump shaft during installation.

REQUIRED TOOL	
PROTECTOR SLEEVE (P/N 529 036 406)	

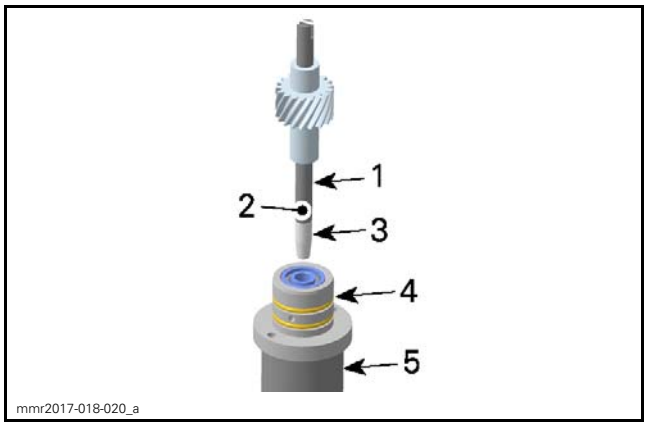
Apply injection oil on pump shaft.

Press pump shaft into the bearing carrier with the appropriate force.

NOTICE **Inadequate force will damage the oil seal and bearing.**

NOTE: During installation support the ceramic seal as shown on the following illustration.

REQUIRED TOOL	
CERAMIC SEAL INSTALLER (P/N 529 036 014)	



1. *Pump shaft*
2. *Apply injection oil*
3. *Protector sleeve*
4. *Bearing carrier*
5. *Ceramic seal installer*

Remove oil seal guide from pump shaft.

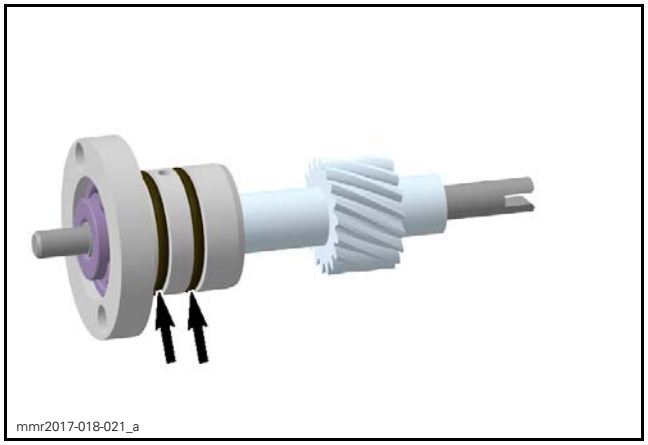
Clean water pump shaft thread using a part cleaner and compressed air.

WATER PUMP SHAFT THREAD CLEANING	
Service product	BRAKE AND PARTS CLEANER PRO S2 (P/N 779245)

Installing the Bearing Carrier and Pump Shaft

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

Install **NEW** O-rings on bearing carrier and apply injection oil.



Install pump shaft and bearing carrier in crankcase while turning shaft to mesh gears.

Tighten bearing carrier retaining screws to specification.

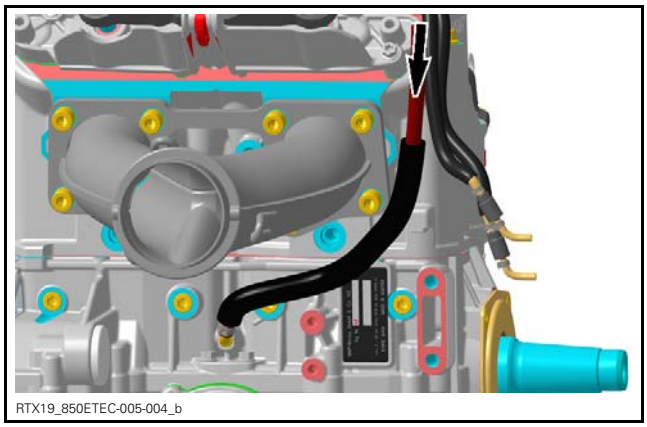
TIGHTENING TORQUE	
Bearing carrier screws	5 N•m ± 0.3 N•m (44 lbf•**in** ± 3 lbf•**in**)

Install **NEW** sealing ring and tighten plug screw to specification.

TIGHTENING TORQUE	
Plug screw	30 N•m ± 2 N•m (22 lbf•ft ± 1 lbf•ft)

Fill injection oil in the water pump drive chamber.

REQUIRED TOOL
Syringe

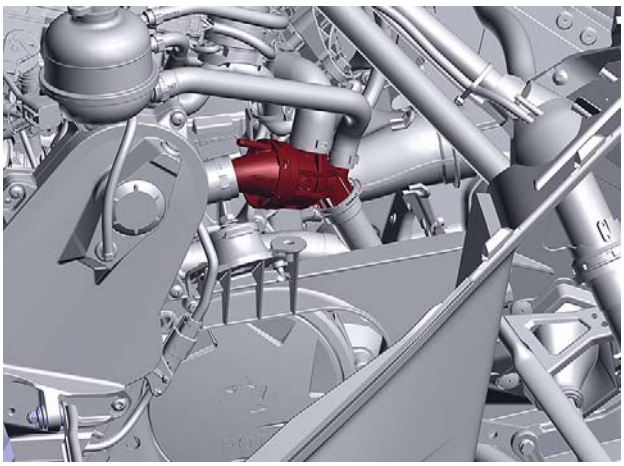


CRANKSHAFT WORM GEAR LUBRICATION	
Service product	Injection oil
Quantity	50 ml (1.7 U.S. oz)

THERMOSTAT

Thermostat Location

The thermostat is located on the RH side of the engine (PTO side), behind the muffler.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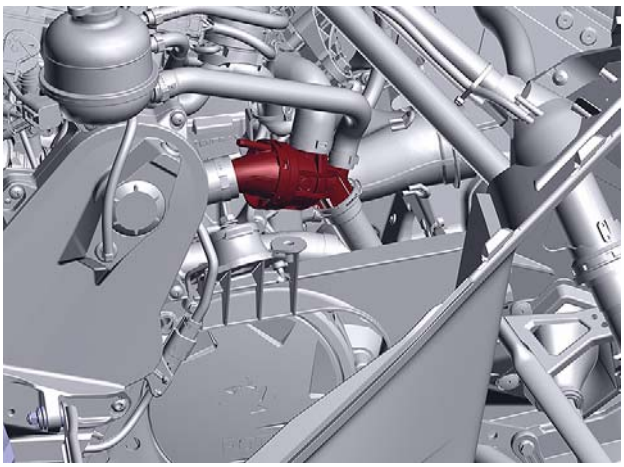
Removing the Thermostat

To remove thermostat:

– Block all four thermostat hoses with hose pinchers **or**
– Drain cooling system.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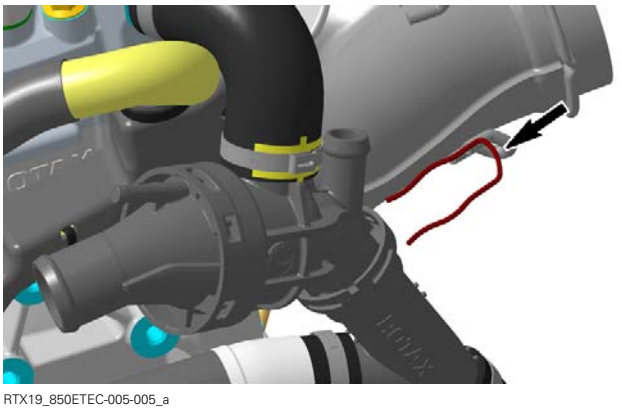
Remove spring clip from thermostat housing.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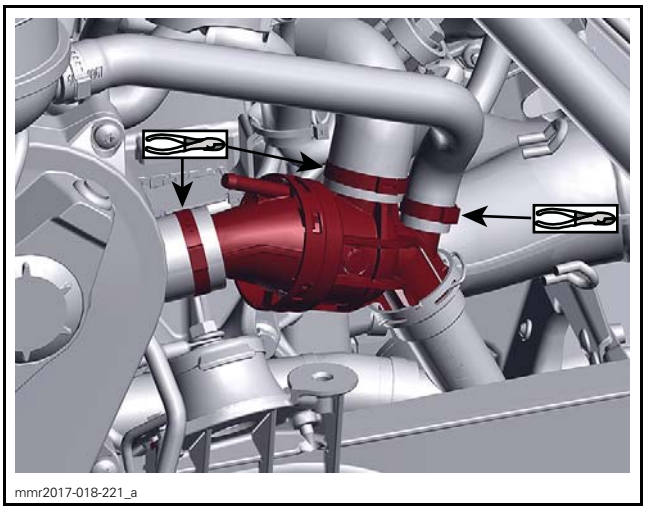
Cut Oetiker clamps (3x) then unplug hoses.

Remove thermostat housing from molded hose assembly.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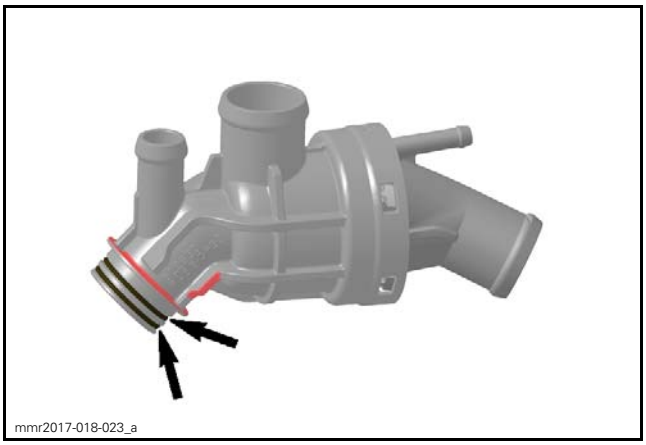
Remove O-rings and discard them.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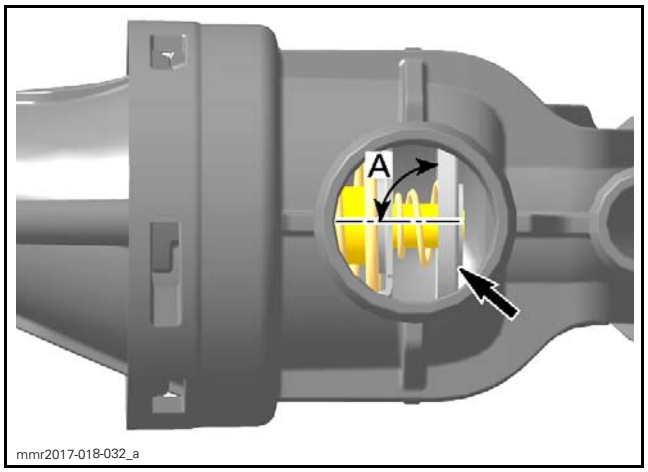
Testing the Thermostat

To check thermostat, put in water and heat water.

THERMOSTAT TEMPERATURE	
Starts to open	37°C (99°F)
Fully open	55°C (131°F)

Inspecting the Thermostat

Check for proper alignment of the thermostat plunger.



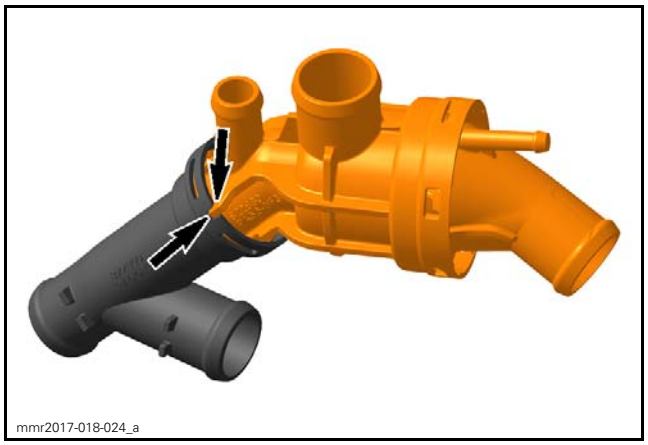
A. 90°

Installing the Thermostat

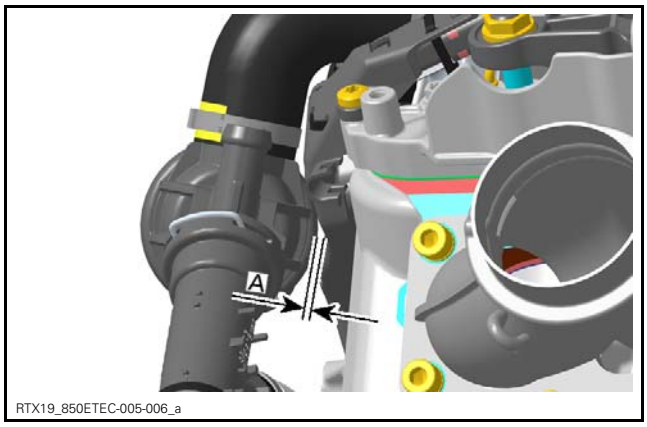
The installation is the reverse of the removal procedure. However, pay attention to the following.

Install NEW O-rings and apply coolant.

Take care that the nose of the thermostat housing is properly positioned in the recess of the molded hose assembly.



After installation ensure proper distance of thermostat housing to the cylinder block and exhaust manifold.



A. 5 mm ± 2 mm (.2 in ± .08 in)

Properly refill cooling system. Refer to *REFILLING AND BLEEDING THE COOLING SYSTEM* in *PERIODIC MAINTENANCE PROCEDURES* subsection.

COOLANT TEMPERATURE SENSOR (CTS)

To test and replace the CTS, refer to *E-TEC DIRECT FUEL INJECTION* subsection.

COOLING SYSTEM - VEHICLE COMPONENTS

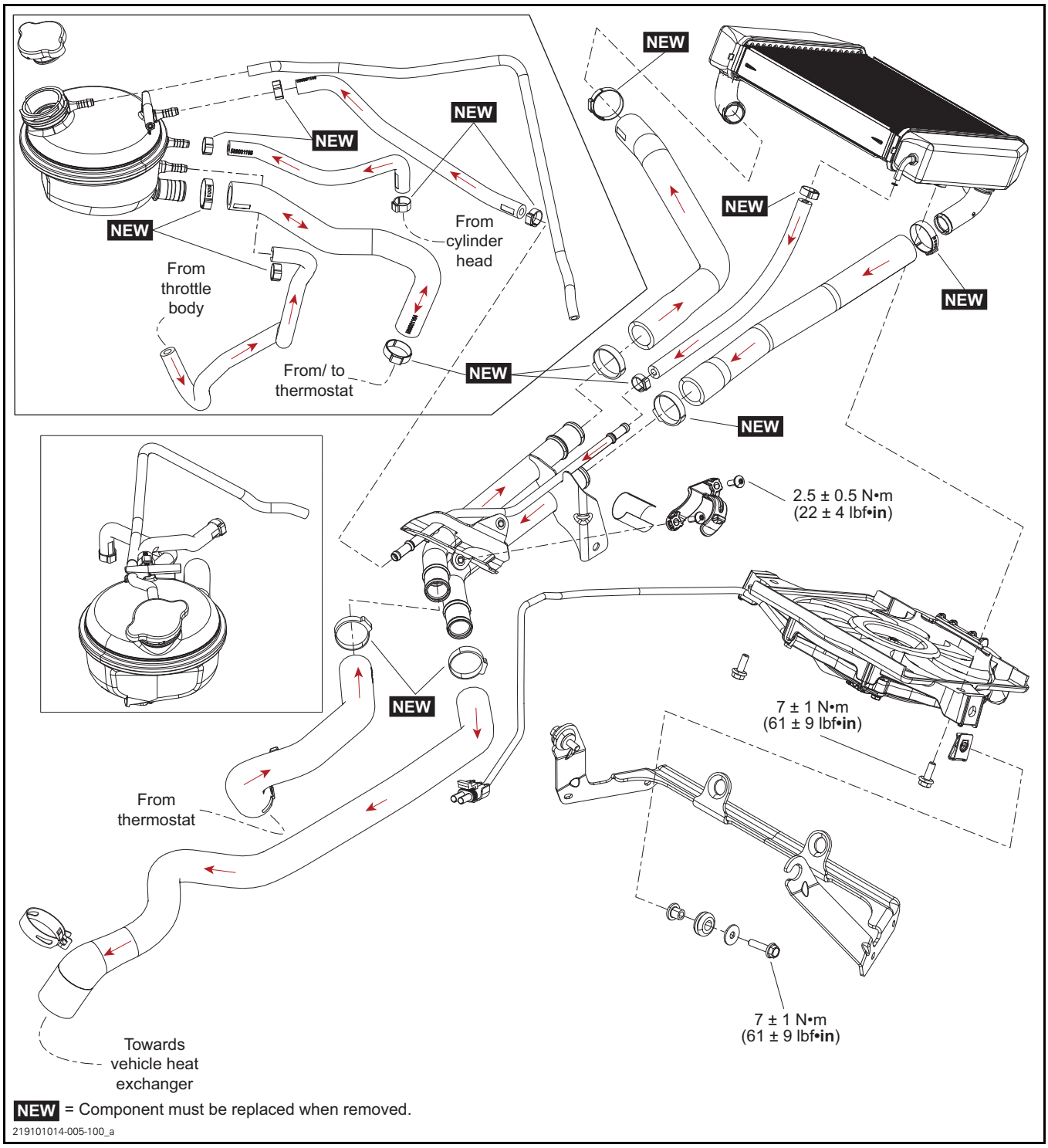
SERVICE TOOLS

Description	Part Number	Page
LARGE HOSE PINCHER	529 032 500	7
SMALL HOSE PINCHER	295 000 076	7
TEST CAP	529 035 991	6
VACUUM/PRESSURE PUMP	529 021 800	6

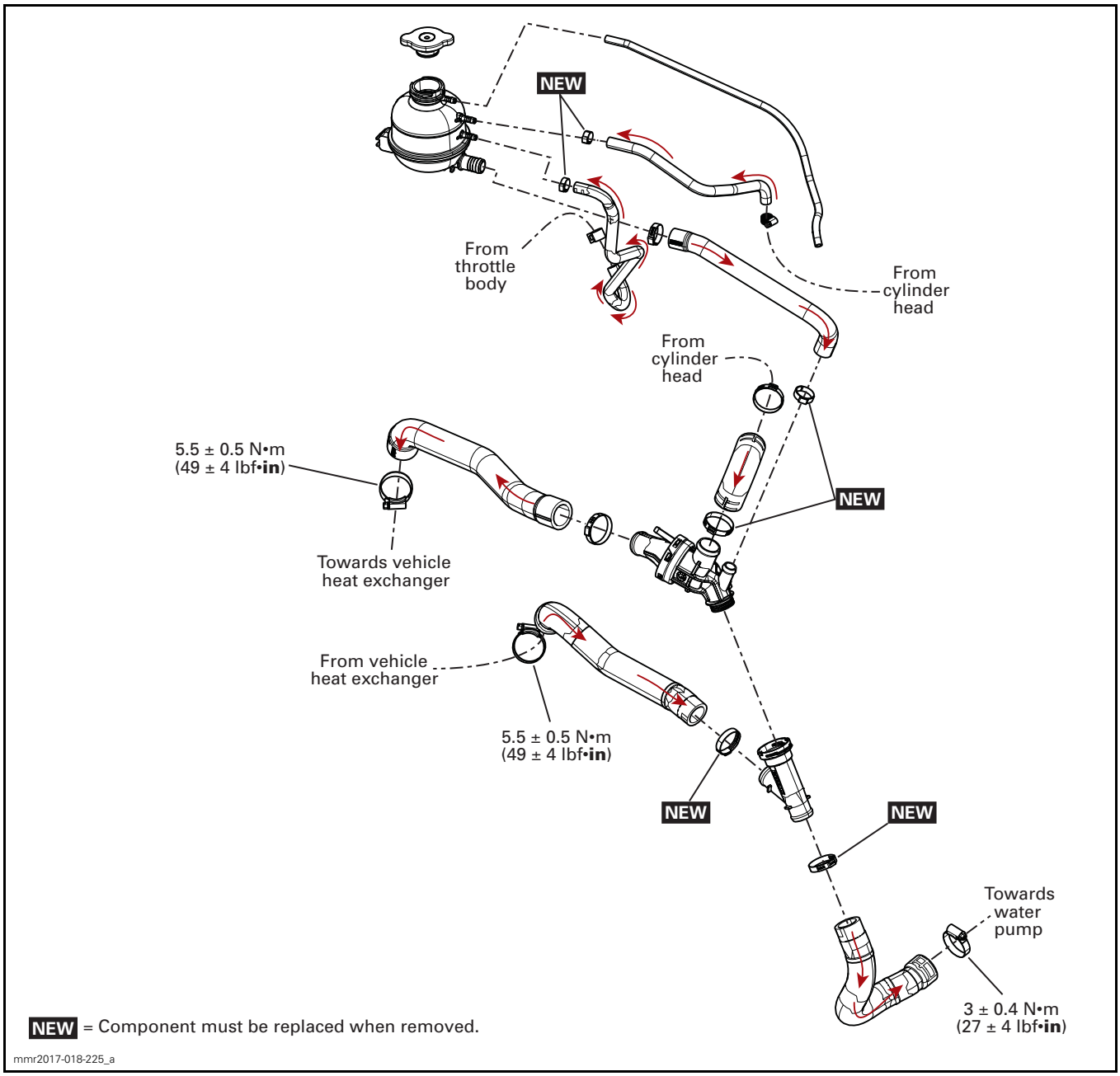
SERVICE PRODUCTS

Description	Part Number	Page
EXTENDED LIFE PRE-MIXED COOLANT (EUR)	779223	4
EXTENDED LIFE PRE-MIXED COOLANT	779150	4

With Front Radiator



Without Front Radiator



GENERAL

NOTE: It is a good practice to check for fault codes using BUDS2 software as a first troubleshooting step

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

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

⚠ WARNING

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

MAINTENANCE

COOLING SYSTEM

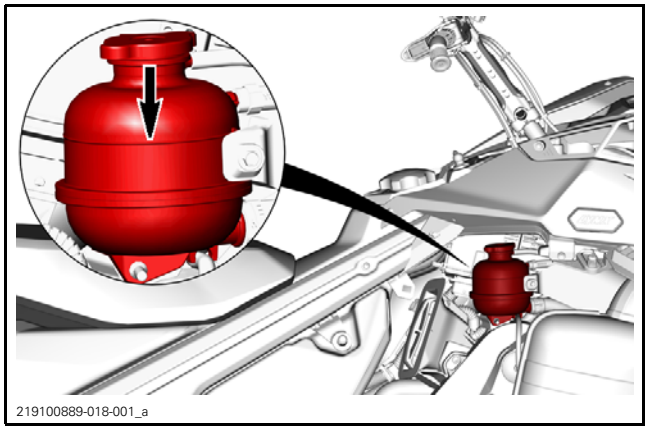
⚠ WARNING

Never open coolant tank cap when engine is hot.

Verifying the Engine Coolant Level

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

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



COLD LEVEL LINE

Verifying the Engine Coolant Strength

Remove pressure cap.

Use an antifreeze tester to test coolant strength.

MINIMUM RECOMMENDED COOLANT STRENGTH
-30°C (-22°F)

Replacing the Engine Coolant

Recommended Engine Coolant

COUNTRY	RECOMMENDED SERVICE PRODUCT
Scandinavia	EXTENDED LIFE PRE-MIXED COOLANT (EUR) (P/N 779223)
All other countries	EXTENDED LIFE PRE-MIXED COOLANT (P/N 779150)
Alternative, or if not available	A blend of 50% distilled water with 50% antifreeze (especially formulated for aluminum engines

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

NOTICE **To prevent rust formation or freezing condition, always replenish the system with the BRP premixed coolant or with 50% antifreeze and 50% distilled water. 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. During cold weather, straight water causes the system to freeze while straight antifreeze thickens (like slush ice) and does not have the same efficiency. Always use ethylene glycol antifreeze containing corrosion inhibitors specifically recommended for aluminum engines.**

Draining the Cooling System

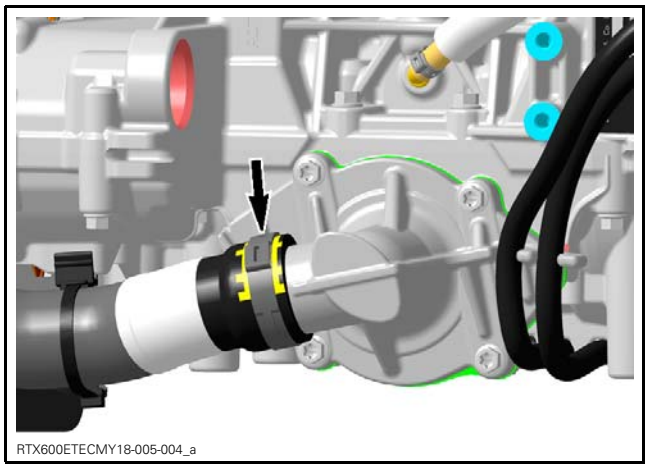
⚠ WARNING

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

Remove muffler and tuned pipe. Refer to *EXHAUST SYSTEM* subsection.

Place a large drain pan under the vehicle bottom pan.

Remove coolant hose from water pump to drain coolant.

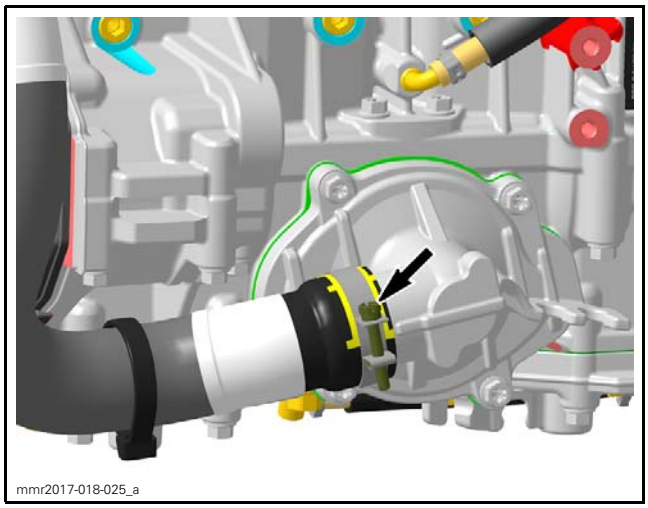


REMOVE CLAMP (DISCARD ORIGINAL INSTALLED 1–EAR CLAMP)

When coolant level is low enough, lift the rear of vehicle to drain the heat exchangers.

TYPICAL

Install and tighten coolant hose clamp on water pump.



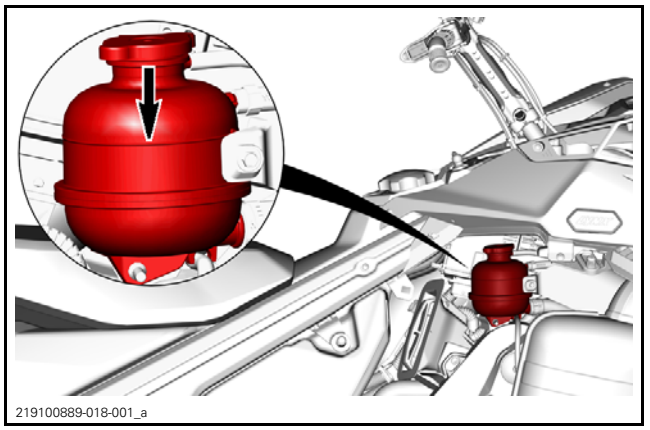
TIGHTENING TORQUE	
Coolant hose clamp	3 N•m ± 0.4 N•m (27 lbf•**in** ± 4 lbf•**in**)

Refilling and Bleeding the Cooling System

1. Apply parking brake.
2. Lift front of vehicle as shown and support it safely.

TYPICAL
A. 25 cm ± 5 cm (10 in ± 2 in)

3. With engine cold, slowly fill coolant tank up to COLD LEVEL line allowing time for the air in the cooling system to seep out.



COLD LEVEL LINE

4. Start engine.
5. Refill coolant tank up to COLD LEVEL line while engine is idling until rear heat exchangers are warm to the touch (about 4 to 5 minutes).

NOTE: Always monitor coolant level while filling coolant tank to avoid emptying and thus allowing air to enter the system.

6. Install pressure cap.
7. Lower vehicle back to the ground.
8. Lift rear of vehicle and support it safely.

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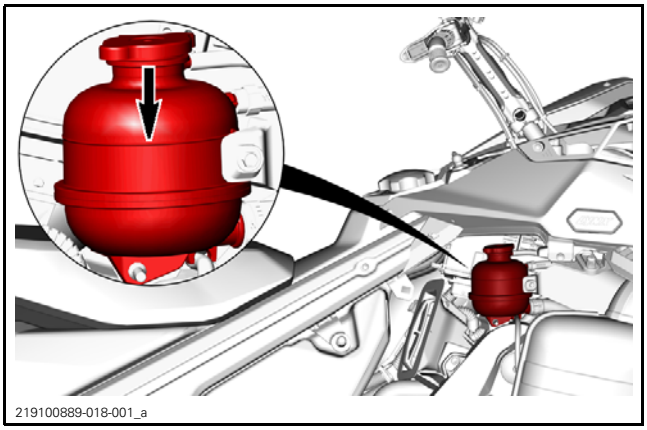
TYPICAL

⚠ WARNING

Before revving engine, ensure that the track is free of particles which could be thrown out while track is rotating. Keep hands, tools, feet and clothing clear of track. Always lift the snowmobile on a wide-base stand with a rear deflector panel. Ensure no one is standing in close proximity to the snowmobile, especially at the rear of the track. Centrifugal force could cause debris, damaged or loose studs, pieces of torn track, or an entire track to be violently thrown backwards out of the frame with tremendous force, possibly resulting in the loss of a leg or other serious injury.

9. Remove parking brake.
10. Activate throttle lever 3 - 4 times to bring engine speed to 7000 RPM.
11. Apply the brake.
12. Lower vehicle back to ground.
13. Stop engine.
14. Add coolant up to 15 mm (1/2 in) above the COLD LEVEL line.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COLD LEVEL LINE

15. When engine has completely cooled down, recheck coolant level in coolant tank and refill up to line if needed.
16. Visual check for any leakages.
17. Perform *VERIFYING THE ENGINE COOLANT STRENGTH*. See procedure in this subsection.
18. Adjust mixture as necessary.
19. Reinstall removed parts.

INSPECTION

COOLING SYSTEM LEAK TEST

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

⚠ WARNING

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

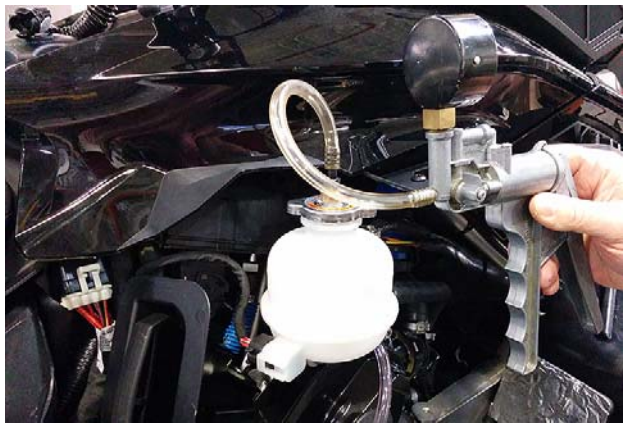
Remove the RH side panel.

Remove coolant tank cap.

Pressurize system through coolant tank.

REQUIRED TOOL	
TEST CAP (P/N 529 035 991)	
VACUUM/PRESSURE PUMP (P/N 529 021 800)	

TEST PRESSURE
100 kPa (15 PSI)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TYPICAL

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

If no external leak is found and pressure drops, carry out the *ENGINE COOLING CIRCUIT LEAK TEST* to find a potential engine internal leak.

PROCEDURES

COOLANT TANK CAP

Using a pressure cap tester, check the relief pressure of coolant tank cap as per specification.

CAP OPENING PRESSURE
110 kPa (16 PSI)

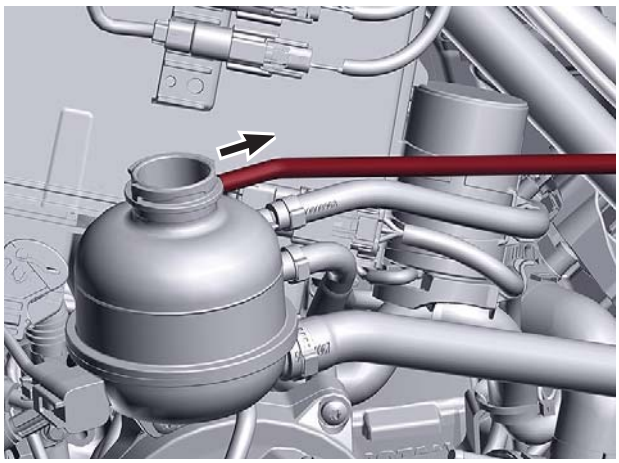
If the test failed, replace with a new cap with same specification.

NOTICE **Do not install a tank cap exceeding the recommended pressure.**

COOLANT TANK

Removing the Coolant Tank

1. Remove the RH side panel.
2. Siphon the coolant tank.
3. Unplug the upper vent hose.



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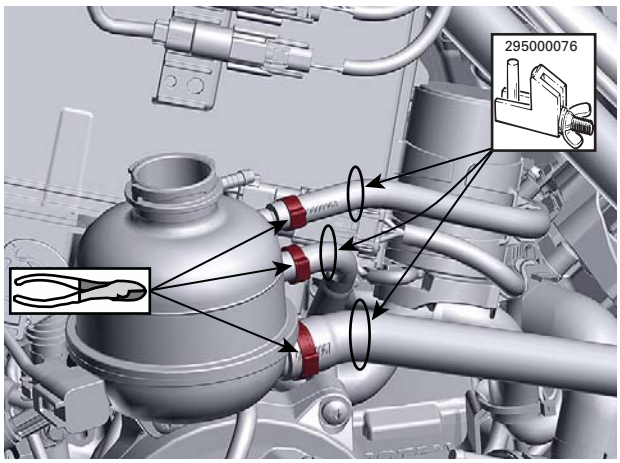
TYPICAL

4. Block the three lower coolant hoses with pinchers.

REQUIRED TOOL	
SMALL HOSE PINCHER (P/N 295 000 076)	

5. Cut Oetiker clamps and remove coolant hoses from coolant tank.



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TYPICAL

6. Detach the coolant tank from the top of the chaincase.

Inspecting the Coolant Tank

Check if the tank is cracked or melted. Replace if necessary.

Installing the Coolant Tank

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

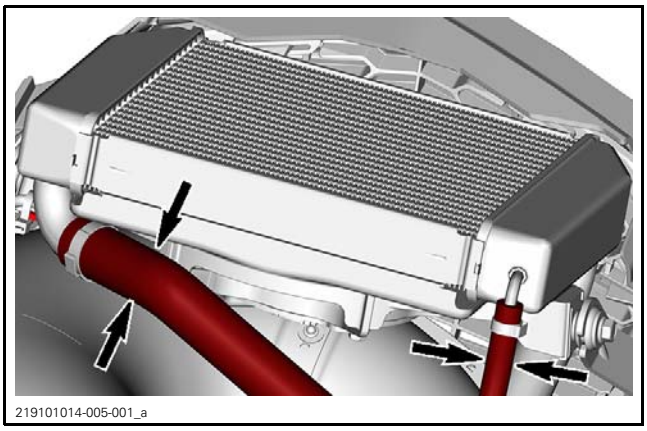
Properly refill cooling system. Refer to *REFILLING AND BLEEDING THE COOLING SYSTEM* in this subsection.

FRONT RADIATOR

Removing the Front Radiator

1. Remove the upper body module. Refer to *BODY* subsection.
2. Cut cooling fan harness locking ties.
3. Disconnect cooling fan connector.
4. Install hose pinchers on radiator inlet and bleeder hoses.

REQUIRED TOOL	
SMALL HOSE PINCHER (P/N 295 000 076)	
LARGE HOSE PINCHER (P/N 529 032 500)	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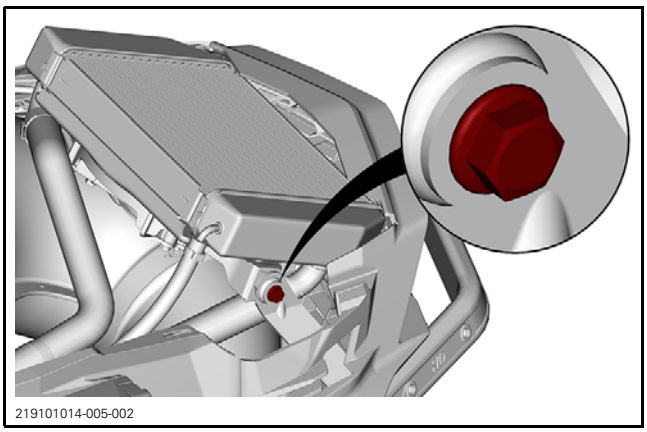
5. Remove radiator retaining screws.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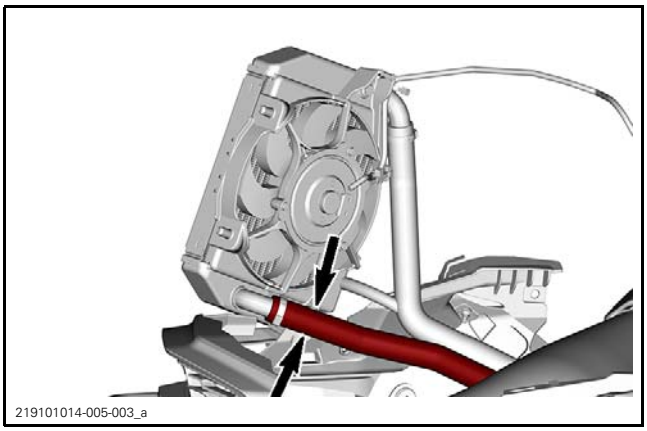
6. Pivot radiator on the RH side.
7. Install a hose pincher on the outlet hose.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8. Place a coolant pan under the radiator.
9. Remove and discard Oetiker clamps.
10. Disconnect coolant hoses from radiator.
11. When empty, remove radiator from vehicle.

Installing the Front Radiator

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

Install **NEW** Oetiker clamps to secure coolant hoses.

Properly refill cooling system. Refer to *REFILLING AND BLEEDING THE COOLING SYSTEM* in this subsection.

RADIATOR COOLING FAN

Radiator Cooling Fan Operation

The ECM controls the radiator cooling fan via the inputs of the coolant temperature sensor (CTS). Refer to the following table.

ENGINE TEMP.	65°C (149°F)	60°C (140°F)	85°C (185°F)
COOLING FAN	Turns ON	Turn OFF	ON
CHECK ENGINE LIGHT	—	—	OFF
MESSAGE IN GAUGE	—	—	- Limp Home - Hi Temp
LIMP HOME MODE	—	—	Gradual power reduction according to engine temperature.

If voltage decrease to 11 V and cooling fan is running, the ECM will shut it off. If voltage remains low and coolant temperature reaches 85°C (185°F), the ECM will turn on the cooling fan.

Cooling Fan Configuration in BUDS2

1. Connect vehicle to the BRP diagnostic software (BUDS2). Refer to *COMMUNICATION TOOLS* subsection.
2. In BUDS2, select the following:
   – **Settings** page
   – **ECM** button.
3. Ensure that **With fan** box is properly checked.

Testing the Radiator Cooling Fan

1. Connect the vehicle to the BRP diagnostic software (BUDS2). Refer to *COMMUNICATION TOOLS* for procedure and connector location.
2. In BUDS2, go to:
   – **Functions** page
   – **ECM** button
   – **IO Controls** tab.

3. Select **Activate Cooling Fan** action

If fan turns on, check the cooling temperature sensor (CTS). Refer to *ELECTRONIC FUEL INJECTION* subsection.

If fan does not turn on when the **Activate Cooling Fan** button is pressed, refer to the following troubleshooting chart.

COOLING FAN TROUBLESHOOTING CHART		
Is fan working?	YES →	Everything is OK
NO ↓		
Check fan fuse (15A). Is fuse burnt?	YES →	Replace fuse Is fan working?
NO ↓		
Bypass fan relay Refer to *BYPASSING THE RADIATOR FAN RELAY*		
↓		
Fan turns?	YES →	Replace relay Is fan working?
NO ↓		
Apply 12 Vdc to fan connector		
↓		
Fan turns?	NO →	Replace fan Is fan working?
YES ↓		
Check wiring harness and connectors (Refer to *TESTING THE COOLING FAN CIRCUIT CONTINUITY*)		
↓		
Harness and connectors good?	NO →	Repair or replace defective part(s)
YES ↓		
Check CTS (Refer to *ELECTRONIC FUEL INJECTION* subsection)		
↓		
CTS works?	NO →	Replace CTS Is fan working?
YES ↓		
Try a new ECM	→	Is fan working?

Bypassing the Radiator Fan Relay

1. Remove the fan relay. Refer to *WIRING DIAGRAM* for relay identification.

2. Install a fused jumper wire between relay pins 30 and 87.

Testing the Radiator Fan Relay

1. Pull on the fan relay without completely removing it. Refer to *WIRING DIAGRAM* for relay identification.
2. Install a fused jumper wire between pin 86 and battery negative (-) post.

If the relay "clicks", it is good.

If the relay does not "click", continue with the following test.

INPUT VOLTAGE AT COOLING FAN RELAY TEST		
FAN RELAY PIN	BATTERY POST	SPECIFICATION
85	Negative (-)	Battery voltage
87		

If reading is to specification, replace the relay.

If reading is not to specification:

– Check the fuse
– Check the power supply circuit continuity. Refer to *WIRING DIAGRAM*.

Testing the Cooling Fan Circuit Continuity

If one of the following tests is not to specification, repair the terminals and the wire accordingly.

COOLING FAN MOTOR POWER CIRCUIT CONTINUITY TEST		
FAN CONNECTOR PIN	FUSE BOX TERMINAL	SPECIFICATION
B	D6	Close to 0 Ω

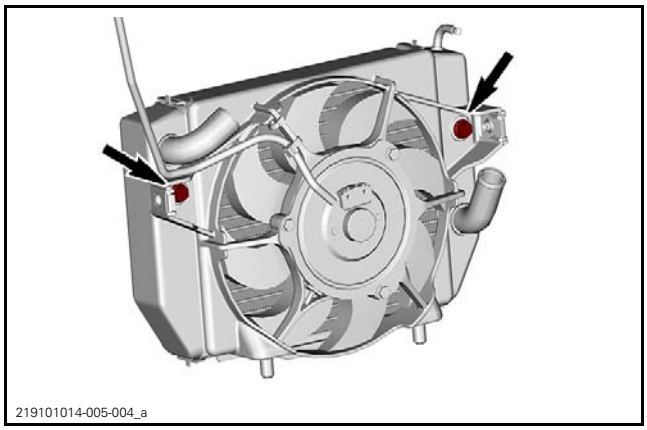
COOLING FAN MOTOR GROUND CIRCUIT CONTINUITY TEST		
FAN CONNECTOR PIN	BATTERY	SPECIFICATION
A	Negative (-) post	Close to 0 Ω

COOLING FAN MOTOR CONTROL CIRCUIT CONTINUITY TEST		
FUSE BOX TERMINAL	ECM ADAPTER PIN	SPECIFICATION
D5	B-J2	Close to 0 Ω

COOLING FAN MOTOR POWER CIRCUIT CONTINUITY TEST		
FUSE BOX TERMINAL		SPECIFICATION
C5	D4	Close to 0 Ω

Removing the Radiator Cooling Fan

1. Remove the radiator.
2. Remove fan retaining screws.
3. Remove the radiator fan.



Installing the Radiator Cooling Fan

The installation is the reverse of the removal procedure.

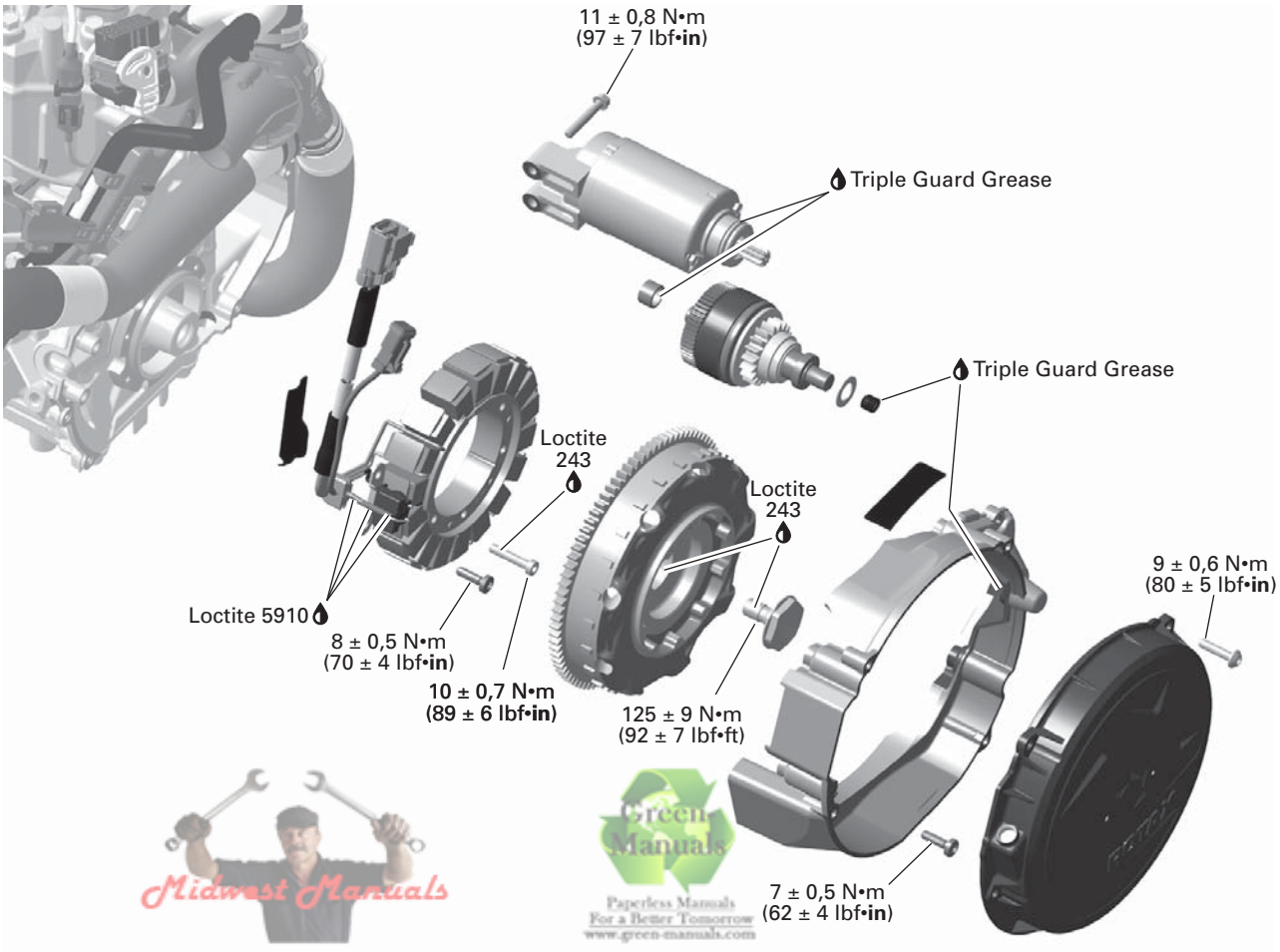
MAGNETO AND STARTER

SERVICE TOOLS

Description	Part Number	Page
ACG ADAPTER	529 036 410	10
CLUTCH HOLDER	529 036 369	3, 6
CRANKSHAFT PROTECTOR	529 036 434	4
FLUKE 115 MULTIMETER	529 035 868	9–10
HANDLE	420 877 650	14
MAGNETO HOLDER	529 036 404	3–4, 6
MAGNETO PULLER	529 036 403	4–5
STARTER DRIVE NEEDLE INSTALLER	529 035 934	14

SERVICE PRODUCTS

Description	Part Number	Page
BLACK NEOPRENE PAINT	909570	13
BRAKE AND PARTS CLEANER PRO S2	779245	5
LOCTITE 243 (BLUE)	293 800 060	5–6, 11
LOCTITE 5910	293 800 081	9
PULLEY FLANGE CLEANER (F)	619 600 022	5
TRIPLE-GUARD GREASE	508298	12, 14



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NEW = Component must be replaced when removed.

RTX20_600R-007_001_a

GENERAL

⚠ CAUTION Ensure tether cord is removed from D.E.S.S. post and engine shut-off switch is in the OFF position.

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

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

⚠ WARNING

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

PROCEDURES

MAGNETO FLYWHEEL

Magneto Flywheel Access

Remove the rewind starter, refer to *REWIND STARTER* subsection.

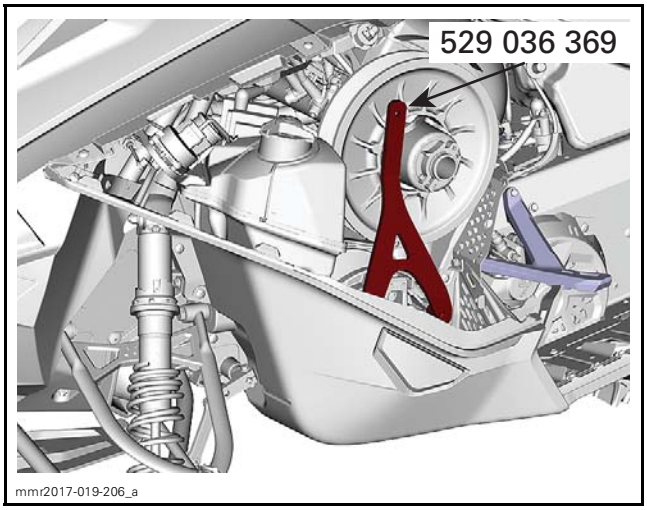
Removing the Magneto Flywheel

⚠ CAUTION Ensure tether cord is removed from D.E.S.S. post and engine shut-off switch is in the OFF position.

Engine In the Vehicle

1. Block the drive pulley to avoid engine turning during the removal of the magneto retaining screw.

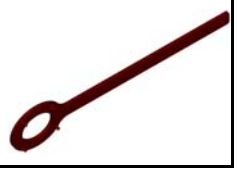
REQUIRED TOOL	
CLUTCH HOLDER (P/N 529 036 369)	

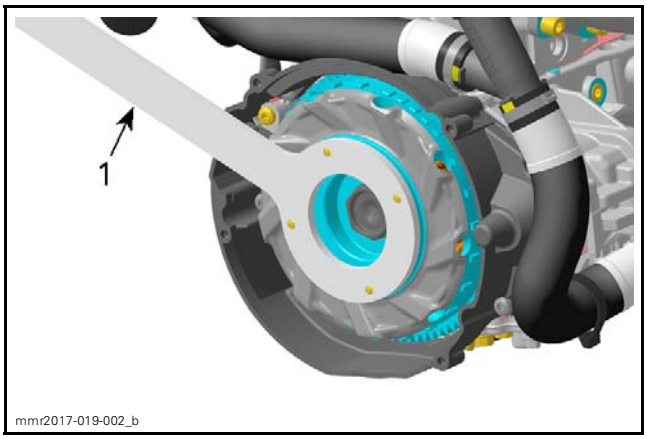


TYPICAL

Engine Out of the Vehicle

2. Install the magneto holder.

REQUIRED TOOL	
MAGNETO HOLDER (P/N 529 036 404)	



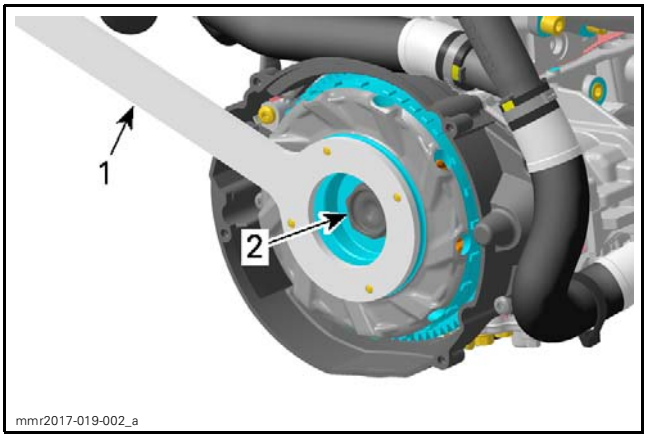
1. Magneto holder

Engine In or Out of the Vehicle

3. Remove magneto flywheel retaining screw.

NOTICE The hexagon head of the retaining screw is very flat. To avoid slipping off thoroughly hold socket against the screw head when loosening the retaining screw.

REQUIRED TOOLS	
MAGNETO HOLDER (P/N 529 036 404)	
32 mm socket	



1. *Magneto holder (engine out of vehicle)*
2. *Magneto flywheel retaining screw*

Engine In the Vehicle

4. Remove the crankshaft position sensor (CPS). Refer to procedure in this subsection.

Engine Out of the Vehicle

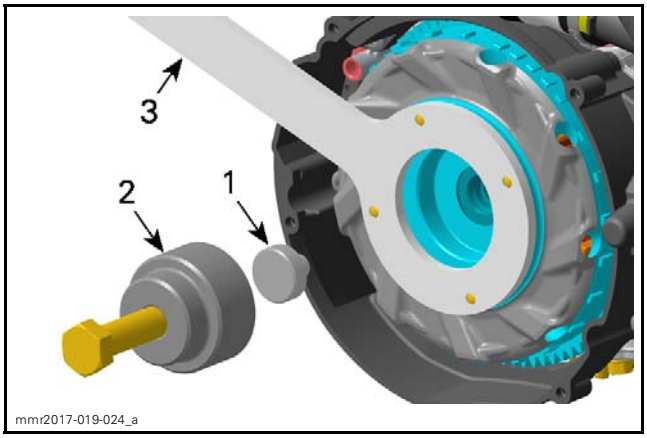
5. Unscrew crankshaft position sensor (CPS). Refer to procedure in this subsection.
6. Slightly pull crank position sensor and cut silicone sealer between crank position sensor and crankcase.
7. Move CPS aside.

Engine In or Out of the Vehicle

8. Remove magneto flywheel.

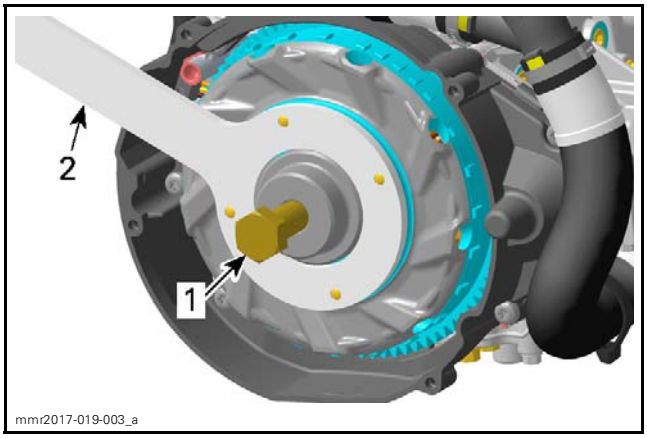
REQUIRED TOOLS	
CRANKSHAFT PROTECTOR (P/N 529 036 434)	
MAGNETO PULLER (P/N 529 036 403)	
MAGNETO HOLDER (P/N 529 036 404)	
24mm socket	

Install service tools on engine.



1. *Crankshaft protector*
2. *Magneto puller*
3. *Magneto holder (engine out of vehicle)*

Tighten puller bolt, while holding the magneto flywheel in place until magneto flywheel releases from crankshaft.



1. *Puller bolt*
2. *Magneto holder (engine out of vehicle)*

Inspecting the Magneto Flywheel

Clean magneto flywheel using only a clean cloth.

Inspect magneto flywheel for abnormal coloration (brown or blue) that would indicate overheating condition.

If overheating condition is suspected, carry out the following:

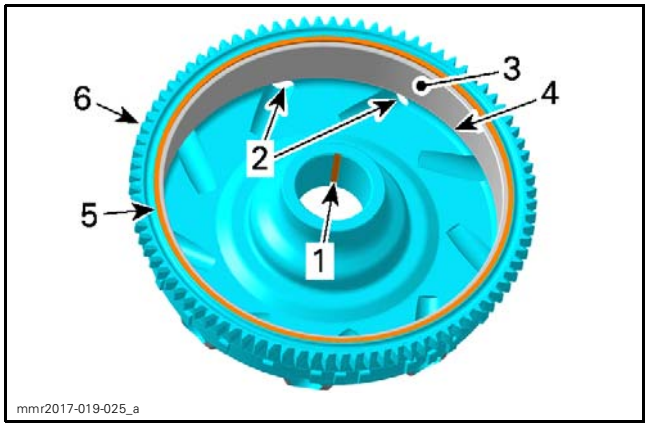
- Check flywheel magnetic field using a piece of metal. If magnetic field is not felt or weak, replace flywheel.
- Inspect flywheel for cracks, pay particular attention to the inside circumference (magnets), and the tapered center portion.
- Check if magneto flywheel ventilation holes are clean.
- Check if magneto housing ventilation holes are clean.
- Check stator for signs of overheating.
- Test stator, see procedures in this subsection.

Check INOX sheet metal ring on inside of magneto flywheel for proper position and fixation.

Check if bead of silicone is not damaged.

Check starter gear teeth for wear or any other damage.

Check keyway of the magneto flywheel for wear or damages.



1. *Keyway*
2. *Ventilation holes*
3. *INOX sheet metal ring (magnets underneath)*
4. *INOX sheet metal ring flush with flywheel (no gap)*
5. *Bead of silicone*
6. *Starter gear*

Installing the Magneto Flywheel

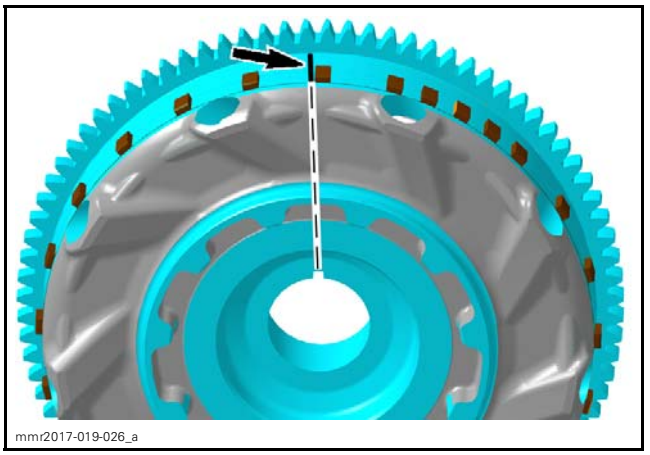
1. Clean:
   - Crankshaft taper
   - Thread in crankshaft
   - Magneto flywheel taper
   - Magneto flywheel retaining screw threads.

SERVICE PRODUCT	
Scandinavia	PULLEY FLANGE CLEANER (F) (P/N 619 600 022)
Other countries	BRAKE AND PARTS CLEANER PRO S2 (P/N 779245)

2. Apply threadlocker on magneto flywheel taper.

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

3. Install woodruff key on crankshaft.
4. Turn crankshaft to position woodruff key in top position.
5. Mark keyway position on magneto flywheel.



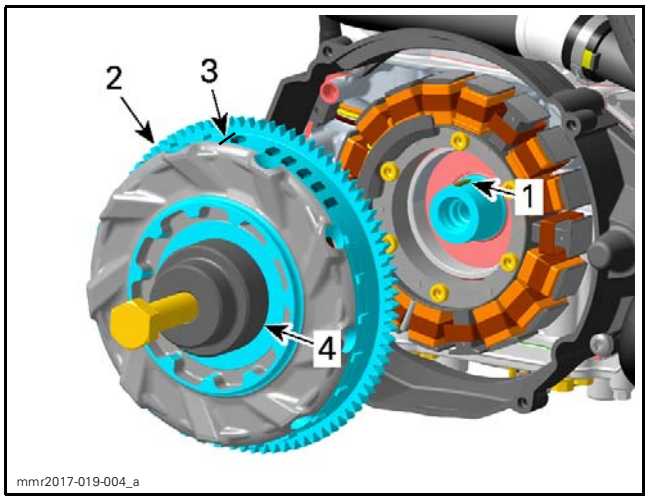
MARK KEYWAY POSITION

6. Install magneto flywheel.

⚠ CAUTION For installation use magneto puller to avoid injuries due to the high magnetic pull of the magneto flywheel.

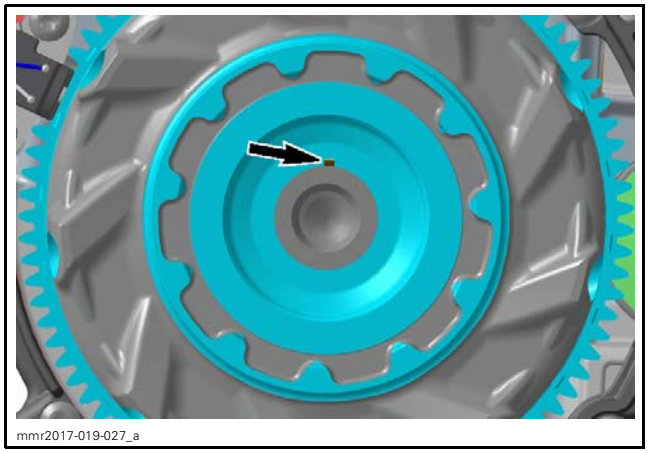
REQUIRED TOOL	
MAGNETO PULLER (P/N 529 036 403)	

Hold magneto flywheel with mark in top position.



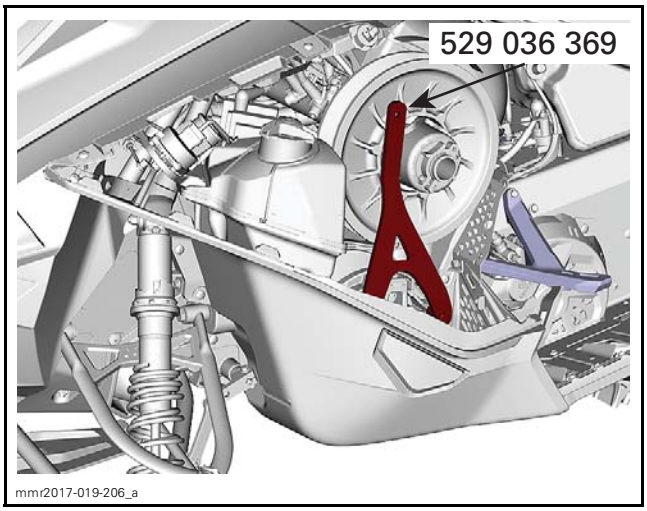
1. *Woodruff key in top position*
2. *Magneto flywheel*
3. *Mark on magneto flywheel*
4. *Magneto puller*

7. Check if woodruff key is in proper position.

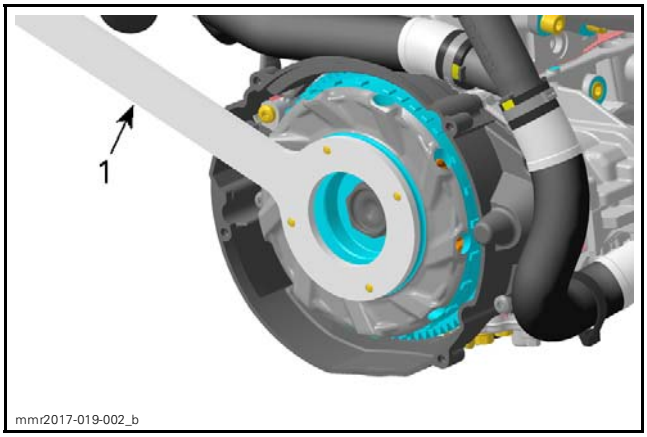


8. Block the drive pulley or the magneto flywheel using the appropriate tool.

REQUIRED TOOLS	
CLUTCH HOLDER (P/N 529 036 369)	
MAGNETO HOLDER (P/N 529 036 404)	



TYPICAL - IN VEHICLE

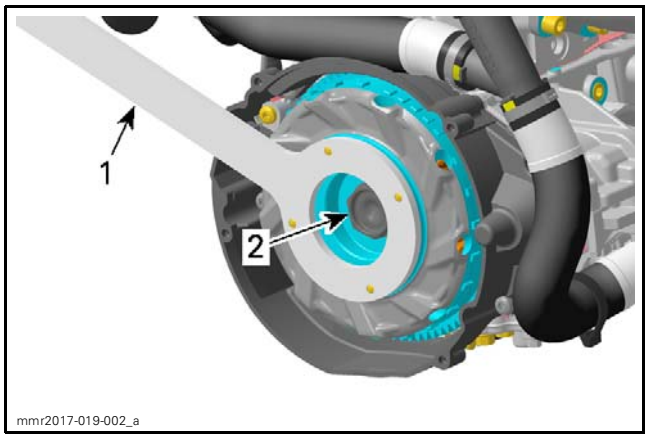


OUTSIDE VEHICLE
1. *Magneto holder*
2. *Magneto flywheel screw*

9. Install magneto flywheel retaining screw and tighten to specification.

NOTICE **The hexagon head of the retaining screw is very flat. To avoid slipping off thoroughly hold socket against the screw head when tightening the retaining screw.**

TIGHTENING TORQUE	
Magneto flywheel retaining screw	125 N•m ± 9 N•m (92 lbf•ft ± 7 lbf•ft) + LOCTITE 243 (BLUE) (P/N 293 800 060)



1. *Magneto holder*
2. *Magneto flywheel retaining screw*

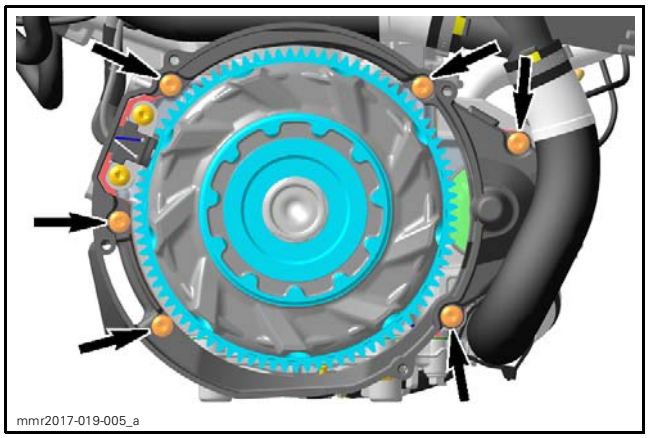
MAGNETO HOUSING

Inspecting the Magneto Housing

Inspect housing for cracks or other apparent damage. Replace if necessary.

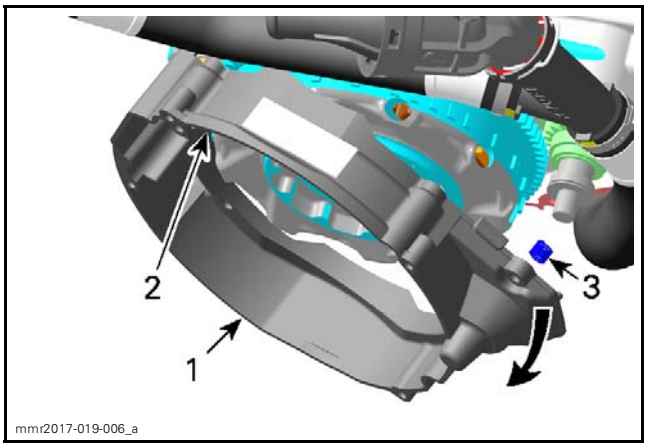
Removing the Magneto Housing

1. Remove the engine from the vehicle.
2. Remove magneto housing screws.



3. Slightly pull magneto housing and cut silicone sealer from between CPS and magneto housing.

NOTE: Do not lose starter drive spring during removal of magneto housing.



PULL MAGNETO COVER
1. *Magneto cover*
2. *CPS*
3. *Spring*

4. Remove magneto housing.

Installing the Magneto Housing

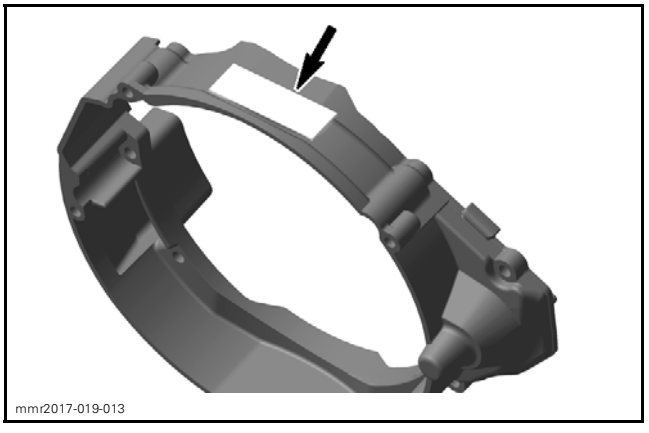
The installation is the reverse of the removal procedure. However, pay attention to the following.

Remove the old silicon at CPS.

Tighten magneto housing screws to specification.

TIGHTENING TORQUE	
Magneto housing screws	7 N•m ± 0.5 N•m (62 lbf•**in** ± 4 lbf•**in**)

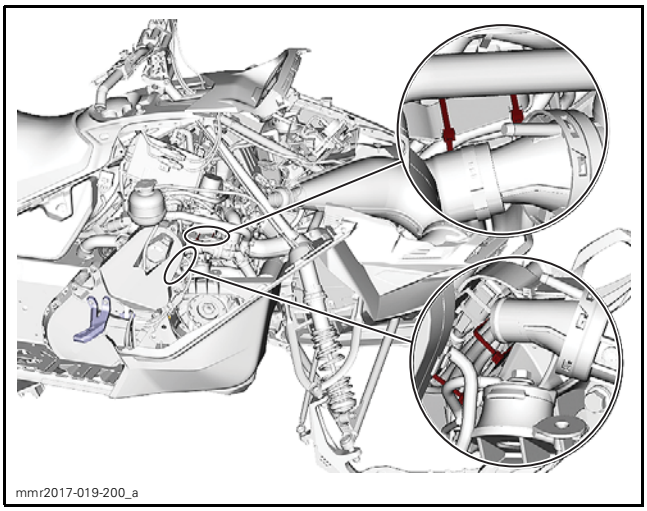
On a new magneto cover install adhesive pad.



CRANKSHAFT POSITION SENSOR (CPS)

CPS Connector Access

1. Remove the muffler. Refer to *EXHAUST SYSTEM* subsection.
2. Cut locking ties securing the wiring harness to engine harness support.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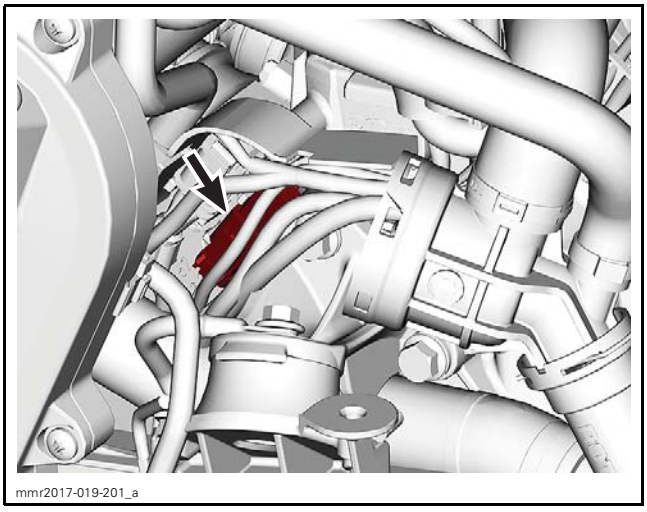
3. Move wirings aside and disconnect the CPS connector.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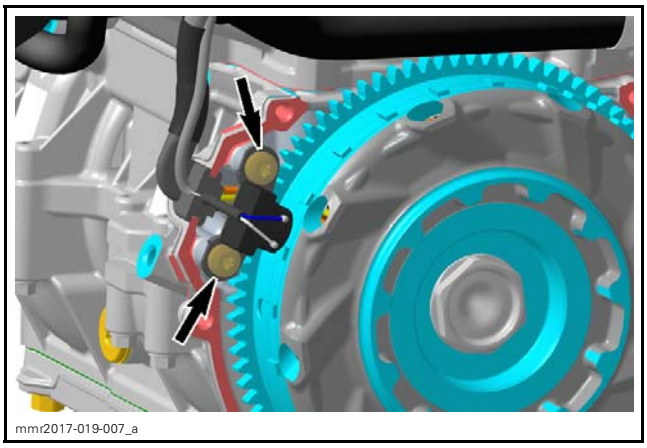
Testing the CPS

Refer to *E-TEC DIRECT INJECTION* subsection.

Removing the CPS

⚠ CAUTION **Ensure tether cord is removed from D.E.S.S. post and engine shut-off switch is in the OFF position.**

1. Remove magneto housing, refer to *MAGNETO HOUSING* in this subsection.
2. Remove CPS retaining screws.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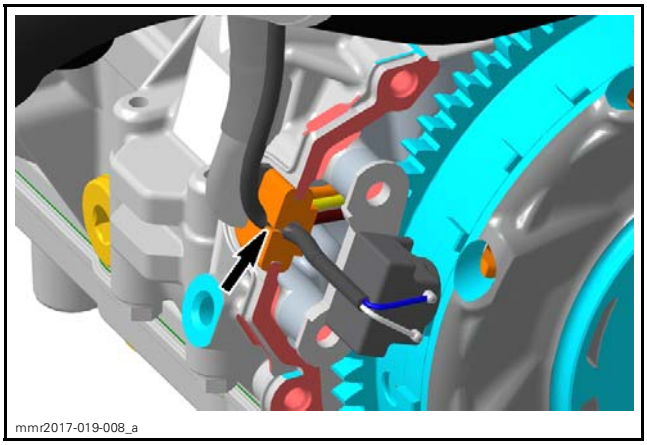
3. Disconnect CPS connector, refer to *CPS CONNECTOR ACCESS* in this subsection.
4. Remove CPS.
5. Remove the old silicon at CPS sensor location

Installing the CPS

NOTICE **Do not apply silicone dielectric grease or any other product on Deutsch waterproof housings as housing seal may be damaged.**

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

Insert CPS cable into stator cable grommet.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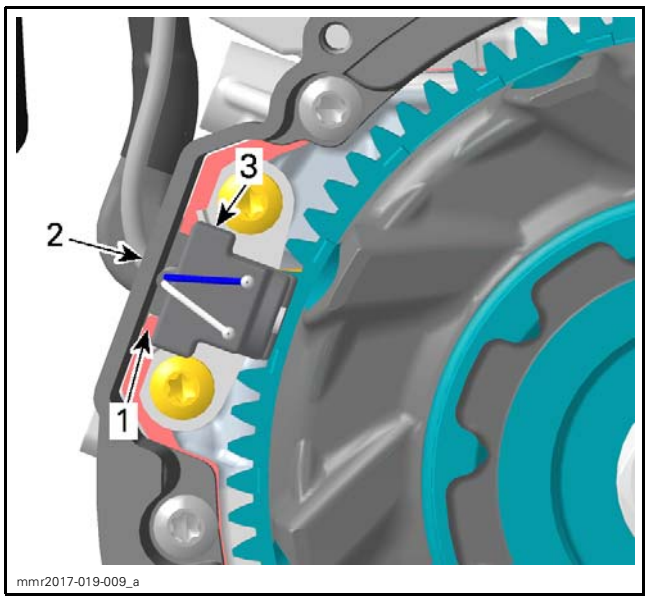
Tighten CPS retaining screws to specification.

TIGHTENING TORQUE	
CPS retaining screws	8 N•m ± 0.5 N•m (71 lbf•**in** ± 4 lbf•**in**)

NOTE: It is important to remove the old silicon at CPS location.

Fill up the gap between CPS and magneto housing with silicon.

SERVICE TOOL
LOCTITE 5910 (P/N 293 800 081)

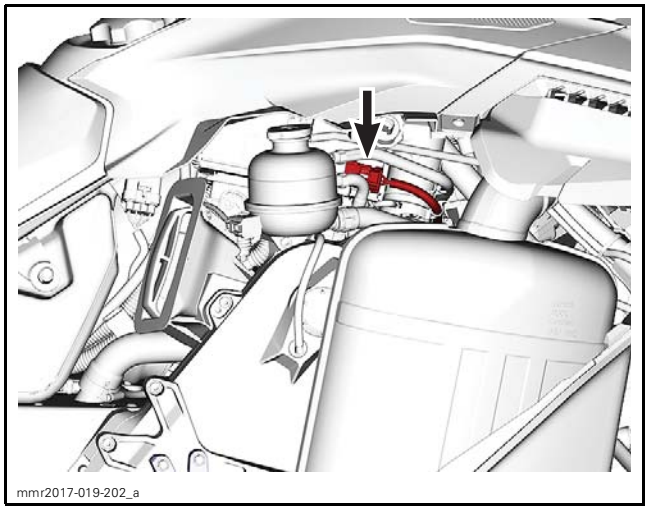


1. *Fill up with silicon.*
2. *Magneto housing*
3. *CPS*

STATOR

Stator Connector Access

1. Remove the RH side panel.
2. Disconnect stator connector (3-pin connector).



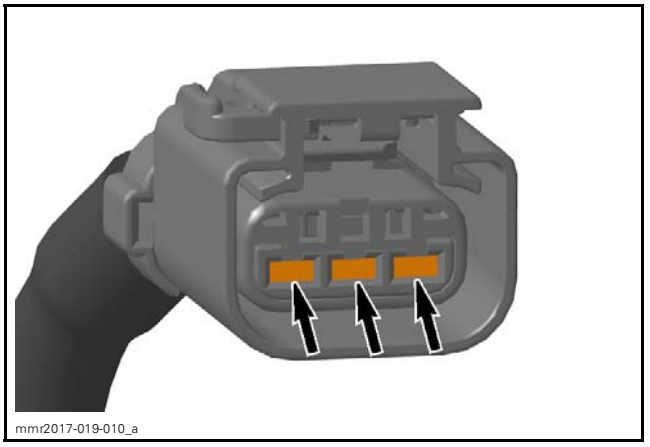
Testing the Stator Continuity

1. Disconnect stator connector.
2. Set multimeter to Ω.

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

3. Measure resistance of each stator coil as follows.

STATOR CONTINUITY TEST		
TEST PROBES		RESISTANCE @ 20°C (68°F)
Pin 1	Pin 2	0.63 ± 0.03 Ω
Pin 1	Pin 3	
Pin 2	Pin 3	



STATOR CONNECTOR PIN-OUT

NOTE: The stator resistance values mentioned in the table are manufacturers specifications under ideal conditions. If stator coil resistance is less than 1 Ω, consider stator to be in good working condition.

If resistance is out of specification, replace stator.

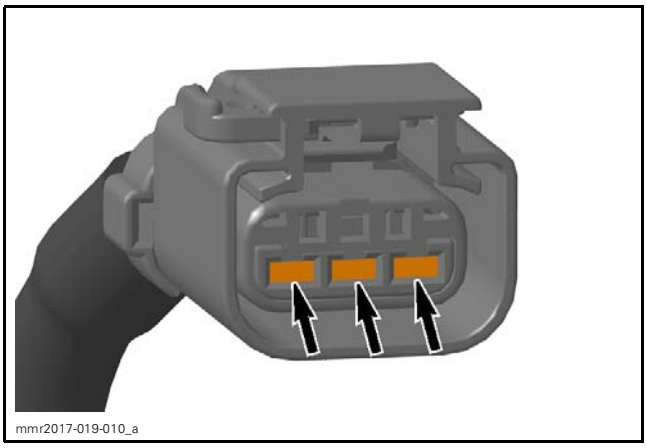
Testing the Stator Insulation

1. Disconnect stator connector.
2. Set multimeter to Ω.

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

3. Measure resistance as follows.

STATOR INSULATION TEST		
TEST PROBES		RESISTANCE @ 20°C (68°F)
Pin 1	Engine ground	OL (open circuit)
Pin 2		
Pin 3		



STATOR CONNECTOR PIN-OUT

If results are out of specification, the stator and/or the wiring need to be repaired or replaced.

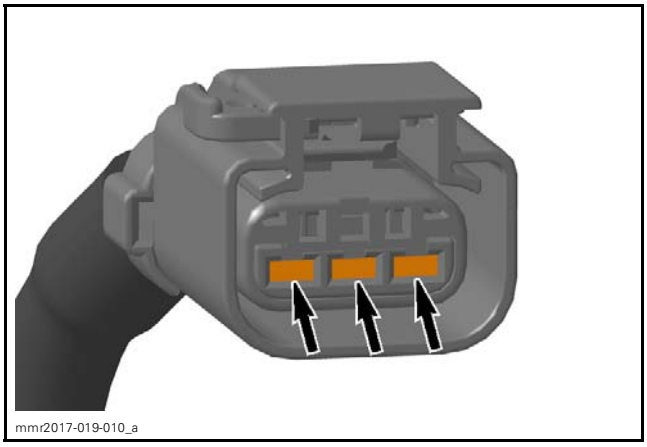
Testing the Stator Voltage Output

1. Disconnect stator connector.
2. Set multimeter to Vac and **manually set a scale** capable of reading at least 20 Vac.

REQUIRED TOOL	
FLUKE 115 MULTIMETER (P/N 529 035 868)	
ACG ADAPTER (P/N 529 036 410)	

3. Manually crank engine and read voltage from each winding as follows.
4. Repeat the test 3 times for each winding.

STATOR OUTPUT VOLTAGE TEST		
TEST PROBES		VOLTAGE
Pin 1	Pin 2	Approximately 15 - 20 Vac
Pin 1	Pin 3	
Pin 2	Pin 3	

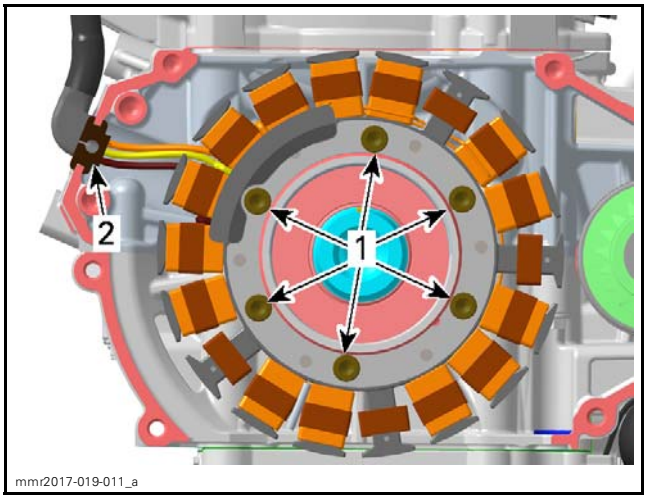


STATOR CONNECTOR PIN-OUT

5. If voltage is lower than specification, remove and inspect magneto flywheel and stator. Refer to *MAGNETO FLYWHEEL* in this subsection.
6. Replace magneto flywheel and/or stator if applicable.

Removing the Stator

1. Refer to procedures in this subsection and remove:
   - Magneto flywheel
   - Magneto housing
   - CPS.
2. Remove stator retaining screws.
3. Remove grommet from crankcase.



1. Stator retaining screws
2. Grommet

4. Disconnect stator connector. Refer to *STATOR CONNECTOR ACCESS* in this subsection.

NOTE: To ease harness routing at installation, tie a string on the connector and let the string follow through as you pull on the harnesses.

5. Remove stator.

Cleaning the Stator

NOTICE Clean stator using only a clean cloth.

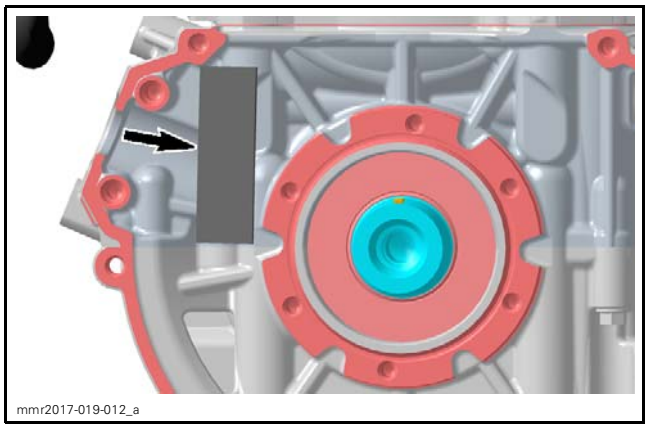
Inspecting the Stator

Refer to *INSPECTING THE MAGNETO FLYWHEEL* in this subsection.

Installing the Stator

NOTICE Do not apply silicone dielectric grease or any other product on Deutsch waterproof housings as housing seal may be damaged.

1. Install adhesive pad on crankcase.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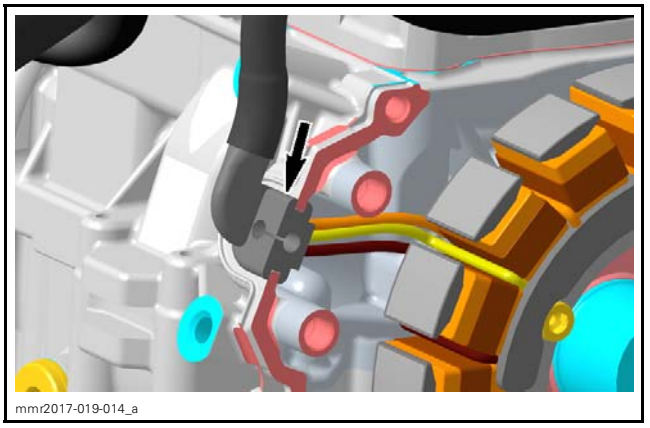
2. Install stator into crankcase.

NOTE: During installation, ensure stator harness is located on the left side.

3. Tighten stator retaining screws to specification.

TIGHTENING TORQUE	
Stator retaining screws	10 N•m ± 0.7 N•m (89 lbf•**in** ± 6 lbf•**in**) + LOCTITE 243 (BLUE) (P/N 293 800 060)

4. Position grommet into crankcase recess.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5. Tie the string on the connector used during removal of the stator connector, then pull on him to route the harness up to his original locations.
6. Reinstall all other removed parts.

STARTER

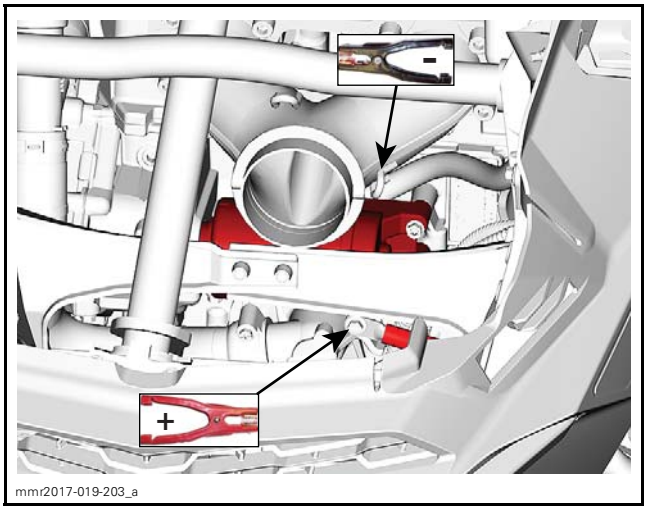
Starter Location

The starter is located at the front of the engine, below the exhaust manifold.

Testing the Starter Operation

Use booster cables and a booster battery to supply current directly to the starter.

1. Connect the RED jumper cable from the booster battery to the starter screw.
2. Momentarily connect the BLACK jumper cable to an ear of the exhaust manifold.



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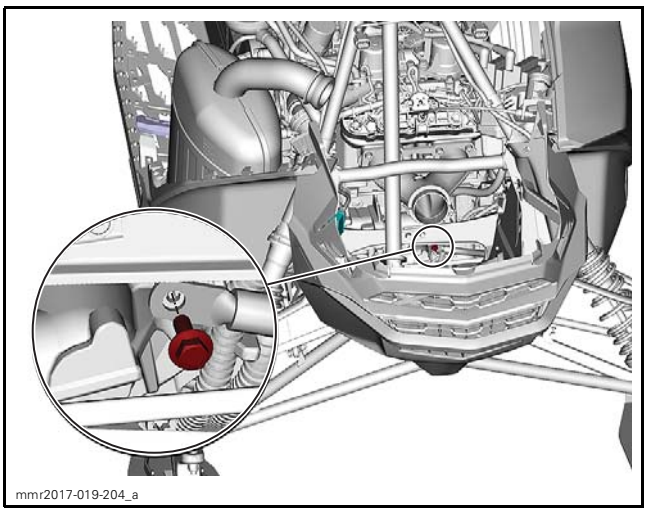
If the starter turns, test other starting system components. Refer to *STARTING SYSTEM* subsection.

Removing the Starter

1. Disconnect the BLACK (-) battery cable from the battery.

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

2. Remove the tuned pipe, refer to *EXHAUST SYSTEM* subsection.
3. Disconnect the RED (+) power cable from starter.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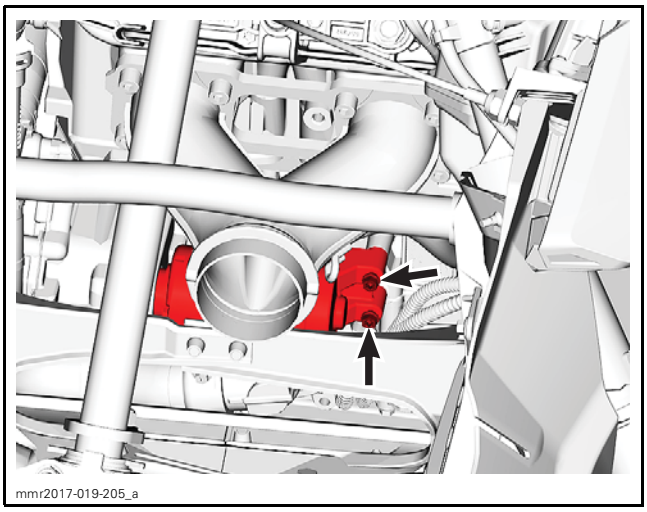
4. Clean starter and surrounding area.
5. Remove starter mounting screws.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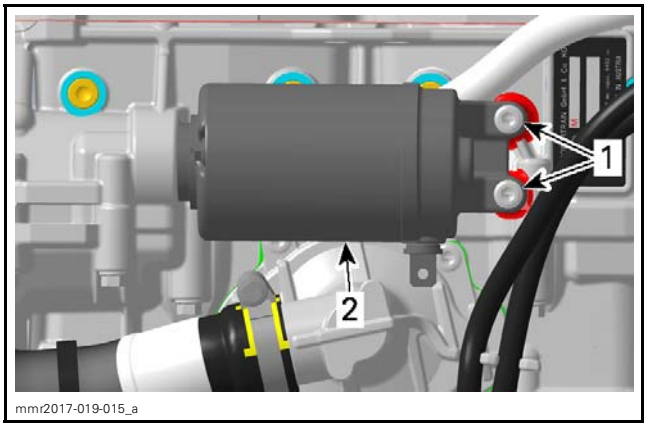

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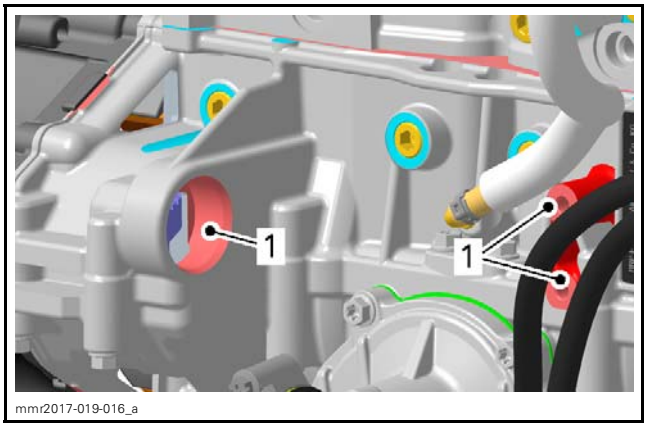
1. Starter mounting screws
2. Starter

6. Pull starter out of crankcase.

Installing the Starter

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

Make sure the starter and engine mating surfaces are free of debris. Serious problems may arise if the starter is not properly aligned.



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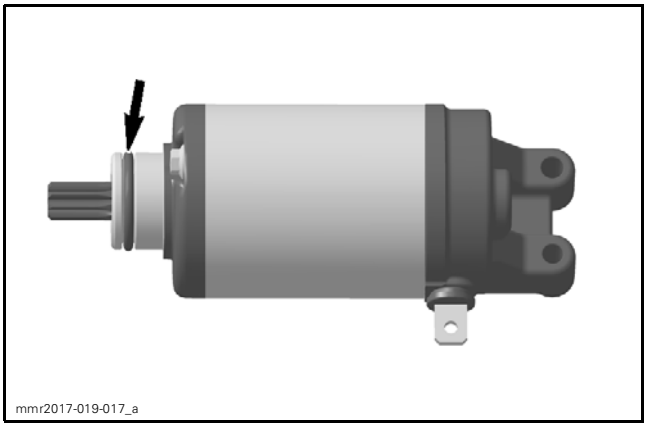
1. Clean starter mating surfaces

Lubricate starter O-ring.

SERVICE PRODUCT
TRIPLE-GUARD GREASE (P/N 508298)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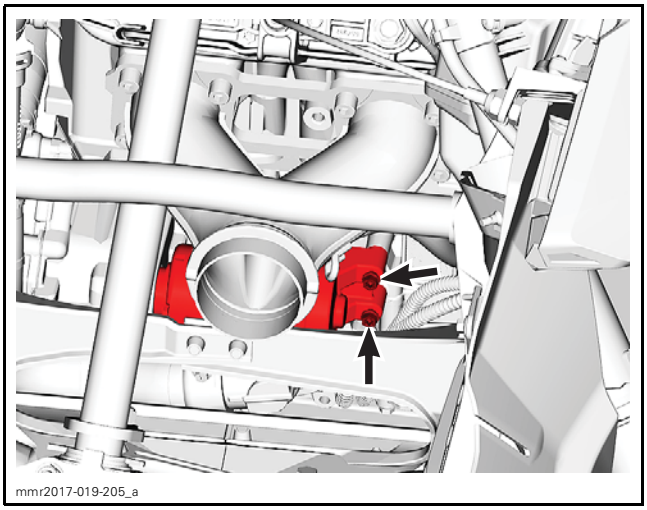
Install starter and tighten mounting screws to specification

TIGHTENING TORQUE	
Starter mounting screws	11 N•m ± 0.8 N•m (97 lbf•**in** ± 7 lbf•**in**)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Connect the RED (+) cable to the starter and tighten screw to specification.

TIGHTENING TORQUE	
RED (+) power cable screw	2.7 N•m ± 0.7 N•m (24 lbf•**in** ± 6 lbf•**in**)

Apply neoprene paint on RED (+) power cable screw.

SERVICE PRODUCT
BLACK NEOPRENE PAINT (P/N 909570)

NOTE: If the neoprene paint is not available, use dielectric grease.

Connect the BLACK (-) battery cable last.

Test starter operation.

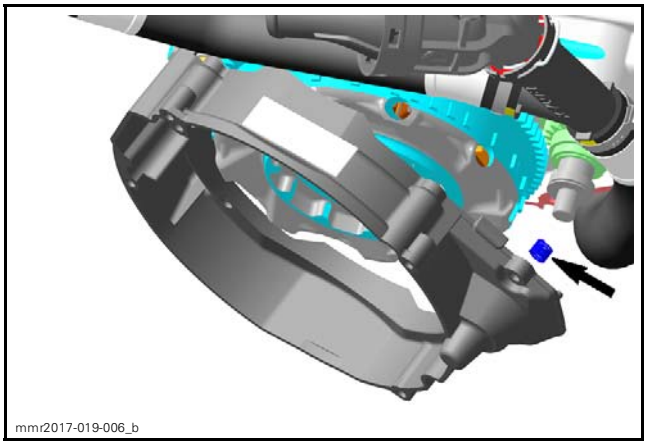
STARTER DRIVE

Removing the Starter Drive

Remove the magneto flywheel. Refer to *REMOVING THE MAGNETO FLYWHEEL* in this subsection.

Remove the magneto housing screws and rotate the housing forwards to make enough room to remove the starter drive.

NOTE: Do not lose starter drive spring during removal of magneto housing.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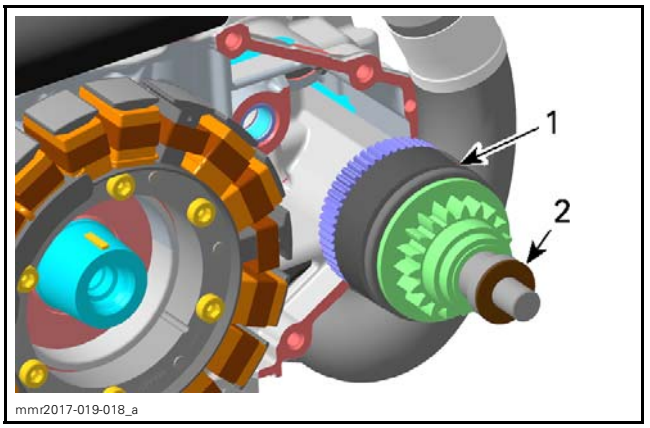
Pull out starter drive.

NOTE: Do not lose washer of starter drive gear during removal.



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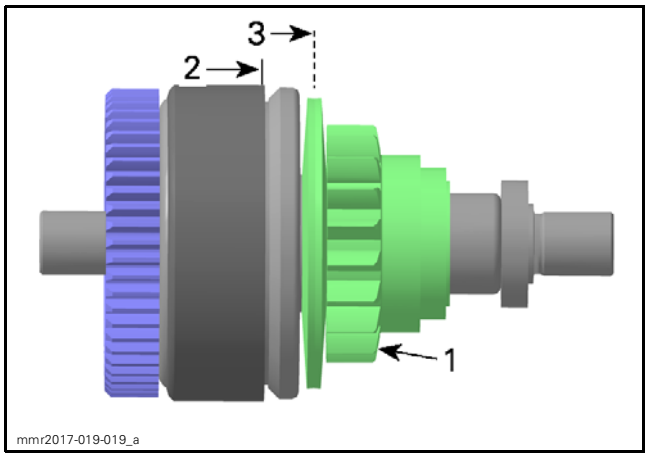
1. *Starter drive*
2. *Washer*

Inspecting the Starter Drive

Check if starter drive pinion is free of movement.

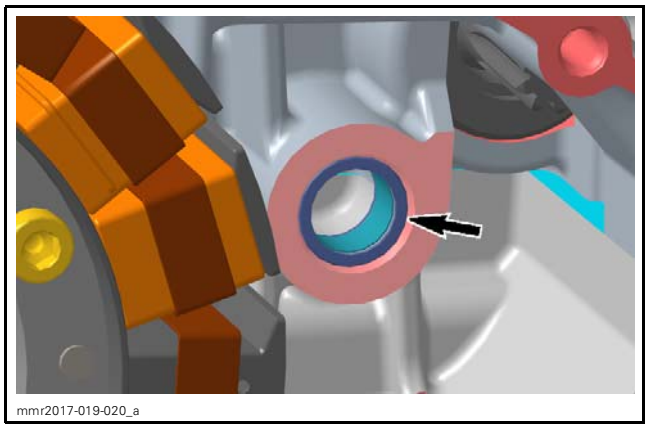
Ensure proper operation of the starter drive sprag clutch.

NOTE: Centrifugal weights avoid disengaging of the pinion while starting the engine.



1. *Starter drive pinion*
2. *Starting position (spring released)*
3. *Gear is engaged drive pulley fixed half (spring loaded)*

Check needle bearing excessive play and smooth operation. If damaged see *STARTER DRIVE NEEDLE BEARING REPLACEMENT* in this subsection.



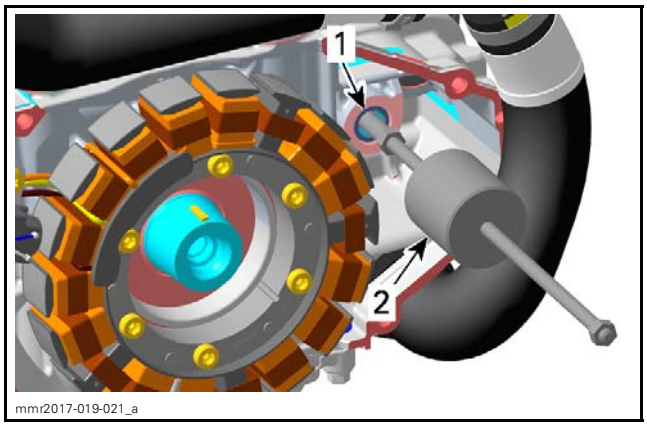
1. *Starter drive needle bearing*

Check magneto housing:
- for cracks at the starter drive bore location
- if starter drive bore is worn or otherwise damaged.

Replace magneto housing if necessary.

Starter Drive Needle Bearing Replacement

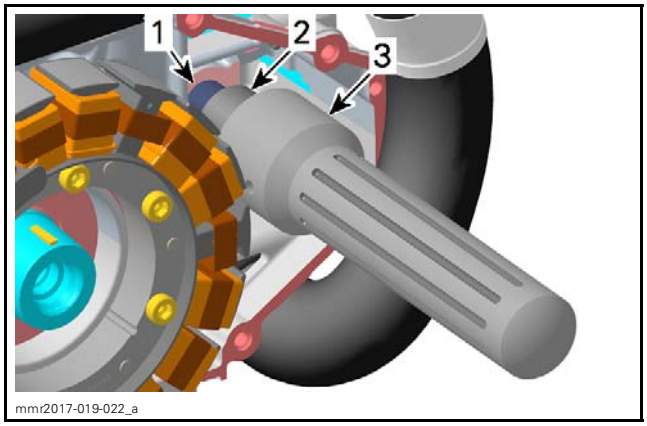
Remove needle bearing using a blind hole bearing puller.



1. *Needle bearing*
2. *Blind hole bearing puller*

Install needle bearing.

REQUIRED TOOLS	
STARTER DRIVE NEEDLE INSTALLER (P/N 529 035 934)	
HANDLE (P/N 420 877 650)	



1. *Needle bearing*
2. *Starter drive needle bearing installer*
3. *Handle*

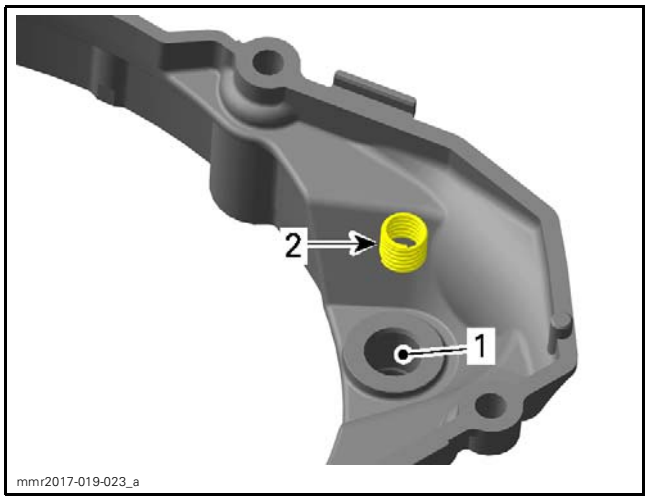
Installing the Starter Drive

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

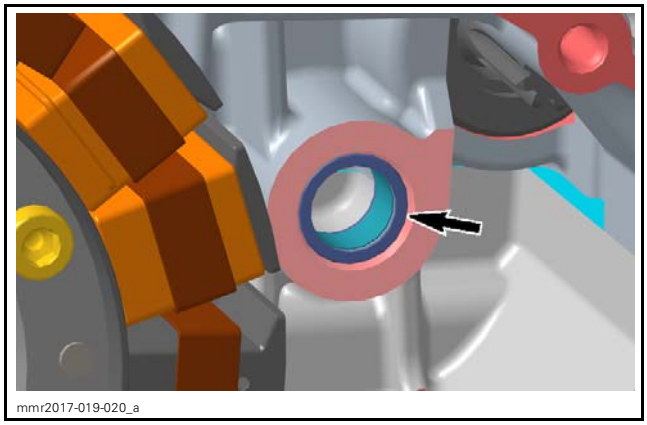
Clean out all residues of grease from:
- Needle bearing in the crankcase
- Starter drive journals
- Starter drive bore in magneto housing
- Spring.

Lubricate:
- Needle bearing in crankcase
- Starter drive bore in magneto housing
- Spring.

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

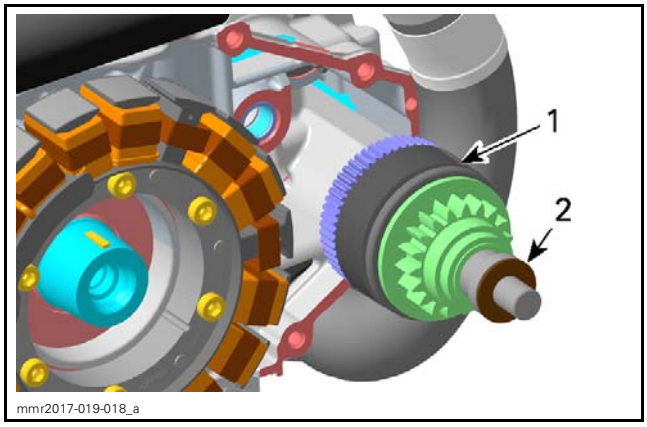


LUBRICATE
1. *Starter drive bore*
2. *Spring*



LUBRICATE NEEDLE BEARING IN CRANKCASE

Install starter drive with washer.



1. *Starter drive*
2. *Washer*

RAVE

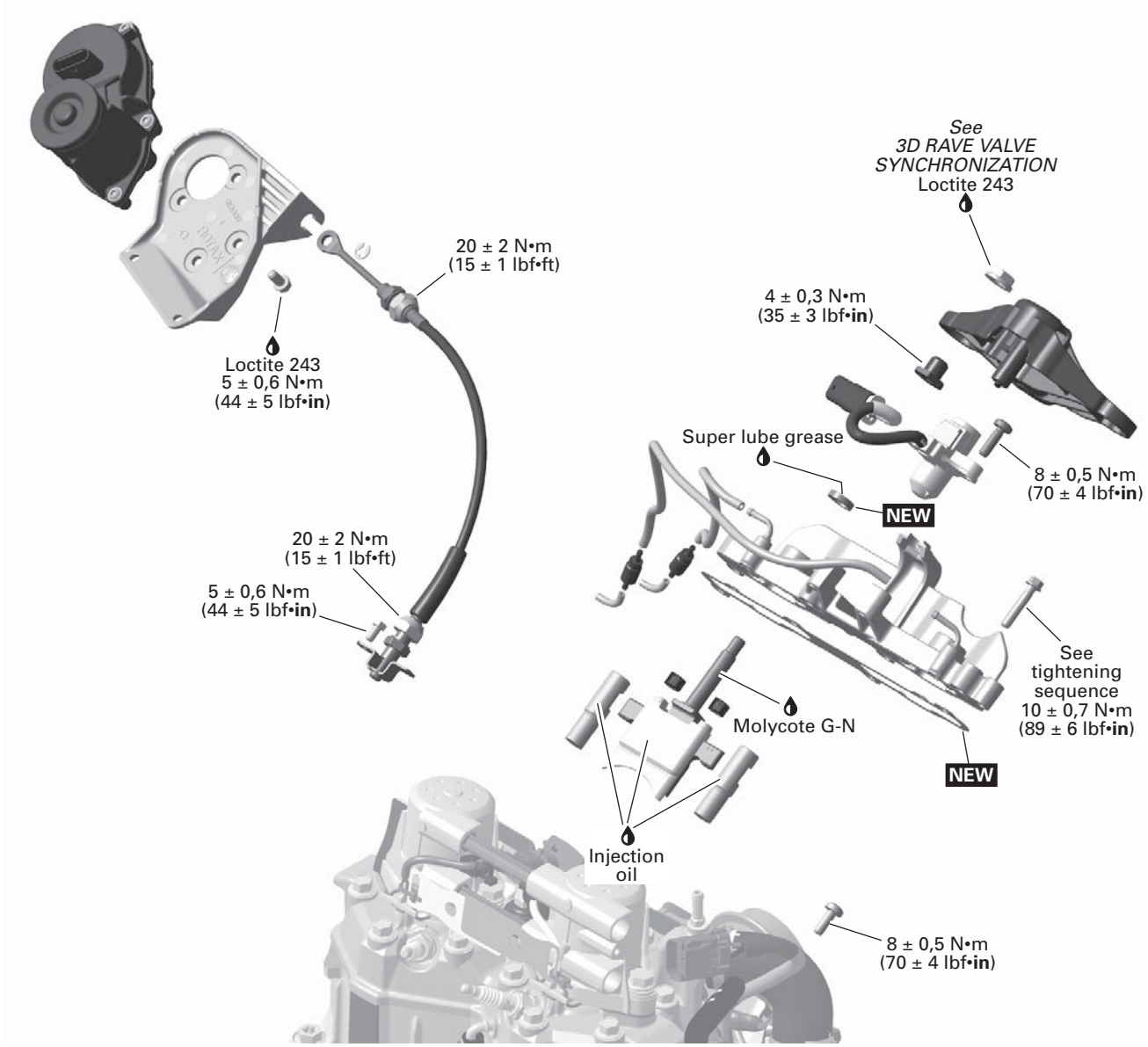
SERVICE TOOLS

Description	Part Number	Page
12 V BATTERY SUPPLY CABLE	529 035 997	8
ECM ADAPTER TOOL	529 036 166	3, 18
FLUKE 115 MULTIMETER	529 035 868	3
POWER INTERFACE	515 177 223	8
PROTECTOR SLEEVE (RAVE)	529 036 488	15
RAVE NUT WRENCH	529 036 439	10, 12

SERVICE PRODUCTS

Description	Part Number	Page
BRAKE AND PARTS CLEANER PRO S2	779245	13
LOCTITE 243 (BLUE)	293 800 060	11, 19
MOLYKOTE G-N	420 297 433	15
SUPER LUBE GREASE	293 550 030	14

RAVE VALVE



NEW = Component must be replaced when removed.

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GENERAL

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

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

⚠ WARNING

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

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

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

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

SYSTEM DESCRIPTION

3D RAVE Basic Operation

3-step RAVE valves are used. Their positions vary according to engine operating condition.

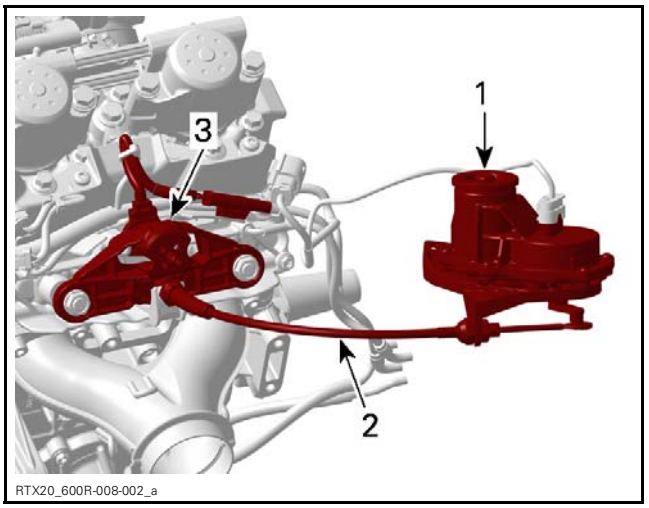
The RAVE valve steps are:

– Fully closed
– Partially opened
– Fully opened.

RAVE valves are moved to the desired position by a servomotor via a RAVE cable that is controlled by the ECM through mappings.

Different mappings are used by the ECM to control the 3D RAVE valves. The mappings are based on current engine RPM and the following inputs: intake temperature, TPS, knock sensor, engine coolant temperature and APS.

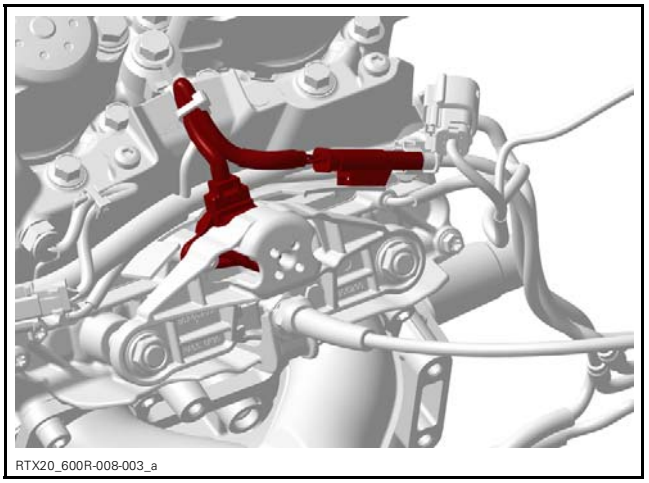
NOTE: 3D RAVE valves may go through all 3 positions or skip the partially opened position and go directly to either the fully opened or closed positions depending on present engine load and how quickly the throttle is depressed.



RTX20_600R-008-002_a

1. Servomotor
2. RAVE cable
3. 3D RAVE valve

A hall-effect position sensor (RPS: RAVE position sensor) is used to provide RAVE valve position feedback to the ECM.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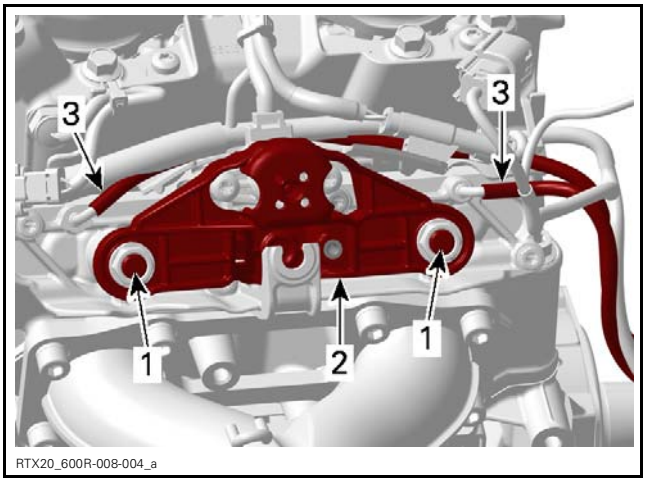
The RAVE position sensor (RPS) provides the ECM the actual position of the RAVE valves. Either closed, mid-position or opened. This informs the ECM that the RAVE valves are really at the expected position so that the proper amount of fuel is injected as well as other required operating parameters are applied.

RAVE valves are lubricated by the electronic oil injection pump.

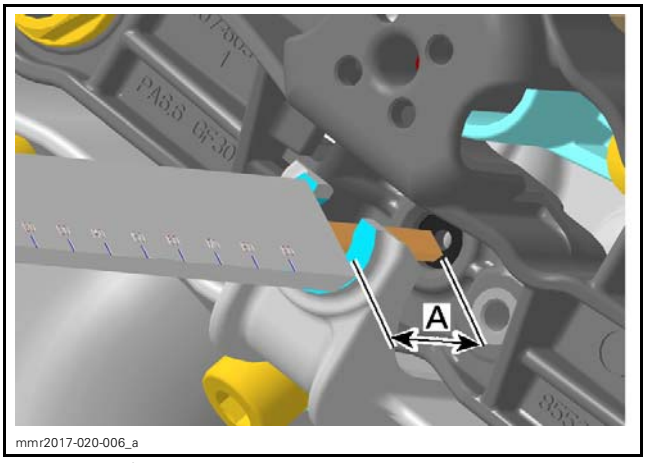
RAVE valves are moved and monitored with a link bar.



1. *Linked RAVE valves*
2. *Link bar*
3. *Oil lines to RAVE valves*

NOTICE It is very important to perform *3D RAVE VALVE SYNCHRONIZATION* and *3D RAVE VALVES POSITION SENSOR SETTING* whenever link bar is removed.

3D RAVE Position According to Engine Operation

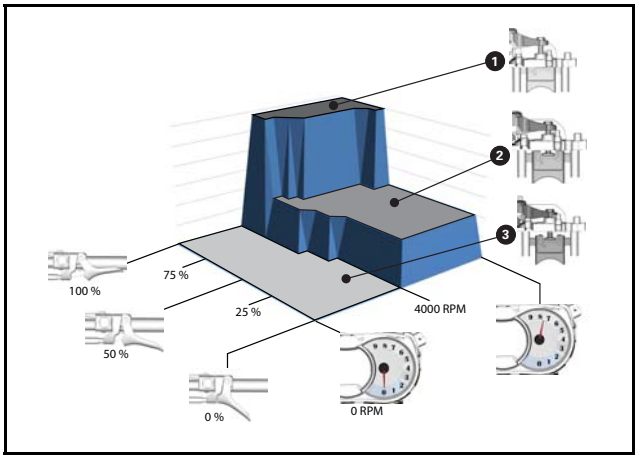


A. Measure from counter bearing to link bar

NOTICE For correct measurement the RAVE cable must be removed.

Move both RAVE valves simultaneously to fully opened / mid / fully closed position by hand.

RAVE VALVE POSITION MEASURED FROM COUNTER BEARING OF THE RAVE CABLE TO THE LINK BAR		
Engine type	600R E-TEC	850 E-TEC
Fully closed	1. Measure from counter bearing to link bar. 2. Set calliper to 0 mm (0 in).	
Mid position	A: Approximately 7.2 mm (9/32 in) from 0 mm (0 in) (fully closed position)	A: Approximately 6 mm (15/64 in) from 0 mm (0 in) (fully closed position)
Fully opened	A: Approximately16 mm (5/8 in) from 0 mm (0 in) (fully closed position)	A: Approximately 17.5 mm (11/16 in) from 0 mm (0 in) (fully closed position)



RAVE POSITION
1. *Fully opened*
2. *Mid*
3. *Fully closed*

MAINTENANCE

CLEANING THE 3D RAVE VALVE

Clean carbon deposits as required. Refer to *CLEANING THE 3D RAVE VALVE*.

TROUBLESHOOTING

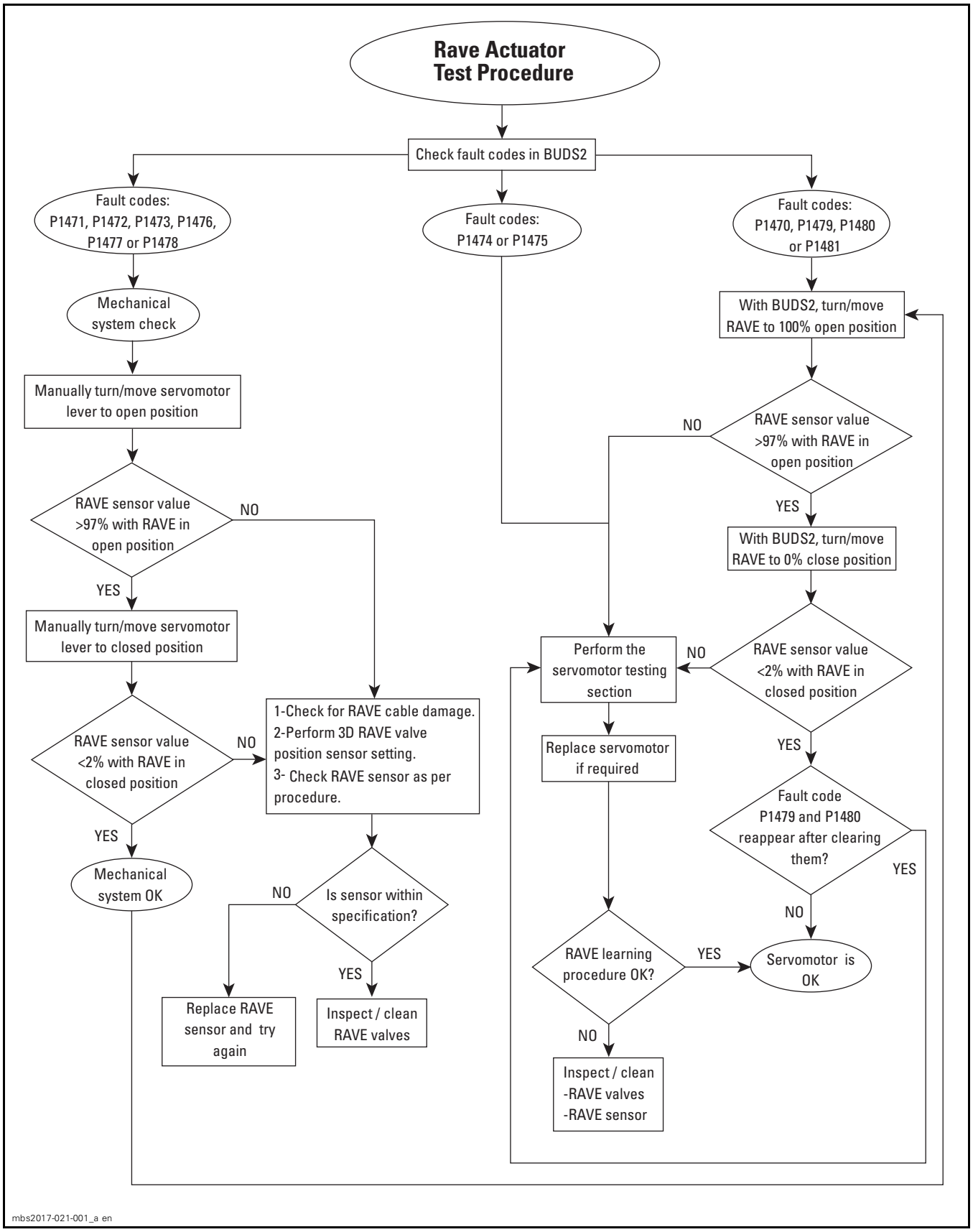
DIAGNOSTIC TIPS

As a first troubleshooting step, perform the following procedures to ensure RAVE system is properly adjusted.

1. *3D RAVE VALVE SYNCHRONIZATION*

2. *3D RAVE VALVES POSITION SENSOR SETTING*
3. *3D RAVE VALVES POSITION VALIDATION*.

If fault code still displayed, follow the steps on the flowchart.


Rave Actuator Test Procedure
Check fault codes in BUDS2
Fault codes: P1471, P1472, P1473, P1476, P1477 or P1478
Fault codes: P1474 or P1475
Fault codes: P1470, P1479, P1480 or P1481
Mechanical system check
Manually turn/move servomotor lever to open position
RAVE sensor value >97% with RAVE in open position
NO
YES
Manually turn/move servomotor lever to closed position
RAVE sensor value <2% with RAVE in closed position
NO
YES
Mechanical system OK
1-Check for RAVE cable damage.
2-Perform 3D RAVE valve position sensor setting.
3- Check RAVE sensor as per procedure.
Is sensor within specification?
NO
YES
Replace RAVE sensor and try again
Inspect / clean RAVE valves
With BUDS2, turn/move RAVE to 100% open position
RAVE sensor value >97% with RAVE in open position
NO
YES
With BUDS2, turn/move RAVE to 0% close position
RAVE sensor value <2% with RAVE in closed position
NO
YES
Perform the servomotor testing section
Replace servomotor if required
Fault code P1479 and P1480 reappear after clearing them?
YES
NO
RAVE learning procedure OK?
YES
NO
Servomotor is OK
Inspect / clean
-RAVE valves
-RAVE sensor
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TROUBLESHOOTING GUIDELINES

RAVE Valves Position Sensor Fault Code

The ECM may generate a **position sensor fault code** if the RAVE valve is not reaching the desired position.

If a position sensor fault code is generated by the ECM, check for the following:

DEFECTIVE POSITION SENSOR

1. Test position sensor operation, perform *3D RAVE VALVES POSITION VALIDATION*, see procedure in this subsection.
2. Check position sensor wiring, perform *INSPECTING THE 3D RAVE VALVES POSITION SENSOR*, see procedures in this subsection.
3. Check movement of the RAVE manually.

EXCESSIVE CARBON BUILD-UP IN RAVE VALVES

1. Use the recommended oil quality, refer to *LUBRICATION SYSTEM* subsection.
2. Check oil lines (installed incorrectly, air bubbles).
3. Check for proper oil injection pump code in the BRP diagnostic software (BUDS2) , refer to *LUBRICATION SYSTEM* subsection.

NOTICE Insufficient oil delivery to RAVE valves may result in a carbon build-up.

PROCEDURES

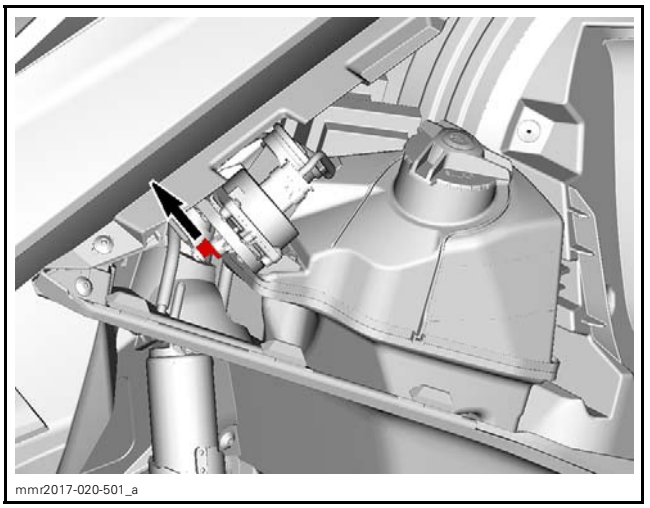
3D RAVE VALVES POSITION SENSOR

3D RAVE Valves Position Sensor Setting

1. Ensure RAVE valves are properly synchronized as per *3D RAVE VALVE SYNCHRONIZATION* procedure.

NOTICE It is very important to perform *3D RAVE VALVE SYNCHRONIZATION* and *3D RAVE VALVES POSITION SENSOR SETTING* whenever link bar is removed.

2. Connect the vehicle to the BRP diagnostic software (BUDS2). Refer to *COMMUNICATION TOOLS AND B.U.D.S.* subsection.
3. In BUDS2, go to:
   - **Settings** page
   - **ECM** button
   - **Settings** tab
   - **Initialization - RAVE Setting**.
4. Perform setting at **fully closed** position:
   - 4.1 Select "**RAVE Closed Position Setting**" in the list.
   - 4.2 **Push** the servomotor lever in **fully closed** position and **hold** it.



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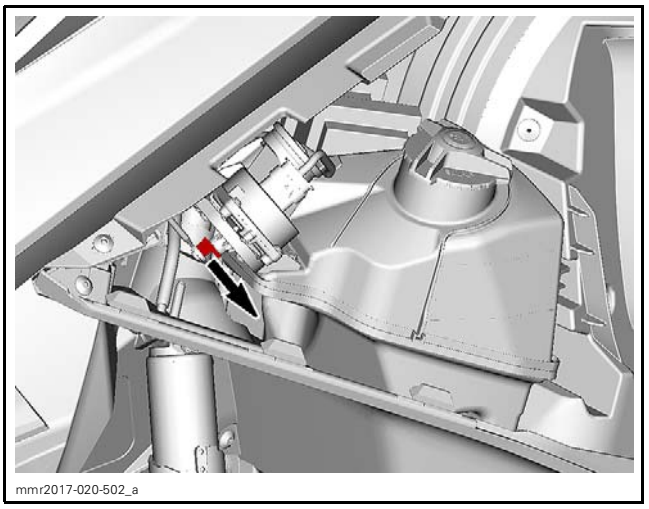
   - 4.3 Confirm that the *SAVED VALUE* is within specification. Refer to *3D RAVE VALVES POSITION VALIDATION*.
   - 4.4 Save the value by pressing the **SET** button.
5. Perform setting at **fully opened** position:
   - 5.1 Select "**RAVE Fully Position Setting**" in the list.
   - 5.2 **Pull** the servomotor lever in **fully opened** position and **hold** it.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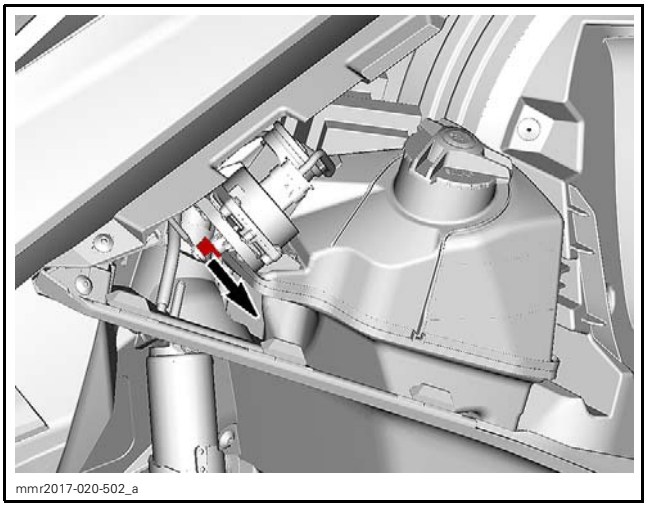
5.3 Confirm that the *SAVED VALUE* is within specification. Refer to *3D RAVE VALVES POSITION VALIDATION*.

5.4 Save the value by pressing the **SET** button.

6. Perform setting at **middle** position:

6.1 Select "**RAVE Middle Position Setting**" in the list.

6.2 **Pull** the servomotor lever in **fully opened** position and **release** it.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6.3 Confirm that the *SAVED VALUE* is within specification. Refer to *3D RAVE VALVES POSITION VALIDATION*.

6.4 Save the value by pressing the **SET** button.

7. Validate that position sensor is properly set. Refer to *3D RAVE VALVES POSITION VALIDATION* in this subsection.

8. Start engine.

At first engine start after RAVE position sensor setting is completed RAVE valves travel to fully opened position and than moving slowly to fully closed position

NOTICE **Do not push throttle lever during this initialization procedure, otherwise the ECM will discontinue the initialization and starts initialization from the beginning.**

Testing the 3D RAVE Valves Position Sensor

As a first troubleshooting step, always check for applicable fault codes using the BRP diagnostic software (BUDS2).

Testing the 3D RAVE Valves Position Sensor Voltage Input

1. Disconnect position sensor connector.

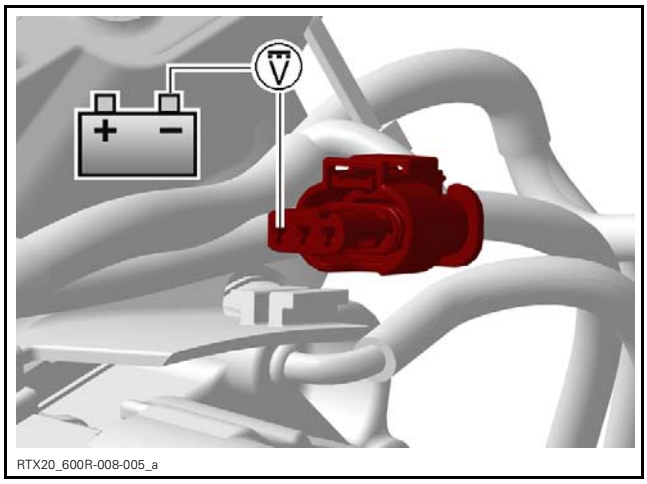
On vehicle without electric starting, connect the vehicle to a booster battery.

REQUIRED TOOLS	
POWER INTERFACE (P/N 515 177 223)	
12 V BATTERY SUPPLY CABLE (P/N 529 035 997)	

2. Install D.E.S.S. key and press start/RER button to wake up ECM.

3. Set multimeter to Vdc and probe terminals as per following table.

3D RAVE VALVES POSITION SENSOR INPUT VOLTAGE		
Position Sensor Connector (harness side)	Battery ground	Measurement
Pin 3		5 ± 0.25 Vdc



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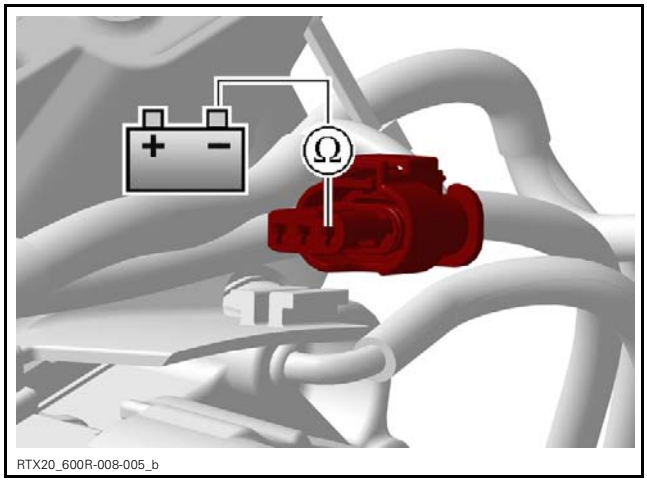
If voltage is exceeding the range check:
– F1 - ECM power supply fuse
– F3 - Battery fuse (electric starting vehicle)
– Wiring harness.

Testing the Continuity of 3D RAVE Valves Position Sensor Ground Circuit

1. Disconnect position sensor connector.
2. Set multimeter to Ω and probe terminals as per following table.

3D RAVE VALVES POSITION SENSOR RESISTANCE		
Position Sensor Connector (harness side)	Battery ground	Resistance @ 20°C (68°F)
Pin 1		Close to 0 Ω



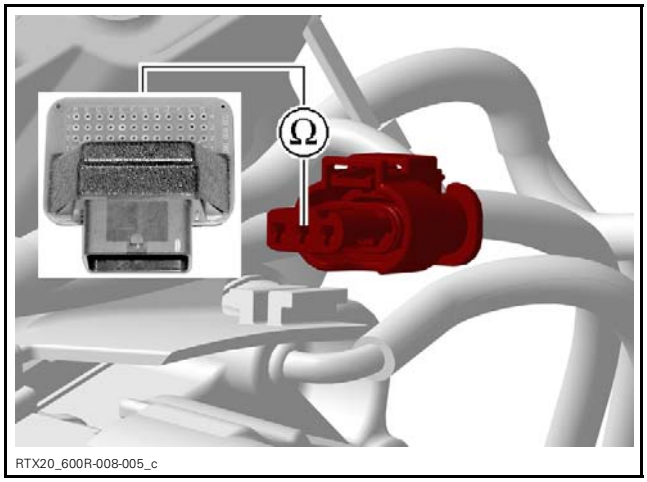
RTX20_600R-008-005_b

If resistance is out of specifications check ECM grounding and wiring harness.

Testing the Continuity of 3D RAVE Valves Position Sensor Circuit

1. Disconnect:
   – ECM connector
   – Position sensor connector.
2. Connect ECM connector to ECM adapter tool.
3. Set multimeter to Ω and probe terminals as per following table.

3D RAVE VALVES POSITION SENSOR RESISTANCE		
Position Sensor Connector (harness side)	ECM-A	Resistance @ 20°C (68°F)
Pin 1	E2	Close to 0 Ω
Pin 2	E3	
Pin 3	F3	

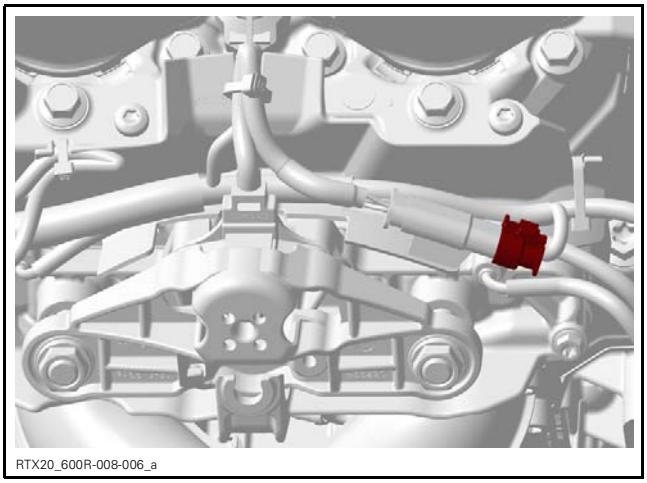


RTX20_600R-008-005_c

If resistance is not within specification, repair or replace the wiring harness.

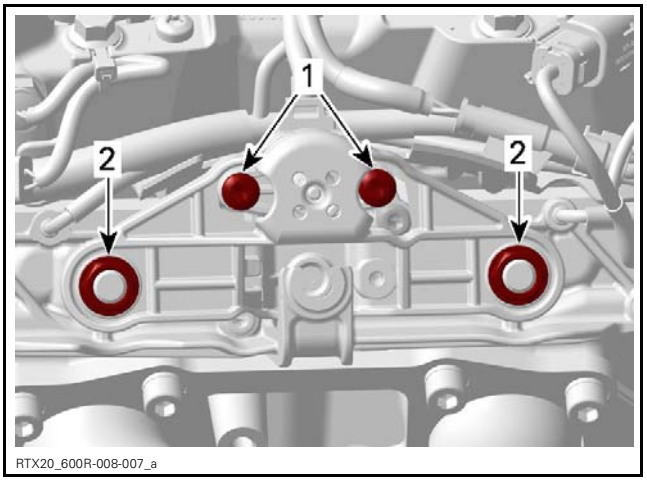
Removing the 3D Rave Valves Position Sensor

1. Remove upper body module. Refer to *BODY*.
2. Remove RAVE cable from link bar. Refer to *REMOVING THE RAVE CABLE* in this subsection.
3. Disconnect position sensor connector.


RTX20_600R-008-006_a

4. Unscrew:
   – RAVE valves position sensor retaining screws
   – Link bar retaining nuts.

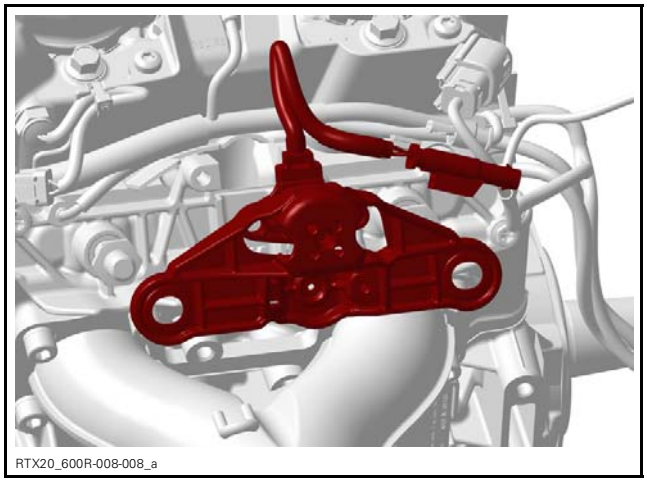
REQUIRED TOOL	
RAVE NUT WRENCH (P/N 529 036 439) (to hold the plastic collar nuts)	



RTX20_600R-008-007_a

1. RAVE valves position sensor retaining screws
2. Link bar collar nuts

5. Remove link bar with RAVE valves position sensor.


RTX20_600R-008-008_a

NOTICE It is very important to perform *3D RAVE VALVES SYNCHRONIZATION* whenever link bar is removed.

Installing the 3D RAVE Valves Position Sensor

1. Position RAVE valves position sensor with link bar on RAVE valve housing.
2. Install position sensor retaining screws but do not tighten yet.
3. Perform *3D RAVE VALVE SYNCHRONIZATION* procedure in this subsection to complete link bar installation.

NOTICE It is very important to perform *3D RAVE VALVES SYNCHRONIZATION* and *3D RAVE VALVES POSITION SENSOR SETTING* whenever link bar is removed.

4. Install position sensor retaining screws.

TIGHTENING TORQUE	
Position sensor retaining screws	8 N•m ± 0.5 N•m (71 lbf•**in** ± 4 lbf•**in**)

5. Install connector.

3D RAVE VALVES

3D RAVE Valve Synchronization

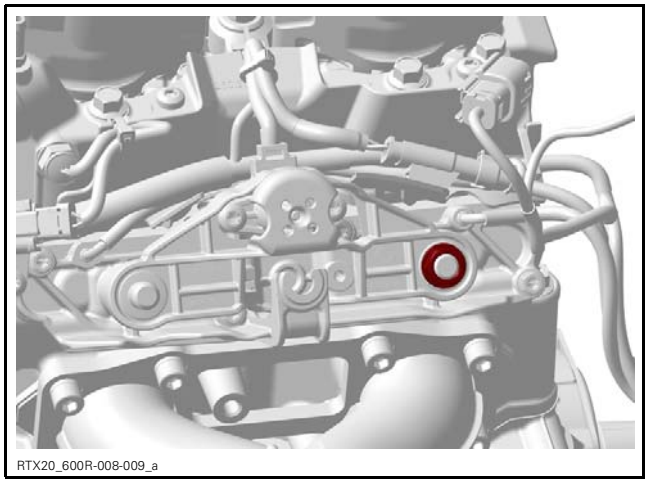
Synchronization Adjustment Procedure

1. Remove link bar retaining nuts and clean threads.

REQUIRED TOOL	
RAVE NUT WRENCH (P/N 529 036 439) (to hold the plastic collar nuts)	

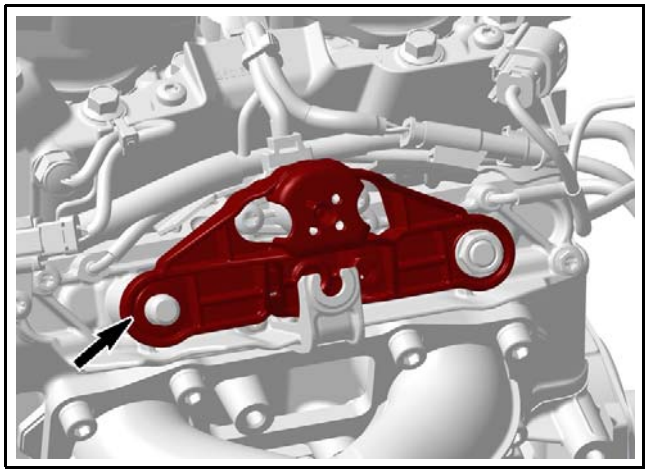
2. Install PTO link bar retaining nut and tighten by hand.

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


RTX20_600R-008-009_a

3. Check if the link bar rests flat on the retaining nut.

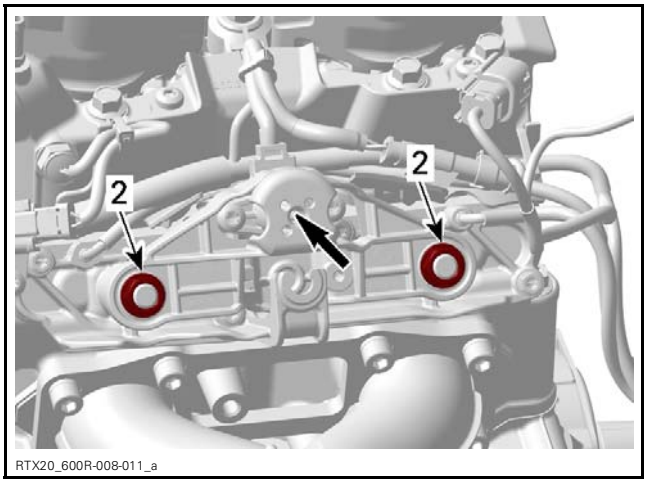
Tip on link bar at MAG side an listen if link bar rests on retaining nut.



4. If the link bar does not rest flat:
   4.1 Unscrew PTO nut then slightly move link bar.
   4.2 Tighten PTO nut by hand and recheck position.
   4.3 Repeat above sequence until the link bar rests flat.
5. Install MAG link bar retaining nut and tighten by hand.

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

6. Push the center of link bar downwards in order to seat both RAVE valves on their fully closed position.
7. Firmly hold link bar downwards.
8. Tighten both retaining nuts.



RTX20_600R-008-011_a

Step 1: Push link bar
Step 2: Tighten retaining nuts

TIGHTENING TORQUE	
Link bar retaining nuts	4 N•m ± 0.3 N•m (35 lbf•**in** ± 3 lbf•**in**)

9. Adjust position sensor using BUDS2. Refer to *3D RAVE VALVES POSITION SENSOR SETTING*.
10. Push link bar down to fully closed position.
11. Install RAVE cable, refer to *INSTALLING THE RAVE CABLE* in this subsection.

Synchronization Validation Procedure

1. Push and pull link bar to force RAVE valves to pass through their 3 positions.
   1.1 Ensure that only **one** step is felt at mid position.
   1.2 If out of specification, redo the *SYNCHRONIZATION ADJUSTMENT PROCEDURE*.

3D RAVE Valves Position Validation

1. Ensure RAVE valves are properly synchronized as per *3D RAVE VALVE SYNCHRONIZATION*.
2. Ensure position sensor is properly set as per *3D RAVE VALVES POSITION SENSOR SETTING*.
3. Connect the vehicle to the BRP diagnostic software (BUDS2). Refer to *COMMUNICATION TOOLS AND B.U.D.S.* subsection.
4. In BUDS2, go to:
   – **Settings** page

– **ECM** button
– **Settings** tab
– **Initialization - RAVE Setting**

5. Select the appropriate RAVE position in the list.

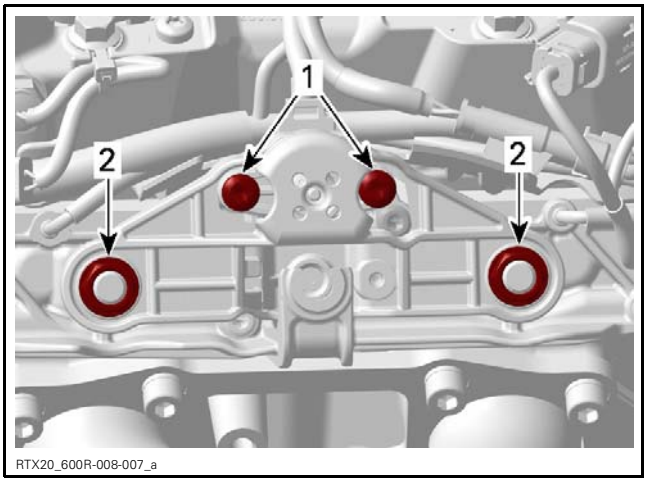
RAVE ACTUAL POSITION SPECIFICATION	
Closed	0.25 V - 1.25 V
Middle	1.00 V - 3.00 V
Opened	3.00 V - 4.50 V

If RAVE valves actual position are out of specification, check the following:
– RAVE valve position sensor setting
– RAVE valve synchronization
– RAVE valves cleanliness.

Removing the 3D RAVE Valves

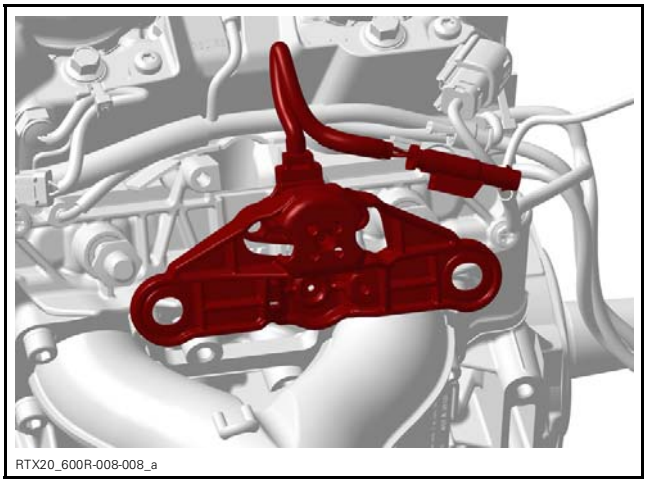
1. Remove upper body module. Refer to *BODY*.
2. Remove RAVE cable from link bar, refer to *REMOVING THE RAVE CABLE* in this subsection.
3. Disconnect RAVE valve position sensor connector and put harness away.
4. Unscrew:
   – RAVE valves position sensor retaining screws
   – Link bar retaining nuts.

REQUIRED TOOL	
RAVE NUT WRENCH (P/N 529 036 439) (to hold the plastic collar nuts)	



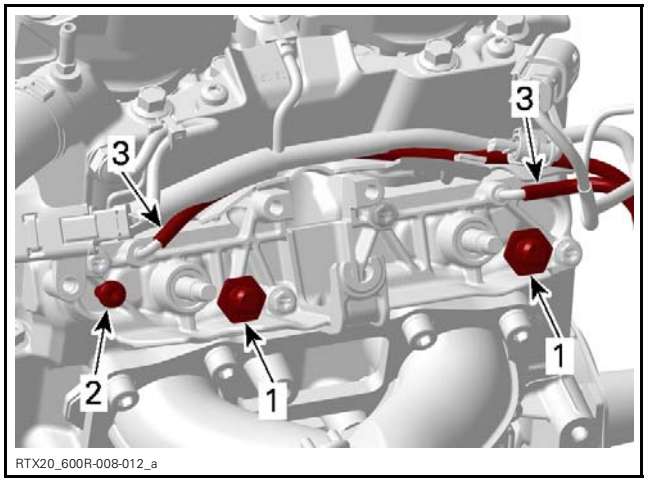
1. *RAVE valves position sensor retaining screws*
2. *Link bar retaining nuts*

5. Remove link bar with RAVE valves position sensor.



1. *Link bar*
2. *RAVE valves position sensor*

6. Remove collar nuts.
7. Remove screw from harness support.
8. Disconnect lubrication hose.

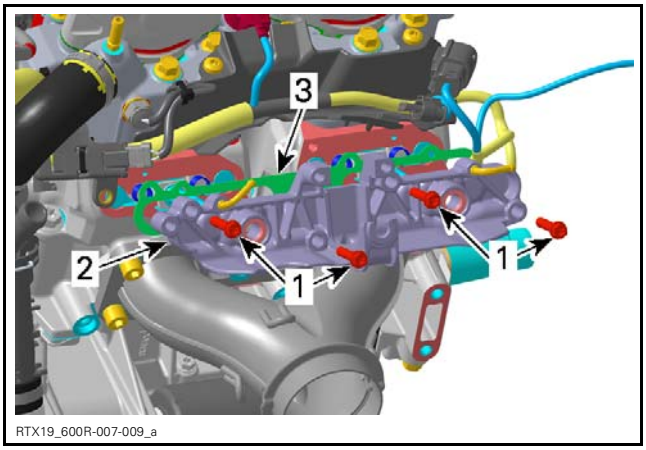


1. *Collar nuts*
2. *Harness support screw*
3. *Lubrication hoses*

9. Remove the RAVE valve housing.

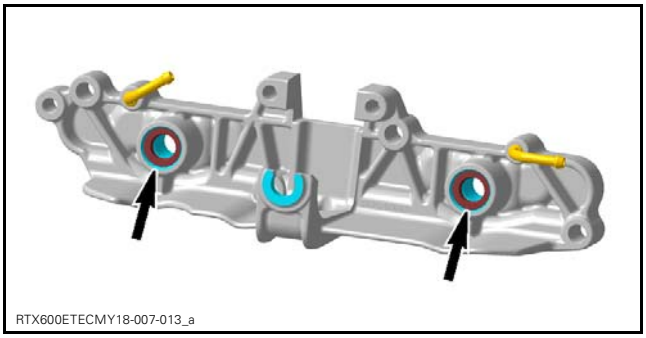
NOTE: Be careful not to loose springs underneath housing.

NOTICE **If signs of oil are found outside the housing, replace seals.**

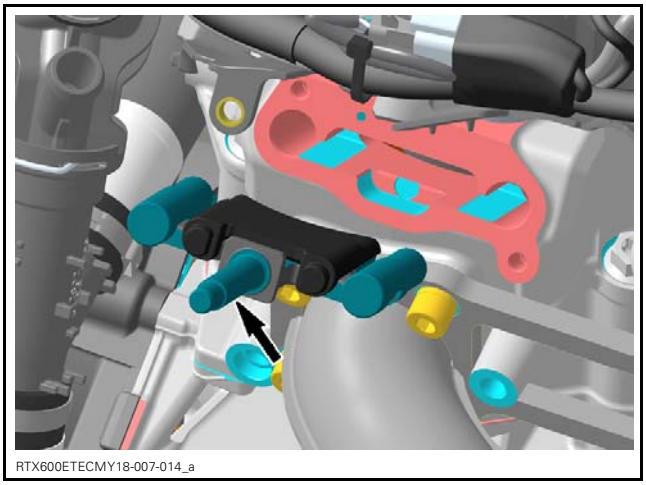


1. *Retaining screws*
2. *RAVE valve housing*
3. *Gasket (discard it)*

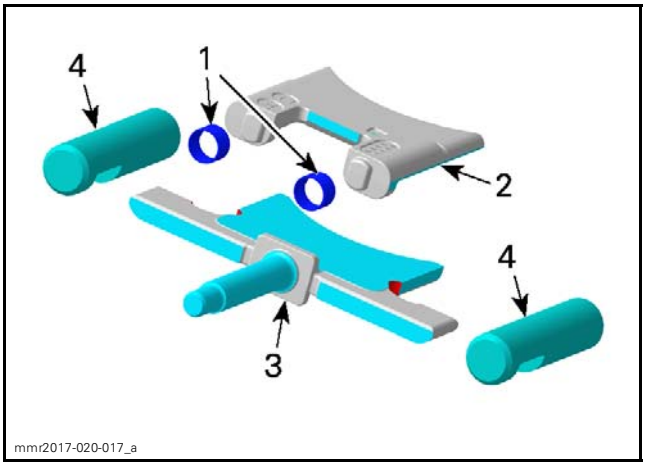
10. Take note of seals orientation and carefully pry them out using a screwdriver.



11. Pull RAVE valve assembly out.



12. If necessary separate RAVE valve assembly.



1. *Springs*
2. *Main valve upper part*
3. *Main valve lower part*
4. *Side valves*

Cleaning the 3D RAVE Valve

Thoroughly clean all RAVE VALVES components and cylinder slots.

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

NOTICE **Use a moderate quantity of cleaner when cleaning the cylinder slots. Fluids can cause corrosion of the cylinder bore which may result in severe engine damage.**

RAVE Valves Frequently Gummed

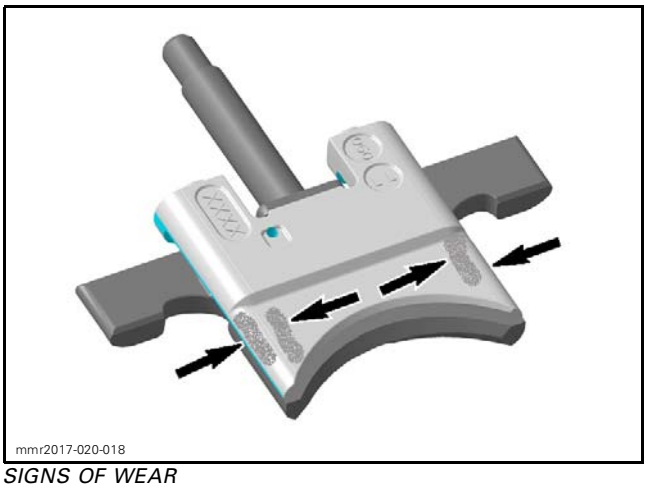
If the valves are getting gummed more frequently than usual, do the following:

- Check if the recommended injection oil is used.
- Check lubrication hoses for restriction.
- Check lubrication hoses for presence of air. Bleed system if needed.
- Check lubrication hose check valves as explained in this subsection.

Inspecting the 3D RAVE Valve

Check valves for:

- wear at sliding points
- straightness
- breakage.



SIGNS OF WEAR

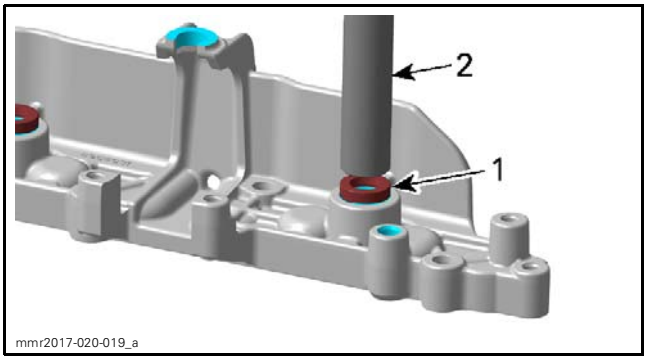
Check spring condition and straightness.

NOTE: Make sure hoses are not leaking, kinked or damaged.

Installing the 3D RAVE Valve

1. Use an appropriate pusher to reinstall seals.
2. Lubricate outer oil seal diameter.

SERVICE PRODUCT
Injection oil

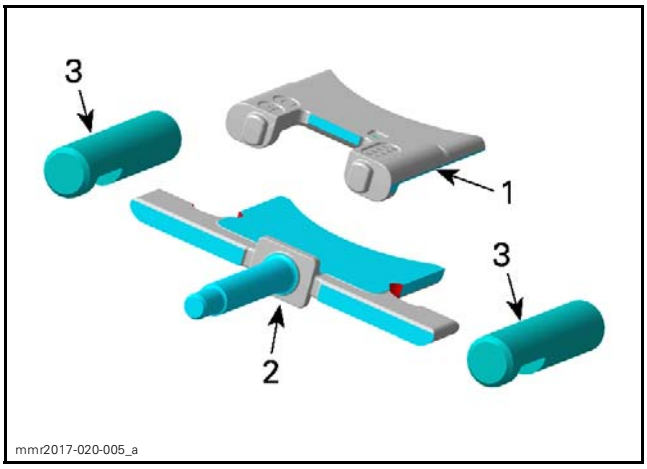


1. *Oil seal*
2. *Pusher*

3. Lubricate sealing lips of oil seals.

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

4. Preassemble the main and side valves.

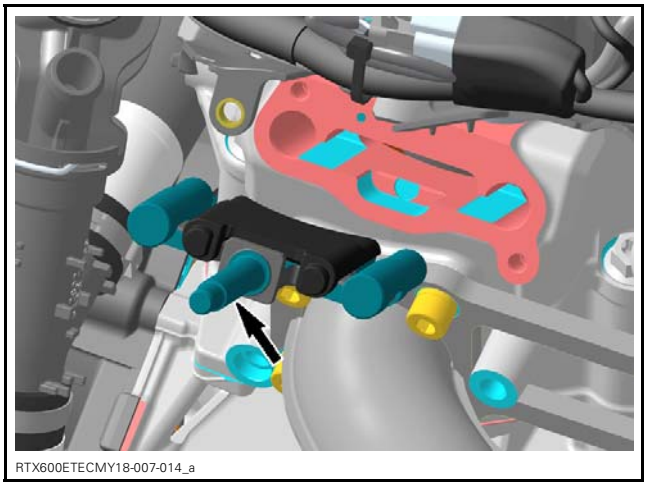


1. *Main valve upper part*
2. *Main valve lower part*
3. *Side valves*

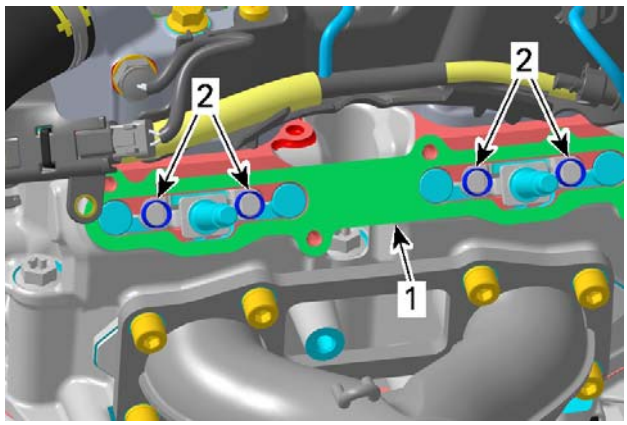
5. Lubricate:
   - RAVE chamber in cylinder block, main and side valves
   - Sliding surfaces of RAVE valves.

SERVICE PRODUCT
Injection oil

6. Insert RAVE valves in cylinder.



7. Install NEW gasket.
8. Install springs on stud ends of valves.



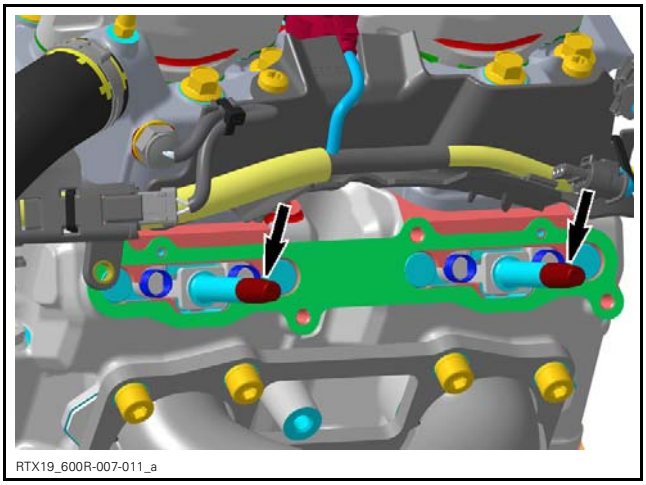
1. *Gasket*
2. *Springs*

9. Lubricate valve shaft.

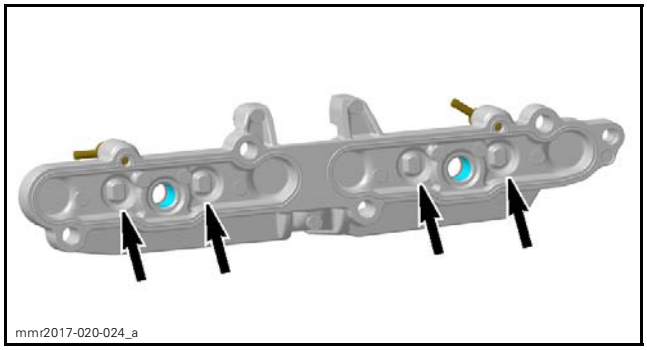
SERVICE PRODUCT
MOLYKOTE G-N (P/N 420 297 433)

10. Place protector sleeves on RAVE valve threads.

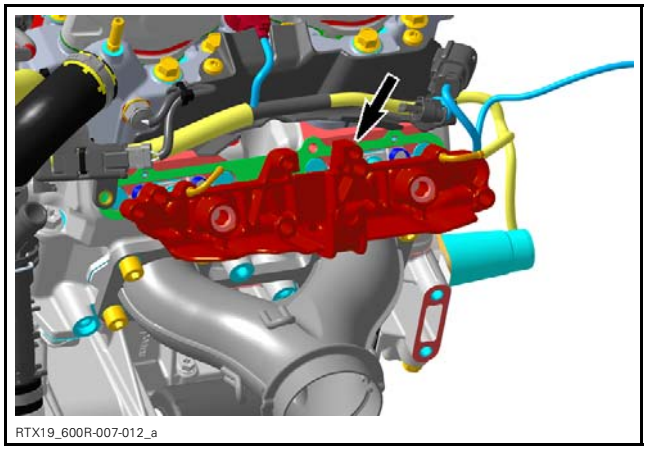
REQUIRED TOOL	
PROTECTOR SLEEVE (RAVE) (P/N 529 036 488)	



11. Install RAVE valve housing and carefully align springs in recess of RAVE valve housing.

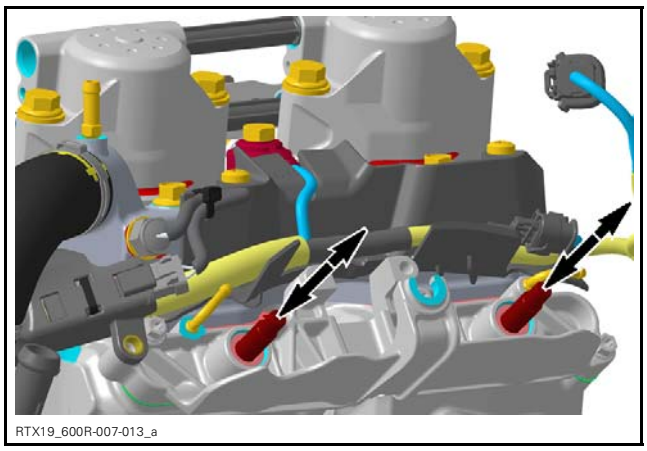


RECESS FOR RAVE SPRINGS



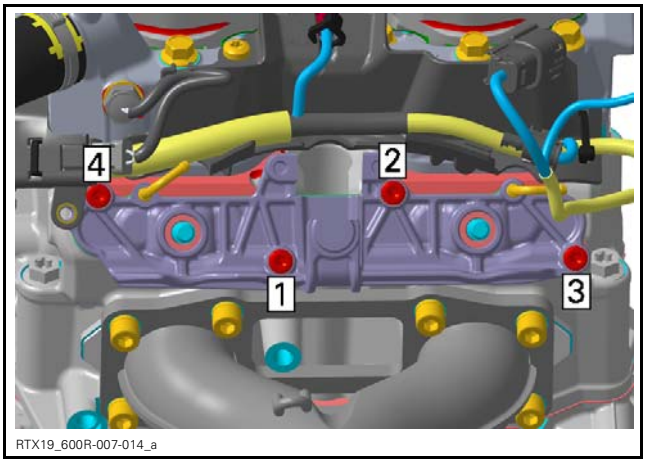
12. Remove protector sleeves.
13. Install and **hand tighten** screws.

Push and pull main valve stems to make sure they move freely.



14. Tighten RAVE valve housing screws and check valve stem for free movement again. If some friction is felt, slightly loosen screws and readjust housing then retighten screws.

TIGHTENING TORQUE	
RAVE valve housing screw	10 N•m ± 0.7 N•m (89 lbf•**in** ± 6 lbf•**in**)

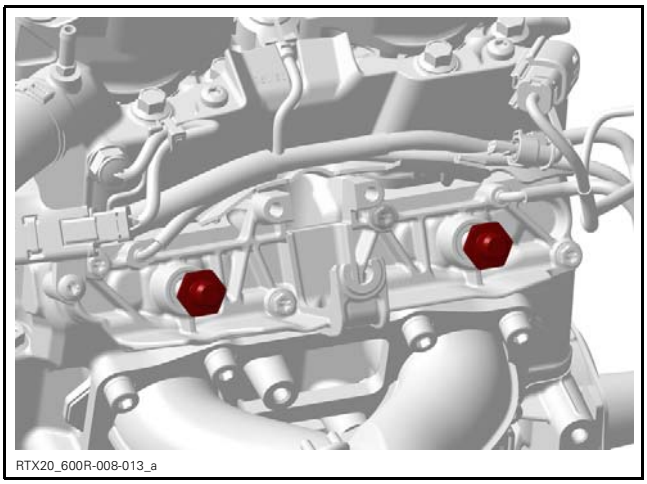


RTX19_600R-007-014_a

TIGHTENING SEQUENCE

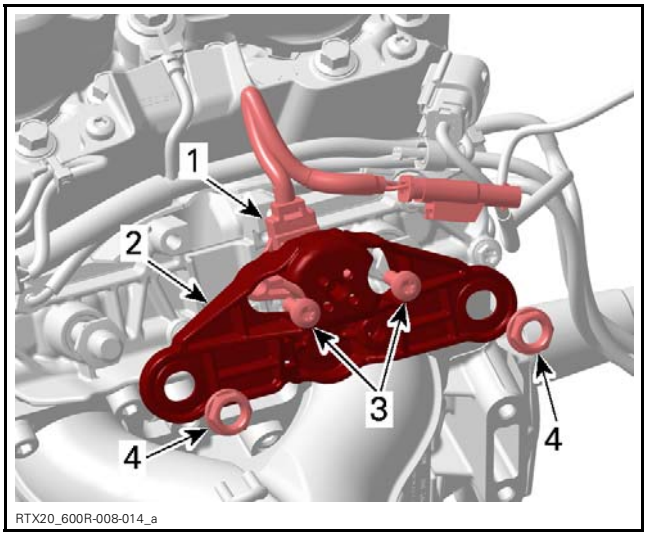
15. Repeat the process until a free movement is obtained.
16. Install lubrication hoses.
17. Tighten collar nuts to specification.

TIGHTENING TORQUE	
Collar nuts	4 N•m ± 0.3 N•m (35 lbf•**in** ± 3 lbf•**in**)


RTX20_600R-008-013_a

18. Position RAVE valves position sensor with link bar on RAVE valve housing.
19. Refer to *INSTALLING THE 3D RAVE VALVES POSITION SENSOR* in this subsection and install:
    – Position sensor retaining screws
    – Link bar retaining nuts.

NOTICE **It is very important to perform *3D RAVE VALVES SYNCHRONIZATION* whenever link bar is removed.**

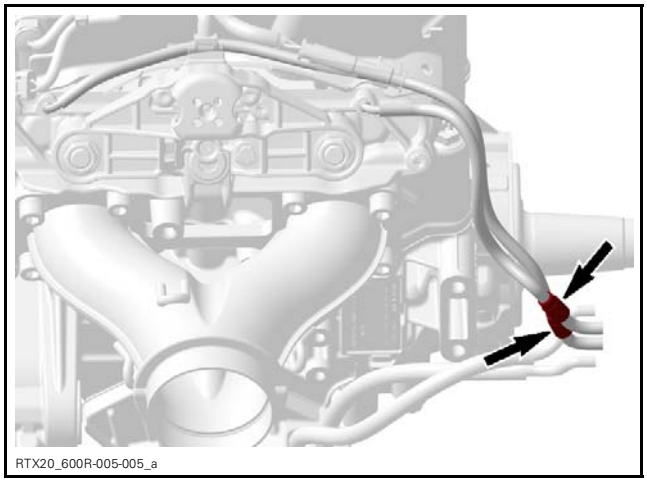


RTX20_600R-008-014_a

1. *RAVE valves position sensor*
2. *Link bar*
3. *Position sensor retaining screws*
4. *Link bar retaining nuts*

20. Connect the RAVE valves position sensor.
21. Install RAVE cable. Refer to *INSTALLING THE RAVE CABLE* in this subsection
22. Bleed oil lines. Refer to *OIL INJECTION PUMP* in the *LUBRICATION SYSTEM* subsection.

CHECK VALVES


RTX20_600R-005-005_a

For testing and replacement refer to the *LUBRICATION SYSTEM* subsection.

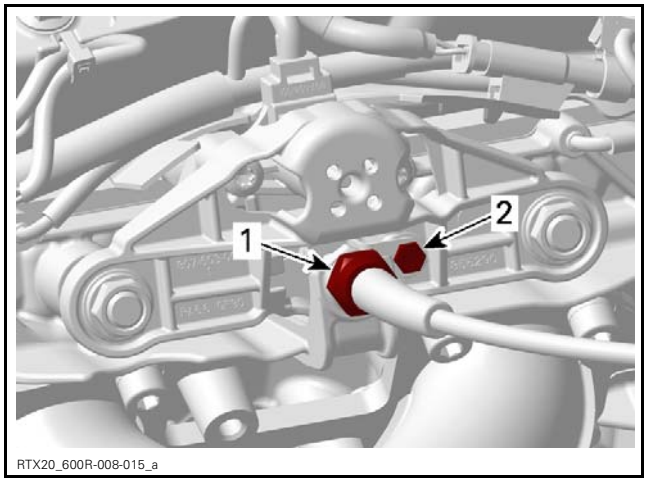
RAVE CABLE

Removing the Rave Cable

NOTICE **To avoid twisting the RAVE cable, start by removing it from the link bar.**

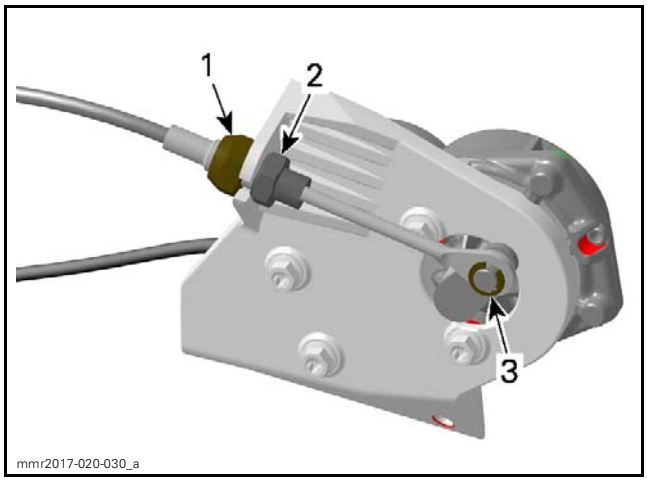
1. Push RAVE valves to closed position.

2. Loosen RAVE cable lock nut. Hold counter nut.
3. Remove retaining plate screw.



1. Rave cable lock nut
2. Retaining plate screw

4. Remove RAVE cable.
5. Remove RAVE cable lock nut at servomotor bracket. Hold counter nut.
6. Remove snap ring from servomotor lever.

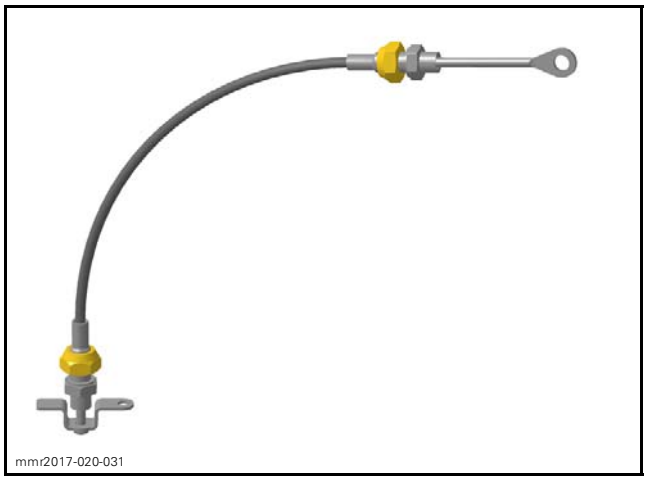


1. Rave cable lock nut
2. Counter nut
3. Snap ring

7. Remove RAVE cable.

Inspecting the RAVE Cable

Check RAVE cable and retaining plate for wear or any other damage.



Check if cable moves freely.

If not, lubricate both ends of the RAVE cable sleeve and check if the RAVE cable is sliding without any resistance. Replace if necessary.

SERVICE PRODUCT
O-ring chain lubricant

Installing the RAVE Cable

1. Install RAVE cable on the servomotor lever.
2. Install snap ring.
3. Install RAVE cable lock nut at the Servomotor bracket.

TIGHTENING TORQUE	
RAVE cable lock nut	20 N•m ± 2 N•m (15 lbf•ft ± 1 lbf•ft)

4. Install RAVE cable on the link bar.
5. Install retaining plate screw but do not tighten yet.
6. Install RAVE cable lock nut.

TIGHTENING TORQUE	
RAVE cable lock nut	20 N•m ± 2 N•m (15 lbf•ft ± 1 lbf•ft)

7. Tighten retaining plate screw.

TIGHTENING TORQUE	
Retaining plate screw	5 N•m ± 0.6 N•m (44 lbf•**in** ± 5 lbf•**in**)

SERVOMOTOR

The servomotor consists of a brush DC motor (actuator) and a non-contacting angle sensor integrated in one housing.

Servomotor Location

The servomotor is located on the top of the oil tank, on the LH side of the vehicle.

Remove the upper body module to work on the servomotor.

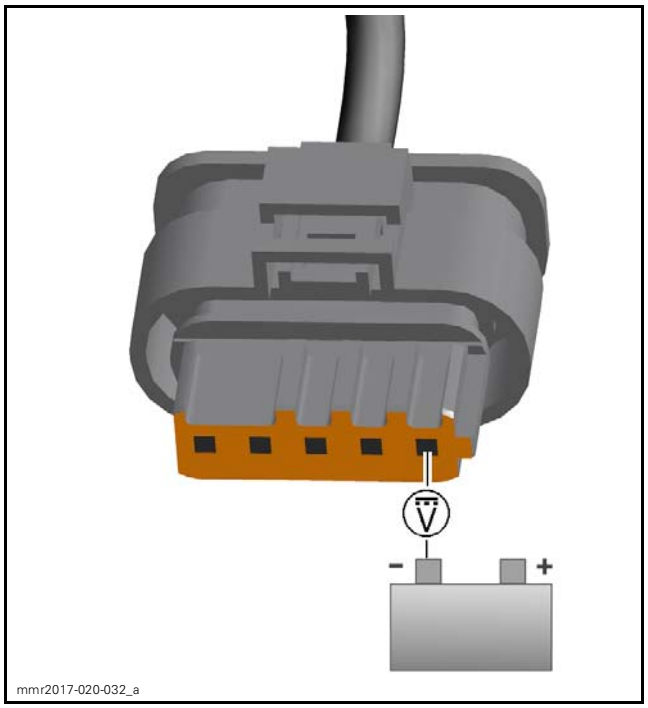
Testing the Servomotor

As a first troubleshooting step, always connect vehicle to the BRP diagnostic software (BUDS2) to check for applicable fault codes. Refer to *COMMUNICATION TOOLS AND B.U.D.S.* subsection.

Testing the Sensor Input Voltage

1. Disconnect the servomotor connector.
2. Install D.E.S.S. key and press start/RER button to wake up ECM.
3. Set multimeter to Vdc and check voltage as per following table.

SENSOR INPUT VOLTAGE		
Servomotor connector (wiring harness side)	Battery ground	MEASUREMENT
Pin 1		5 ± 0.25 Vdc

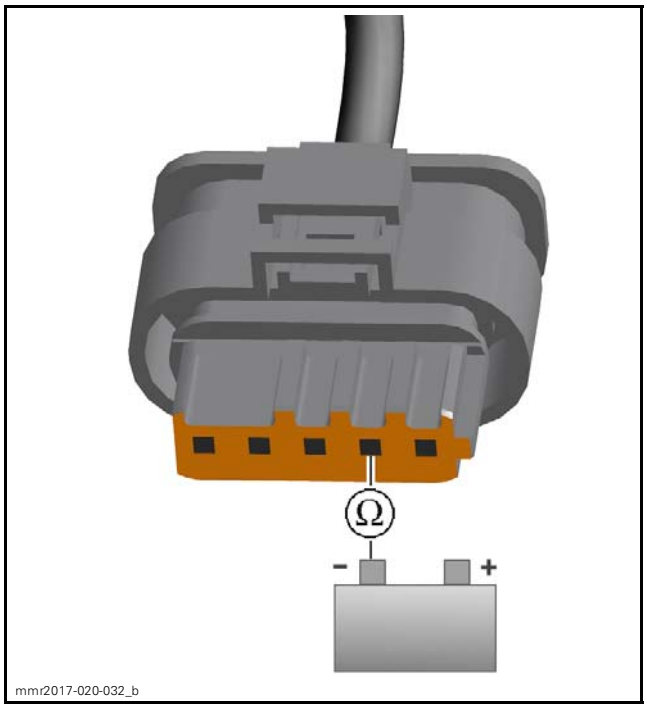


If voltage is exceeding the range check ECM power supply (Fuses F1 and F3) and servomotor wiring.

Testing the Sensor Ground

1. Disconnect the servomotor connector.
2. Set multimeter to Ω and probe terminals as per following table.

SENSOR GROUND		
Servomotor connector (wiring harness side)	Battery ground	MEASUREMENT
Pin 2		Close to 0 Ω



If resistance is incorrect check ECM grounding and servomotor wiring.

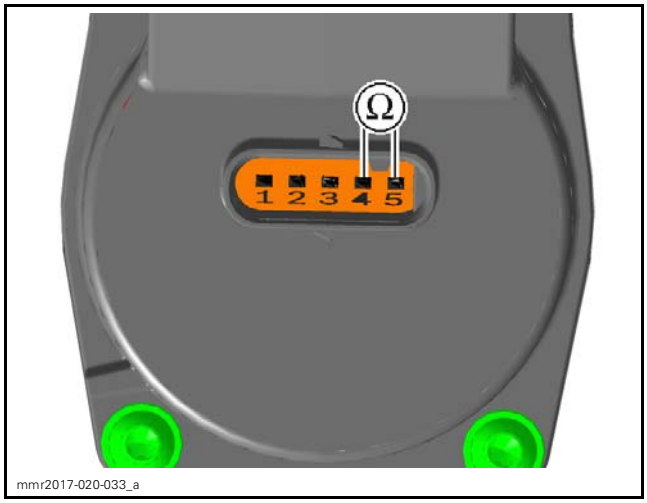
Testing the Servomotor Wiring

1. Disconnect ECM connector.
2. Connect ECM connector to the ECM ADAPTER TOOL (P/N 529 036 166).
3. Disconnect the servomotor connector.
4. Set multimeter to Ω and probe terminals as per following table.

ECM ADAPTER	SERVOMOTOR CONNECTOR (WIRING HARNESS SIDE)	RESISTANCE
E4	1	Close to 0 Ω
F4	2	
D4	3	
H4	4	
G4	4	
J4	5	
K4	5	

Testing the Servomotor Resistance

1. Disconnect the servomotor connector.
2. Set multimeter to Ω and probe the servomotor terminals as per following table.



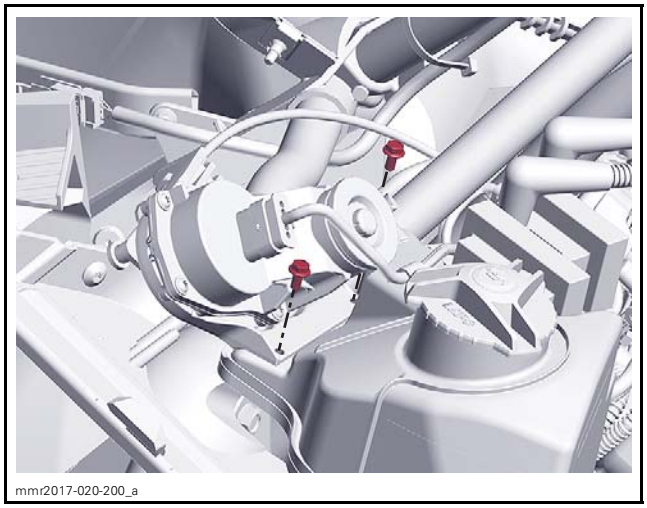
SERVOMOTOR TERMINALS

SERVOMOTOR RESISTANCE		
PIN		RESISTANCE @ 20°C (68°F)
4	5	Close to 0 Ω

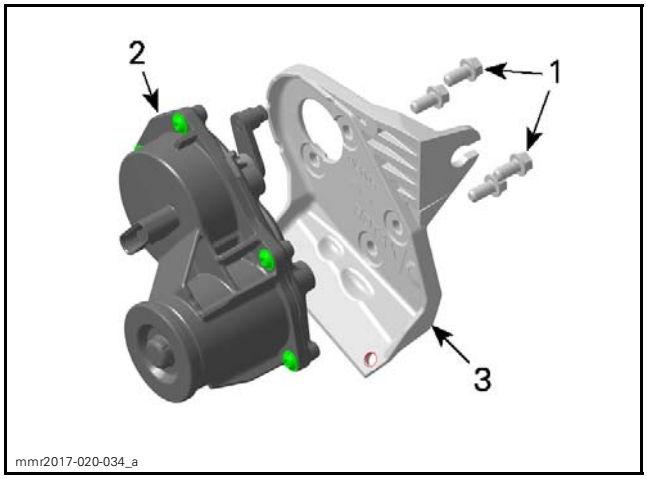
Removing the Servomotor

Remove RAVE cable. Refer to *REMOVING THE RAVE CABLE* in this subsection.

Remove servomotor from the oil tank.



Separate servomotor from its bracket.



1. *Retaining screws*
2. *Servomotor*
3. *Servomotor bracket*

Inspecting the Servomotor

Check ease of movement of the servomotor lever.

Check mechanical end stop of servomotor lever.

If necessary replace servomotor.

Installing the Servomotor

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

TIGHTENING TORQUE	
Bracket retaining screws	11 N•m ± 0.8 N•m (97 lbf•**in** ± 7 lbf•**in**) + LOCTITE 243 (BLUE) (P/N 293 800 060)
Servomotor retaining screws	4 N•m ± 1 N•m (35 lbf•**in** ± 9 lbf•**in**)

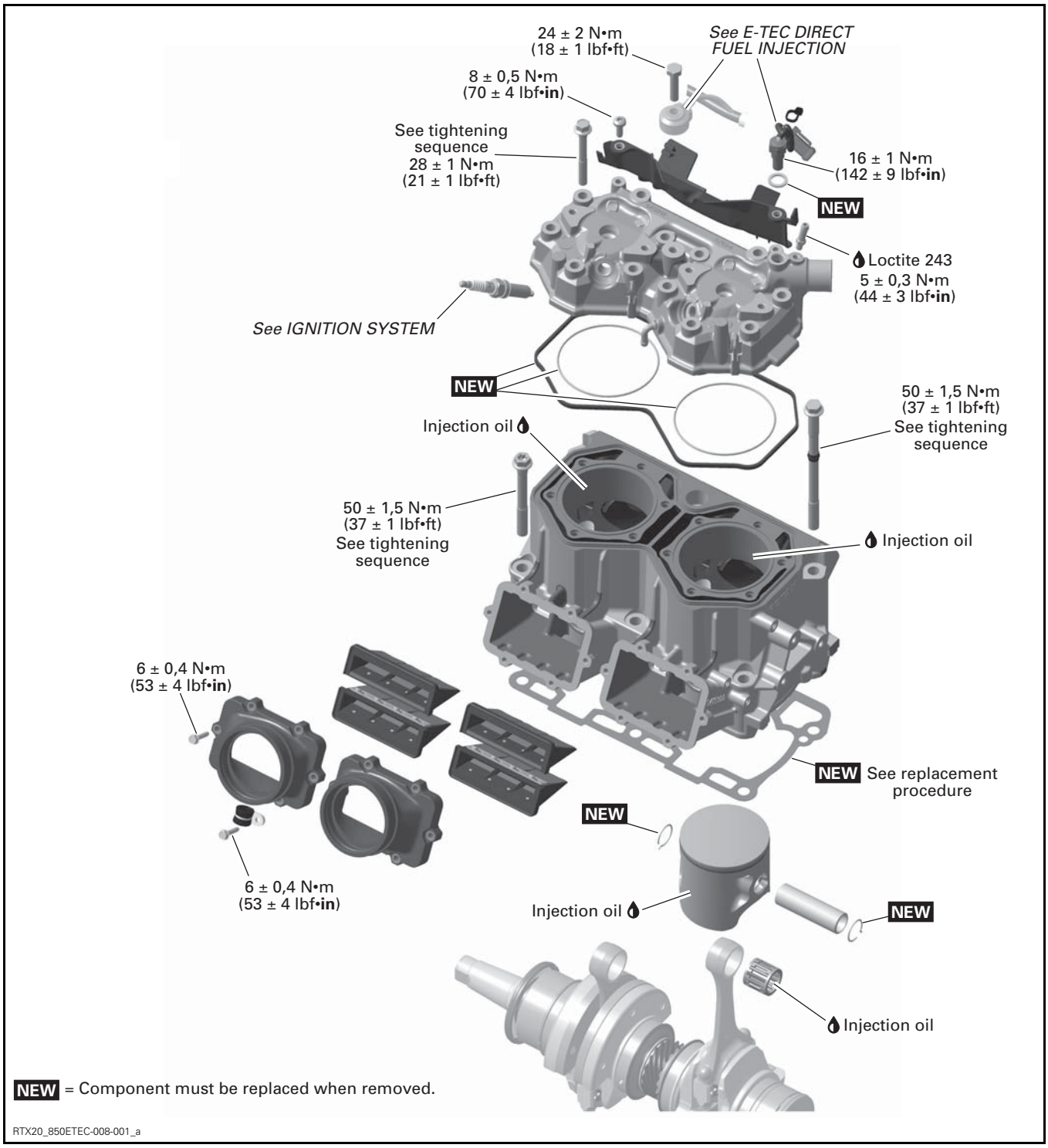
TOP END (850)

SERVICE TOOLS

Description	Part Number	Page
PISTON CIRCLIP INSTALLER 21MM	529 036 138	15
PISTON PROJECTION	529 036 215	11
TDC DIAL INDICATOR	295 000 143	11

SERVICE PRODUCTS

Description	Part Number	Page
LOCTITE CHISEL (GASKET REMOVER)	413 708 500	7, 10


24 ± 2 N•m
(18 ± 1 lbf•ft)
See E-TEC DIRECT FUEL INJECTION
8 ± 0,5 N•m
(70 ± 4 lbf•in)
See tightening sequence
28 ± 1 N•m
(21 ± 1 lbf•ft)
16 ± 1 N•m
(142 ± 9 lbf•in)
NEW
Loctite 243
5 ± 0,3 N•m
(44 ± 3 lbf•in)
See IGNITION SYSTEM
NEW
50 ± 1,5 N•m
(37 ± 1 lbf•ft)
See tightening sequence
Injection oil
50 ± 1,5 N•m
(37 ± 1 lbf•ft)
See tightening sequence
Injection oil
6 ± 0,4 N•m
(53 ± 4 lbf•in)
NEW See replacement procedure
NEW
6 ± 0,4 N•m
(53 ± 4 lbf•in)
Injection oil
NEW
Injection oil
NEW = Component must be replaced when removed.
RTX20_850ETEC-008-001_a

GENERAL

Before completely disassembling the engine, check airtightness. Refer to *ENGINE LEAK TEST* subsection.

During assembly or installation:

– Use torque values and service products as shown in the exploded view.
– Clean threads before applying a threadlocker. Refer to the *INTRODUCTION* subsection.

⚠ 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 with new ones.

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

⚠ WARNING

Always disconnect the magneto connector prior to:
– Disconnecting any fuel hose.
– Removing a fuel injector.
– Removing a spark plug cable or spark plug.
Otherwise, if the engine is cranked, fuel vapors may ignite in presence of a spark creating a fire hazard.

ENGINE BREAK-IN

NOTICE **After a repair involving major parts replacement, a break-in period must be observed. Follow *OPERATOR'S GUIDE* recommendation relating to break-in.**

To reactivate the break-in period, use the BUDS2 software.

Go to:

– Settings page
– Initialization - Restart Break-In.

INSPECTION

ENGINE COMPRESSION TEST

1. Remove body parts as required to access to the spark plugs.
2. Lift rear of vehicle to clear track from the ground. Support it with a wide base stand.

⚠ WARNING

Prior to measuring engine compression, ensure vehicle is properly lifted with the track off the ground.

3. Safely warm up engine.
4. Remove a spark plug.
5. Install an appropriate engine compression tool on engine.

Place emergency engine stop switch to OFF position.

Crank engine several times:

– Pull rewind starter several times (if applicable) - or
– Press START/STOP button to crank engine.

Check if engine compression is according to specification.

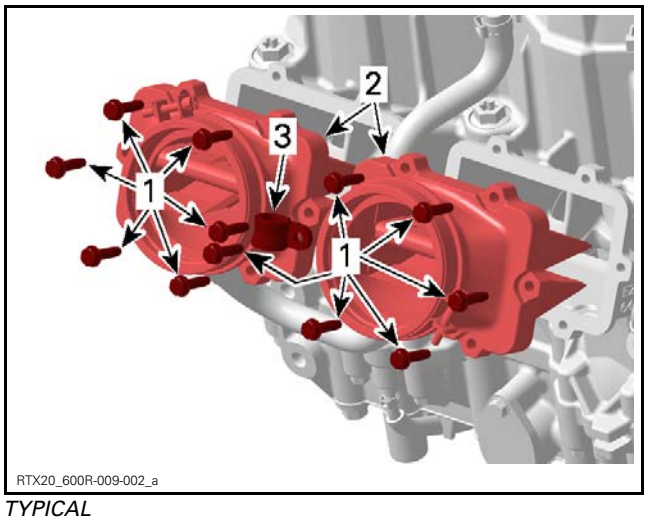
SERVICE LIMIT	
ENGINE COMPRESSION SPECIFICATION	7.5 bar (110 PSI)

PROCEDURES

REED VALVES

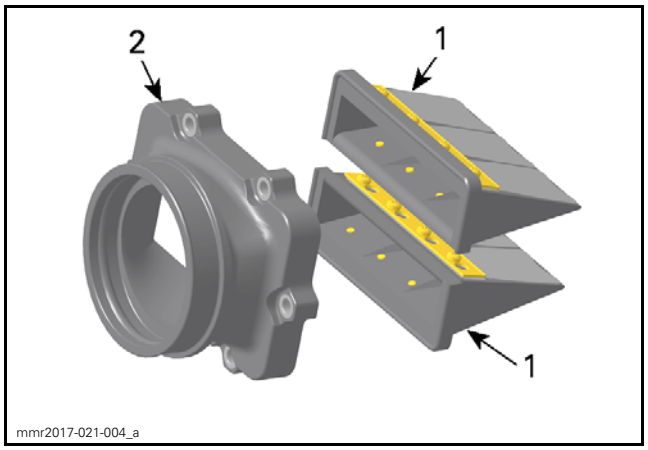
Removing the Reed Valve

1. Remove throttle body, refer to *E-TEC DIRECT FUEL INJECTION* subsection.
2. Remove the following parts.



TYPICAL
1. *Retaining screws (12x)*
2. *Clamp*
3. *Intake adapters with reed valves*

3. Remove reed valves from intake adapter.



1. *Reed valves*
2. *Intake adapter*

Inspecting the Reed Valve

Check reed valve for proper tightness.

Check blades for breakouts at their end tips. In case of breakouts replace it.

There must not be any free play between blade and valve body when exerting a finger pressure on blade at blade stopper location.

In case of a free play, turn blade upside down and recheck.

TIGHTENING TORQUE	
Reed valve blade screws	1.5 N•m ± 0.3 N•m (13 lbf•**in** ± 3 lbf•**in**)

If there is still a free play, replace blade and/or reed valve assembly.

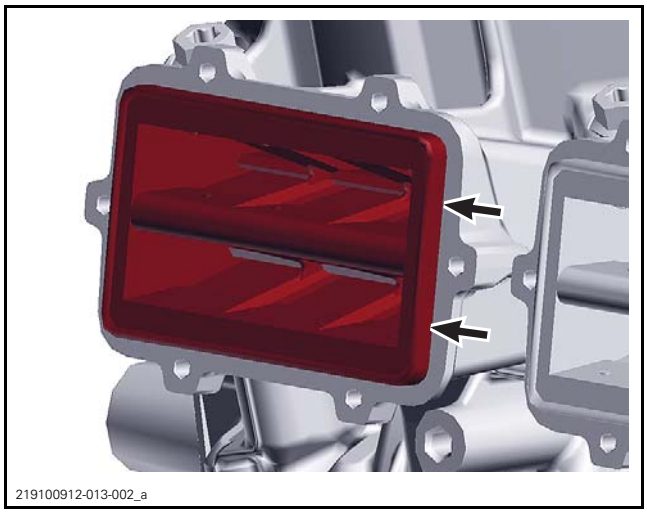
Installing the Reed Valve

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

Blades have a curved shape. Install with their curve facing reed block.

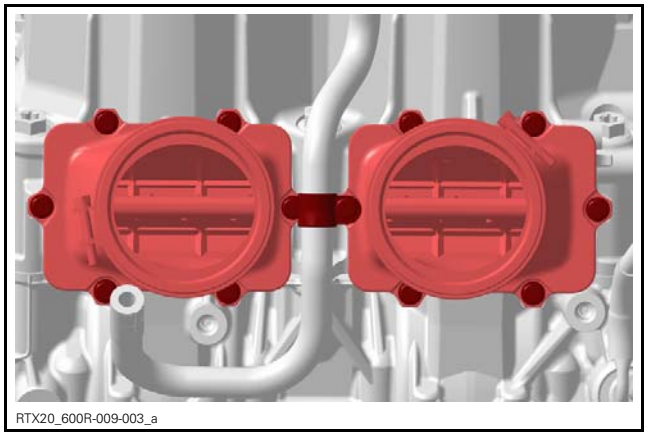
TIGHTENING TORQUE	
Reed valve blade screws	1.5 N•m ± 0.3 N•m (13 lbf•**in** ± 3 lbf•**in**)

Ensure to position reed valves so that they rest flat in intake opening.



Ensure to position intake adapter as shown.

Install clamps as shown in the illustration.



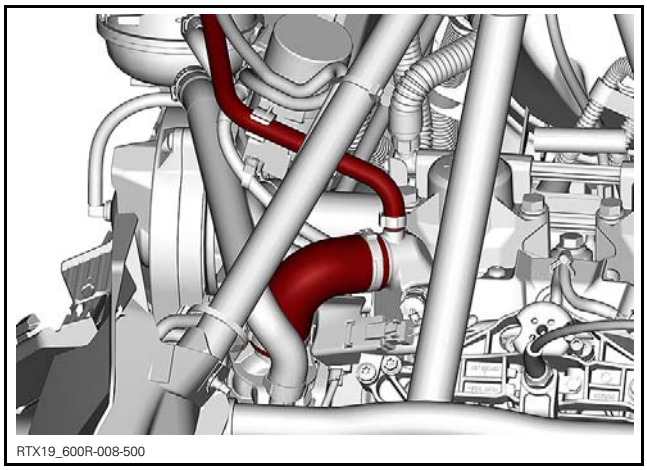
Tighten intake adapter retaining screws to specification.

TIGHTENING TORQUE	
Intake adapter retaining screws	6 N•m ± 0.4 N•m (53 lbf•**in** ± 4 lbf•**in**)

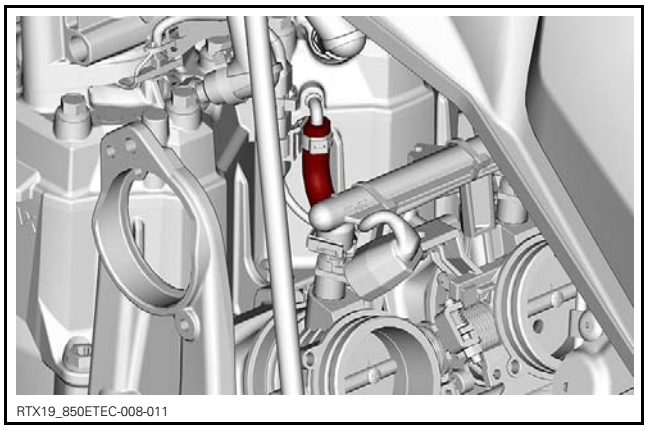
CYLINDER HEAD

Removing the Cylinder Head

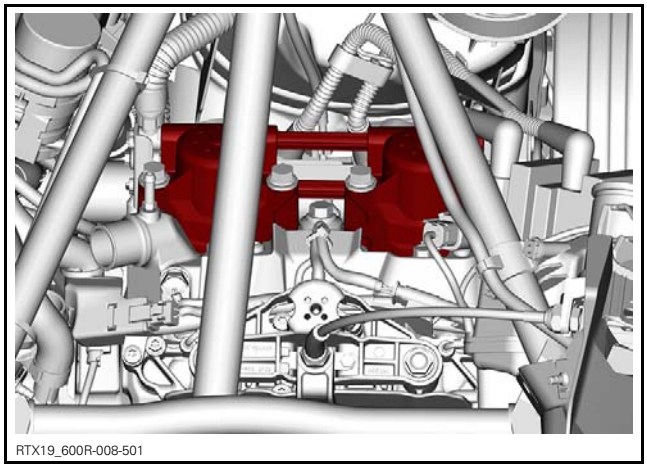
1. Drain coolant. Refer to *COOLING SYSTEM* subsection.
2. Disconnect the coolant hose and the bleeding hose from the cylinder head.


RTX19_600R-008-500

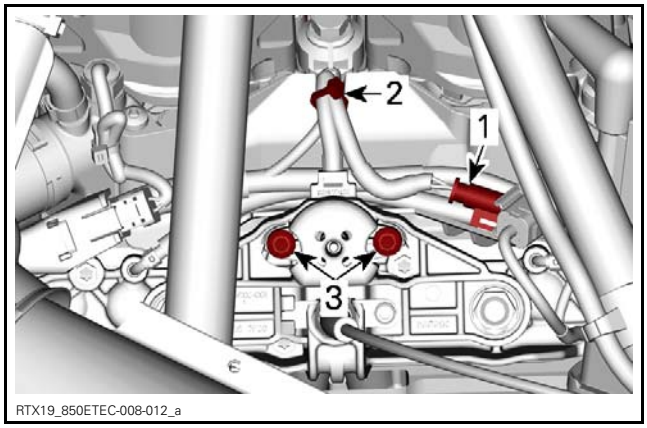
3. Remove the primary air intake silencer. Refer to *AIR INTAKE SYSTEM* subsection.
4. Disconnect the inlet hose for throttle body heating from the cylinder head.


RTX19_850ETEC-008-011

5. Remove the E-TEC direct fuel injectors from the cylinder head. Refer to *E-TEC DIRECT FUEL INJECTION* subsection.


RTX19_600R-008-501

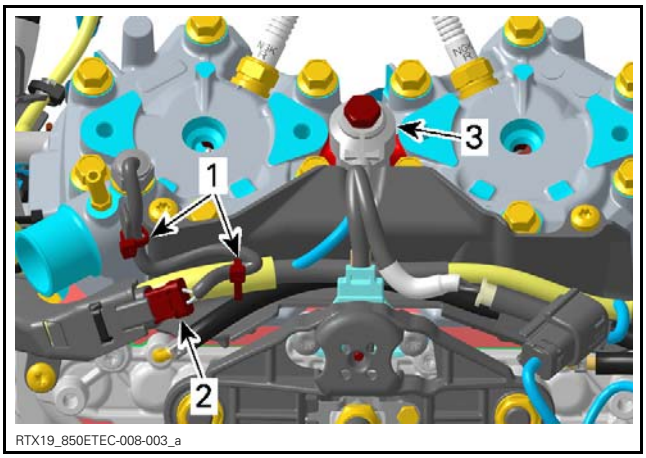
6. Disconnect the RAVE valve connector.
7. Detach the RAVE valve connector housing from the harness support.
8. Cut the locking tie securing the RAVE valve sensor harness to the knock sensor harness.
9. Loosen RAVE position sensor screws.



RTX19_850ETEC-008-012_a

1. RAVE valve connector housing
2. Locking tie to be cut
3. RAVE position sensor screws

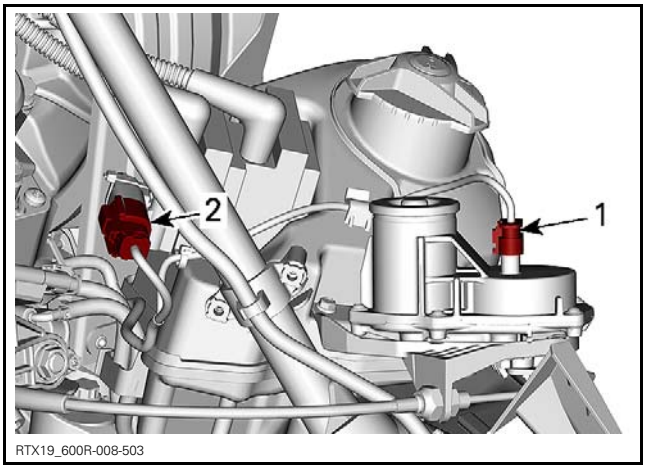
10. Cut locking ties securing the CTS harness.
11. Disconnect the CTS connector.
12. Remove knock sensor retaining screw and move knock sensor aside.



RTX19_850ETEC-008-003_a

1. *Locking ties securing the CTS harness*
2. *CTS connector*
3. *Knock sensor screw*

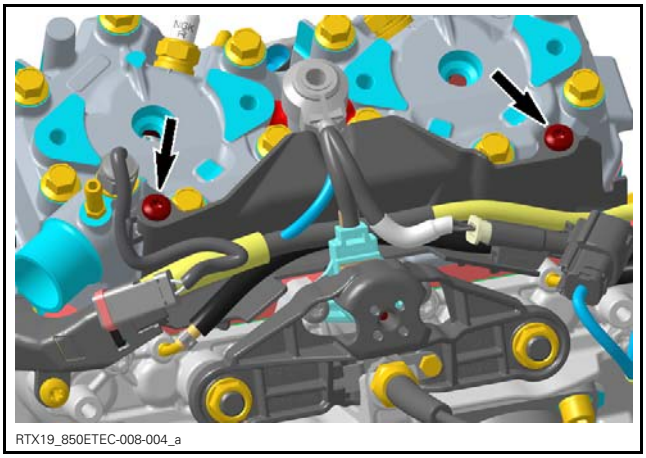
13. Disconnect the following connectors.



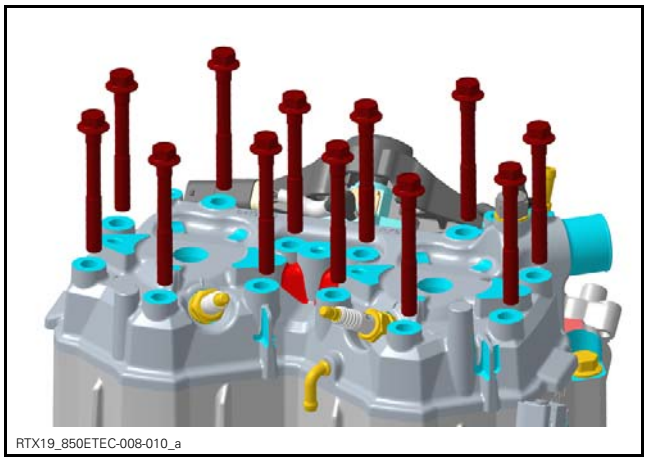
RTX19_600R-008-503

1. *Ignition coil connector*
2. *RAVE servomotor connector*

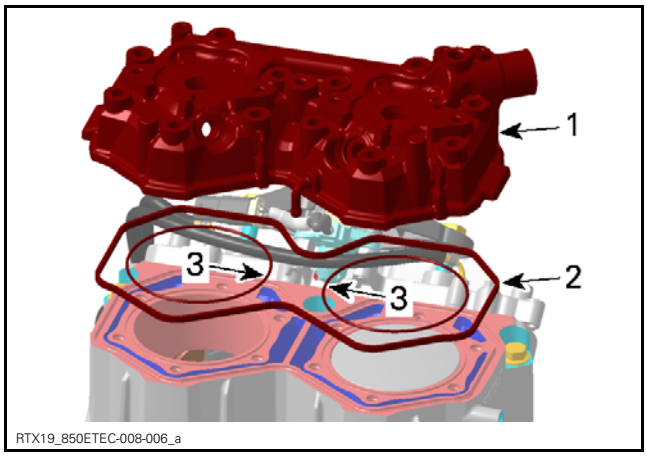
14. Remove screws securing the front harness support.


RTX19_850ETEC-008-004_a

15. Move the support and the harness aside.
16. Unplug spark plug wires.
17. If necessary remove following parts from cylinder head:
    - Spark plugs
    - Coolant temperature sensor (CTS)
    - Bleeding nipple.
18. Remove the cylinder head.
    18.1 Remove cylinder head screws.


RTX19_850ETEC-008-010_a

18.2 Remove the cylinder head and discard the cylinder rubber ring and O-rings.



RTX19_850ETEC-008-006_a

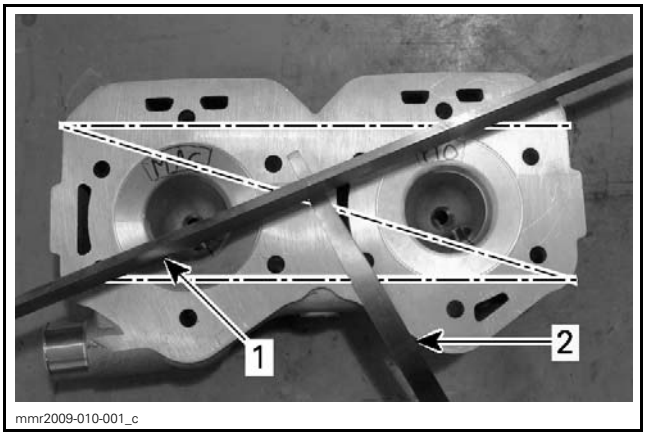
1. *Cylinder head*
2. *Cylinder rubber ring*
3. *O-rings*

Inspecting the Cylinder Head

Check cylinder head for cracks or other damages. Replace if necessary.

Cylinder Head Warpage

1. Check gasket mating surface of the cylinder head with a straight edge and a feeler gauge. Make sure part is within the given specification.
2. If cylinder head is out of specification, replace it.



TYPICAL
1. *Straight edge*
2. *Feeler gauge*

SERVICE LIMIT	
CYLINDER HEAD WARPAGE	0.05 mm (.002 in) per 50 mm (2 in) of surface
	0.5 mm (.02 in) for total length of cylinder head

Cleaning the Cylinder Head

Scrape off any carbon deposits from cylinder head.

SERVICE PRODUCT
LOCTITE CHISEL (GASKET REMOVER) (P/N 413 708 500)

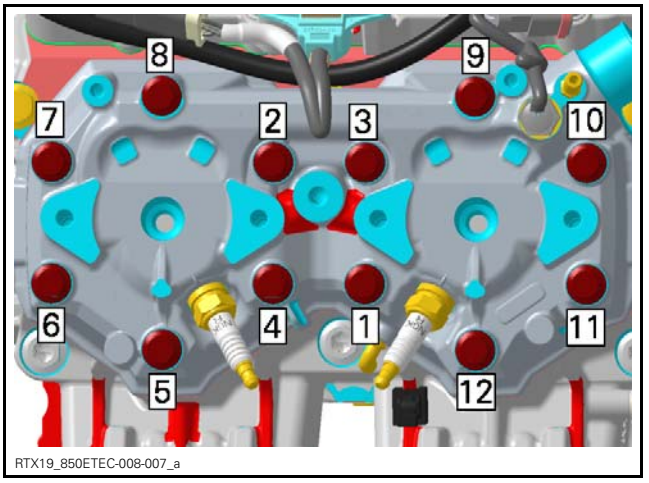
Installing the Cylinder Head

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

Install **NEW** rubber ring and round O-rings on cylinder block.

Tighten cylinder head screws to specification as per the following sequence.

TIGHTENING TORQUE	
Cylinder head screws	28 N•m ± 1 N•m (21 lbf•ft ± 1 lbf•ft)

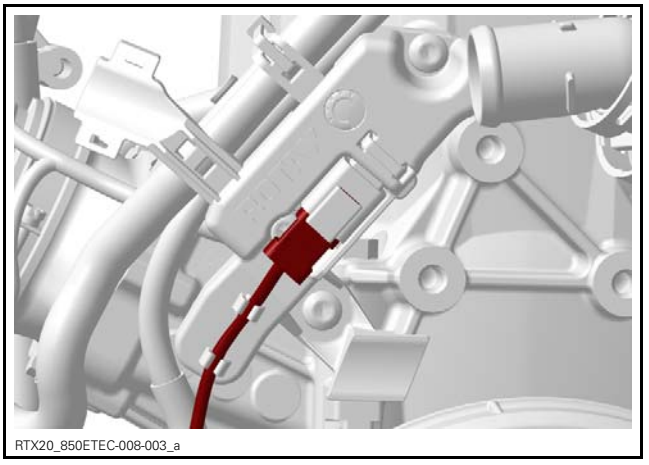


TIGHTENING SEQUENCE

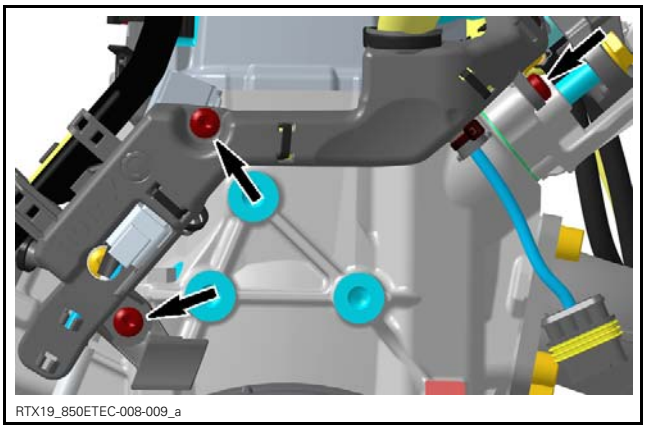
CYLINDER BLOCK

Removing the Cylinder Block

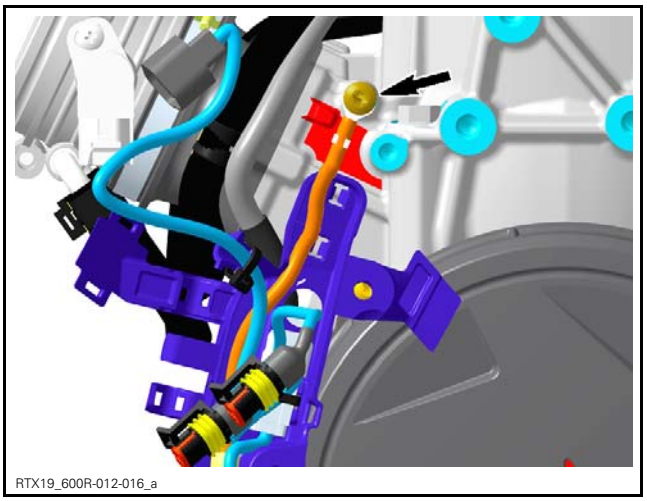
1. Drain coolant. Refer to *COOLING SYSTEM* subsection.
2. Remove hoses for throttle body heating. Refer to *COOLING SYSTEM* subsection.
3. Remove *CYLINDER HEAD*, see procedure in this subsection.
4. Remove the throttle body. Refer to *E-TEC DIRECT FUEL INJECTION* subsection.
5. Detach the RAVE cable form the 3D RAVE link bar. Refer to *RAVE* subsection.
6. Disconnect CPS.



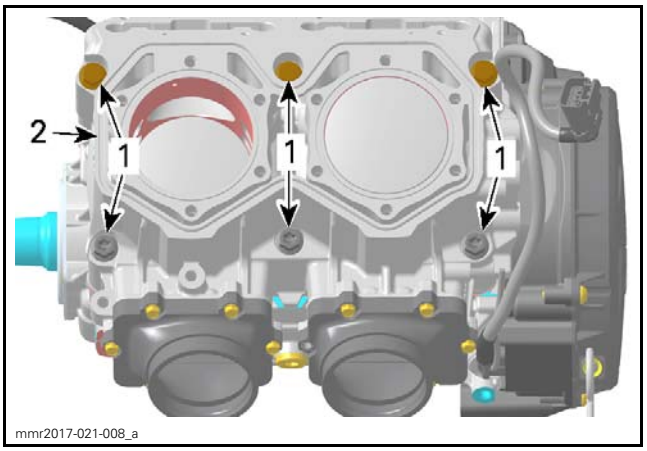
7. Remove screws from harness support.


RTX19_850ETEC-008-009_a

8. Put wiring harness with support aside and remove screw from ground cable.


RTX19_600R-012-016_a

9. If necessary remove RAVE assembly. Refer to *RAVE* subsection.
10. Remove the cylinder block.



mmr2017-021-008_a

1. Cylinder block screws
2. Cylinder block

Inspecting the Cylinder Block

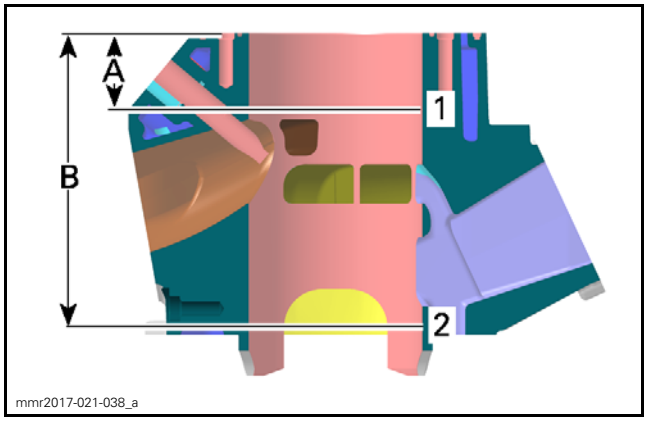
Remove RAVE valves, refer to *RAVE* subsection.

Remove reed valves, refer to *REMOVING THE REED VALVES* in this subsection.

Check cylinder bores for cracks and scoring on the top and bottom of cylinders. Replace if necessary.

Cylinder Taper

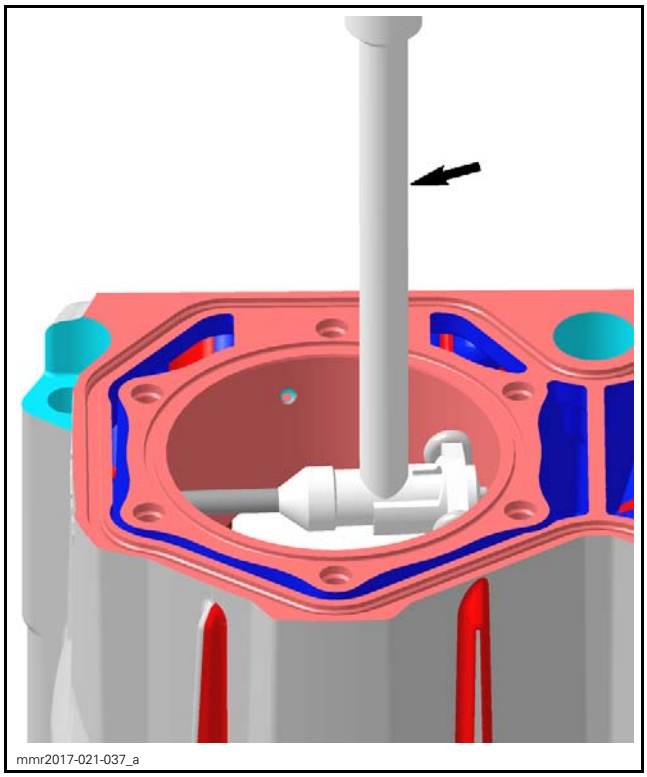
1. Measure cylinder diameter at the following positions:
   – Above exhaust port
   – Below intake port.



mmr2017-021-038_a

CYLINDER TAPER MEASUREMENTS		
POSITION	MEASUREMENT	FROM TOP OF CYLINDER BLOCK
1	A	30 mm (1.18 in)
2	B	140 mm (5.51 in)

REQUIRED TOOL
Cylinder bore gauge


mmr2017-021-037_a

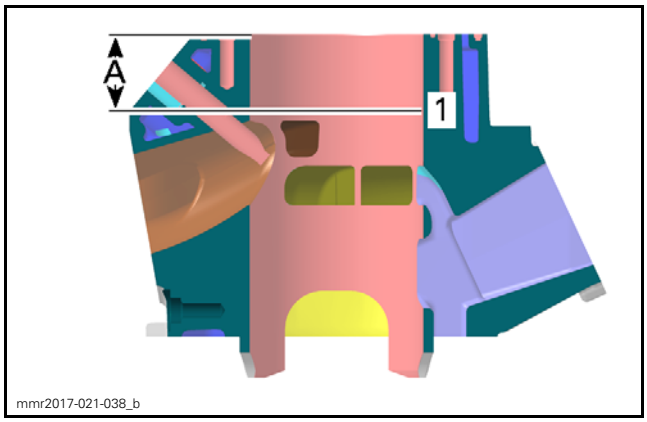
2. Compare cylinder diameters.
3. If the difference exceeds the specified dimension, replace the cylinder block.

CYLINDER BORE TAPER	
SERVICE LIMIT	0.10 mm (.0039 in)

Cylinder out of Round

1. Check if the cylinder out of round is more than the specified dimension.

Measure above exhaust port:
- in piston pin axis
- perpendicular to piston pin axis.



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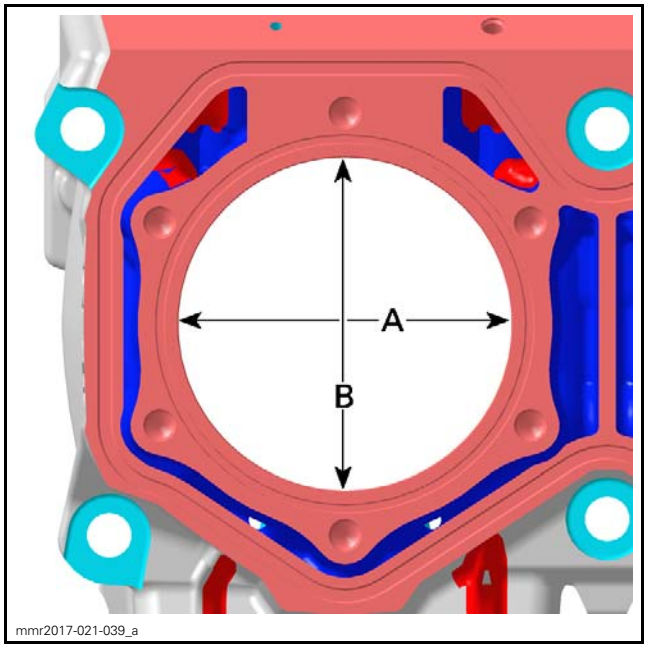
CYLINDER OUT OF ROUND MEASUREMENT		
POSITION	MEASUREMENT	FROM TOP OF CYLINDER BLOCK
1	A	30 mm (1.18 in)



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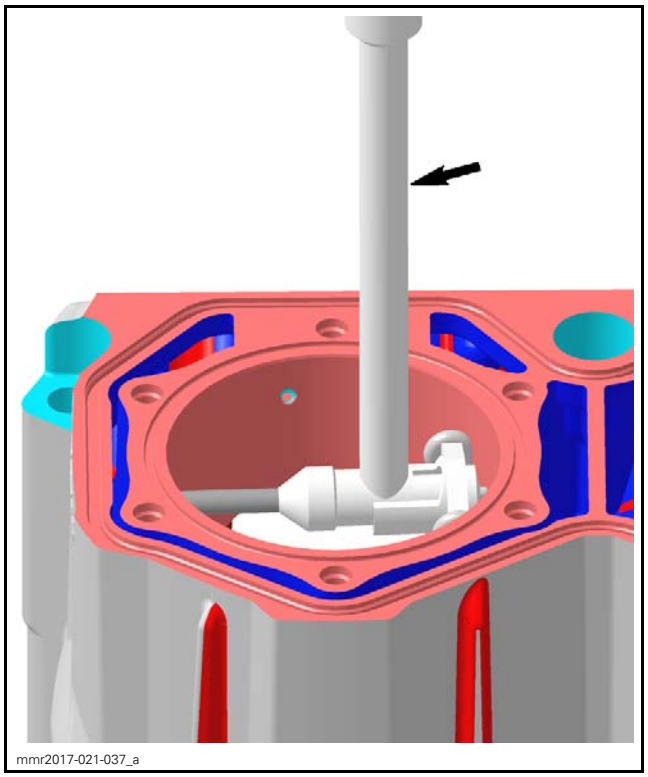
A. Measure in piston pin axis
B. Measure perpendicular to piston pin axis

REQUIRED TOOL
Cylinder bore gauge


mmr2017-021-037_a

2. If the measurement exceeds the specifications, replace the cylinder block.

CYLINDER BORE OUT OF ROUND	
SERVICE LIMIT	0.08 mm (.0031 in)

Cleaning the Cylinder Block

Scrape off any carbon deposits from exhaust ports.

Carefully clean cylinder block screws, specifically under screw head.

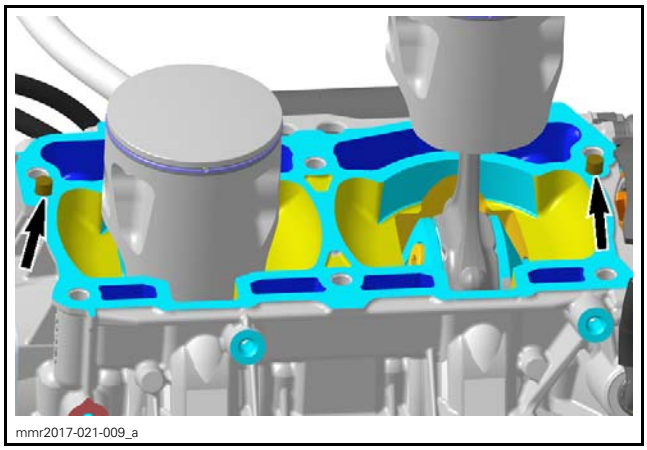
SERVICE PRODUCT
LOCTITE CHISEL (GASKET REMOVER) (P/N 413 708 500)

Installing the Cylinder Block

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

Ensure top surface of crankcase is clean.

Check if dowel pins are in crankcase holes.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Install a NEW cylinder block base gasket of the same thickness as the old one. Refer to *PISTON PROJECTION MEASUREMENT* in this subsection.

NOTE: If thickness of the factory-installed gasket is unknown, install a 7-holes gasket (0.7 mm (.028 in)) as a base line.

Lubricate cylinder bores.

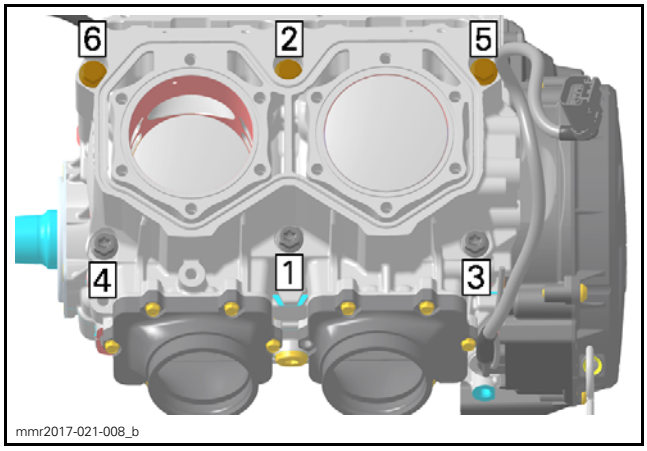
SERVICE PRODUCT
Injection oil

Carefully slide cylinder block down while squeezing piston rings to allow cylinder insertion.

Proceed one piston at a time, the help of an assistant may be required.

Tighten cylinder block screws to specification as per the following sequence.

TIGHTENING SEQUENCE	
Cylinder block screws	50 N•m ± 1.5 N•m (37 lbf•ft ± 1 lbf•ft)



mmr2017-021-008_b

TIGHTENING SEQUENCE

Measure piston projection as described in *PISTON PROJECTION MEASUREMENT* in this subsection.

NOTICE **Always install a cylinder block base gasket of the proper thickness. Failure to do so may cause detonation and severe engine damage.**

Install the 3D RAVE valve. Refer to *INSTALLING THE 3D RAVE VALVE* in the *RAVE* subsection.

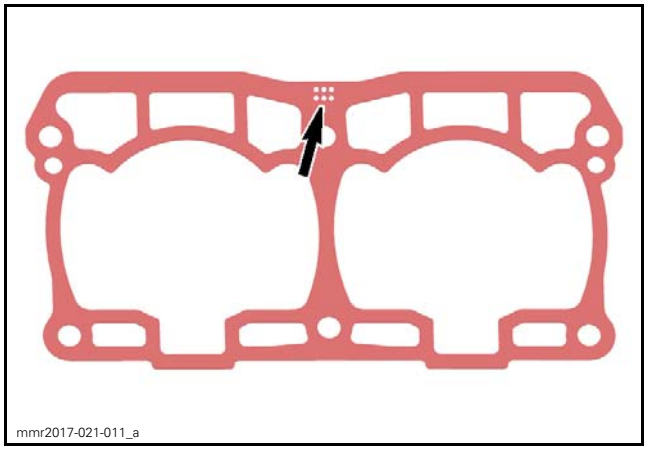
PISTON PROJECTION MEASUREMENT

The piston projection measurement is used to determine the correct cylinder base gasket thickness when engine components are replaced.

Cylinder Block Base Gasket

The cylinder block base gasket is available in different thicknesses to adjust precisely the piston projection.

CYLINDER BLOCK BASE GASKET	
THICKNESS	HOLES QUANTITY
0.9	9
0.8	8
0.7	7
0.6	6
0.5	5



TYPICAL - GASKET THICKNESS IDENTIFICATION HOLES

NOTICE **Always install a cylinder block base gasket of the proper thickness. Failure to do so may cause detonation and severe engine damage.**

Engine Preparation

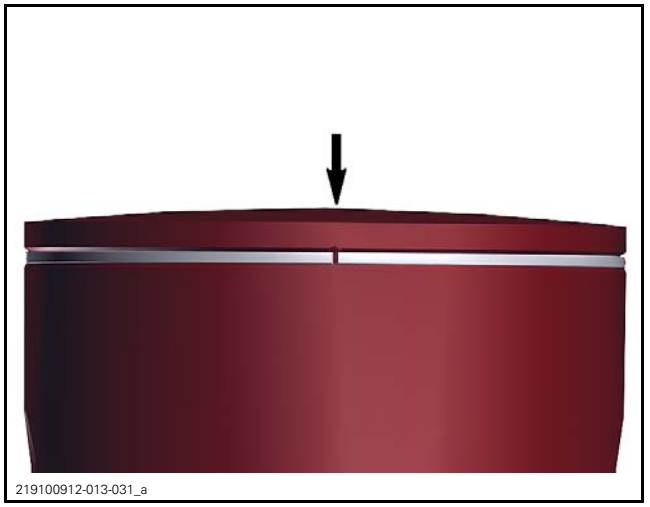
1. Bring PTO piston to TDC.

REQUIRED TOOL	
TDC DIAL INDICATOR (P/N 295 000 143)	

2. Remove cylinder head from engine. Refer to *CYLINDER HEAD* in this subsection.
3. Remove O-rings from cylinder block.
4. Clean top surface of cylinder block.
5. Ensure piston dome is clean and free of any carbon deposits.
6. Ensure cylinder block screws are properly tightened.

Piston Projection Measurement

NOTICE **Before performing the piston projection measurement, check with a straight edge if the shape of the piston dome is still convex and does not show any flat spots. A deformed piston will lead to wrong piston protrusion which can result in a severe engine damage.**



CONVEX SHAPE OF THE PISTON DOME

1. Place piston projection tool on a flat steel surface.

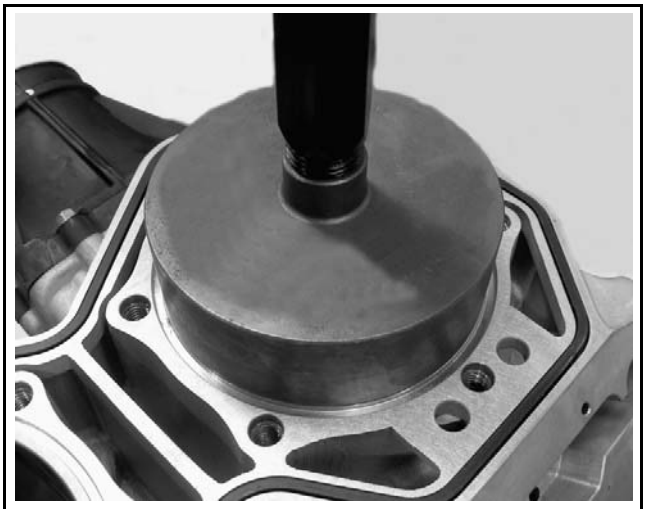
REQUIRED TOOL	
PISTON PROJECTION (P/N 529 036 215)	
TDC DIAL INDICATOR (P/N 295 000 143)	

2. Rotate dial indicator face to position the **0** in line with needle.

mmr2011-010-002_a

SETTING THE ZERO

3. Install tool on PTO cylinder.
4. Center tool with cylinder to ensure that dial indicator reads piston dome.


mmr2011-010-003

TYPICAL - TOOL PROPERLY CENTERED

5. Ensure that PTO piston is set to TDC.
6. Read dial indicator then note measurement.

mmr2011-010-004

TYPICAL

NOTE: Convert dial indicator measurement to millimeter.

PISTON PROJECTION MEASUREMENT
1.75 mm to 1.82 mm (.069 in to .072 in)

7. If piston projection measurement is out of specification, change cylinder block base gasket thickness. Refer to *CYLINDER BLOCK* in this subsection.

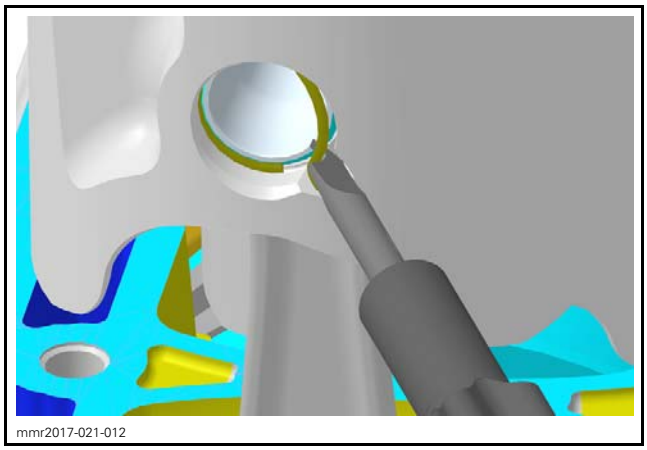
CYLINDER BLOCK BASE GASKET SELECTION GUIDELINE	
MEASURED PISTON PROJECTION	GASKET TO INSTALL
Below specification	Thinner
Above specification	Thicker

NOTICE **Take care to use the proper specification according to the type of engine and the model of vehicle.**

PISTONS

Removing the Piston

1. Remove *CYLINDER BLOCK*, see procedure in this subsection.
2. Place a clean cloth over crankcase.
3. Using a pointed tool inserted in piston notch, remove circlips from piston.



4. Push piston pin out of piston.
5. Remove piston.
6. Remove bearing.
7. Discard circlips.

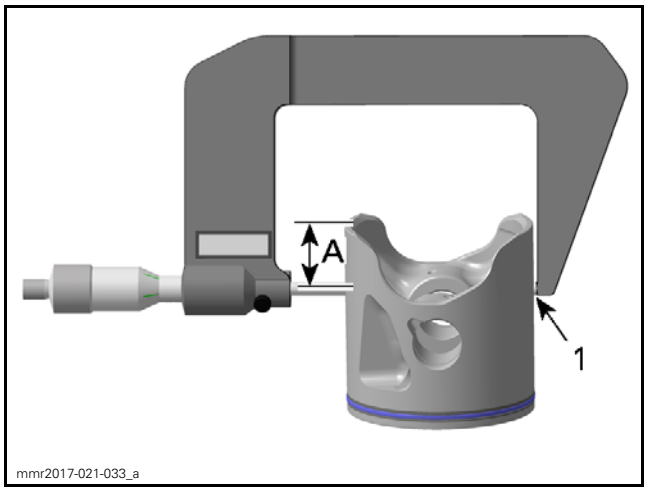
Inspecting the Piston

Inspect piston for scoring, cracking or other damage.

Cylinder/Piston Clearance

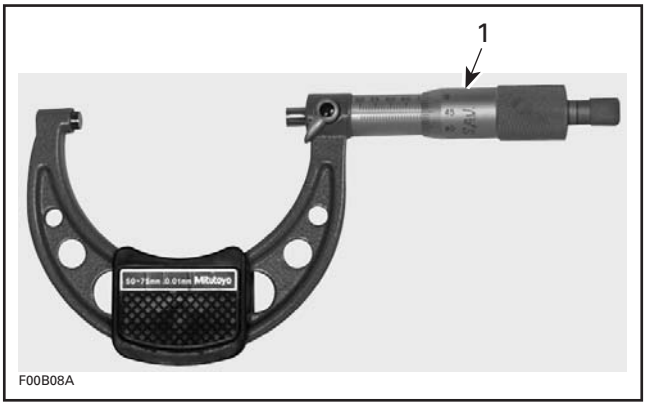
1. Measure piston diameter at "A" perpendicularly (90°) to piston pin.

REQUIRED TOOL
Micrometer



1. Measuring diameter perpendicularly (90°) to piston pin axis
A. 30 mm (1.181 in)

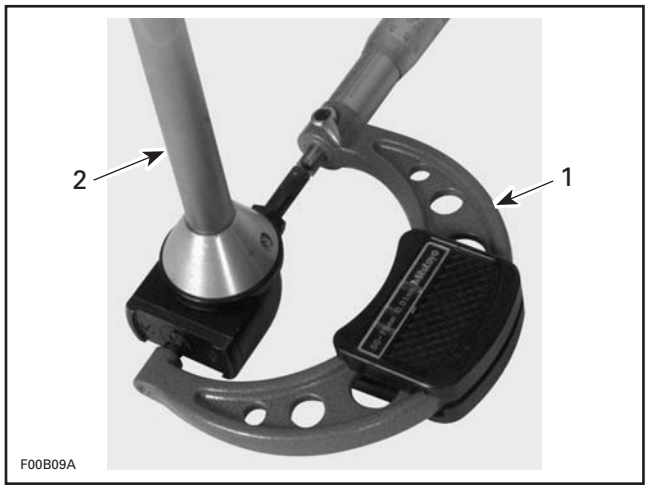
2. Adjust and **lock** a micrometer to the piston diameter.



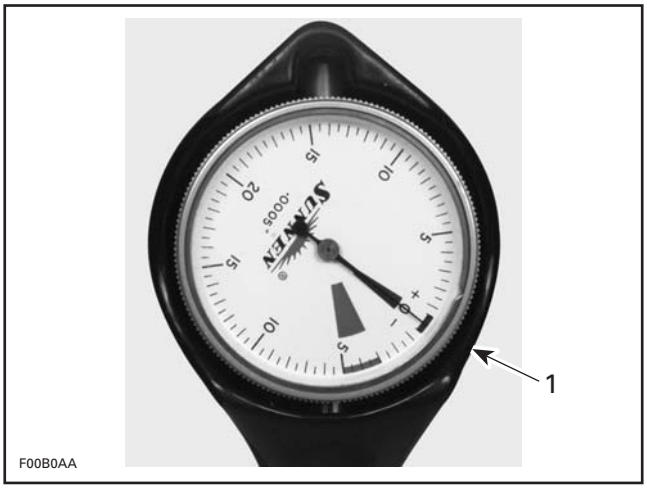
1. Micrometer set to the piston diameter

3. Adjust a cylinder bore gauge to the locked micrometer and set the indicator to 0.

REQUIRED TOOL
Cylinder bore gauge



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

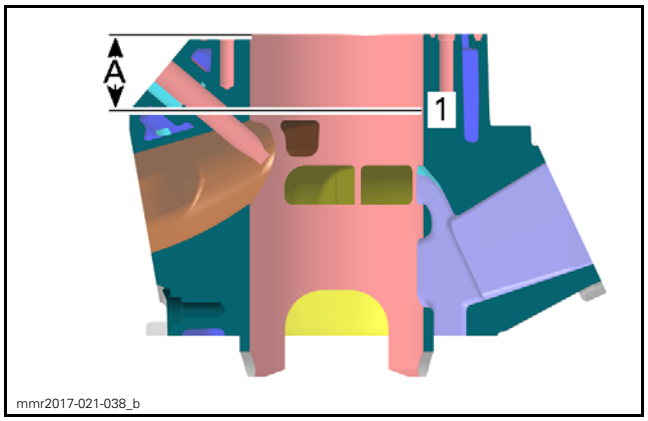


1. Indicator set to 0 (zero)

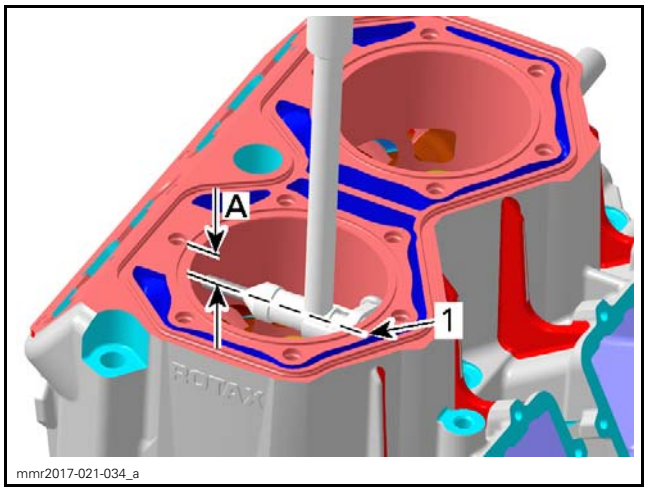
NOTE: Make sure the cylinder bore gauge indicator is set exactly at the same position as with the micrometer, otherwise the reading will be false.

4. Position the dial bore gauge above the exhaust port.

NOTICE Always remove cylinder-block from crankcase before measuring.



CYLINDER OUT OF ROUND MEASUREMENT		
POSITION	MEASUREMENT	FROM TOP OF CYLINDER BLOCK
1	A	30 mm (1.18 in)



1. Measuring perpendicularly (90°) to piston pin axis
A. 30 mm (1.18 in)

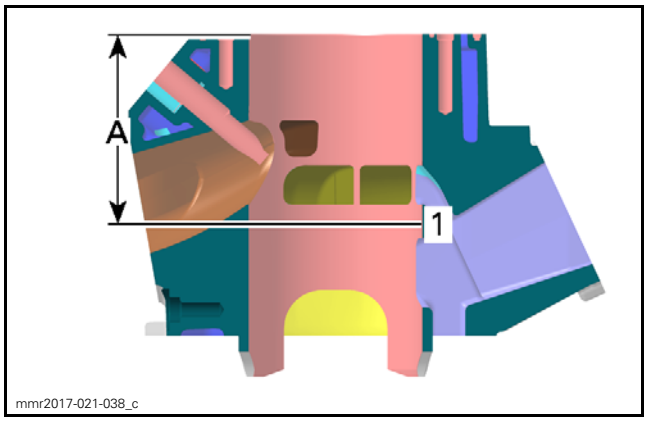
5. Read the measurement on the cylinder bore gauge. The result is the exact piston/cylinder wall clearance.

CYLINDER/PISTON CLEARANCE	
NEW	0.135 mm to 0.161 mm (.005 in to .006 in)
SERVICE LIMIT	0.200 mm (.0079 in)

6. If clearance exceeds specified tolerance, replace cylinder and piston.

Ring End Gap

1. Position ring halfway between transfer ports and intake port.



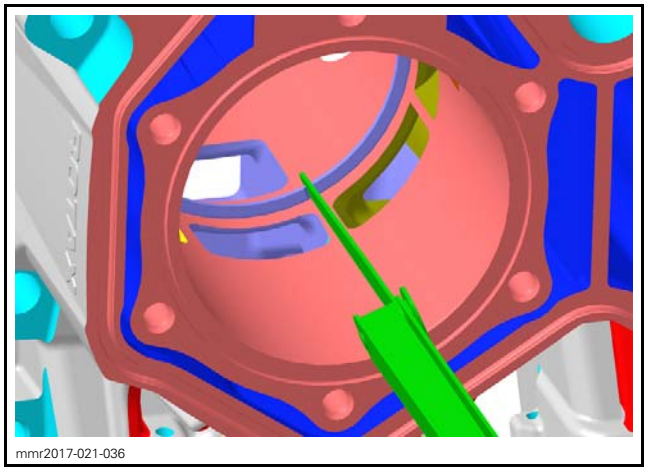
RING END GAP MEASUREMENT		
POSITION	MEASUREMENT	FROM TOP OF CYLINDER BLOCK
1	A	89 mm (3.5 in)

NOTE: In order to correctly position the ring in the cylinder, use piston as a pusher.

2. Check ring end gap. Replace ring if gap exceeds specified tolerance.

REQUIRED TOOL
Feeler gauge

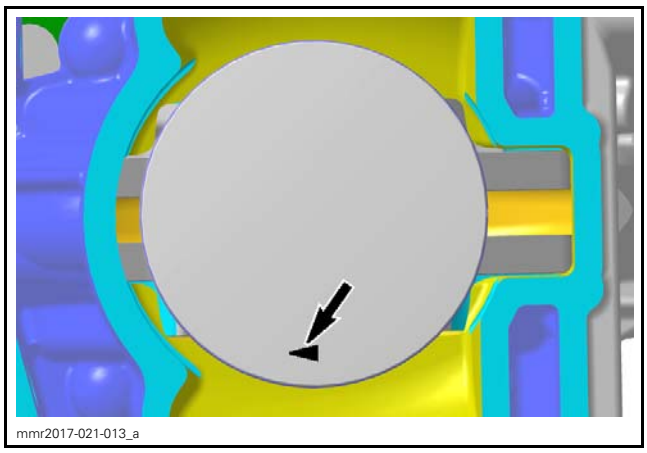
RING END GAP	
NEW	0.400 mm to 0.600 mm (.0157 in to .0236 in)
SERVICE LIMIT	1.000 mm (.0394 in)



Cleaning the Piston

1. Scrape off any carbon deposits from piston dome.

NOTE: The arrow on the piston dome must be visible after cleaning.



EXHAUST DIRECTION INDICATION

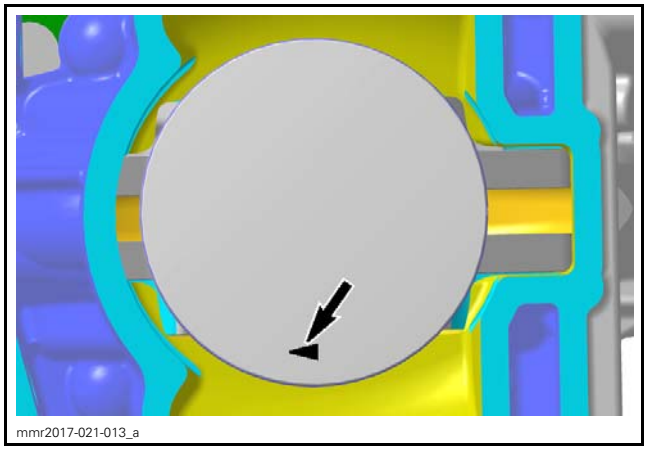
2. Clean the piston ring groove with a groove cleaner tool or with a piece of broken ring.

Installing the Piston

1. Lubricate needle bearing.

SERVICE PRODUCT
Injection oil

2. Insert bearing into connecting rod.
3. Place pistons over connecting rods with the arrow on the piston dome facing towards exhaust port.



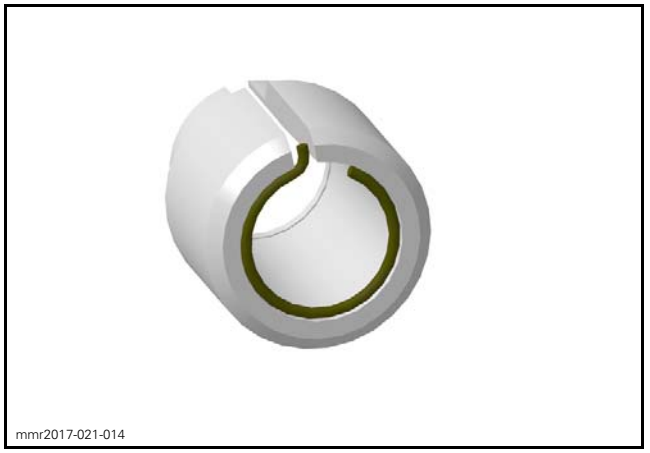
EXHAUST DIRECTION INDICATION

4. Install piston pin in piston.
5. Install NEW circlips.

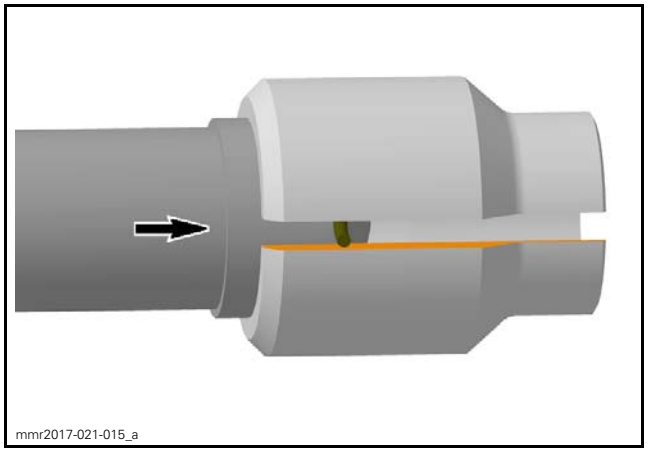
REQUIRED TOOL	
PISTON CIRCLIP INSTALLER 21MM (P/N 529 036 138)	

NOTICE **Always install NEW mono-hook circlips. If circlip installation fails at the first attempt, always retry with a new one.**

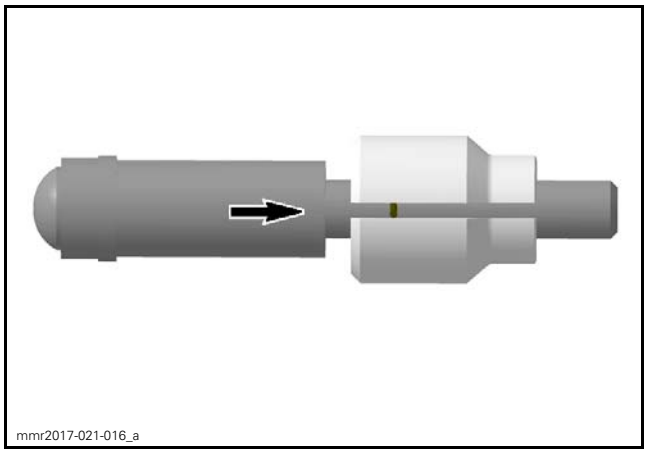
6. Use the following procedure to properly install circlip.
   6.1 Insert circlip into support so that, when installed in piston groove, the gap will be below the tab.

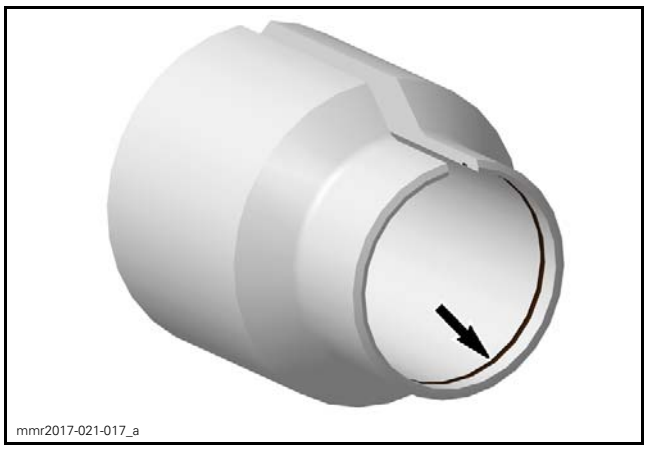


   6.2 With round end of pusher, position circlip perpendicularly to the support axis.

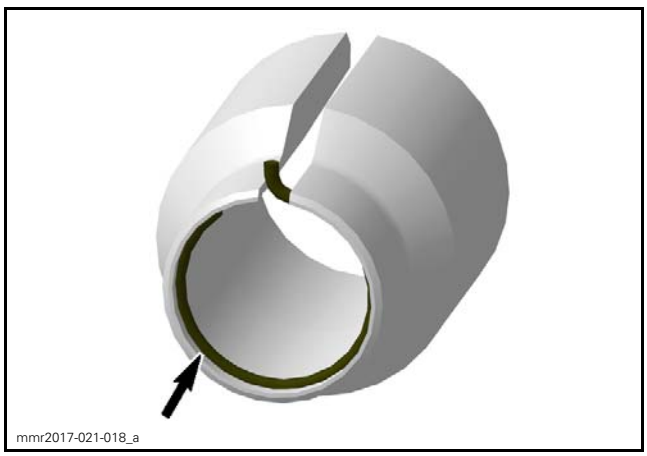


   6.3 With the other end of the pusher, push circlip into the support groove.

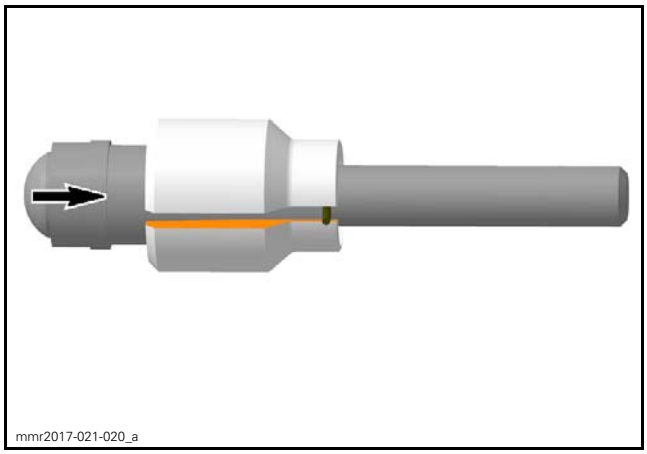




GROOVE

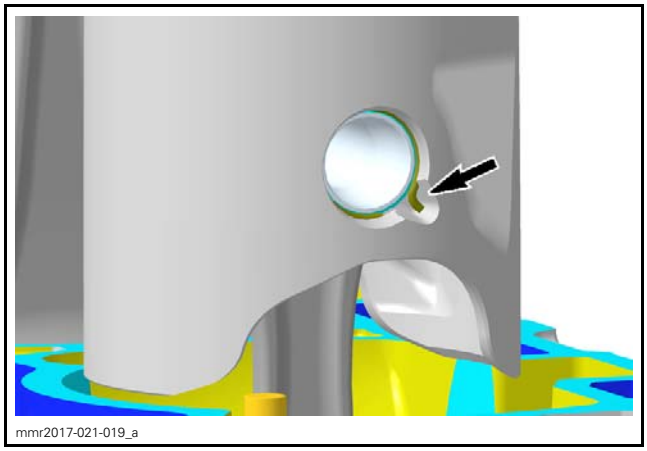


CIRCLIP READY TO BE INSTALLED ON PISTON



6.4 Using a plastic hammer, tap pusher to put the new circlip in place.

NOTE: Make sure to install new circlips with the gap below the tab exactly as shown on the following photo.



GAP BELOW THE TAB

NOTICE Circlips must not move freely after installation; if so, replace them.

7. Install all other removed parts as the reverse of removal procedure.

BOTTOM END (850)

SERVICE TOOLS

Description	Part Number	Page
BEARING HEATER	529 035 969	11
CRANKSHAFT BEARING PULLER	529 036 004	10
CRANKSHAFT PROTECTOR	529 036 434	10
DEGREE WHEEL	529 035 607	9
DIAL GAUGE ADAPTER	529 036 443	8
DISTANCE GAUGE	529 036 415	13
HALF-RING	529 036 414	10
PULLER RING	420 977 490	10
TEMPERATURE INDICATOR STICK	529 035 970	11
WATER PUMP BEARING PUNCH	529 036 417	6

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SERVICE PRODUCTS

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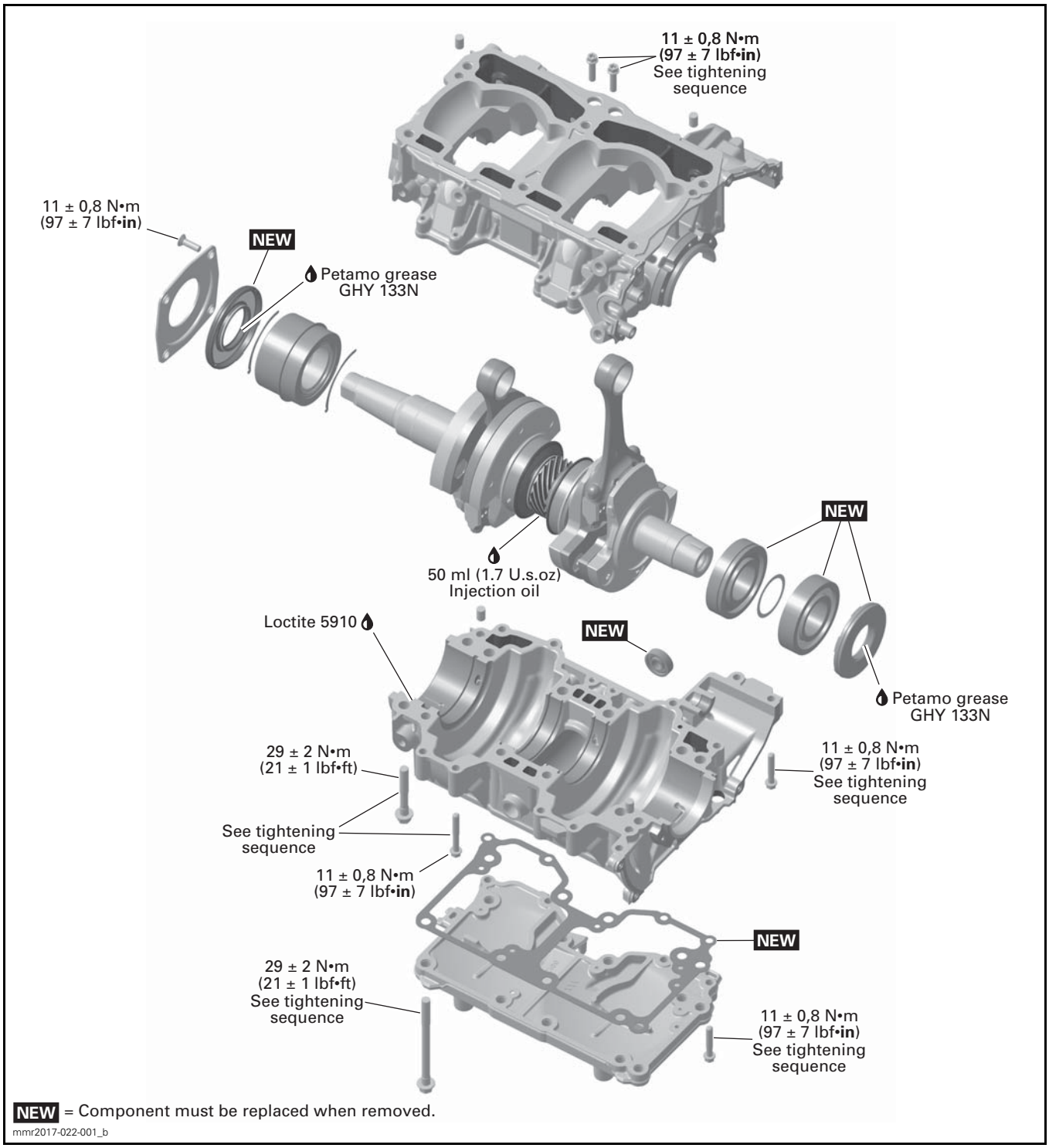
Description	Part Number	Page
CLUTCH AND PULLEY FLANGE CLEANER PRO S1	779244	11
LOCTITE 5910	293 800 081	6
LOCTITE CHISEL (GASKET REMOVER)	413 708 500	5
LUB. & ANTI-CORROSIVE	779168	10
PETAMO GREASE GHY 133N	420 899 271	12, 15


11 ± 0,8 N•m
(97 ± 7 lbf•in)
See tightening sequence
11 ± 0,8 N•m
(97 ± 7 lbf•in)
NEW
Petamo grease
GHY 133N
50 ml (1.7 U.s.oz)
Injection oil
NEW
Loctite 5910
NEW
Petamo grease
GHY 133N
29 ± 2 N•m
(21 ± 1 lbf•ft)
See tightening sequence
11 ± 0,8 N•m
(97 ± 7 lbf•in)
See tightening sequence
See tightening sequence
11 ± 0,8 N•m
(97 ± 7 lbf•in)
NEW
29 ± 2 N•m
(21 ± 1 lbf•ft)
See tightening sequence
11 ± 0,8 N•m
(97 ± 7 lbf•in)
See tightening sequence
NEW = Component must be replaced when removed.
mmr2017-022-001_b

GENERAL

Engine removal is required to repair bottom end.

All oil seals and gaskets must be discarded and replaced with new ones when crankcase is split.

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

During assembly or installation:

– Use torque values and service products as shown in the exploded view.
– Clean threads before applying a threadlocker. Refer to the *INTRODUCTION* subsection.

⚠ 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 with new ones.

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

⚠ WARNING

Always disconnect the magneto connector prior to:
– Disconnecting any fuel hose.
– Removing a fuel injector.
– Removing a spark plug cable or spark plug.
Otherwise, if the engine is cranked, fuel vapors may ignite in presence of a spark creating a fire hazard.

ENGINE BREAK-IN

NOTICE **After a repair involving major parts replacement, a break-in period must be observed. Follow *OPERATOR'S GUIDE* recommendation relating to break-in.**

To reactivate the break-in period, use the BRP diagnostic software (BUDS2).

Go to:

– **Settings** page
– **Initialization - Restart Break-In**.

PROCEDURES

CRANKCASE

Disassembling the Crankcase

Remove engine from vehicle. Refer to *ENGINE REMOVAL AND INSTALLATION* subsection.

Refer to *TOP END* subsection to remove:

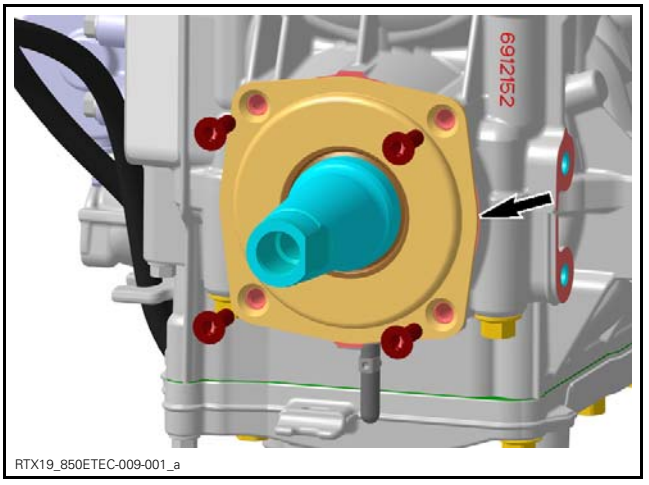
– Cylinder head
– Cylinder block
– Pistons.

Refer to *MAGNETO AND STARTER* subsection to remove:

– Stator
– Magneto housing
– Starter drive
– Starter.

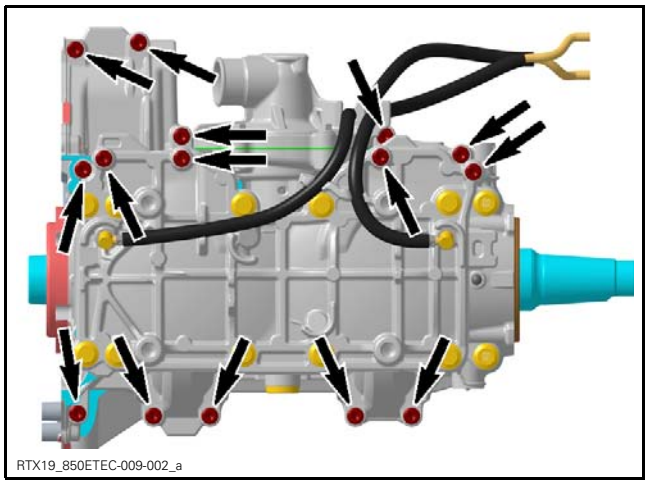
Remove drive pulley. Refer to *DRIVE PULLEY* subsection.

Remove PTO oil seal cover.

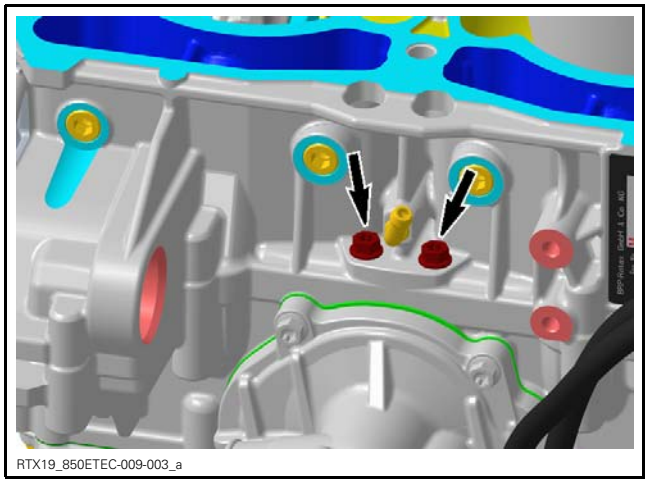


Remove engine front supports.

Remove M6 crankcase screws.

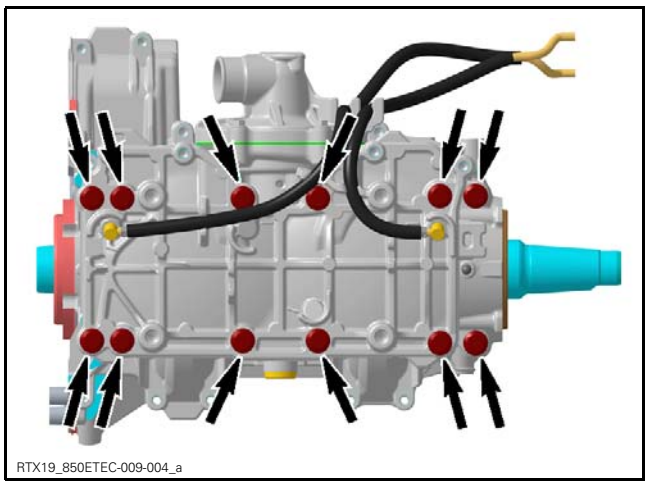


TYPICAL - M6 CRANKCASE SCREWS - BOTTOM SIDE



M6 CRANKCASE SCREW - WATER PUMP SIDE

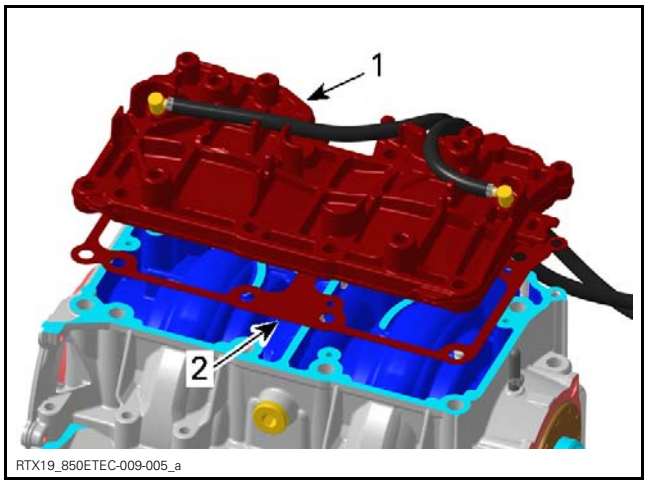
Remove M8 crankcase screws.



TYPICAL - BASE PLATE RETAINING SCREWS

Remove base plate and discard gasket.

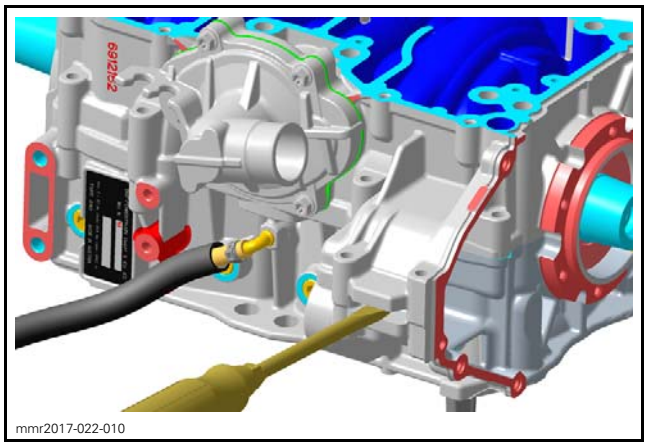
NOTICE **Whenever base plate is removed, crankcase must be opened, cleaned, and re-sealed.**



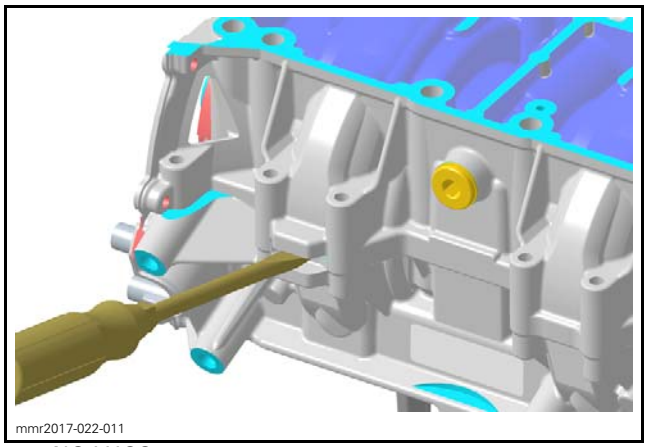
1. Base plate
2. Gasket (discard it)

Split crankcase.

NOTE: To prevent damage to crankcase mating surfaces, use prying lugs to "unstick" crankcase.

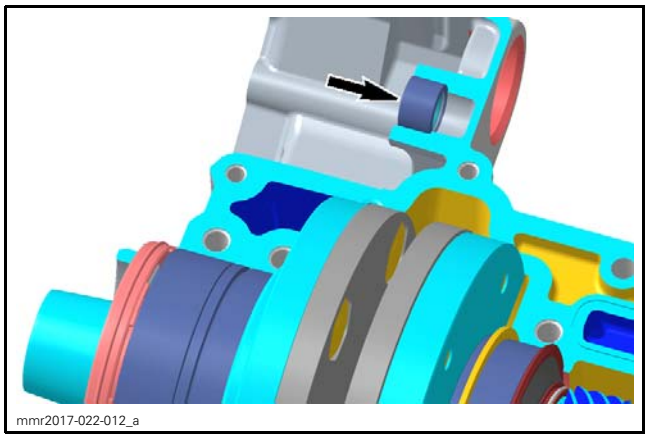


TYPICAL - PRYING LUGS

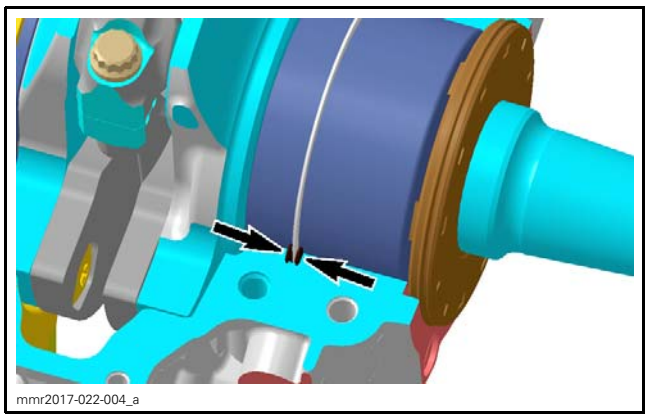


PRYING LUGS

Remove:
- Starter drive needle bearing
- Crankshaft assembly
- Shims.



STARTER DRIVE NEEDLE BEARING



SHIMS

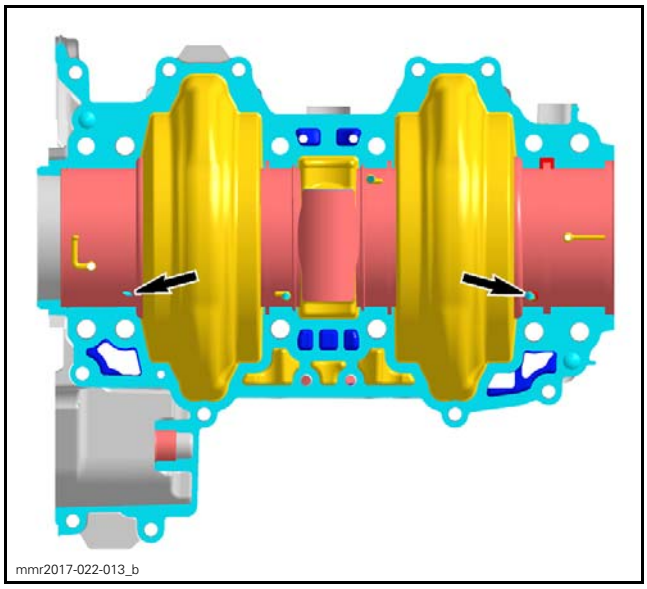
Cleaning the Crankcase and Base Plate

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

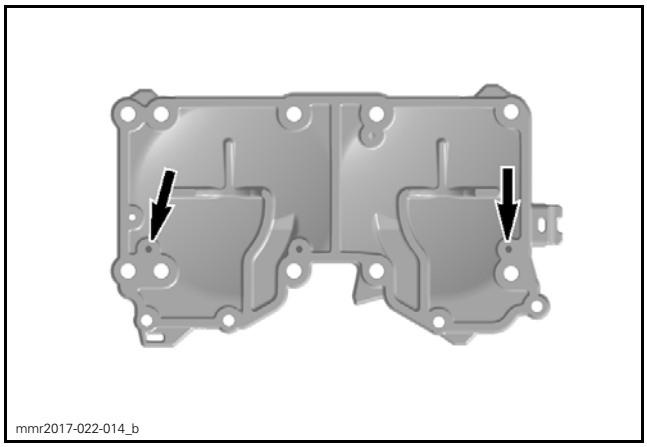
CRANKCASE CLEANING	
Service product	LOCTITE CHISEL (GASKET REMOVER) (P/N 413 708 500)

NOTICE **Never use a sharp object to remove sealant as score marks incurred are harmful to crankcase sealing.**

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



OIL BORES IN CRANKCASE LOWER PART



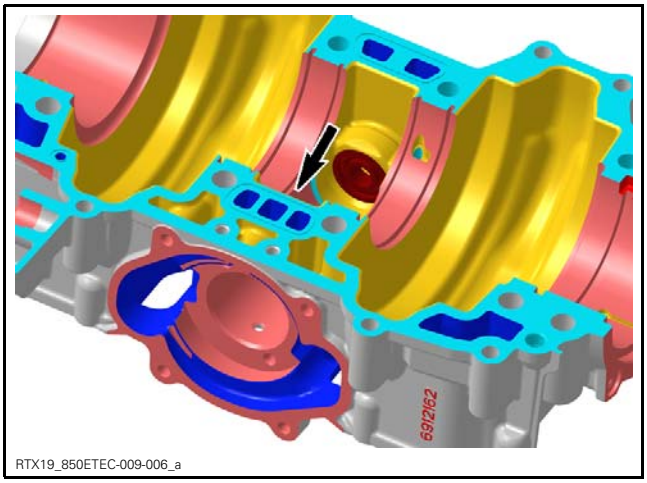
OIL BORES IN BASE PLATE

Inspecting the Crankcase and Base Plate

Check crankcase and base plate for cracks or other damages. Replace if necessary.

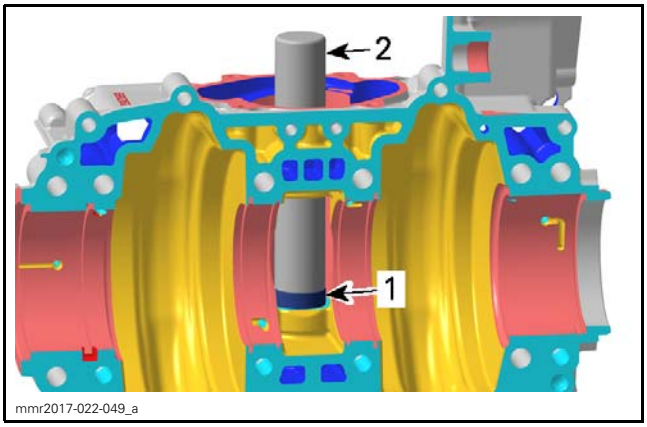
Water Pump Bearing Replacement

Use a suitable punch to push ball bearing out of crankcase.



Install **NEW** ball bearing.

REQUIRED TOOL	
WATER PUMP BEARING PUNCH (P/N 529 036 417)	



1. *Ball bearing*
2. *Water pump bearing punch*

Assembling the Crankcase

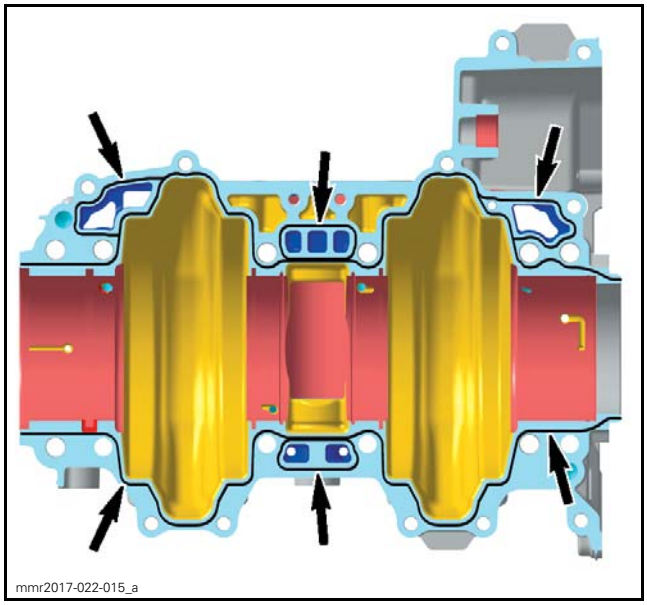
Install crankshaft in upper crankcase. See *CRANKSHAFT* for procedure.

Install needle bushing in crankcase upper with the writing showing to the outside.

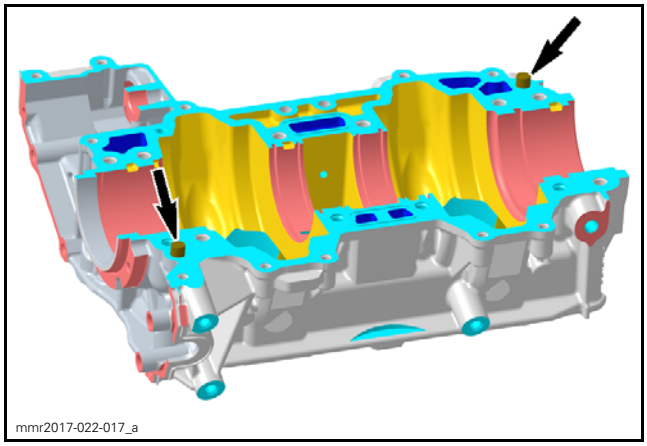
Apply sealant on lower crankcase as per following procedure.

CRANKCASE SEALANT	
Service product	LOCTITE 5910 (P/N 293 800 081)

NOTE: The total assembly sequence, including sealing compound application and crankcase torquing, must be performed within 10 minutes.



Ensure dowel pins are in their holes.



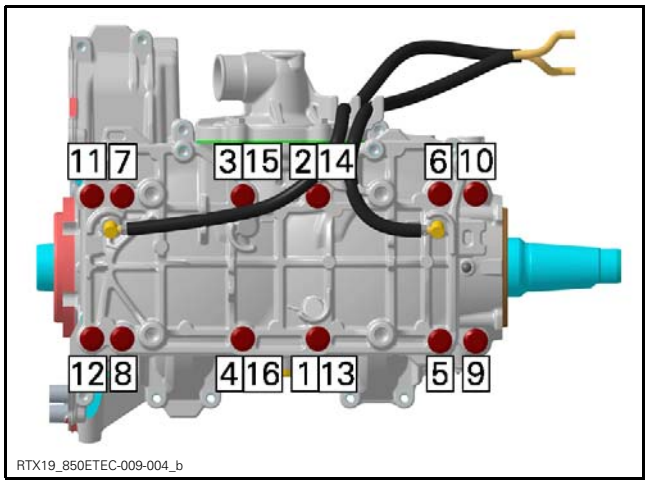
Assemble crankcase lower half.

Install base plate with **NEW** gasket.

Install crankcase screws.

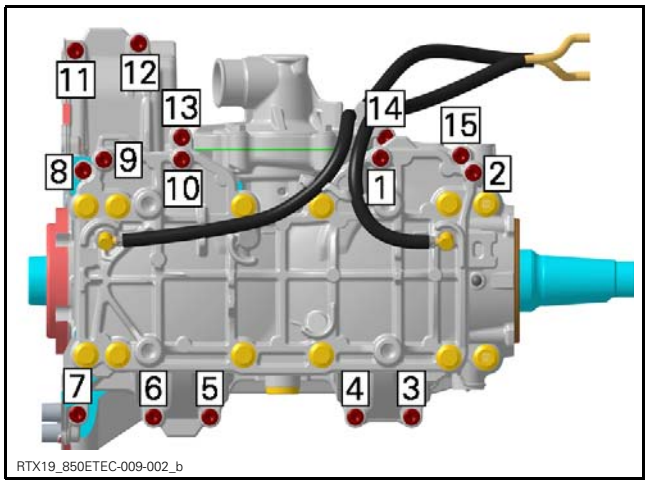
Tighten crankcase screws to specification as per illustrated sequence.

TIGHTENING TORQUE	
M8 Crankcase screws	29 N•m ± 2 N•m (21 lbf•ft ± 1 lbf•ft)

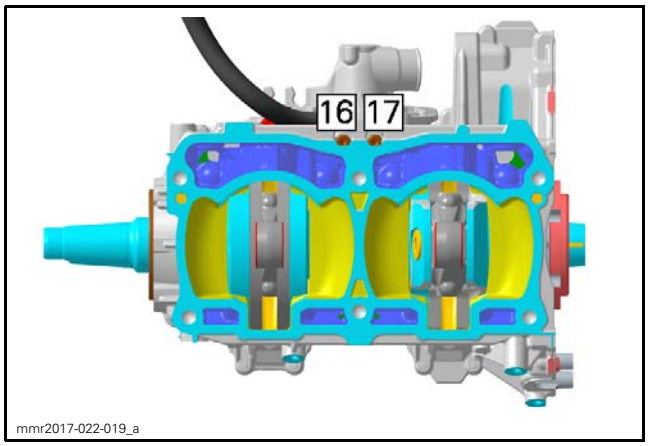


TYPICAL - TIGHTENING SEQUENCE - M8 CRANKCASE SCREWS

TIGHTENING TORQUE	
M6 Crankcase screws	11 N•m ± 0.8 N•m (97 lbf•**in** ± 7 lbf•**in**)



TYPICAL - TIGHTENING SEQUENCE - BOTTOM VIEW



TYPICAL - TIGHTENING SEQUENCE- M6 CRANKCASE SCREWS - TOP VIEW

Install PTO oil seal cover.

Tighten oil seal cover to specification.

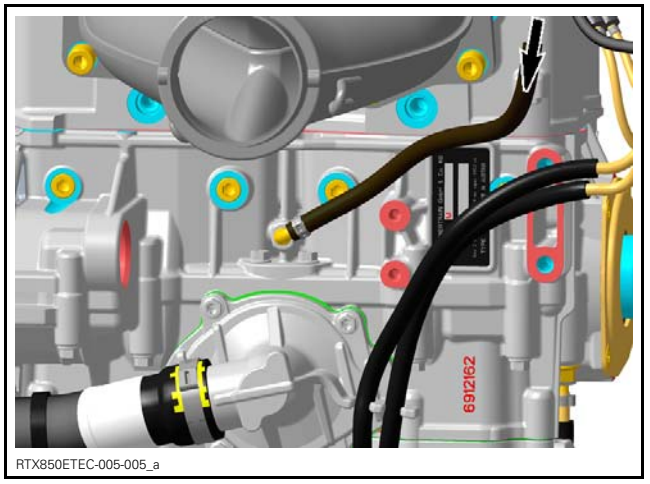
TIGHTENING TORQUE	
Oil seal cover screws	11 N•m ± 0.8 N•m (97 lbf•**in** ± 7 lbf•**in**)

NOTE: It is recommended to test engine cooling system for leaks after engine assembly, before installation in vehicle. Refer to *COOLING SYSTEM* subsection.

NOTE: It is recommended to always check the functionality of the check valves before installation in vehicle. Refer to *CHECK VALVES AND FITTINGS* in *LUBRICATION SYSTEM* subsection.

Using a syringe, fill the water pump gear chamber with injection oil.

CRANKSHAFT WORM GEAR LUBRICATION	
Service product	Injection oil
Quantity	50 ml (1.7 U.S. oz)



TYPICAL

CRANKSHAFT

Removing the Crankshaft

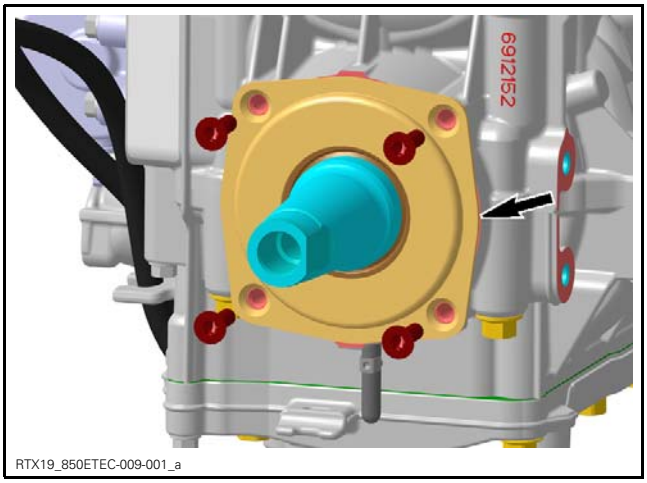
To remove crankshaft, use crankcase disassembly procedure.

Inspecting the Crankshaft

For crankshaft specifications refer to *TECHNICAL SPECIFICATIONS* subsection.

Crankshaft Deflection PTO side (Measuring in Crankcase)

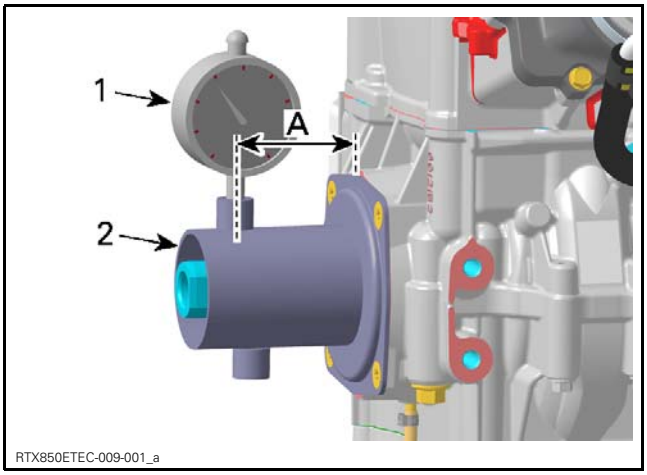
1. Remove PTO oil seal cover.



2. Install the dial gauge adapter.

NOTE: Ensure that the dial gauge tip is compressed at least for 2 mm (.079 in) (2 full rotations of the dial gauge needle).

REQUIRED TOOL
DIAL GAUGE ADAPTER (P/N 529 036 443)
Dial gauge



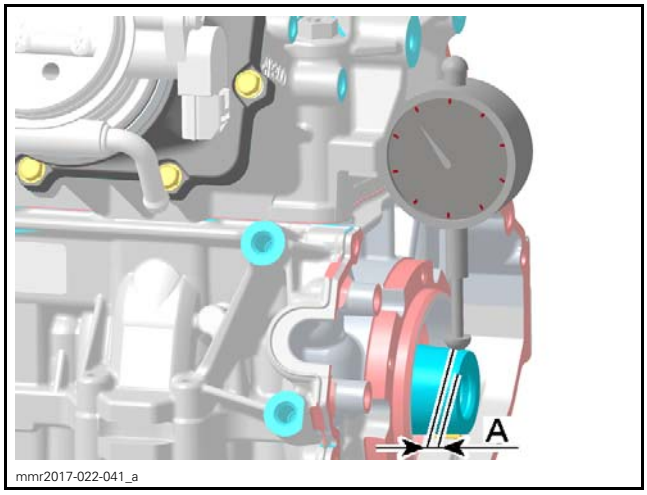
1. Dial gauge
2. Dial gauge adapter
A. 56 mm (2.2 in)

CRANKSHAFT DEFLECTION PTO SIDE	
SERVICE LIMIT	0.08 mm (.0031 in)

3. If deflection exceeds the specified tolerance, recheck deflection using V-shaped blocks to determine the defective part(s). See *CRANKSHAFT DEFLECTION (MEASURING ON BENCH)*.

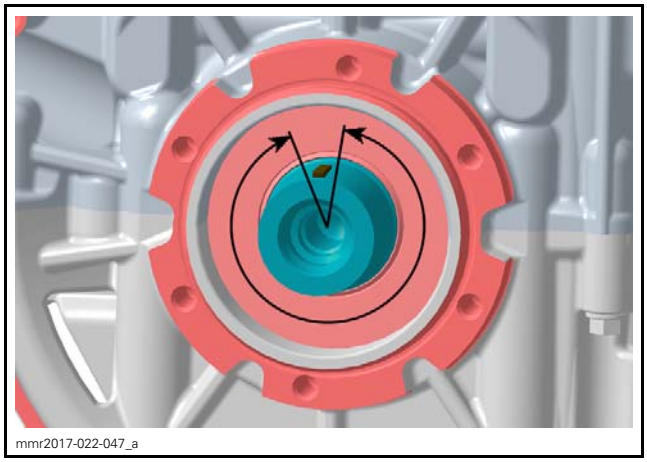
Crankshaft Deflection MAG side (Measuring in Crankcase)

REQUIRED TOOL
Magnetic-base dial gauge holder
Dial gauge



CRANKSHAFT MAG SIDE
A. 3 mm (.12 in)

1. Measure deflection circumferential excluding the woodruff key.

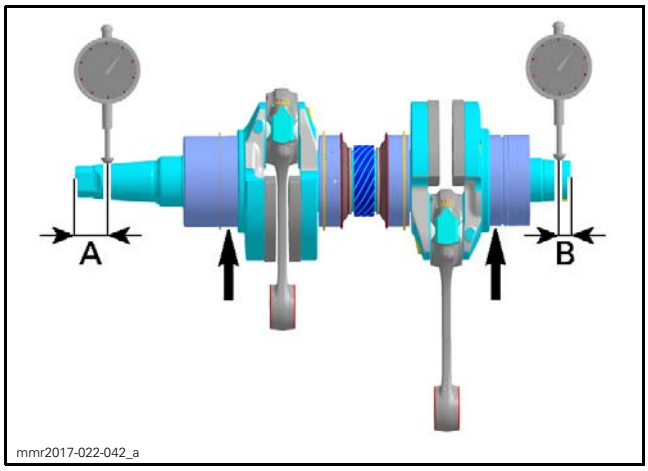


CRANKSHAFT DEFLECTION MAG SIDE	
SERVICE LIMIT	0.050 mm (.002 in)

2. If deflection exceeds the specified tolerance, recheck deflection using V-shaped blocks to determine the defective part(s). See *CRANKSHAFT DEFLECTION (MEASURING ON BENCH)*.

Crankshaft Deflection (Measuring on Bench)

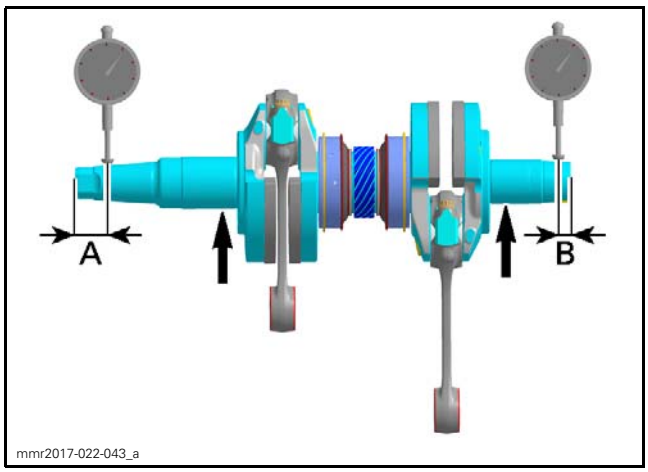
1. Once engine is disassembled, check crankshaft deflection on V-shaped blocks.



TYPICAL — V-SHAPED BLOCKS POSITION WITH BEARINGS
A. 17 mm (.67 in)
B. 3 mm (.12 in)

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

2. If deflection exceeds the specified tolerance, it can be worn bearings or a bent crankshaft.
3. Remove crankshaft bearings and check deflection again on V-shaped blocks to determine the defective part(s).



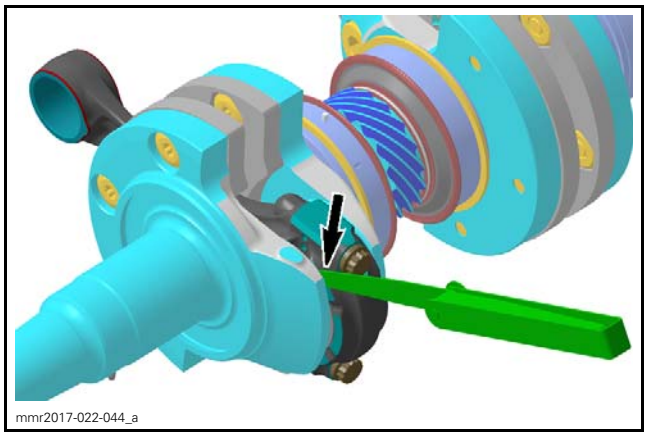
TYPICAL — V-SHAPED BLOCKS POSITION WITHOUT BEARINGS
A. 17 mm (.67 in)
B. 3 mm (.12 in)

4. If the deflection exceeds the specified tolerance, replace crankshaft.

Connecting Rod Big End Axial Play

1. Measure distance between connecting rod and crankshaft counterweight.

REQUIRED TOOL
Feeler gauge



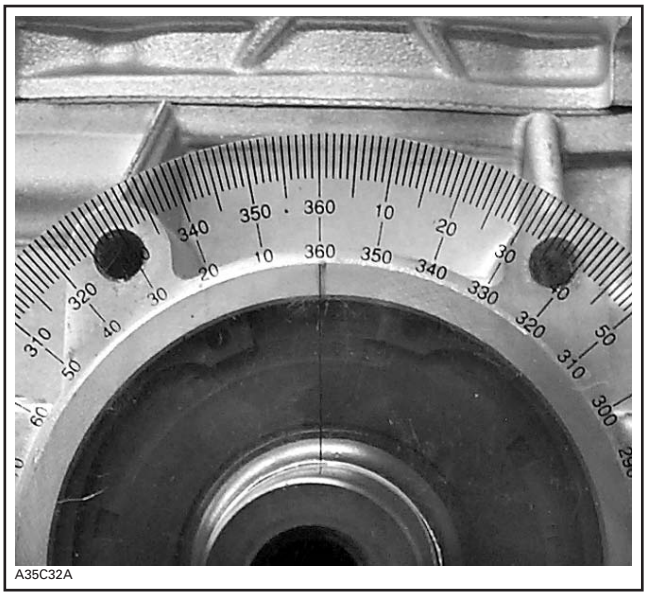
CONNECTING ROD BIG END AXIAL PLAY	
New	0.152 mm to 0.352 mm (.006 in to .0139 in)

2. If the distance exceeds specified tolerance, replace crankshaft.

Crankshaft Alignment

1. Remove injectors. Refer to *E-TEC DIRECT FUEL INJECTION* subsection.
2. Bring MAG piston at top dead center. Refer to *IGNITION SYSTEM* subsection.
3. Scribe a mark on crankcase (see illustration).
4. Install a degree wheel on crankshaft end so that 360° mark aligns with the mark on crankcase. Do not rotate crankshaft.

REQUIRED TOOL
DEGREE WHEEL (P/N 529 035 607)



5. Remove dial indicator and install it in spark plug hole on PTO side.
6. Bring PTO piston to top dead center. Degree wheel must rotate with crankshaft.
7. Interval between cylinders must be 180° ± 0.5.
8. Any other reading indicates a misaligned (twisted) crankshaft.

Removing the Crankshaft Bearing

NOTE: 10 minutes is required to heat up a new bearing for its installation, To save time, it is recommended to start the heating process prior to bearing removal operation. See procedure further.

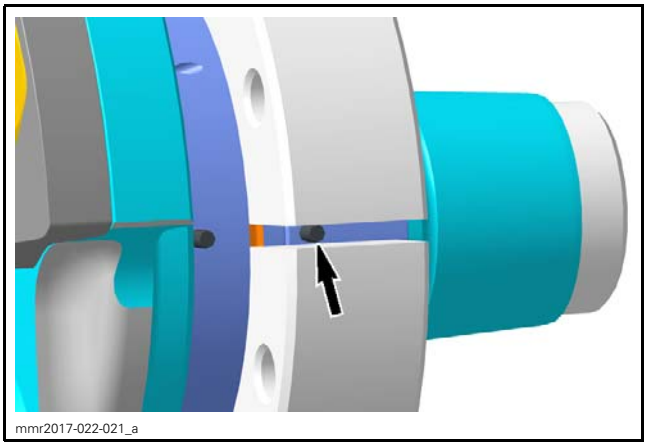
To remove MAG side bearings from crankshaft, install proper half rings and puller ring on the outer bearing race.

The roller bearing on PTO side has a sliding seat and can be removed without a tool.

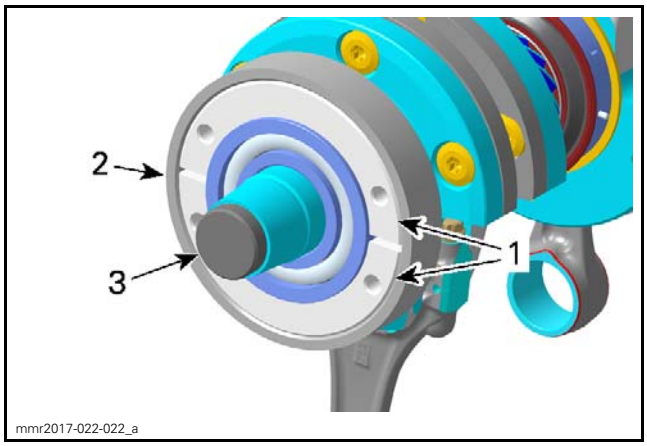
NOTE: Position tools in the groove of the inner bearing and pull out both bearings together.

REQUIRED TOOL	
HALF-RING (P/N 529 036 414)	
PULLER RING (P/N 420 977 490)	
CRANKSHAFT PROTECTOR (P/N 529 036 434)	

Ensure to position bearing pin between half ring gap.



MAG SIDE

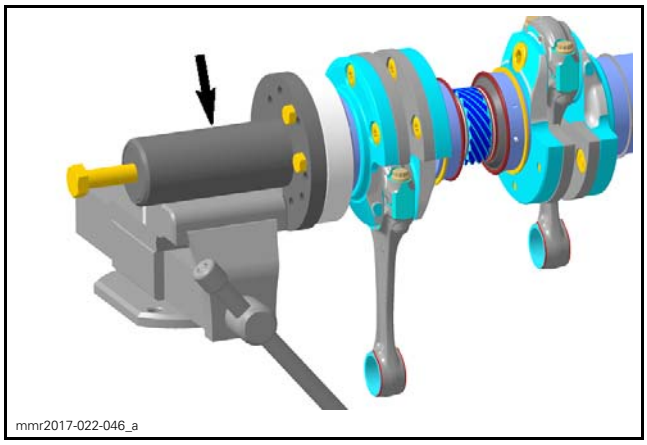


MAG SIDE
1. *Half rings*
2. *Puller ring*
3. *Crankshaft protector*

Install bearing puller on the half rings.

REQUIRED TOOL	
CRANKSHAFT BEARING PULLER (P/N 529 036 004)	

Secure the bearing puller in a vise at its rib.



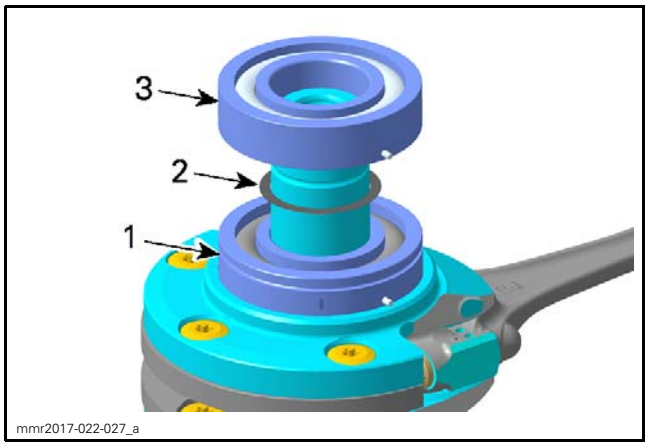
TYPICAL - BEARING PULLER SECURED IN THE VISE

NOTICE **Never use any air impact tool for tightening the puller bolt. Lubricate the bolt with LUB. & ANTI-CORROSIVE (P/N 779168) to avoid damaging the threads.**

Screw in the puller bolt until the bearings come out.

During bearing removal take care not to lose the distance shim installed between inner and outer bearing.

Discard ball bearings.

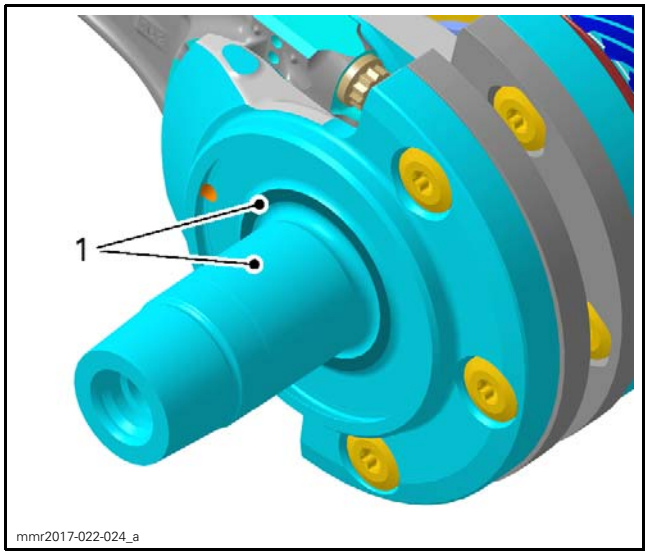


MAG SIDE
1. *Inner bearing*
2. *Distance shim*
3. *Outer bearing*

Installing the Crankshaft Bearing

Inspect crankshaft ends for damage.

Clean crankshaft ends with sand paper no. 400 to remove possible seal marks and debris.



Remove all residue.

CRANKSHAFT ENDS CLEANING	
Service product	CLUTCH AND PULLEY FLANGE CLEANER PRO S1 (P/N 779244)

Heating the Bearing

Heat up the bearing(s) to ease installation.

REQUIRED TOOL	
BEARING HEATER (P/N 529 035 969)	

NOTICE Bearing(s) should not be heated to more than 80°C (176°F). Do not heat bearing(s) with direct flame, or with a heat gun or soaked in a heated oil bath. Inappropriate bearing(s) heating may result in cage failure.

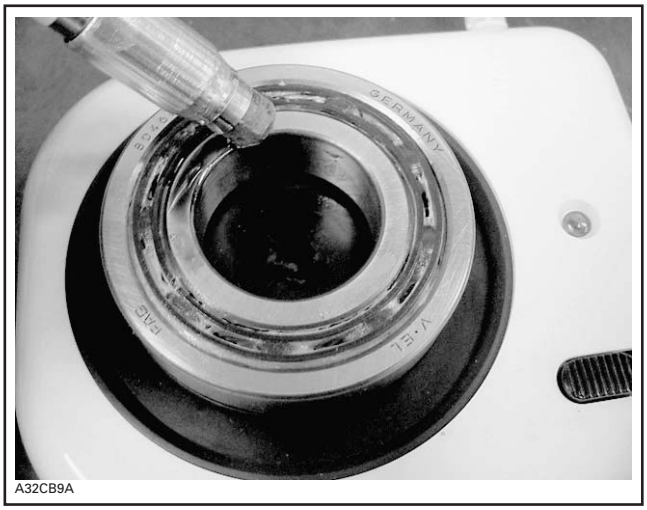
For even heat distribution, turn bearing several times during heating process.

NOTE: Two bearings can be heated at the same time on one bearing heater.

1. Bearings

Probe the side of the inner race of the bearing with a temperature indicator stick. Stick will liquefy when the bearing reaches the proper temperature.

REQUIRED TOOL	
TEMPERATURE INDICATOR STICK (P/N 529 035 970)	



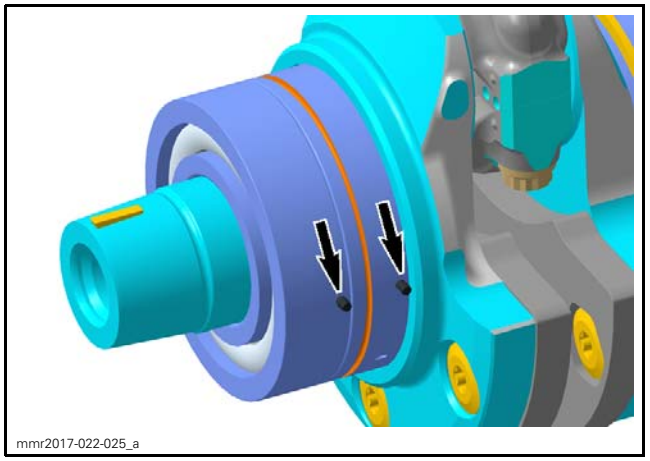
⚠ WARNING

Do not touch heated bearing with bare hands. Always wear heat resisting gloves before handling the heated bearing(s).

NOTICE Never reinstall a bearing that has been removed.

MAG Side Bearings

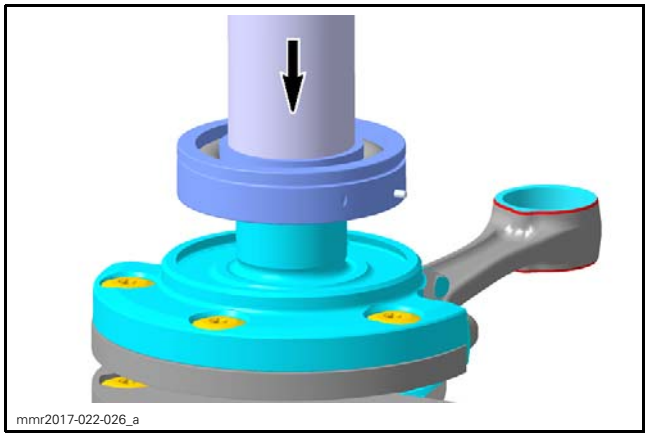
Install MAG bearings on crankshaft so that locating pins will be positioned as shown.



MAG SIDE

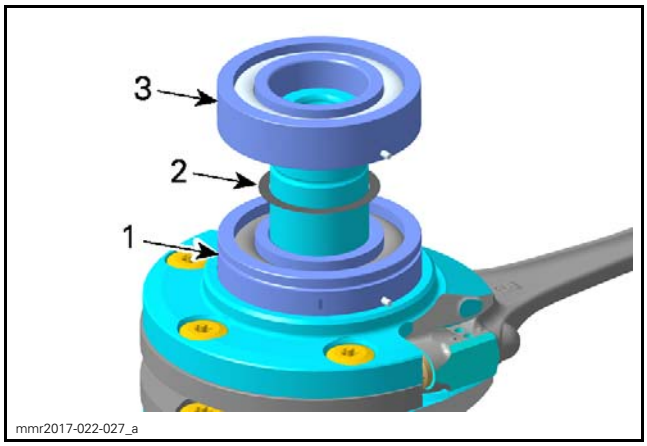
Slide the inner MAG bearing until it bottoms on crankshaft shoulder.

NOTE: Heated bearing should slide easily onto the crankshaft. If required, push with a steel tube on the inner race of the bearing.



Put distance shim on inner MAG bearing.

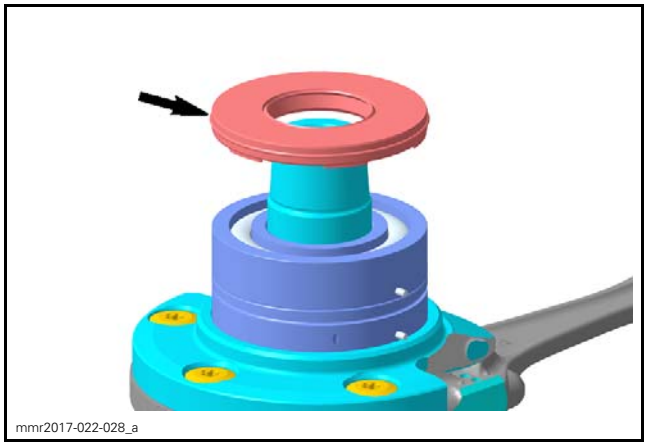
Slide the outer bearing until it sits on distance shim.



MAG SIDE
1. *Inner bearing*
2. *Distance shim*
3. *Outer bearing*

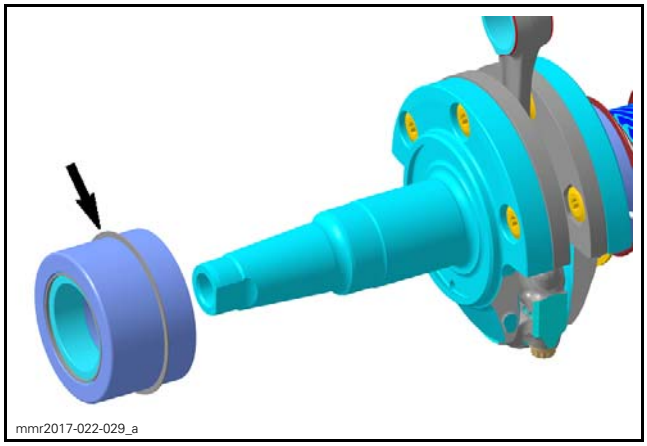
Lubricate oil seal sealing lip and slide it on crankshaft until it sits on outer bearing.

SEALING LIP LUBRICATION	
Service product	PETAMO GREASE GHY 133N (P/N 420 899 271)

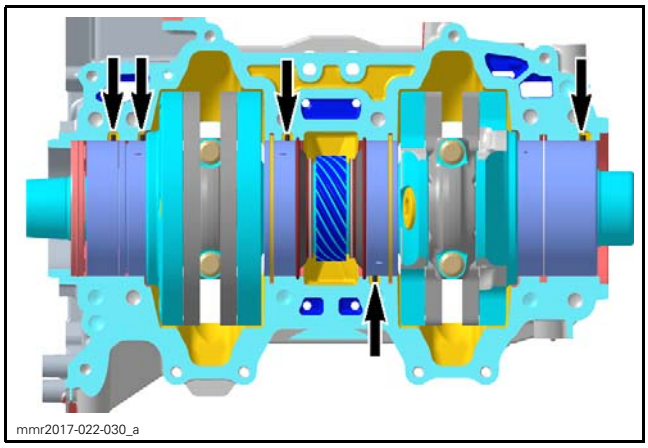


Installing the Crankshaft

1. Slide cylinder roller bearing on crankshaft journal PTO side.



2. Position locating pins in their recess as illustrated.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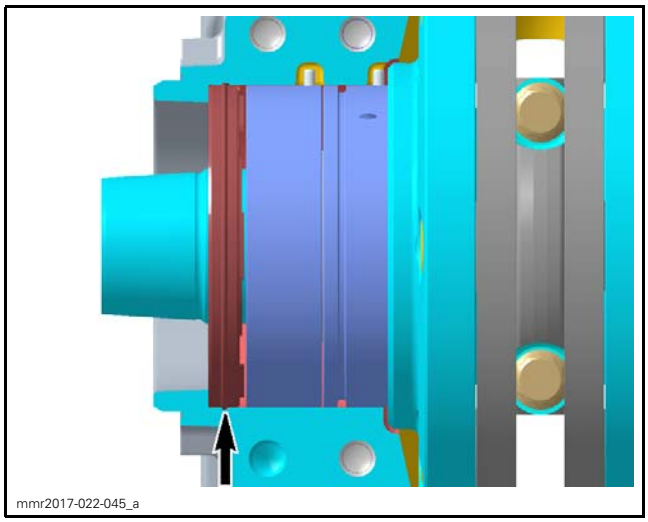
3. Pay attention to properly locate MAG seal in its groove.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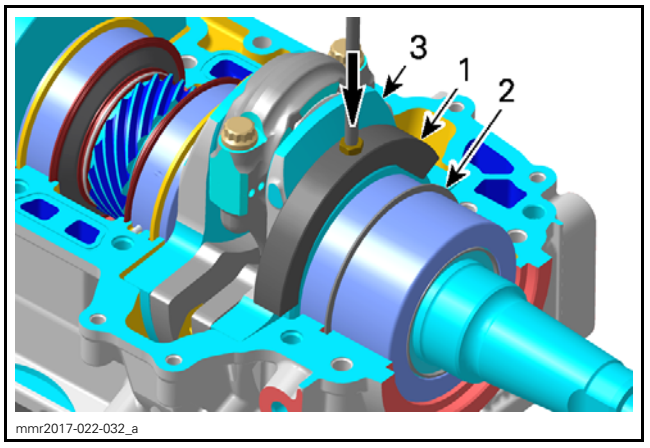
4. Place distance gauge between distance ring and crank web PTO.

REQUIRED TOOL	
DISTANCE GAUGE (P/N 529 036 415)	



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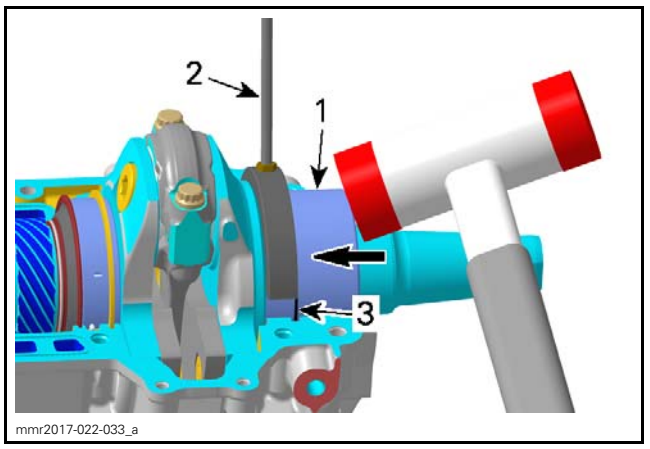
1. *Distance gauge*
2. *Distance ring*
3. *Crank web PTO*

5. Tap the cylinder roller bearing with a plastic hammer until the distance gauge is in contact with the distance ring and crank web.



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1. *Roller bearing*
2. *Distance gauge*
3. *Distance ring*

6. Perform shimming procedure:

NOTICE To achieve proper adjustment observe following rules:

- A package of 3 shims must be installed.
- The complete package of the shims must achieve 3 mm (.12 in).
- Maximum 2 shims must be installed at any side beside the distance ring.

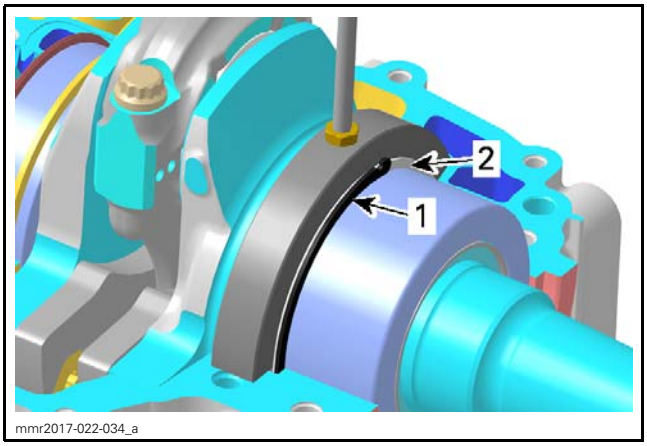
AVAILABLE SHIMS	
SHIM NUMBER	SHIM THICKNESS
50	0.50 mm (.02 in)
75	0.75 mm (.03 in)

AVAILABLE SHIMS	
SHIM NUMBER	SHIM THICKNESS
100	1.00 mm (.039 in)
125	1.25 mm (.049 in)
150	1.50 mm (.059 in)

6.1 Try to install the thickest shimming right hand side of the distance ring.

NOTE: If the thickest shimming does not fit, try to install the next thinner shimming.

SHIMMING	
RIGHT HAND SIDE OF THE DISTANCE RING	LEFT HAND SIDE OF THE DISTANCE RING
100 + 150	50
100 + 125	75
50 + 150	100
75 + 100	125
150	50 + 100
125	75 + 100
100	50 + 150
75	100 + 125
50	100 + 150



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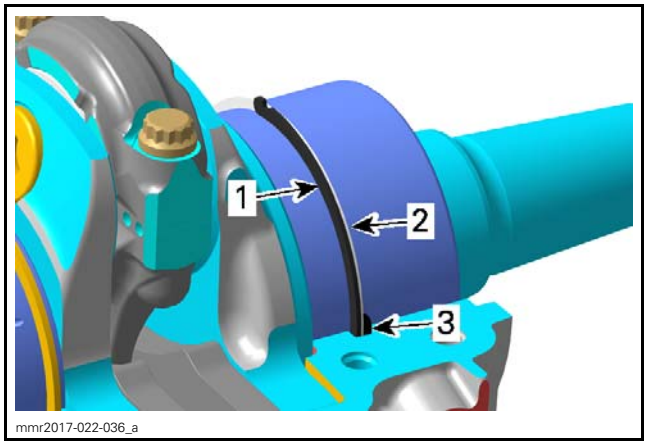
1. Shimming (right hand)
2. Distance ring

6.2 Remove the distance gauge carefully.

6.3 Install the proper shimming at left hand side of the distance ring.



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1. Shimming (left hand)
2. Distance ring
3. Shimming (right hand)

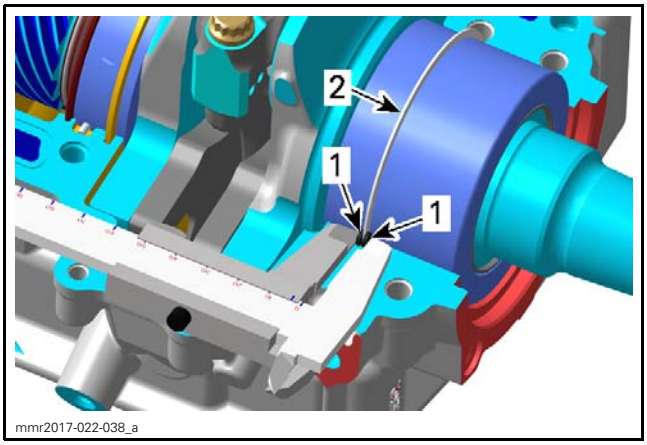
EXAMPLE:

If right hand side of the distance ring shimming 50 + 150 is installed, on the left hand side the shim 100 must be installed.

SHIMMING	
RIGHT HAND SIDE OF THE DISTANCE RING	LEFT HAND SIDE OF THE DISTANCE RING
100 + 150	50
100 + 125	75
50 + 150	100
75 + 100	125
150	50 + 100
125	75 + 100
100	50 + 150
75	100 + 125
50	100 + 150

7. Measure the width of the complete package (shims + distance ring).

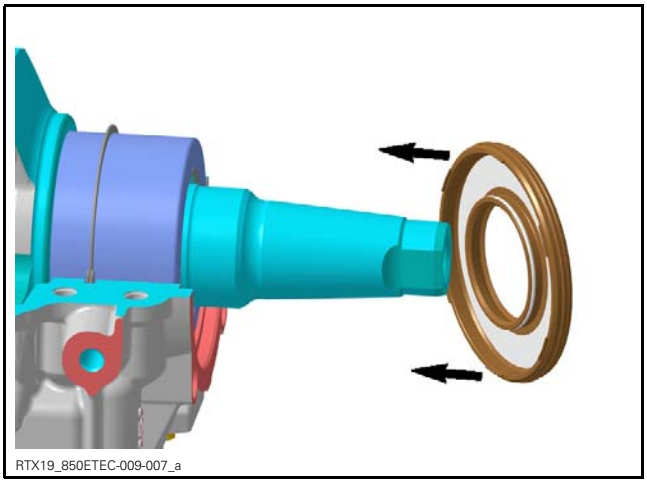
MINIMUM WIDTH OF THE PACKAGE (SHIMS + DISTANCE RING)
3.60 mm to 3.94 mm (.14 in to .16 in)



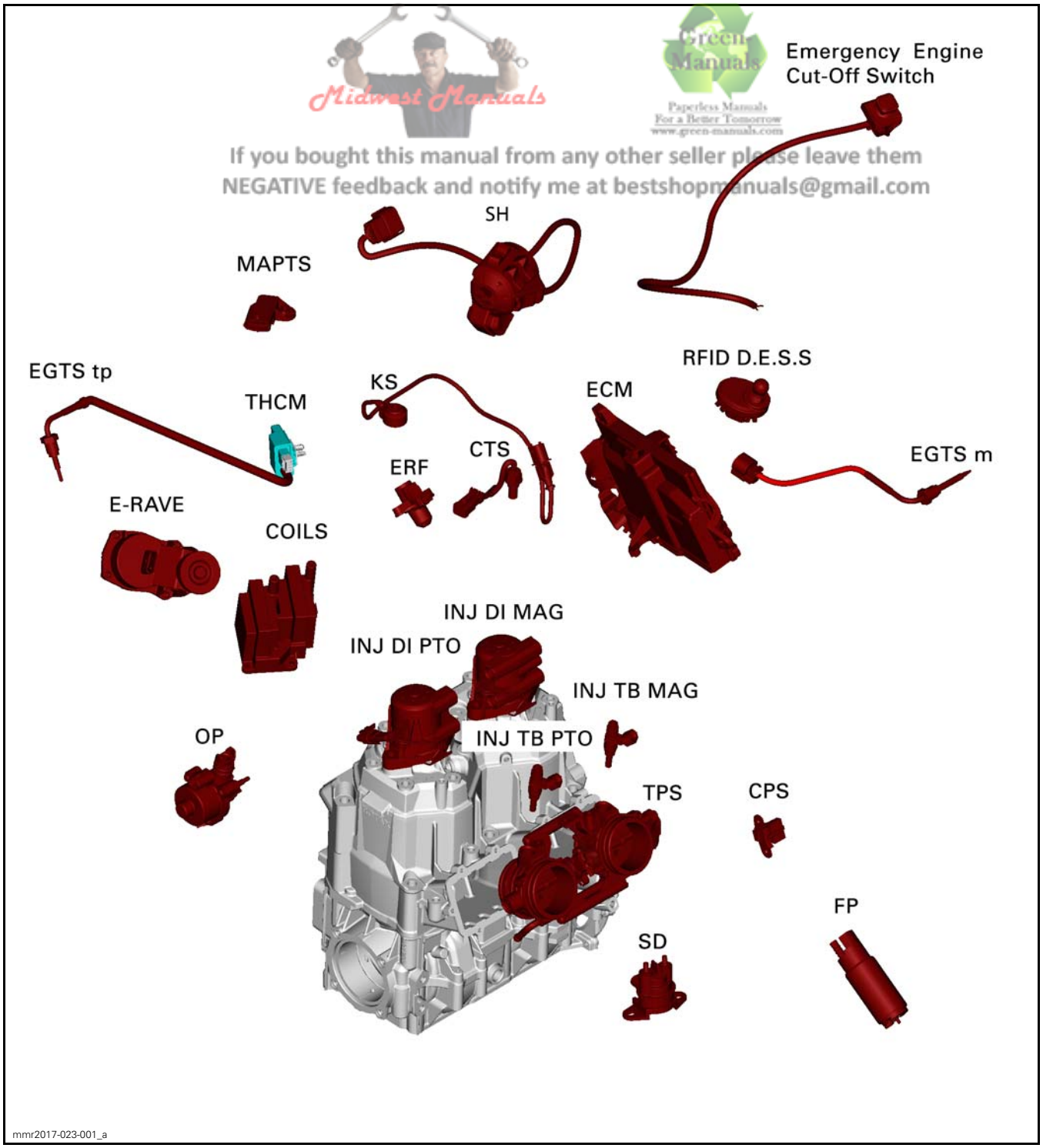
1. *Shims*
2. *Distance ring*

8. Lubricate oil seal sealing lip and slide it on crankshaft until it sits on outer bearing.

SEALING LIP LUBRICATION	
Service product	PETAMO GREASE GHY 133N (P/N 420 899 271)



ENGINE MANAGEMENT SYSTEM (EMS)



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GENERAL

ACRONYM	DEFINITION
SH	Left hand multi-function switch
COILS	Ignition Coils
CPS	Crankshaft Position Sensor
CTS	Coolant Temperature Sensor
RFID DESS	Digitally Encoded Security System
ECM	Engine Control Module
EGTSm	Exhaust Gas Temperature Sensor muffler
EGTStp	Exhaust Gas Temperature Sensor tuned pipe
FP	Fuel Pump
INJ DI MAG	E-TEC Direct Injector (Mag Side)
INJ DI PTO	E-TEC Direct Injector (PTO Side)
INJ TB MAG	Throttle body Injector (Mag Side)
INJ TB PTO	Throttle body Injector (PTO Side)
KS	Knock Sensor
MAPTS	Manifold (intake) Air Pressure / Temperature Sensor
OP	Oil Pump
RER	Rotax Electronic Reverse
ERF	Rave Position Sensor
E-RAVE	Rave Actuator
SD	Starter Solenoid
TPS	Throttle Position Sensor
THCM	Thermocouple Module

SYSTEM DESCRIPTION

The Engine Control Module (ECM) ensures a high power output with a clean combustion with practically no exhaust smoke.

There are 8 main systems that are controlled by the ECM:

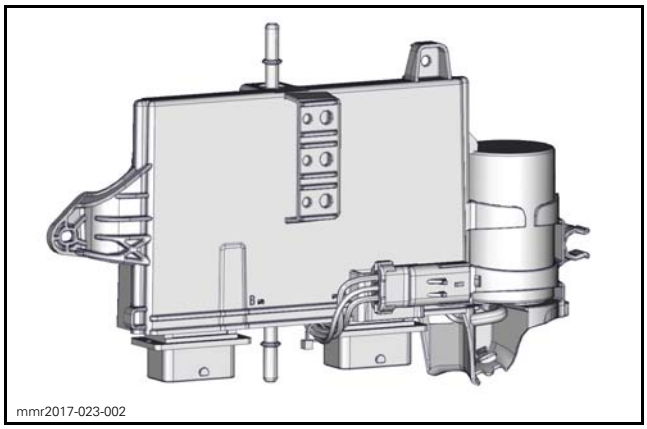
1. E-TEC Direct fuel injection
2. Throttle body injection
3. Ignition system
4. Starting system
5. Rotax electronic reverse (RER)
6. Digitally encoded security system (D.E.S.S.)
7. Lubrication system
8. 3D RAVE
9. Fuel pump
10. Electrical accessories.

The ECM features a monitoring system that self-diagnoses its electronic components. For more information, refer to *DIAGNOSTIC FAULT CODES* subsection.

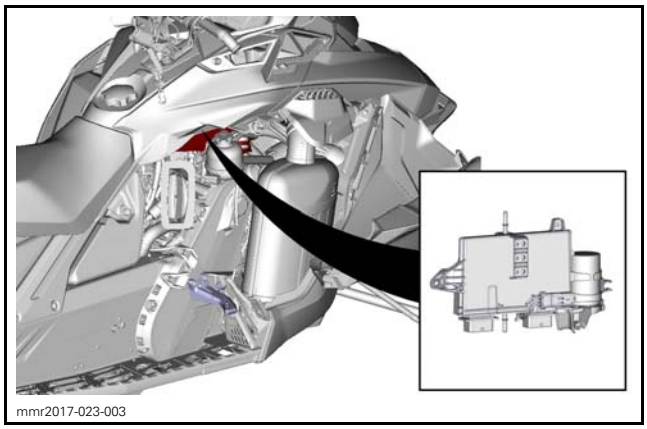
Electrical power distribution is also controlled by the ECM. Refer to *POWER DISTRIBUTION* subsection.

Engine Control Module (ECM)

The ECM reads the inputs and makes computations by comparing them to pre-determined parameters, and sends the required control signals to the outputs to ensure proper engine management.



ECM

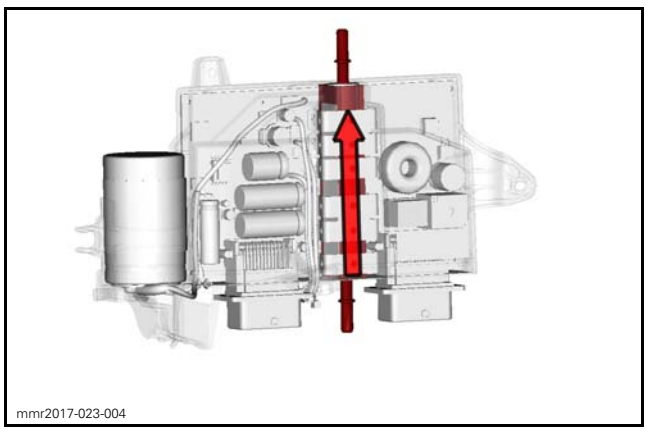


The ECM features a permanent memory that will store fault codes, customer information and other engine information when the engine is stopped.

ECM Cooling

Since the ECM manages all the vehicle's power needs as it incorporates the voltage regulator/ rectifier and other power components, a lot of heat needs to be dissipated.

To ensure adequate heat dissipation, a constant fresh fuel flow from the fuel pump is used to cool down the ECM.



ECM COOLING (FUEL FLOW DIRECTION)

SYSTEM FEATURES

Throttle Protection

If the throttle is not completely closed during engine startup, engine RPM will be limited to idle speed by the ECM.

To revert to normal operation, release the throttle completely and then depress it again.

Warm-Up Protection

The engine's RPM is limited until the desired engine and injection oil temperatures are obtained.

WARM-UP PROTECTION	ENGINE WARM-UP TEMPERATURE
850 E-TEC	20°C to 30°C (68°F to 86°F)

Engine Warm-Up

During the engine warm-up period, the RAVE valves will be limited to the MID position which, limits the engine to a maximum of 7500 ± 200 RPM.

Injection Oil Warm-Up

The injection oil warm-up period is based on oil viscosity.

This is accomplished by measuring the time it takes for the electric oil pump to complete a stroke (oil pump switch signal) from the time at which is was commanded. This provides an indication of the oil viscosity, and therefore temperature and flow capacity.

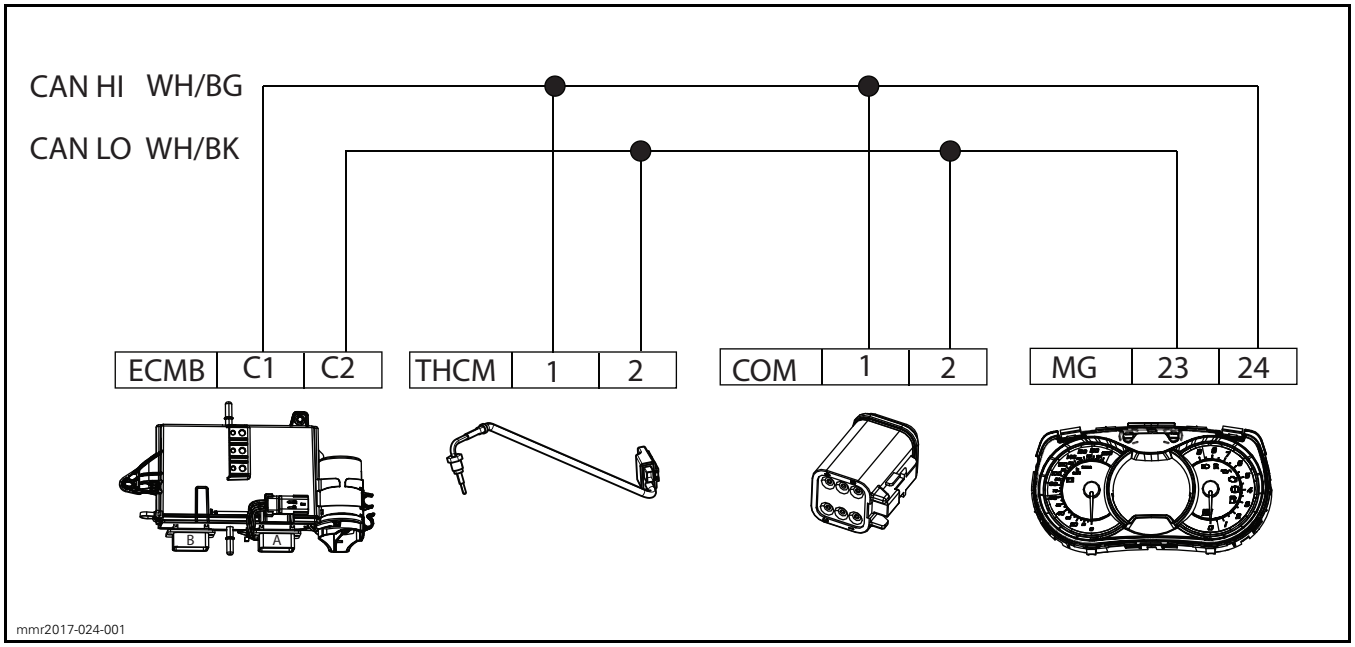
This function will limit engine speed to 5500 - 7500 RPM depending on detected oil viscosity.

This function may remain active for up to 10 - 15 minutes.

Automated Engine Oil Fogging (E-TEC)

An automated engine oil fogging has been implemented to automatically inject the required oil to protect the engine during vehicle storage. Refer to *STORAGE PROCEDURE* subsection for details.

COMMUNICATION PROTOCOLS



COM (Diagnostic connector)
ECM (Engine control module)
MG (Multifunction gauge)
THCM (Thermocouple module)
WH/BG (White/beige)
WH/BK (White/black)

GENERAL

CONTROLLER AREA NETWORK (CAN)

The CAN protocol is an ISO standard for serial data communication.

The ECM forms a network with other components linked with the CAN bus.

The CAN bus (or CAN lines) consist of a pair of wires (WHITE/BEIGE and WHITE/BLACK) that connect every component to each other. The electronic modules are in constant communication within the network.

There are resistors on the CAN lines in the ECM, multifunction gauge and the thermocouple module.

CAN network resistance can be measured from the COM connector pins.

TROUBLESHOOTING

CAN COMMUNICATION PROBLEMS

1. Measure CAN network resistance from the COM connector pins.
2. Disconnect modules one by one and observe change in network resistance to find network communication fault.

NOTE: Disconnect THCM last.

CAN NETWORK RESISTANCE	
CONDITION	SPECIFICATION ± 10%
Good network or THCM fault	60 Ω
ECM or MG network fault	120 Ω
ECM and MG network fault	above 1 MΩ
ECM, MG, and THCM network fault	O.L.
1 MΩ = 1,000,000Ω	

If the resistance does not vary when a module is unplugged ensure wiring harness and pins are in good condition before replacing a module.

NOTE: There is no resistor in the COM connector.

COMMUNICATION TOOLS AND B.U.D.S.

SERVICE TOOLS

Description	Part Number	Page
12 V BATTERY SUPPLY CABLE	529 035 997	1
DIAGNOSTIC CABLE	710 000 851	1
MPI-2 INTERFACE CARD	529 036 018	1
MPI-3 INTERFACE CARD	529 036 353	1
POWER INTERFACE	515 177 223	1

GENERAL

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

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

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)	
POWER INTERFACE (P/N 515 177 223)	
12 V BATTERY SUPPLY CABLE (P/N 529 035 997)	
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.

Power Interface

The power interface and power supply cable allows the connection of a fully charged external battery to provide stable voltage to the unit and BUDS2.

Stable voltage is essential to prevent update crashes.

Do not use a charger on the battery (unit or external) during software updates.

The power interface and power supply cable connected to external battery can be used for extended diagnostic time.

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TYPICAL

The power interface with or without the power supply cable will keep the unit powered even if the ignition switch is turned off or the D.E.S.S. key is removed.

The power interface has a fuse protected voltmeter included and an extra fuse to protect from polarity inversion of the power supply cable.

TROUBLESHOOTING

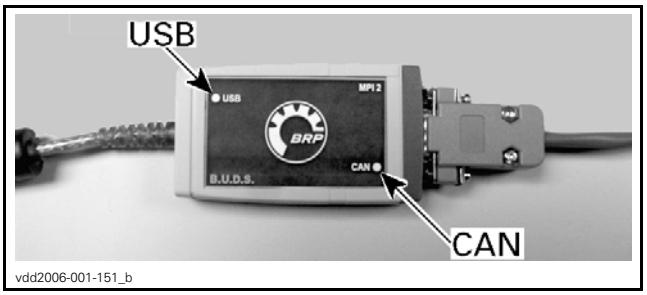
Refer to the BRP BUDS chart to ensure you are using the appropriate hardware and tools.

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.



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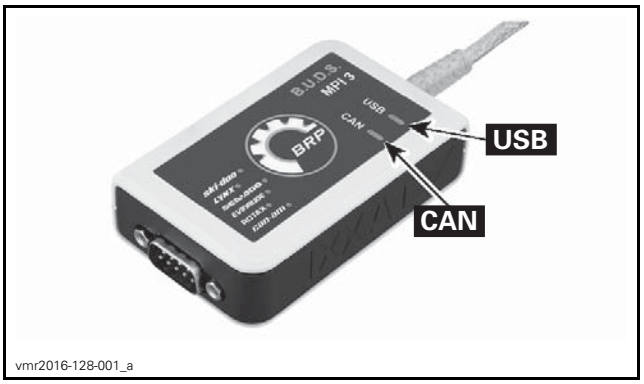
MPI-2 CARD



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MPI-3 CARD

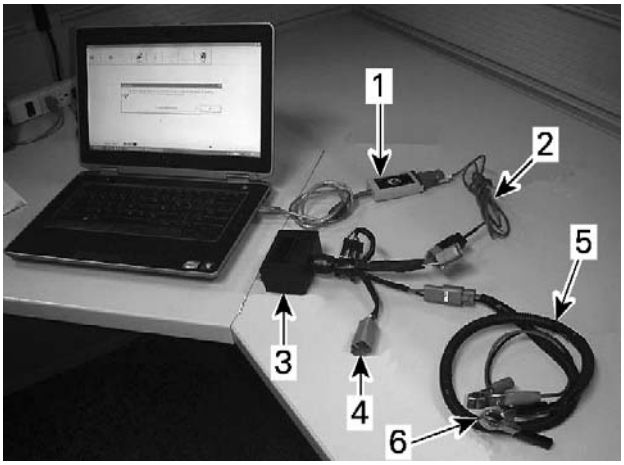
Prerequisite for USB Communication:

– PC Computer turned ON
– MPI connected to PC computer.

COMMUNICATION PROBLEM (USB)	
STATUS	WHAT TO DO
USB Light is OFF	– Check USB connection between MPI-2 and PC computer. – Check USB operation on PC 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 connected to diagnostic connector.
2. The tether cord cap (D.E.S.S. key) is installed on the engine cut-off switch and pull the emergency stop switch.
3. B.U.D.S. started and logged.
4. ECM is powered.



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1. *MPI Interface card*
2. *Diagnostic cable*
3. *Power interface*
4. *To vehicle diagnostic connector*
5. *12 V battery supply cable*
6. *To 12 V battery*

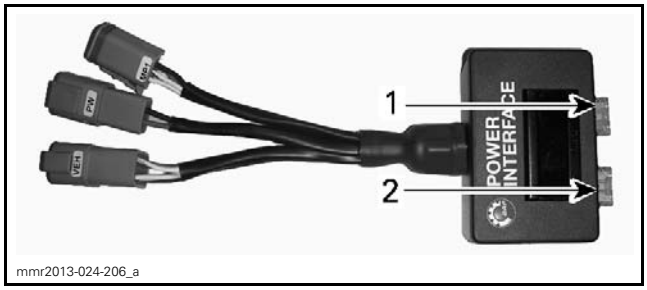
NOTE: The battery supply cable is only necessary on models without a battery.

COMMUNICATION PROBLEM (CAN)	
STATUS	WHAT TO DO
CAN Light is OFF	– B.U.D.S. does not communicate with the vehicle. – Check connections from computer to vehicle. – Check if B.U.D.S. 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 and pull the emergency stop switch.
CAN Light is RED	This occurs when B.U.D.S. looses 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 and pull the emergency stop switch.
CAN Light is GREEN	– Connections are GOOD. B.U.D.S. communicates normally with the vehicle.

Power Interface Test

When the power interface is connected to the vehicle diagnostic connector and the emergency stop switch is pulled, the multifunction gauge and the headlight should turn on. If any test failed, check the following and repair or replace power interface.

1. Set the emergency stop switch to run position.
2. Power interface fuses.



1. Fuse 1
2. Fuse 2

3. External battery voltage should be displayed on Power interface (primary voltage if engine running).
   3.1 Ensure battery charge is high enough to keep the vehicle ON for the duration of the maintenance.

NOTE: This is especially IMPORTANT if you are updating vehicle software. In case of doubt, charge battery for at least 15 minutes; disconnect charger prior to updating software.

DIAGNOSTIC AND FAULT CODES

GENERAL

MONITORING SYSTEM

The ECM features a monitoring system that self-diagnose its electronic components.

When a predefined condition (engine overheat for example) or a fault occurs, the ECM sends a signal to the multifunction gauge and/or audible signals to a beeper to inform you of this particular condition.

The ECM monitors the following functions and components.

COMPONENT
ECM, TPS, CTS, CPS, KS, RAVE valve solenoids, MAPTS, RPS, ignition coils, fuel injectors and THCM (EGTSm and EGTStp)
12 volts under/over voltage 60 volts under/over voltage
D.E.S.S.
RER
Low oil level, electronic oil injection pump
Oil temperature (end of piston stroke feedback from electronic oil injection pump)
Engine RPM
CAN
Fuel pump

Limp Home Mode

The ECM may automatically set default parameters to ensure the adequate operation of the vehicle if a component of the engine management system is not operating properly.

NOTE: Sensor failures will not automatically result in limp home mode. The appropriate fault code will turn on and in some cases the beeper will sound.

The engine RPM may be limited if some critical components fail. In this case, releasing the throttle and letting the engine return to idle speed may allow normal operation to come back. If it does not, try removing and reinstalling the tether cord cap (D.E.S.S. key) on the engine cut-off switch.

These performance-reduced modes allow the rider to continue on to seek help, or return home, which would otherwise not be possible.

ECM ACTION	CAUSE
Engine is gradually stopped. Continuous fast short beeps and a shutdown message is displayed in multifunction gauge until shutdown.	Fuel pump wiring short circuit to ground or open circuit.
	Fuel pump current requirement is too high.
	Engine idle overheat protection: – Engine idled more than 5 seconds after engine temperature increased above 95°C (203°F). – Engine idled more than 5 minutes after engine temperature increased above 37°C (99°F).
Engine speed is limited to 2500 RPM.	D.E.S.S. key is not recognized by the ECM. The antitheft system is active. RAVE valves are kept at closed position.
Engine speed is limited to 5500 RPM (RAVE valves are kept closed).	Oil injection pump wiring shorted to ground or open circuit.
	Low voltage in the 55 Vdc system. Voltage dropped by 5 V.
	ECM overheat (85°C (185°F)). Engine overheat (100°C (212°F) and above).
	Exhaust gas temperature too high (800°C (1,472°F) and above).
	High engine detonation.
Engine speed is limited to 7000 RPM.	Max. RPM allowed to the engine in reverse. RAVE valves are kept closed.
Engine speed is limited (Variable limit)	Max. RPM allowed varies when engine is cold, according to oil viscosity
Engine speed is limited to 8600 RPM.	Maximum engine RPM allowed.

Pilot Lamps and Beep Codes

Warning lights in the multifunction gauge and/or a beeper provide signals as to a vehicle operation feedback, or to indicate a problem.

A pilot lamp can flash alone or in combination with another lamp.

Beeper codes will be heard and messages (depending on gauge model) will be displayed to attract your attention and inform you of the situation.

DIAGNOSTIC FAULT CODES (DTC)

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 BUDS2 software. This will properly reset their states.

How to Read Fault Codes Using BUDS2 Software

Refer to *COMMUNICATION TOOLS AND B.U.D.S.* subsection.

For more information pertaining to the faults code status and report, refer to B.U.D.S. online help.

How to Read Fault Codes on the Multifunction Gauge

Same gauges can display fault codes.. Refer to the applicable *GAUGE* subsection.

How to Find Fault Code Descriptions

Connect BUDS2 to the vehicle. Refer to *COMMUNICATION TOOLS AND BUDS* subsection.

Navigate to the faults page in BUDS2.

Browse lists of active/occurred and inactive fault codes.

DIAGNOSTIC AND FAULT CODES

GENERAL

FAULT CODE TABLES

PCODE	MODULE	DESCRIPTION	CAUSE	ACTION
P0106	ECM	Manifold air pressure sensor voltage not plausible.	Vacuum leakage between throttle body and plenum (ex: rubber hose disconnected, loose screws, missing gasket at cylinder head flange, missing injector o-rings, cracks) Air intake duct or filter severely clogged MAPTS sensor Defective Damaged circuit wires, damaged connector or damaged ECM pins, ECM voltage supply.	Make sure sensor connector is fully inserted. Measure voltage between harness connector MAPTS-1and MAPTS-3 (expected value: 4.8 to 5.1 volts).
P0107	ECM	Manifold air pressure sensor voltage too low.	Voltage on system circuit MAPTS-4 reached a low value. Sensor may be disconnected. Circuit wires MAPTS-3 or MAPTS-4 may be disconnected. MAPTS-4 is shorted to ground No 5 volts supply on MAPTS-3 circuit. Damaged sensor.	Make sure sensor's connector is fully inserted. Measure voltage between harness connector MAPTS-1 and MAPTS-3 with the vehicle turned on (expected value: 4.8 to 5.1 volts) Check continuity between ECMA-H2 and MAPTS-1. Check continuity between ECMA-B4 and MAPTS-3. Check continuity between ECMA-G4 and MAPTS-4.
P0108	ECM	Manifold air pressure sensor voltage too high.	Voltage on system circuit MAPTS-4 reached a high value. Circuit wire MAPTS-4 shorted to a supply Circuit wire MAPTS-1 is not connected. Damaged sensor.	Make sure sensor's connector is fully inserted. Measure voltage between harness connector MAPTS-1 and MAPTS-3 with the vehicle turned on (expected value: 4.8 to 5.1 volts) Check continuity between ECMA-H2 and MAPTS-1. Check continuity between ECMA-B4 and MAPTS-3. Check continuity between ECMA-G4 and MAPTS-4.

PCODE	MODULE	DESCRIPTION	CAUSE	ACTION
P0112	ECM	Manifold air temperature sensor voltage too high.	Voltage on system circuit MAPTS-2 reached a high value. Sensor may be disconnected. Circuit wires MAPTS-1 or MAPTS-2 may be disconnected. Damaged sensor.	Make sure sensor's connector is fully inserted. If it is correct then disconnect it and perform the following tests. Check MAPTS sensor pins 1 and 2 for approximately 2280 to 2736 ohms at 19 to 21°C (66 to 70°F). If the sensor resistivity is out of range replace the sensor. Check system circuits ECMA-H3 for continuity to terminal 2 of the MAPTS sensor. Check system circuits ECMA-H2 for continuity to terminal 1 of the MAPTS sensor.
P0113	ECM	Manifold air temperature sensor voltage too low.	Voltage on system circuit MAPTS-2 reached a low value. System circuit MAPTS-2 shorted to ground. Damaged sensor.	Disconnect the sensor and check for a change in the fault code. If the fault code stays the same, look for a short circuit on the harness. If the fault code is different, replace the sensor. Check MAPTS sensor pins 1 and 2 for approximately 2280 to 2736 ohms at 19 to 21°C (66 to 70°F). If the sensor resistivity is out of range replace the sensor. If the sensor resistivity is correct according to the specified temperature range then check circuit wire MAPTS-2 for a short to the ground.
P0117	ECM	Engine coolant temperature sensor voltage too high.	Voltage on system circuit CTS-2 reached a high value. Sensor may be disconnected. Circuit wires CTS-1 or CTS-2 may be disconnected. Circuit CTS-2 shorted to 5 or 12 volts. Damaged sensor.	Make sure sensor's connector is fully inserted. Check system circuit ECMA-1A for continuity to terminal 1 of the CTS connector and ECMA-J2 for continuity to terminal 2 of the CTS connector. Check CTS resistivity on the sensor pins for approximately 2280 to 2736 ohms at 19 to 21°C (66 to 70°F). If the sensor resistivity is out of range replace the sensor.

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PCODE	MODULE	DESCRIPTION	CAUSE	ACTION
P0118	ECM	Engine coolant temperature sensor voltage too low.	Voltage on system circuit CTS-2 reached a low value. Circuit wire CTS-2 shorted to ground. Damaged sensor.	Disconnect the sensor and check for a change in the fault code. If the fault code stays the same, look for a short circuit on the harness. If the fault code is different, replace the sensor. Check system circuit CTS-2 for resistivity to ground (Expected value = 1.2 Kohms when ECMA connector is still connected). Check system circuit ECMA-1A for continuity to terminal 1 of the CTS connector and ECMA-J2 for continuity to terminal 2 of the CTS connector. Check CTS sensor pins for approximately 2280 to 2736 ohms at 19 to 21°C (66 to 70°F). If the sensor resistivity is out of range replace the sensor.
P0122	ECM	First Throttle Accelerator Sensor (TAS) Short circuit to GND	Damaged circuit wires, damaged throttle position sensor or damaged ECM pins.	Make sure sensor connector is fully inserted. Measure resistance from connector: ECMB-K1 to TAS-D (expected value: < 2 ohms). Measure resistance from connector: ECMB-K3 to TAS-E (expected value: < 2 ohms). Measure resistance from connector: ECMB-E1 to TAS-F (expected value: < 2 ohms).
P0123	ECM	First Throttle Accelerator Sensor (TAS) shorted to supply	Damaged circuit wires, damaged throttle position sensor or damaged ECM pins.	Make sure sensor connector is fully inserted. Measure resistance from connector: ECMB-K1 to TAS-D (expected value: < 2 ohms). Measure resistance from connector: ECMB-K3 to TAS-E (expected value: < 2 ohms). Measure resistance from connector: ECMB-E1 to TAS-F (expected value: < 2 ohms).

PCODE	MODULE	DESCRIPTION	CAUSE	ACTION
P0127	ECM	Torque reduction due to high manifold air temperature.	Temperature detected by the MAPTS sensor exceeded the maximum limit. Could happen during extended idling at high ambient temperatures or very low speed with load	
P0201	ECM	Injector Cyl. #1 (PTO) open circuit.	Circuit wires INJ1-1 or INJ1-2 open circuit. Blown fuse. Disconnected injector connector. Disconnected HIC connector. Injector coil open circuit,	Check fuel injector fuse. Make sure injector connector is fully inserted. Make sure HIC connector is connected. Check system circuit ECMA-B3 for continuity to pin 2 of INJ1 connector. Check system circuit INJ-1 for continuity to the fusebox. Check injector resistivity for approximately 14.5 ohms.
P0202	ECM	Injector Cyl. #2 (MAG) open circuit.	Circuit wires INJ2-1 or INJ2-2 open circuit. Blown fuse. Disconnected injector connector. Disconnected HIC connector. Injector coil open circuit.	Check fuel injector fuse. Make sure injector connector is fully inserted. Make sure HIC connector is connected. Check system circuit ECMA-K1 for continuity to pin 2 of INJ1 connector. Check system circuit INJ-1 for continuity to the fusebox. Check injector resistivity for approximately 14.5 ohms.
P0217	ECM	Torque reduction due to high engine coolant temperature.	Warm riding condition, lack of cooling.	Check coolant level. Check for air pocket in cooling system.
P0222	ECM	2nd Throttle Accelerator Sensor (TAS) shorted to GND	Damaged circuit wires, damaged throttle position sensor or damaged ECM pins.	Make sure sensor connector is fully inserted. Measure resistance from connector: ECMB-J3 to TAS-A (expected value: < 2 ohms). Measure resistance from connector: ECMB-B3 to TAS-B (expected value: < 2 ohms). Measure resistance from connector: ECMB-A3 to TAS-C (expected value: < 2 ohms).

PCODE	MODULE	DESCRIPTION	CAUSE	ACTION
P0223	ECM	2nd Throttle Accelerator Sensor (TAS) shorted to supply	Damaged circuit wires, damaged throttle position sensor, or damaged ECM pins.	Make sure sensor connector is fully inserted. Measure resistance from connector: ECMB-J3 to TAS-A (expected value: < 2 ohms). Measure resistance from connector: ECMB-B3 to TAS-B (expected value: < 2 ohms). Measure resistance from connector: ECMB-A3 to TAS-C (expected value: < 2 ohms).
P0231	ECM	Fuel pump open circuit or shorted to ground.	There is no load on circuit wire ECMB-M1 or it is shorted to ground. Blown fuse. Fuel pump connector is not connected. Fuel pump motor is open.	Check fuse. Make sure the fuel pump connector is fully inserted. Open ECM ACTIVATION page in B.U.D.S. Activate fuel pump and check if it reacts as expected. With vehicule power ON check voltage on FP-C connector (Expected value = battery voltage). Check system circuit ECMB-M1 for continuity to FP-A connector. Measure resistance between FP-C and FP-A (expected value: < 2 ohms)
P0232	ECM	Fuel pump shorted to battery.	Circuit wire ECMB-M1 is shorted to 12 volts. Fuel pump motor is stuck or shorted.	Disconnect the fuel pump and check if the fault disapears. If it does then replace the fuel pump. Ckeck if system circuits FP-A and FP-C are shorted together.
P0261	ECM	Injector Cyl. #1 (PTO) shorted to ground.	Circuit wire INJ1-1 is shorted to ground.	Disconnect injector 1. Measure resistance between injector pin 1 and 2 (Expected value = 10 to 15 ohms). With vehicule power ON and engine not running, check the voltage on pin 2 of the INJ2 connector (Expected value = around 3.3 volts). If the voltage is close to 12 volts check for a short to 12 volts on this circuit.

PCODE	MODULE	DESCRIPTION	CAUSE	ACTION
P0262	ECM	Injector Cyl. #1 (PTO) shorted to battery.	Circuit wire INJ1-1 is shorted to battery. Injector coil is shorted.	Disconnect injector 1. Measure resistance between injector pin 1 and 2 (Expected value = 10 to 15 ohms). With vehicule power ON and engine not running, check the voltage on pin 2 of the INJ2 connector (Expected value = around 3.3 volts). If the voltage is close to 12 volts check for a short to 12 volts on this circuit.
P0264	ECM	Injector Cyl. #2 (MAG) shorted to ground.	Circuit wire INJ2-1 is shorted to ground. Injector coil is open	Disconnect injector 2. Measure resistance between injector pin 1 and 2 (Expected value = 10 to 15 ohms). With vehicule power ON and engine not running, check the voltage on pin 2 of the INJ2 connector (Expected value = around 3.3 volts). If the voltage is close to 12 volts check for a short to 12 volts on this circuit.
P0265	ECM	Injector Cyl. #2 (MAG) shorted to battery.	Circuit wire INJ2-1 is shorted to battery. Injector coil is shorted.	Disconnect injector 2. Measure resistance between injector pin 1 and 2 (Expected value = 10 to 15 ohms). With vehicule power ON and engine not running, check the voltage on pin 2 of the INJ2 connector (Expected value = around 3.3 volts). If the voltage is close to 12 volts check for a short to 12 volts on this circuit.
P0335	ECM	Crankshaft signal fault.	Slow engine cranking due to low battery voltage Intermittent signal from crankshaft position sensor. Damaged circuit wires, damaged sensor. Sensor may not be properly secured.	Verify that the battery is properly charged Make sure sensor connector is fully inserted. Measure resistance from connector: ECMA-H1 to CPS-1 (Expected value: < 2 ohms). Measure resistance from connector: ECMA-K2 to CPS-2 (Expected value: < 2 ohms).

PCODE	MODULE	DESCRIPTION	CAUSE	ACTION
P0340	ECM	Engine phase determination error.	CAPS signal not plausible, damaged circuit wires, damaged connector or damaged tooth wheel.	Make sure sensor connector is fully inserted. Measure voltage between harness connector CAPS-3 and CAPS-1 (expected value: 11 to 13 volts). Measure resistance between connector ECMA-E2 to CAPS-2. (expected value : <2 ohms)
P0359	ECM	Ignition coil Cyl. #2 (MAG) shorted to battery.	Circuit wire IGN2-3 is shorted to battery. Ignition coil is damaged.	Disconnect ignition coil #2. With vehicule power ON and engine not running check voltage on pin 3 of IGN2 connector. (Expected value = 0 volt). If voltage is close to 12 volts, check for a short on this circuit.
P0360	ECM	Ignition coil Cyl. #1 (PTO) shorted to battery.	Circuit wire IGN1-3 is shorted to battery. Ignition coil is damaged.	Disconnect ignition coil #1. With vehicule power ON and engine not running check voltage on pin 3 of IGN1 connector. (Expected value = 0 volt). If voltage is close to 12 volts, check for a short on this circuit.
P0361	ECM	ECM ignition coil driver #2 (MAG) fault	Ignition coil or HIC connector not connected or damaged. Blown fuse. Broken wire or terminal.	Check if HIC connector connected. Check ignition fuse. Check circuit wire IGN2-3.
P0362	ECM	ECM ignition coil driver #1 (PTO) fault	Ignition coil or HIC connector not connected or damaged. Blown fuse. Broken wire or terminal.	Check if HIC connector connected. Check ignition fuse. Check circuit wire IGN1-3.
P0480	ECM	Fan relay circuit	Blown fuse, damaged or disconnected relay, damaged circuit wires, damaged connectors or damaged ECM output pins.	Check fuse. Disconnect Fan relay. Measure voltage between harness connector CFM-4 and ground (expected value: 11 to 13 volts). Measure resistance from harness connector: ECMB-J4 to CFM-2 (expected value: < 2 ohms). With the engine turned off measure voltage between CFM-2 and ground (expected value: 11 to 13 volts). Use BUDS to activate the fan and measure voltage between CFM-2 and ground (expected value: close to 0 volts). Check fuse F4

PCODE	MODULE	DESCRIPTION	CAUSE	ACTION
P0513	ECM	Invalid Access Key Detected	A non stored access key was detected when key switch was turned to ON. If no access key is available, program a new one and retry.	
P0520	ECM	Engine oil pressure switch functional problem.	Defective oil pressure switch, damaged circuit wires, damaged connector or loose terminals, damaged ECM pins.	Measure resistance between harness connector EOP and ground when engine stopped (expected value < 2 ohms). Measure resistance between harness connector EOP and ground when engine running (expected value = open). Measure resistance from harness connector: EOP to ECMA-E3 (expected value: < 2 ohms). Check if HIC connector is properly connected (engine harness to the vehicle harness).
P0523	ECM	Engine oil pressure switch sticking	Disconnected oil pressure switch Damaged oil pressure switch, damaged circuit wires, damaged connector, damaged ECM pins.	Measure resistance between harness connector EOP and ground when engine stopped (expected value < 2 ohms). Measure resistance between harness connector EOP and ground when engine running (expected value = open). Measure resistance from harness connector: EOP to ECMA-E3 (expected value: < 2 ohms). Check if HIC connector is properly connected (engine harness to the vehicle harness).
P0524	ECM	Low oil pressure.	Oil level too low Engine mechanical problem Defective oil pressure switch, damaged circuit wires, damaged connector, damaged ECM pins. Vehicle was turned upside down with the engine running	Check oil level. Check system circuit ECMA-E3 for continuity to the terminal of the OPS connector. Check oil pressure. If the vehicle was turned upside down while the engine was running, delete the fault
P0560	ECM	Non-plausibility error on system voltage	ECU internal failure in reading system voltage	Replace ECU if fault is persisting

PCODE	MODULE	DESCRIPTION	CAUSE	ACTION
P0562	ECM	Battery voltage too low.	Battery voltage dropped under 11 volts.	Check battery voltage for 11 to 13 volts with engine stopped. Check battery voltage for 13.5 to 14.5 volts with engine speed above 2500 RPM. Check connections on regulator. Check charging system.
P0563	ECM	Battery voltage too high.	Battery voltage exceeded 15.6 volts.	Check battery voltage for 11 to 13 volts with engine stopped. Check battery voltage for 13.5 to 14.5 volts with engine speed above 2500 RPM. Check connections on regulator. Check charging system.
P060D	ECM	Throttle Accelerator Sensor (TAS) signals not synchronized.	Throttle Accelerator Sensors (TAS) plausibility check error.	Make sure sensor connector is fully inserted. Check voltages on connector TAS-F and TAS-C. Voltage on pin TAS-F must be 2 times greater than voltage on pin TAS-C at any given position of the lever. Check for 5 volts on pin TAS-A and TAS-D.
P060E	ECM	Electrical Throttle Actuator (ETA) control fault	Damaged wiring harness Damaged TPS Damaged ECM	Disconnect throttle body Measure resistance between ETC pin 3 and 5 (expected value = 2 to 3 ohms). Disconnect ECMA. Measure resistance from harness connector: ETC-5 to ECMA-L1 (expected value: < 2 ohms). Measure resistance from harness connector: ETC-3 to ECMA-L2 (expected value: < 2 ohms).
P0610	ECM	Variant Coding error.	Faulty variant coding, faulty programming, wrong ECM after replacement	

PCODE	MODULE	DESCRIPTION	CAUSE	ACTION
P062C	ECM	Loss of vehicle speed information from multifunction gauge.	ECM lost communication with the cluster. Multifunction gauge may be disconnected. Loss of power on the multidunction gauge. Loss of communication with the multidunction gauge via the CAN bus. CAN bus lines shorted together. CAN bus line shorted to ground.	Make sure the multidunction gauge connector is fully inserted. Check for bent pin on the cluster connector Measure voltage between harness connector MG-8 and ground with the vehicle turned on (expected value: 11 to 13 volts). Measure voltage between harness connector MG-9 and ground with the vehicle turned off (expected value: 11 to 13 volts). Measure resistivity between harness connector MG-11 for continuity to the ground (Expected value < 2 ohms). Check continuity between harness connector MG-24 and ECMB-C1 Check continuity between harness connector MG-23 and ECMB-C2 Resistance between harness connector MG-23 and MG-24 should be around 120 ohms Verify that harness connector MG-23 and MG-24 are not shorted to ground or anything else

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PCODE	MODULE	DESCRIPTION	CAUSE	ACTION
P0685	ECM	Lighting relay circuit	Blown fuse, damaged or disconnected relay, damaged circuit wires, damaged connectors or damaged ECM output pins.	Check fuse. Disconnect lighting relay. Measure voltage between harness connector FB-D1 and ground (expected value: 11 to 13 volts). Measure voltage between harness connector FB-D2 and ground (expected value: 11 to 13 volts). Measure resistance from harness connector: ECMB-G1 to FB-C2 (expected value: < 2 ohms). With the engine turned off measure voltage between FB-C2 and ground (expected value: 11 to 13 volts). With the engine turned on measure voltage between FB-C2 and ground (expected value: close to 0 volts). Measure resistance between terminals 85 and 86 on the 2 relays (expected value: 70 to 90 ohms).
P0686	ECM	Lighting relay circuit shorted to ground or open circuit	Blown fuse, damaged or disconnected relay, damaged circuit wires, damaged connectors or damaged ECM output pins.	Check fuse. Disconnect lighting relay. Measure voltage between harness connector FB-D1 and ground (expected value: 11 to 13 volts). Measure voltage between harness connector FB-D2 and ground (expected value: 11 to 13 volts). Measure resistance from harness connector: ECMB-G1 to FB-C2 (expected value: < 2 ohms). With the engine turned off measure voltage between FB-C2 and ground (expected value: 11 to 13 volts). With the engine turned on measure voltage between FB-C2 and ground (expected value: close to 0 volts). Measure resistance between terminals 85 and 86 on the 2 relays (expected value: 70 to 90 ohms).

PCODE	MODULE	DESCRIPTION	CAUSE	ACTION
P0687	ECM	Lighting relay circuit shorted to battery +	Damaged relay, damaged circuit wires, damaged connector or damaged ECM output pins.	Check fuse. Disconnect lighting relay. Measure voltage between harness connector FB-D1 and ground (expected value: 11 to 13 volts). Measure voltage between harness connector FB-D2 and ground (expected value: 11 to 13 volts). Measure resistance from harness connector: ECMB-G1 to FB-C2 (expected value: < 2 ohms). With the engine turned off measure voltage between FB-C2 and ground (expected value: 11 to 13 volts). With the engine turned on measure voltage between FB-C2 and ground (expected value: close to 0 volts). Measure resistance between terminals 85 and 86 on the 2 relays (expected value: 70 to 90 ohms).
P0691	ECM	Fan relay circuit shorted to ground or open circuit	Blown fuse, damaged or disconnected relay, damaged circuit wires, damaged connectors or damaged ECM output pins.	Check fuse. Disconnect Fan relay. Measure voltage between harness connector CFM-4 and ground (expected value: 11 to 13 volts). Measure resistance from harness connector: ECMB-J4 to CFM-2 (expected value: < 2 ohms). With the engine turned off measure voltage between CFM-2 and ground (expected value: 11 to 13 volts). Use BUDS to activate the fan and measure voltage between CFM-2 and ground (expected value: close to 0 volts). Check fuse F4

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PCODE	MODULE	DESCRIPTION	CAUSE	ACTION
P0692	ECM	Fan relay circuit shorted to battery +	Damaged relay, damaged circuit wires, damaged connector or damaged ECM output pins.	Check fuse. Disconnect Fan relay. Measure voltage between harness connector CFM-4 and ground (expected value: 11 to 13 volts). Measure resistance from harness connector: ECMB-J4 to CFM-2 (expected value: < 2 ohms). With the engine turned off measure voltage between CFM-2 and ground (expected value: 11 to 13 volts). Use BUDS to activate the fan and measure voltage between CFM-2 and ground (expected value: close to 0 volts). Check fuse F4
P1120	ECM	Wrong ratio between both throttle position sensor (TPS)	Damaged wiring harness Damaged TPS Damaged ECM	Make sure the TPS connector is fully inserted. Reset TPS postion. Measure voltage between harness connector ETC-6 and ETC-2 with the vehicle turned on (expected value: 3.3 volts) Check for short between ETC-1 or ETC-4 and a supply or a ground Check continuity between harness connector ETC-1 and ECMA-F3 Check continuity between harness connector ETC-4 and ECMA-K3 Check continuity between harness connector ETC-6 and ECMA-K4 Check continuity between harness connector ETC-2 and ECMA-A2
P160E	ECM	Electrical Throttle Actuator (ETA) control fault	Damaged wiring harness Damaged TPS Damaged ECM	Disconnect throttle body Measure resistance between ETC pin 3 and 5 (expected value = 2 to 3 ohms). Disconnect ECMA. Measure resistance from harness connector: ETC-5 to ECMA-L1 (expected value: < 2 ohms). Measure resistance from harness connector: ETC-3 to ECMA-L2 (expected value: < 2 ohms).

PCODE	MODULE	DESCRIPTION	CAUSE	ACTION
P1610	ECM	Electrical Throttle Actuator (ETA) shorted to supply	Damaged ETC module, damaged circuit wires, damaged connector or damaged ECM output pins.	Disconnect ETC module. Check for a short between ECMA-L1 or ECMA-L2 and a supply Measure resistance from connector: ECMA-L1 to ETC-5 (expected value: < 2 ohms). Measure resistance from connector: ECMA-L2 to ETC-3 (expected value: < 2 ohms).
P1611	ECM	Electrical Throttle Actuator (ETA) shorted to ground	Damaged ETC module, damaged circuit wires, damaged connector or damaged ECM output pins.	Disconnect ETC module. Check for a short between ECMA-1L or ECMA-L2 and gnd Measure resistance from connector: ECMA-L1 to ETC-5 (expected value: < 2 ohms). Measure resistance from connector: ECMA-L2 to ETC-3 (expected value: < 2 ohms).
P1612	ECM	Electrical Throttle Actuator (ETA) signal not plausible	Damaged ETC module, damaged circuit wires, damaged connector or damaged ECM output pins.	Disconnect ETC module. Measure resistance from connector: ECMA-L1 to ETC-5 (expected value: < 2 ohms). Measure resistance from connector: ECMA-L2 to ETA-3 (expected value: < 2 ohms).
P1613	ECM	Electrical Throttle Actuator (ETA) open electrical load	Damaged ETC module, damaged circuit wires, damaged connector or damaged ECM output pins.	Disconnect ETC module. Measure resistance from connector: ECMA-L1 to ETC-5 (expected value: < 2 ohms). Measure resistance from connector: ECMA-L2 to ETA-3 (expected value: < 2 ohms). Measure resistance between ETC-5 and ETC-3 (expected value < 5 ohms)

PCODE	MODULE	DESCRIPTION	CAUSE	ACTION
P1614	ECM	Electronic throttle control (ETC) return spring check not passed	Throttle mechanical adjustment. No TPS reset after throttle body/ECM replacement. Damaged throttle body	Check throttle plate movement. Check idle stop for wear. Check throttle position sensor angle at idle, expected value 1-4.5 degrees Perform THROTTLE POSITION SENSOR RESET in B.U.D.S. with throttle grip accelerator not activated since at least 30 seconds. Refer to the SERVICE MANUAL for more details.
P1615	ECM	Electronic throttle control (ETC) position deviation fault	Throttle mechanical adjustment. No TPS reset after throttle body/ECM replacement.	Check throttle plate movement. Check idle stop for wear. Check throttle position sensor angle at idle, expected value 1-4.5 degrees Perform THROTTLE POSITION SENSOR RESET in B.U.D.S. with throttle grip accelerator not activated since at least 30 seconds. Refer to the SERVICE MANUAL for more details.
P1616	ECM	Electronic throttle control (ETC) check of limp-home position failed	Throttle mechanical stop. No TPS reset after throttle body/ECM replacement.	Check throttle plate movement. Check idle stop for wear. Check throttle position sensor angle at idle, expected value 1-4.5 degrees Perform THROTTLE POSITION SENSOR RESET in B.U.D.S. with throttle grip accelerator not activated since at least 30 seconds. Refer to the SERVICE MANUAL for more details.
P1619	ECM	TPS adaptation failure	Wrong throttle body mechanical position during reset of closed TPS or no TPS reset after ECM replacement.	Check idle stop for wear. Perform THROTTLE POSITION SENSOR RESET in B.U.D.S. with throttle grip accelerator not activated since at least 30 seconds.
P1620	ECM	TPS adaptation failure	Wrong throttle body mechanical position during reset of closed TPS or no TPS reset after ECM replacement.	Check idle stop for wear. Perform THROTTLE POSITION SENSOR RESET in B.U.D.S. with throttle grip accelerator not activated since at least 30 seconds.

PCODE	MODULE	DESCRIPTION	CAUSE	ACTION
P1621	ECM	TPS adaptation cancelled lower mechanical stop failed	Throttle mechanical stop. No TPS reset after throttle body/ECM replacement.	Check idle stop for wear. Ensure throttle plate is against throttle stop. Check throttle Position sensor angle at idle. Perform THROTTLE POSITION SENSOR RESET in B.U.D.S. with throttle grip accelerator not activated since at least 30 seconds. Refer to the SERVICE MANUAL for more details.
P1622	ECM	TPS adaptation failed	Throttle mechanical stop. No TPS reset after throttle body/ECM replacement.	Check idle stop for wear. Check throttle position sensor angle at idle. Perform THROTTLE POSITION SENSOR RESET in B.U.D.S. with throttle grip accelerator not activated since at least 30 seconds. Refer to the SERVICE MANUAL for more details.
P1672	ECM	Accessories relay circuit shorted to battery +	Damaged relay, damaged circuit wires, damaged connector or damaged ECM output pins.	Check fuse. Disconnect lighting relay. Measure voltage between harness connector FB-C6 and ground (expected value: 11 to 13 volts). Measure voltage between harness connector FB-C5 and ground (expected value: 11 to 13 volts). Measure resistance from harness connector: ECMB-J2 to FB-D5 (expected value: < 2 ohms). With the engine turned off measure voltage between FB-D5 and ground (expected value: 11 to 13 volts). With the engine turned on measure voltage between FB-D5 and ground (expected value: close to 0 volts). Measure resistance between terminals 85 and 86 on the 2 relays (expected value: 70 to 90 ohms).

PCODE	MODULE	DESCRIPTION	CAUSE	ACTION
P1673	ECM	Accessories relay circuit shorted to ground or open circuit	Blown fuse, damaged or disconnected relay, damaged circuit wires, damaged connectors or damaged ECM output pins.	Check fuse. Disconnect lighting relay. Measure voltage between harness connector FB-C6 and ground (expected value: 11 to 13 volts). Measure voltage between harness connector FB-C5 and ground (expected value: 11 to 13 volts). Measure resistance from harness connector: ECMB-J2 to FB-D5 (expected value: < 2 ohms). With the engine turned off measure voltage between FB-D5 and ground (expected value: 11 to 13 volts). With the engine turned on measure voltage between FB-D5 and ground (expected value: close to 0 volts). Measure resistance between terminals 85 and 86 on the 2 relays (expected value: 70 to 90 ohms).
P1674	ECM	Accessories relay circuit	Blown fuse, damaged or disconnected relay, damaged circuit wires, damaged connectors or damaged ECM output pins.	Check fuse. Disconnect lighting relay. Measure voltage between harness connector FB-C6 and ground (expected value: 11 to 13 volts). Measure voltage between harness connector FB-C5 and ground (expected value: 11 to 13 volts). Measure resistance from harness connector: ECMB-J2 to FB-D5 (expected value: < 2 ohms). With the engine turned off measure voltage between FB-D5 and ground (expected value: 11 to 13 volts). With the engine turned on measure voltage between FB-D5 and ground (expected value: close to 0 volts). Measure resistance between terminals 85 and 86 on the 2 relays (expected value: 70 to 90 ohms).
P16C0	ECM	ECU ADC plausibility check	Monitoring plausibility check failed.	Check for ECM fault.
P16C1	ECM	ECU ADC test failed	Monitoring plausibility check failed.	Check for ECM fault.

PCODE	MODULE	DESCRIPTION	CAUSE	ACTION
P16C2	ECM	ECU monitoring error	Monitoring plausibility check failed.	Check for ECM fault.
P16C3	ECM	Throttle Accelerator Sensors (TAS) monitoring check fault	Monitoring plausibility check failed.	Check for ECM fault.
P16C4	ECM	Engine speed monitoring check fault	Monitoring plausibility check failed.	Check for ECM fault.
P16C5	ECM	Safety fuel cut-off activated monitoring check level 1	Monitoring plausibility check failed.	Check for ECM fault.
P16C6	ECM	Safety fuel cut-off activated monitoring check level 2	Monitoring plausibility check failed.	Check for ECM fault.
P16C7	ECM	Throttle valve plausibility check failed	Monitoring plausibility check failed.	Check for ECM fault.
P16C8	ECM	Permitted throttle valve position monitoring check exceeded	Monitoring plausibility check failed.	Check for ECM fault.
P16C9	ECM	function monitoring: monitoring of the emergency switch in level 2 (DFC_MoFEmgcySwOff)	Monitoring plausibility check failed.	Check for ECM fault.
P1790	ECM	Driving mode selector switch	Driving mode selector switch has the up and down selection pressed at the same time	Check for a short between ECMB-D3 or ECO-A with ECM-A1 or ECO-B Check for a short between ECMB-E3 or ECO-C with ECM-A1 or ECO-B
P20EB	ECM	Main relay de-energized too late or sticking	Damaged circuit wires Damaged connectors Damaged ECM output pins Damaged main relay	Disconnect main relay. Measure resistance between terminals 85 and 86 on relay (expected value: 70 to 90 ohms). Measure resistance between terminals 30 and 87 on relay (expected value: open circuit). Disconnect relay and measure resistance between terminals FB-A4 and ground (expected value: open circuit).

PCODE	MODULE	DESCRIPTION	CAUSE	ACTION
P212C	ECM	Throttle position sensor #2 voltage too low.	Low voltage or short to ground on circuit wire ETC-4. No 3.3 volts supply on ETC-6. ETC-1 is shorted to ground Damaged sensor.	Make sure the TPS connector is fully inserted. Reset TPS postion. Measure voltage between harness connector ETC-6 and ETC-2 with the vehicle turned on (expected value: 3.3 volts) Check continuity between harness connector ETC-4 and ECMA-K3 Check continuity between harness connector ETC-6 and ECMA-K4 Check continuity between harness connector ETC-2 and ECMA-A2 Check for a short between ETC-4 and a supply
P212D	ECM	Throttle position sensor #2 voltage too high.	Voltage on circuit wire ETC-4 too high. Circuit wire ETC-4 shorted to a supply. Circuit wire ETC-2 is open.	Make sure the TPS connector is fully inserted. Reset TPS postion. Measure voltage between harness connector ETC-6 and ETC-2 with the vehicle turned on (expected value: 3.3 volts) Check continuity between harness connector ETC-4 and ECMA-K3 Check continuity between harness connector ETC-6 and ECMA-K4 Check continuity between harness connector ETC-2 and ECMA-A2 Check for a short between ETC-4 and a supply
P2279	ECM	Air leak from intake plenum	Cracked plenum Leak in air intake system. TPS learning position not done correctly. MAP Sensor problem. Throttle body air leakage.	Reset TPS postion. Check for faulty Air Pressure Sensor. Check for faulty TPS. Check for cracked plenum. Check for leak on the throttle body
P2299	ECM	Throttle and break paddle are used at the same time		

PCODE	MODULE	DESCRIPTION	CAUSE	ACTION
P2621	ECM	Throttle position sensor #1 voltage too low.	Low voltage or short to ground on circuit wire ETC-1. No 3.3 volts supply on ETC-6. ETC-1 is shorted to ground Damaged sensor.	Make sure the TPS connector is fully inserted. Reset TPS postion. Measure voltage between harness connector ETC-6 and ETC-2 with the vehicle turned on (expected value: 3.3 volts) Check continuity between harness connector ETC-1 and ECMA-F3 Check continuity between harness connector ETC-6 and ECMA-K4 Check continuity between harness connector ETC-2 and ECMA-A2 Check for a short between ETC-1 and a supply
P2622	ECM	Throttle position sensor #1 voltage too high.	Voltage on circuit wire ETC-1 too high. Circuit wire ETC-1 shorted to a supply. Circuit wire ETC-2 is open.	Make sure the TPS connector is fully inserted. Reset TPS postion. Measure voltage between harness connector ETC-6 and ETC-2 with the vehicle turned on (expected value: 3.3 volts) Check continuity between harness connector ETC-1 and ECMA-F3 Check continuity between harness connector ETC-6 and ECMA-K4 Check continuity between harness connector ETC-2 and ECMA-A2 Check for a short between ETC-1 and a supply
U0167	ECM	No communication with DESS key.	Damaged circuit wires, damaged or disconnected DESS post, damaged DESS key.	Measure voltage between harness connector RFID-D and ground (expected value: 11 to 13 volts). Check continuity betweem hesness connector RFID-A and ECMB-F2 Check continuity betweem hesness connector RFID-B and ECMB-E4 Check continuity betweem hesness connector RFID-C and ECMB-B2

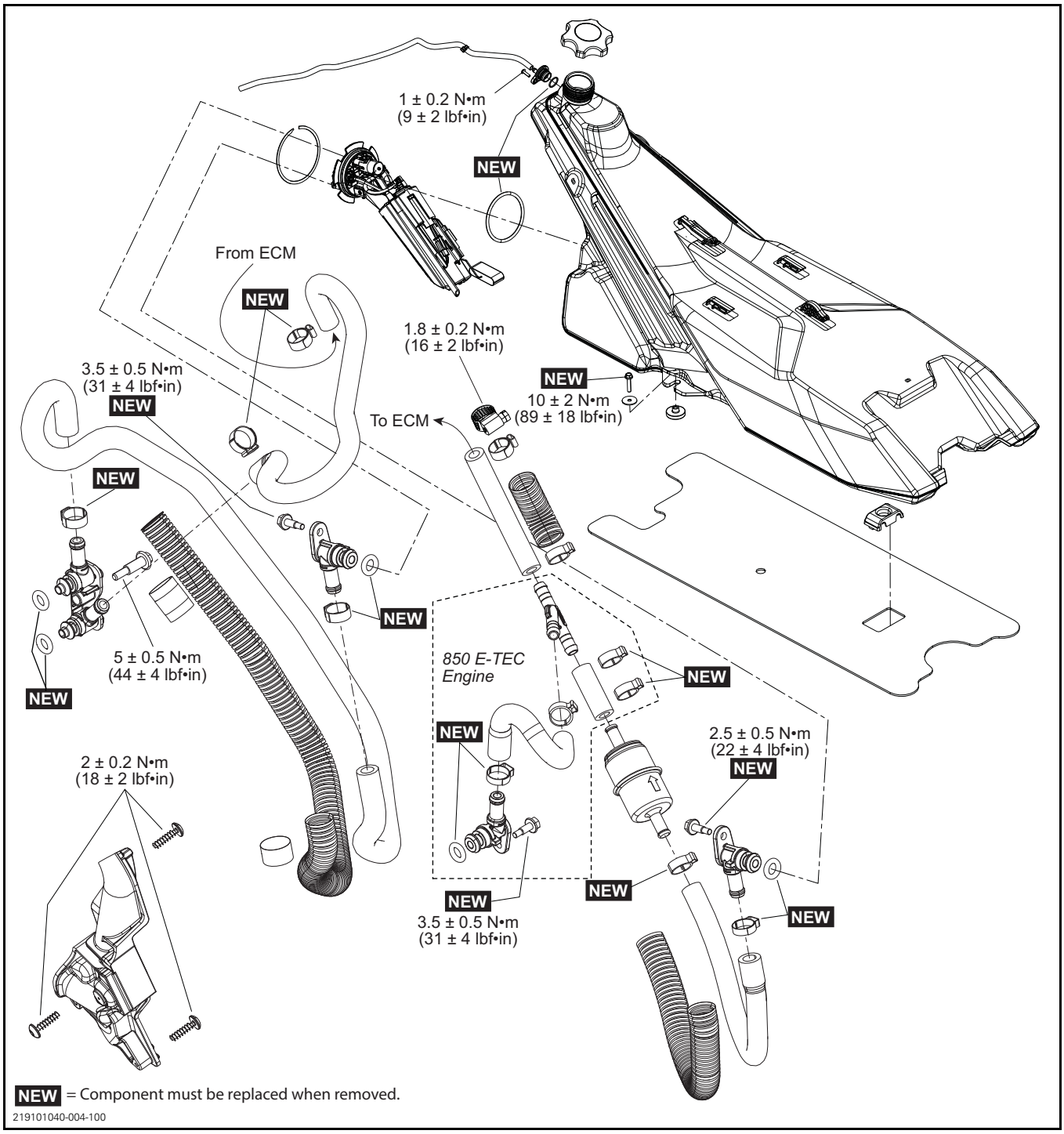
PCODE	MODULE	DESCRIPTION	CAUSE	ACTION
U0400	ECM	Variant coding failure software incompatibility	Faulty variant coding. Faulty programming.	Try updating the ECM. If the problem persists, make sure the ECM part number is correct for the model it is installed on.
U0426	ECM	DESS key communication error.	Damaged circuit wires, damaged or disconnected DESS post, damaged DESS key.	Measure voltage between harness connector RFID-D and ground (expected value: 11 to 13 volts). Check continuity betweem hesness connector RFID-A and ECMB-F2 Check continuity betweem hesness connector RFID-B and ECMB-E4 Check continuity betweem hesness connector RFID-C and ECMB-B2
U300A	ECM	State of the DESS key switch not plausible	Damaged wiring harness Damaged RFID module	Measure voltage between harness connector RFID-D and ground (expected value: 11 to 13 volts). Check continuity betweem hesness connector RFID-A and ECMB-F2 Check continuity betweem hesness connector RFID-B and ECMB-E4 Check continuity betweem hesness connector RFID-C and ECMB-B2

FUEL TANK AND FUEL PUMP (E-TEC)

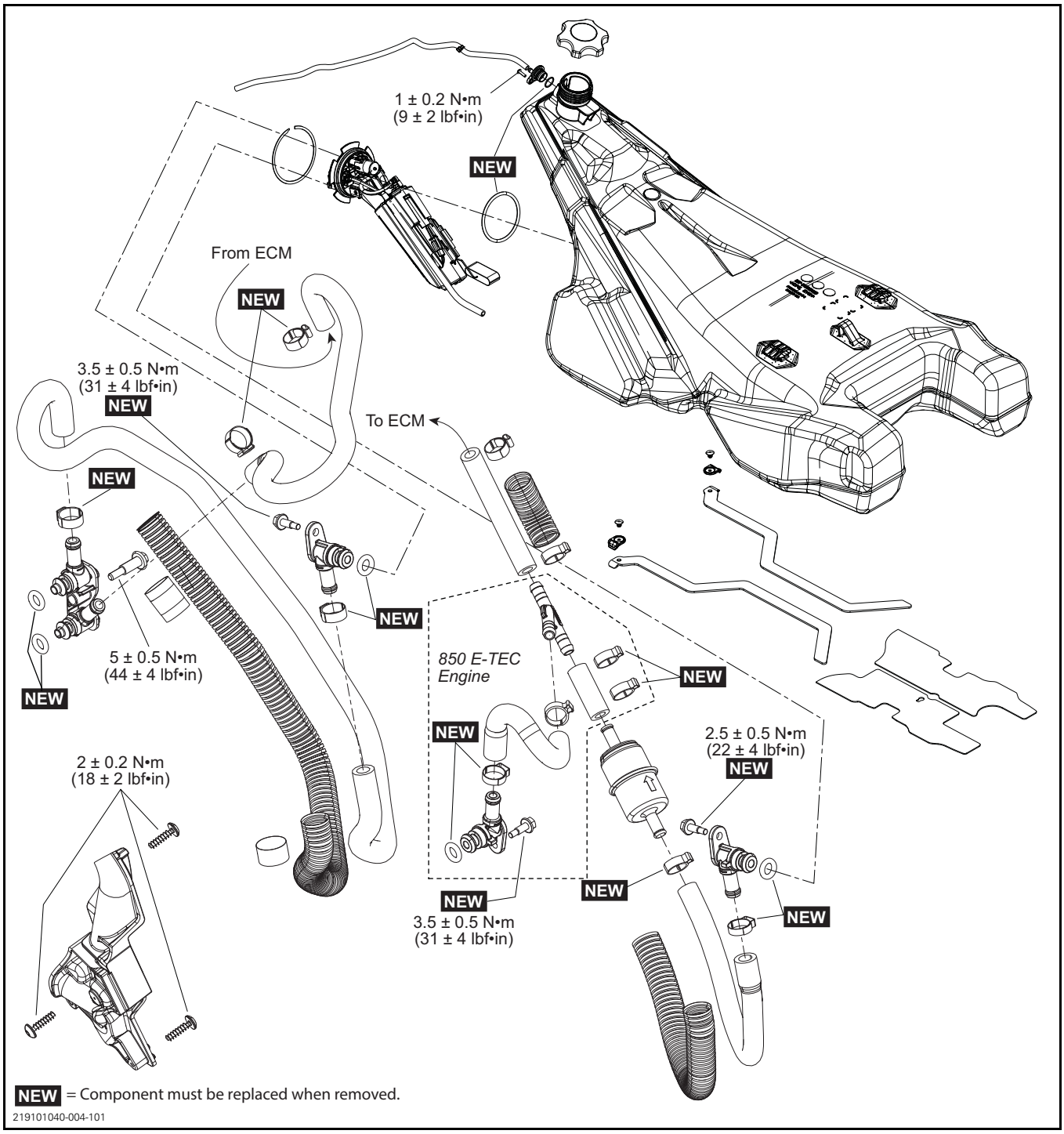
SERVICE TOOLS

Description	Part Number	Page
LEAK TEST KIT	529 033 100	7
OETIKER PLIER	295 000 070	10
PRESSURE GAUGE	529 036 395	8
SMALL HOSE PINCHER	295 000 076	7
T FITTING FUEL PRESSURE	529 036 509	8
VACUUM/PRESSURE PUMP	529 021 800	7

16 in Track


1 ± 0.2 N•m
(9 ± 2 lbf•in)
NEW
From ECM
NEW
1.8 ± 0.2 N•m
(16 ± 2 lbf•in)
3.5 ± 0.5 N•m
(31 ± 4 lbf•in)
NEW
NEW
10 ± 2 N•m
(89 ± 18 lbf•in)
To ECM
NEW
NEW
5 ± 0.5 N•m
(44 ± 4 lbf•in)
NEW
850 E-TEC
Engine
NEW
NEW
2.5 ± 0.5 N•m
(22 ± 4 lbf•in)
NEW
2 ± 0.2 N•m
(18 ± 2 lbf•in)
NEW
NEW
NEW
3.5 ± 0.5 N•m
(31 ± 4 lbf•in)
NEW = Component must be replaced when removed.
219101040-004-100

20 and 24 in Track



GENERAL

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*.

⚠ WARNING

Always disconnect the magneto connector prior to:
– Disconnecting any fuel hose.
– Removing a fuel injector.
– Removing a spark plug cable or spark plug.
Otherwise, if the engine is cranked, fuel vapors may ignite in presence of a spark creating a fire hazard.

When disconnecting a fuel line, cover the connection with an absorbent shop rag and proceed slowly to minimize spilling.

⚠ WARNING

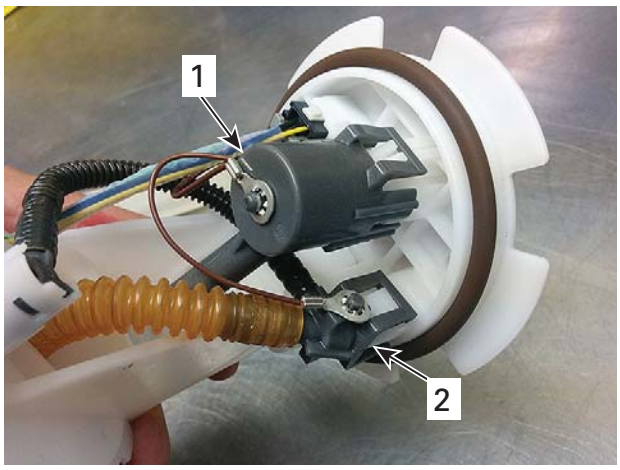
Do not allow fuel to spill on hot engine parts and/or on electrical connectors. Wipe off any fuel spillage in the engine compartment. Fuel is flammable and explosive under certain conditions.

⚠ WARNING

After working on the fuel system, always carry out a fuel system pressurization test to check for leaks.

⚠ WARNING

Never remove the eyelet connectors from the fuel pressure regulator and the fuel hose connector. A bad connection may create a static electricity discharge causing a fire hazard.



tmr2017-027-306_a

1. Fuel pressure regulator
2. Fuel hose connector

SYSTEM DESCRIPTION

Electric Fuel Pump

mmr2017-027-002

An electric fuel pump is mounted in the front center portion of the fuel tank.

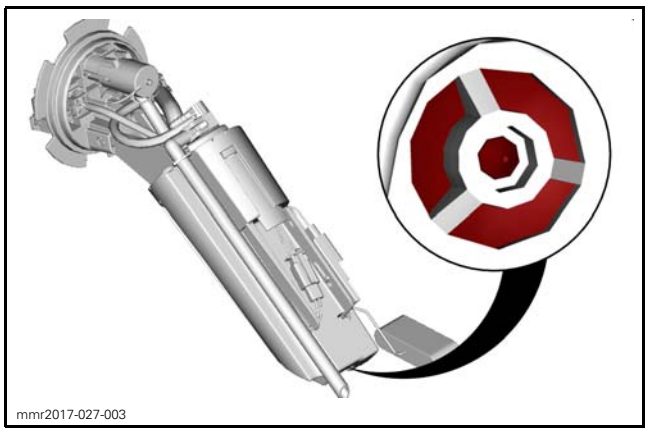
A 12 Vdc high pressure fuel pump with an integrated jet pump is used.

NOTE: Although the fuel pump is connected to the 55 Vdc system, the ECM modulates the voltage (Pulse Width Modulation) between 9 and 16 Vdc depending on the engine RPM. The fuel pump output will change as voltage changes.

As soon as the engine is cranking, the electric fuel pump turns on in preparation for the engine start. When the engine runs, the fuel pump is ON continuously to provide a constant fuel pressure to the injectors.

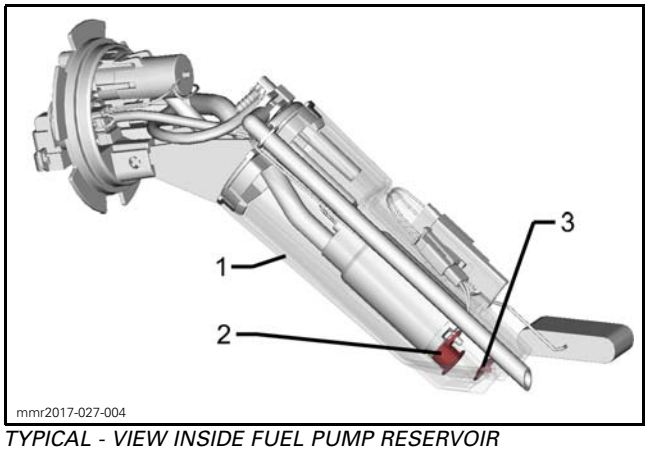
To ensure a constant delivery of fuel to the engine for all riding conditions when the fuel level is low, a rear pickup and a fuel pump reservoir is used.

The fuel pump reservoir is actually the housing of the fuel pump module in which the fuel pump is located. A check valve at the bottom of the housing allows the fuel in the tank to enter the fuel pump reservoir.



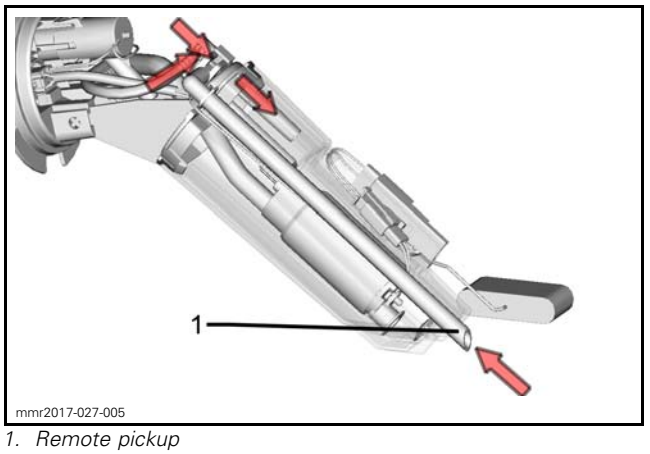
When the fuel pump runs, it draws the fuel from the fuel pump reservoir and feeds it to the injection system. This causes fuel in the tank to enter the fuel pump reservoir, by gravity, through its bottom inlet check valve.

At the same time, a portion of the fuel flow from the electric fuel pump flows through a jet pump that contains a venturi.



TYPICAL - VIEW INSIDE FUEL PUMP RESERVOIR
1. *Fuel pump reservoir*
2. *Bottom inlet*
3. *Check valve (open upwards)*

As the fuel accelerates through the venturi, it generates a low pressure area at a connection to the remote pickup, which draws fuel into the fuel pump reservoir from the remote pickup.



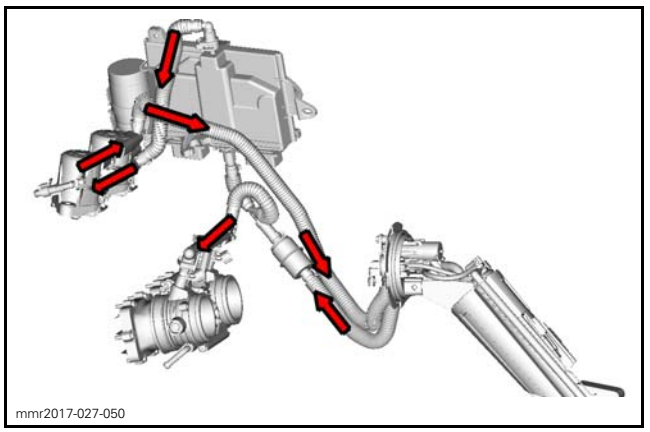
1. *Remote pickup*

When riding the vehicle on a level surface, fuel enters into the fuel pump reservoir through its check valve and through the remote pickup simultaneously, as long as there is enough fuel in the tank to cover the remote pickup.

When riding downhill with a low amount of fuel in the tank, the fuel moves towards the front of fuel tank. The fuel enters the fuel pump reservoir through the check valve only as there is no fuel at the remote pickup.

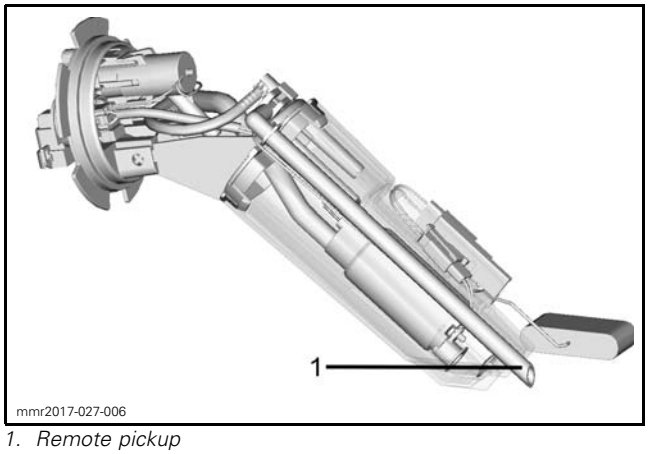
When riding uphill with a low amount of fuel in the tank, the fuel moves towards the rear of the fuel tank. The check valve closes and traps the fuel in the pump reservoir. The fuel pump continues to draw fuel from the fuel pump reservoir, which is now only fed by the jet pump using the remote pickup. This prevents air from being drawn into the fuel lines from the fuel tank.

The continuous fuel flow cools down the fuel pump, the injectors and the ECM. To cool these components, the fuel circulates as follows:
- Out of fuel pump
- Through the ECM
- To the direct injectors (around the voice coils)
- Through the pressure regulator
- Back to fuel tank.



Fuel Pickup

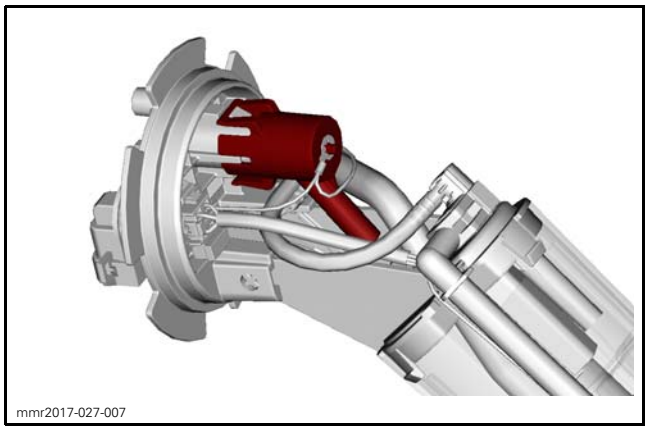
Fuel enters the fuel pump reservoir from either a check valve at the bottom of the fuel pump reservoir, or from a remote pickup in the rear portion of the fuel tank.



1. Remote pickup

Fuel Pressure Regulator

An integrated fuel pressure regulator is mounted on the fuel pump flange. It is basically a spring loaded valve that opens and closes the path of fuel returning to the tank, thus maintaining a constant fuel pressure in the system.



FUEL PRESSURE
Approximately 303 kPa (44 PSI) at 2000 RPM (will be lower at idle)

Fuel pressure should drop less than 35 kPa (5 PSI) when engine stops running.

If a leak is present, pressure will continue to drop within the first minute after engine stops running.

Fuel Tank Vent

The fuel tank is vented through a combination type check valve that allows ambient air pressure to enter fuel tank at all times.

As fuel is consumed by the engine, a negative pressure would occur in the fuel tank. This could eventually prevent the fuel pump from drawing enough fuel. The **negative pressure relieve function** of the valve allows the higher outside air pressure in.

If pressure builds up and exceeds 2.0 kPa to 4.8 kPa (.3 PSI to .7 PSI) in the fuel tank, the check valve opens and lets the excess pressure vent out of the tank.

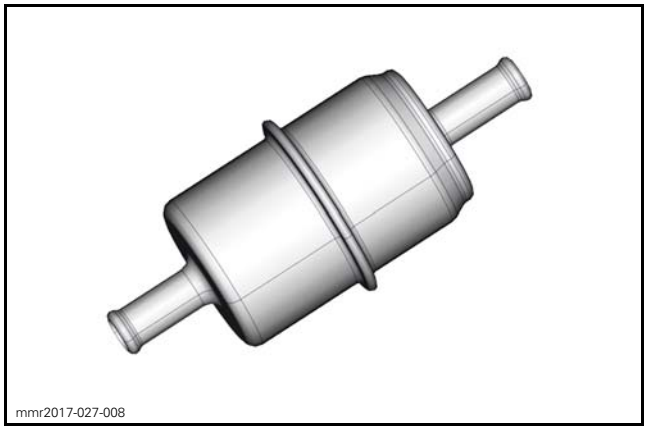
Fuel Filters

Fuel Pump Pre-Filter

A fuel pump pre-filter is used at the electric fuel pump inlet. It is a replaceable nylon mesh filter located within the fuel pump module housing (fuel pump reservoir).

The fuel pump pre-filter protects the fuel pump and prevents clogging of the fuel passages within the fuel pump module.

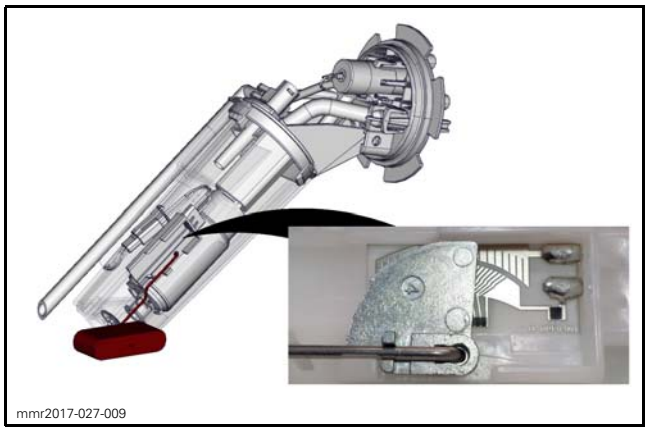
In-Line Fuel Filter



An in-line filter on the supply side is located between the fuel pump and the ECM.

It is a replaceable metallic canister type filter used to deliver dirt-free fuel to the injectors.

Fuel Level Indication


mmr2017-027-009

A float type fuel level sensor varies its resistance with fuel level thus providing a signal to the multifunction gauge for fuel level indication.

INSPECTION

INSPECTING THE FUEL LINES AND CONNECTIONS

Visually inspect fuel lines and connections for cracks or leaks.

TESTING FUEL SYSTEM FOR LEAKS

Activate the fuel pump from the **Functions** page in BUDS2.

Check for fuel leaks.

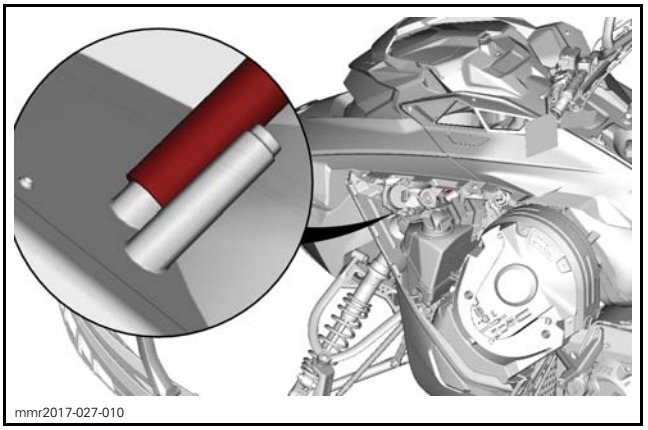
⚠ WARNING

After working on the fuel system, carry out a fuel system pressurization test to check for leaks. Failure to carry out a fuel system pressurization test could result in severe injury or a life threatening situation should a leak occur.

TESTING FUEL TANK FOR LEAKS

REQUIRED TOOLS	
SMALL HOSE PINCHER (P/N 295 000 076)	
LEAK TEST KIT (P/N 529 033 100)	
VACUUM/PRESSURE PUMP (P/N 529 021 800)	

1. Fill up fuel tank.
2. Open the left side panel to access the fuel vent tube.
3. Install a hose pincher on the vent tube.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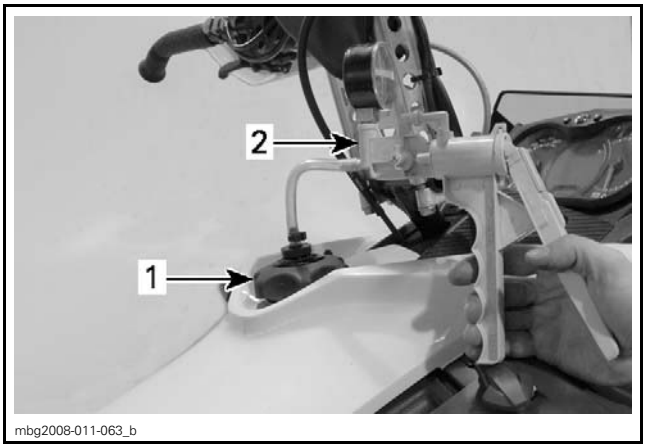
4. Install the appropriate test cap from the leak test kit on fuel tank inlet.
5. Install the pressure pump on pressure test fuel cap.



mbg2008-011-063_b

TYPICAL
1. Pressure test fuel cap
2. Vacuum/pressure pump

6. Set pump selector to pressure.
7. Pressurize fuel tank as follows.

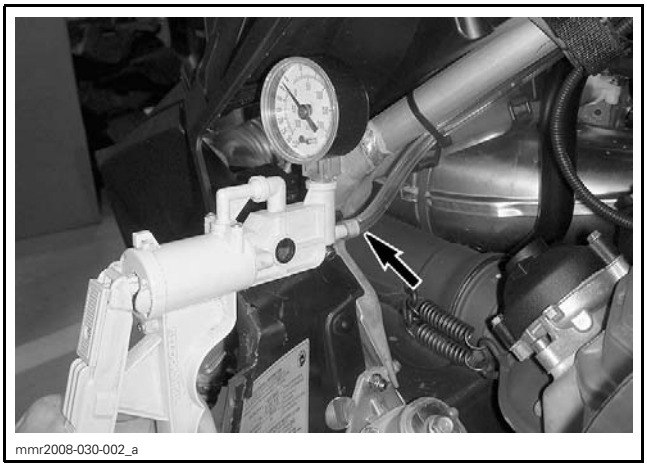
PRESSURE	TIME WITHOUT PRESSURE DROP
21 kPa (3 PSI)	3 minutes

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

To ease locating leak(s), spray soapy water on components; bubbles will indicate leak location(s).

Fuel Tank Vent Valve Test

1. While the fuel tank is still pressurized as in the previous test, carry out the following:
2. Place a finger over the vent hose outlet.
3. When removing hose pincher, alternately touch and release vent hose outlet. You should feel pressurized air flowing out indicating the pressure relief valve function is working.
4. Release any remaining pressure in the fuel tank by slowly unscrewing fuel tank cap.
5. Remove the pressure test fuel cap.
6. Remove the fuel tank vent tube from its fitting on the lower left front body panel.
7. Install the pressure pump on the vent tube and apply air pressure through the vent valve. Air must flow freely towards the fuel tank neck.



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TYPICAL - VACUUM/PRESSURE PUMP ON VENT TUBE

NOTE: If fuel vent check valve does not function as indicated in test, replace vent valve.

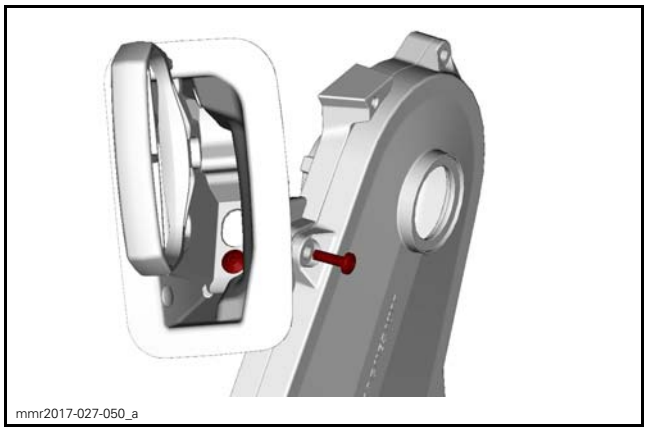
8. Remove vacuum/pressure pump.
9. Install vent tube on its fitting.
10. Install normal fuel tank cap.

TESTING THE FUEL PRESSURE

REQUIRED TOOLS	
PRESSURE GAUGE (P/N 529 036 395)	
T FITTING FUEL PRESSURE (P/N 529 036 509)	

Open right hand side panel.

Move rewind starter handle assembly (applicable models).



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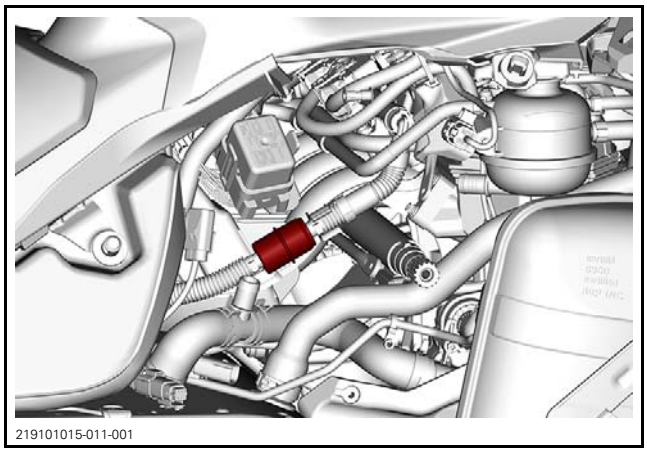
The pressure test provides an indication of the available fuel pressure at the fuel pump outlet. It validates the pressure regulator and the fuel pump.

1. Ensure there is enough gas in fuel tank.
2. Install a rag under the fuel filter to catch the fuel spillage.
3. Remove the fuel filter.



219101015-011-001

4. Install the T fitting tool in place of the fuel filter. Secure with gear clamps.

219101040-012-001

5. Install the pressure gauge on the T fitting tool.

⚠ WARNING

When carrying out pressure test, ensure fuel is not leaking from test equipment onto hot exhaust system or electrical components. Ensure fuel hose do not come into contact with hot engine parts or hot exhaust system.

6. Start engine.
7. Run engine above 2000 RPM and observe the fuel pressure.

FUEL PRESSURE
303 kPa (44 PSI)

If pressure is lower than specified, momentarily block the return hose while monitoring the pressure gauge.

NOTICE **Do not block the fuel return for more than 2 seconds.**

If pressure rises to reach or exceed specification with the fuel return blocked, replace fuel regulator.

If pressure does not rise with the fuel return blocked, refer to *PRESSURE BELOW SPECIFICATIONS* in the following table.

FUEL PRESSURE TROUBLESHOOTING	
RESULT	POSSIBLE CAUSE
Pressure above specifications	Defective fuel regulator

FUEL PRESSURE TROUBLESHOOTING	
RESULT	POSSIBLE CAUSE
Pressure below specifications	Clogged fuel filter
	Poor electrical connection
	Defective fuel regulator
	Defective fuel pump
	Leak in the fuel system circuit

8. Stop engine.

Fuel pressure should remain stable.

9. If fuel pressure drops, check the following for leaks:
   - Tools
   - Hoses
   - Fuel injectors
   - Fuel pressure regulator
   - Fuel pump.
10. Bleed away any remaining fuel in the pressure gauge and fuel hose adapter using the bleed valve on the fuel hose adapter.
11. Remove pressure gauge and fuel hose adapter.
12. Reinstall the fuel pressure hose on ECM . Refer to *REPLACING THE ECM LOWER FUEL HOSE*
13. Reinstall all remaining removed parts.

PROCEDURES

FUEL HOSE AND OETIKER CLAMPS

Replacing Fuel Hoses

mmr2017-027-013

TYPICAL PRE-FORMED FUEL HOSE

When replacing fuel hoses, be sure to use hoses 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 performing a *FUEL SYSTEM PRESSURIZATION AND LEAK TEST*.

Replacing Oetiker Clamps

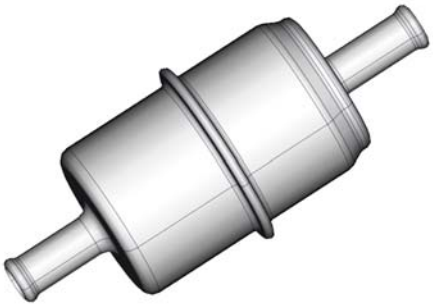
mmr2017-027-012

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.

REPLACING THE IN-LINE FUEL FILTER



mmr2017-027-008

Removing the In-line Fuel Filter

⚠ WARNING

Work in a well ventilated area. Wipe up all spilled fuel.

1. Release fuel pressure in the system. .
2. Remove the upper body module. Refer to *BODY* subsection.
3. Disconnect magneto connector.

⚠ WARNING

The magneto connector must be disconnected to prevent any spark in the engine compartment and to remove power from the fuel pump. Otherwise, if the engine is cranked, fuel vapors may ignite in presence of a spark creating a fire hazard.

4. Place a rag between fuel filter and oil injection tank.
5. Cut both Oetiker clamps securing the fuel filter.
6. Remove fuel filter from vehicle.

Dispose fuel filter as per your local environmental regulations.

Installing the In-Line Fuel Filter

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

Insert new Oetiker clamps on both hoses.

Install the new filter. Make sure printed arrow pointed towards the ECM.

Secure the fuel filter with Oetiker clamps.

⚠ WARNING

Ensure hose clamp is tight and that hose cannot turn on the fitting.

When installation is complete, carry out a fuel system leak test, refer to *TESTING FUEL SYSTEM FOR LEAKS* in this subsection.

⚠ WARNING

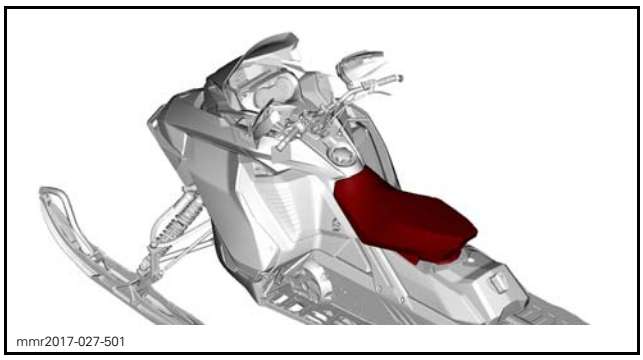
After working on the fuel system, carry out a fuel system pressurization test to check for leaks. Failure to carry out a fuel system leak test could result in severe injury or a life threatening situation should a leak occur.

Reinstall all removed parts.

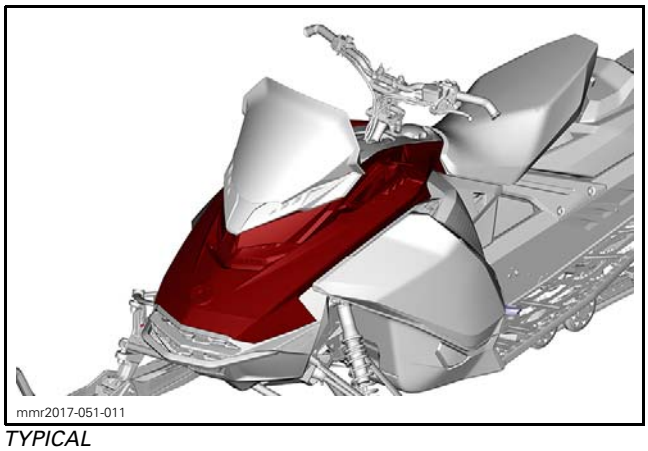
FUEL TANK

Removing the Fuel Tank

1. Remove seat.

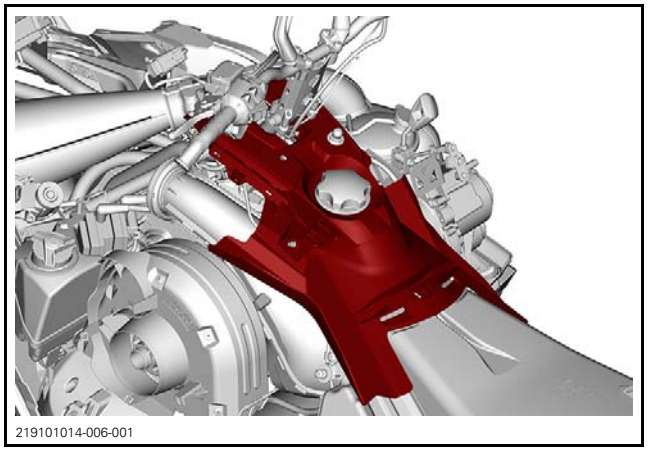


2. Remove upper body module. Refer to *BODY* subsection.



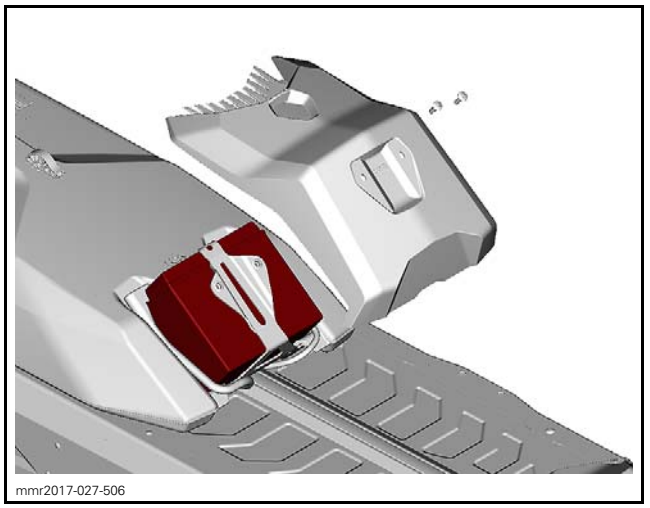
TYPICAL

3. Remove tank cover.

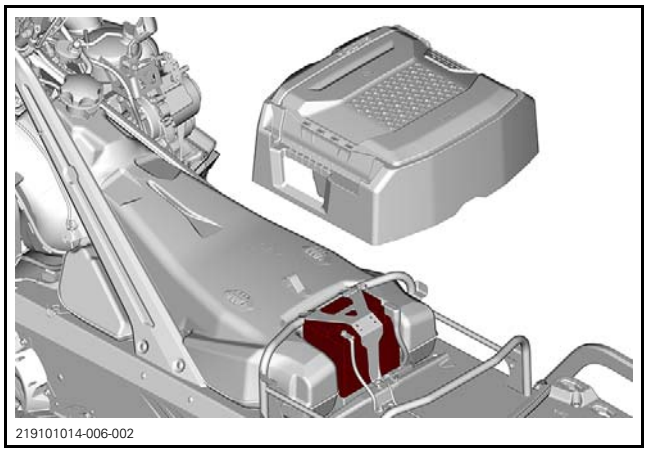


4. Remove the battery, if applicable.

16 in Track

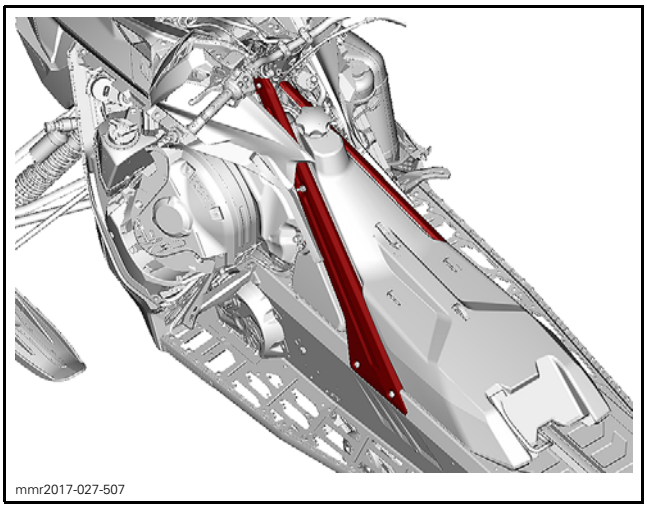


20 in Track



All Models

5. Remove rear frame members. Refer to *FRAME* subsection.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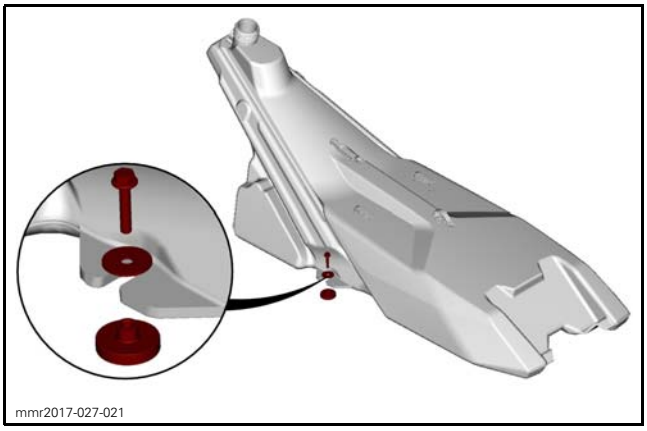
6. Remove and discard fuel tank retaining screws or rivets.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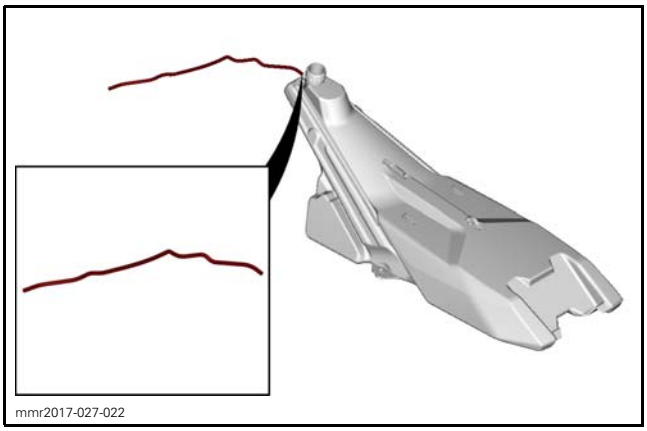
7. Remove fuel tank vent.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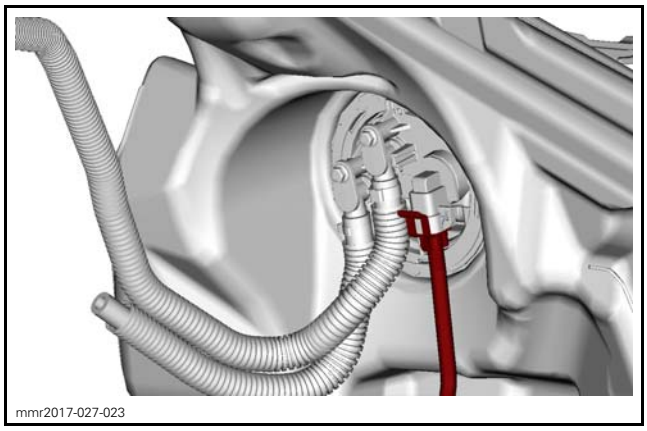
8. Remove fuel pump electrical connector.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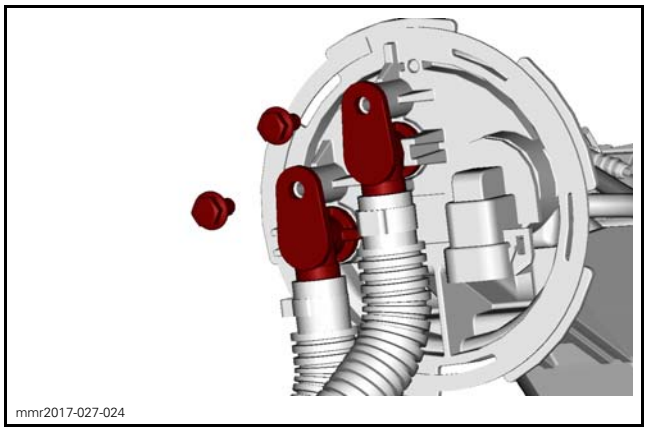
9. Remove fuel hoses from pump. Discard screws.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10. Remove fuel tank.

Installing the Fuel Tank

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

Refer to appropriate subsections to properly reinstall all removed components.

Pressurize and test fuel system for leaks.

FUEL PUMP

Relieving Fuel Pressure

1. Connect vehicle to BUDS2, refer to the *COMMUNICATION TOOLS* subsection.
2. From the **Functions** page, relieve fuel pressure.

Activating the Fuel Pump with BUDS2

NOTE: Activating the fuel pump as described in this procedure can be used for purging air from the fuel system whenever a fuel hose has been disconnected and reconnected. The pump should be activated for 15 seconds to ensure proper purging of the system.

1. Connect vehicle to BUDS2 software, refer to *COMMUNICATION TOOLS* subsection.
2. From the **Functions** page, activate the fuel pump.
3. Listen for fuel pump operation.

If you do not hear the pump come ON, select the **Faults** tab in BUDS2 and check for fault codes.

If there is no fault code, connect a known good fuel pump to the vehicle harness (in parallel) and repeat the test.

NOTE: No voltage test can be done when the fuel pump is disconnected.

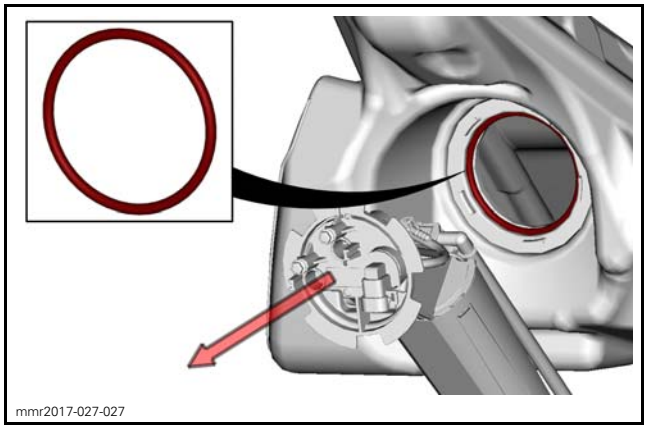
If the second fuel pump functions when connected to the vehicle harness, then replace the fuel pump installed in the vehicle.

Removing the Fuel Pump

1. Remove the fuel tank.
2. Remove fuel pump assembly snap ring from fuel tank.

mmr2017-027-026

3. Remove and discard fuel pump gasket.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4. Visually inspect for broken or damaged ground wires, if any issue are found, the module should be replaced.

Installing the Fuel Pump

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

Make sure the remote pick-up is inserted all the way to the rear of fuel tank and does not interfere with the fuel level sensor float.

Install a **NEW** gasket on the fuel pump prior to installing the pump in the tank.

Ensure the fuel pump snap ring is fully engaged with the gap on top. Refer to image in removal procedure.

NOTE: The gasket must be installed on the fuel tank side so it is located between the pump and the fuel tank.

Install fuel tank.

⚠ WARNING

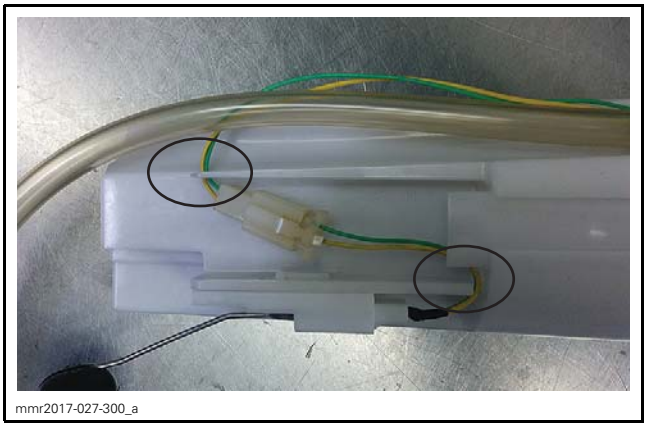
After working on the fuel system, carry out a fuel system pressurization test to check for leaks. Failure to carry out a fuel system leak test could result in severe injury or a life threatening situation should a leak occur.

FUEL PUMP INLET FILTER

Replacing the Fuel Pump Inlet Filter

1. Remove fuel pump assembly from fuel tank. Refer to procedure in this subsection.
2. Free the wires of the fuel level sensor of the fuel pump reservoir.

NOTICE **Do not pull / push on wires or metal terminals that connect the grounding wires to the plastic parts. Keep hands and tools away from this area.**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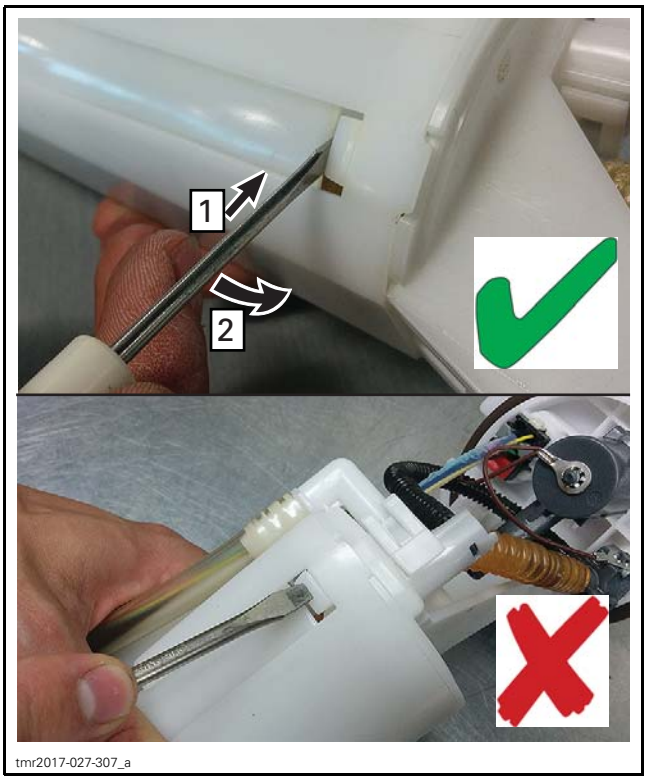
3. Unlock fuel pump reservoir by carefully inserting a small screwdriver between the tab and the fuel pump reservoir.

NOTICE Do not push directly on tabs or twist the screwdriver.



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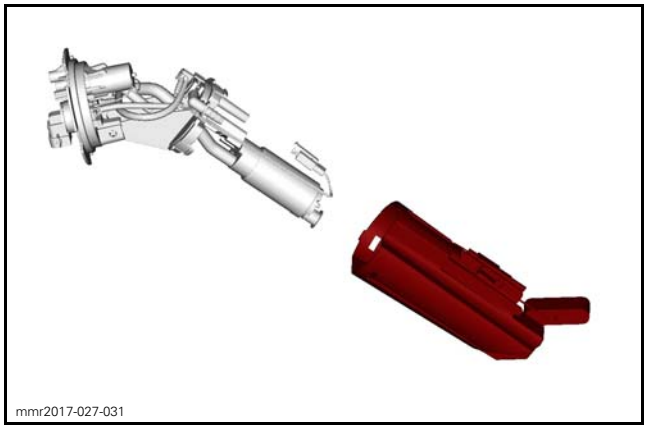
4. Completely remove fuel pump reservoir by pulling it carefully.


mmr2017-027-031

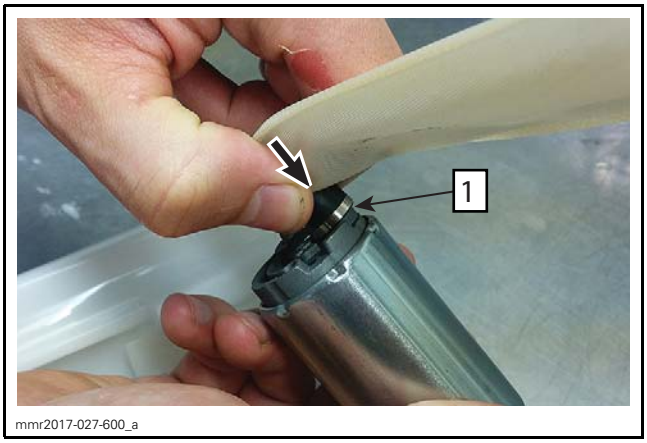
NOTICE To avoid damaging wires, Pull the reservoir carefully and do not let reservoir hang by wires.

5. Remove inlet fuel pump filter by pulling on it. If the filter is hard to remove, pry the filter gently using a small screwdriver.

NOTICE Be careful to avoid scratching the outside diameter of the pump inlet fitting where the filter fits.

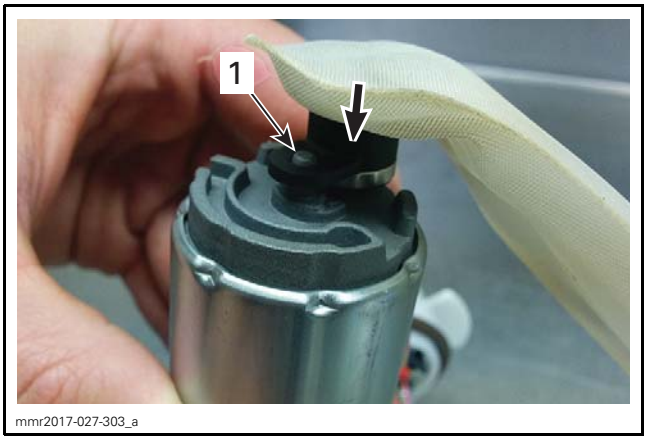
mmr2017-027-302_a

6. Discard inlet fuel pump filter and steel ring.
7. Install new fuel pump inlet filter.
   - 7.1 Insert inlet filter onto fuel pump by pressing it downward.
   - 7.2 Push the filter on until the fitting bottoms out on the pump inlet face, there should be no gap.



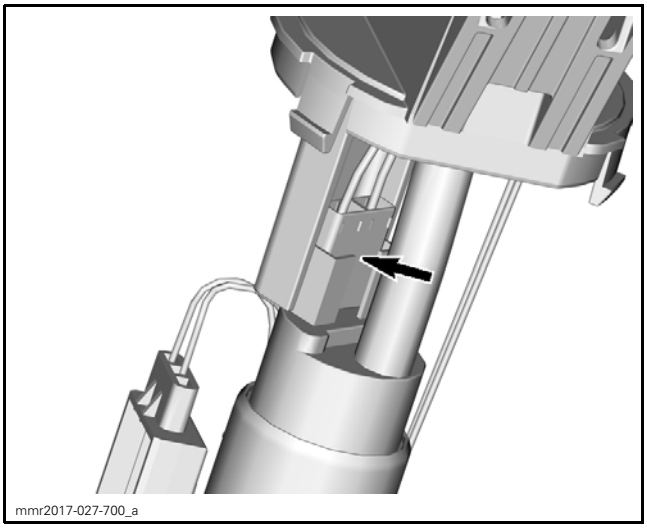
1. No gap here

7.3 Ensure that the filter hole is properly positioned into the pin.



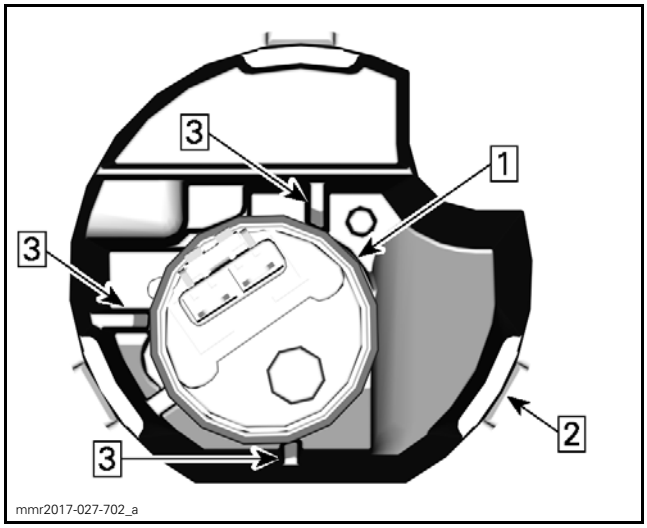
1. Pin

8. Install fuel pump reservoir carefully and ensure that all parts are properly positioned.

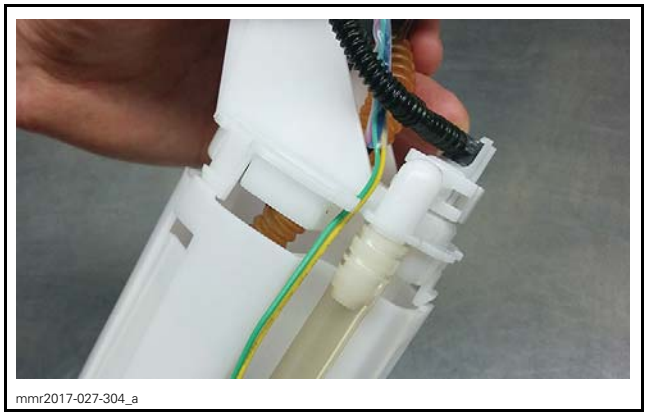


ELECTRICAL CONNECTOR MUST BE IN THIS POSITION

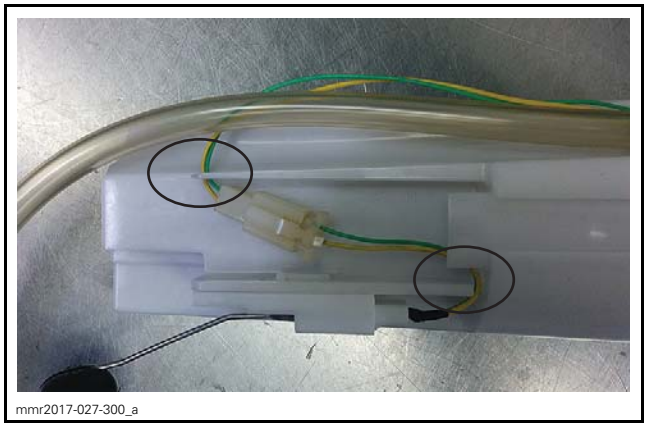
NOTE: Make sure the pump motor is positioned between the molded ribs in the reservoir.



1. Fuel pump motor
2. Reservoir
3. Ribs



9. Ensure that fuel tank reservoir tabs are properly locked.
10. Route the fuel level sensor wires properly.



11. Reinstall fuel pump in fuel tank. Refer to procedure in this subsection.

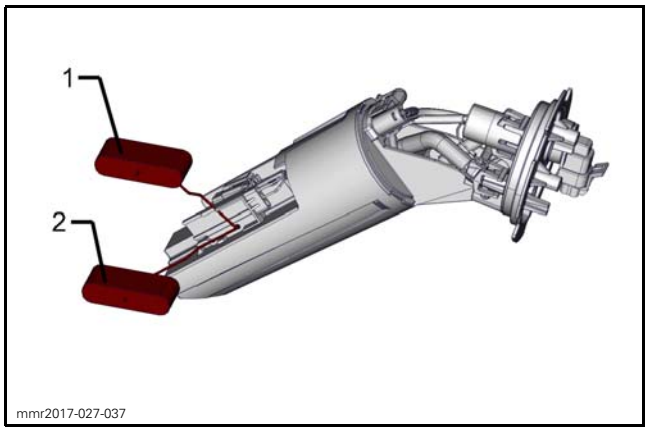
FUEL LEVEL SENSOR

NOTE: Verify the gauge functions related to the fuel level sensor before testing the sensor. Refer to *GAUGE* subsection.

Testing Fuel Level Sensor Resistance

1. Remove fuel pump from fuel tank, refer to *FUEL PUMP* in this subsection.
2. Ensure the fuel level sensor is properly connected in the fuel pump module.
3. Measure the resistance at the fuel pump connector **(FP)**.

FUEL LEVEL SENSOR BENCH TEST		
PROBE	FLOAT POSITION	RESISTANCE
FP- B to FP-D	Empty	95 Ω ± 5 Ω
	Full	9 Ω ± 2 Ω



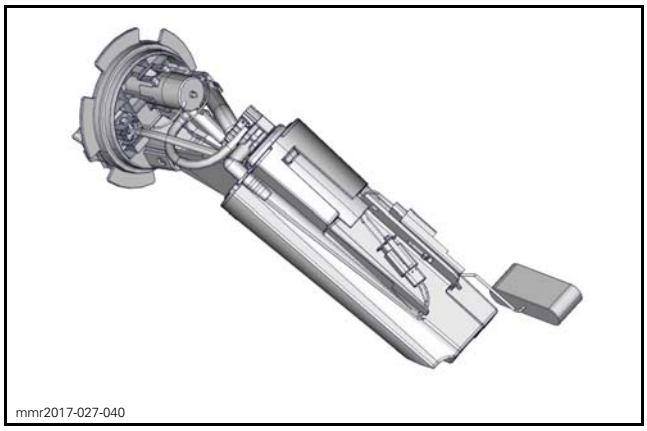
TYPICAL FUEL PUMP FLOAT
1. Full position
2. Empty position

4. When fuel level sensor travels from full to empty or vice-versa, there should be a constant linearity to the resistance readings. Any spike or drop of resistance indicates a "flat spot" in the fuel level sensor circuitry.

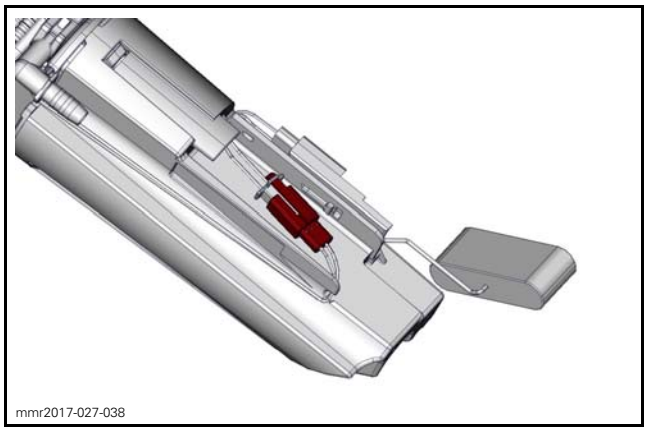
If fuel level sensor fails bench test, replace the fuel level sensor.

Replacing the Fuel Level Sensor

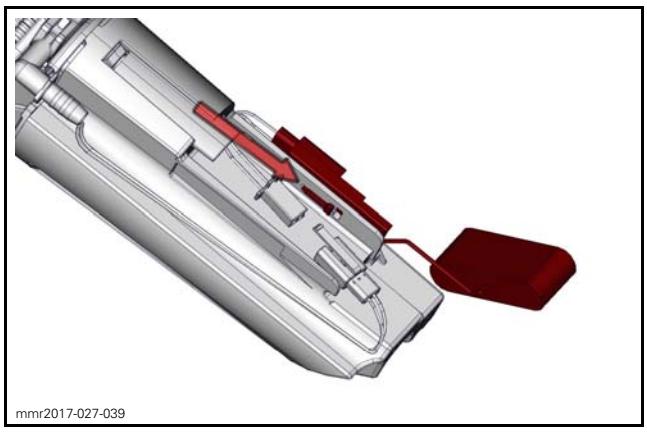
1. Remove the fuel pump.



2. Disconnect fuel level sensor connector.



3. Slide the potentiometer out of the fuel pump reservoir.



4. Remove fuel level sensor.
5. Replace the fuel level sensor with a new one and reverse steps.

E-TEC DIRECT FUEL INJECTION

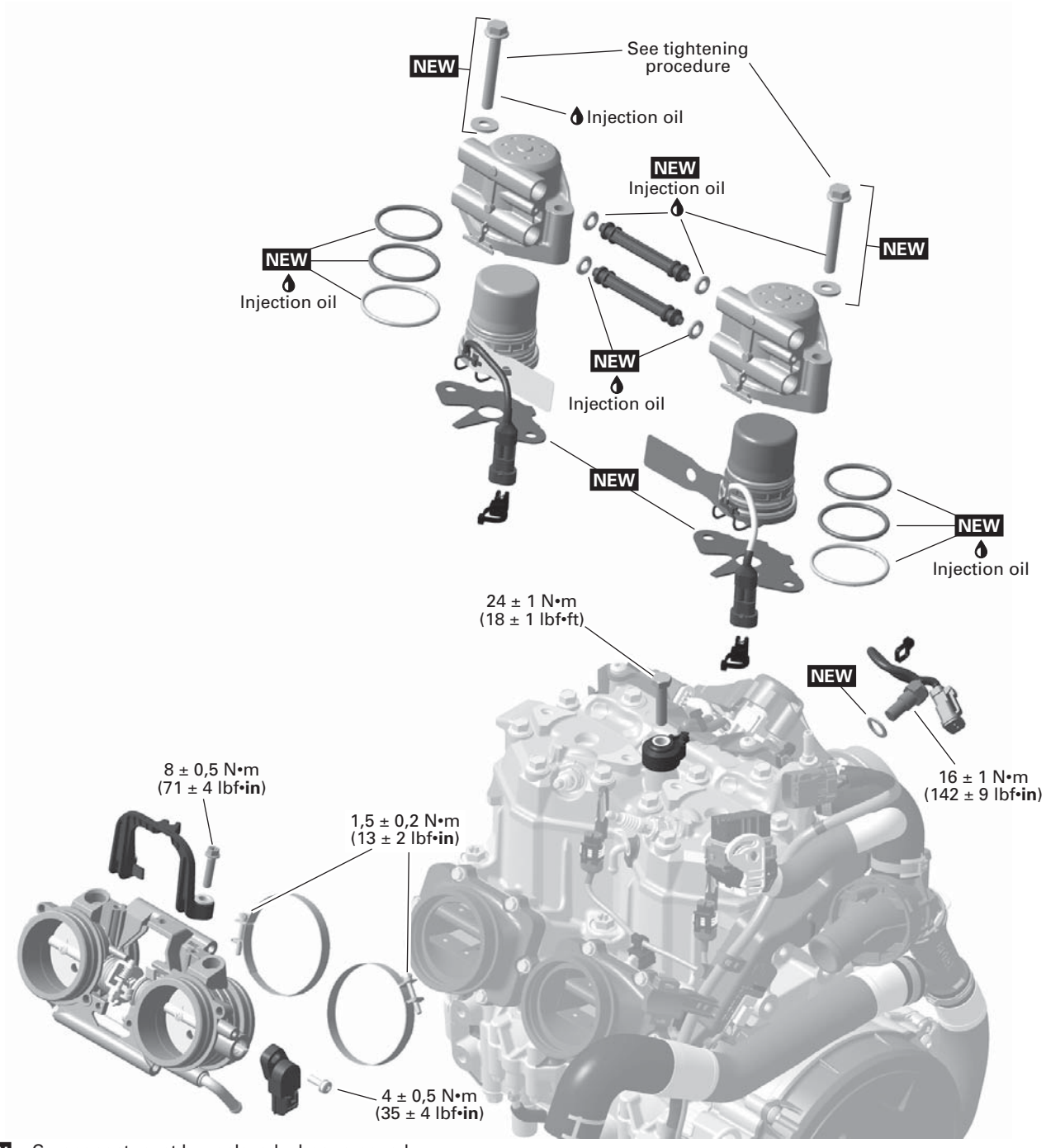
SERVICE TOOLS

Description	Part Number	Page
ECM ADAPTER TOOL	529 036 166	4
EXTRACTOR ADAPTOR	529 036 136	18
FLUKE 115 MULTIMETER	529 035 868	4
OETIKER PLIER	295 000 070	8
SMALL HOSE PINCHER	295 000 076	33

SERVICE PRODUCTS

Description	Part Number	Page
BRAKE AND PARTS CLEANER PRO S2	779245	34
CLUTCH AND PULLEY FLANGE CLEANER PRO S1	779244	7
DIELECTRIC GREASE	293 550 004	23, 39
PULLEY FLANGE CLEANER (F)	619 600 022	7

600R E-TEC



NEW = Component must be replaced when removed.

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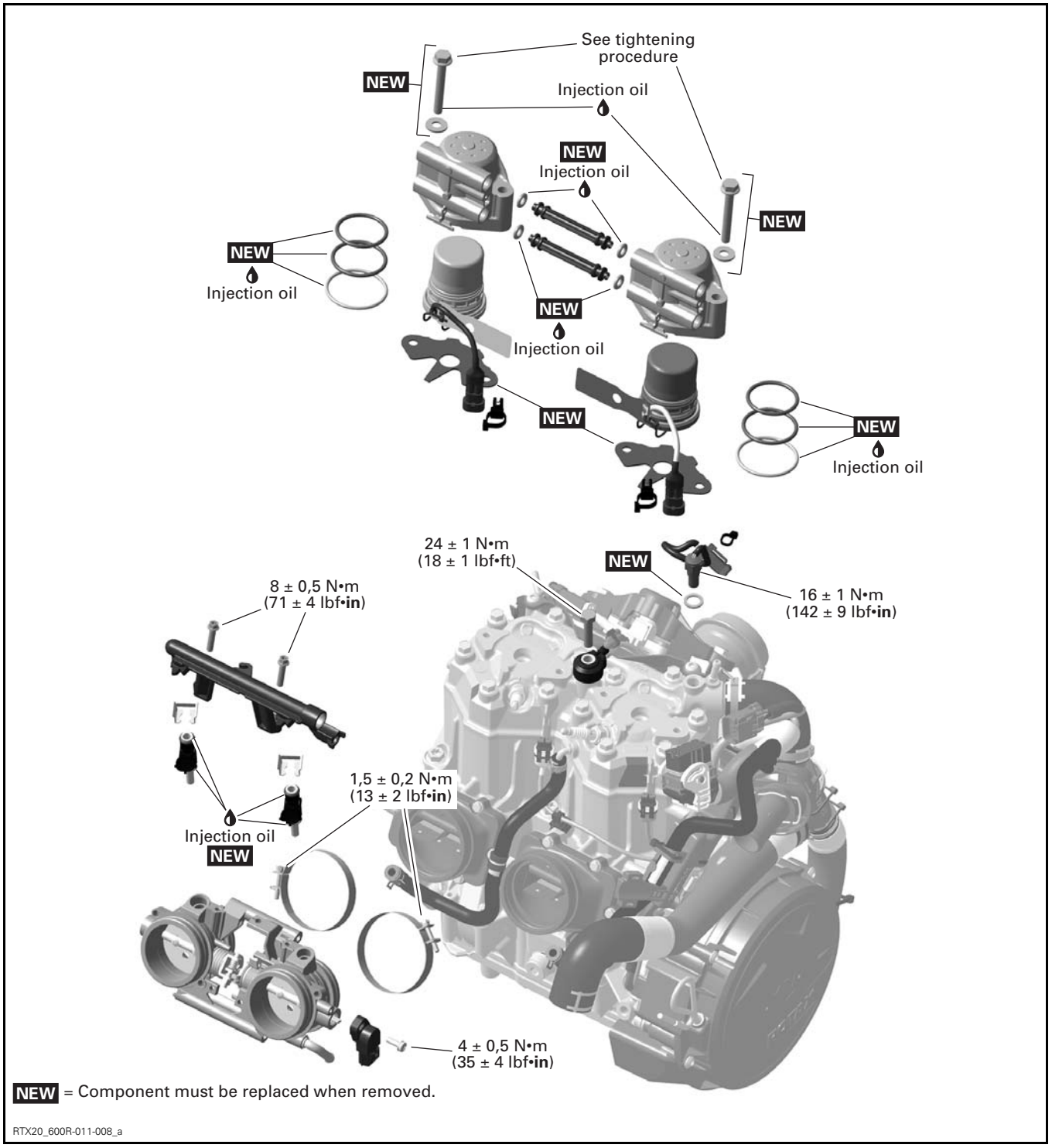
850 E-TEC



NEW = Component must be replaced when removed.

RTX20_600R-011-008_a

GENERAL

For proper installation of the engine wiring harness and locking ties refer to *ENGINE WIRING HARNESS* subsection.

When testing electrical systems, the emergency stop switch must always be in the RUN position unless otherwise mentioned, or test is performed while cranking engine.

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)	

⚠ WARNING

Always disconnect the magneto connector prior to:
- Disconnecting any fuel hose.
- Removing a fuel injector.
- Removing a spark plug cable or spark plug.

Otherwise, fuel vapors may ignite in presence of a spark creating a fire hazard.

⚠ WARNING

The fuel system is under high pressure. Proceed with care when working on the fuel system. Wear safety glasses and work in a well ventilated area.

Release fuel system pressure prior to removing fuel system components. Refer to *REMOVING THE FUEL TANK* in *FUEL TANK AND FUEL PUMP* subsection.

⚠ WARNING

Perform a fuel pressure test each time a component from the fuel system is removed. Prior to starting the engine when a fuel hose was disconnected or a fuel injector removed:
- Ensure all fuel lines are properly connected.
- Inspect engine compartment to detect any fuel leakage or an abnormally strong fuel odor which may be an indication of a fuel leak that is not readily visible.

SYSTEM DESCRIPTION

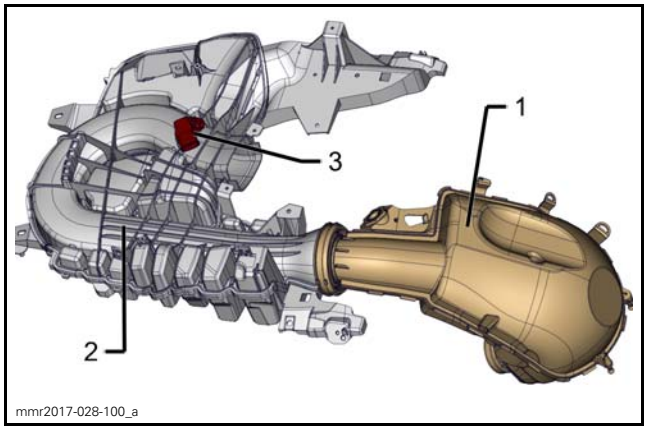
The ECM reads the input signals from different sensors which indicate engine operating conditions at micro-second intervals.

The ECM calculates the proper air/fuel ratio and activates the output to fuel injectors.

Signals from sensors are used by the ECM to determine the injection parameters (fuel maps required for optimum air-fuel ratio).

The crankshaft position sensor (CPS), the throttle position sensor (TPS) are the primary sensors used to control the injection. Other sensors (like temperature sensors, etc.) are used as secondary input.

Air Induction



1. Primary air intake silencer
2. Secondary air intake silencer
3. MAPTS

Air flows through a mesh filter in the secondary air intake silencer mounted on top of engine. The mesh filter prevents snow from being drawn into the engine.

Air pressure and temperature is measured in the secondary air intake silencer by the Manifold Absolute Air and Temperature Sensor (MAPTS).

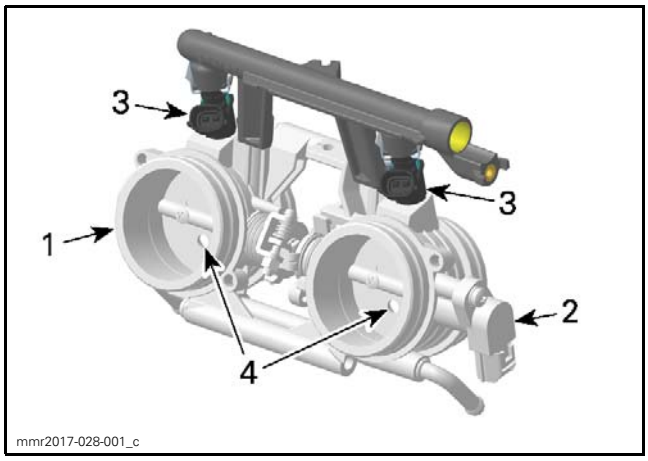
Air then flows through the primary air intake silencer.

Air is then drawn in through a dual throttle body mounted on the engine intake side.

Throttle Body

A dual throttle body assembly is directly mounted on the intake flange of each cylinder (52 mm (2.05 in)).

The air flow is controlled by two throttle plates. Each throttle plate has a 6.8 mm (.268 in) idle port in it.

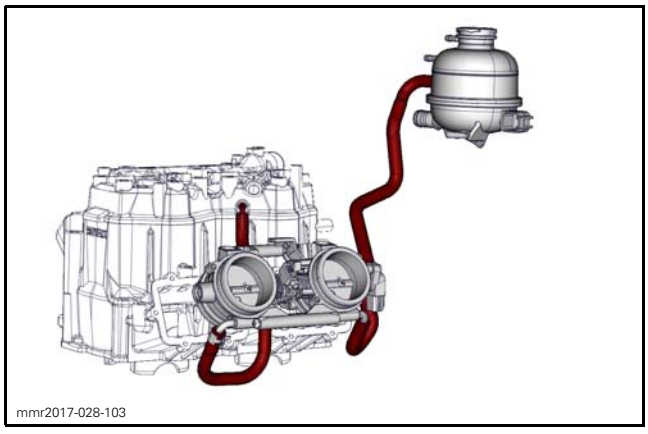


TYPICAL
1. *Throttle body*
2. *TPS (Throttle Position Sensor)*
3. *Throttle body injectors (850 E-TEC only)*
4. *Idle ports*

Since there is a constant airflow through the idle ports of the throttle plates, the idle speed is controlled by the ECM by varying the amount of fuel injected in the combustion chamber and by controlling the injection timing.

The TPS (Throttle Position Sensor) is fitted on the throttle body. The TPS sends throttle angle position to the ECM.

Engine coolant flows through the throttle body to prevent potential freezing of throttle plates due to the temperature drop naturally created by the venturi.

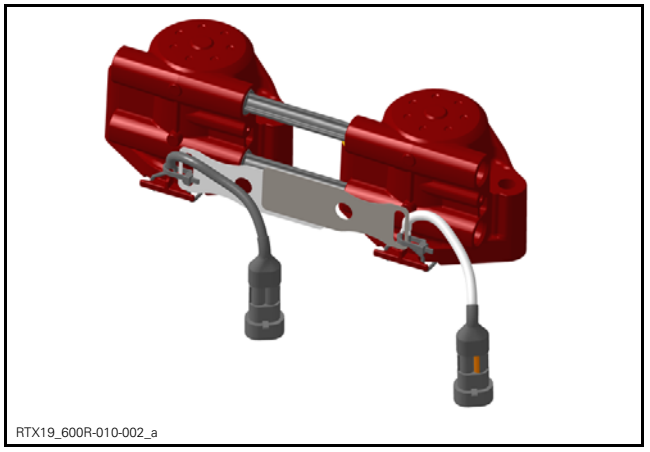


The air then continues through the reed valves into the cylinder base then into the crankcase.

Fuel Injectors

Each cylinder is supplied with fuel by a fuel injector on the top of the cylinder (high pressure direct E-TEC injectors).

High Pressure Direct E-TEC Injectors

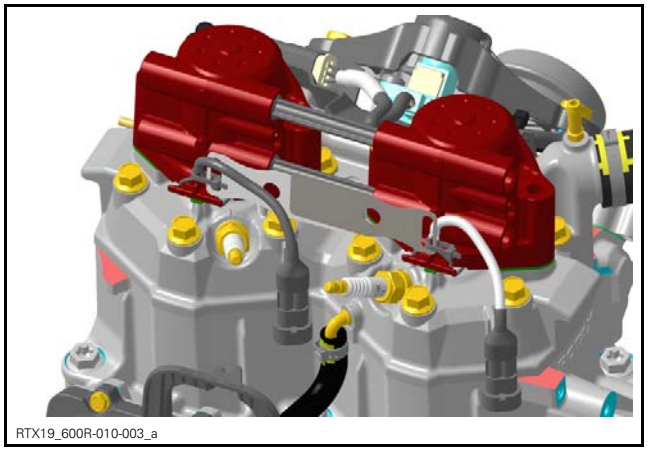


DIRECT INJECTORS

The fuel injectors are powered from the 55 Vdc system.

One fuel injector per cylinder is used.

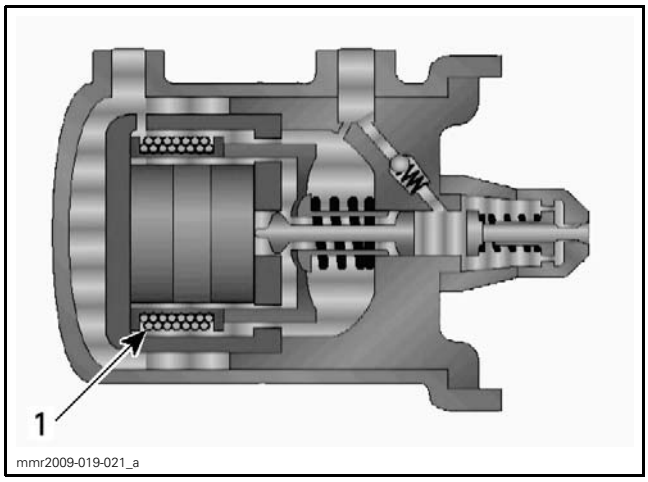
The E-TEC fuel injector is mounted directly on top of the cylinder head.



TYPICAL

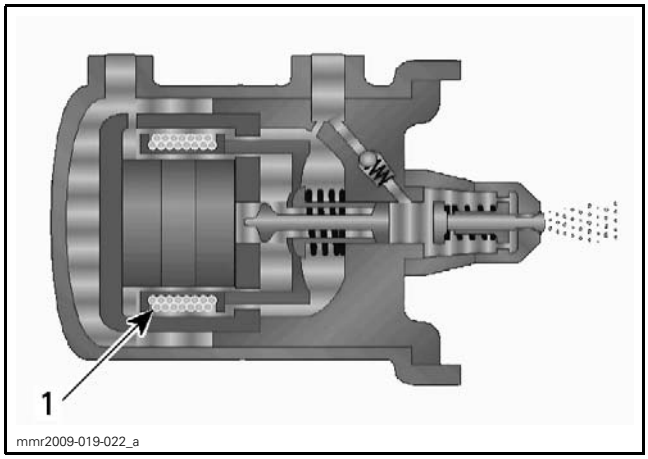
The fuel injector achieves a direct injection right into the combustion chamber. This keeps the piston cooler with less fuel.

A voice coil type is used to open and close the fuel injector nozzle. This allows for quick operation of the fuel injector; opening stage as well as the closing stage. This results in the ability to operate the engine at a higher RPM and lowers unburned fuel to the exhaust port.



FUEL INJECTOR CLOSED
1. Voice coil

When a positive current is supplied to the coil by the ECM, the fuel injector plunger moves towards the spring loaded injector needle. As the injector plunger moves, this builds up a pressure in the fuel injector chamber. When the pressure reaches approximately 2 068 kPa (300 PSI), the injector needle spring is overcome and the needle opens. Fuel injection then takes place while the pressure peaks at 3 792 kPa (550 PSI).



FUEL INJECTOR OPENED
1. Voice coil

Swirl channels are used in the fuel injector to better atomize the fuel charge.

The quantity of injected fuel is controlled by varying the injector plunger stroke.

To bring the injector plunger backward to its rest position, the current is reversed and the return springs close the injector needle and plunger. Near the end of the return stroke, a brief positive current is applied to "brake" the injector plunger. This results in a quieter operation of the fuel injectors.

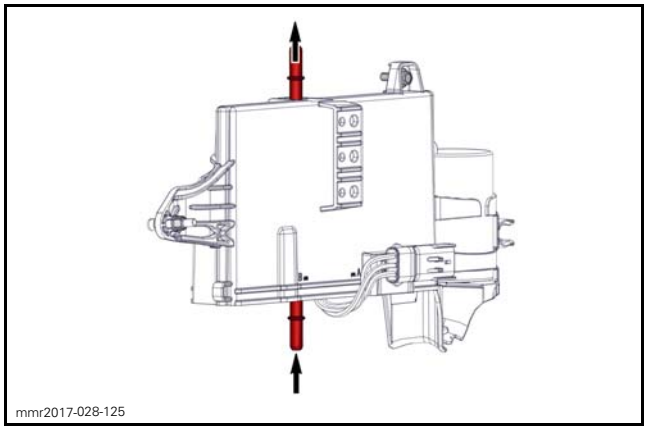
The fuel injectors provide a stratified fuel charge to the combustion chamber at idle speed only. Beyond this RPM, the fuel charge becomes homogeneous.

The stratified fuel charge provides a cleaner combustion, better idling and less smoke.

Fuel is used to maintain proper fuel injector operating temperature.

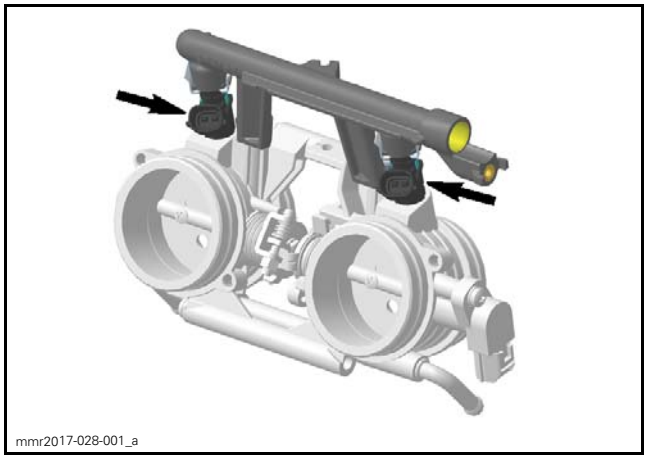
The flow starts from the fuel pump, through the ECM, then around the voice coil inside the fuel injector housings to cool down the fuel injector components.

Fuel enters the inlet port located at the bottom of the fuel injector housing and exits through the outlet port on top of the fuel injector.



Throttle Body Injectors (850 E-TEC only)

The fuel injectors are mounted directly on top of the throttle body.



Fuel injectors are used to inject fuel directly before the reed valves. One injector is used per cylinder.

The fuel injectors are supplied with fuel by the fuel rail. The fuel rail ensures all times that enough fuel at the right pressure can be delivered to the fuel injectors. The fuel rail is fed by the fuel pump module.

ADJUSTMENT

IDLE SPEED

Idle speed is controlled by the ECM and is not adjustable with an idle screw.

If idle speed is not as per specification (refer to *TECHNICAL SPECIFICATIONS*), perform the *RESETTING CLOSED THROTTLE VALUE (TPS)*.

RESETTING CLOSED THROTTLE VALUE (TPS)

General Information

This operation performs a reset of the TPS (throttle position sensor) values in the ECM when the throttle is closed. This reset is very important as the setting of the TPS will determine the basic parameters for all fuel mapping and several ECM calculations for idle speed control of the engine.

NOTICE An improperly set TPS may lead to poor engine performance.

Verifying TPS Closed Throttle Value

1. Connect the vehicle to the BRP diagnostic software (BUDS2). Refer to *COMMUNICATION TOOLS AND B.U.D.S.* subsection.
2. In BUDS2, go to:
   – **Measurements** page
   – **ECM** button
   – **ECM - Basic** tab
   – **Throttle Opening**
3. Ensure throttle cable is properly adjusted, refer to *ADJUSTING THROTTLE CABLE* in this subsection.
4. Look for the throttle opening value .

NOTE: The Throttle Opening indication must be within the following specification.

THROTTLE OPENING SPECIFICATION	TEMPERATURE
(0 % ± 0.2)	Above 5°C (41°F)

If the throttle opening is within the % specification, DO NOT reset the closed throttle value unless the following parts were replaced:

– Engine control module (ECM)
– Throttle body
– Throttle position sensor (TPS).

If TPS is not within specification, reset the closed throttle value.

Resetting the Closed Throttle Value

NOTICE Proper throttle cable adjustment must be verified before proceeding.

1. In BUDS2, go to:
   – **Settings** page
   – **Vehicle** or **ECM** button
   – **Settings** tab
   – **Initialization - Reset TPS**
2. Press on the Reset button.
3. Confirm Throttle Opening value indicates 0.0%.

NOTE: A throttle opening of 0.0% after reset indicates the operation is successful.

If the TPS cannot be reset, check the following.

– Fault codes related to TPS
– Throttle cable adjustment
– TPS properly installed
– TPS connector and terminal condition.

Troubleshooting Actual TPS Voltage Out of Range

If the Actual TPS Voltage is out of specification, check the following.

– Fault codes related to TPS
– Throttle cable adjustment
– TPS properly installed
– TPS connector and terminal condition.

INSPECTION

INSPECTING AND CLEANING THE THROTTLE BODY

Clean throttle plates and throttle body bores.

RECOMMENDED SERVICE PRODUCT	
Scandinavia	PULLEY FLANGE CLEANER (F) (P/N 619 600 022)
Other countries	CLUTCH AND PULLEY FLANGE CLEANER PRO S1 (P/N 779244)

TROUBLESHOOTING

DIAGNOSTIC TIPS

Engine problems are not necessarily related to the injection system.

It is important to ensure the mechanical integrity of the engine is present.

Spark Plugs

Improper spark plug indexing may lead to engine misfiring. Check if BRP spark plugs are installed or if spark plugs are properly indexed. Refer to *SPARK PLUGS* in the *IGNITION SYSTEM* subsection.

3D RAVE Valves

Improper position of RAVE valves may lead to engine misfiring. Check RAVE valves. Refer to *RAVE* subsection.

Crankshaft Position Sensor (CPS)

Confirm that ECM receives the CPS signal. Refer to *CRANKSHAFT POSITION SENSOR (CPS)* in this subsection.

Electrical System

It is important to check that the electrical system is functioning properly:

– 55V system voltage
– Capacitor (refer to *CHARGING SYSTEM*)
– Ground connections
– Wiring and connectors.

Ensure that all electronic components are original BRP recommended components.

Any modification to the wiring harness may lead to fault codes or bad operation.

Always refer to the wiring diagram when diagnosing an electrical problem.

⚠ WARNING

The EMS operates on high voltage (55 Vdc), be careful to avoid electrical shocks.

⚠ WARNING

All electrical actuators (example: fuel injectors, fuel pump, ignition coils and electronic oil injection pump) are powered as soon as engine is cranked when the emergency engine stop switch is at the RUN position.

Electrical Connections

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

Make sure that connections are very tight, make good contact, are corrosion-free, and show no signs of moisture. Particularly check ECM ground connections.

NOTE: Do not apply dielectric grease or other lubricant in the ECM connectors.

Check if wiring harness shows any signs of scoring.

Resistance Measurement

When measuring the resistance with an ohmmeter, all values are given for a temperature of 20°C (68°F). The value of a resistor varies with the temperature. The value for common resistor or windings (such as solenoid) increases as the temperature increases. However, our temperature sensors are NTC types (Negative Temperature Coefficient) except for the EGTS, which means that the value decreases as the temperature increases. Use the provided tables for sensor resistive values at given temperature.

The resistive value of a temperature sensor may test good at a certain temperature but may be defective at other temperatures.

A good test is to put the sensor in a container filled with ice and water and measure resistance. Then, heat the water and read the resistance at different temperatures.

PROCEDURES

FUEL HOSES AND OETIKER CLAMPS

Removing and Installing Oetiker Clamps

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

Always use a shop rag when disconnecting a fuel hose.

⚠ CAUTION **Fuel system is under high pressure.**

⚠ WARNING

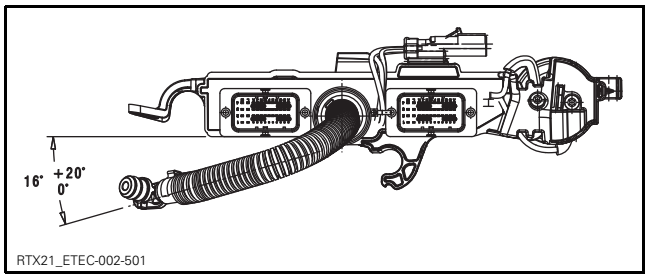
- Never use a hose pincher on high pressure hoses.
- Never change the routing of a fuel hose.
- Always reinstall the corrugated protective tubing on fuel hoses.
- Secure fuel hoses using the appropriate locking tie or fastener to prevent contact with sharp edges or hot, rotating and moving parts.
- After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

Use of improper fuel lines could compromise fuel system integrity.

Installing the Inlet Fuel Hose

Position the inlet fuel hose as per the following illustrations.

600R Engines



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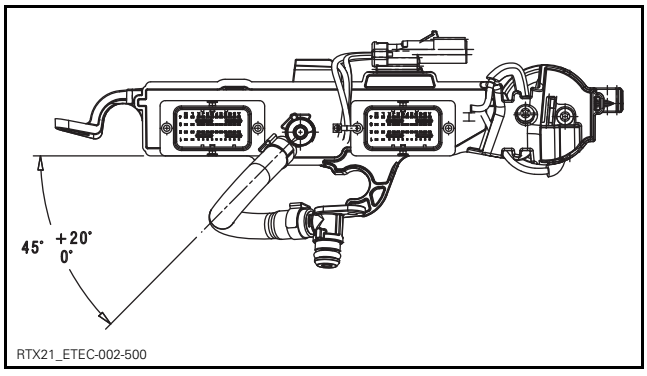
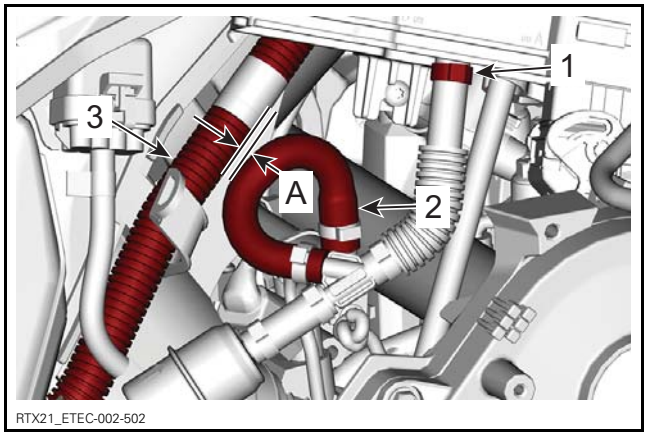
850 and 850 Turbo Engines



RTX21_ETEC-002-500

NOTICE Make sure to have a minimum of 5 mm (7/32 in) between the fuel hoses (inlet and outlet) before and after the clamp crimping.



RTX21_ETEC-002-502

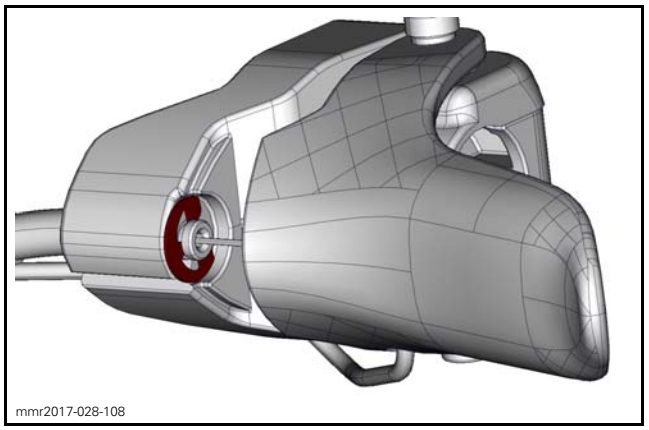
1. *Oetiker clamp*
2. *Fuel inlet hose*
3. *Fuel outlet hose*

A. *Required minimum distance: 5 mm (7/32 in)*

THROTTLE CABLE

Removing the Throttle Cable

1. Depress and hold throttle lever.
2. Pull out circlip using long nose pliers. Keep circlip for re-use.



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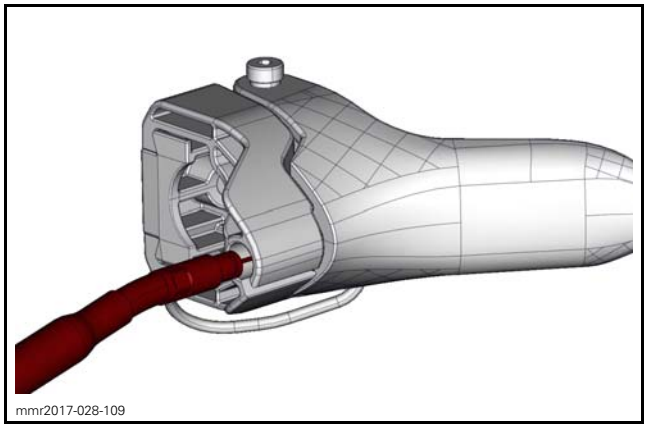
3. Pull throttle cable out of the throttle lever housing.



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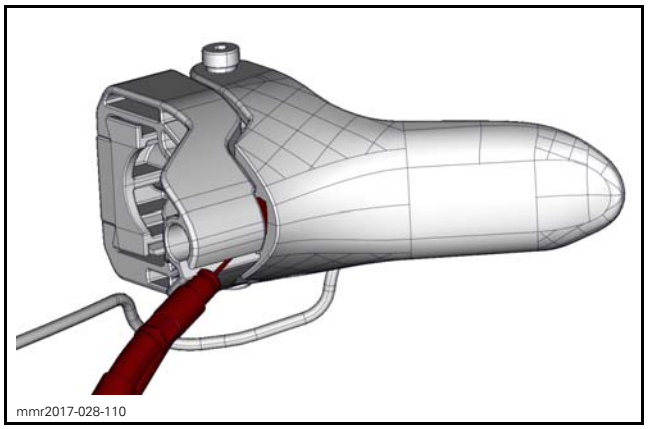
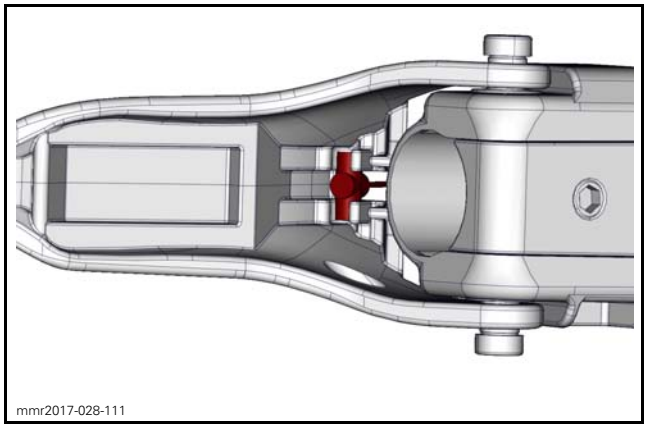
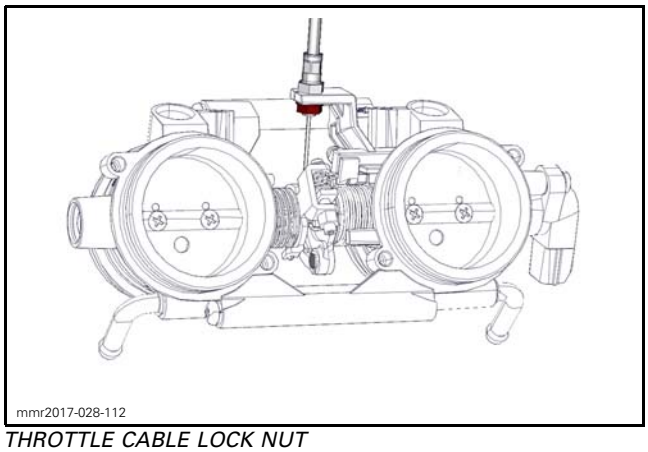


4. Unhook cable end barrel from throttle lever and remove cable.



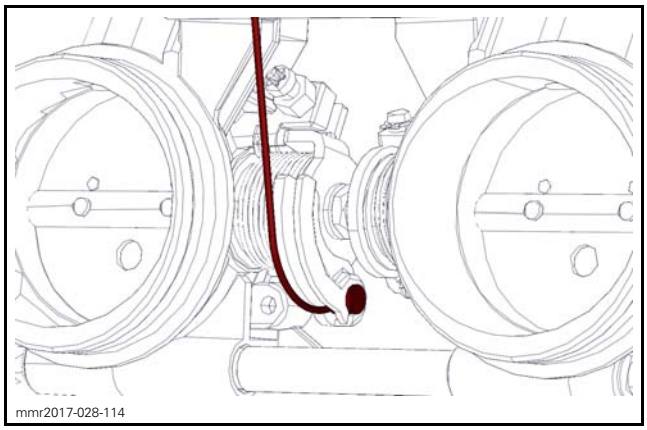
NOTE: Take note of cable routing before removal.

5. At throttle body, fully unscrew cable lock nut.



THROTTLE CABLE LOCK NUT

6. Unhook throttle cable end.



7. Remove throttle cable.

Inspecting the Throttle Cable

Visually inspect cable sheath for kinks, wear or other damage.

Visually inspect cable at throttle body and at throttle lever for fraying or other damage.

Make sure the throttle cable operates smoothly.

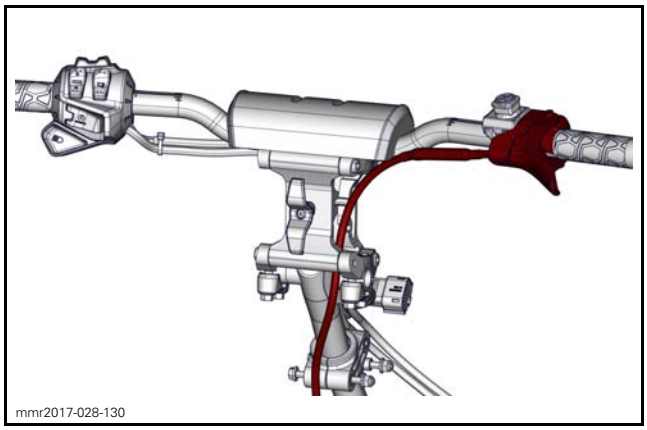
Installing the Throttle Cable

Reverse removal procedure however, pay attention to the following.

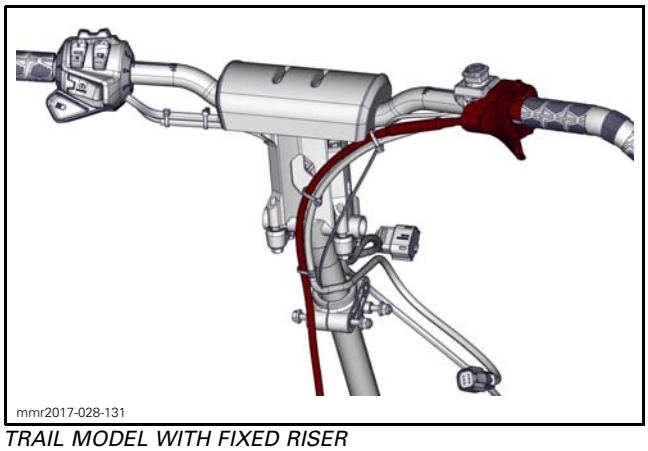
Route cable as noted prior to removal.

⚠ WARNING

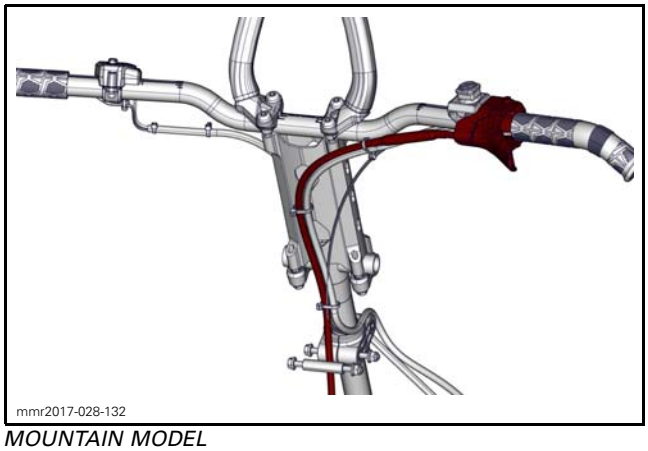
Ensure proper routing of throttle cable as per following illustration.



TRAIL MODEL WITH ADJUSTABLE RISER



TRAIL MODEL WITH FIXED RISER



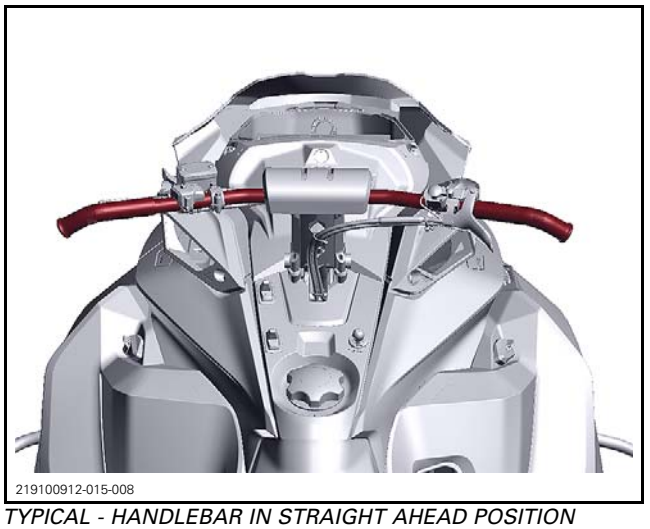
MOUNTAIN MODEL

Ensure that cable ends are properly secured in their levers.

Proceed with throttle cable adjustment.

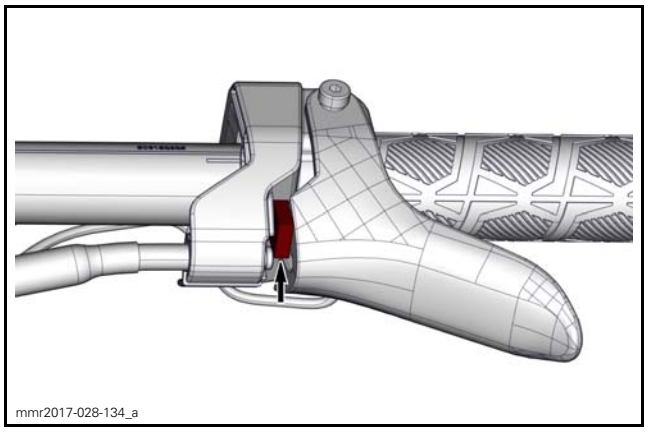
Adjusting the Throttle Cable

1. Connect the vehicle to the BRP diagnostic software (BUDS2). Refer to *COMMUNICATION TOOLS AND BUDS* subsection.
2. In BUDS2, go to:
   - **Measurements** page
   - **ECM** button
   - **Presets** / **ECM-Basic** tabs
   - **Throttle opening %**.
3. Position handlebar straight and level.

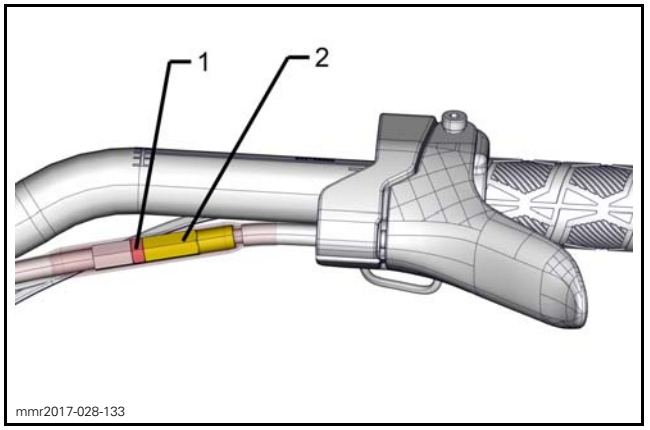


TYPICAL - HANDLEBAR IN STRAIGHT AHEAD POSITION

4. Insert a 4 mm (.157 in) spacer between throttle lever and throttle lever housing.



5. Unlock throttle cable adjuster lock nut.
6. Adjust throttle cable until the throttle opening value (%) is between 3 and 5% in BUDS2.



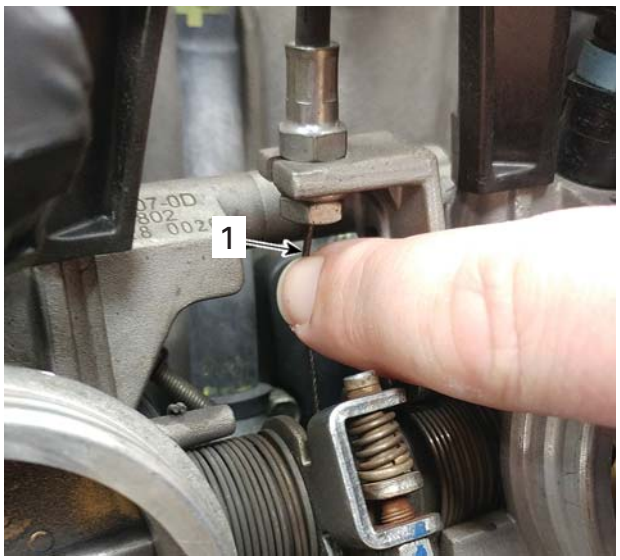
1. *Throttle cable adjuster lock nut*
2. *Throttle cable adjuster*

7. Lock throttle cable adjuster lock nut.
8. Remove the 4 mm (.157 in) spacer.

9. Fully depress the throttle lever and ensure the opening value is more than 95 % in BUDS2.
10. Ensure there is free play in the cable with the throttle lever at rest.

NOTICE Do not tamper with any throttle body adjustment screws. Otherwise, throttle body must be replaced.

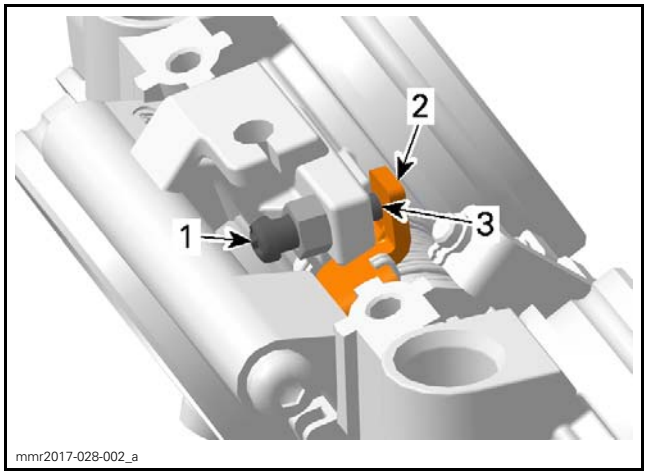
NOTE: To ensure cable free play, lightly press on throttle cable as in following illustration.



THROTTLE CABLE FREE PLAY
1. Cable slightly loose here

11. Activate and release throttle lever 2 - 3 times to settle throttle plate.
12. Confirm throttle plate stopper is STILL in contact with master zero position screw.

NOTICE Do not tamper with any throttle body adjustment screws. Otherwise, throttle body must be replaced.



THROTTLE BODY MASTER ZERO POSITION
1. Master zero position screw
2. Throttle plate stopper
3. Contact here

13. Readjust throttle cable if necessary.
14. Inspect the throttle cable operating range with BUDS2.
15. Reset the Closed Throttle Value, refer to procedure in this subsection.

Inspecting the Throttle Cable Operating Range

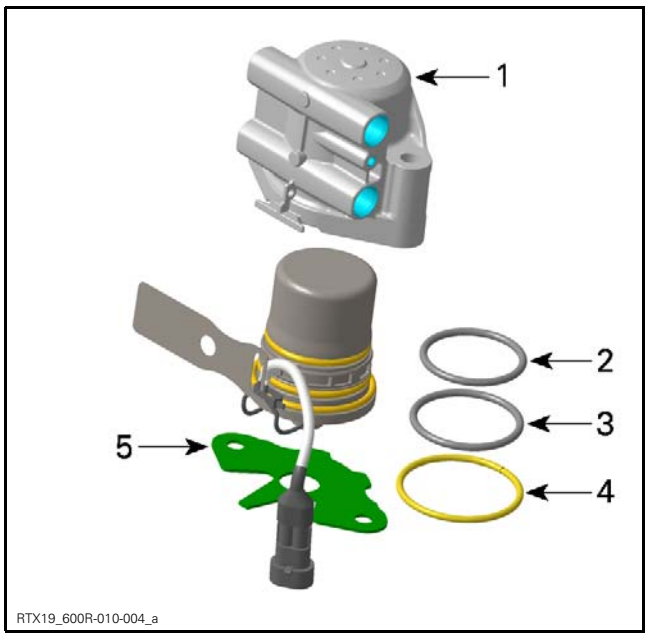
1. In BUDS2, go to:
   - **Measurements** page
   - **ECM** button
   - **Presets / ECM-Basic** tabs
   - **Throttle opening %**.
2. Fully depress throttle lever and hold.
   2.1 Confirm throttle opening is within specification.

THROTTLE OPENING SPECIFICATION (WIDE OPEN THROTTLE)
More than 95%

3. If throttle opening is out of specification, readjust as follows.

THROTTLE OPENING OUT OF SPECIFICATION	
Above specification	Loosen throttle cable
Below specification	Tighten throttle cable

E-TEC DIRECT INJECTORS



E-TEC DIRECT INJECTOR
1. *Fuel injector housing*
2. *Top O-ring*
3. *Bottom O-ring*
4. *Crush ring*
5. *Gasket*

Every E-TEC direct injector is bench tested. Its electrical and flow characteristics are registered throughout all its operating range in a calibration file.

NOTICE When an E-TEC direct injector is replaced, the matching calibrated file must be loaded in the ECM using the BRP diagnostic software (BUDS2) so that the ECM properly controls the fuel injector.

E-TEC Direct Injector Troubleshooting Tips

Usually, a faulty fuel injector will lead to poor engine idling and a low RPM (around 800 RPM and below). It may also lead to engine misfiring.

To troubleshoot a fuel injector 2 methods may be used. While engine is running, try disconnecting a fuel injector connector or use the BRP diagnostic software (BUDS2) to disable the injectors.

– If the engine RPM drops momentarily, the injector on this cylinder is functioning normally.
– If the engine RPM does not drop momentarily, this cylinder is not functioning properly. Check the following:
  • Fuel injector operation. Refer to *TESTING THE FUEL INJECTOR BALANCE*.
  • Spark plug and ignition coil. Refer to *IGNITION SYSTEM* subsection.
  • Engine condition.

Ensure the correct E-TEC direct injector is installed on the proper cylinder. Refer to *E-TEC DIRECT INJECTOR POSITION VALIDATION*.

If one injector is thought to be faulty, proceed with the injector tests.

Inspecting E-TEC Direct Injectors Area Visually

If a fuel leak is noticed in the hoses area, inspect hoses and connections.

If a fuel leak is noticed in fuel injector base area, it indicates a leak of the lower O-ring of fuel injector.

If a dark carbon sooted area is noticed in fuel injector base area, it indicates a leak between the fuel injector nozzle and the cylinder head. The fuel injector retaining screws may not be tight enough.

Testing the E-TEC Direct Injectors for Leak

This test will check if all fuel injection components are clear of leakages, including the nozzle of each E-TEC direct injector.

1. First make sure fuel pressure is within specifications. Refer to *FUEL TANK AND FUEL PUMP* subsection.

NOTE: Keep the pressure gauge installed for the leak test.

2. Disconnect magneto connector. Refer to *WIRING HARNESS AND CONNECTORS* subsection.

⚠ WARNING

The magneto connector must be disconnected to prevent any spark in the engine compartment should the engine be cranked. Fuel vapors may ignite in presence of a spark creating a fire hazard.

3. Release fuel pressure. Refer to *FUEL TANK AND FUEL PUMP* subsection

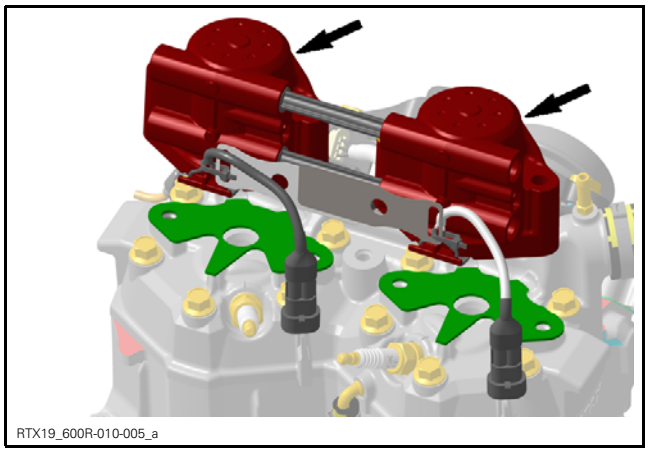
NOTICE **If the fuel pressure is not released, the pressure will push the fuel injector out of its housing when removing the fuel injector from the engine. This could damage the fuel injector and lead to an important fuel spill.**

4. Remove upper body module. Refer to *BODY* subsection.

NOTE: Fuel injector leak test can only be done on both injectors simultaneously.

5. Unscrew both E-TEC direct injectors. Refer to *REMOVING THE E-TEC DIRECT INJECTOR* in this subsection.
6. Carefully lift both fuel injectors. Be careful not to pry hoses against their plastic fittings.

⚠ CAUTION **If both fuel injectors are not lifted carefully from the engine together, the strain on the injector fuel fittings may cause them to crack and leak fuel when pressurized, resulting in a fire hazard.**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TYPICAL

7. Install new crush rings on E-TEC direct injectors.

NOTICE **If a new crush ring is not installed, it will be difficult to determine if the E-TEC direct injector is leaking.**

8. Secure the E-TEC direct injectors on a cylinder head (either remove it from engine or order a spare one as a tool).

⚠ WARNING

Fuel injector must be secured during the leak test to avoid the fuel injector to be projected.

9. Place a container under the E-TEC direct injectors.
10. Ensure there is enough fuel in fuel tank.
11. With the vehicle connected to the BRP diagnostic software (BUDS2), activate the fuel pump.
12. Check all fuel injection components and especially the injector nozzles for leakages.
13. Monitor fuel pressure at fuel pressure gauge. If pressure drops below 275 kPa (40 PSI) during the test, re-activate fuel pump as necessary.

FUEL INJECTOR LEAKAGE	
TEST DURATION	SPECIFICATION
2 minutes	2 drops per minute maximum

If test is not within specification, find the problematic component and repair or replace it.

14. Properly reinstall E-TEC direct injectors on the engine. Refer to *INSTALLING E-TEC DIRECT INJECTORS* in this subsection.
15. Reinstall remaining removed components.
16. Connect magneto connector.

⚠ WARNING

Wipe up any spilled fuel.

Testing the E-TEC Direct Injector

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. Connect vehicle to the BRP diagnostic software (BUDS2). Refer to *COMMUNICATION TOOLS AND B.U.D.S.* subsection.
2. In BUDS2, go to:
   - **Functions** page
   - **ECM** button
   - **Functions** tab
   - **IO Controls - Activate Fuel Injectors**.
3. Activate each fuel injector.

With each activation a sound coming from the targeted injector should be heard.

If the fuel injector does not work, possible causes are:

- Injector

– Harness
– ECM.

If the fuel injector does not work, connect it to the opposite fuel injector connector, then test again.

If the suspected fuel injector works normally with the opposite fuel injector connector, carry out the *TESTING THE E-TEC DIRECT INJECTOR INPUT VOLTAGE* in this subsection.

If the fuel injector still does not work, carry out the *TESTING E-TEC DIRECT INJECTOR RESISTANCE*.

Testing the E-TEC Direct Injector Balance

NOTICE After fuel injector activation using BUDS2, always crank engine in drowned mode to ventilate engine and prevent a potential backfire due to fuel accumulation in engine.

1. Set emergency stop switch to RUN.
2. Install a fuel pressure gauge as described in *FUEL TANK AND FUEL PUMP* subsection.
3. Connect vehicle to the BRP diagnostic software (BUDS2). Refer to *COMMUNICATION TOOLS AND B.U.D.S.* subsection.
4. In **Functions** page, activate fuel pump.
5. Fuel pressure must be within specification. Refer to *FUEL TANK AND FUEL PUMP* subsection. Re-activate fuel pump as necessary.
6. Go to **Activate Fuel Injectors**.
7. Activate all injectors and record the fuel pressure drop for each.
8. 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.

9. Remove fuel pressure gauge and reinstall removed parts.

Testing the E-TEC Direct Injector Input Voltage

1. Connect vehicle to the BRP diagnostic software (BUDS2). Refer to *COMMUNICATION TOOLS AND B.U.D.S.* subsection.
2. In BUDS2, go to:
   – **Measurements** page
   – **ECM** button
   – **ECM - Basic** tab.
3. Read the voltage on the 55V/60V System Circuit Voltage meter.

55V/60V SYSTEM CIRCUIT VALUE
30 Vdc minimun

4. Measure voltage at E-TEC direct injector connector with a multimeter.

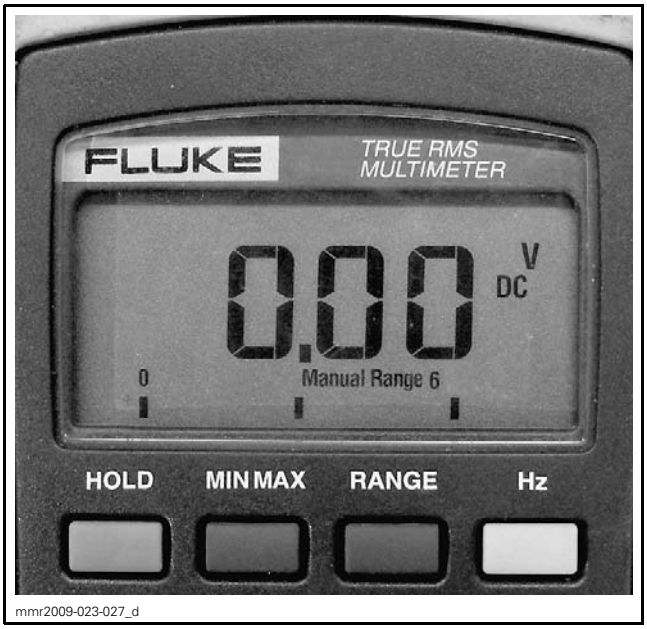
E-TEC DIRECT INJECTOR INPUT VOLTAGE TEST			
INJ	INJ DI CONNECTOR PIN	BATTERY	SPECIFICATION
MAG and PTO	1	Negative (-) post	30 Vdc minimun

If voltage test is as per specification, carry out *TESTING THE E-TEC DIRECT INJECTOR CONTROL CIRCUIT SIGNAL*.

If voltage test is not as per specification, check wire continuity between ECM and fuel injector connector.

Testing the E-TEC Direct Injector Control Circuit Signal

1. Connect vehicle to the BRP diagnostic software (BUDS2). Refer to *COMMUNICATION TOOLS AND B.U.D.S.* subsection.
2. Back probe injector connector, do not disconnect injector connector.
3. Set multimeter to Vdc (Hz).
4. Repeatedly press the RANGE button until the display shows Manual Range 6.



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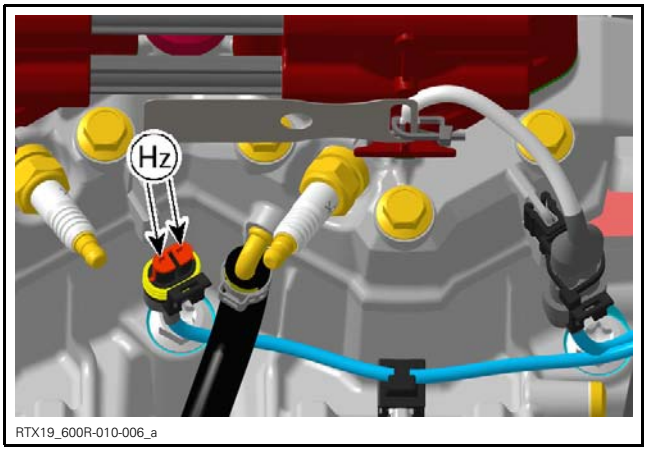
DC VOLTS AND MANUAL RANGE 6 SELECTED

5. Press the Hz button so that the display shows Hz.
6. Activate fuel injector and read the frequency on the multimeter.

NOTE: The multimeter counts the pulses per second (Hertz) of current the ECM sends to the fuel injector.

E-TEC DIRECT INJECTOR CONTROL CIRCUIT SIGNAL TEST		
INJ DI CONNECTOR PIN		SPECIFICATION
1	2	Approximately 2 Hz



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FUEL INJECTOR WIRING HARNESS CONNECTOR

If there is no reading, check continuity of wiring between ECM and fuel injector connector.

If you hear the injector click, control circuit is good.

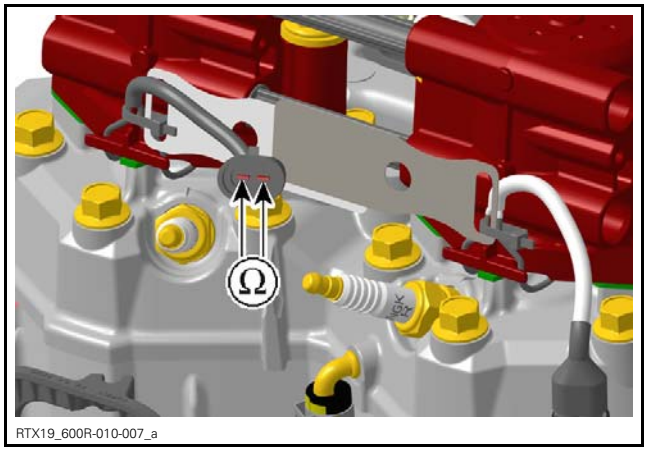
If reading is good, the control circuit is functional.

Testinging the E-TEC Direct Injector Resistance

Injector Resistance

1. Disconnect the fuel injector connector.
2. Measure fuel injector resistance directly on its terminals.

E-TEC DIRECT INJECTOR RESISTANCE TEST		
INJ DI PIN		SPECIFICATION @ 22°C (72°F)
1	2	Below 2.7 Ω



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TYPICAL - FUEL INJECTOR CONNECTOR

If measurement is out of specification, replace fuel injector.

Injector Harness Resistance

1. Disconnect ECM-A connector from the ECM.
2. Connect the ECM-A connector to the ECM adaptor tool.
3. Check resistance value between terminals as follows.

E-TEC DIRECT INJECTOR RESISTANCE TEST			
INJ	ECM ADAPTER PIN		SPECIFICATION @ 22°C (72°F)
MAG	M1	L1	Below 2.7 Ω
PTO	M2		

If resistance value is as specified, the injector and its circuits are good. Replace the fuel injector.

Removing the E-TEC Direct Injectors

NOTICE Always replaced fuel injector screws, washers, O-rings and crush rings when the fuel injectors are removed. Otherwise, leakage or damage to fuel injector or cylinder head might occur.

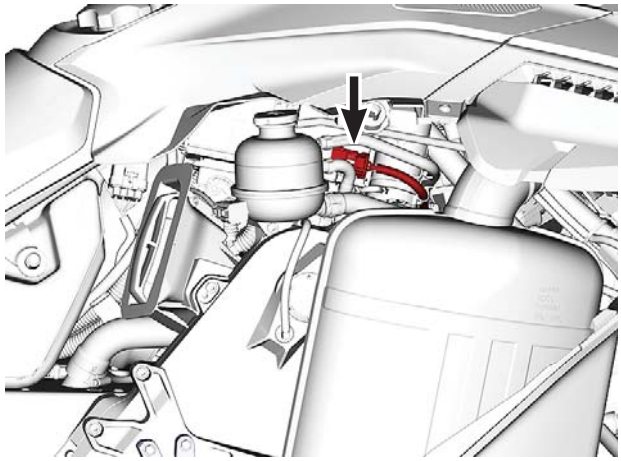
1. Release the fuel pressure in the system. Refer to *FUEL TANK AND FUEL PUMP* subsection.

NOTICE If fuel pressure is not released, the pressure will push the fuel injector out of its housing when removing the fuel injector. This could damage the fuel injector and lead to an important fuel spill.

2. Disconnect magneto connector (3-pin connector).

⚠ WARNING

The magneto connector must be disconnected to prevent any spark in the engine compartment should the engine be cranked. Fuel vapors may ignite in presence of a spark creating a fire hazard.



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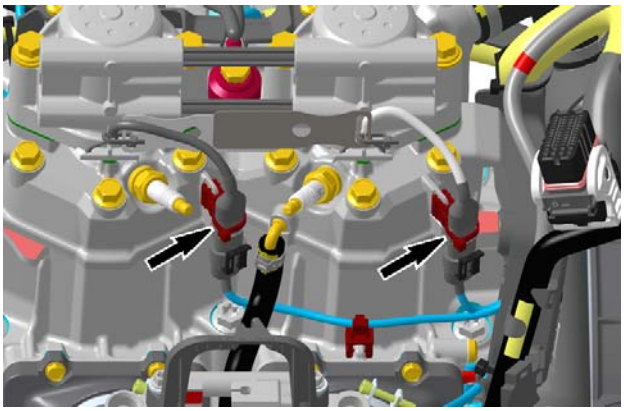
3. Remove upper body module.
4. Clean fuel injector area.
5. Cut locking ties.



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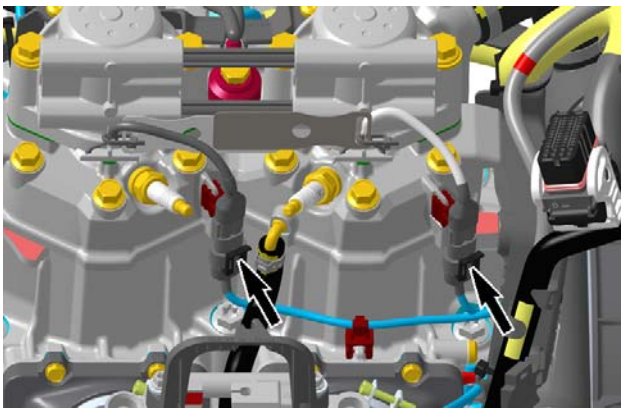
TYPICAL

6. Disconnect fuel injector connectors.



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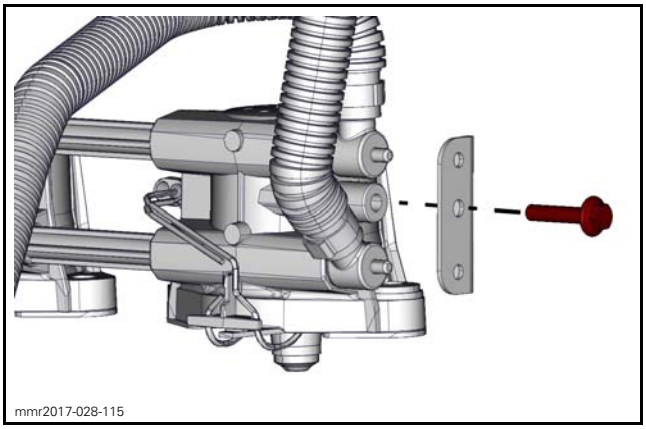
TYPICAL

7. Install a rag under the hose ends to catch fuel spillage.
8. Remove fuel hose retainer screw and retainer. Discard screw.



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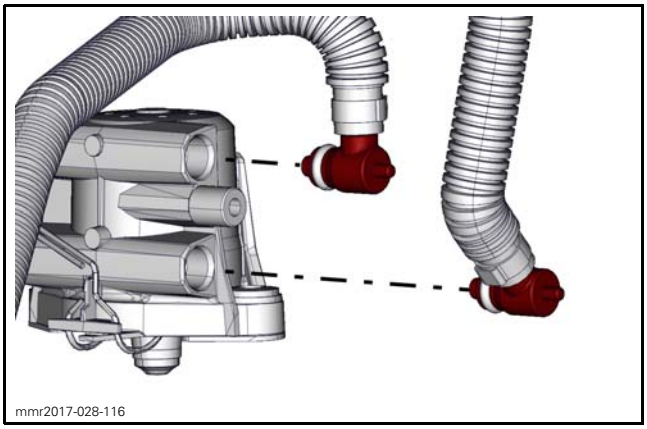
9. Disconnect fuel hoses from fuel injector.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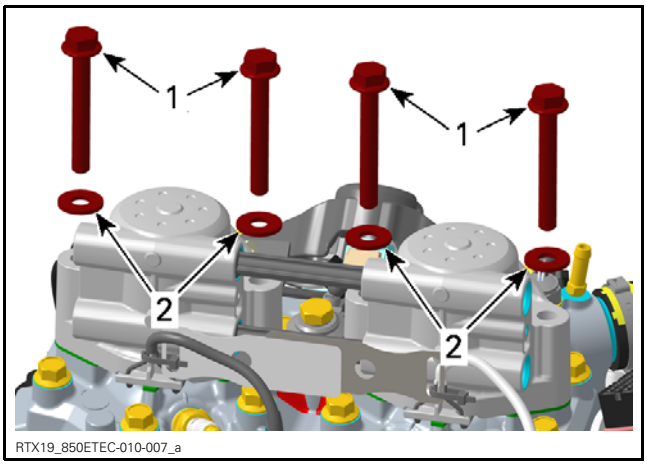
⚠ WARNING

More fuel than usual will flow out of the fuel injectors. Work in a well ventilated area and wipe up spilled fuel.

10. Remove and discard the following components:



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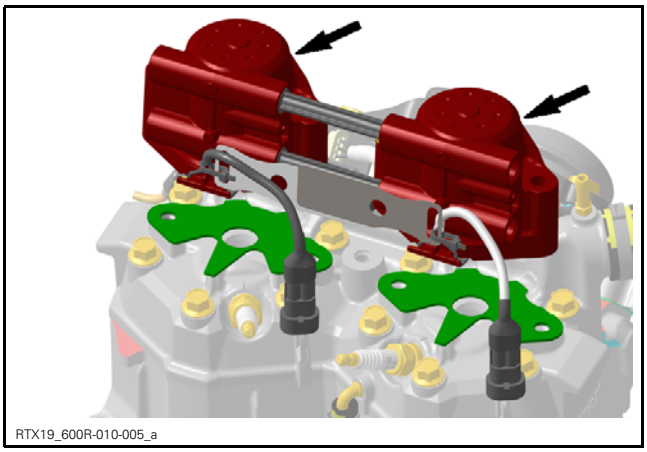
1. Fuel injector screw
2. Washer

11. Gently pull up on the fuel injectors to remove them.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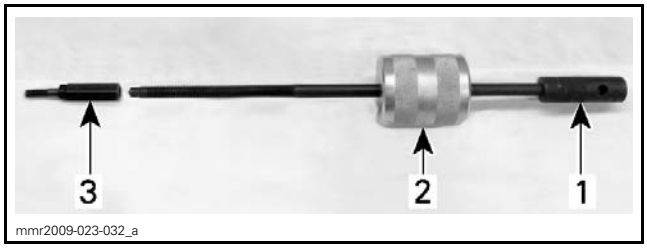
NOTICE **Use caution when handling fuel injector. Never hold injector by its electrical wires. Prevent dirt and debris from entering fuel inlet and outlet ports of fuel injectors or fuel hoses. Cover the fuel injector nozzle port in cylinder head to prevent contamination of combustion chamber.**

Disassembling the E-TEC Direct Injector

To remove fuel injector from its housing, the following tools will be required.

REQUIRED TOOLS
Slide hammer shaft
Slide hammer weight
EXTRACTOR ADAPTOR (P/N 529 036 136)



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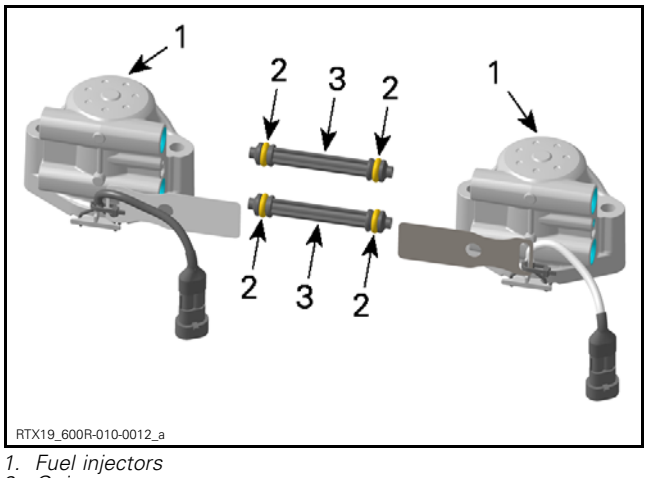
1. Slide hammer shaft
2. Slide hammer weight
3. Extractor adapter

1. Separate fuel injectors and connecting tubes.
2. Remove and discard O-rings.



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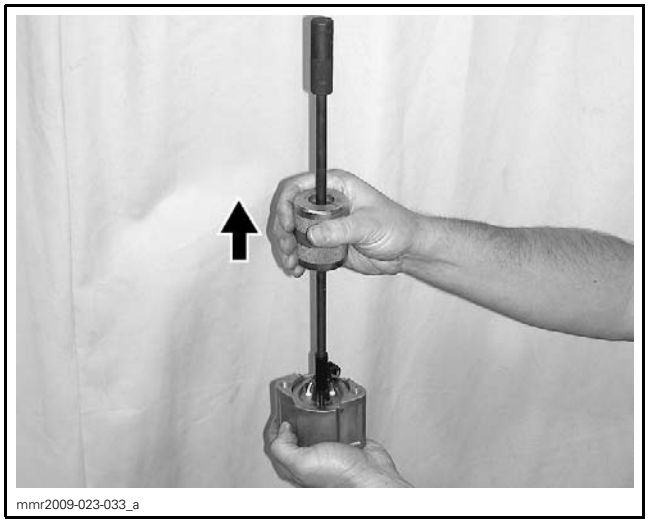
1. Fuel injectors
2. O-rings
3. Connecting tubes

3. Thread the extractor adapter into the fuel injector.
4. Securely hold the fuel injector housing upside down to avoid dropping it.
5. Work slide hammer to pull the fuel injector out.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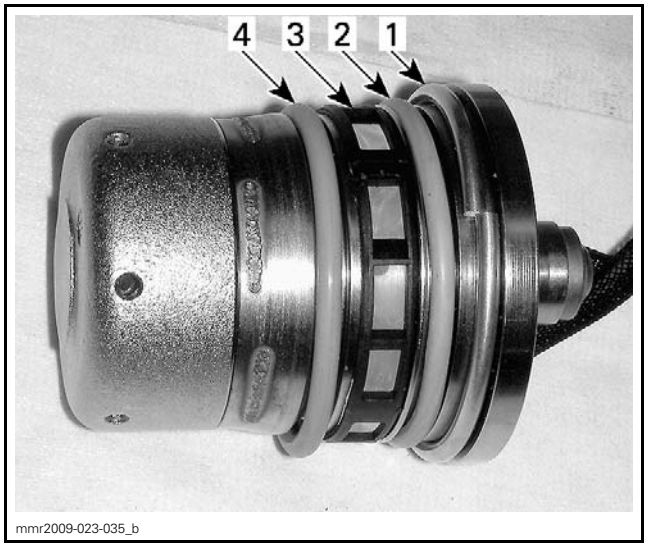
TYPICAL

mmr2009-023-034

TYPICAL

6. Remove the extractor adaptor from the fuel injector.
7. Remove O-rings, crush ring and filter from the fuel injector.



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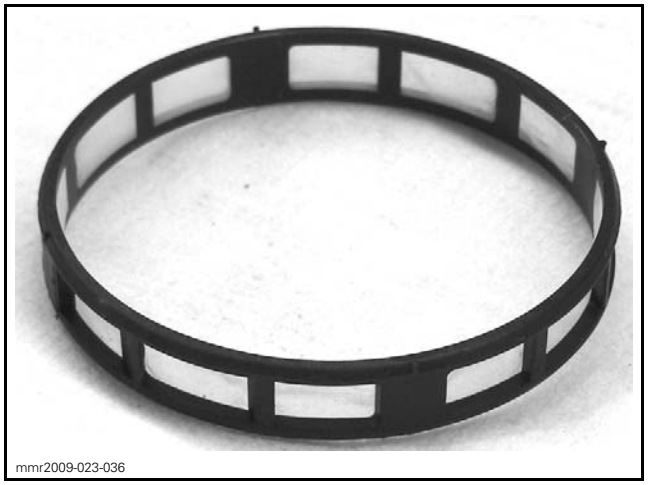
1. *Crush ring (discard)*
2. *ORANGE O-ring (discard)*
3. *Filter*
4. *BLUE O-ring (discard)*

8. Inspect and clean fuel injector filter.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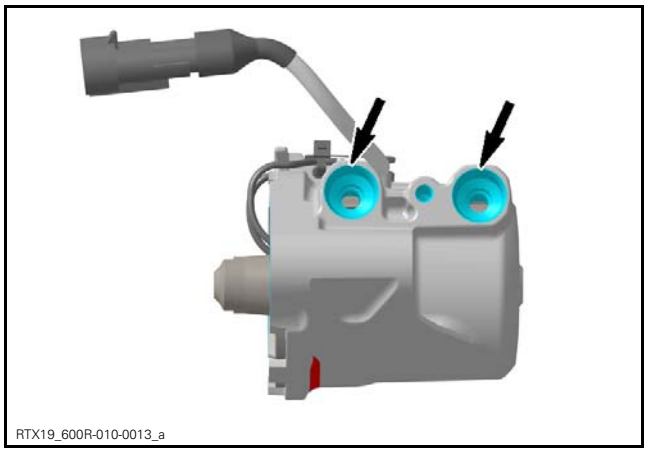
9. Clean connecting tube bores in injector housing.


RTX19_600R-010-0013_a

Assembling the E-TEC Direct Injector

The assembly procedure is the reverse of disassembly. However, pay attention to the following:

Lubricate O-rings.

SERVICE PRODUCT
Injection oil

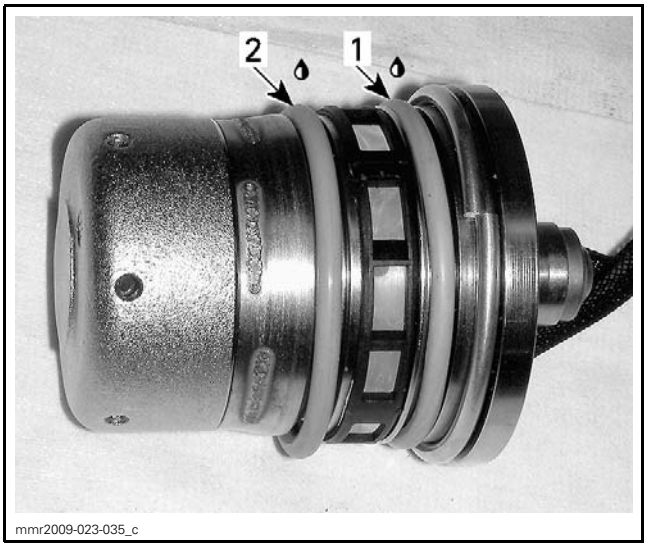
Install a **NEW** crush ring.

Install a **NEW** ORANGE O-ring next to the crush ring (bottom).

NOTICE **Always use the O-rings specifically designed for these fuel injectors.**

Install filter. Ensure filter is retained firmly on fuel injector. Otherwise, remove it, invert it half a turn, then reinstall. If it still not retained securely, install a new one.

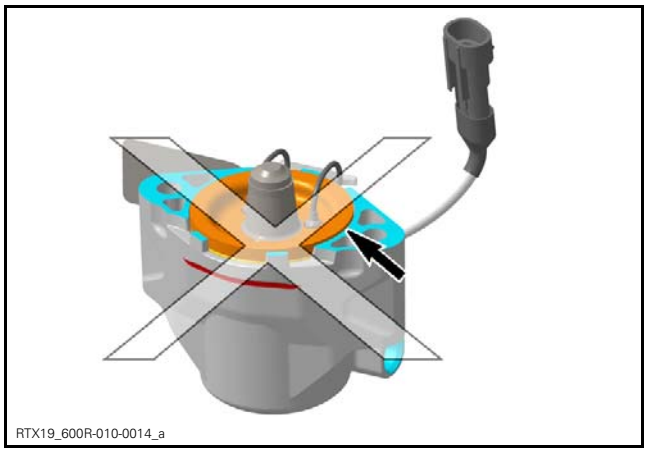
Install a **NEW** BLUE O-ring above the filter (top).



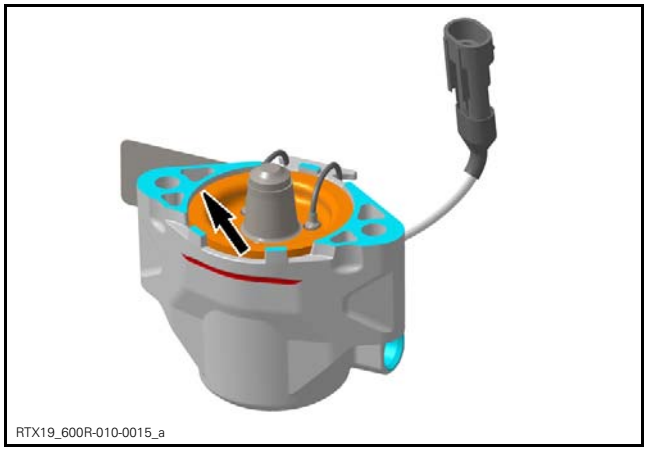
OIL INJECTION ON O-RINGS
1. ORANGE
2. BLUE

Fully insert the fuel injector in its housing as shown on following illustrations.

NOTICE **Never press or tap the fuel injector tip.**



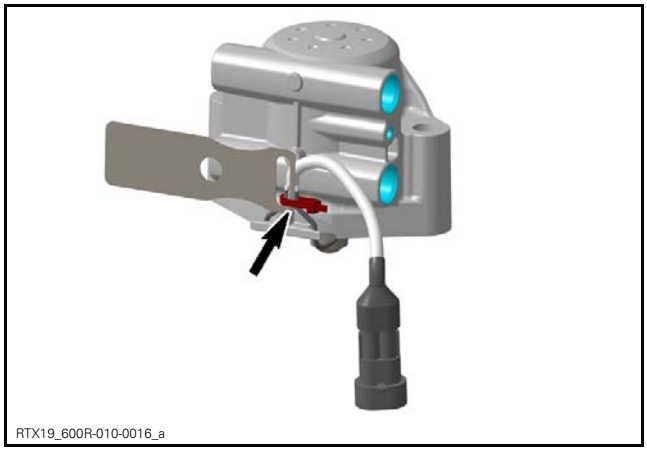
WRONG INSTALLATION



CORRECT INSTALLATION

IMPORTANT: When installing a previously removed injector, make sure to install the injector in the same location. If no mark was inscribed on the injector during the removal, verify the correct injector-cylinder match using the BRP diagnostic software (BUDS2). Refer to *E-TEC DIRECT INJECTOR POSITION VALIDATION*.

Reinstall locking tie securing wires and tag.



Installing the E-TEC Direct Injector

The following items and their mating surfaces must be cleaned and inspected prior to assembly:

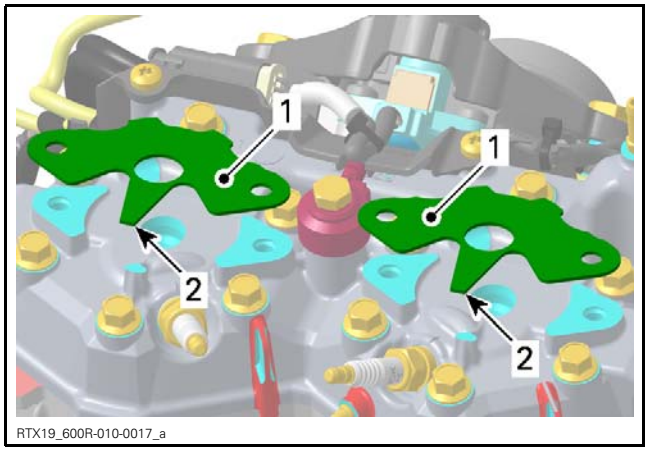
– Fuel Injector
– Cylinder head: fuel injector housing and fuel injector tip contact surfaces
– Fuel injector screw threads and cylinder head threads (must be dry).

NOTICE **All fuel injector components must be clean to ensure correct torque tightening specifications and to avoid leakage. Carefully follow the installation instructions.**

NOTE: When installing a used fuel injector, reinstall the fuel injector in the same location. If it was not marked at removal, verify the correct fuel injector-cylinder match using BUDS2 Refer to *E-TEC DIRECT INJECTOR POSITION VALIDATION*.

1. Position the NEW gaskets on cylinder head.

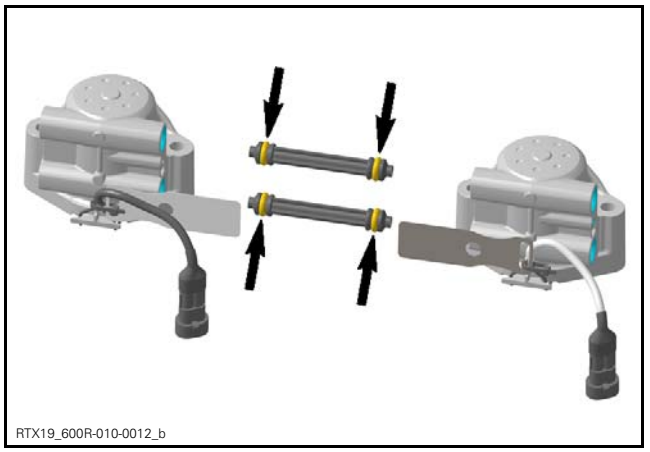
NOTICE **Smooth surface of gasket must face toward injector housing.**



1. Smooth surface of gasket
2. Tab facing towards intake side

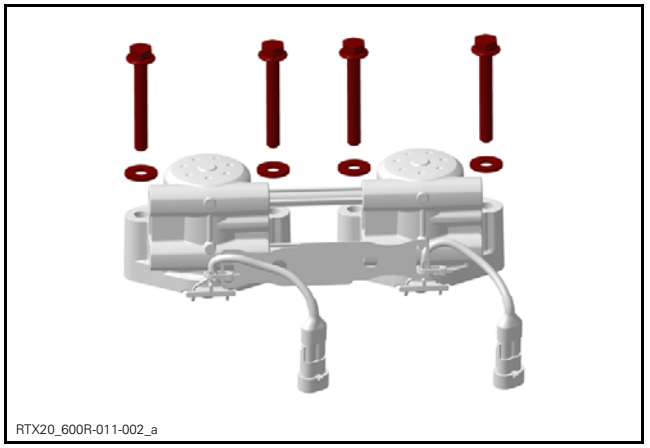
2. Install NEW O-rings on connecting tubes.
3. Lubricate O-rings and pre-assemble fuel injectors and connecting tubes.

SERVICE PRODUCT
Injection oil



LUBRICATE O-RINGS

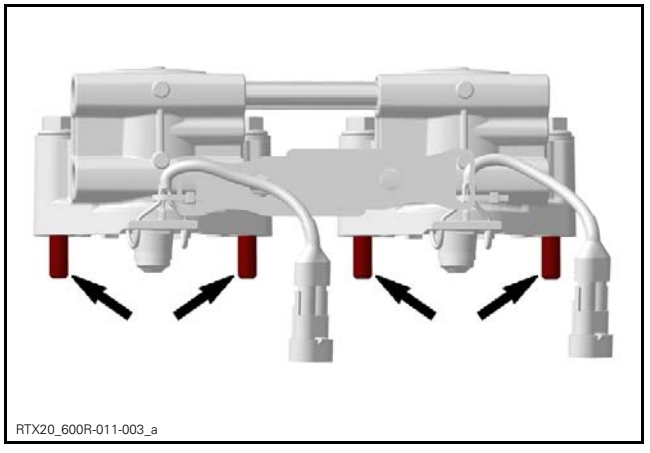
4. Place NEW screws with NEW washers into fuel injectors.



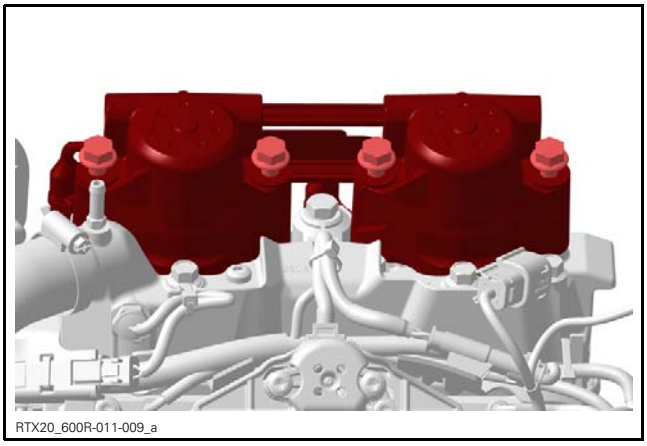
5. Put one drop of oil on the beginning of the thread of each screw.

NOTICE **The screw head contact surface has to be free of oil.**

SERVICE PRODUCT
Injection oil



6. Place the fuel injectors on the cylinder head.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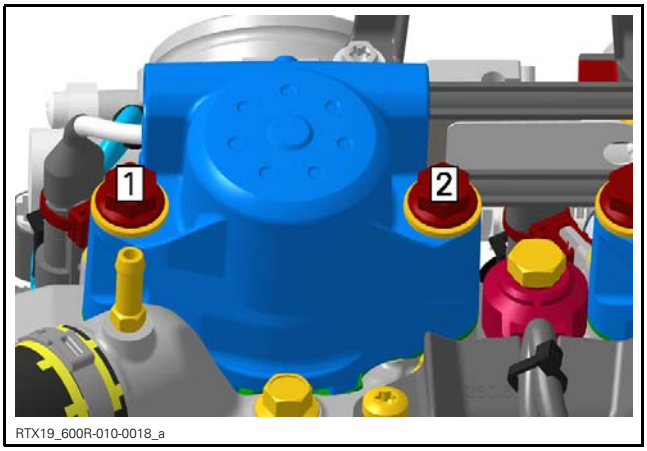
7. Tighten fuel injector retaining screws as per the following procedure:

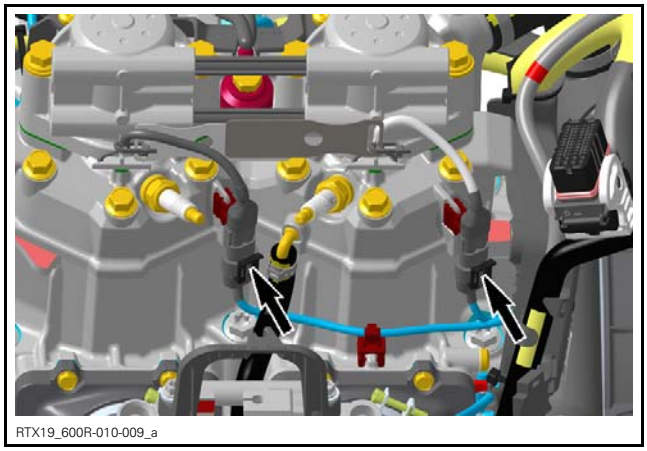
NOTICE Perform tightening procedure on one injector before tightening the screws of the second injector.



RTX19_600R-010-0018_a

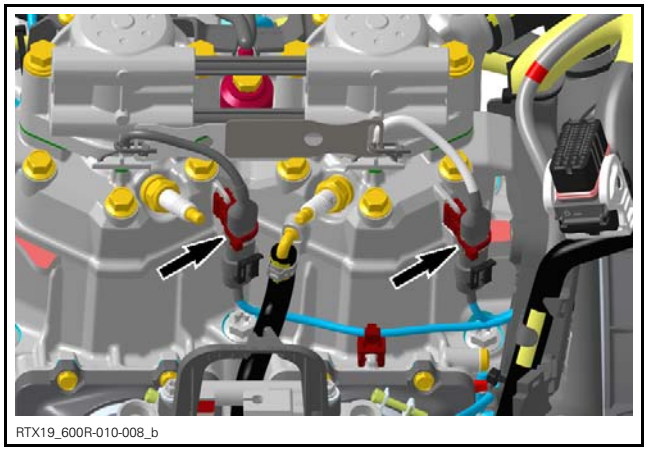
TIGHTENING PROCEDURE		
Screw no.	"1"	"2"
Step A	7 N•m ± 0.5 N•m (62 lbf•**in** ± 4 lbf•**in**)	
Step B		25 N•m ± 0.7 N•m (18 lbf•ft ± 1 lbf•ft)
Step C	25 N•m ± 0.7 N•m (18 lbf•ft ± 1 lbf•ft)	
Step D		40 N•m ± 1 N•m (30 lbf•ft ± 1 lbf•ft)
Step E	40 N•m ± 1 N•m (30 lbf•ft ± 1 lbf•ft)	

8. Connect both fuel injector connectors.


RTX19_600R-010-009_a

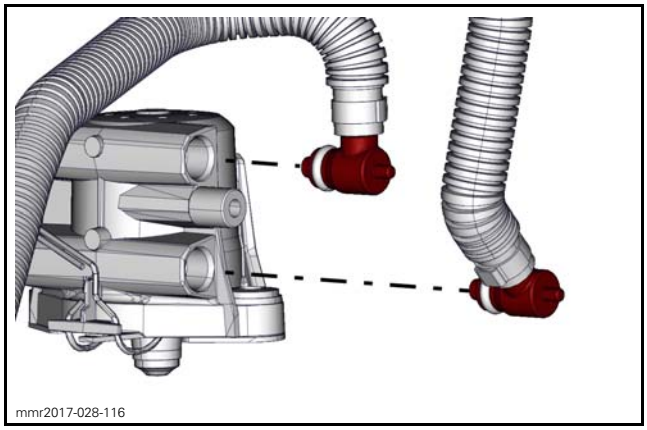
TYPICAL

9. Secure E-TEC direct fuel injector cables with locking ties.


RTX19_600R-010-008_b

TYPICAL
1. E-TEC direct fuel injector connector
2. Locking ties

10. Check condition of fuel hose O-rings and plastic flange on hose fittings.
11. Apply injection oil on O-rings.
12. Insert fuel hoses in fuel injector housing.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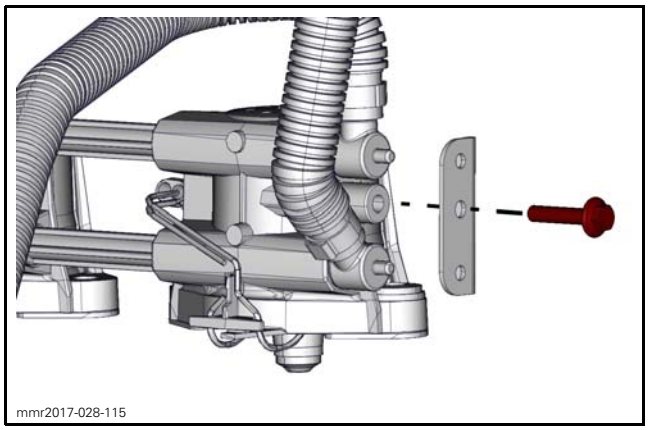
NOTE: Both hose fittings must be fully seated in the fuel injector housing.

13. Insert the hose retainer so that it engages the groove in the fuel injector fittings.



NOTE: Ensure open end of retainer that locks in the fuel hoses faces inboard. The hole in the hose retainer used to secure the injector wiring must be on top for the PTO injector, and on the bottom for the MAG injector.

14. Install a NEW screw to secure hose retainer.

NOTICE **The screw features a threadlocker coating that is destroyed when loosening screw. Always replace screw with a new one each time it is loosened.**

TIGHTENING TORQUE	
Fuel hose retainer screw	5 N•m (44 lbf•**in**)

15. Secure fuel injector wiring. Refer to *ENGINE HARNESS* subsection.

16. Grease fuel injector connector.

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

17. Reconnect fuel injector connector.

NOTICE **Never fasten the electrical connector to the fuel injector. The connector must be "free floating".**

18. If installing a NEW fuel injector, use BUDS2 to configure it in the ECM. Refer to *MATCHING THE E-TEC DIRECT INJECTOR TO A CYLINDER*.

NOTE: The engine will be able to run with an improperly matched fuel injector. However, the engine may misfire, run rough at idle, have poor fuel economy or run lean.

⚠ WARNING

Perform a fuel pressure test and make sure there is no leak.

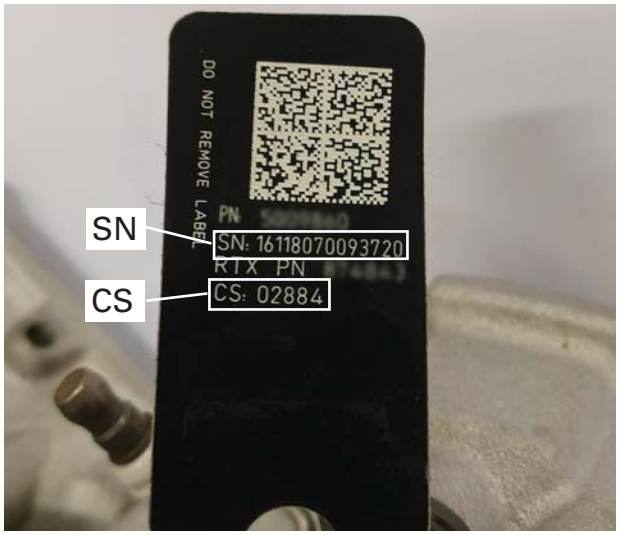
Validating the E-TEC Direct Injector Position

When troubleshooting or reinstalling a fuel injector, the correct matching of the fuel injector and cylinder must be confirmed using BUDS2.

An incorrect match between the fuel injector and cylinder may lead to engine misfiring, improper idling or poor fuel economy.

To configure a new fuel injector at installation, refer to *MATCHING THE E-TEC DIRECT INJECTOR TO A CYLINDER.*

1. Look for the fuel injector identification tag.
2. Note the fuel injector serial number (SN) on the tag of the fuel injector you want to validate.



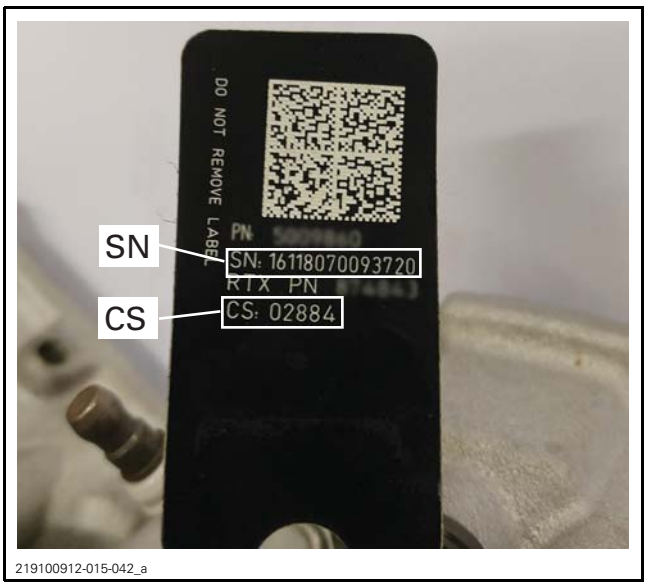
SN: Serial number
CS: Checksum number

3. In BUDS2, go to:
   - **Settings** page
   - **Injector Coefficient**.
4. In the **Injector Coefficient** box, look for the fuel injector serial numbers (S/N) that are registered in the ECM.
5. Compare the MAG or PTO Injector S/N that is configured in the ECM with the fuel injector SN installed on the engine.

If numbers do not match, configure the fuel injector in BUDS2. Refer to *MATCHING A FUEL INJECTOR TO A CYLINDER.*

Matching the E-TEC Direct Injector to a Cylinder

1. Note the serial number (SN) and the checksum number (CS) on the fuel injector tag.



SN: Serial number
CS: Checksum number

2. Download the E-TEC injector coefficient file.
   2.1 Login to BOSSWeb.
   2.2 Under the Com Center tab, click on E-TEC injector coefficient link.
   2.3 Save the calibration file on the computer.
3. Connect the vehicle to the BRP diagnostic software (BUDS2).
4. In BUDS2, go to:
   – **Settings** page
   – **Injector Coefficient**
5. In the Injector Coefficient box, click on the **New** button of the fuel injector to be replaced (MAG or PTO) and find the previously saved file.
6. Select and open the fuel injector serial number file that matches the fuel injector installed on the engine.
7. Enter the checksum number noted earlier and select **Write**.

NOTE: The file will be loaded in BUDS2

8. Click the OK button when the confirmation box appears.
9. Click on the **Write** button to save the changes to the ECM.

IMPORTANT: To ensure the proper file has been saved in the ECM, do the following:

10. Click on the Scan button.
11. Look in the Injector Coefficient area in the **Settings** page.
12. Ensure the S/N matches the SN of the fuel injector installed on the engine and the PTO/MAG numbers are not inverted.
13. If there is a mismatch, reload the proper configuration file. Write data and read it again to recheck.

FUEL RAIL AND THROTTLE BODY INJECTORS (850 E-TEC ONLY)

Testing the Fuel Injector Operation Using BUDS2 (Dynamic)

1. Connect the vehicle to the BRP diagnostic software (BUDS2). Refer to *COMMUNICATION TOOLS AND B.U.D.S.* subsection.
2. Start engine.
3. Using BUDS2, shut down fuel injection to each engine cylinder one at a time by clicking on the button under the applicable cylinder.

If the engine RPM drops momentarily when clicking on a cylinder, the injector on this cylinder is functioning normally.

If the engine RPM does not drop momentarily when clicking on a cylinder, this cylinder is not functioning properly. Check the following:

– Fuel injector operation. Refer to *TESTING THE FUEL INJECTOR BALANCE*
– Spark plug and ignition coil. Refer to *IGNITION SYSTEM* subsection
– Engine condition.

Testing the Fuel Injector Balance

NOTICE **After fuel injector activation using BUDS2, always crank engine in drowned mode to ventilate engine and prevent a potential backfire due to fuel accumulation in engine.**

1. Set emergency stop switch to RUN.
2. Install a fuel pressure gauge as described in *FUEL TANK AND FUEL PUMP* subsection.
3. Connect the vehicle to the BRP diagnostic software (BUDS2). Refer to *COMMUNICATION TOOLS AND B.U.D.S.* subsection.
4. In BUDS2, activate fuel pump.
5. Fuel pressure must be within specification. Refer to *FUEL TANK AND FUEL PUMP* subsection. Re-activate fuel pump as necessary.

6. In BUDS2, energize fuel injector **no. 1**.
7. Record the fuel pressure drop for injector **no. 1**.
8. In BUDS2, activate fuel pump.
9. Repeat the procedure for fuel injector **no. 2** and record the pressure drop.
10. 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.

11. Using the valve on the fuel pressure gauge, release the pressure in the system (if so equipped).
12. Remove fuel pressure gauge and reinstall removed parts.

Testing for Fuel Injector Leaks

Carry out the *TESTING THE FUEL PUMP PRESSURE* as detailed in the *FUEL TANK AND FUEL PUMP* subsection.

Testing the Fuel Injector Activation Using BUDS2

Connect the vehicle to the BRP diagnostic software (BUDS2). Refer to *COMMUNICATION TOOLS AND B.U.D.S.* subsection.

On the **Functions** page of BUDS2, energize the fuel injector to be tested.

You should hear or feel the injector functioning.

This will validate the injector mechanical and electrical operation.

If the injector does not function, carry out the *TESTING THE FUEL INJECTOR RESISTANCE*.

Testing the Fuel Injector Resistance

Disconnect ECM-A connector from the ECM and connect it to ECM adapter tool. Refer to *WIRING HARNESS AND CONNECTORS*

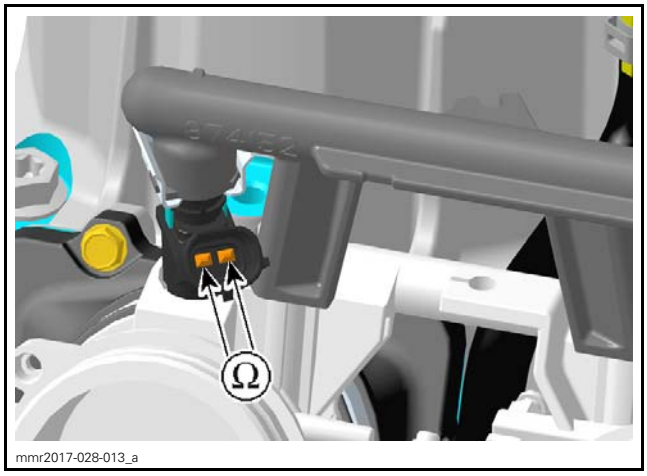
Check resistance value between terminals as follows.

FUEL INJECTOR RESISTANCE TEST AT ECM-A CONNECTOR			
INJ	ECM ADAPTER PIN		SPECIFICATION @ 20°C (68°F)
MAG	A-A3	A-A4	11.4 - 12.6 Ω
PTO	A-A2	A-A1	

If resistance value is as specified, the injector and its circuits are good. Refer to *TESTING FOR FUEL INJECTOR INPUT VOLTAGE* in this subsection.

If resistance value is NOT as specified, remove injector connector and check resistance value between injector pins.

FUEL INJECTOR RESISTANCE TEST AT INJECTOR CONNECTOR			
INJ	INJECTOR PIN		SPECIFICATION @ 20°C (68°F)
MAG and PTO	1	2	11.4 - 12.6 Ω



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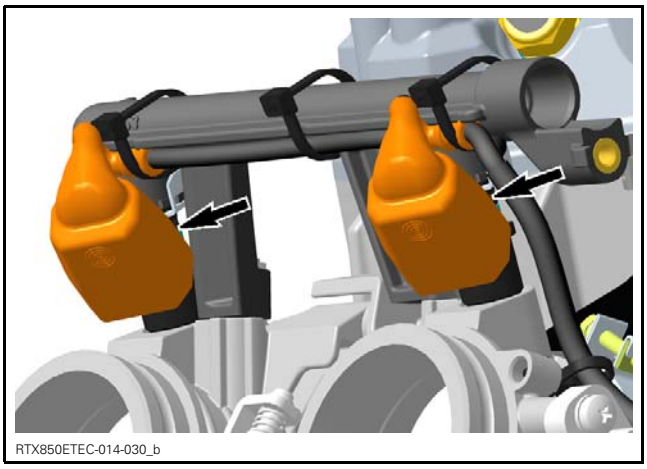
If readings are out of specifications, replace injector.

If readings are good, carry out *TESTING THE FUEL INJECTOR CIRCUIT RESISTANCE*.

Testing the Fuel Injector Input Voltage

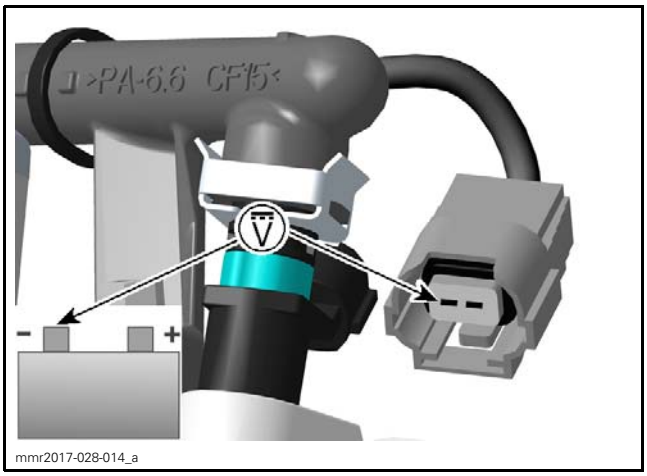
Disconnect the fuel injector connector.


RTX850ETEC-014-030_b

It is not necessary to activate the injector since it is continuously powered when the emergency stop switch is set to RUN and BUDS2 is connected.

Set the multimeter to Vdc and read voltage.

FUEL INJECTOR RESISTANCE TEST AT INJECTOR CONNECTOR			
INJ	INJ PIN	BATTERY	SPECIFICATION @ 20°C (68°F)
MAG and PTO	2	Negative (-) post	11.4 - 12.6 Ω



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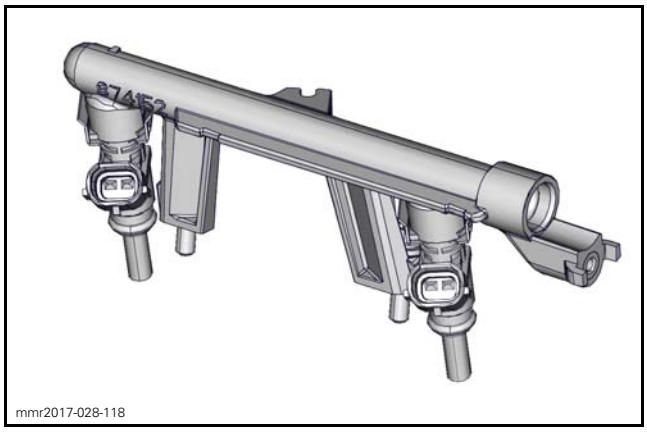
TYPICAL

If supply voltage is good:

1. Check if ground circuit is faulty, repair/replace wiring and connectors. Refer to *TESTING THE FUEL INJECTOR CIRCUIT RESISTANCE*.
2. If the ground circuit is good, the injector problem may be mechanical. Replace the injector.
3. If injector and ground circuit are good the problem may be in the power distribution system in the ECM (does not provide a ground signal) refer to *TROUBLESHOOTING ECM POWER SUPPLY*.

Removing the Fuel Rail with Throttle Body Injectors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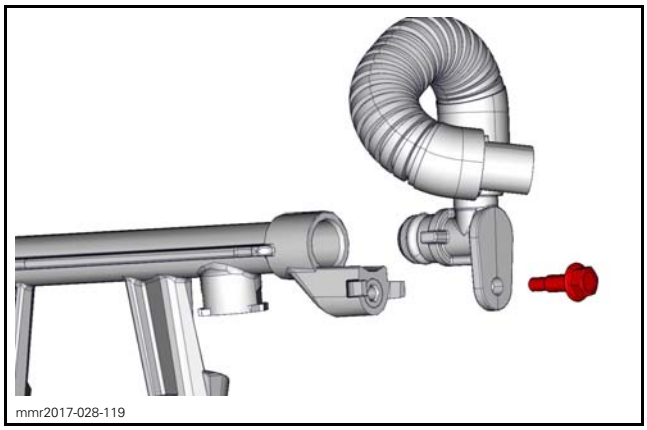
Release fuel pressure from fuel system, refer to *FUEL TANK AND FUEL PUMP* subsection.

Place an absorbent shop rag around the fuel supply hose fitting at the fuel rail to catch any fuel leakage.

Disconnect fuel hose from fuel rail.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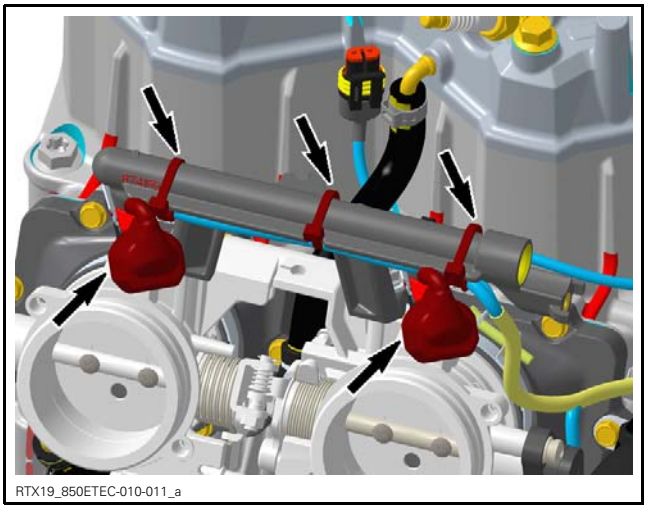
Cut locking ties securing engine harness to fuel rail.

Disconnect fuel injector connectors.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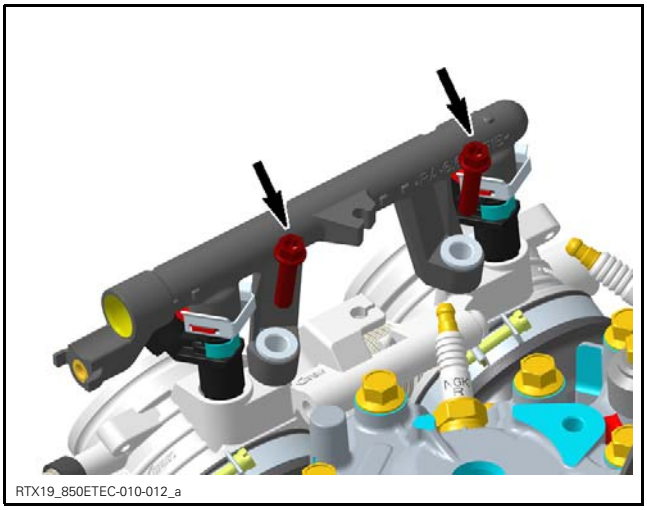
Remove fuel rail retaining screws .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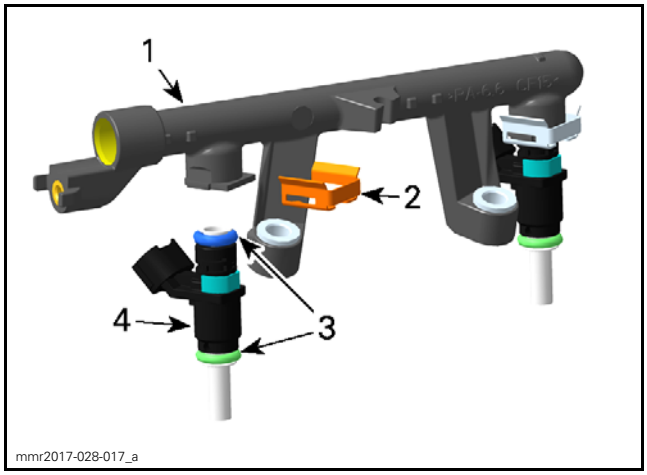
Gently wiggle fuel rail side to side as you pull the fuel rail out with fuel injectors.

Remove the injector retaining clip.

Pull the fuel injector out of the fuel rail and discard the O-rings.



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1. *Fuel rail*
2. *Retaining clip*
3. *Fuel injector*
4. *O-rings*

Installing the Fuel Rail and Fuel Injectors

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

NOTICE **If installing the removed injector(s), always install new O-rings.**

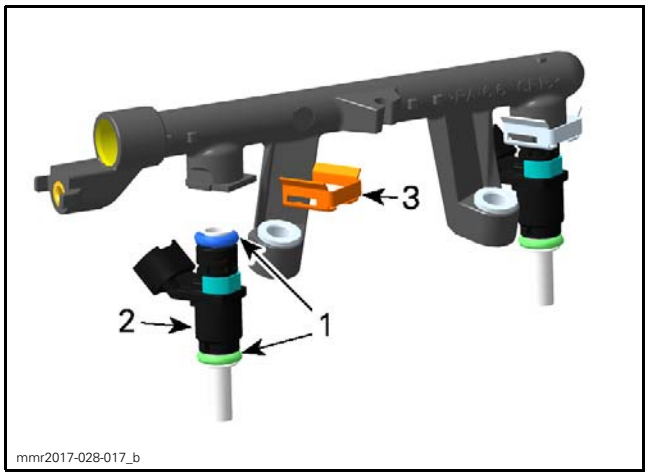
Lubricate new O-rings to ease insertion in rail.

SERVICE PRODUCT
Injection oil

NOTICE **Ensure that injector nozzle is free from oil. Surplus oil can close injector nozzle which may have a negative impact on engine performance.**

Install fuel injector with your hand. Do not use any tool.

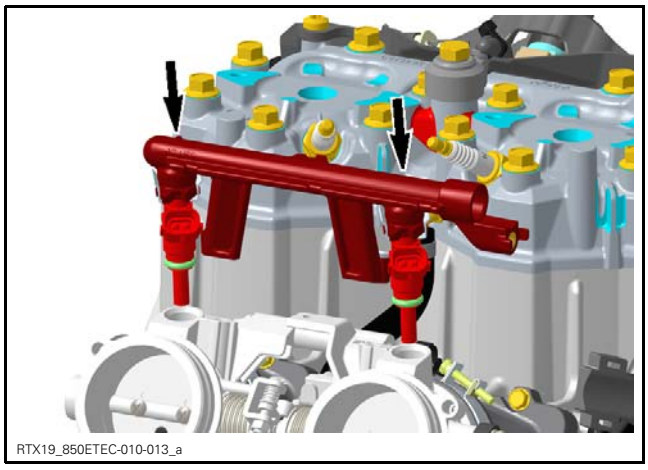
Carefully insert fuel injectors in fuel rail and install injector retaining clips.



1. *O-rings*
2. *Fuel injector*
3. *Retaining clip*

Insert the injectors in the throttle body holes and gently push on the fuel rail to position it on throttle body.

NOTICE **Pay attention to not damage the O-rings.**



Tighten fuel rail retaining screws.

TIGHTENING TORQUE	
Fuel rail retaining screws	8 N•m ± 0.5 N•m (71 lbf•**in** ± 4 lbf•**in**)

Connect fuel pressure hose to fuel rail.

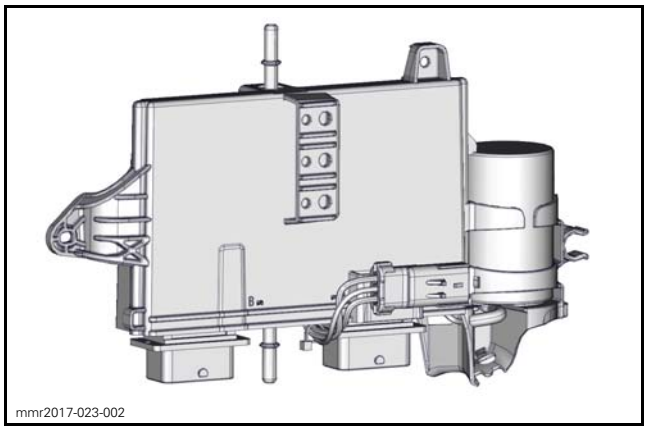
Pressurize the fuel system and check for fuel leaks. Refer to *FUEL TANK AND FUEL PUMP* subsection.

⚠ WARNING

Failure to pressurize the fuel system and checking for fuel leaks may result in severe injury or a life threatening situation should a leak occur.

Reinstall all remaining removed parts.

ECM (ENGINE CONTROL MODULE)



ECM

NOTE: Prior to replacing an ECM, carry out all testing procedures.

Troubleshooting ECM Power Supply

Verifying System Voltage

Set emergency stop switch to RUN.

Connect the vehicle to the BRP diagnostic software (BUDS2). Refer to *COMMUNICATION TOOLS AND B.U.D.S.* subsection.

In BUDS2, go to:
- **Measurements** page
- **ECM** button
- **ECM - Basic** tab.

View high voltage system circuit voltage.

Start or crank engine while viewing System Voltage.

TEST CONDITION	SPECIFICATION
Manual crank speed	30 Vdc min.
Engine running	55 Vdc

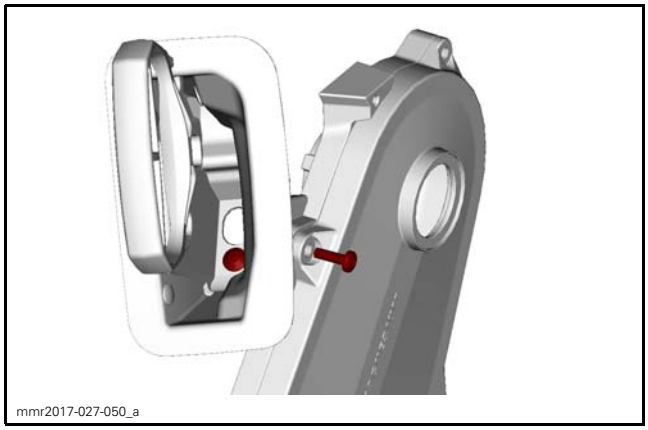
If voltage is as per specification, ECM is properly powered.

If voltage is out of specification, refer to *CHARGING SYSTEM*.

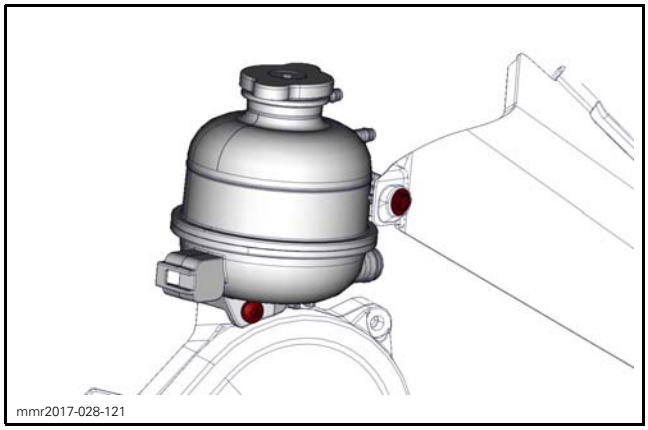
Removing the ECM

1. Save a **".buds2"** file.
2. Set emergency engine stop switch to STOP.
3. Remove upper body module. Refer to *BODY* subsection.

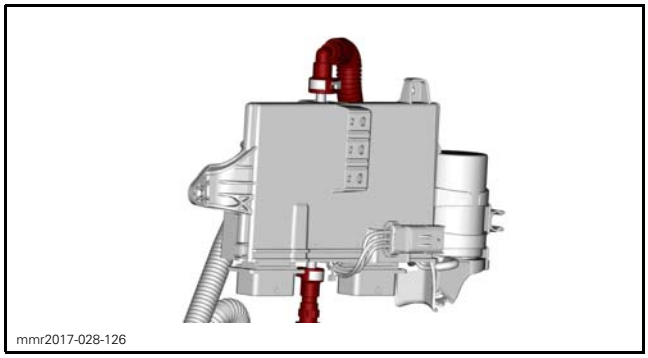
4. Move rewind starter handle assembly (applicable models).


mmr2017-027-050_a

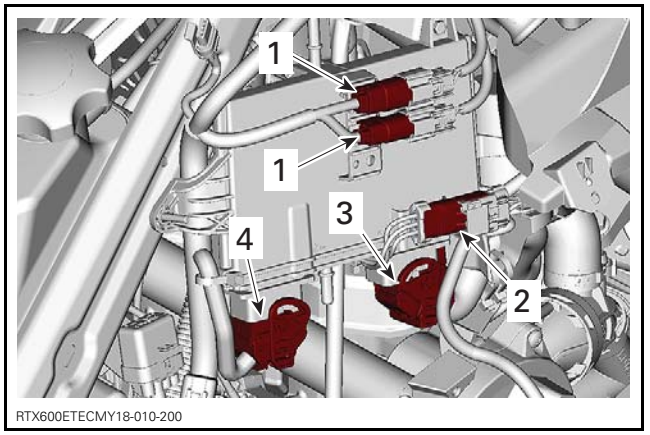
5. Detach coolant tank from its support.


mmr2017-028-121

6. Install a rag under the ECM fuel hose quick connect to catch fuel spillage.
7. Place a container under the hose connector to recover fuel.
8. Slowly disconnect fuel both hoses from ECM and drain fuel.


mmr2017-028-126

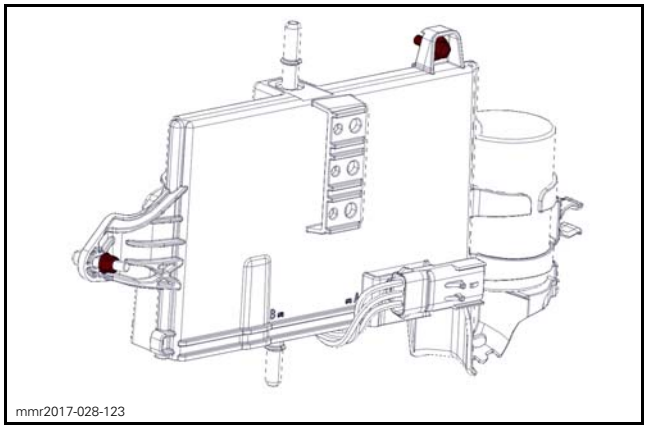
9. Disconnect heated grips, magneto, ECM-A, and ECM-B connectors. Refer to *WIRING HARNESS AND CONNECTORS*.



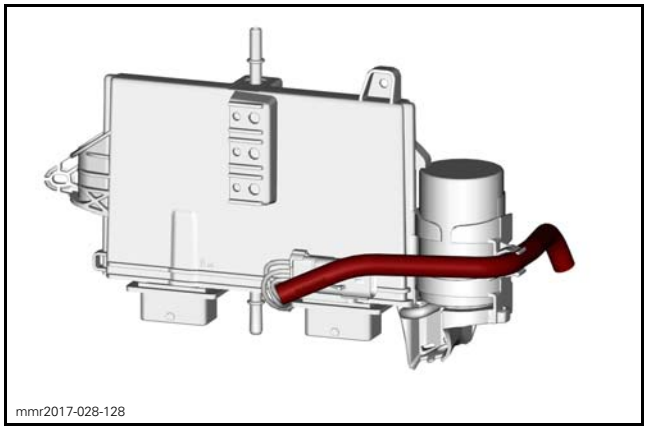
RTX600ETECMY18-010-200

1. *Heated grip connectors*
2. *Magneto connector*
3. *Connector A*
4. *Connector B*

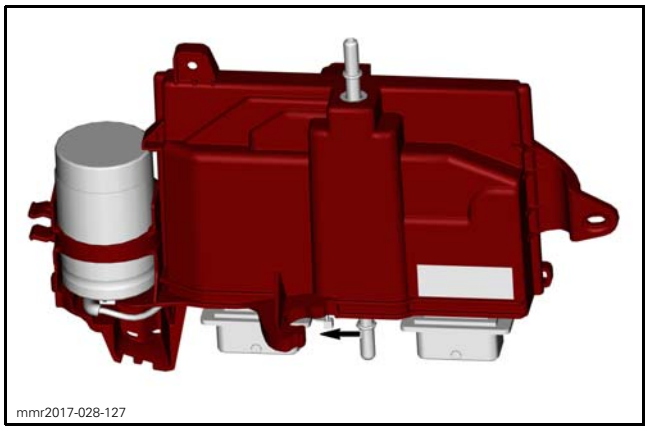
10. Remove connector housings from ECM.
11. Remove ECM retaining screw and nut.


mmr2017-028-123

12. Move coolant hose.


mmr2017-028-128

13. Carefully slide ECM forwards to unhook clip behind ECM.



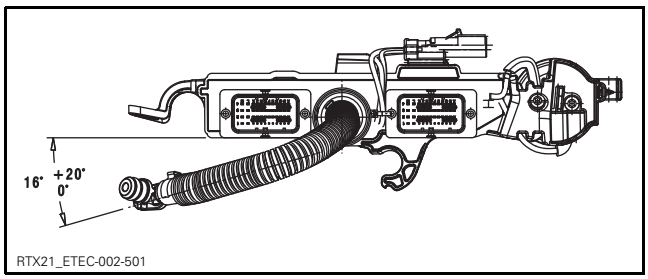
14. Remove. Cut locking ties as applicable.

Installing ECM

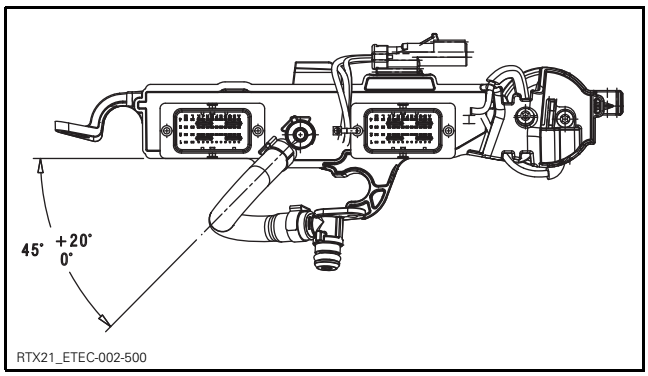
The installation is the reverse of the removal procedure. However, pay attention to the following.

Position the inlet fuel hose as per the following illustrations.

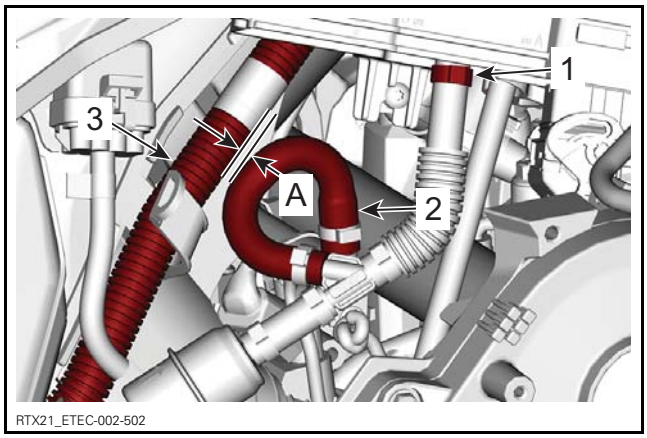
600R Engines



850 and 850 Turbo Engines



NOTICE Make sure to have a minimum of 5 mm (7/32 in) between the fuel hoses (inlet and outlet) before and after the clamp crimping.



1. Oetiker clamp
2. Fuel inlet hose
3. Fuel outlet hose

A. Required minimum distance: 5 mm (7/32 in)

All Engines

⚠ WARNING

Wipe up all spilled fuel.

Set engine stop switch to RUN.

Install tether cord cap on engine cut-off switch.

If a new ECM is installed, transfer or enter data in new ECM. Refer to *PROGRAMMING A NEW ECM* in this subsection.

Collecting the Vehicle Information

There are 2 methods to collect the vehicle information.

First Method

Use the BRP diagnostic software (BUDS2) and collect the data from the file saved previously.

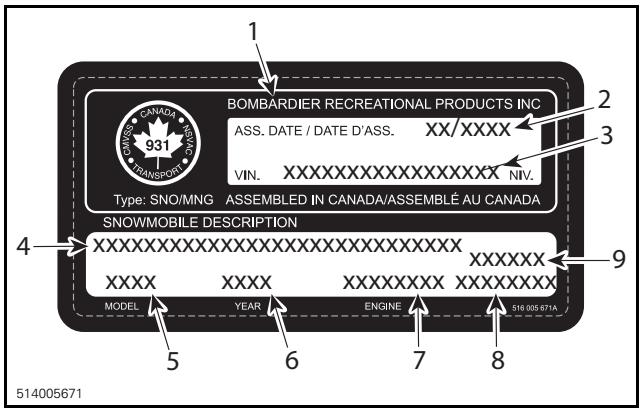
From the **Summary** page:
- VIN (vehicle identification number
- Engine serial number
- Vehicle model number
- Customer name.

From the **Settings** page:
- **Configuration - Change Oil Compensation Settings** under the **Settings** tab
- **Options** values
- Injector coefficient numbers, under **Injector Coefficient** tab.

Second Method

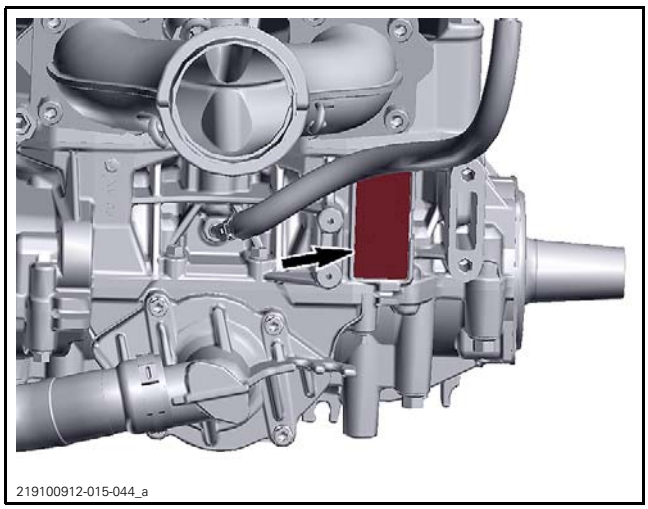
Collect the information from the vehicle.

Record model number.



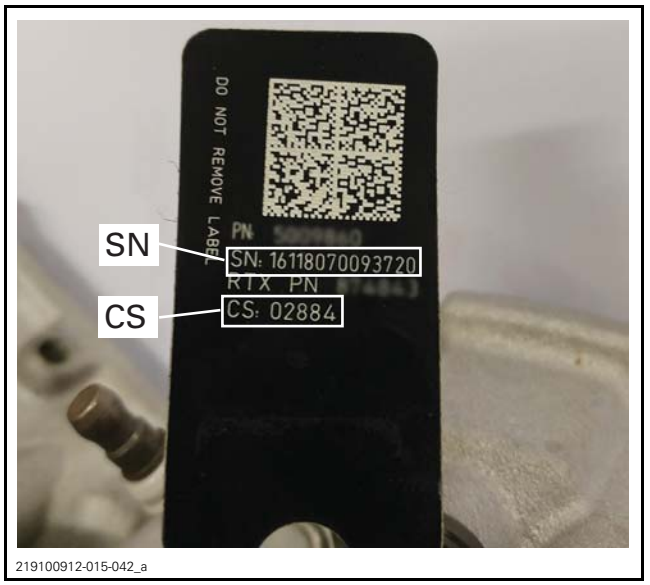
VEHICLE DESCRIPTION DECAL
1. *Manufacturer name*
2. *Manufacturing date*
3. *Vehicle identification number (VIN)*
4. *Model and package name*
5. *Model number*
6. *Model year*
7. *Engine type*
8. *Vehicle weight (European models)*
9. *Vehicle engine power (European models)*

The engine serial number can be found on the cylinder block.



TYPICAL - CYLINDER BLOCK, EXHAUST SIDE

Record MAG/PTO injector S/N and Checksum numbers.



SN: Serial number
CS: Checksum number

Programming a New ECM (when replacing the ECM)

Make sure to have the vehicle information in hand. Refer to *COLLECTING THE VEHICLE INFORMATION*.

1. Connect the vehicle to BRP diagnostic software (BUDS2) using the power interface. Refer to *COMMUNICATION TOOLS AND B.U.D.S.*
   1.1 Disconnect SHOT connector if equipped.
2. In BUDS2, **Scan** the vehicle.
3. To flash the ECM, select the correct flash file for the right engine type and vehicle model year.
4. Click on the green **Play** button at the right end of the field.
5. In the **Summary** tab of the **Summary** page, enter the information collected previously:
   1. VIN
   2. Engine serial number
   3. Vehicle model number.
6. Wait for the second confirmation window before to continue.
7. **Scan** the vehicle to get all the ECM refreshed information.
8. Enter the customer name in the **Summary** tab of the **Summary** page.
9. To add a D.E.S.S. key, go to **Key** page:
   1. Click on the **Read** button
   2. Select the key type
   3. Click on the **Add** button.

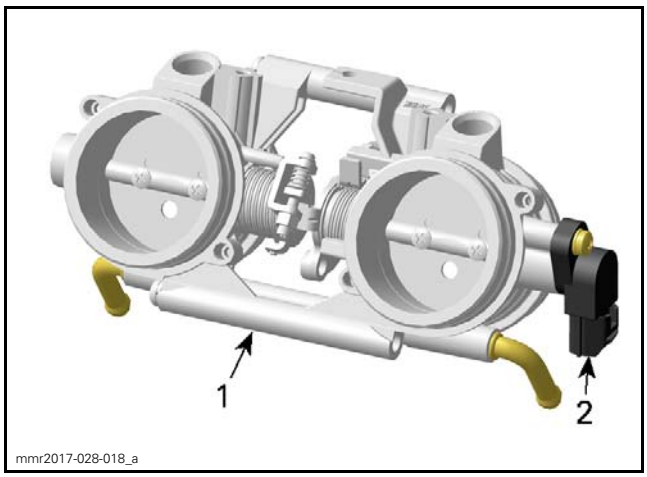
To add another key, shut down and power up the ECM, and repeat previous step.

10. In **Settings** page:
    1. Click on **Configuration - Change Oil Compensation Settings**
    2. Write the value saved previously.
11. Click on:
    1. **Initialization - Change Ignition/Injection Timing** button
    2. **Freeze time** button.
12. Click on:
    1. **Initialization - RAVE Setting** button
    2. **Set** button.
13. Click on:
    1. **Initialization - Reset TPS** button
    2. **Reset** button.
14. Go to:
    – **BOSSWeb** site
    – **Comcenter** page
    – **Injector Coefficient** tab.
15. Write the serial number and the checksum number previously collected for the MAG and PTO, and download the files.
16. In BUDS2, go to:
    1. **Settings** page
    2. **Injector Coefficient** tab
    3. Click on the **New** button
    4. Open the MAG file
    5. Click on the **Ok** button
    6. Write the checksum
    7. Click on the **Write** button.

Repeat previous steps for the PTO file.

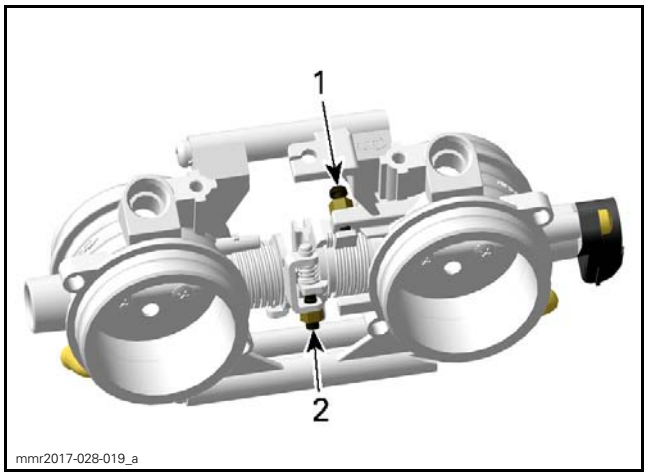
17. Check if options are correctly entered.
18. If equipped, perform a SHOT alignment procedure. Refer to *SHOT* subsection.
19. **Scan** the vehicle to confirm that all fault codes are cleared.

THROTTLE BODY



1. Throttle body
2. TPS (Throttle position sensor)

Throttle Body Screw Identification



1. Master zero position screw
2. Synchronizing screw

NOTICE **Do not tamper with any adjustment screw. Otherwise, throttle body may have to be replaced.**

Inspecting the Throttle Body

Ensure throttle plates move freely and smoothly when depressing throttle lever.

Ensure throttle body master zero position screw is NOT loose. If so, replace throttle body.

Ensure that the master zero position screw stops the throttle plate.

Ensure TPS is NOT loose.

Check for corroded or damaged wiring or connectors.

Removing the Throttle Body

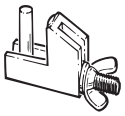
1. Remove upper body module. Refer to *BODY* subsection.
2. Remove primary intake silencer. Refer to *AIR INTAKE SILENCER* subsection.

850 E-TEC

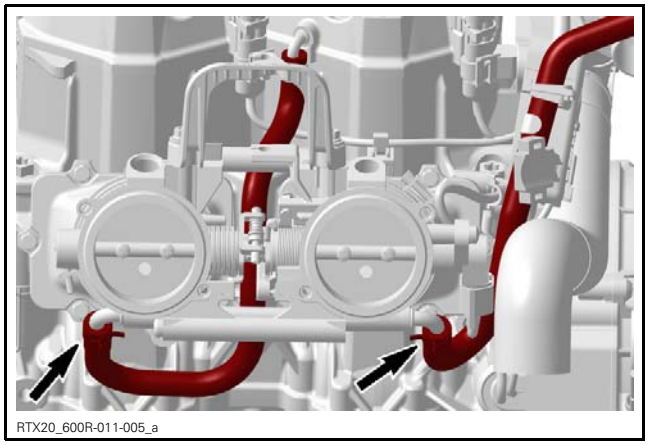
3. Remove fuel rail with fuel injectors and put it aside, refer to *FUEL RAIL AND THROTTLE BODY INJECTORS* in this subsection.

All Models

4. Block coolant hoses of throttle body heating.

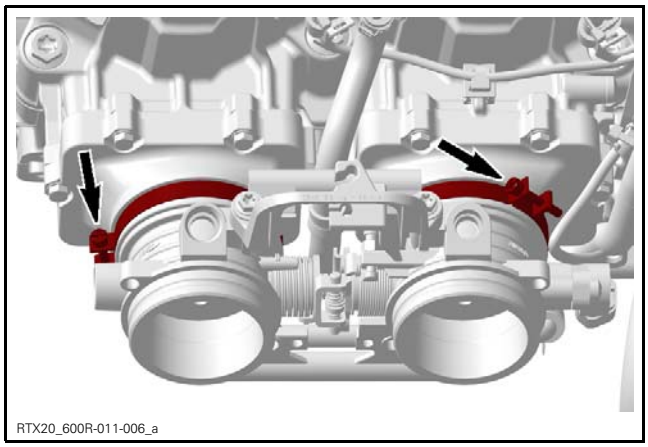
REQUIRED TOOL	
SMALL HOSE PINCHER (P/N 295 000 076)	

5. Remove coolant hoses from throttle body.



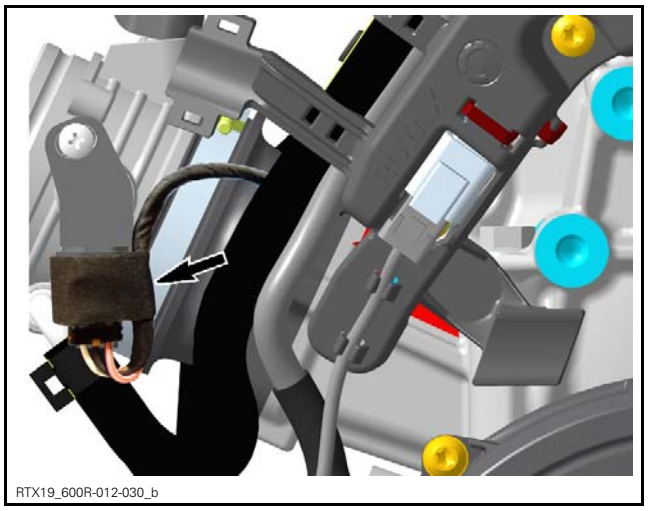
RTX20_600R-011-005_a

6. Loosen clamps retaining throttle body.



RTX20_600R-011-006_a

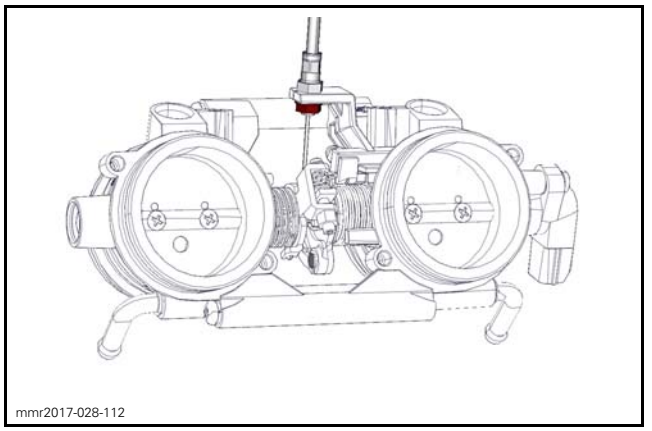
7. Disconnect TPS connector.



RTX19_600R-012-030_b

NOTICE **The TPS connector can be disconnected without cutting the tape.**

8. Disconnect throttle cable.
9. At throttle body, fully unscrew cable lock nut.



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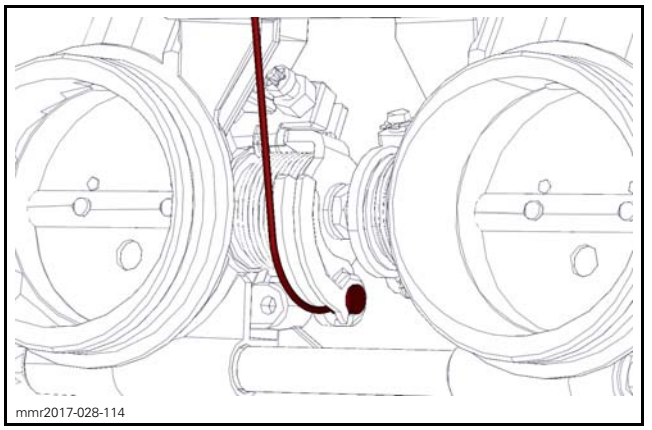
THROTTLE CABLE LOCK NUT

10. Unhook throttle cable end.



mmr2017-028-114

11. Remove throttle cable.
12. Remove throttle body from vehicle.

Installing the Throttle Body

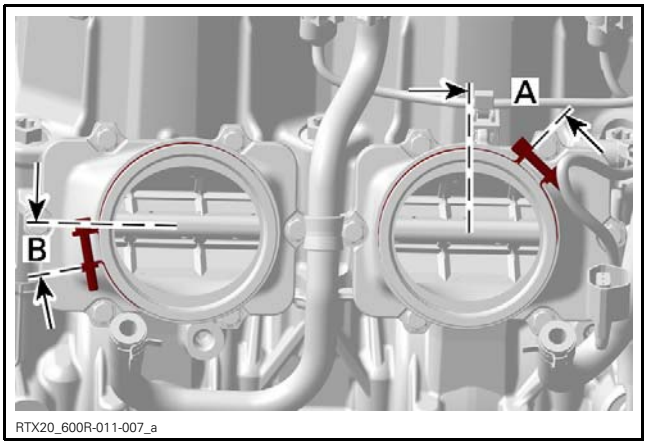
1. If installing the removed throttle body, clean throttle plates and bores before installation.

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

2. Install cooling hoses on throttle body.
3. Remove hose pinchers.
4. Connect TPS connector.

NOTICE **Ensure TPS connector tab is properly locked.**

5. Install throttle body on intake adapters.
6. Position throttle body clamps and tighten to specification.



RTX20_600R-011-007_a

A. 25° +/- 5°
B. 4° +/- 5°

TIGHTENING TORQUE	
Throttle body clamps	1.5 N•m ± 0.2 N•m (13 lbf•**in** ± 2 lbf•**in**)

7. Install throttle cable loosely.
8. Carry out the *ADJUSTING THROTTLE CABLE* procedure as detailed in this subsection.

850 E-TEC

9. Install fuel rail with fuel injectors, refer to *FUEL RAIL AND THROTTLE BODY INJECTORS* in this subsection.

All Models

10. If a new throttle body or TPS is installed, carry out the *CLOSED THROTTLE RESET (TPS)* as detailed in this subsection.
11. Refill and bleed cooling system, refer to *COOLING SYSTEM - VEHICLE* subsection.
12. Install adapter plate (primary air intake silencer) on throttle body.

TIGHTENING TORQUE	
Adapter plate clamps	0.7 N•m ± 0.1 N•m (6 lbf•**in** ± 1 lbf•**in**)

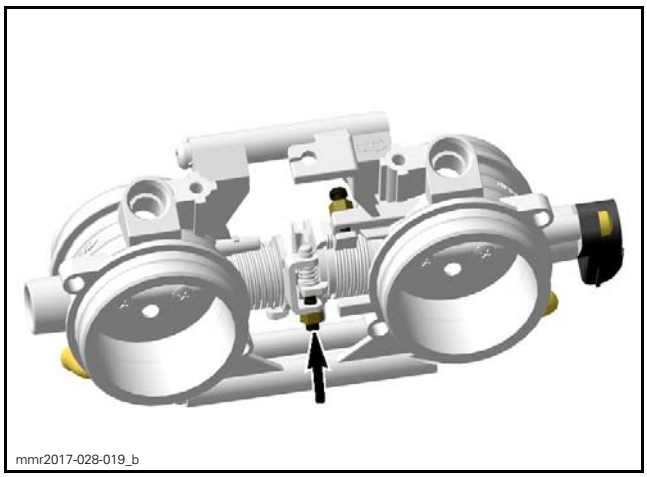
13. Install primary air intake silencer, refer to *AIR INTAKE SYSTEM* subsection.
14. Install all remaining removed parts.

NOTICE **Make sure the TPS wire does not touch the frame. Secure TPS wire safely to the throttle body heating hose, refer to *ENGINE HARNESS* subsection.**

Throttle Body Synchronization

No synchronization is required as it has already been done at the factory.

NOTICE **Do not alter synchronization screw setting. Otherwise throttle body must be replaced.**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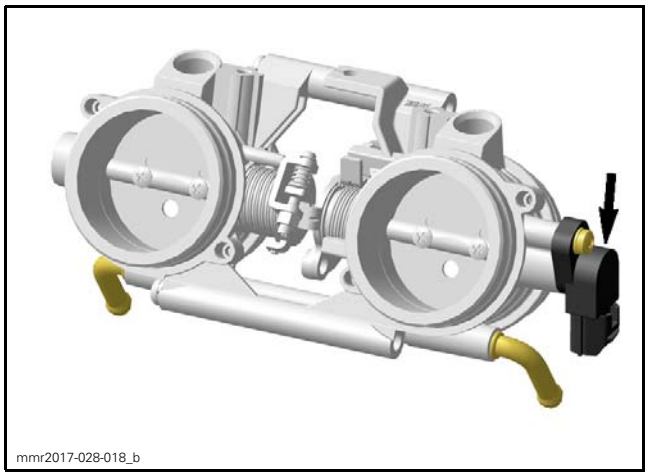
TPS (THROTTLE POSITION SENSOR)

Description

The throttle position sensor (TPS) is a potentiometer that sends a signal to the ECM which is proportional to the throttle shaft angle.



THROTTLE POSITION SENSOR (TPS)

Reset TPS (Closed Throttle)

Refer to *RESETTING THE CLOSED THROTTLE VALUE* in the *ADJUSTMENT* topic of this subsection.

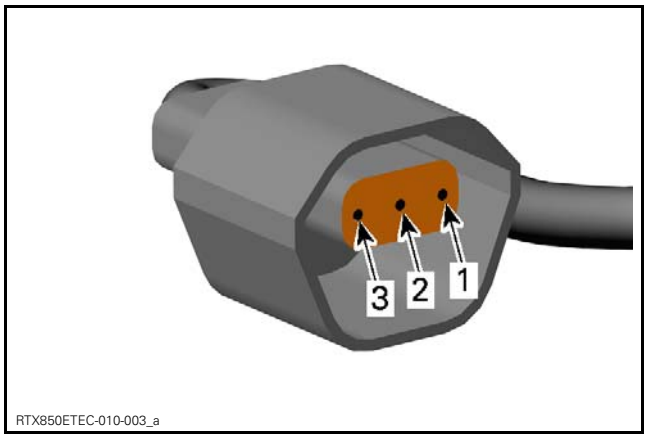
Testing the TPS Wear

1. Ensure TPS connector is properly connected.
2. While engine is not running, activate throttle and pay attention for smooth operation without physical stops of the cable.
3. Connect the vehicle to the BRP diagnostic software (BUDS2).
4. Select the **Measurements** page and **ECM** button. Monitor the TPS voltage and percentage.
5. Slowly and regularly depress the throttle.

The values must change gradually and regularly as the throttle is activated. If the values "stick", bounce, suddenly drops off or if any discrepancy between the throttle movement and the needle movement is noticed, it indicates a worn TPS that needs to be replaced.

Testing the TPS Input Voltage

1. Remove upper body module. Refer to *BODY* subsection.
2. Connect the vehicle to the BRP diagnostic software (BUDS2).
3. Disconnect TPS connector.
4. Read voltage at TPS harness connector as follows.



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

TPS INPUT VOLTAGE TEST		
TPS CONNECTOR PIN		SPECIFICATION
3	2	5.0 Vdc

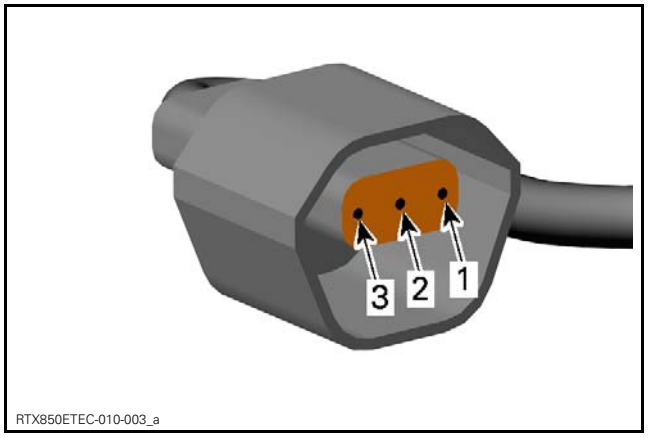
If voltage is good, carry out *TESTING THE TPS RESISTANCE*.

If test result is out of specification, carry out *TESTING THE TPS CIRCUIT CONTINUITY*.

Testing the TPS Circuit Continuity

Disconnect ECM-A connector from ECM and connect it to ECM adapter tool.

Check the wiring continuity as follows.



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

TPS CIRCUIT CONTINUITY TEST		
TPS CONNECTOR PIN	ECM ADAPTER PIN	SPECIFICATION
1	A-D3	Close to 0 Ω
2	A-C2	
3	A-D2	

If tests are good, replace the TPS.

If tests are not good, continue to check the resistance of the remainder of the TPS circuit.

Testing the TPS Resistance

1. Reconnect the TPS.
2. Disconnect ECM-A connector from ECM and connect it to ECM adapter tool.

TPS RESISTANCE TEST			
ECM ADAPTER PIN		IDLE POSITION	W.O.T. POSITION
		SPECIFICATION	
A-D3	A-C2	1140±300 Ω	5140±1900 Ω
A-D3	A-D2	5140±1900 Ω	540±300 Ω
A-C2	A-D2	5000±2000 Ω	5000±2000 Ω

NOTE: The resistive value should change smoothly and proportionally to the throttle movement. Otherwise, replace TPS.

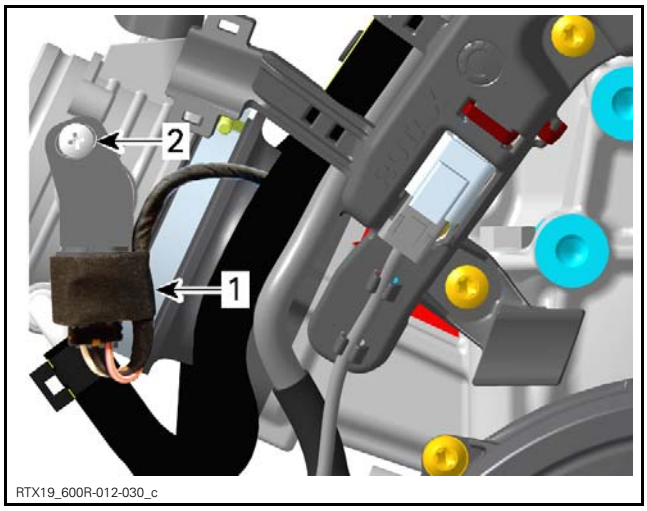
If resistive values are correct, try a new ECM. Refer to *ENGINE CONTROL MODULE (ECM)* elsewhere in this subsection.

If resistive values are incorrect:

– Repair or replace wiring or connectors.
– Replace TPS.

Replacing the TPS

1. Remove the throttle body, refer to *REMOVING THE THROTTLE BODY* in this subsection.
2. Disconnect TPS connector.
3. Remove TPS retaining screw.



1. TPS connector
2. Screw

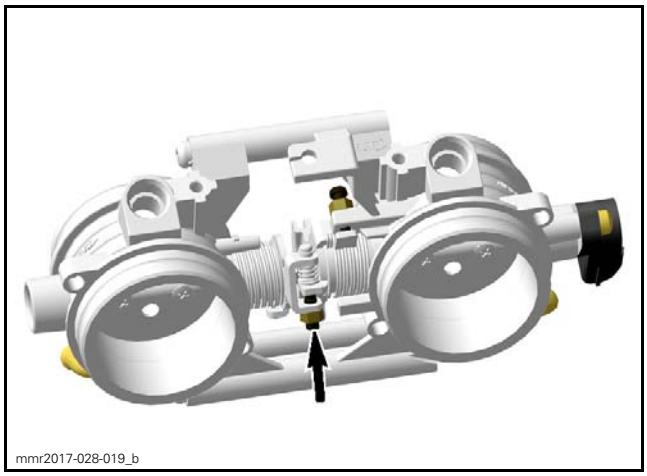
4. Remove TPS.
5. Install new TPS.

NOTICE **Ensure that the throttle body is fully closed before installing the TPS.**

6. Tighten TPS retaining screw to specification.

TIGHTENING TORQUE	
TPS retaining screw	4 N•m ± 0.5 N•m (35 lbf•**in** ± 4 lbf•**in**)

7. Open and quickly release throttle plates 6 times (throttle plates must snap shut).



PUSH TO OPEN THROTTLE PLATES

8. Reinstall remaining removed parts.
9. Reset TPS, refer to *CLOSED THROTTLE RESET (TPS)* in this subsection.

CRANKSHAFT POSITION SENSOR (CPS)

Testing the CPS with BUDS2

1. Connect the vehicle to the BRP diagnostic software (BUDS2). Refer to *COMMUNICATION TOOLS AND B.U.D.S.* subsection.
2. In BUDS2, navigate to the **Measurements** page
3. Monitor the **Engine Speed (RPM)** indicator while cranking engine.

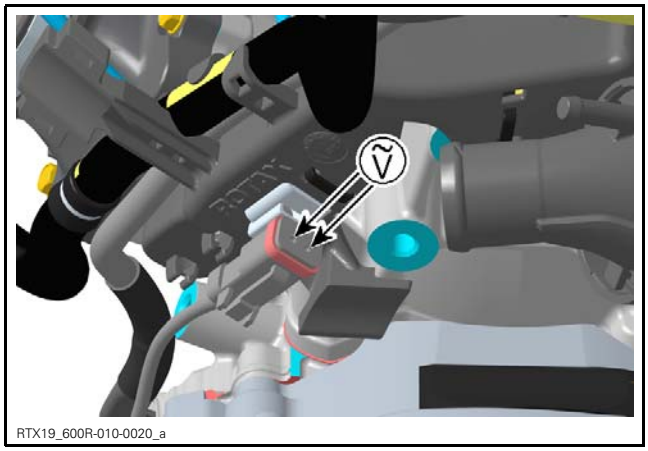
The value should move proportionally to the cranking RPM. If no value movement is observed, test the *CPS OUTPUT VOLTAGE*.

NOTE: A loose CPS or CPS connector can send an intermittent signal that can prevent the engine from starting.

Testing the CPS Output Voltage

1. Disconnect CPS connector (2-pin connector). Refer to *WIRING HARNESS AND CONNECTORS* for connector location.
2. Probe terminals coming from CPS while cranking engine.

CPS OUTPUT VOLTAGE TEST		
CPS CONNECTOR PIN		SPECIFICATION
1	2	1 - 2 Vac min.



RTX19_600R-010-0020_a

If voltage is out of specification, inspect wiring/connectors. Replace CPS if wiring is good.

Testing the CPS Resistance

1. Disconnect ECM-A connector from ECM and connect it to ECM adapter tool.
2. Measure the resistance of the sensor through its wiring.

CPS RESISTANCE TEST		
ECM ADAPTER PIN		SPECIFICATION @ 20°C (68°F)
A-K1	A-K2	190 - 290 Ω

If measurement is out of specification, check wiring continuity between ECM and CPS.

3. Also check for a shorted connection to ground as per table.

CPS RESISTANCE TEST		
ECM ADAPTER PIN	BATERRY	SPECIFICATION @ 20°C (68°F)
A-K1	Negative (-) post	Open circuit (OL)
A-K2		

If the previous tests were good, replace CPS.

Replacing the CPS

Refer to *MAGNETO AND STARTER* subsection.

3D RAVE VALVES POSITION SENSOR

Refer to *RAVE* subsection.

MANIFOLD ABSOLUTE PRESSURE AND TEMPERATURE SENSOR (MAPTS)

NOTE: This sensor is a multifunction device. It measures ambient absolute pressure and intake air temperature for air flow calculations.

MAPTS Location

The MAPTS is on the secondary air intake silencer.

MAPTS Pressure Function

The sensor measures the ambient atmospheric air pressure. The ambient air pressure is at that moment stored in the ECM.

The sensor must be correctly installed on the secondary air intake silencer. Otherwise, the MAPTS could generate a fault code for an unexpected sensor range at idle when it reads an erroneous pressure. If this is the case, remove sensor and check for oil or dirt on its end and if problem persists, check throttle plate condition/position and the wiring harness. Perform the following tests.

Testing the MAPTS Quick (Pressure Function)

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

2. In BUDS2, go to:
   – Measurements page
   – ECM button.
3. In the bottom right table, find and note the Intake Air Pressure value.

NOTE: The indicated intake air pressure in BUDS2 must be within 34.5 mbar (.5 PSI) of local atmospheric pressure when the engine is stopped.

MAPTS PRESSURE FUNCTION QUICK TEST			
RESULT	Service action		
NO READING	Circuit Continuity Test of MAPTS Pressure Function	MAPTS Input Voltage Test	Repair or replace wiring
VALUE IS OUT OF RANGE	Replace MAPTS		

4. Perform the same test with a new MAPTS and compare both readings.

Testing the MAPTS Input Voltage

1. Connect the vehicle to the BRP diagnostic software (BUDS2).
2. Remove electrical connector from MAPTS.
3. Install tether cord cap on engine shut-off switch.
4. Using a multimeter set to Vdc, measure for MAPTS input voltage as per following table.

MAPTS INTPUT VOLTAGE TEST		
MAPTS CONNECTOR PIN		SPECIFICATION
1	2	5 Vdc

If voltage test is good, replace the MAPTS.

If voltage test is not good, carry out *TESTING THE MAPTS CIRCUIT CONTINUITY (PRESSURE FUNCTION)*.

Testing the MAPTS Circuit Continuity (Pressure Function)

1. Disconnect the ECM-B connector from the ECM and connect it to the ECM adapter tool.
2. Using the multimeter set to Ω, check continuity of the following circuits.

MAPTS CIRCUIT CONTINUITY (PRESSURE FUNCTION)		
ECM ADAPTER PIN	MAPTS CONNECTOR PIN	SPECIFICATION
B-E4	3	Close to 0.1 Ω
B-F3	4	
B-F4	1	

If resistance is not within specification, repair or replace the wiring harness between ECM connector and the MAPTS. Refer to *WIRING DIAGRAM.*

If value is not correct, try a new ECM.

MAPTS Temperature Function

The MAPTS also monitors the temperature of the air in the intake manifold.

Testing the MAPTS Quick (Temperature Function)

1. Connect vehicle to the BRP diagnostic software (BUDS2).
2. In BUDS2, go to:
   – Measurements page
   – ECM button.
3. Look for the Intake 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.

4. Perform the same test with a new MAPTS and compare both readings.

NOTE: Both sensors must feel same ambient air temperature.

If the temperature reading from the original MAPTS is significantly different than the temperature indicated by the new, the original MAPTS is defective.

If there is no reading, carry out a *TESTING THE MAPTS RESISTANCE (TEMPERATURE FUNCTION)*.

Testing the MAPTS Resistance (Temperature Function)

1. Disconnect the MAPTS connector.
2. Using the multimeter set to Ω, test MAPTS resistance at the sensor as per following tables.

MAPTS RESISTANCE TEST		
MAPTS PIN		SPECIFICATION
1	2	Refer to MAPTS TEMPERATURE SENSOR TABLE

MAPTS TEMPERATURE SENSOR TABLE	
TEMPERATURE	SPECIFICATION
-40°C (-40°F)	40528 to 56935 Ω
-10°C (14°F)	8103 to 10919 Ω
20°C (68°F)	2193 to 2863 Ω
80°C (176°F)	294 to 368 Ω
120°C (248°F)	98 to 122 Ω

If resistance is not within specification, replace the MAPTS.

If resistance tests good, reconnect the MAPTS and proceed with the following steps.

3. Disconnect the ECM-B connector from the ECM and connect it to the ECM adapter tool.
4. Using a multimeter, recheck resistance value as per following table.

MAPTS RESISTANCE TEST		
ECM ADAPTER PIN		SPECIFICATION
B-B2	B-F4	Refer to MAPTS TEMPERATURE SENSOR TABLE

MAPTS TEMPERATURE SENSOR TEST RESULTS			
RESULT	Service action		
NO READING	Circuit Continuity Test of MAPTS Temperature Function	MAPTS Input Voltage Test	Repair or replace wiring
INCORRECT RESISTANCE VALUE	Check condition of connector pins, replace MAPTS		
CORRECT RESISTANCE VALUE	Try a new ECM		

Testing the MAPTS Circuit Continuity (Temperature Function)

MAPTS CIRCUIT CONTINUITY TEST (TEMPERATURE FUNCTION)		
ECM ADAPTER PIN	MAPTS CONNECTOR PIN	SPECIFICATION
B-F4	1	Close to 0.1 Ω
B-B2	2	
B-E4	3	

Repair or replace wiring as required.

Replacing MAPTS

1. Disconnect MAPTS connector and remove the MAPTS from the intake manifold.
2. Install new MAPTS.
   2.1 Apply dielectric grease in the MAPTS connector.

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

   2.2 Secure the MAPTS.

TIGHTENING TORQUE	
MAPTS retaining screw	4.5 N•m ± 0.5 N•m (40 lbf•**in** ± 4 lbf•**in**)

COOLANT TEMPERATURE SENSOR (CTS)

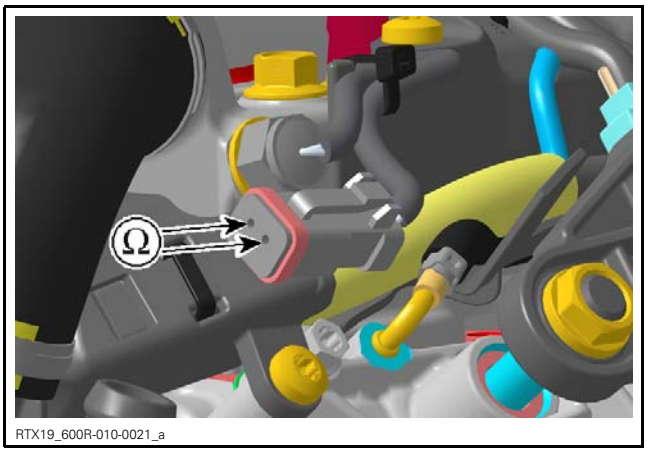
Testing the CTS with BUDS2

1. Connect the vehicle to the BRP diagnostic software (BUDS2). Refer to *COMMUNICATION TOOLS AND B.U.D.S.* subsection.
2. In BUDS2, go to:
   – **Measurements** page
   – **ECM** button.
3. Monitor the **Engine temperature** indicator. It should show the coolant temperature. Otherwise, perform *TESTING THE CTS RESISTANCE*.

Testing the CTS Resistance

1. Disconnect CTS sensor connector. Refer to *WIRING HARNESS AND CONNECTORS* for connector location.
2. Set multimeter to Ω.
3. Measure resistance between sensor terminals.

CTS RESISTANCE TEST		
CTS PIN		SPECIFICATION
1	2	Refer to MAPTS TEMPERATURE SENSOR TABLE



TYPICAL - CTS RESISTANCE CHECK

CTS SENSOR TEMPERATURE TABLE	
TEMPERATURE	**SPECIFICATION**
25°C (77°F)	2138 - 2570 Ω
38°C (100°F)	1284 - 1514 Ω
104°C (219°F)	156 - 174 Ω
121°C (250°F)	103 - 115 Ω

If resistance is out of specifications, replace CTS.

If resistance tests good, carry out the following steps.

4. Reconnect the CTS.
5. Disconnect the ECM-A connector from ECM and connect to the ECM adapter tool.
6. Measure CTS circuit resistance as follows.

CTS RESISTANCE TEST		
ECM ADAPTRER PIN		SPECIFICATION
A-B1	A-C1	Refer to *CTS SENSOR TEMPERATURE TABLE (E-TEC)*

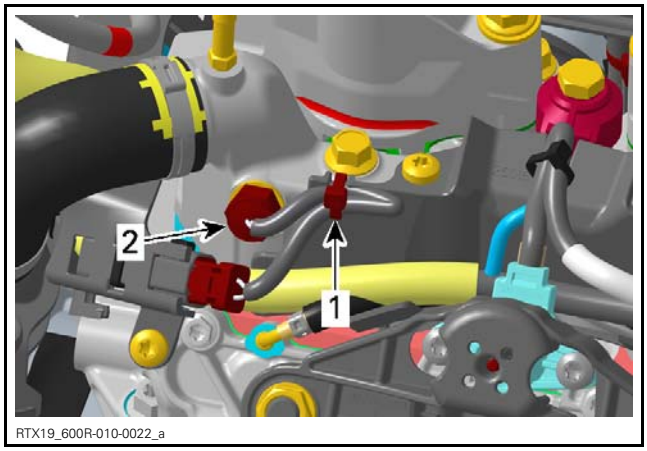
If resistance value is correct, sensor, wiring and connectors are good.

If resistance value is incorrect, repair or replace wiring and connectors between ECM and CTS.

Replacing the CTS

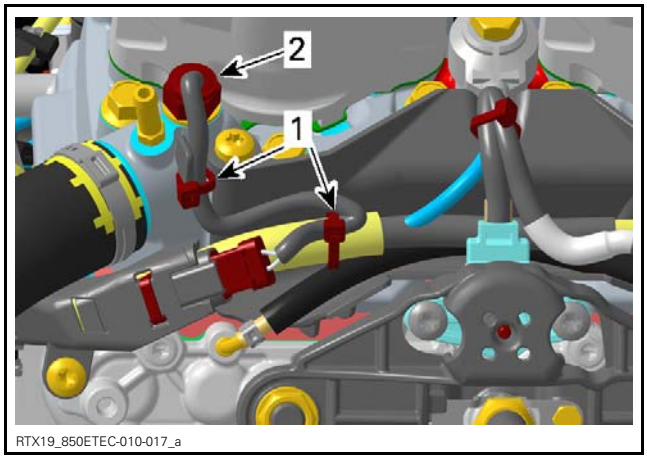
1. Cut locking tie(s) and disconnect CTS connector.
2. Remove CTS.

600R E-TEC



1. Locking tie
2. CTS

850 E-TEC



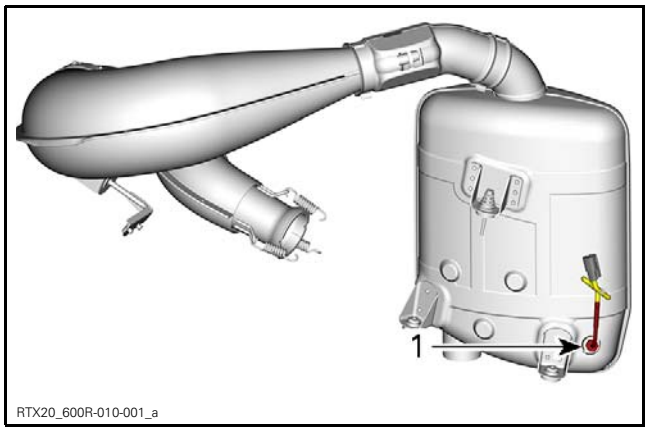
1. Locking ties
2. CTS

3. Install new CTS.

TIGHTENING TORQUE	
CTS	16 N•m ± 1 N•m (142 lbf•**in** ± 9 lbf•**in**)

4. Reinstall removed parts.
5. Refill engine coolant. If an important quantity of coolant spilled from the engine, bleed cooling system. Refer to *COOLING SYSTEM - VEHICLE* subsection.

EXHAUST GAS TEMPERATURE SENSOR



1. Muffler EGTS

Testing the EGTS with BUDS2

Connect the vehicle to the BRP diagnostic software (BUDS2). Refer to *COMMUNICATION TOOLS AND B.U.D.S.* subsection.

In BUDS2, go to:

– **Measurements** page
– **ECM** button.

Monitor the Exhaust temperature indicators. They should show the exhaust temperature.

Use an infrared thermometer and measure the sensor's temperature.

The measured temperature should be close to the temperature displayed in BUDS2.

If temperature is not the same, replace EGTS.

NOTE: If engine runs with the EGTS connected but not installed in the muffler, the reading will be 710°C (1,310°F) steady.

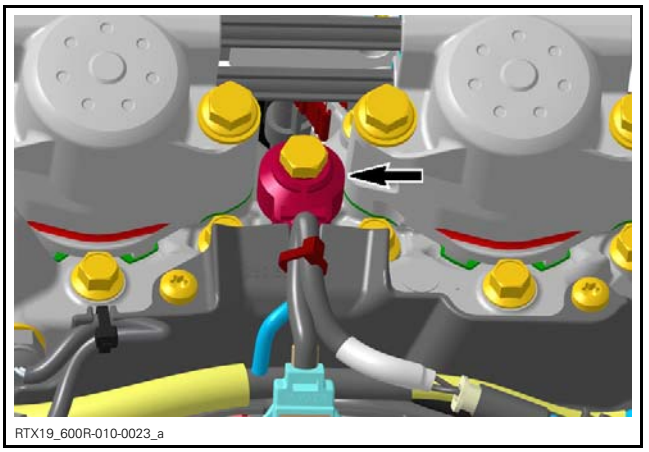
Replacing the EGTS

Refer to *EXHAUST SYSTEM* subsection.

KNOCK SENSOR (KS)

Knock Sensor Location

The knock sensor is located on top of the cylinder head, between the fuel injectors.



Testing the KS with BUDS2

1. Lift rear of vehicle off the ground and support it with a wide-base mechanical stand.
2. Connect the vehicle to the BRP diagnostic software (BUDS2).
3. In BUDS2, go to:
   – Measurements page
   – ECM button.
4. Monitor the Knock Sensor Noise Level
5. Start the engine.
6. Bring engine speed above 5200 RPM and vary engine RPM above 5200 RPM.

NOTE: Use the custom screen and graph the knock sensor signal.

The Knock Sensor Signal value should move between 0 and 100. The movement pattern is not important as long as it moves indicating the knock sensor senses the engine vibrations.

If the value changes as described, the knock sensor should be good.

If the value sticks either at 0 or 100, there is a problem.

NOTE: Ensure ignition coil cables are not close to knock sensor harness. If so, this might generate a false fault code.

Perform *TESTING THE KS RESISTANCE*.

Testing the KS Resistance

Disconnect the ECM-A connector from the ECM and install it on the ECM adapter tool.

Using the multimeter, measure the knock sensor circuit resistance as per following table.

KS RESISTANCE TEST		
ECM ADAPTRER PIN		SPECIFICATION @ 20°C (68°F)
A-H1	A-G1	3.92 - 5.88 MΩ

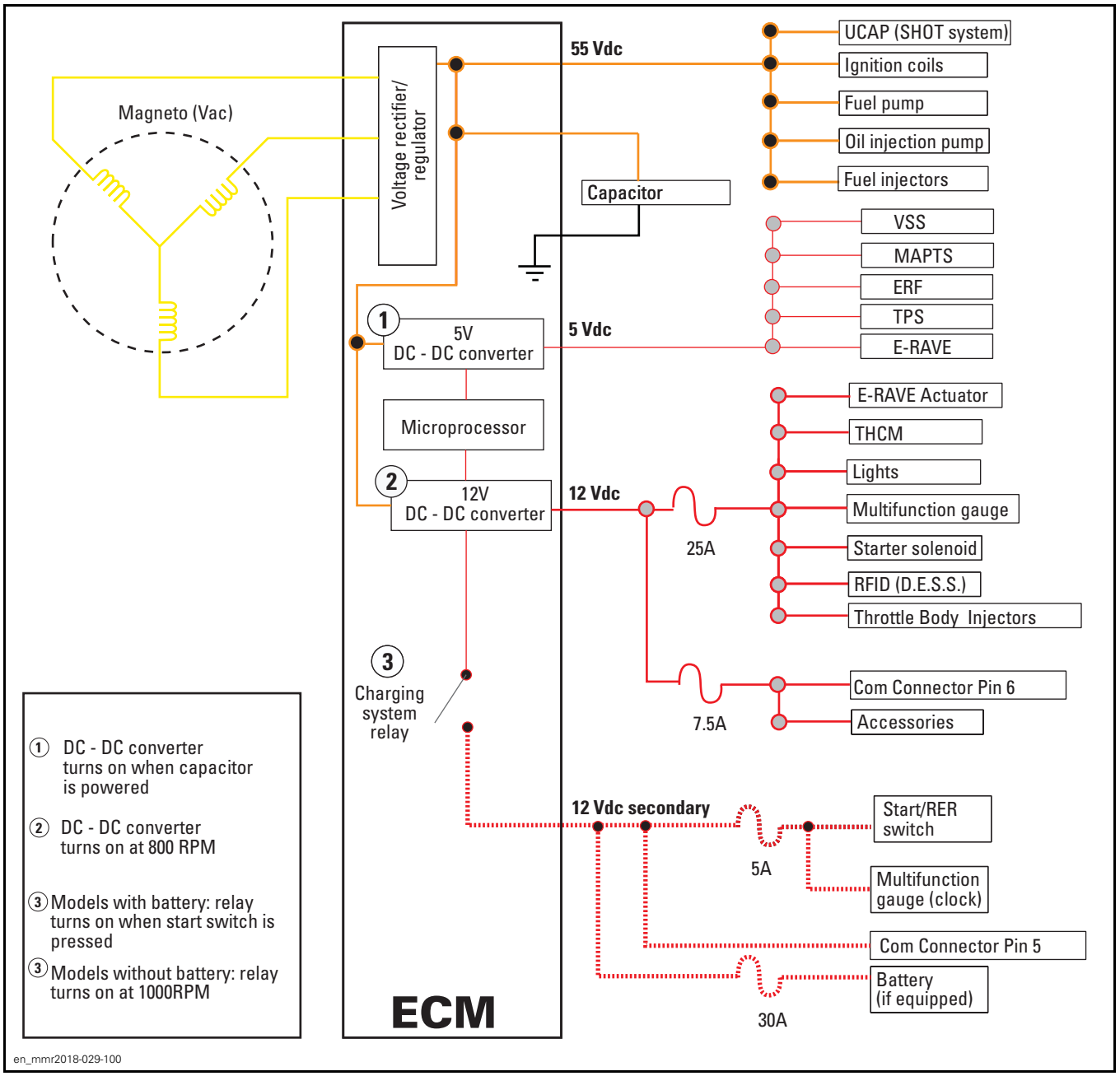
If resistance is not as specified, replace engine wiring harness.

Replacing the KS

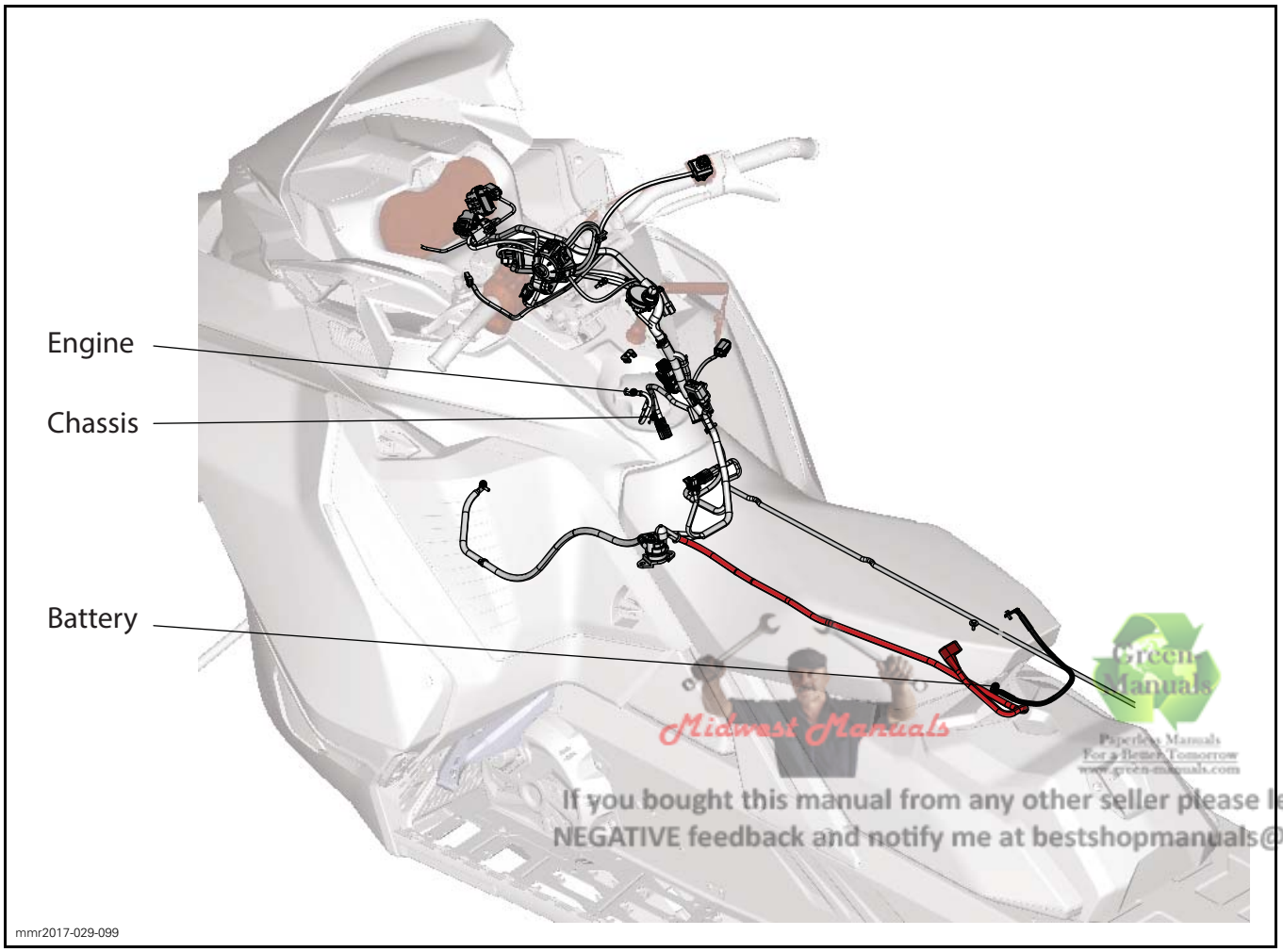
Replace engine wiring harness. Refer to *ENGINE HARNESS* subsection.

POWER DISTRIBUTION

POWER DISTRIBUTION



GROUNDS



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GENERAL

OVERVIEW

Power distribution is shown in red on the wiring diagram. Refer to *KNOWLEDGE CENTER*.

The magneto stator is wired with a 3 phase star configuration winding.

At high RPM if the magneto power is greater than the loads, the ECM will shunt the stator windings to regulate its power as necessary.

The voltage regulator/rectifier is part of the ECM.

The ECM receives the energy produced by the magneto, rectifies the alternating current (AC) to direct current (DC) and regulates the voltage.

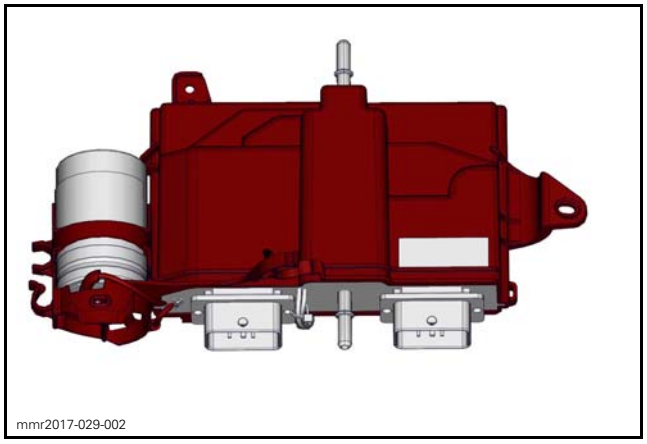
SYSTEM VOLTAGE (55 VDC)

Since the available power is low when cranking, the ECM first supplies 55 Vdc to the illustrated components that need voltage for the starting and the basic operation of the engine.

NOTE: When starting, voltage may be closer to 40Vdc until RPM increases.

ECM

For more information, refer to *ENGINE MANAGEMENT SYSTEM* subsection.



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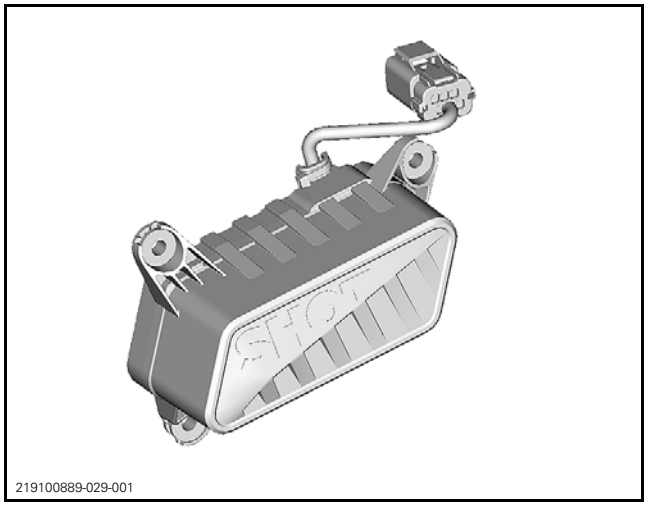
UCAP (SHOT System)

For information, refer to *SHOT SYSTEM* subsection.



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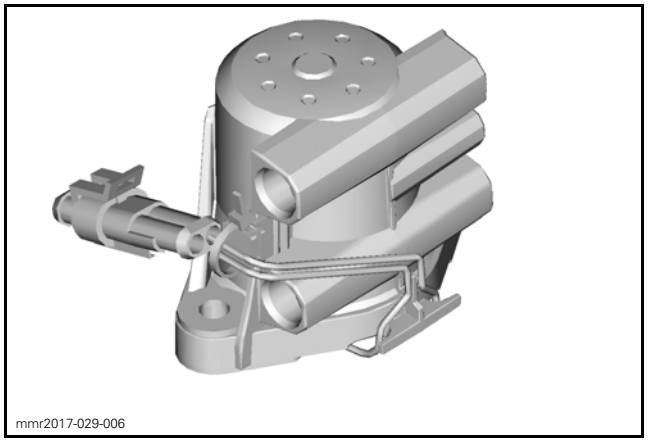
Fuel Injector

For more information, refer to *E-TEC DIRECT FUEL INJECTION* subsection.



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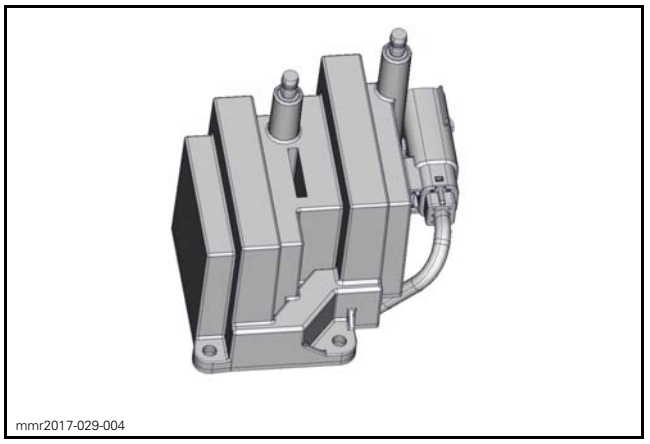
Ignition Coil

For more information, refer to *IGNITION SYSTEM* subsection.



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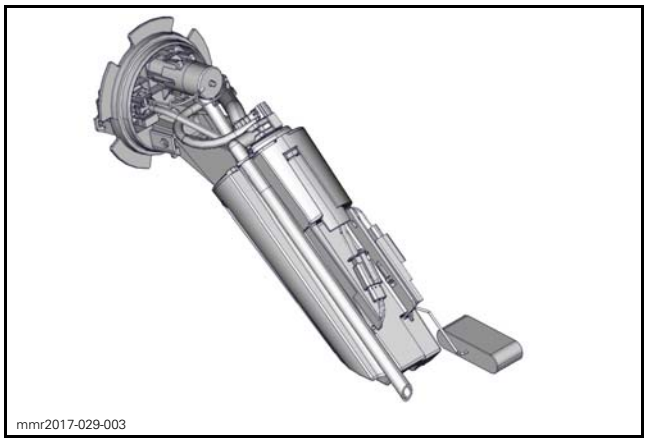
Fuel Pump

For more information, refer to *FUEL TANK AND FUEL PUMP* subsection.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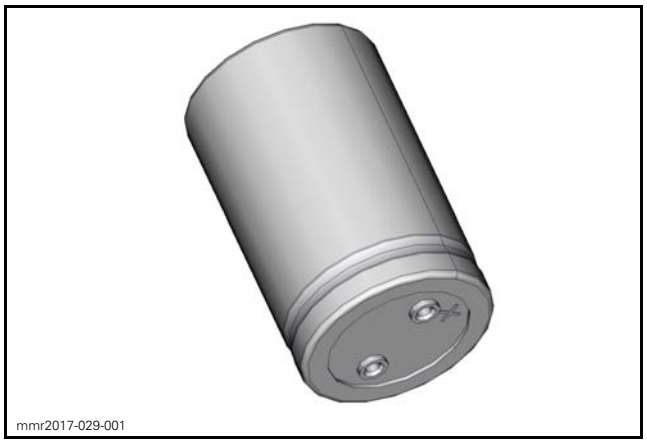
Capacitor

For more information, refer to *CHARGING SYSTEM* subsection.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SYSTEM VOLTAGE (12 VDC)

A DC-DC converter, in the ECM, steps down the 55 DC voltage to 12 Vdc when the engine reaches 800 RPM.

Since the available power is not at its maximum at the early stage of engine starting, the ECM supplies 12 Vdc to the following components when engine reaches 800 RPM.

- THCM (thermocouple module)
- E-RAVE actuator
- Communication connector
- Lighting system
- Multifunction gauge
- Heaters
- Heated visor
- Auxiliary lights
- 12 V power outlet
- Other accessories.

Approximately 25 A are available at idle (1200 RPM). Refer to *CHARGING SYSTEM* for more information.

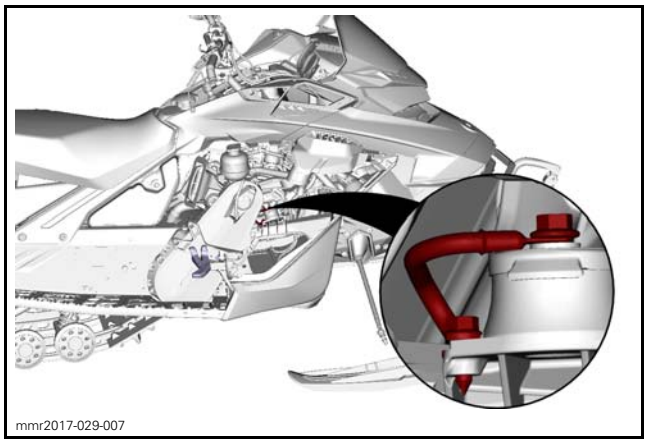
Below 2000 RPM, the total available current is limited to reduce the load on the system voltage.

Above 2000 RPM, the 12 Vdc system has a maximum of 30 A available.

If electrical system load is increased, or the RPM is decreased, the 12 Vdc system output is reduced in order to maintain 55 Vdc for engine operation.

GROUNDS

Engine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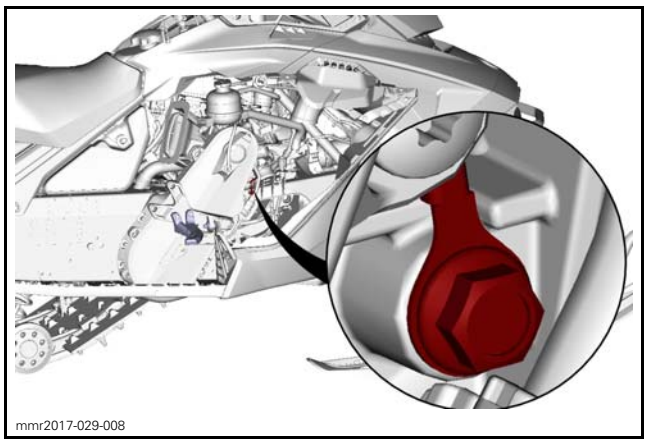
TIGHTENING TORQUE	
M6 screw on chassis	10 N•m ± 2 N•m (89 lbf•**in** ± 18 lbf•**in**)

Chassis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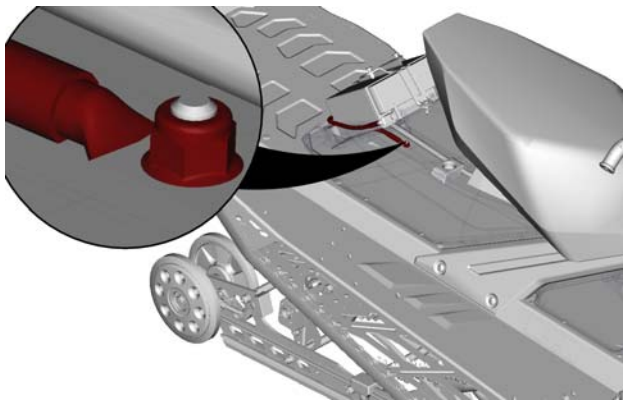
TIGHTENING TORQUE	
M5 screw on chassis	5 N•m ± 0.5 N•m (44 lbf•**in** ± 4 lbf•**in**)

Battery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TIGHTENING TORQUE	
M6 shoulder nut	10 N•m ± 2 N•m (89 lbf•**in** ± 18 lbf•**in**)

WIRING HARNESS AND CONNECTORS

SERVICE TOOLS

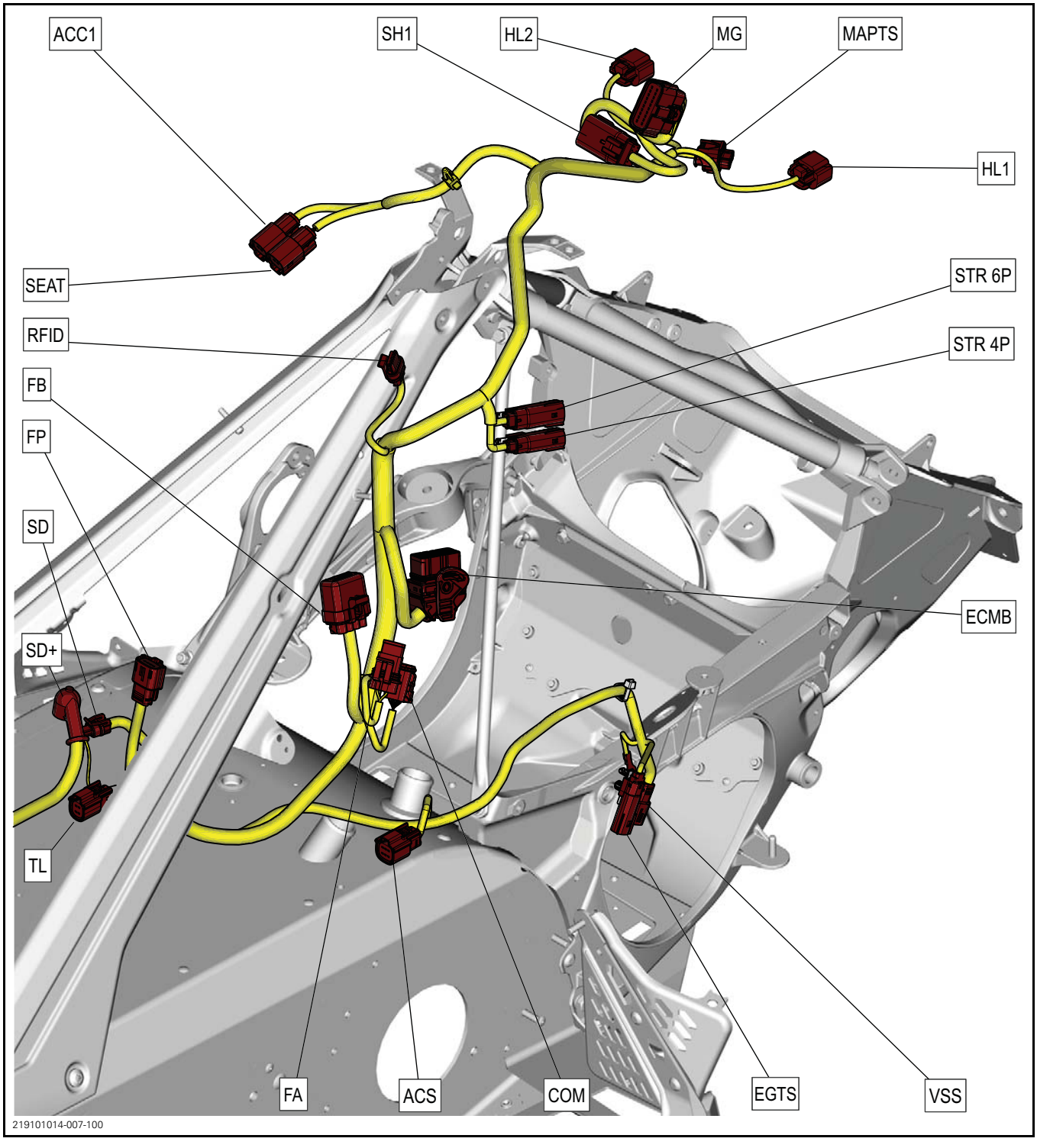
Description	Part Number	Page
ECM ADAPTER TOOL	529 036 166	10
ECM TERMINAL REMOVER 2.25	529 036 175	10
ECM TERMINAL REMOVER 3.36	529 036 174	10

SERVICE TOOLS – OTHER SUPPLIER

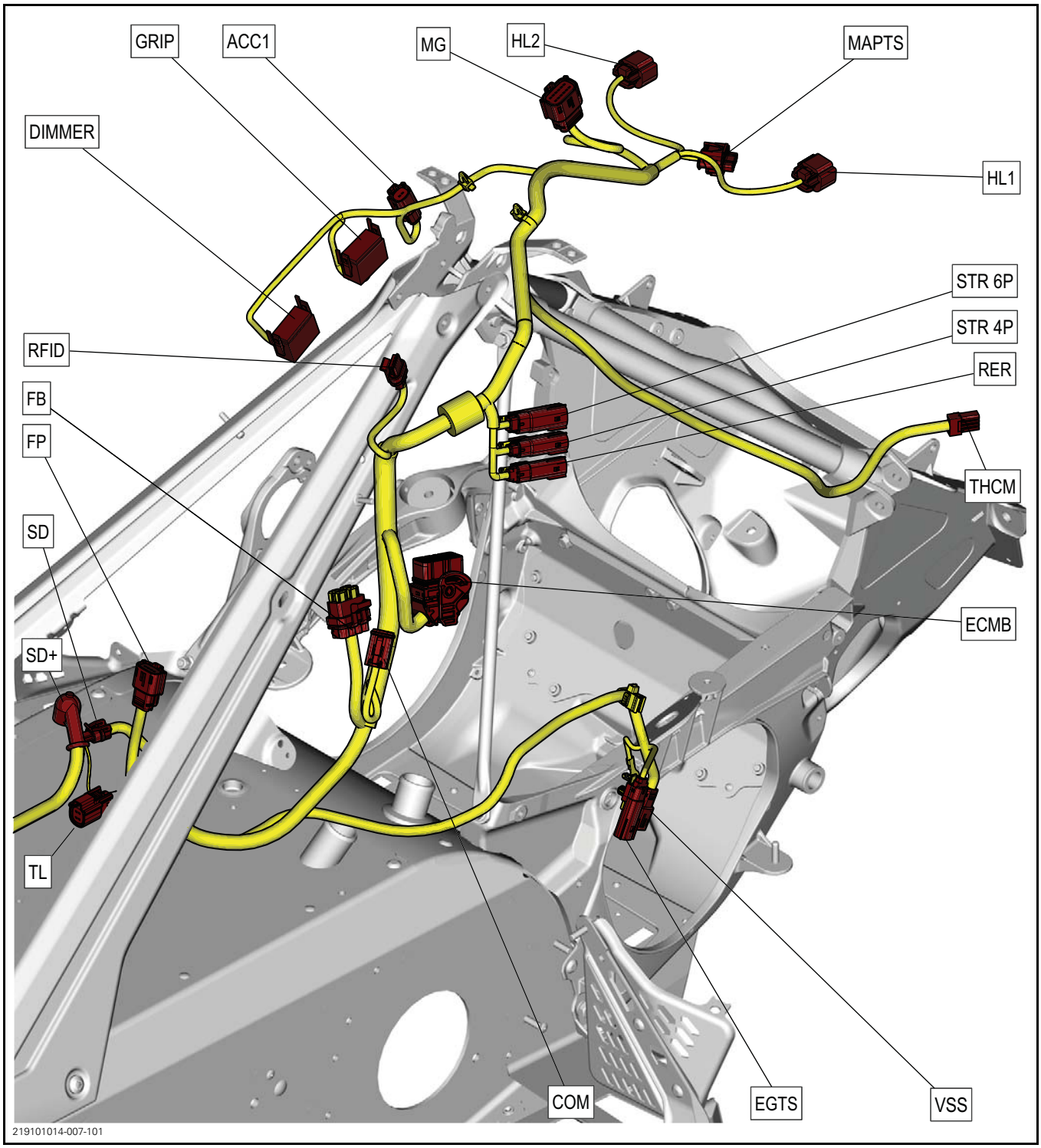
Description	Part Number	Page
DELPHI TERMINAL EXTRACTOR	12094429	12–13
FCI TERMINAL EXTRACTOR TOOL	54241678	11–12
MOLEX 150 TERMINAL EXTRACTOR TOOL	63813 - 1500	11–12

NOTE: Vehicles may not be equipped with all connectors shown in illustrations.

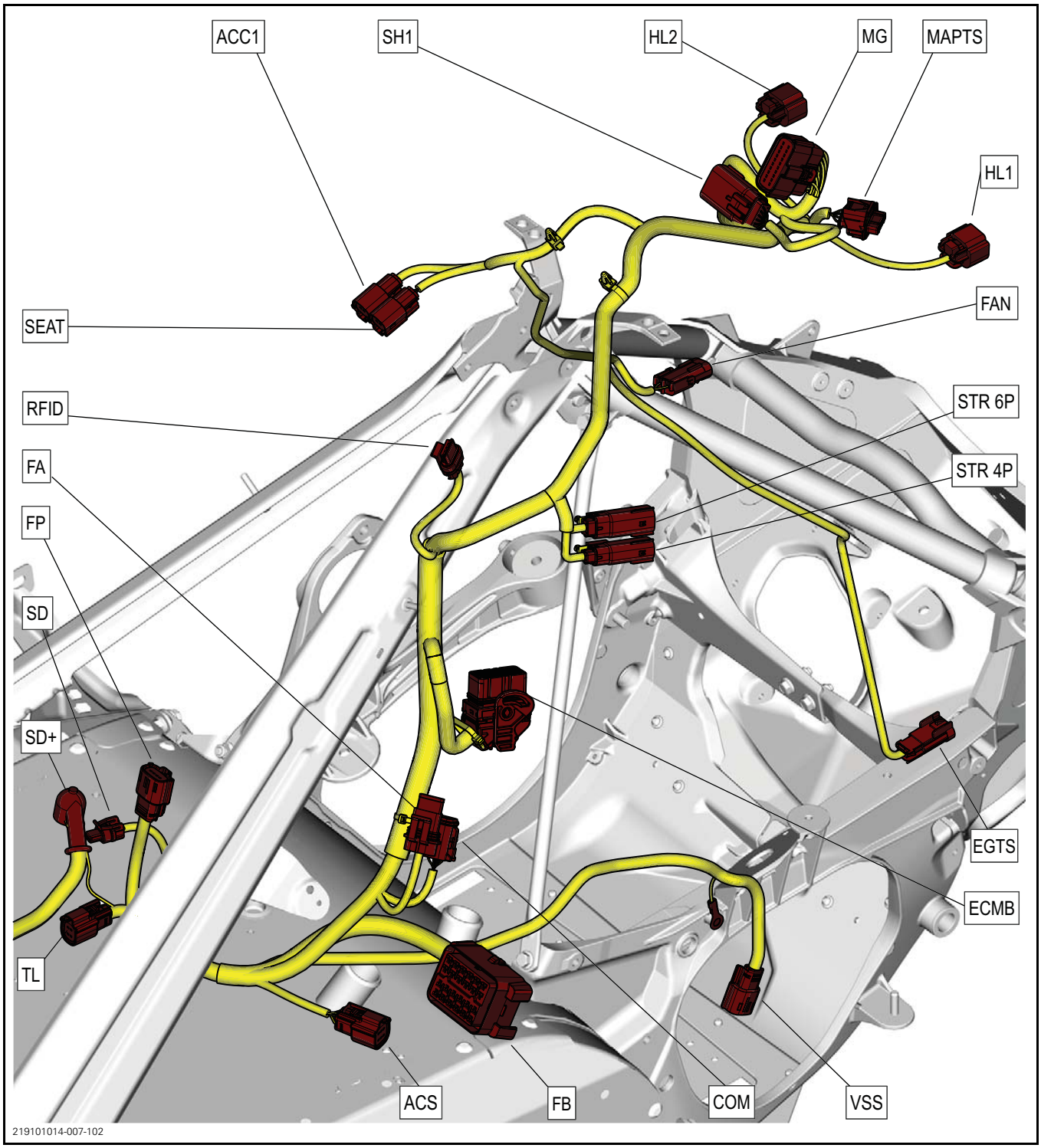
CHASSIS HARNESS - TRAIL AND CROSSOVER VEHICLES



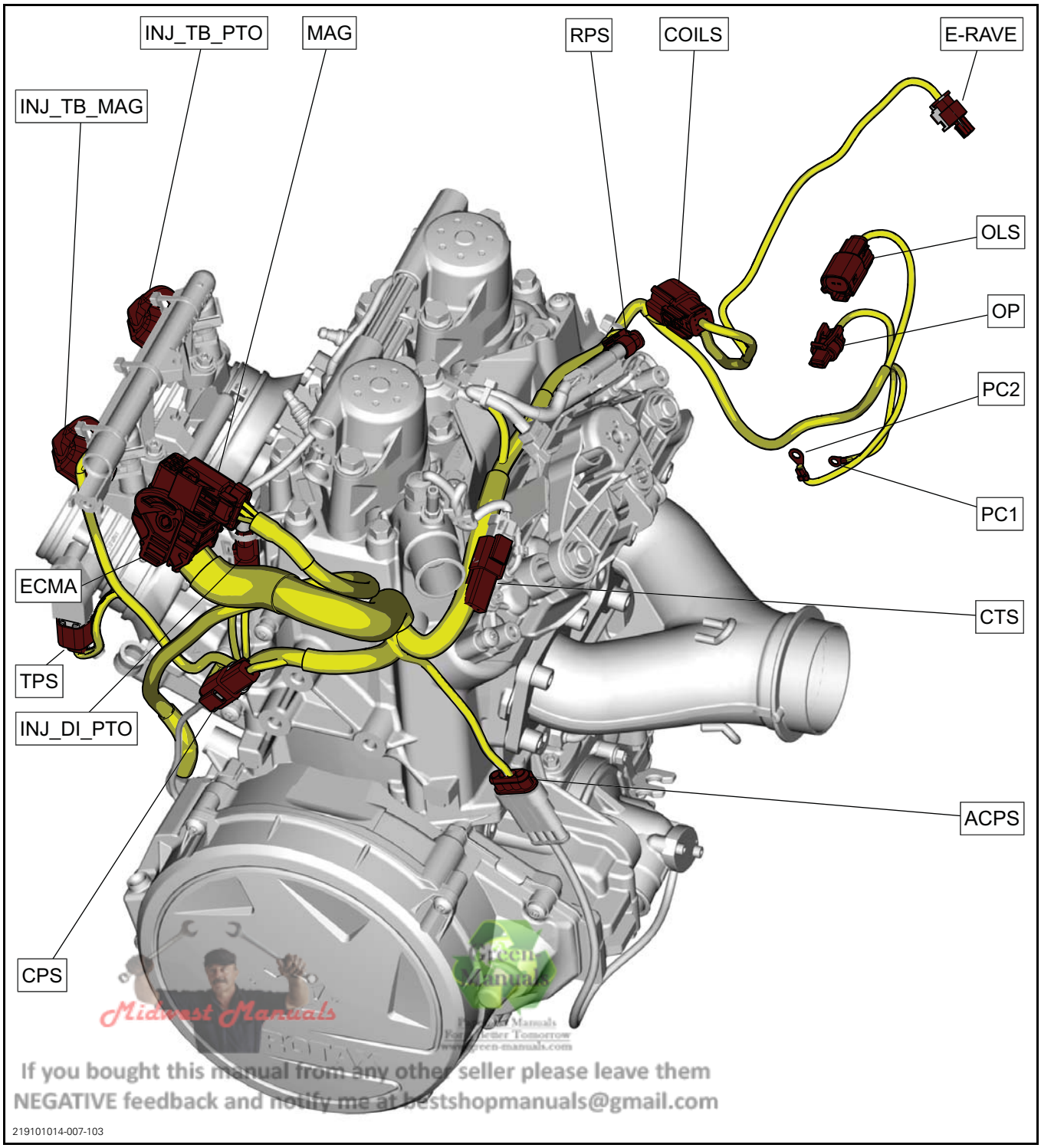
CHASSIS HARNESS - DEEP SNOW VEHICLES



CHASSIS HARNESS - UTILITY VEHICLES



ENGINE HARNESS



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GENERAL

ACRONYMS

ACRONYM	DESCRIPTION	ACRONYM	DESCRIPTION
ACC	Accessory	INJ_TB_MAG	Throttle Body Injector Magneto
ACS	Air Controlled Suspension	INJ_TB_PTO	Throttle Body Injector PTO
COM	Communication	MAG	Magneto
CPS	Crankshaft Position Sensor	MAPTS	Manifold Air Pressure and Temperature Sensor
CTS	Coolant Temperature Sensor	MG	Multifunction Gauge
DIMMER	Dimmer switch	OLS	Oil Level Sensor
ECMA	ECM connector A (engine harness)	OP	Oil Pump
ECMB	ECM connector B (chassis harness)	PC	Oil Pump Feedback Switch
EGTS	Engine Gas Temperature Sensor	RER	Rotax Electronic Reverse
E-RAVE	RAVE Actuator	RFID	Radio Frequency Identification
RPS	Rave Position Sensor)	SD	Starter Solenoid
FA	Fuse holder	SEAT	Heated seat
FAN	Radiator fan	SH1	Switch Housing 1
FB	Fusebox	STR	Steering Connector
FP	Fuel Pump	THCM	Thermocouple Module
GRIP	Heater switch	TL	Tail Light
HL	HeadLamp	TPS	Throttle Position Sensor
INJ_DI_MAG	Direct Injector Magneto	VSS	Vehicle Speed Sensor
INJ_DI_PTO	Direct Injector PTO		

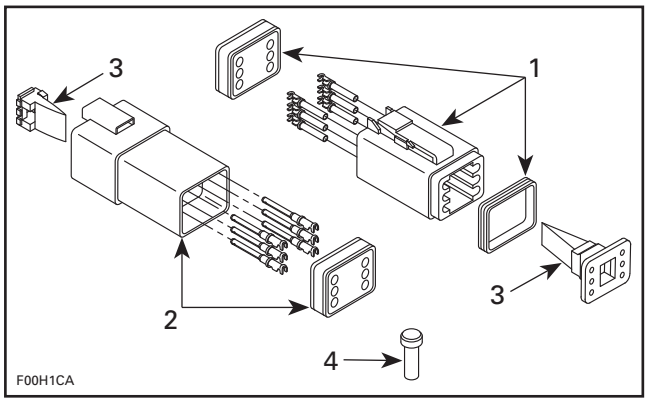
PROCEDURES

⚠ 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 (DEUTSCH)

Disassembling and Reassembling the Connector

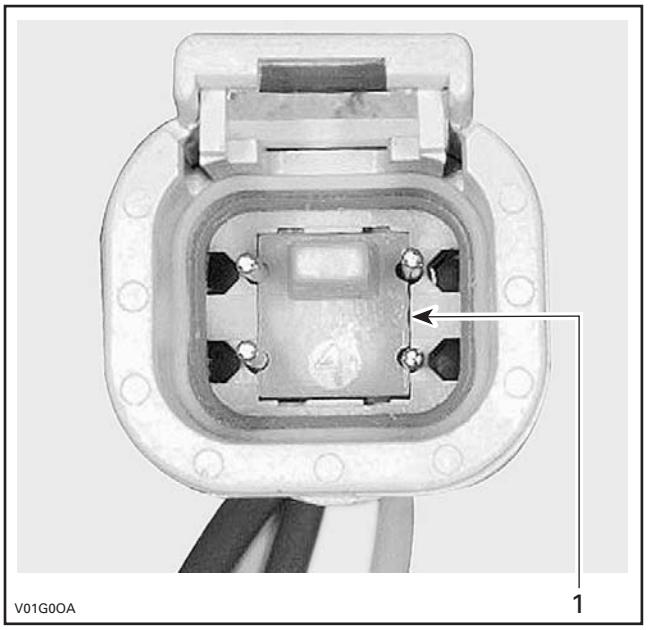


TYPICAL - DEUTSCH CONNECTOR
1. *Male connector*
2. *Female connector*
3. *Secondary lock*
4. *Sealing cap*

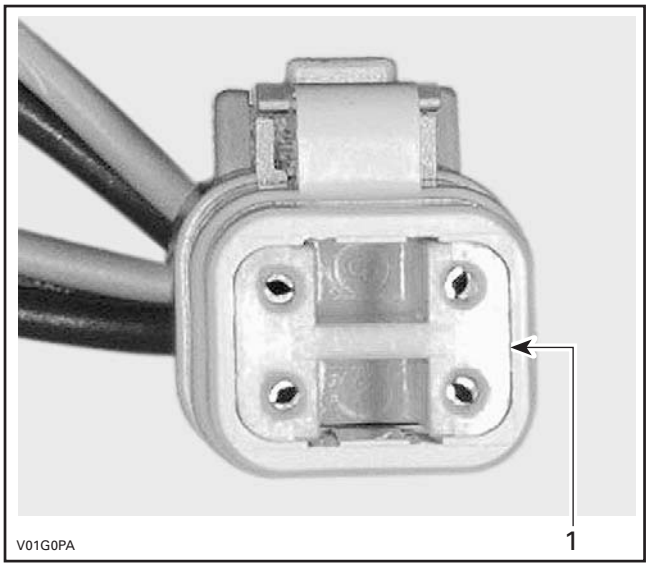
NOTICE Do not apply dielectric grease on terminal inside connector.

To remove terminals from connector, proceed as follows:

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



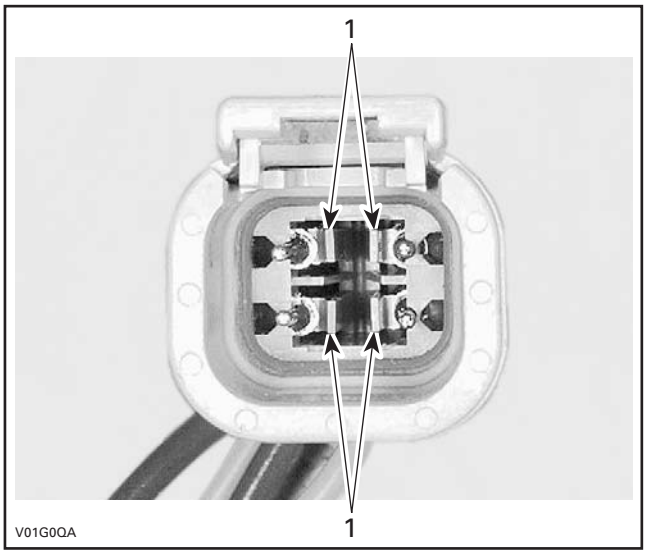
TYPICAL - FEMALE CONNECTOR
1. *Female lock*



TYPICAL - MALE CONNECTOR
1. *Male lock*

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

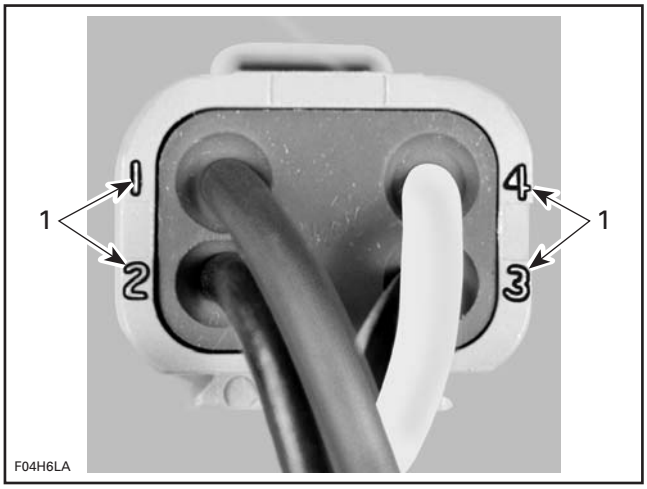
2. Insert a 4.8 mm (.189 in) wide screwdriver blade inside the front of the terminal cavity.
3. Pry the retaining tab away from the terminal while gently pulling the wire and terminal out of the back of the connector.



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

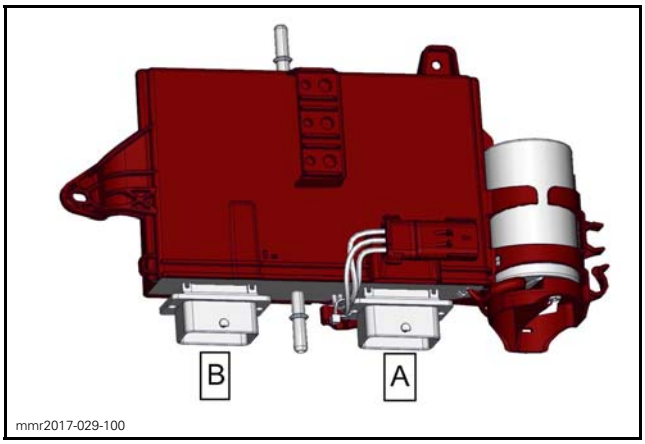
ECM CONNECTOR (MOLEX)

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.

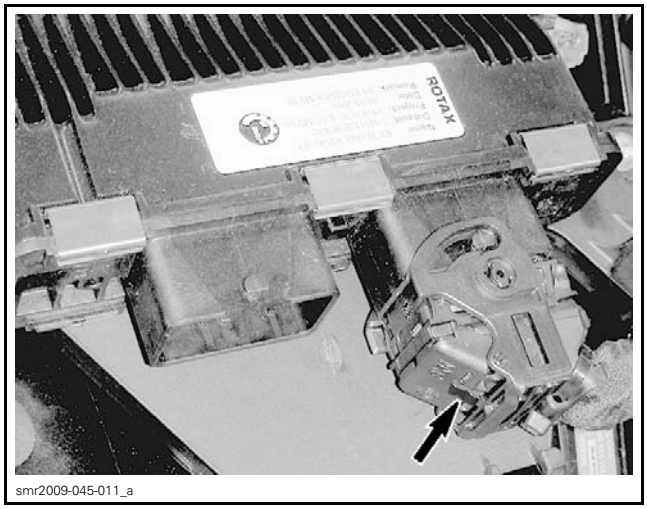
NOTE: If you need to remove the connector, be sure to not disconnect fuel quick-connector at ECM. If you need to remove the ECM or fuel quick connector, insure the ECM electrical connectors are securely in place and avoid fuel intrusion into connector/seal.



ECM CONNECTORS

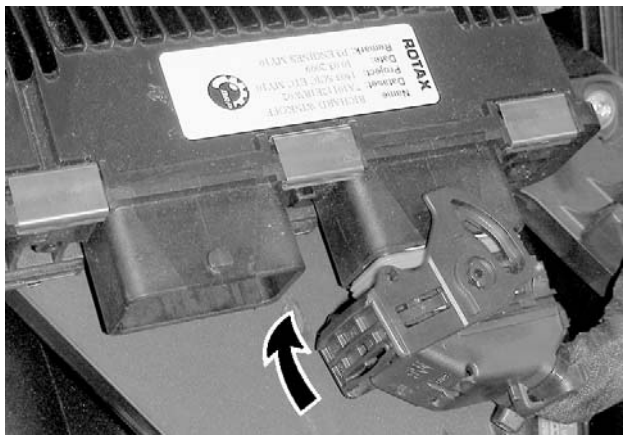
Removing the Connector

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.



smr2009-045-012_a

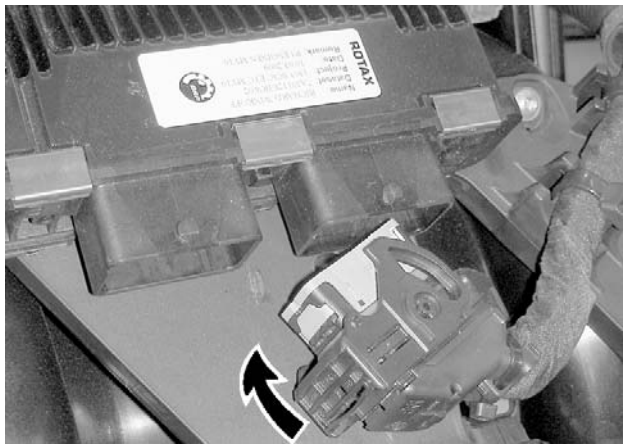
CONNECTOR LOCKING CAM ROTATION TO RELEASE

4. Pull connector off ECM.

smr2009-045-013_a

Installing the Connector

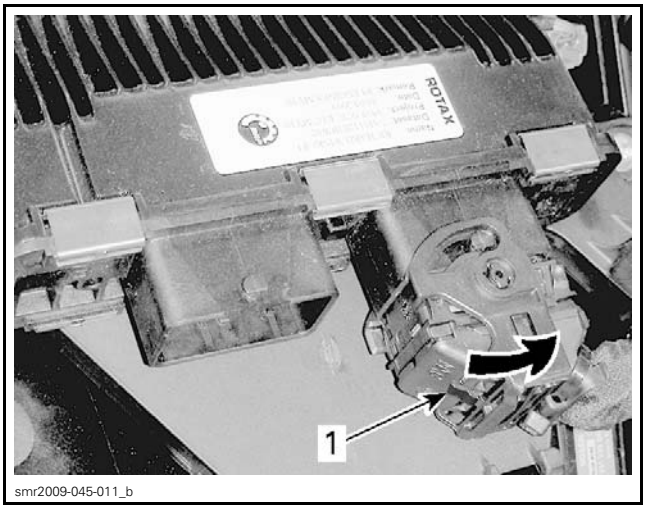
1. Fully open connector locking cam.



smr2009-045-013_b

CONNECTOR LOCKING CAM IN RELEASE POSITION

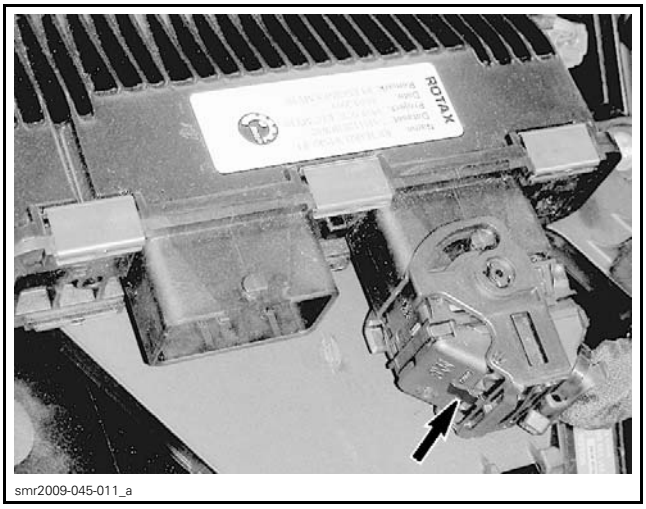
2. Insert connector on ECM.
3. As you push the connector onto the ECM, rotate the connector locking cam until it snaps locked.



smr2009-045-011_b

1. Locked here

4. Ensure the locking tab is fully out.



smr2009-045-011_a

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.

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

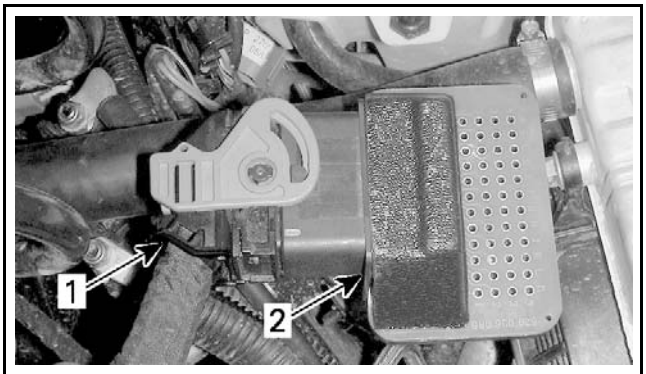
NOTICE Do not apply any lubricant product to the pins of the ECM connector.

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.



vmr2008-139-016_a

TYPICAL
1. ECM connector
2. ECM adapter

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

Removing the Connector Terminal (Harness Connector)

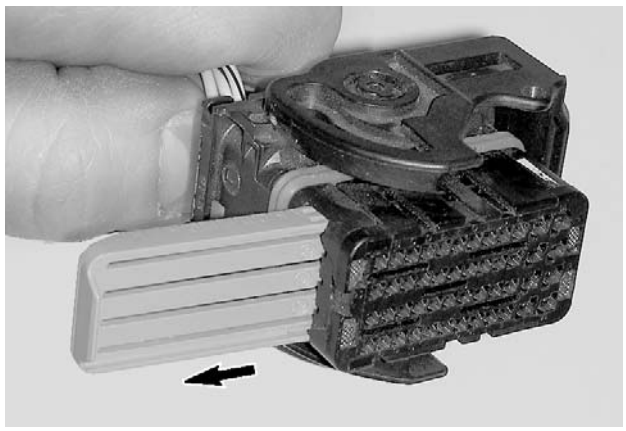
To remove a signal terminal from the ECM harness connector, use the ECM terminal remover 2.25.

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

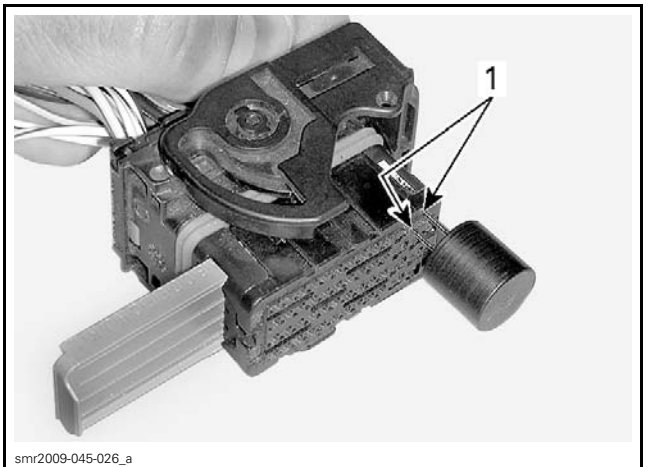
To remove a power terminal, use the ECM terminal remover 3.36.

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

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


smr2009-045-025_a

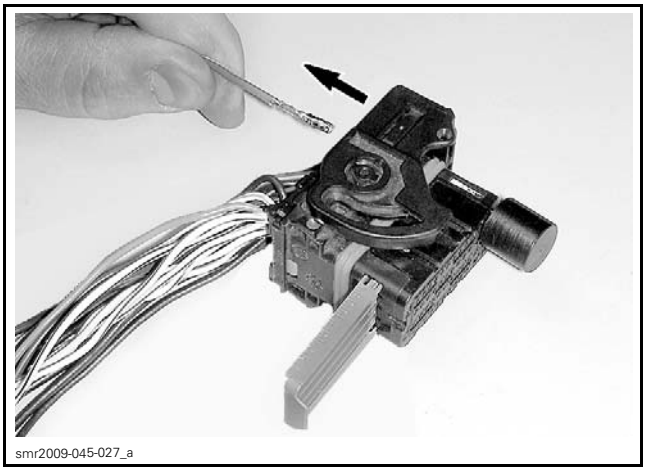
3. Insert tool to unlock terminal.



smr2009-045-026_a

1. Unlock here

4. Gently pull on the wire to extract the terminal out the back of the connector.


smr2009-045-027_a

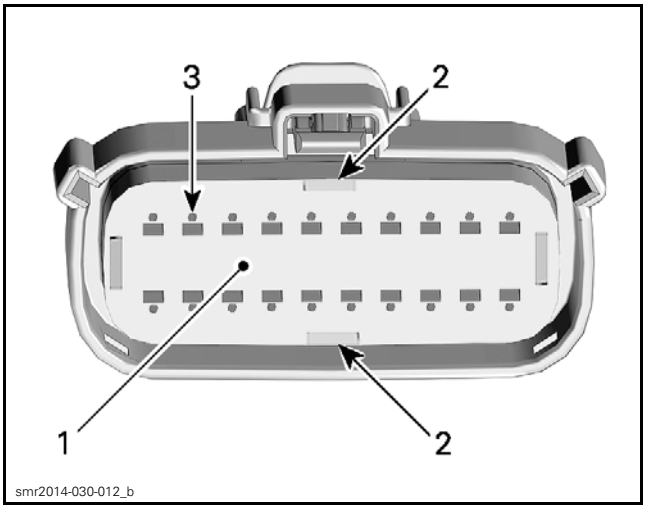
NOTICE Before installing wire terminals in the connector, ensure all terminals are properly crimped on wires. After installation of wire terminals in the connectors, ensure they are properly locked by gently pulling on them as if to extract them.

MOLEX CONNECTORS (EXCEPT ECM)

Extracting a Terminal (Female Connector)

The same procedure must be done to remove a seal plug.

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



smr2014-030-012_b

1. Terminal locator
2. Pry holes
3. Holes for inserting terminal extractor tool

2. Apply slight pressure and pry the terminal locator out until it clicks (± 4 mm (.16 in)).

NOTE: Do not remove the terminal locator from the connector housing.

3. Insert the extractor tool in the small hole adjacent to the terminal.

NOTE: Push the extractor tool in only as far as required to release the lock from the terminal. The tool should slide along the terminal and be inserted between the connector housing and the terminal lock.

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

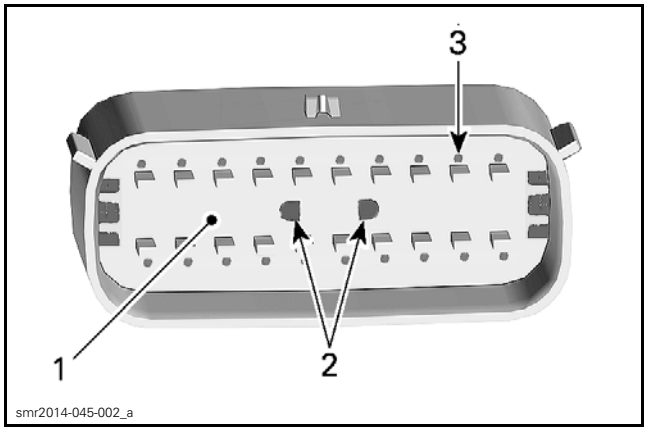
4. Gently pull on the wire to extract the terminal out the back of the connector.

Extracting the Terminal (Male Connector)

The same procedure must be done to remove a seal plug.

1. Using a pair of thin long nose pliers, pull the terminal locator (the white plastic insert in the connector) out to the detent position (± 13 mm (1/2 in) between terminal locator and connector housing face). This will allow unlocking of the pins.

NOTICE Do not attempt to remove the terminal locator or damage will occur. Be careful not to bend the pins when using the pliers.



smr2014-045-002_a

1. Terminal 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 terminal.

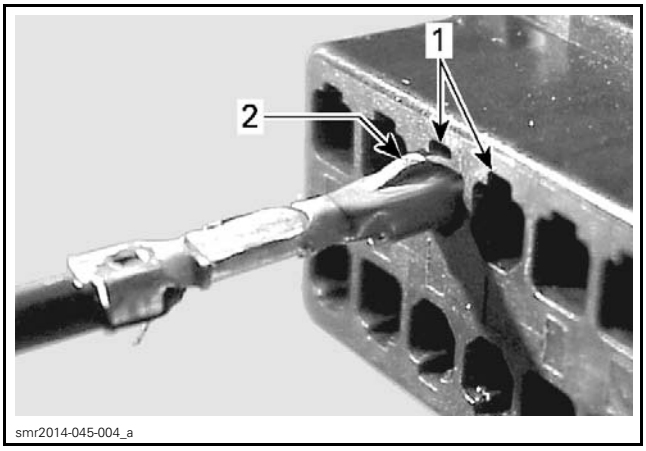
NOTE: Push the extractor tool in only as far as required to release the lock from the terminal. The tool should slide along the terminal and be inserted between the connector housing and the terminal lock.

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 terminal out the back of the connector.

Inserting the Terminal

1. Ensure the terminal is properly crimped onto the wire.
2. Ensure the terminal locator (the white plastic insert in the connector) is out in the detent position.
3. Orient the key on the back of the male terminal with the keyway on the rear of the housing



smr2014-045-004_a

TYPICAL - PIN INSERTION
1. Keyway
2. Terminal key

4. Push the terminal into the housing until it clicks.
5. Gently pull on the terminal to ensure it is properly locked.
6. Repeat previous steps for each terminal to be inserted.
7. Push the terminal locator into the connector to the locked position.

DELPHI/PACKARD CONNECTORS

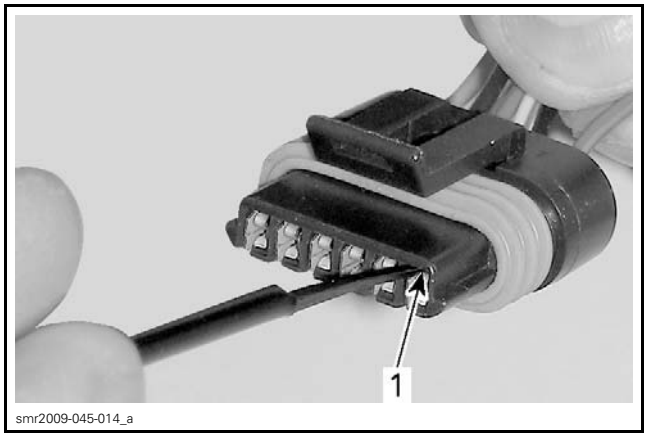
Removing the Connector Terminal

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)	

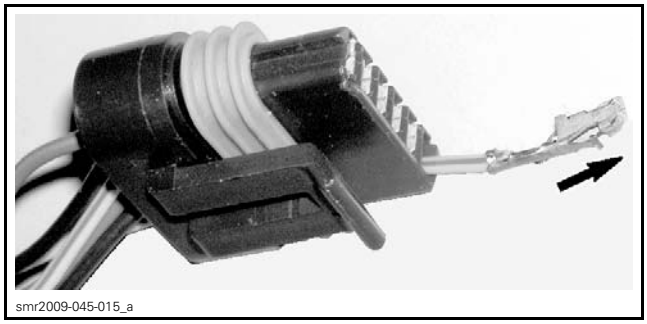
NOTE: Grinding the tool end to a taper is required.

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.



smr2009-045-014_a

1. Unlock terminal here

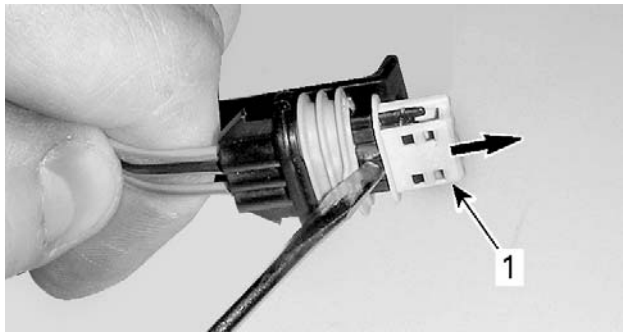

smr2009-045-015_a

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.**

DELPHI CONNECTORS

Removing the Terminal

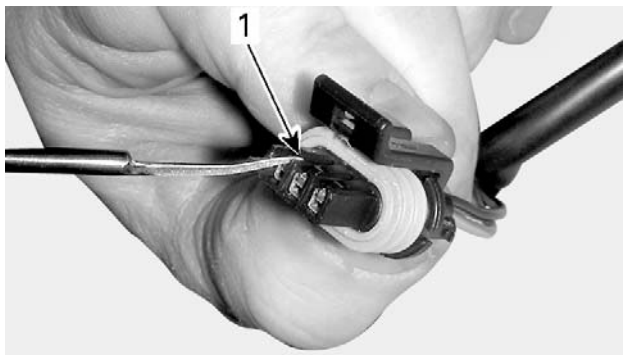
1. To remove a terminal from connector, first remove the locking cap.



1. Pry out locking cap

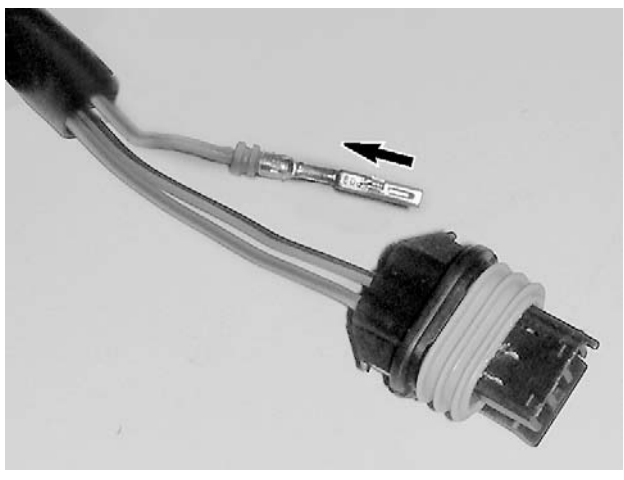
2. Carefully insert the Delphi terminal extractor in the space provided to release the pin lock.

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.

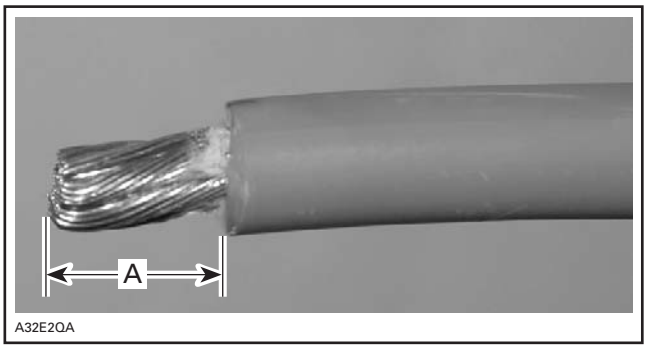


NOTICE Before installing terminals in the connectors, ensure all terminals are properly crimped on the wires. After installation of the wire terminals in the connectors, ensure they are properly locked by gently pushing on them as if to extract them.

BATTERY CABLES

Crimping the Battery Cable

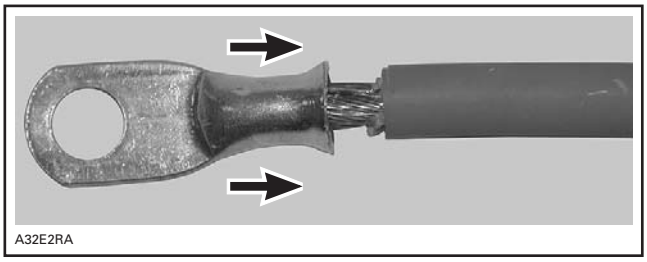
Carefully strip the wire approximately to 10 mm (3/8 in) in length, using a wire stripping tool or sharp blade/knife.



A. 10 mm (3/8 in)

NOTE: Make sure not to cut wire strands while stripping the wire.

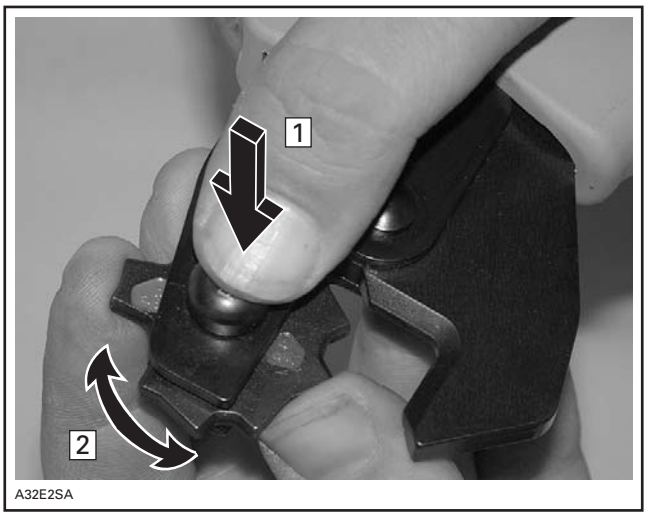
Install the appropriate terminal on the wire according to the requirement. Refer to appropriate *PARTS CATALOG*.



INSTALLATION OF TERMINAL

Follow the instructions provided with the crimping tool to select the proper position of the tool.

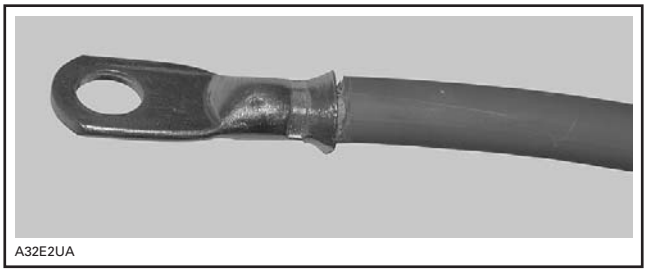
NOTE: Different wires require different crimping pliers settings, so make sure to follow the instruction supplied with the tool.



POSITIONING THE CRIMPING PLIERS
Step 1: Press
Step 2: Rotate

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.

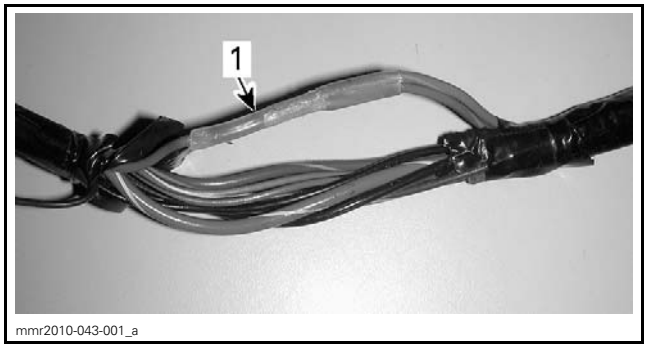
NOTICE Make sure that the protective heat shrink rubber tube has been properly installed and no part of wire is exposed.

SPLICES REPAIR PROCEDURE

CASE 1: Wire Detached from Splice

NOTICE Repairs described in this section should never be performed on harness sections that can be exposed to water.

1. Locate splice. Refer to splices location diagrams.
2. Remove wires from protector tube.
3. Locate the shrink tube protecting the defective splice.

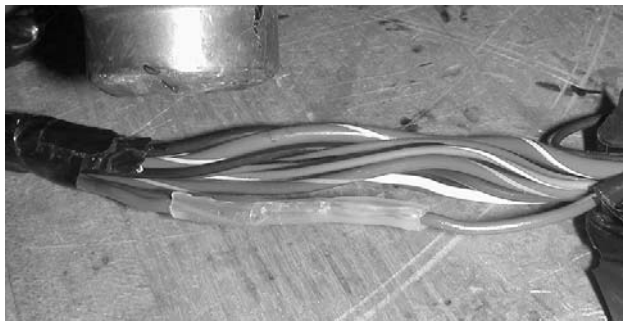


1. Shrink tube

4. Remove the shrink tube.
   4.1 Using a blade, cut the shrink tube.

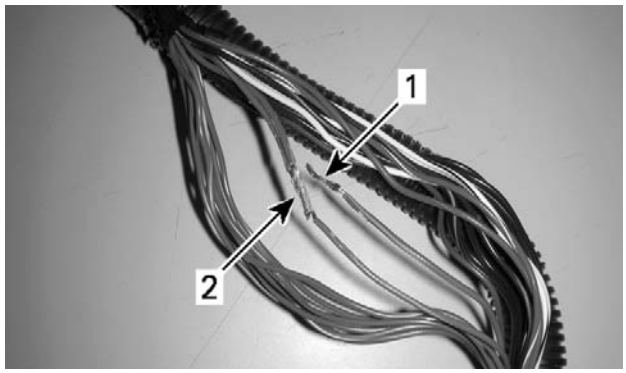
NOTICE Be careful with the blade to avoid cutting wires insulation.

   4.2 Slightly heat the shrink tube using a heat gun.


mmr2010-043-003

4.3 Remove the shrink tube with long nose pliers.

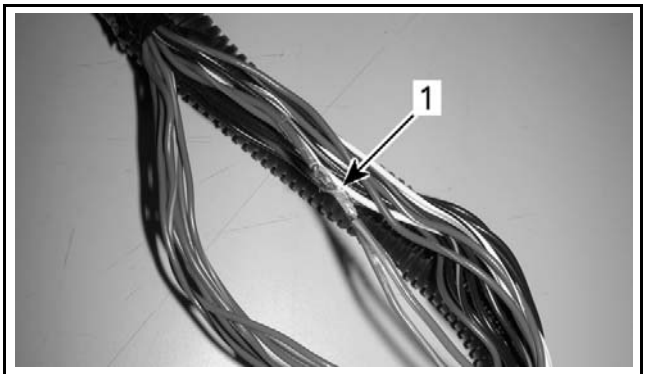
5. Locate detached wire from splice.



mbg2008-021-116_a

1. Detached wire
2. Splice

6. Twist detached wire around splice.



mbg2008-021-117_a

1. Twisted wire

7. Perform a tin solder on twisted wire.

8. Apply electrical tape to cover splice.

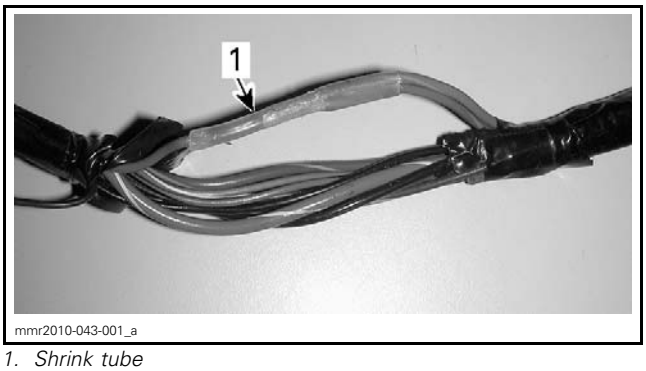
NOTE: Make sure tape overlaps on wire insulation, approximately 13 mm (1/2 in) each side.

9. Reinstall wires into protector tube.

CASE 2: Wire Broken from Splice

NOTICE Repairs described in this section should never be performed on harness sections that can be exposed to water.

1. Locate splice. Refer to splices location diagrams.
2. Remove wires from protector tube.
3. Locate the shrink tube protecting the defective splice.



mmr2010-043-001_a

1. Shrink tube

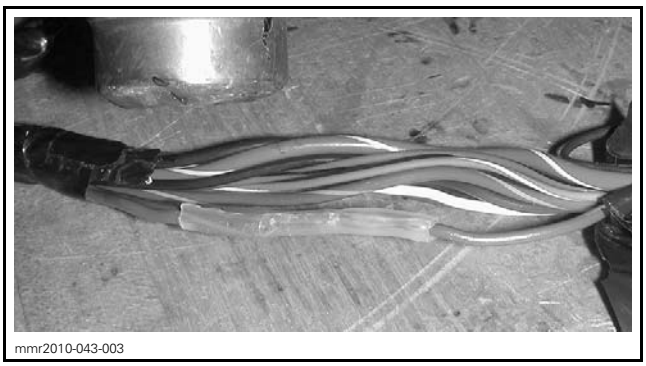
4. Remove the shrink tube.

4.1 Using a blade, cut the shrink tube.

mmr2010-043-002

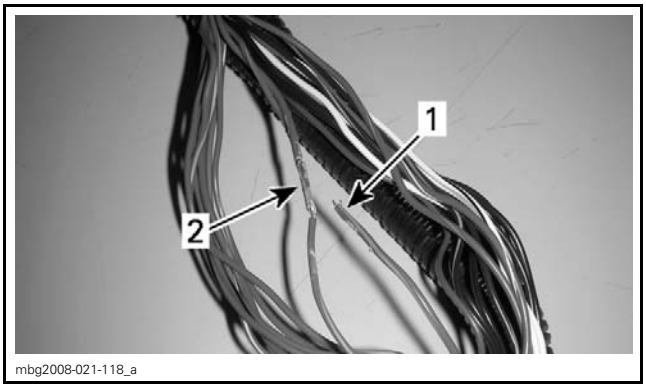
NOTICE Be careful with the blade to avoid cutting wires insulation.

4.2 Slightly heat the shrink tube using a heat gun.


mmr2010-043-003

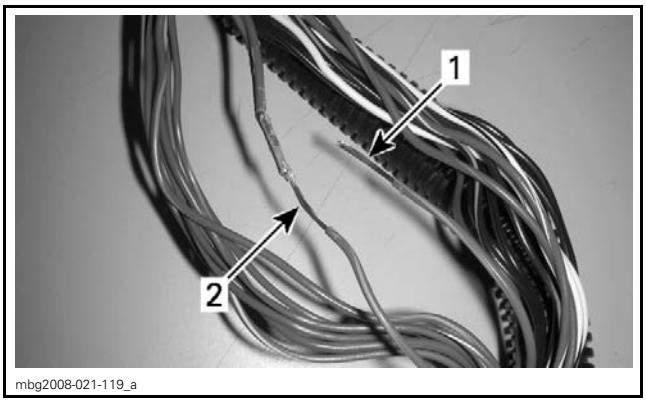
4.3 Remove the shrink tube with long nose pliers.

5. Locate broken wire from splice.



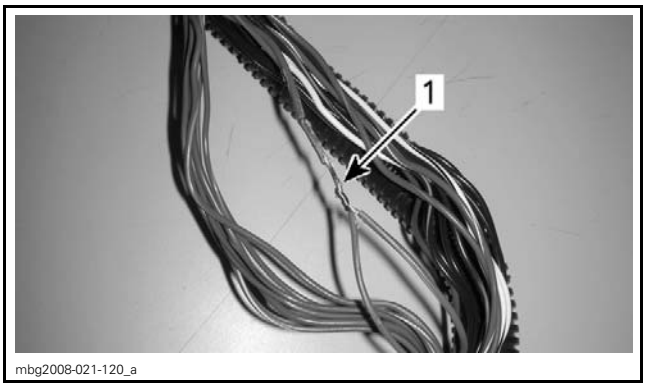
1. Broken wire
2. Splice

6. Strip wire insulation at the end of broken wire.
7. Strip wire insulation below the splice.



1. Broken wire stripped
2. Splice wire stripped

8. Twist wire around stripped wire.



1. Twisted wire

9. Perform a tin solder on twisted wire.
10. Apply electrical tape to cover splice.

NOTE: Make sure tape overlaps on wire insulation, approximately 13 mm (1/2 in) each side.

11. Reinstall wires into protector tube.

NOTE: Always perform a solder on a bigger wire (lower gage).

IGNITION SYSTEM

SERVICE TOOLS

Description	Part Number	Page
DIAL INDICATOR ADAPTER	529 036 132	4
DIAL INDICATOR ADAPTER	529 036 418	4
TDC DIAL INDICATOR	295 000 143	4
TDC DIAL INDICATOR	414 104 700	4

GENERAL

⚠ WARNING

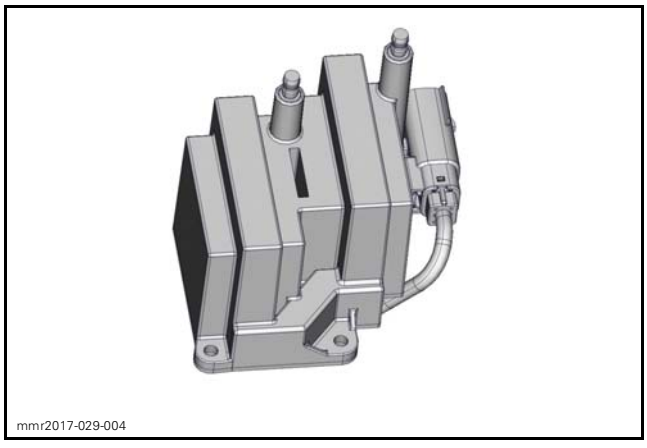
Always electrically disconnect both fuel injectors prior to testing for ignition spark. Otherwise, fuel vapors may ignite in presence of a spark creating a fire hazard.

SYSTEM DESCRIPTION

This ignition system is an inductive type specifically designed for the E-TEC engine with a rapid rise time to prevent spark plug fouling. It provides a quick spark with a long duration.

The ignition system is fully managed by the ECM which controls the ignition system parameters such as spark timing, dwell time, and firing order.

The system uses two separate ignition coils which induce high voltage in their secondary winding to produce a spark at each spark plug independently.



The ignition coils receive power from the 55 Vdc system. Their operating voltage varies from 20 to 55 Vdc.

Ignition System Basic Operation

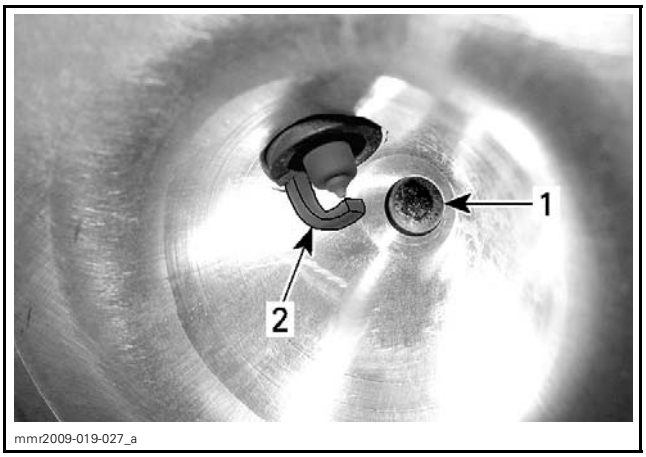
Each ignition coil uses an active circuitry to energize the primary winding when it receive a pulse from the ECM. The pulse has an amplitude of approximately 10 volts. At the end of the dwell time, the power is released from the primary winding which induces a current that produces a high voltage in the secondary winding. This high voltage is then fed to the spark plug.

A resistive core spark plug cable is used to prevent the RFI (Radio Frequency Interference). There is no resistor in the spark plug cap.

Spark Plugs

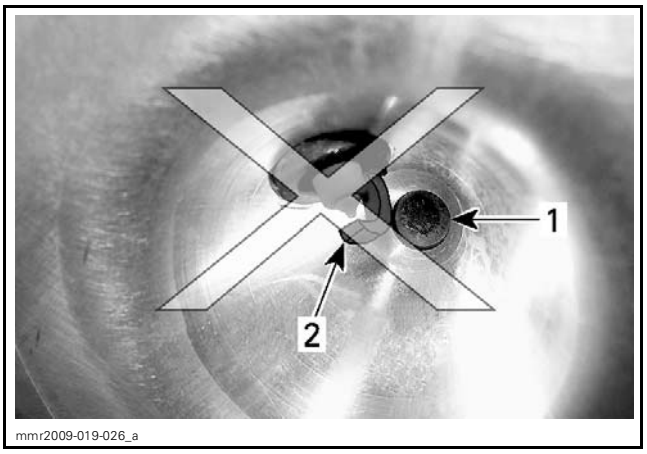
The OEM spark plug used is specially indexed for optimum engine operation and efficiency.

The threads on the spark plug and in the cylinder head are indexed so that when the plug is installed, the open end of the negative electrode will be facing the injection spray, within ± 90°. This ensures the negative electrode does not deviate the injection spray and ensures proper ignition.



CORRECTLY INDEXED
1. *Injector nozzle*
2. *Ground electrode*

NOTE: Using an incorrectly indexed spark plug will result in poor idle and increased emissions.



INCORRECTLY INDEXED
1. *Injector nozzle*
2. *Ground electrode*

If using a non OEM spark plug, a specific installation procedure must be followed. Refer to *INSTALLING THE SPARK PLUG* in this subsection.

Ignition Timing

The crankshaft position sensor (CPS), the air pressure sensor (MAPTS) and the throttle position sensor (TPS) are the primary sensors used to control the ignition timing.

The ECM is programmed with data (ignition mappings). Using feedback provided by the sensors, the ECM controls the ignition timing for optimum engine operation under all operating conditions.

Ignition timing can be adjusted using BUDS2.

Knock Detection

The knock sensor detects specific vibration that would be typically generated by engine detonation.

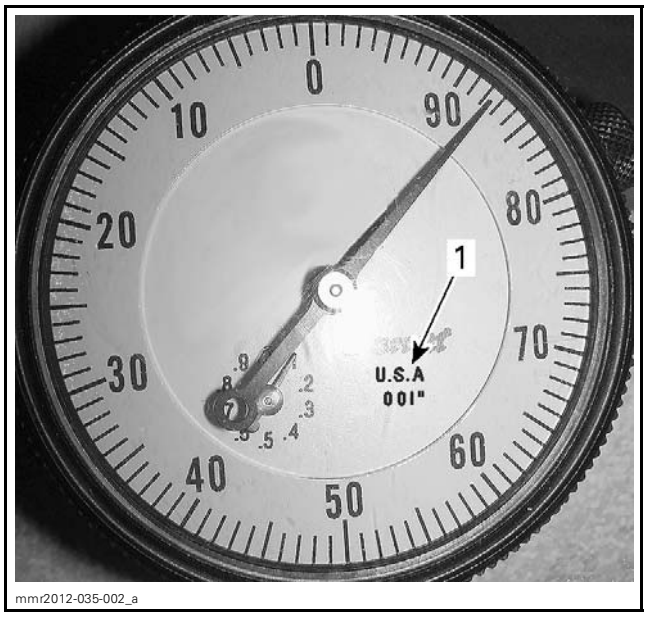
If detonation occurs, the ECMs retards the ignition and increases the fuel injected temporarily (it goes into a specific operating mode) until detonation stops.

ADJUSTMENT

UNDERSTANDING THE TDC GAUGE

Dial gauges can be either in imperial or metric units. It is crucial to identify gauge units and graduation.

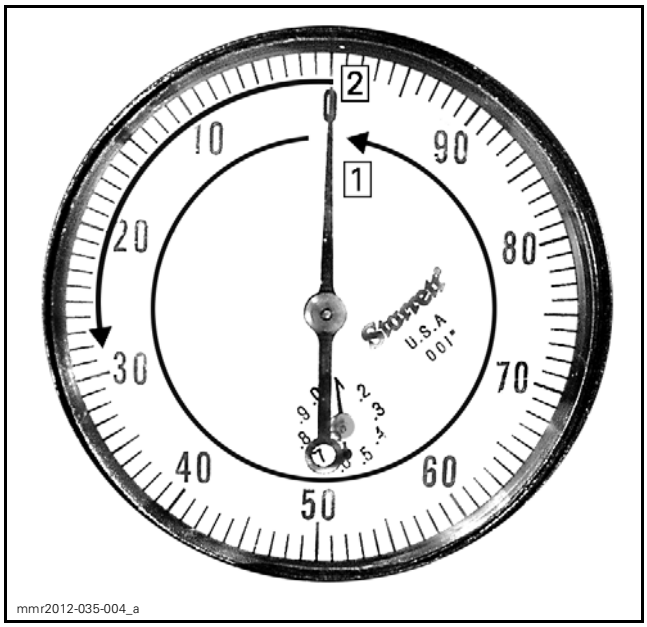
Imperial Dial Gauge



IMPERIAL GAUGE EXAMPLE
1. *001 inch means it is graduated each 1/1000 inch*

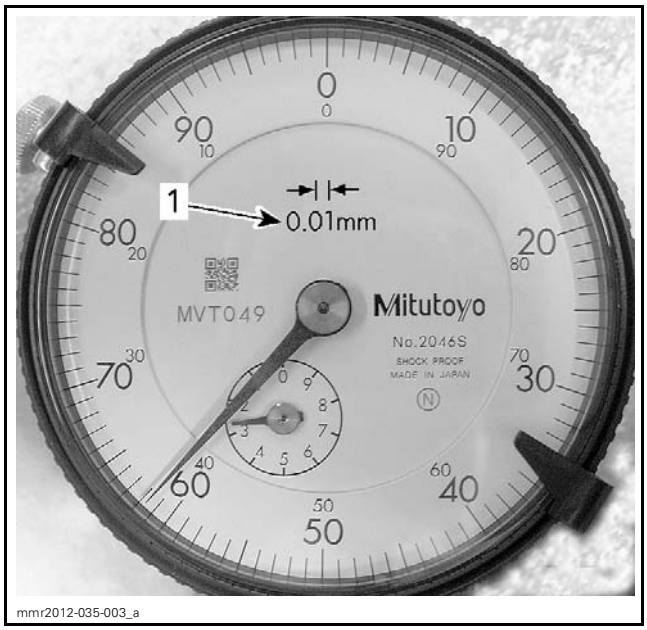
TYPICAL IMPERIAL DIAL GAUGE		
GRADUATION	MEASURE PER NEEDLE TURN	MEASURE EXAMPLE: .128 INCH
1/1000 inch (.001) per graduation line	1 turn = .100 inch	1 complete turn + 28 graduation lines

NOTE: The small dial indicates the number of turns the long needle traveled around the main dial.



.128 INCH AS AN EXAMPLE
Step 1: 1 complete turn
Step 2: 28 lines

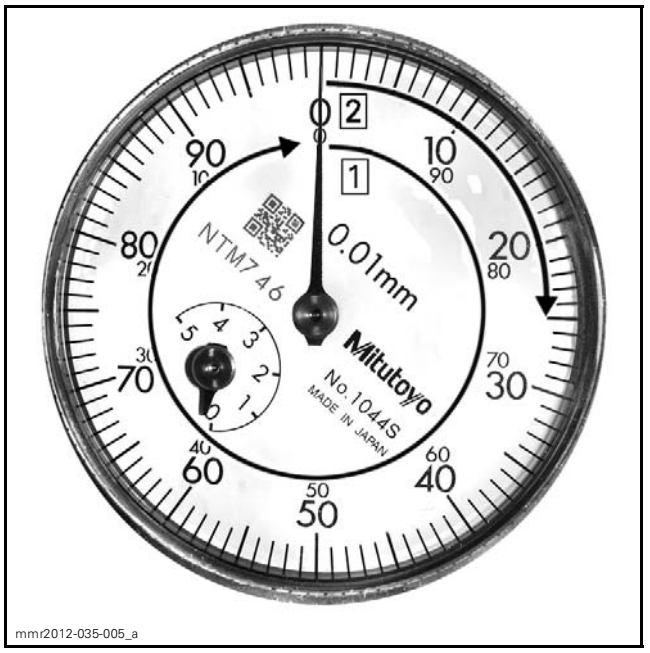
Metric Dial Gauge



METRIC GAUGE EXAMPLE
1. 0.01 mm means its graduated each 1/100 millimeter

METRIC DIAL GAUGE EXAMPLE		
GRADUATION	MEASURE PER NEEDLE TURN	MEASURE EXAMPLE: 3.25 mm
1/100 millimeter (.01) per graduation line	1 turn = 1 millimeter	3 complete turns + 25 graduation lines

NOTE: The small dial indicates the number of turns the long needle traveled around the main dial.



3.25 mm AS AN EXAMPLE
Step 1: Complete turns (3 X)
Step 2: 25 lines

IGNITION TIMING

Normally, ignition timing adjustments should not be required. It has been set at the factory and should remain correctly adjusted as every component is fixed and non adjustable.

The only time the ignition timing may require adjustment is when replacing the:

- Crankshaft
- Magneto flywheel
- CPS
- ECM.

Adjustment procedure summary:

- TDC Gauge Installation
- Locating Piston TDC
- Scribing the timing marks
- Checking Ignition timing
- Adjusting timing.

If the ignition timing is incorrect, first check for proper crankshaft alignment. This might be an indication of a twisted crankshaft. Refer to *BOTTOM END* subsection.

Installing the TDC Gauge

⚠ WARNING

Ensure tether cord is removed from engine cut-off switch and emergency engine stop switch is in the STOP position.

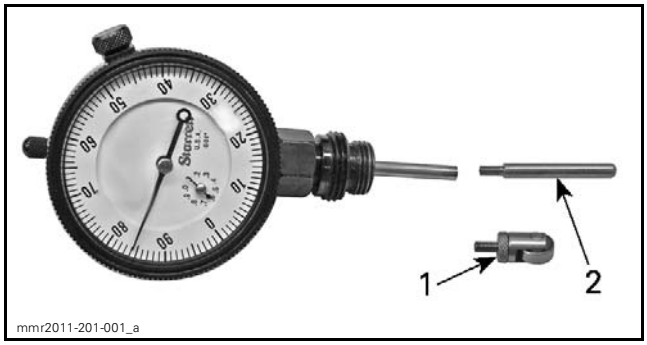
Two TDC gauges can be used:

TDC GAUGES	
Preferred Gauge TDC DIAL INDICATOR (P/N 295 000 143) **(short reach)**	
TDC DIAL INDICATOR (P/N 414 104 700) **(long reach)**	

Preparing the Gauge

REQUIRED TOOL	
Rounded tip from DIAL INDICATOR ADAPTER (P/N 529 036 132)	

1. Remove the roller tip from the gauge.
2. Use the rounded tip from the adapter.



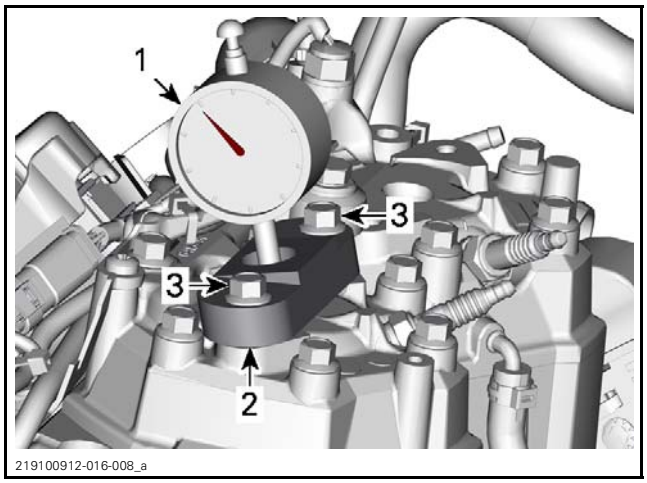
1. Roller tip removed
2. Rounded tip to install

3. Install the rounded tip on the gauge.

Installing the Gauge

REQUIRED TOOL	
DIAL INDICATOR ADAPTER (P/N 529 036 418)	

1. Remove the direct injectors, refer to *E-TEC DIRECT FUEL INJECTION* subsection.
2. Install the dial indicator adaptor over the PTO injector hole.
3. Use two screws M10 x 1.5 x 35 to secure the adaptor.
4. Carefully insert the TDC gauge through the dial indicator adapter hole.



1. TDC gauge
2. Dial indicator adaptor
3. Screws

5. Screw the gauge into the adapter plate with the dial face towards the PTO and tighten it sufficiently to prevent movement.

Locating Piston TDC

NOTE: Normal engine rotation as seen from the PTO side is counterclockwise.

1. With a firm hold on the drive pulley, slowly rotate the drive pulley counterclockwise while observing the TDC gauge needle.

NOTE: Note that the needle stops moving only as the piston is changing direction at the top of its stroke.

2. Rotate the dial face so the "0" is in line with the needle when it stops moving.
3. Resume rotating the engine in the same direction (counterclockwise) until the gauge needle has rotated approximately 1/4 turn past TDC.
4. Then slowly rotate the engine in a clockwise direction until needle stops moving.

NOTE: The needle should stop on the "0". If not, reset the dial "0" to the needle.

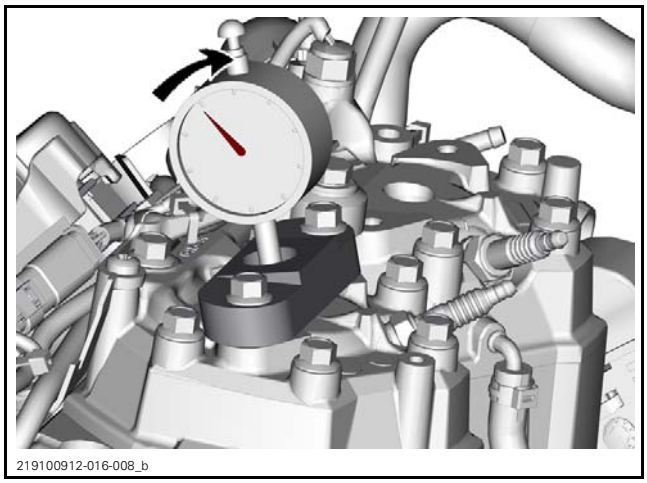
5. Again, slowly rotate the drive pulley back and forth across TDC and confirm the needle always stops exactly at "0" before changing direction. "0" now indicates exact TDC.
6. Lock the dial face with the dial lock screw.

NOTE: If a difference in "0" setting the dial in each direction of rotation is easily noticeable, the engine components may suffer from excessive wear. The engine may require further inspection and maintenance.

Scribing the Timing Mark

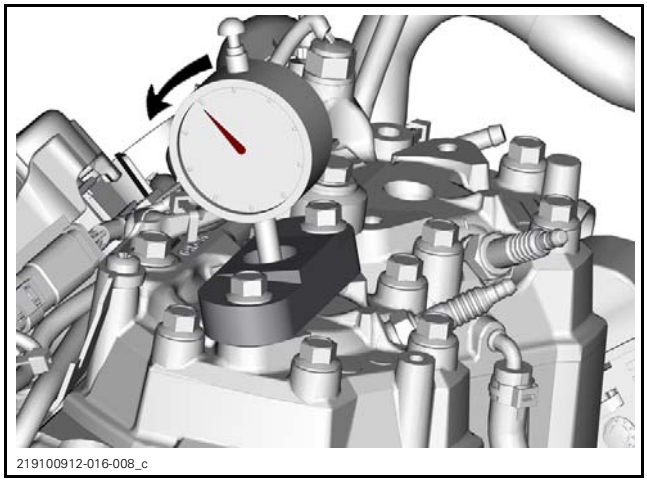
IMPORTANT: Make sure to understand the TDC gauge functioning. Refer to *UNDERSTANDING THE TDC GAUGE* in this subsection.

1. From the "0" (TDC), rotate the drive pulley clockwise (backwards engine rotation) until the dial needle rotates past the BTDC specification (see table below).



PASS THE BTDC SPECIFICATION

2. Then carefully rotate engine forward until needle precisely points the measurement specified in the table.

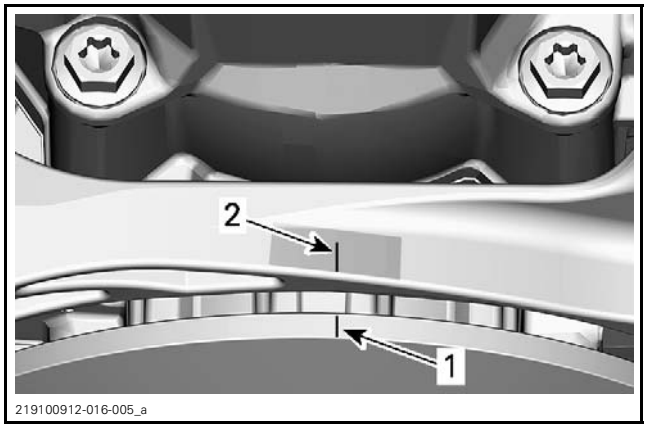


BRING DIAL NEEDLE TO THE BTDC SPECIFICATION

NOTE: Final setting must always be made in the normal engine rotation.

IGNITION TIMING BTDC	
BTDC SPECIFICATION	DEGREE SETTING BTDC
5.39 mm (.212 in)	28°

3. With the TDC gauge indicating specified timing, use a permanent marker to draw a line on the drive pulley fixed sheave and on a piece of tape stuck on the driven pulley bearing support.



1. Timing mark on fixed sheave
2. Timing mark on a tape, on driven pulley bearing support

4. Repeat the procedure to ascertain the marks are exactly aligned.
5. Remove the TDC gauge and dial indicator adapter.
6. Reinstall the fuel injector. Refer to *E-TEC DIRECT INJECTION* subsection.
7. Reconnect magneto connector.
8. Check ignition timing as per applicable procedure in this subsection.

Checking Ignition Timing

The ignition timing can be checked with either the engine hot or cold at the specified RPM.

ENGINE SPEED FOR IGNITION TIMING CHECK
ENGINE RPM
2500 to 4000 (1)
(1) In this range, the spark advance does not change during the procedure.

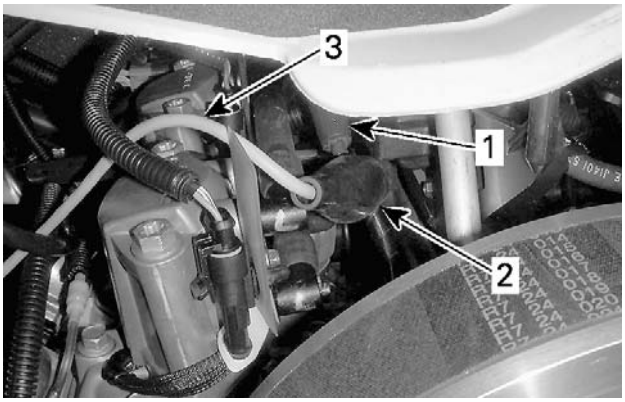
To check the ignition timing proceed as follows:

⚠ WARNING

Place ski tips against a wall, raise rear of vehicle on a stand, so that track does not contact the ground. Do not allow anyone in front of or behind the vehicle while engine is running. Keep clear of track and do not wear loose clothing which can get caught in moving parts.

1. Connect the timing light pick-up to the **PTO** spark plug cable.

NOTE: Be careful to route timing light cable away from drive belt and pulleys.



TYPICAL — TIMING LIGHT CONNECTION
1. *PTO spark plug cable*
2. *Timing light connection to PTO plug cable*
3. *Timing light wire routing*

2. Connect the vehicle to the BRP diagnostic software (BUDS2).
3. Start engine and let idle.
4. In BUDS2, go to:
   - **Settings** page
   - **Vehicle** or **ECM** button
   - **Settings** tab
   - **Initializations - Ignition/Injection Timing**

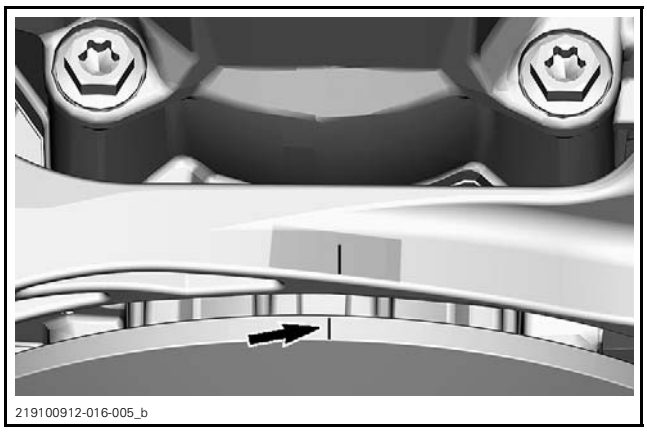
NOTE: Timing will be frozen on the PTO cylinder only for RPM stability. RPM will be limited to 4000 RPM.

5. Point the timing light on the timing mark and increase engine to **3500 RPM** for a brief instant.
6. The timing mark must be aligned with the pointer end within the specified tolerance.

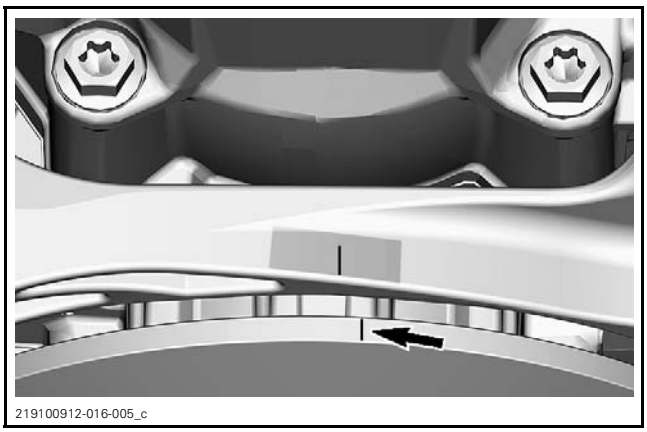
TOLERANCE
± 0.5°

If timing mark and pointer are aligned, no adjustment is required.

If they are not aligned, note if timing is retarded or advanced, see following illustrations. Then, adjust timing as described in *ADJUSTING TIMING* further in this subsection.



TYPICAL — TIMING RETARDED BY ABOUT 1°



TYPICAL — TIMING ADVANCED BY ABOUT 2°

Adjusting Timing

1. In the **Ignition/Injection Timing** window, press the **Freeze Timing** button.
2. In the new window, adjust the timing using the **Advance** or the **Retard** button until the timing mark is in line with the pointer, within 0.5°.
3. Unfreeze ignition timing.
4. Click **Close** button to store the ignition timing correction.
5. Shut down engine.
6. Restart engine and press the**Scan** icon (top left icon in BUDS2.
7. Recheck timing to ensure ignition timing adjustment was properly stored in the ECM.
8. Increase engine RPM past 4000 RPM to ascertain the **Freeze Timing** function is no longer active.

NOTE: The **Freeze Timing** function automatically disengages when the engine is stopped.

9. Remove all tools.

TROUBLESHOOTING

IGNITION SYSTEM TESTING SEQUENCE

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.

In the case of ignition problems, check the following in the prescribed order until the problem can be solved:

1. Spark plugs
2. Spark plug cables
3. Wiring harness/electrical connectors
4. Emergency engine stop switch
5. Ignition cut-off switch
6. Ignition coil(s)
7. CPS
8. ECM (Engine Control Module).

If engine idles roughly or shows signs of increased emissions, the spark plugs may be incorrectly indexed. Refer to *INSTALLING THE SPARK PLUG* in this subsection.

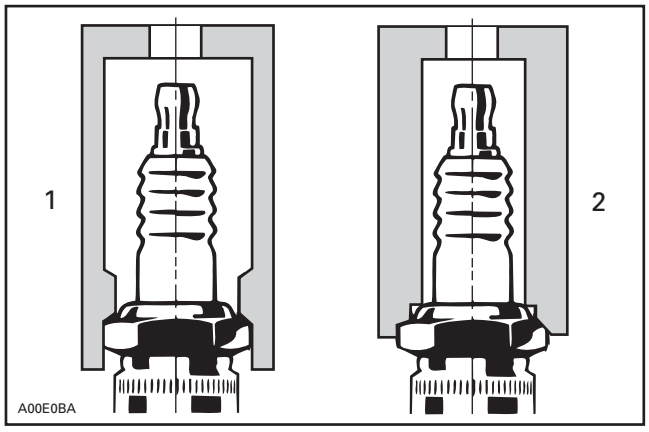
PROCEDURES

SPARK PLUGS

For spark plug type, refer to *TECHNICAL SPECIFICATIONS*.

REPLACING THE SPARK PLUG

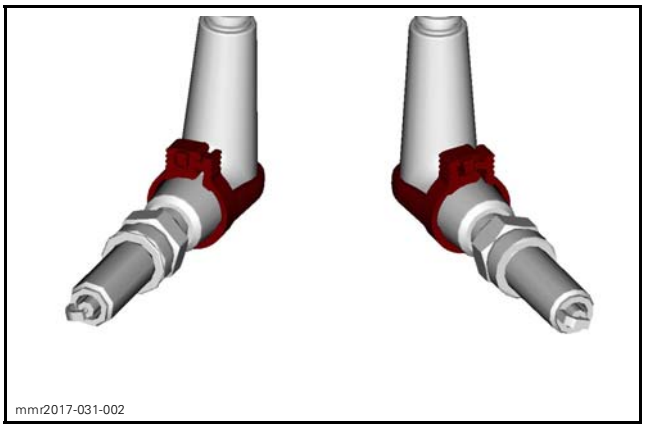
NOTICE Use only an approved spark plug socket for removal and installation. Extra care should be taken to avoid side stresses which could result in a broken spark plug.



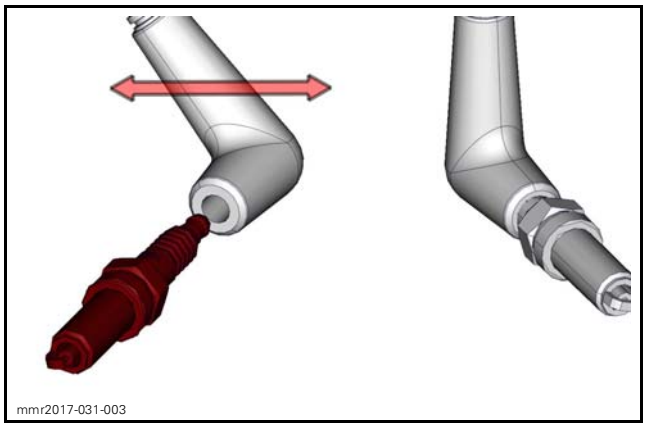
TYPICAL
1. *Approved socket*
2. *Improper socket*

Removing the Spark Plugs

1. Disconnect the stator connector. Refer to *STATOR CONNECTOR ACCESS* in the *MAGNETO AND STARTER* subsection.
2. Remove the upper body module. Refer to *BODY* subsection.
3. Clean the spark plug and cylinder head with pressurized air.
4. Remove lock securing spark plug wire to spark plug.



5. Remove spark plug cables by gently rotating the cap and pulling it off the plug.



6. Unscrew the spark plug sufficiently to break the applied torque using the appropriate tools.

7. Remove spark plugs by hand.

Installing the Spark Plugs (OEM)

1. Prior to installation, ensure the contact surfaces of the cylinder head and spark plug are free of grime.
2. Using a wire gauge, confirm electrode gap is as specified. Refer to *TECHNICAL SPECIFICATIONS*.

NOTE: If spark plug gap is incorrect, use another spark plug.

3. Hand screw spark plug into cylinder head until it bottoms out.
4. Apply specific torque using a torque wrench and approved spark plug socket.

NOTE: Spark plug tightening torque is particularly important on this engine as it contributes to the proper positioning of the negative electrode.

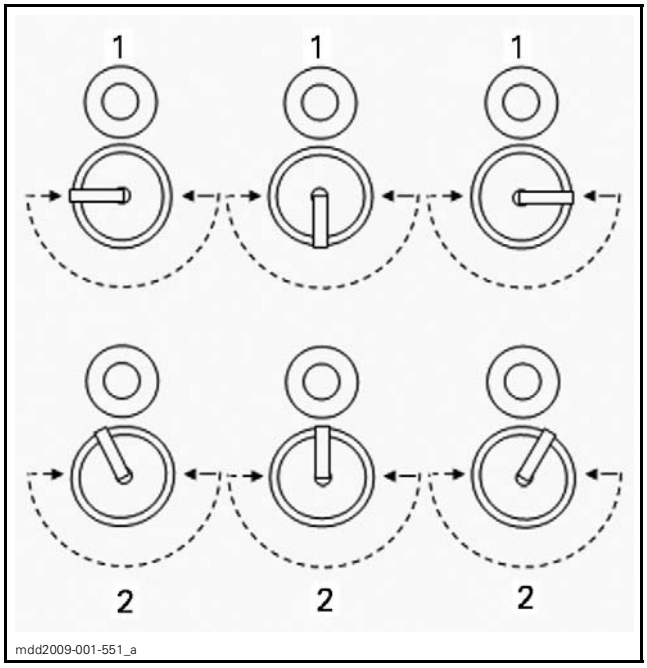
TIGHTENING TORQUE	
Spark plug	18 N•m ± 0.7 N•m (159 lbf•**in** ± 6 lbf•**in**)

Installing the Spark Plugs (Non-OEM)

NOTICE **When using a non-OEM spark plug , it must be correctly indexed or engine may experience rough idling and higher emissions.**

1. Using a marker, mark the open end of the negative electrode on the plug shell (above threads).
2. Ensure the contact surfaces of the cylinder head and spark plug are free of grime.
3. Install and torque the spark plug, refer to previous table for specific torque.
4. Visually check to ensure the open end of the negative electrode is facing the injector nozzle within 90° each side of nozzle.

NOTE: The following illustration uses the point of attachment of the negative electrode to depict the angle. The injector is illustrated above the spark plug.

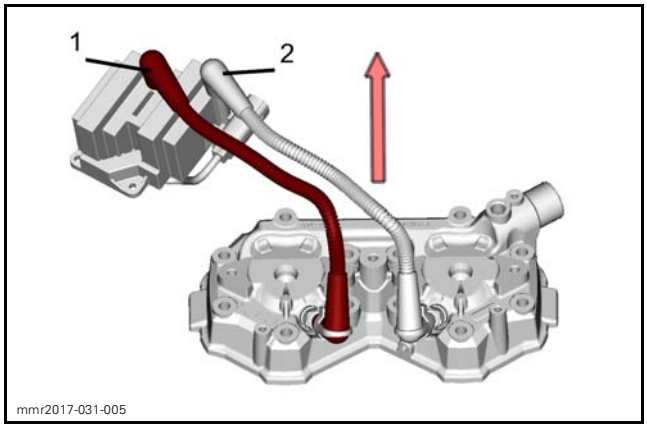


SPARK PLUG INDEXING
1. Acceptable installation
2. Unacceptable installation

If the plug indexing angle is not within specification, repeat procedure with another spark plug until correct indexing is achieved.

SPARK PLUG CABLES

NOTICE Do not interchange spark plug cables. The lower LH coil must be matched to the PTO spark plug.



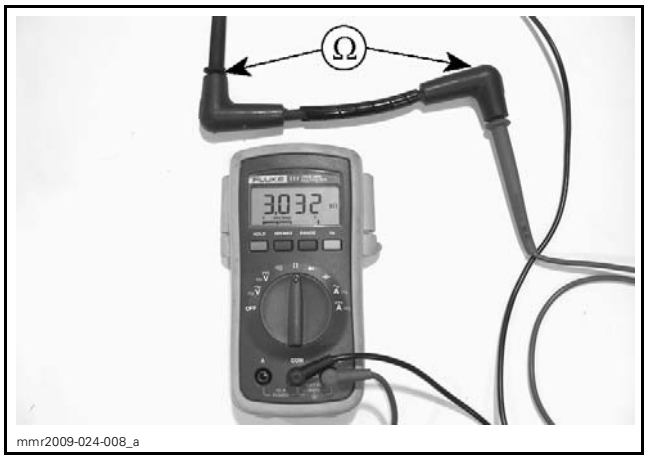
ARROW POINTS TO FRONT OF VEHICLE
1. *PTO side*
2. *MAG side*

Measuring Spark Plug Cable Resistance

If the spark plug cables are in good condition, carry out the following resistance test.

1. Remove each spark plug cable from its ignition coil and spark plug.
2. Insert a probe in each cable end and measure the resistance.

SPARK PLUG CABLE RESISTANCE
2160 – 6870 Ω



SPARK PLUG CABLE RESISTANCE TEST

If resistance is not as specified, replace spark plug cable.

EMERGENCY ENGINE STOP SWITCH

Emergency Engine Stop Switch Operation

The emergency engine stop switch provides a ground signal to the ECM when STOP is selected.

Refer to applicable *WIRING DIAGRAM* for details.

Testing Emergency Engine Stop Switch

1. Disconnect *STR 6P* connector. For connector location, refer to *WIRING HARNESS AND CONNECTORS*.
2. Measure resistance as per following table.

STR 6P CONNECTOR	EMERGENCY ENGINE STOP SWITCH POSITION	SPECIFICATION
Pin 3 to pin 6	RUN	O.L.
	STOP	Continuity

If emergency engine stop switch is unplugged, engine will start and run. If emergency engine stop switch is jumped, engine will stop.

IGNITION COILS

Testing for Spark

NOTICE Use ONLY an approved inductive spark plug tester or a new spark plug to test for ignition spark. In-line (series connected) spark testers must not be used. Radio frequency interference (RFI) generated by the arcing current may cause erratic behavior in the ECM.

⚠ WARNING

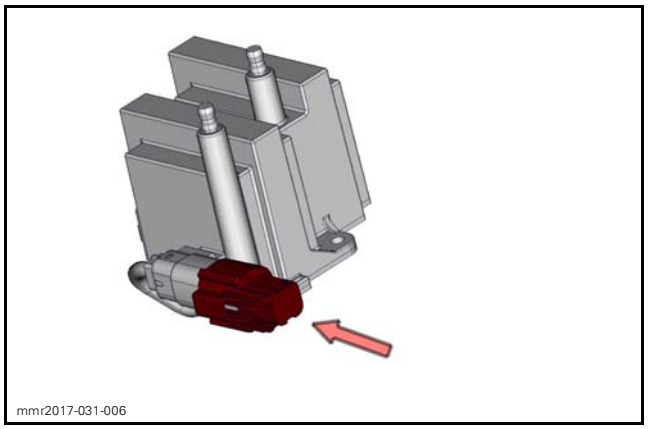
Always electrically disconnect both fuel injectors prior to testing for ignition spark. Otherwise, fuel vapors may ignite in presence of a spark, creating a fire hazard.

1. Ensure emergency stop switch is set to *RUN*.
2. Install the inductive spark tester (or a new spark plug) on the spark plug cable **(Do not remove spark plugs installed on engine)**.
3. Activate ignition coil with BUDS2.
4. If no spark is produced, test ignition coil.

5. If a spark is produced, install new spark plugs in the engine and repeat the test to assure the new spark plugs are in good condition and functioning correctly.

Testing Ignition Coils

1. Ensure emergency stop switch is set to *RUN*.
2. Backprobe the ignition coil connector and measure voltage as per following table.



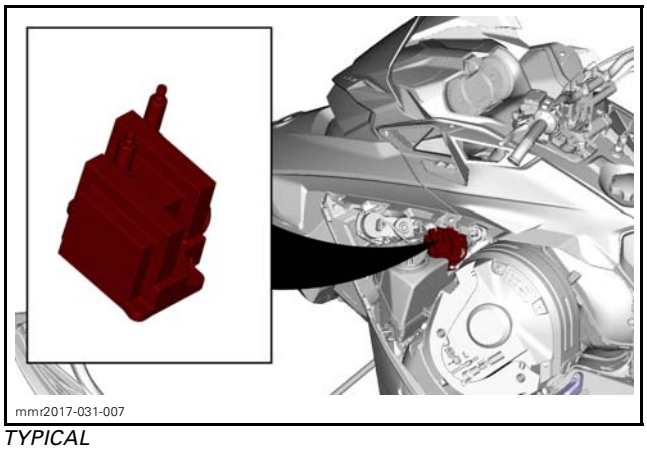
3. Use BUDS2 to activate ignition coil and measure the control signal.

IGNITION COIL CONNECTOR	DESCRIPTION	SPECIFICATION
Pin 1	Ground	Battery ground
Pin 2	Control MAG	Vary when activated 0.015V-0.222V[1]
Pin 3	55 Volts	40V engine off 55V engine running
Pin 4	Ground	Battery ground
Pin 5	Control PTO	Vary when activated 0.015V-0.222V[1]
Pin 6	55 Volts	40V engine off 55V engine running

[1] Control signal actually varies between 13 - 15 volts for 800 micro-seconds (DWELL time) but most multimeters cannot read it, it happens so fast.

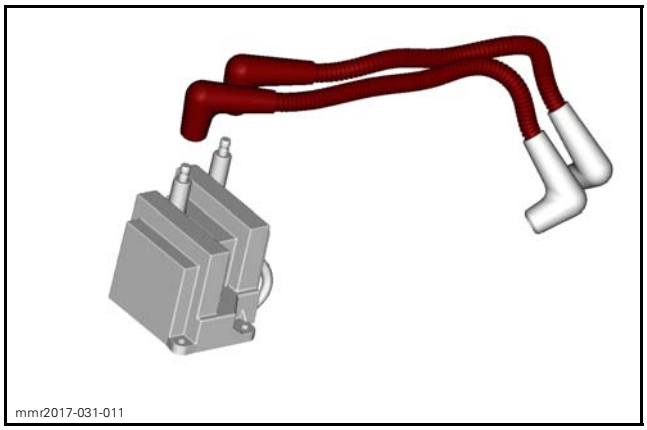
4. If all inputs are as per specifications and there is no spark, replace ignition coil.
5. If a pin does not test as per specification, troubleshoot the affected wire continuity to ground or ECM. Refer to *WIRING DIAGRAM*.

Removing Ignition Coil

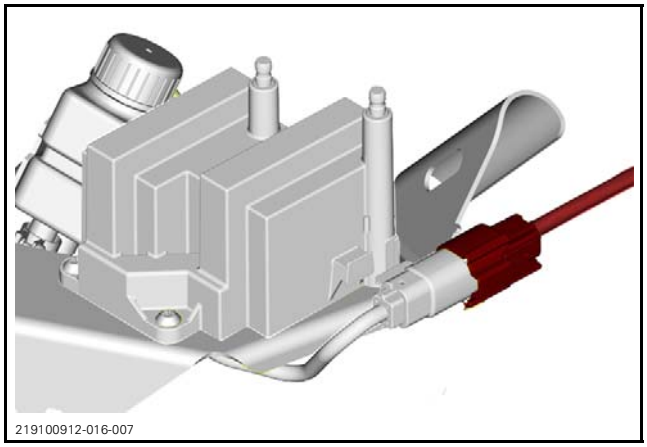


TYPICAL

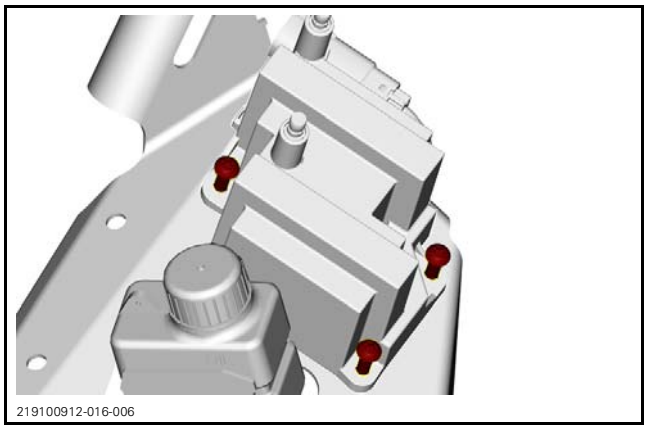
1. Remove the left hand side panel.
2. Note position of spark plug cables and remove them from the spark plugs.



3. Unplug ignition coil connector.



4. Remove retaining screws.



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5. Remove ignition coil.

Installing Ignition Coil

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

TIGHTENING TORQUE	
Ignition coil retaining screws	2.4 N•m ± 0.2 N•m (21 lbf•**in** ± 2 lbf•**in**)

CHARGING SYSTEM

SERVICE TOOLS

Description	Part Number	Page
12 V BATTERY SUPPLY CABLE	529 035 997	4
FLUKE 115 MULTIMETER	529 035 868	5, 7
POWER INTERFACE	515 177 223	4

SERVICE TOOLS – OTHER SUPPLIER

Description	Part Number	Page
NAPA ULTRA PRO BATTERY LOAD TESTER	95260	3

GENERAL

⚠ WARNING

Unless otherwise specified, always disconnect the magneto connector and ensure spark plugs are installed on the engine before carrying out electrical system checks. Should the engine be made to rotate with magneto connected, a spark may occur resulting in electrical shock, a fire, or an explosion.

SYSTEM DESCRIPTION

12V System Capacity

12V SYSTEM CAPACITY	
Over 2000 RPM	30 A
1200 RPM (Idle)	25 A

Magneto

A magneto provides the primary source of electrical energy. It transforms a magnetic field into an alternating current (AC).

The magneto stator is wired with a 3 phase star configuration winding.

AC current is rectified and regulated by a voltage regulator/rectifier circuit within the ECM to provide 55 volts for engine component operation. It is then converted into 14.5 volts by a DC to DC converter for vehicle operation.

TROUBLESHOOTING

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

TROUBLESHOOTING GUIDELINES

Low or No System Voltage (Engine May Not Start)

The vehicle cannot start without having a minimum voltage to the 55 V power circuit. If the engine does not start, see *VOLTAGE REGULATOR/RECTIFIER* in this subsection and test the Vdc Output using BUDS2

If voltage is not as specified, check the following items in the recommended order until you find the fault:

– Stator (refer to *MAGNETO* subsection)
– Capacitor (see procedure in this subsection).

NOTE: The 55 Vdc may be unstable or unobtainable if the capacitor is faulty, not connected, or incorrectly connected.

If the above mentioned checks were good, isolate each of the following components by disconnecting them individually, and repeating the voltage test after each one.

– Each injector
– Each ignition coil
– Fuel pump
– Oil injection pump.

NOTE: When the 55 Vdc test good after a component is disconnected, replace that component and repeat the test.

PROCEDURES

Ensure battery is fully charged (if applicable).

Refer to *WIRING HARNESS AND CONNECTORS* subsection for harness layout and connector locations on vehicle.

Refer to appropriate *WIRING DIAGRAM* for additional information.

The magneto is covered in *MAGNETO AND STARTER* subsection.

⚠ WARNING

Ensure vehicle cannot move when performing charging system tests with the engine running.

BATTERY

Charging Battery

Initial Charging

Sealed VRLA batteries require an initial charge before being used in the vehicle.

NOTE: Since batteries state of charge need to be checked 3 months after their manufacturing date or their last charge, it is highly recommended to check the batteries of all newly arrived vehicles. Consult the "Identification of reminder sticker" section and battery chart on last page.

If you are using a constant current charger, refer to the standard (STD) charging method printed on the battery.

For YTX20HL batteries (18.9 AH), the initial charge must be 1.8 A for 5 - 10 hours.

YTX20HL CHARGING METHOD

If you are using an automatic type taper charger, check to make sure that the charger current (amps) is equal to or greater than the standard charging method listed on the battery.

If the battery gets very hot to the touch, cease charging and allow battery to cool down for 6 to 12 hours. Check voltage using a voltmeter. A fully charged, battery should be 12.8 volts or higher after the battery has been off the charger 1-2 hours. If less, it needs additional charge.

Routine Charging

NOTICE **Overcharging can harm the battery beyond recovery.**

The single most important thing to maintaining a VRLA battery is to not let it sit discharged: keep it fully charged for peak performance.

Use the following guidelines for charging. Always verify battery state of charge before charging, and 30 minutes after charging.

It is not recommended to overcharge sealed VRLA batteries. Because of their characteristics, too much charging will decrease the volume of electrolyte. The longer the overcharge time, the greater the drop in electrolyte – and starting power.

Refer to the following tables for charging routine.

Note that charging times can vary depending on type of charger. Follow the manufacturer's instructions for details.

STATE OF CHARGE : 100%		
VOLTAGE	ACTION	CHARGE TIME
12.8 – 13.0	Check in 3 months or when vehicle is sold***	None required
*** Identify battery as being checked on "date" or needs to be rechecked at "date"		

STATE OF CHARGE : 75% - 100%		
VOLTAGE	ACTION	CHARGE TIME *
12.5 – 12.8	May need slight charge. If no charge given, check in 3 months or when vehicle is sold***	3 – 6 hours
* Using a constant current charger at standard amps specified on the battery		
*** Identify battery as being checked on "date" or needs to be rechecked at "date"		

STATE OF CHARGE : 50% - 75%		
VOLTAGE	ACTION	CHARGE TIME *
12.0 – 12.5	Need charge. Check in 3 months or when vehicle is sold***	5 – 11 hours
* Using a constant current charger at standard amps specified on the battery		
*** Identify battery as being checked on "date" or needs to be rechecked at "date"		

STATE OF CHARGE : 25% - 50%		
VOLTAGE	ACTION	CHARGE TIME *
11.5 – 12.0	Need charge. Check in 3 months or when vehicle is sold***	At least 13 hours verify state of charge
* Using a constant current charger at standard amps specified on the battery		
*** Identify battery as being checked on "date" or needs to be rechecked at "date"		

STATE OF CHARGE : 0% - 25%		
VOLTAGE	ACTION	CHARGE TIME *
11.5 or less (see instructions below)	Need charge. Check in 3 months or when vehicle is sold***	20 hours
* Using a constant current charger at standard amps specified on the battery		
*** Identify battery as being checked on "date" or needs to be rechecked at "date"		

Charging for Voltage of 11.5 V or Less

Batteries with voltage below 11.5 V may require special equipment and procedures to recharge.

In charging an over discharged battery having a terminal voltage of 11.5 V or lower, its internal resistance may be too high to charge at a normal charge voltage.

Therefore, it may be necessary to raise the voltage of the battery initially (20 V as a maximum), and charge for approximately 5 minutes. If the ammeter shows no change in current after 5 minutes, you need a new battery.

Current flowing into the battery at high voltage can become excessive. Monitor amperage and adjust voltage as necessary to keep current at the battery's standard amp rating. Charge for approximately 20 hours.

Testing Battery

Battery Load Test

1. Connect a battery load tester such as the NAPA ULTRA PRO BATTERY LOAD TESTER (P/N 95260).
2. Ensure proper test conditions.

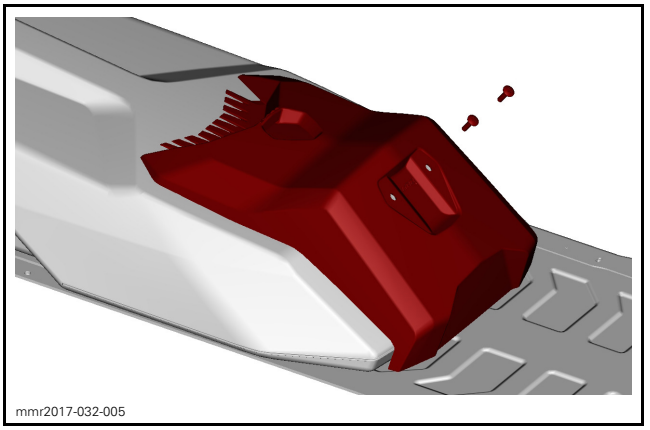
TEST CONDITIONS	
Initial battery voltage‡	Above 12.5 Vdc
Engine	OFF
Load	3 times the amp-hour (AH) rating
Time	15 seconds
‡ Required for accurate testing	

SPECIFICATION	
Battery	Above 9.6 Vdc

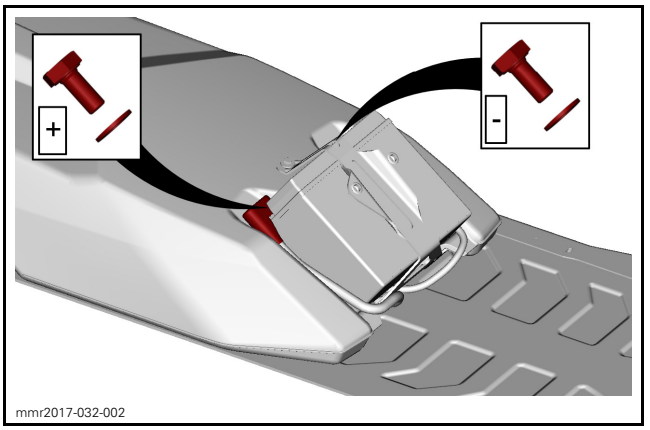
If battery voltage drops below specification during test, replace battery and test charging system.

Removing Battery

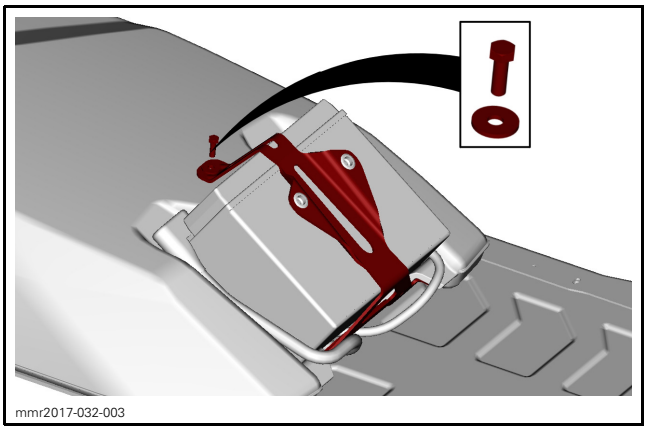
1. Remove seat.
2. Remove battery cover.



3. Disconnect negative before positive terminal.



4. Remove battery hold down bracket.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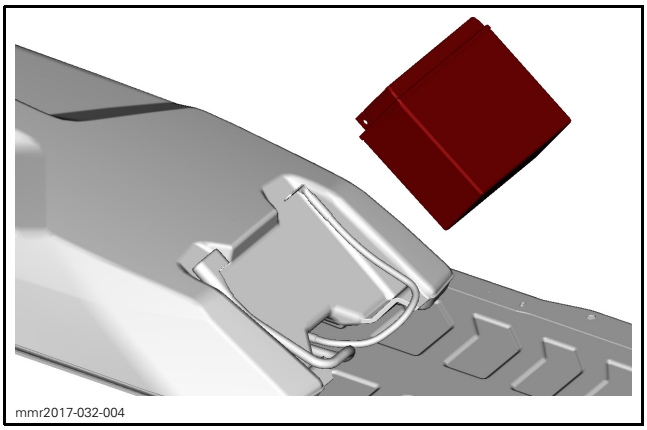
5. Remove battery.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Installing Battery

TIGHTENING TORQUE	
Battery terminals (positive and negative)	10 N•m ± 2 N•m (89 lbf•**in** ± 18 lbf•**in**)
Battery hold down bracket	5 N•m ± 0.5 N•m (44 lbf•**in** ± 4 lbf•**in**)
Battery cover retaining screws	7 N•m ± 1 N•m (62 lbf•**in** ± 9 lbf•**in**)

VOLTAGE REGULATOR/ RECTIFIER

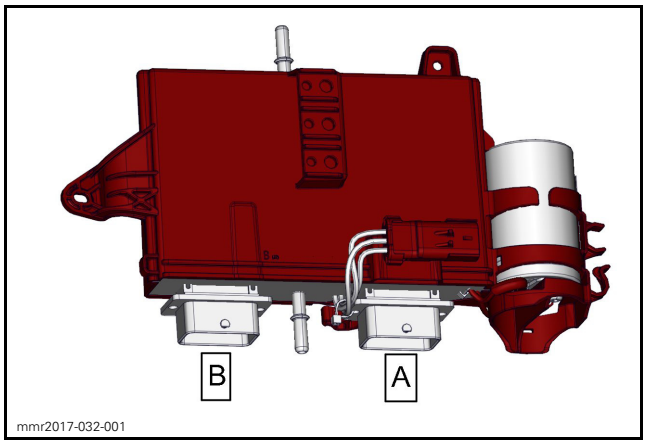
Description

The voltage regulator/rectifier is integrated within the ECM. It receives alternating current (AC) from the magneto which it rectifies and regulates to 55 Vdc.

On a single pull start with the engine between 250 and 500 RPM, the magneto, is capable of producing 30-40 Vdc.

55 Vdc Output

ECMB CONNECTOR
pins M1, M2, M4



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Testing Continuity (Voltage Regulator/Rectifier)

Due to internal circuitry, there is no static test available to check continuity.

Testing 55 Vdc Voltage Output with B.U.D.S. (Voltage Regulator/Rectifier)

1. Raise vehicle so that the track is off the ground and can turn freely.

⚠ WARNING

Ensure vehicle track is completely raised off ground. If the track should come into contact with the ground when the engine is at 5000 RPM, equipment damage and severe injury may result.

2. Remove RH side panel, refer to *BODY* subsection.

Procedure When Engine Cannot be Started

1. Install the following tools to supply power to the 12 Vdc circuits for this test. Refer to *COMMUNICATION TOOLS AND B.U.D.S.* subsection for proper connections.
   - POWER INTERFACE (P/N 515 177 223)
   - 12 V BATTERY SUPPLY CABLE (P/N 529 035 997)
   - 12 volts battery.
2. Select the **Measurements** page.
3. Read the voltage on the **55V System Circuit** meter in B.U.D.S. as the engine is turning over.

55 VDC VOLTAGE OUTPUT TEST	
TEST ENGINE SPEED	VOLTAGE
Pull start (engine not running)	At least 30 Vdc

If you cannot obtain the specified voltage, refer to *TROUBLESHOOTING* in this subsection and carry out the required tests.

Also carry *TESTING VOLTAGE REGULATOR/RECTIFIER GROUND CIRCUIT* in this subsection.

Procedure with Engine Running

1. Connect vehicle to the applicable B.U.D.S. software version, refer to *COMMUNICATION TOOLS AND B.U.D.S.* subsection.
2. Start engine.
3. Select the **Measurements** page.
4. Read the voltage on the **55 V System Circuit** meter in B.U.D.S.

55 VDC VOLTAGE OUTPUT TEST (ENGINE RUNNING)	
TEST ENGINE SPEED	VOLTAGE
Any RPM from idle and above	55 Vdc ± 2

If voltage is below or above specification, refer to *TROUBLESHOOTING* in this subsection and carry out the required tests.

Also test the ECM ground circuit.

Testing ECM Ground Circuit

1. Disconnect the ECMA connector.
2. Test ground circuit continuity as follows.

ECM GROUND CIRCUIT		
Black wire of capacitor	ECMA Connector Pins L3, L4, M3, M4	Continuity
Black wire of capacitor	Chassis ground	Continuity

DC-DC CONVERTER

System voltage (12 Vdc) is explained in *POWER DISTRIBUTION AND GROUNDS* subsection.

12 Vdc Output Voltage Tests (DC-DC Converter)

12 VDC OUTPUT VOLTAGE	
OUTPUT	CONNECTOR - -PIN
Primary 12 Vdc	COM - 6
Secondary 12 Vdc	COM - 5

Testing Primary 12 Vdc Circuit with B.U.D.S.

1. Start engine.
2. Turn off any accessories.
3. Disconnect any external batteries.
4. Select the **Measurements** page.
5. Read the voltage on the **Primary 12 V Circuit** meter in B.U.D.S.

PRIMARY 12 VDC CIRCUIT TEST WITH B.U.D.S.	
TEST ENGINE SPEED	VOLTAGE
Any RPM from idle and above	14.5 ± 0.5 Vdc

If voltage is above specification, replace ECM.

If voltage is below specification, check the *PRIMARY 12 VDC CIRCUIT*

Also test the ECM ground circuit (voltage regulator/rectifier).

Install all removed parts and connectors.

Secondary 12 Vdc Circuit Test

The secondary 12 Vdc system is not monitored in B.U.D.S.

To test it, carry out the following procedure.

1. Remove RH side panel to expose the fuse(s). Refer to *BODY*.
2. Set FLUKE 115 MULTIMETER (P/N 529 035 868) to Vdc scale.
3. Start the engine.
4. Unplug battery (if applicable)
5. Probe the COM connector as follows.

12 VDC OUTPUT VOLTAGE	
OUTPUT	CONNECTOR - -PIN
Secondary 12 Vdc	COM - 5

SECONDARY 12 VDC CIRCUIT TEST	
TEST ENGINE SPEED	VOLTAGE
Any RPM from idle and above	14.5 ± 0.5 Vdc

If voltage cannot be measured, test continuity of wire from COM-5 to ECMB pins L1, L2, and L3.

If the wire continuity is good and other voltages from ECM tested good, ECM may not output secondary 12 Vdc.

Test the *VOLTAGE REGULATOR/RECTIFIER GROUND CIRCUIT*. If the ground circuit tests good, the ECM will need to be replaced.

NOTE: Before replacing ECM, all ECM grounds, power output circuits, and input circuits from the magneto must be tested.

Repair or replace as applicable.

CAPACITOR

The fuel injectors, which require a stable 55 Vdc for their operation, are particularly sensitive to voltage variations. A capacitor is connected to the 55 Vdc electrical system to stabilize the system voltage.

The capacitor is located next to the ECM on the RH side of the vehicle.

Quick Troubleshooting

A faulty capacitor will lead to the following symptoms:

– Unstable, low, or no system voltage (55 V).
– Engine will not start
– Engine hard to start
– Poor idling
– Engine misfiring.

NOTE: A defective capacitor is likely to give off a burning like odor.

Discharging Capacitor

⚠ WARNING

The capacitor remains charged approximately 10 seconds after engine is stopped. A high energy could suddenly be discharged if capacitor terminals were shorted. Always discharge capacitor before servicing.

To properly discharge capacitor, leave it connected for at least 5 minutes after engine has been stopped, or after engine was last cranked before carrying out any maintenance procedure on the capacitor or 55 volt electrical system.

Testing Capacitor Charge Hold

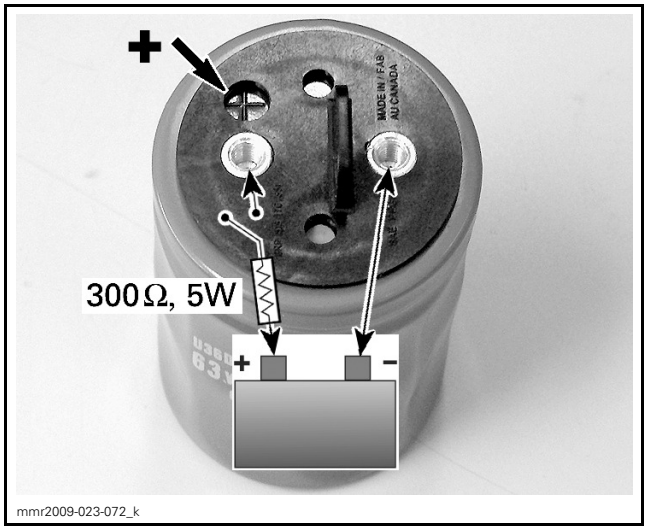
Procedure Setup

1. Remove capacitor from vehicle. Refer to *REMOVING CAPACITOR* in this subsection
2. Work on a non metallic workbench.
3. Connect the following items to the capacitor. See following illustration.
   – A switch
   – Resistor (300 Ω/5 W)
   – 12 V battery (fully charged).

NOTICE **Ensure the test switch is in the OFF position when connecting the battery to the capacitor to prevent sparking or electrical shock.**

⚠ WARNING

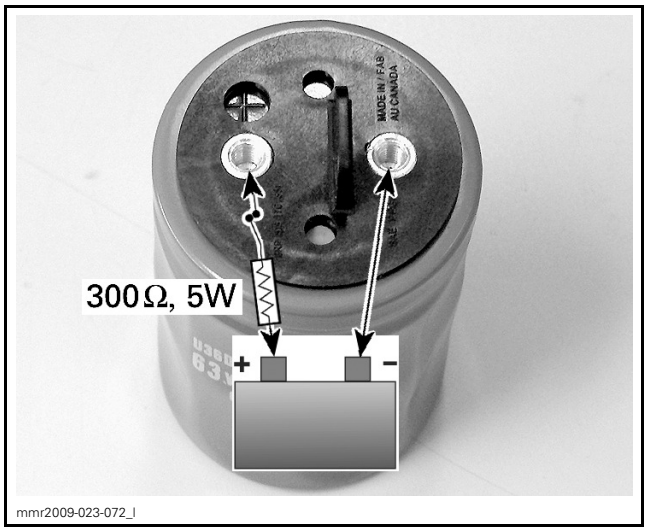
Connect the battery POSITIVE post to the capacitor POSITIVE terminal.



SWITCH AT OFF

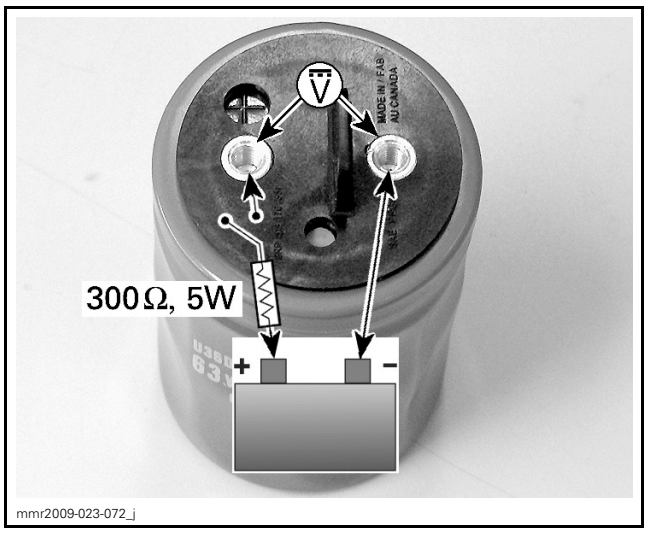
Test Procedure

1. Turn switch to **ON** and read capacitor voltage. Wait until voltage reaches 12 V.



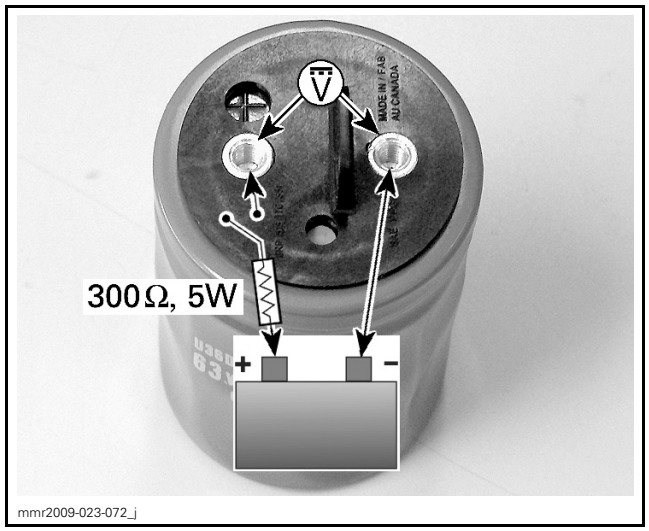
SWITCH AT ON

2. Turn test switch to **OFF**.
3. Use the FLUKE 115 MULTIMETER (P/N 529 035 868) set to Vdc.
4. Read capacitor voltage.



SWITCH AT OFF

5. Wait 5 minutes.
6. Read capacitor voltage again.



SWITCH AT OFF

7. The difference between the readings should not exceed the specification.

ALLOWED VOLTAGE DIFFERENCE BETWEEN READINGS
0.5 Vdc

If readings are out of specification, replace capacitor.

Reinstall capacitor. Refer to *INSTALLING CAPACITOR* in this subsection.

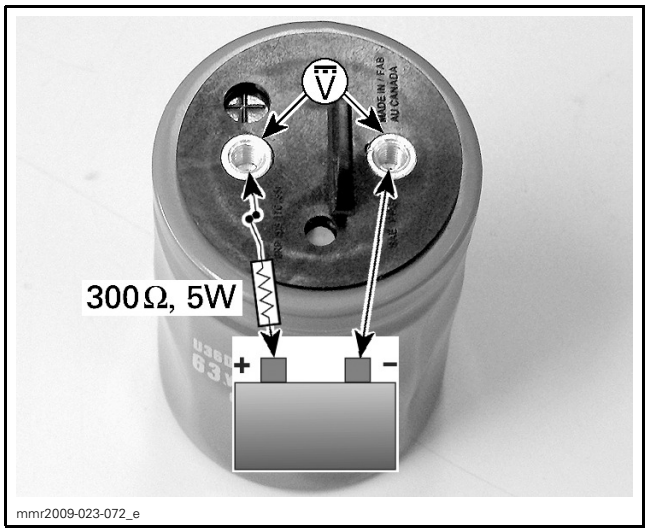
Testing Capacitor Residual Voltage

Procedure Setup

Follow the same steps as described in Procedure Setup of *TESTING CAPACITOR CHARGE HOLD*.

Test Procedure

1. Turn switch to **ON** and read capacitor voltage. Wait until voltage reaches 12 V to ensure the capacitor is fully charged.

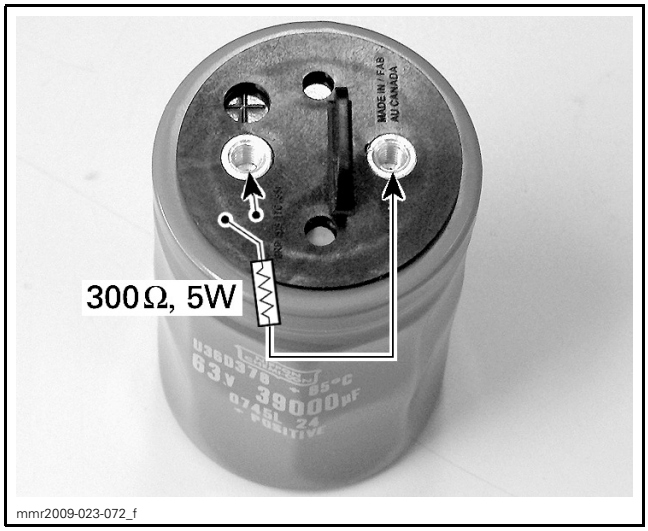


2. Turn test switch to OFF.

NOTE: Carry out the following steps **within one minute** to ensure the capacitor does not begin to discharge before the test.

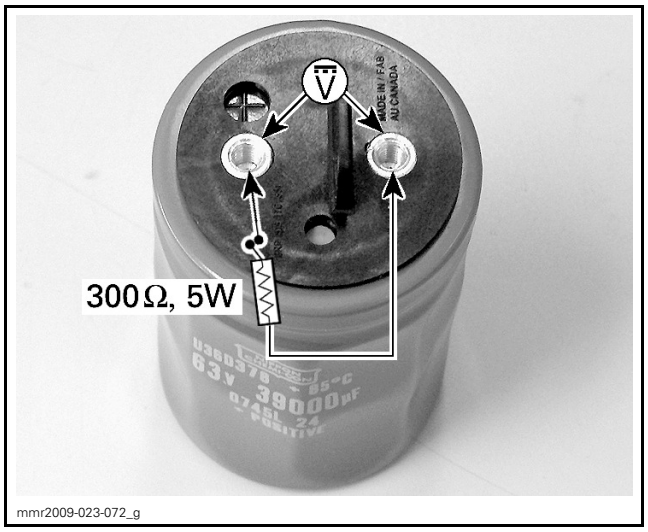
3. Remove battery from circuit and connect the resistor and switch across capacitor terminals.

NOTICE **Ensure test switch is in the OFF position during the circuit configuration change.**



SWITCH AT OFF

4. Turn test switch to the ON position for 12 seconds ± 1 second to slowly discharge capacitor.
5. Read capacitor voltage.



SWITCH AT ON

CAPACITOR RESIDUAL VOLTAGE
Must be above 2.6 Vdc

If voltage is out of specification, replace capacitor.

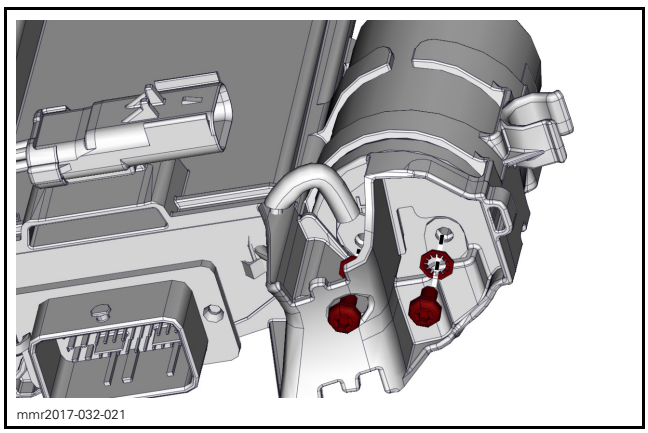
Removing Capacitor

1. Remove upper body module. Refer to *BODY* subsection.
2. Disconnect magneto connector.
3. Remove muffler.

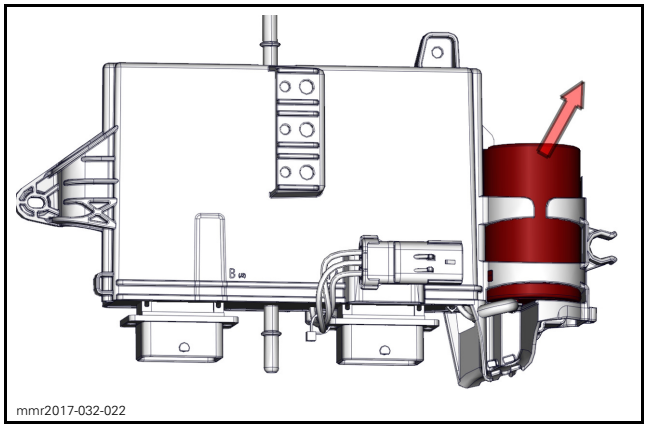
⚠ WARNING

Disconnect the magneto connector. Should the engine be made to rotate with magneto connected, a spark may occur resulting in electrical shock, a fire or an explosion.

4. Ensure capacitor remains connected for at least 1 minute after engine shut down, or after engine was last cranked. This ensures capacitor is fully discharged.
5. Disconnect wire terminals from capacitor.



6. Remove capacitor from bracket.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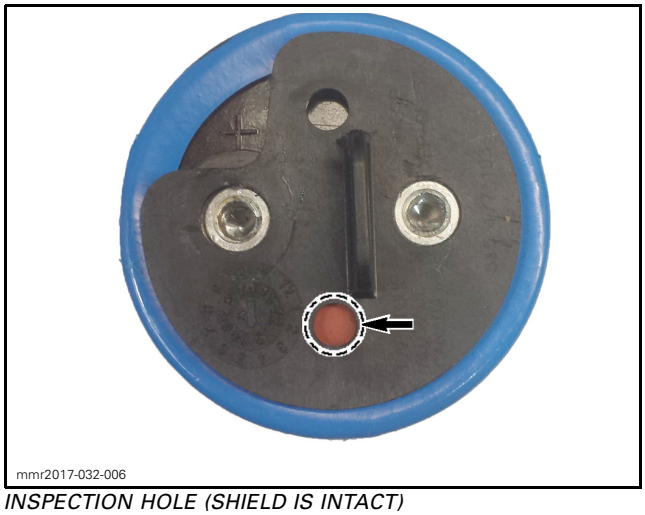
⚠ WARNING

Do not remove plastic protector from top of capacitor unless the capacitor is to be replaced. The cover prevents the two capacitor contacts from being easily shorted together which may cause a spark, possibly resulting in a fire.

7. Check inspection hole on top of capacitor.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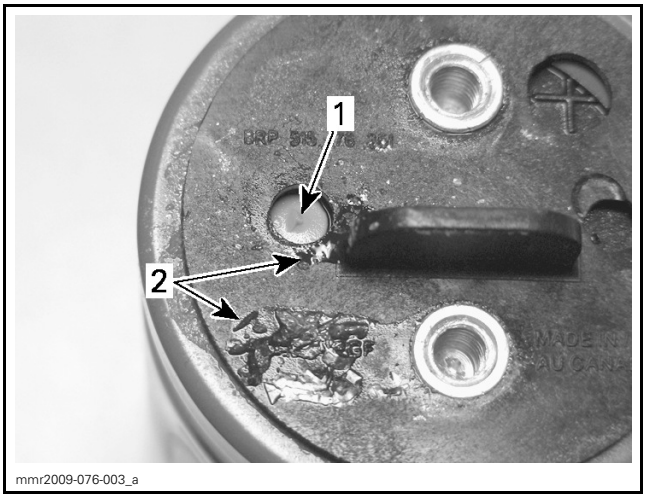
INSPECTION HOLE (SHIELD IS INTACT)

If the top shield is open (pierced), replace capacitor.

NOTE: The following illustration shows a perforated shield with capacitor fluid leakage. This capacitor was connected in reverse polarity.



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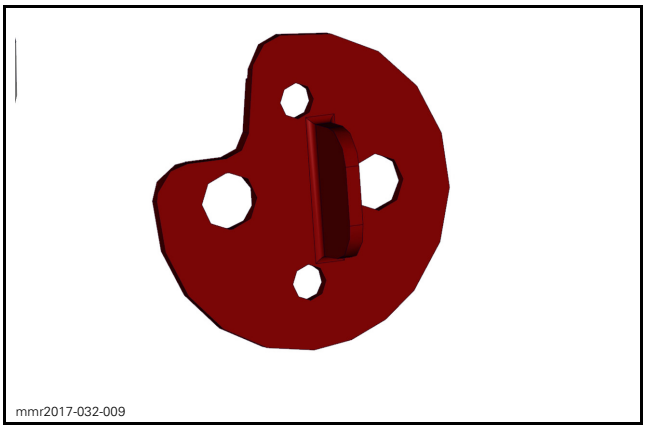
1. Perforated shield
2. Capacitor fluid leakage

Installing Capacitor

1. If capacitor was replaced, install a plastic protector cap on new capacitor.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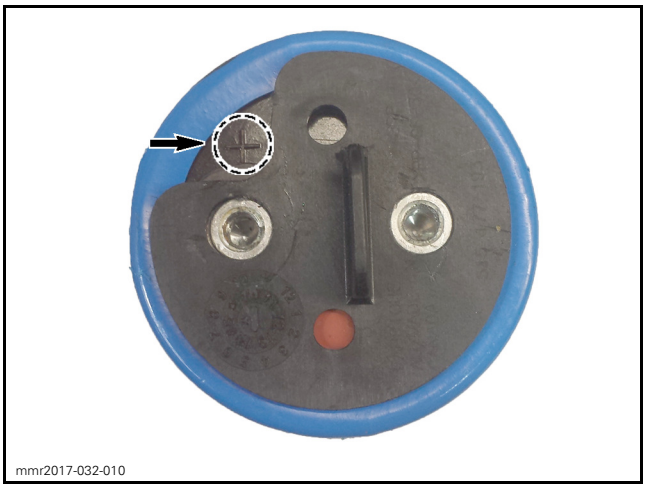
NOTE: When reinstalling plastic protector, ensure the **+** sign on top of capacitor is visible through the hole in protector.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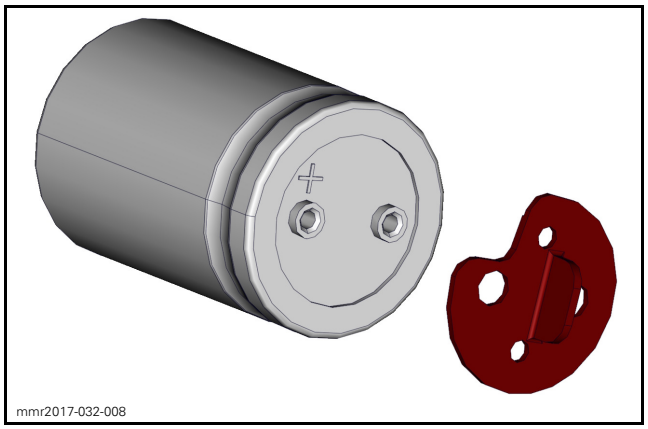
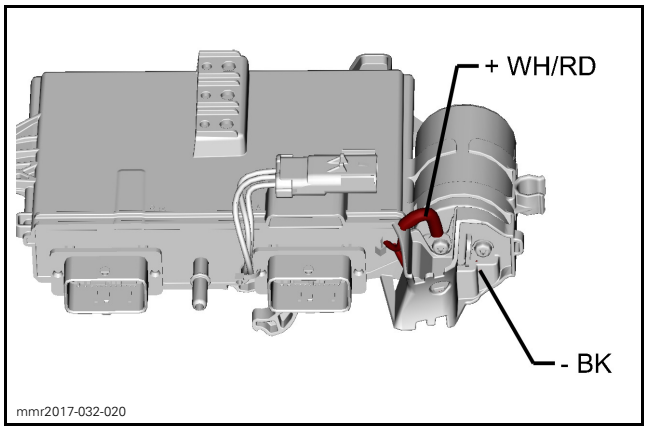
Otherwise, pull off protector, rotate it one half turn, then reinstall it.



2. Route capacitor wires as per illustration and connect wire terminals to capacitor. Connect the WH/RD wire to the **+** terminal.

NOTICE Improper polarity could destroy the capacitor while in operation.



NOTICE Be careful not to damage threads when tightening capacitor screws.

3. Torque screws to 2 N•m (18 lbf•**in**).
4. Complete assembly of remaining parts in the reverse order of removal.

STARTING SYSTEM

SERVICE TOOLS

Description	Part Number	Page
ECM ADAPTER TOOL	529 036 166	3–4
FLUKE 115 MULTIMETER	529 035 868	3

SERVICE PRODUCTS

Description	Part Number	Page
DIELECTRIC GREASE	293 550 004	5

GENERAL

STARTING SYSTEM BASICS (WITHOUT BATTERY)

Conditions for Engine Starting

– Emergency engine stop switch set to RUN;
– D.E.S.S. key on the D.E.S.S. post.

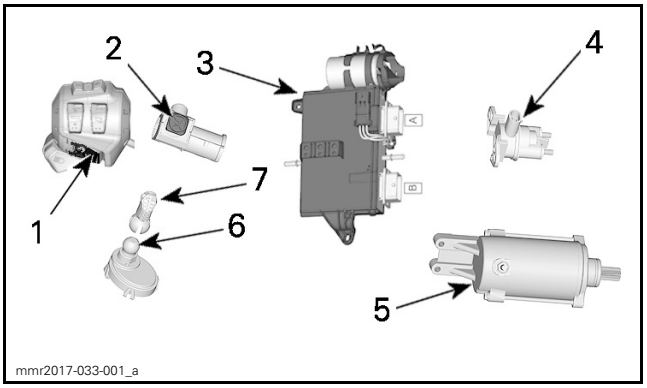
Starting System Operation

Refer to *REWIND STARTER* subsection for starting system operation.

STARTING SYSTEM BASICS (WITH BATTERY)

Basic Starting System Operation (With Battery)

When the START button is pressed, 12 Vdc is applied to the ECM. The ECM activates the internal ECM relay which provides 12 volts to one end of the coil of the starter solenoid. If the engine cranking conditions are met, the ECM completes the starter solenoid control circuit by providing a ground.



1. Start/RER button
2. Emergency engine stop switch
3. ECM
4. Starter solenoid
5. Starter
6. D.E.S.S. post
7. D.E.S.S. key

Engine Cranking Conditions

The following conditions must be met to allow engine cranking:

1. Emergency engine stop switch set to RUN.
2. D.E.S.S. key on the D.E.S.S. post.
3. START button pressed and held.

Starting System Logic

If the START 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 button is held after engine has started, the ECM automatically stops the starter if engine speed reaches at least 1400 RPM.

TROUBLESHOOTING (WITH BATTERY)

DIAGNOSTIC TIPS

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

Starting system failures are not necessarily related to the starter but may be due to one the following:

– Crankshaft position sensor (CPS)
– Starter solenoid fuse and start fuse
– Battery, refer to *CHARGING SYSTEM*
– START/RER button
– Starter solenoid
– Emergency 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 is in good condition. Refer to applicable subsection.

DIAGNOSTIC GUIDELINES

NOTHING HAPPENS WHEN START/RER BUTTON PRESSED

1. Battery not connected
   - *Connect battery.*
2. Burnt fuse
   - *Check fuses*
3. Defective internal ECM relay or related circuits
   - *Test power and ground circuits to starter solenoid.*
4. Defective START/RER switch
   - *Test START/RER switch, wiring and connections.*

ENGINE DOES NOT CRANK

1. Discharged battery
   - *Recharge and test. Refer to CHARGING SYSTEM subsection.*
2. Battery connections
   - *Check/clean/tighten.*
3. Poor/bad or corroded ground contacts (engine, battery ground cable, starter etc.)
   - *Check/clean/repair, refer to POWER DISTRIBUTION AND GROUNDS subsection.*
4. Starter solenoid
   - *Test solenoid, wiring and connections.*
5. Damaged starter or ground cables
   - *Carry out SOLENOID DYNAMIC TEST.*
6. No ground provided by ECM to starter solenoid
   - *Refer to CONTINUITY TEST OF START/RER SWITCH CONTROL CIRCUIT in this subsection.*
7. Engine cannot be rotated (possibly seized)
   - *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 SOLENOID DYNAMIC TEST.*
4. Damaged starter or ground cables
   - *Carry out SOLENOID DYNAMIC TEST.*

STARTER TURNS, BUT STARTER DRIVE DOES NOT MESH WITH RING GEAR

1. Worn starter drive gear/starter gear/ring gear
   - *Replace worn parts. Refer to MAGNETO AND STARTER subsection.*
2. Defective drive
   - *Replace starter drive. Refer to MAGNETO AND STARTER subsection.*

STARTER KEEPS RUNNING

1. Sticking solenoid contacts
   - *Replace solenoid.*
2. Sticking or defective starter drive
   - *Lubricate or replace. Refer to MAGNETO AND STARTER.*

PROCEDURES (WITH BATTERY)

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

⚠ WARNING

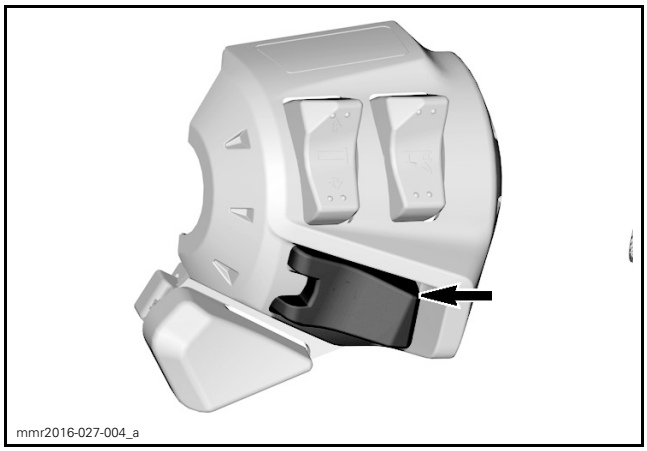
Ensure vehicle cannot move when performing starting system tests.

START/RER SWITCH

Pressing the start/RER switch sends a start signal (battery voltage) to the ECM. If the *ENGINE CRANKING CONDITIONS* are met, the ECM will ground the starter solenoid.

In B.U.D.S., select the **Measurements** page and press the start/RER button to see if the ECM receives the start signal.

START/RER Switch Continuity Test



1. Disconnect the steering connector SH2. Refer to *WIRING HARNESS AND CONNECTORS* subsection.
2. Measure resistance through switch as per following table.

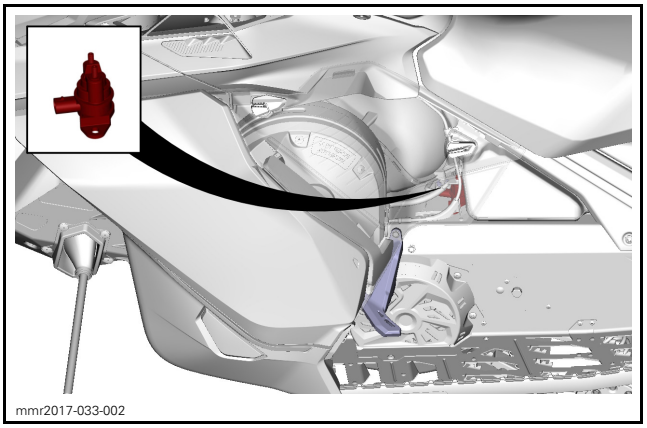
CONTINUITY TEST OF START/RER SWITCH CIRCUIT		
SWITCH POSITION	SH	RESISTANCE
Released	Pins 1 and 2	Close to 0 Ω
Pressed and held	Pins 2 and 8	Close to 0 Ω

If the switch does not test as specified, replace the START/RER switch.

If the switch tests as specified, check for an open circuit in harness.

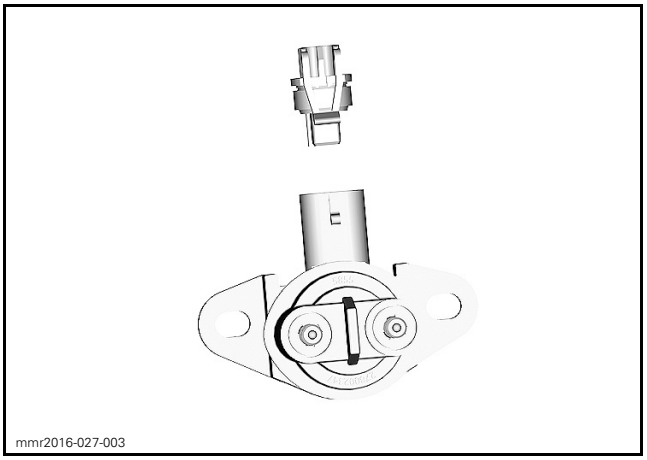
STARTER SOLENOID

Starter Solenoid Location



Testing Solenoid Input Voltage

1. Disconnect solenoid connector.



2. Set the multimeter to Vdc.
3. Install D.E.S.S. key on post.
4. Press the START/RER button to activate ECM.
5. Measure voltage.

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

If test succeeded, carry out a *SOLENOID CONTROL CIRCUIT TEST*.

If test failed, carry out a *START/RER SWITCH CIRCUIT CONTINUITY TEST*.

Testing Solenoid Control Circuit

1. Set the multimeter to Ω.
2. Disconnect connector "B" from ECM, refer to *WIRING HARNESS AND CONNECTORS* subsection.
3. Install the ECM ADAPTER TOOL (P/N 529 036 166) 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	ECMB-A1	Close to 0 Ω (continuity)

If test failed, repair or replace wiring/connectors.

If test succeeded, carry out a *SOLENOID COIL RESISTANCE TEST*.

Testing Solenoid Coil Resistance

1. Set multimeter to Ω.
2. Disconnect solenoid connector.
3. Measure solenoid coil resistance as per following table.

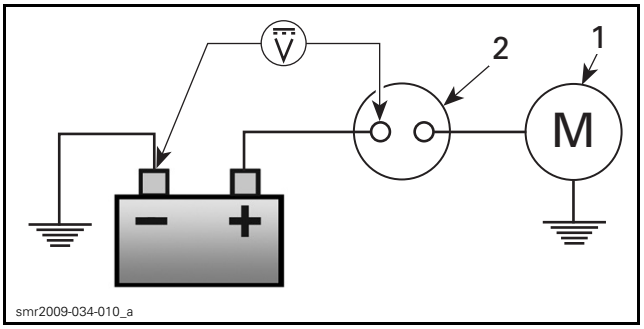
SOLENOID COIL RESISTANCE TEST		
SOLENOID CONNECTOR		RESISTANCE
Pin A	Pin B	4.5 to 5.5 Ω

If test fails, replace solenoid.

Testing Solenoid (Dynamic)

1. Depress the throttle lever to place the ECM in engine drowned mode. Hold throttle lever in place using a rubber band.
2. Set multimeter to Vdc.
3. Crank engine.
4. **As engine is cranking**, measure the voltage as per following tables.

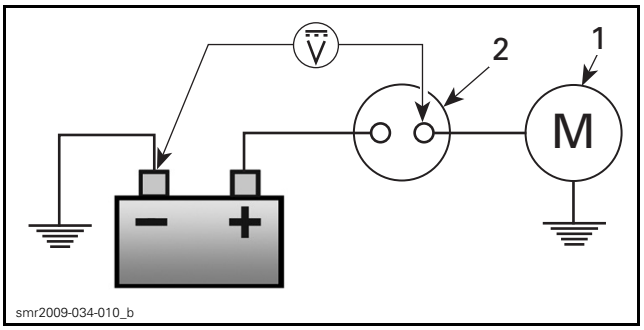
SOLENOID DYNAMIC TEST (ENGINE CRANKING)		
TEST PROBES		SPECIFICATION
Solenoid battery post	Battery ground	Battery voltage



1. Starter motor
2. Starter solenoid

5. If test failed, check battery positive cable (from battery to solenoid).
6. If test succeeded, continue with next step.

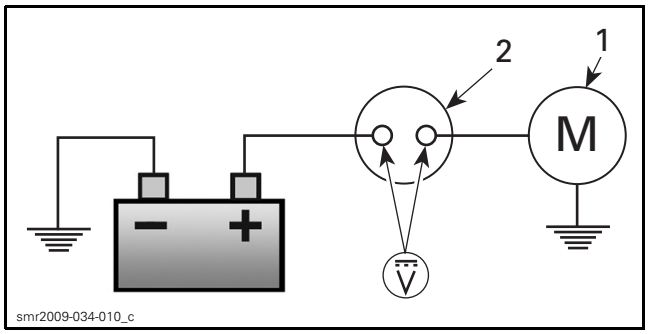
SOLENOID DYNAMIC TEST (ENGINE CRANKING)		
TEST PROBES		SPECIFICATION
Solenoid starter post	Battery ground	Battery voltage



1. Starter motor
2. Starter solenoid

7. If test failed, test *SOLENOID INPUT VOLTAGE*.
8. If test succeeded, continue with next step.

SOLENOID DYNAMIC TEST (ENGINE CRANKING)		
TEST PROBES		SPECIFICATION
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.

9. Remove rubber band from throttle lever.

10. Reinstall removed parts.

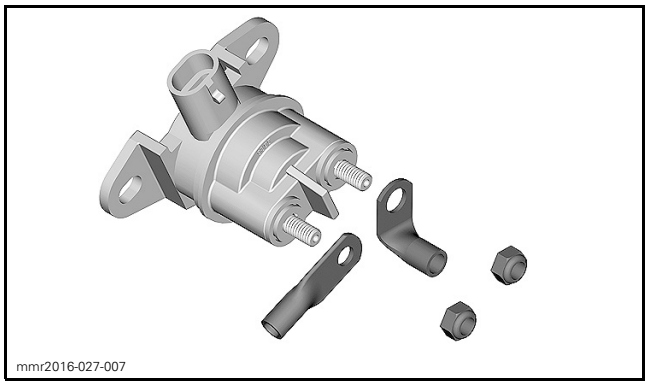
Removing Solenoid

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

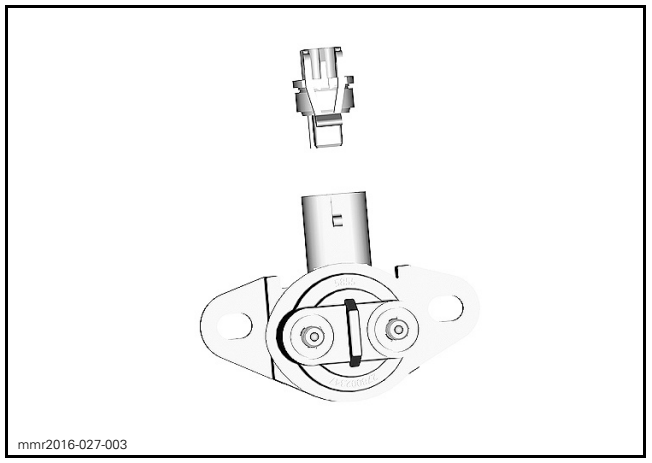
⚠ WARNING

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

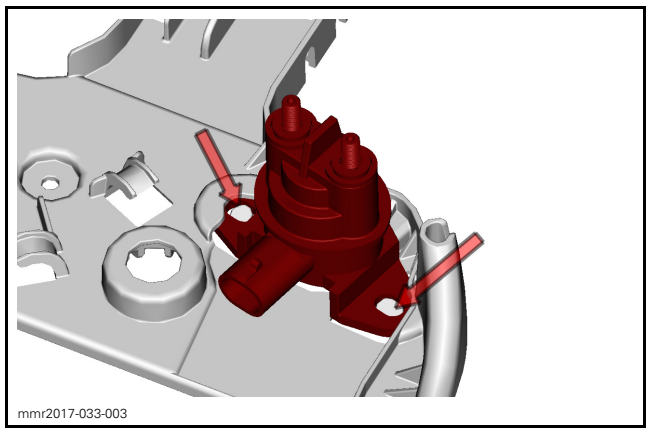
2. Disconnect solenoid cables.



3. Disconnect starter solenoid connector.



4. Press down on the tabs and release the solenoid.



Installing Solenoid

Reverse the removal procedure and pay attention to the following.

1. Secure solenoid on its support, ensure the tabs lock.

NOTE: Apply DIELECTRIC GREASE (P/N 293 550 004) under and over each connections and make sure each nut are well covered.

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

2. Close or slide protective caps.

3. Reconnect battery and test starter solenoid operation.

STARTER

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

RF DIGITALLY ENCODED SECURITY SYSTEM (RF D.E.S.S.)

SERVICE TOOLS

Description	Part Number	Page
POWER INTERFACE	515 177 223	2

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.

This system allows the engine to reach pulley engagement speed only if a D.E.S.S. key is installed on engine cut-off switch and the key is recognized as valid by the ECM.

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.

Up to 8 D.E.S.S. keys may be programmed in the ECM memory using the B.U.D.S. The keys can also be erased individually.

NOTE: If desired, a 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. Beeper Codes

When starting the engine with a D.E.S.S. key on the engine cut-off switch, the key is identified by the ECM and D.E.S.S. signals will be issued according to the key recognition. See table.

D.E.S.S. SIGNAL		DESCRIPTION	COMMENT
BEEPER	DISPLAYED MESSAGE		
2 shorts beeps	Compact digital gauge: "Good Key" Other gauges: DESS tell-tale light will flash	Valid key read	Working D.E.S.S. key.
Short beeps repeating slowly	CHECK KEY	Unable to read key	– Reinstall key – RPM limited to 2500 – Check D.E.S.S. status in B.U.D.S. – No voltage at RFID connector pin D
Shorts beeps repeating rapidly	BAD KEY	Invalid key or key not programmed	– Use the proper key for this vehicle or have the key programmed. – Vehicle can not be driven.

PROCEDURES

D.E.S.S. KEY

D.E.S.S. Key Programming

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

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

D.E.S.S. / ENGINE CUT-OFF OPERATION

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

Navigate to the **keys** page.

Read key. Consult the sections below to troubleshoot a key problem.

Normal Operation (Good Key)

Refer to *WIRING DIAGRAM*.

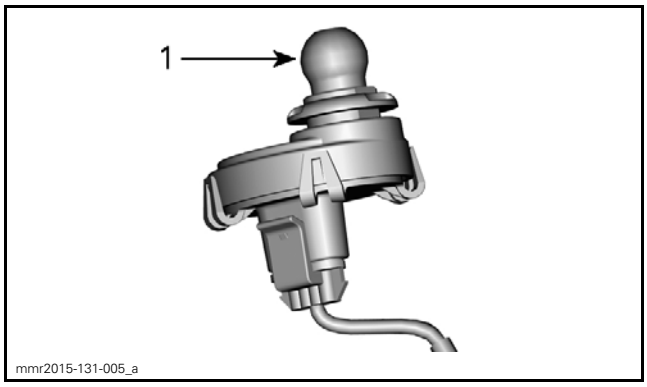
RFID CONNECTOR PIN	SPECIFICATIONS with POWER INTERFACE (P/N 515 177 223) installed
A	ECM ground
B	12 - 15 Vdc
C	5 Vdc
D	12 Vdc

Key Not Read

Possible causes:

– Damaged RFID chip
– No voltage at RFID-D connector
– No voltage at RFID-C connector

Condition can be duplicated with a magnet on the D.E.S.S. post.



1. D.E.S.S. post

Key Not Present

Possible causes:

– No key installed
– No voltage at RFID-B connector
– No ground at RFID-A connector

Condition can be duplicated by unplugging the RFID connector.

Invalid Key

Possible causes:

– Key not programmed to ECM

BEEPER

The beeper is integrated in the multifunction gauge and cannot be replaced alone.

If the beeper does not sound when starting the engine, check the beeper operation. Refer to *GAUGE* subsection.

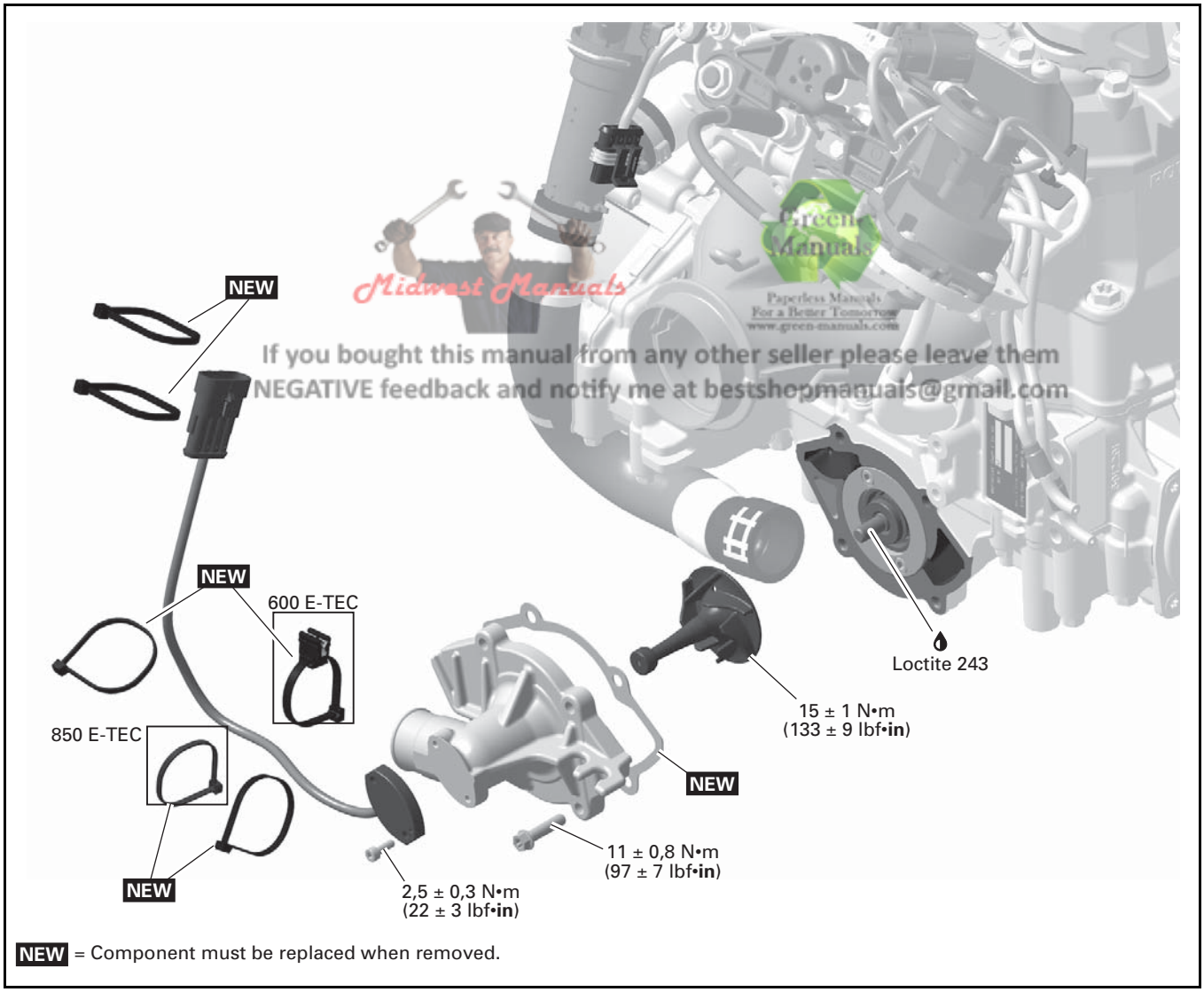
SHOT SYSTEM

SERVICE TOOLS

Description	Part Number	Page
ECM ADAPTER TOOL	529 036 166	5
FLUKE 115 MULTIMETER	529 035 868	5
WATER PUMP IMPELLER TOOL	529 036 444	8
WATER PUMP IMPELLER TOOL	529 036 446	8

SERVICE PRODUCTS

Description	Part Number	Page
CLUTCH AND PULLEY FLANGE CLEANER PRO S1	779244	8
LOCTITE 243 (BLUE)	293 800 060	8
PULLEY FLANGE CLEANER (F)	619 600 022	8



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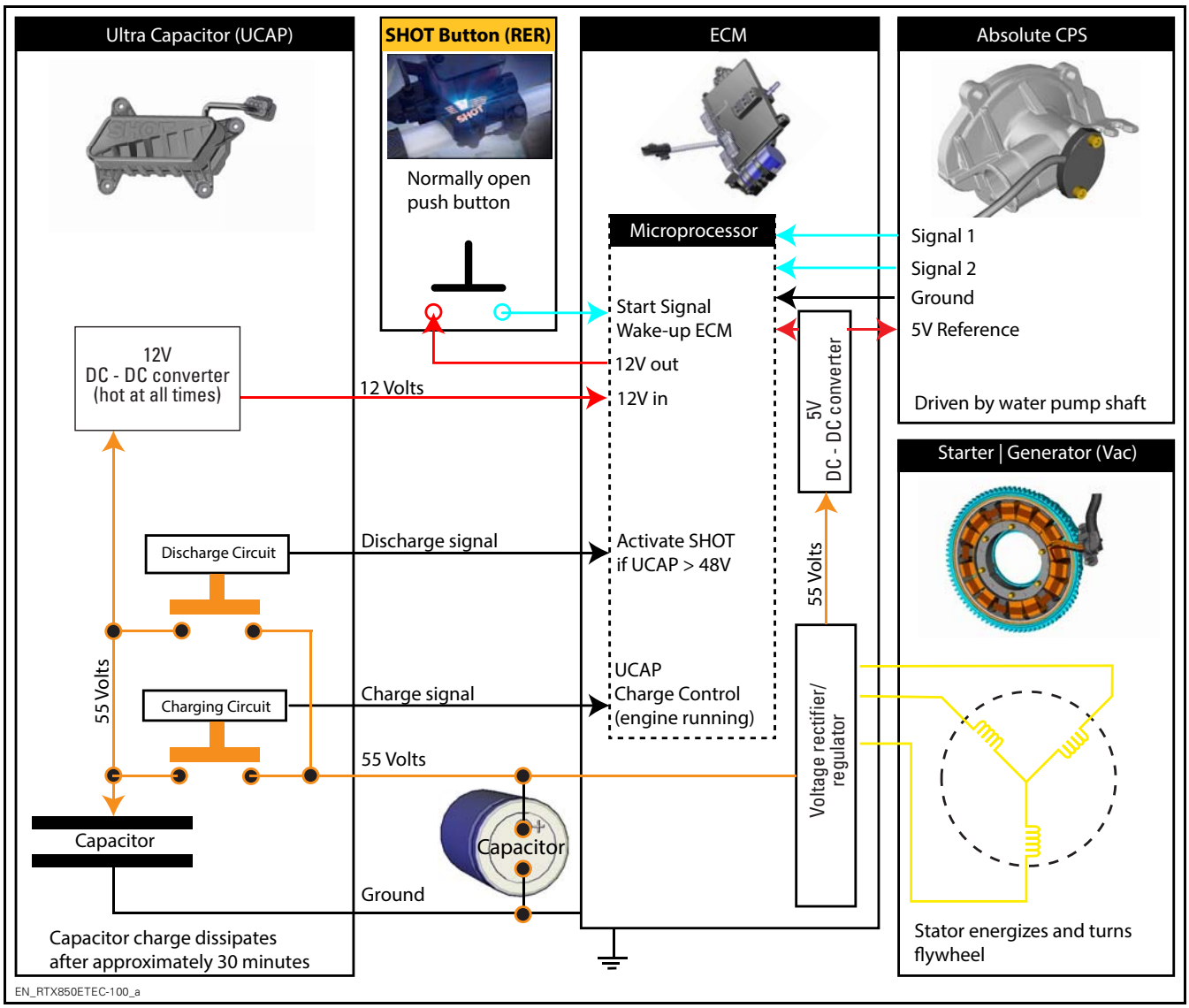
NEW = Component must be replaced when removed.

GENERAL

SHOT POWER DISTRIBUTION



12V DC-DC Converter
Discharge circuit
Charging circuit
Capacitor
Capacitor charge dissipates after approximately 30 minutes
Ground
Start signal wake-up ECM
Activate SHOT if UCAP > 48 volts
UCAP Charge control (engine running)
Votlage rectifier / regulator
Ultra capacitor (UCAP)
SHOT button
Absolute CPS
Driven by water pump shaft
Stator energizes and turns flywheel
Signal
Reference

SYSTEM DESCRIPTION

⚠ WARNING

Capacitors may spark if shorted. Sparks can ignite fuel vapors. Perform all testing procedures on capacitors as indicated.

The SHOT system is lightweight, weighing only 2 pounds more than a rope start and nearly 20 pounds less than a conventional electric start system. The SHOT starting system is only possible with the E-TEC technology, especially its ability to start the engine within a one-third rotation of the crankshaft.

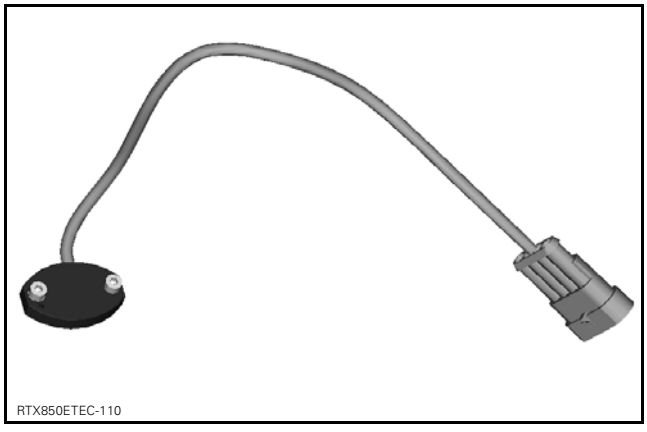
Once you initially pull-start the engine, the magneto begins charging an ultra capacitor. Ultra capacitors are lightweight temporary energy storage devices.

When you push the SHOT button, energy from the ultra capacitor flows to the magneto, transforming it into an electric motor to turn the crankshaft.

Energy also wakes up and powers the ECM, telling the E-TEC system to inject and ignite the fuel at just the right time.

The E-TEC SHOT starting technology eliminates the need for a battery, starter, and ring gear.

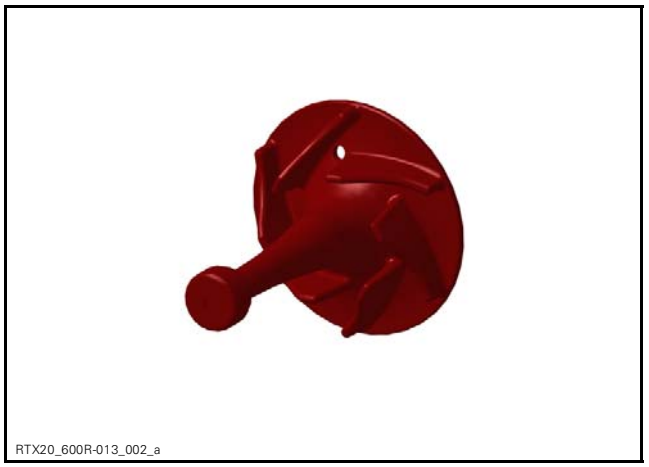
Absolute Crankshaft Position Sensor



RTX850ETEC-110

The Absolute Crankshaft Position Sensor is a contactless rotary sensor and used to verify the position of the crankshaft. It's a hall effect type sensor. It has 4 wires. A power, a ground and 2 signals for redundancy. The hall effect sensor's trigger is the magnet at the end of the water pump's impeller shaft.

Water Pump Impeller with Magnet



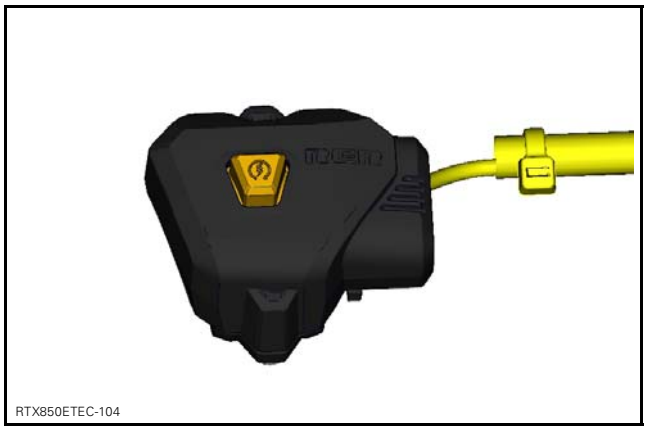
RTX20_600R-013_002_a

TYPICAL

The trigger for the Absolute Crankshaft Position Sensor is the magnet at the end of the water pump shaft. The water pump shafts turns at a 1:1 ratio with the crankshaft.

NOTE: If there is a problem with overheating and SHOT is not working it could give you a good indication that the impeller is stripped on the water pump shaft or an issue with the water pump shaft gear.

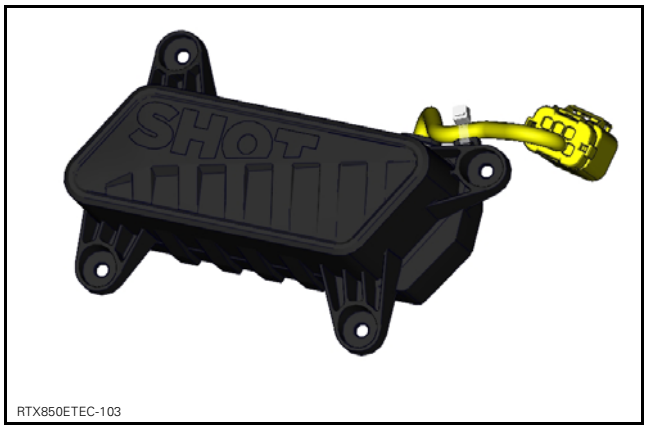
SHOT Button



RTX850ETEC-104

The SHOT button takes the place of the RER button. As it is an open switch it needs to be pushed and held to close the circuit to start the engine using the ultra capacitor and to engage the Rotax Electronic Reverse (RER) if pushed when the engine is idling.

Ultra Capacitor



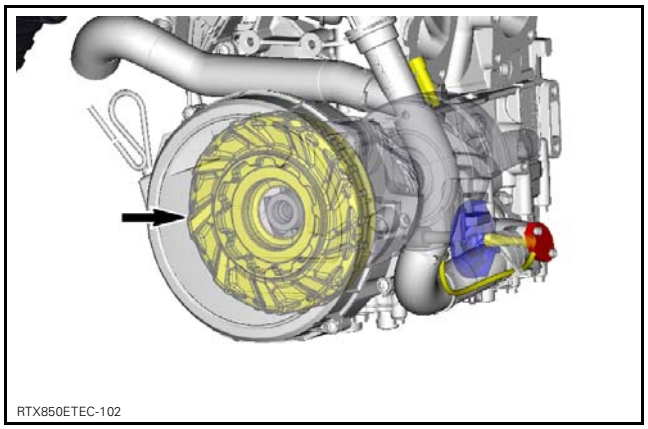
RTX850ETEC-103

The ultra capacitor is a sealed quick discharge power source. It can be charged rapidly and also discharges rapidly. It take about 2 minutes to charge the ultra capacitor at idle. It takes about 30 minutes for the ultra capacitor's voltage to drop below 48 volts.

The ECM will not activate the ultra capacitor if it's voltage drops below 48 volts.

When charged, the ultra capacitor supplies the ECM with enough voltage to check if the SHOT button is being pressed.

Starter Generator (Magneto)


RTX850ETEC-102

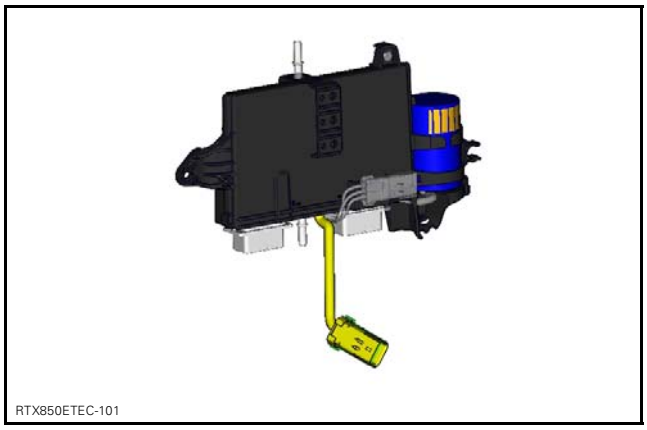
TYPICAL

The magneto produces AC current, and requires AC current to turn the crankshaft. The regulator/rectifier inside the ECM is capable of transforming the AC current from the magneto into DC to charge the Ultra Capacitor. It is also capable of transforming the DC current from the Ultra Capacitor to AC current to turn the engine.

Engine equipped with the SHOT system use a different rotor than an engine without the SHOT system. For more information on these components, refer to the *MAGNETO AND STARTER* subsection.

If there is a problem with the magneto charging system, the SHOT starting system may not work. If you suspect a charging system problem, troubleshoot the charging system before troubleshooting the SHOT system.

ECM


RTX850ETEC-101

You can identify an ECM that is compatible with the SHOT system by the additional connector used to connect to the ultra capacitor. A non-SHOT ECM cannot enable the SHOT starting system.

If any of the following components are replaced, you will need to align the SHOT system. Refer to *ALIGNING THE SHOT SYSTEM AUTOMATICALLY WITH BUDS2* procedure in this subsection.

- ECM
- Water pump impeller or water pump shaft
- Absolute crankshaft position sensor
- Magneto (rotor or stator).

PROCEDURES

ABSOLUTE CRANKSHAFT POSITION SENSOR (ABSOLUTE CPS)

Inspecting the Absolute CPS

When testing electrical systems, the emergency stop switch must always be in the RUN position unless otherwise mentioned, or test is performed while cranking engine.

NOTE: As a first troubleshooting step, always check for applicable fault codes using the BRP diagnostic software (BUDS2).

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

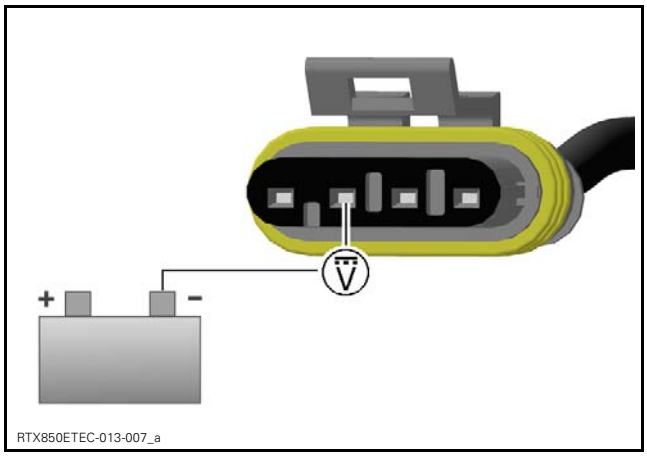
REQUIRED TOOLS	
FLUKE 115 MULTIMETER (P/N 529 035 868)	
ECM ADAPTER TOOL (P/N 529 036 166)	

Testing the Absolute CPS Power Supply

NOTE: The ultra capacitor must be charged for this test.

1. Disconnect the Absolute CPS connector.
2. Install D.E.S.S. key on the D.E.S.S. post.
3. Set the emergency stop switch to the RUN position.
4. Set multimeter to Vdc and check voltage when holding the SHOT button to start the engine.

ABSOLUTE CPS CONNECTOR WIRING HARNESS SIDE	GROUND TERMINAL	MEASUREMENT
Pin 2	Chassis ground	5 ± 0.5 V



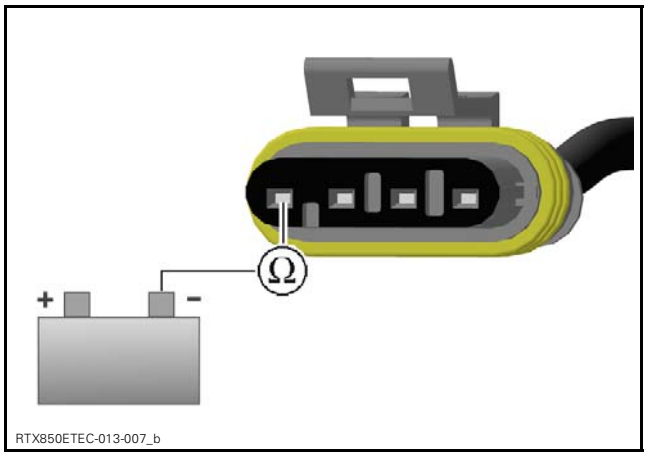
BATTERY ILLUSTRATES A GOOD GROUND

If voltage is out of the specification check ECM power supply and wiring harness.

Testing the Absolute CPS Ground

1. Disconnect the Absolute CPS connector.
2. Set multimeter to Ω and check resistance.

ABSOLUTE CPS CONNECTOR WIRING HARNESS SIDE	TERMINAL	MEASUREMENT
Pin 1	Chassis	Close to 0 Ω (continuity)



BATTERY ILLUSTRATES A GOOD GROUND

If resistance value is out of specification check wiring harness and ground terminal on cylinder block. Be sure to check chassis grounds as well.

NOTE: Perform a voltage drop test across the ground terminals with the engine running to properly check ground connections.

Testing the Absolute CPS Wiring Harness

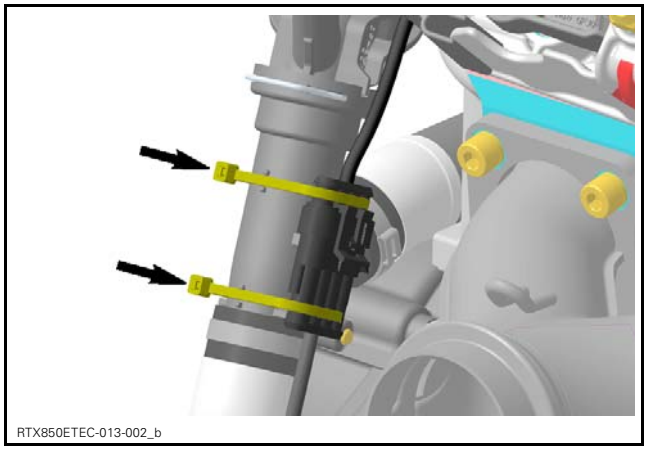
1. Disconnect the ECM-A connector.
2. Connect the ECM adapter tool to the ECM-A connector.
3. Disconnect the Absolute CPS connector.
4. Set multimeter to Ω and probe terminals as per following table.

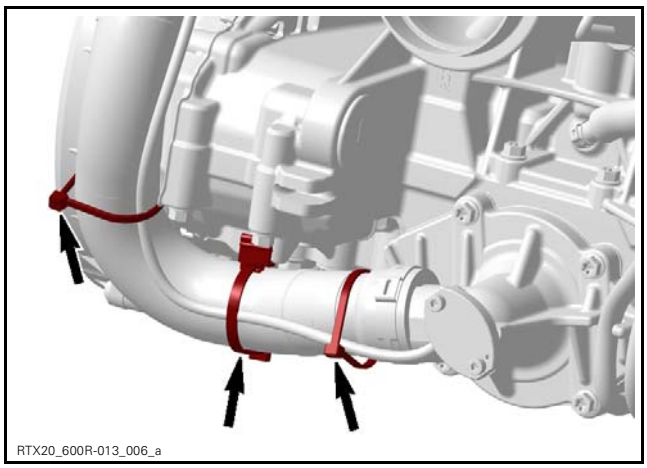
ABSOLUTE CPS CONNECTOR WIRING HARNESS SIDE	ECM ADAPTER	MEASUREMENT
Pin 1	E2	Close to 0 Ω (continuity)
Pin 2	F3	
Pin 3	G2	
Pin 4	H2	

If resistance is out of specification repair wiring harness.

Removing the Absolute CPS

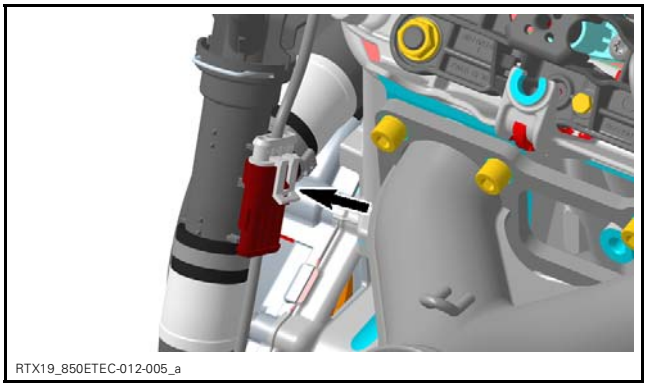
Cut locking ties.


RTX850ETEC-013-002_b

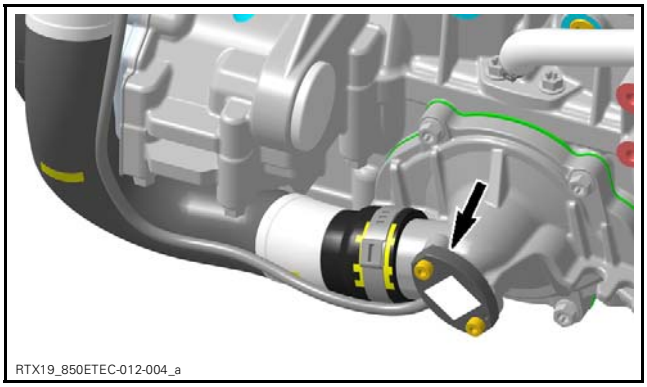

RTX20_600R-013_006_a

TYPICAL

Disconnect Absolute CPS harness connector.


RTX19_850ETEC-012-005_a

Remove Absolute CPS.


RTX19_850ETEC-012-004_a

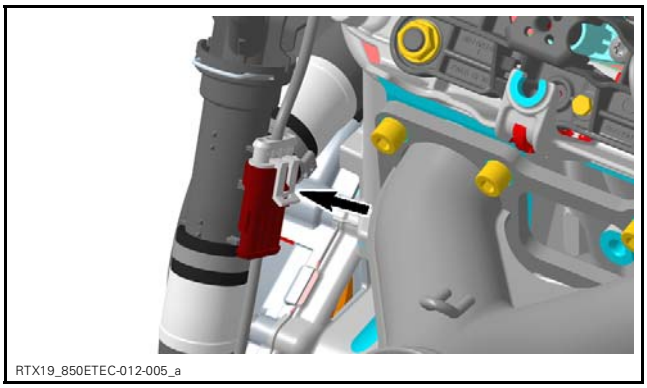
Installing the Absolute CPS

Install Absolute CPS with label facing to the outside.

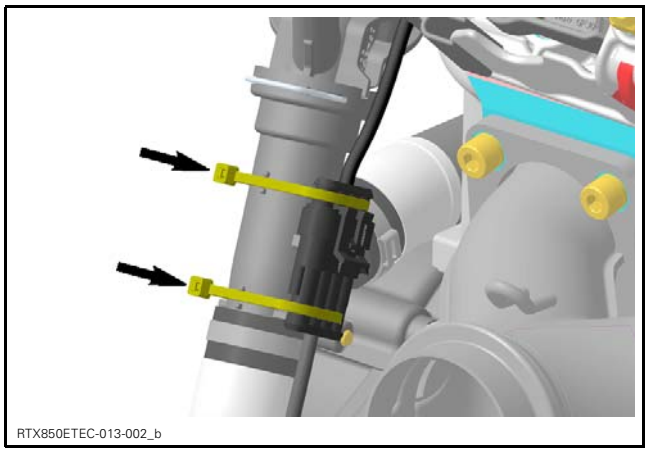
Tighten Absolute CPS screws to specification.

TIGHTENING TORQUE	
Absolute CPS screws	2.5 N•m ± 0.3 N•m (22 lbf•**in** ± 3 lbf•**in**)

Connect Absolute CPS harness connector and engage connector on molded hose assembly.

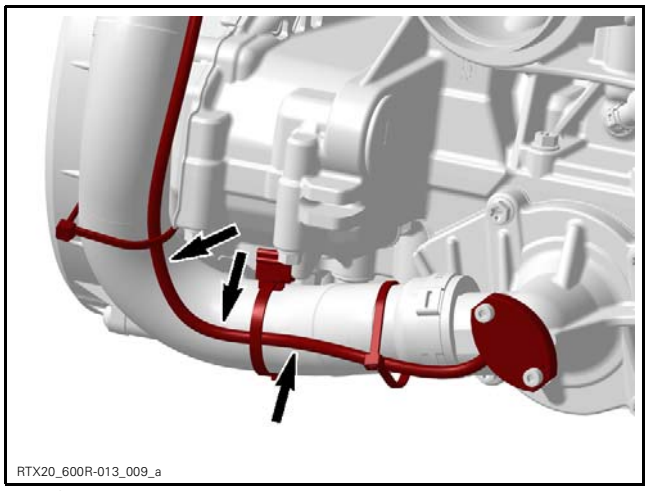

RTX19_850ETEC-012-005_a

Secure Absolute CPS harness connector with locking ties.


RTX850ETEC-013-002_b

Secure Absolute CPS cable with locking ties.

NOTICE Ensure proper cable routing.


RTX20_600R-013_009_a

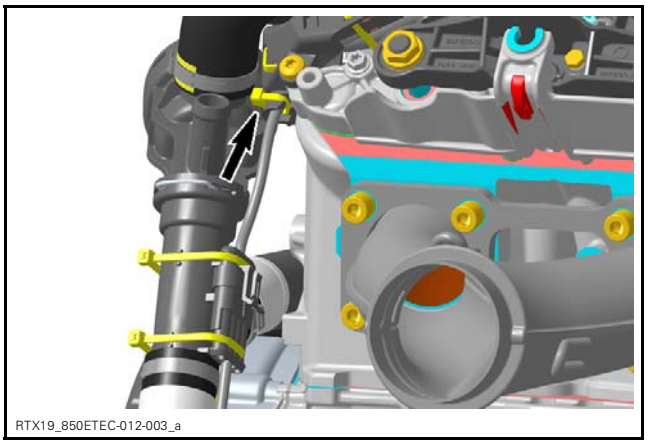
TYPICAL

Realign the SHOT system automatically. Follow the *ALIGNING THE SHOT SYSTEM AUTOMATICALLY WITH BUDS2* procedure in this subsection.

ENGINE WIRING HARNESS - ABSOLUTE CPS WIRING

Installing the Absolute CPS Wiring

Secure Absolute CPS wiring harness.


RTX19_850ETEC-012-003_a

WATER PUMP IMPELLER WITH MAGNET

Removing the Impeller with Magnet

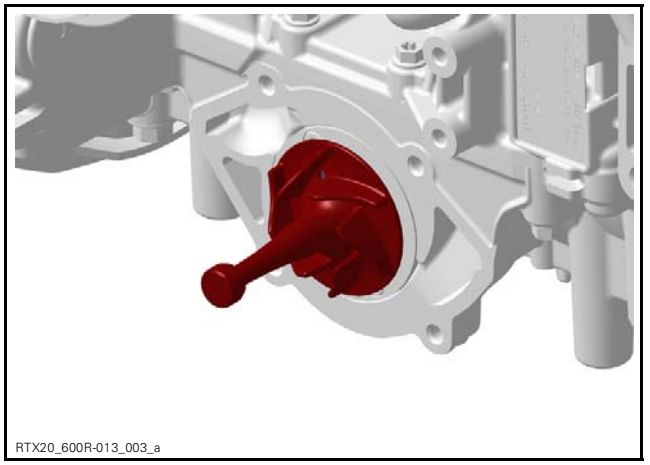
Remove:

- Absolute CPS, refer to the procedure in this subsection.
- Water pump cover, refer to *COOLING SYSTEM - ENGINE* subsection.

Lock engine:

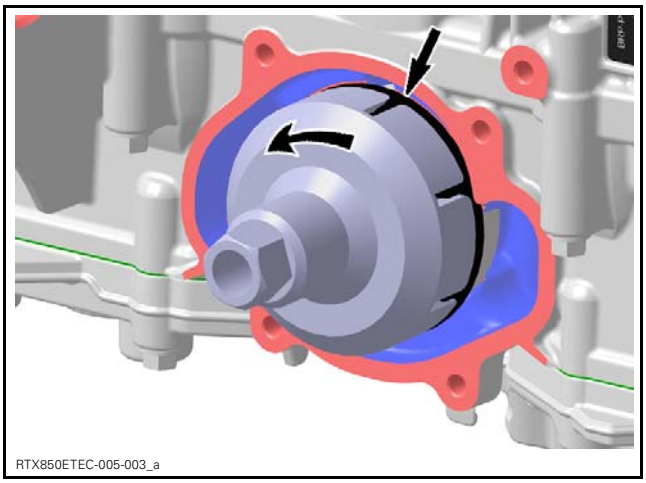
- **Engine installed in the vehicle** - block the drive pulley, refer to *DRIVE SYSTEM AND BRAKE* subsection.
- **Engine removed from vehicle** - block magneto flywheel, refer to *MAGNETO AND STARTER* subsection.

Remove impeller with magnet.


RTX20_600R-013_003_a

TYPICAL

ENGINE	REQUIRED TOOL
600R E-TEC	WATER PUMP IMPELLER TOOL (P/N 529 036 446)
850 E-TEC	WATER PUMP IMPELLER TOOL (P/N 529 036 444)



TYPICAL

Installing the Impeller with Magnet

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

Lock engine:

– **Engine installed in the vehicle** - block the drive pulley, refer to *DRIVE SYSTEM AND BRAKE* subsection.
– **Engine removed from vehicle** - block magneto flywheel, refer to *MAGNETO AND STARTER* subsection.

Clean water pump shaft thread using a part cleaner and compressed air.

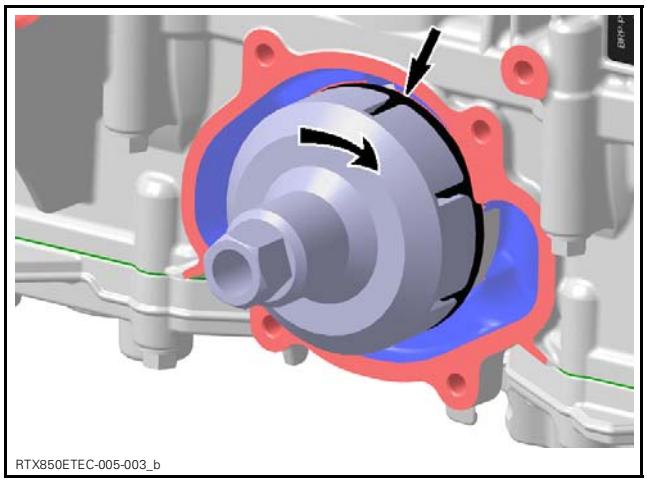
SERVICE PRODUCT	
Scandinavia	PULLEY FLANGE CLEANER (F) (P/N 619 600 022)
Other countries	CLUTCH AND PULLEY FLANGE CLEANER PRO S1 (P/N 779244)

Apply threadlocker on water pump shaft thread.

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

Tighten impeller to specification.

ENGINE	REQUIRED TOOL	
600R E-TEC	WATER PUMP IMPELLER TOOL (P/N 529 036 446)	
850 E-TEC	WATER PUMP IMPELLER TOOL (P/N 529 036 444)	



TYPICAL

TIGHTENING TORQUE	
Impeller	15 N•m ± 1 N•m (133 lbf•**in** ± 9 lbf•**in**)

Align the SHOT system. Follow the *ALIGNING THE SHOT SYSTEM AUTOMATICALLY WITH BUDS2* procedure in this subsection.

SHOT BUTTON

If the Rotax Electronic Reverse (RER) functions normally, the button and/or wiring harness is not at fault. If the SHOT and RER systems are not working, troubleshoot the problem as a faulty RER switch, refer to the *ROTAX ELECTRONIC REVERSE (RER)* subsection.

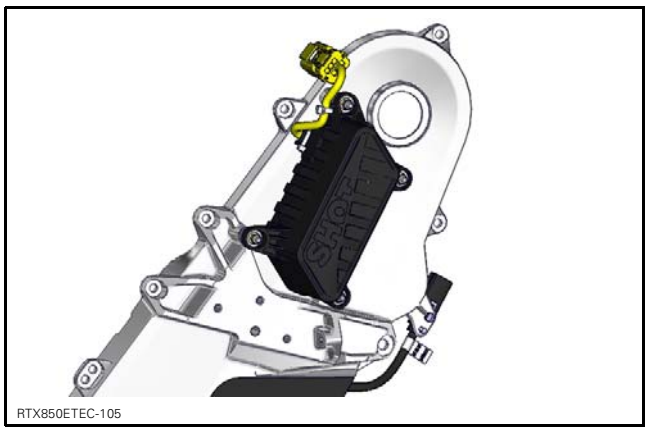
Use the BRP diagnostic software (BUDS2) to monitor if the SHOT / RER button is working.

If the RER works and the SHOT system will not wake-up or start the unit. follow the procedures in this subsection to test the ultra capacitor. Start with *TESTING THE DISCHARGE SIGNAL*.

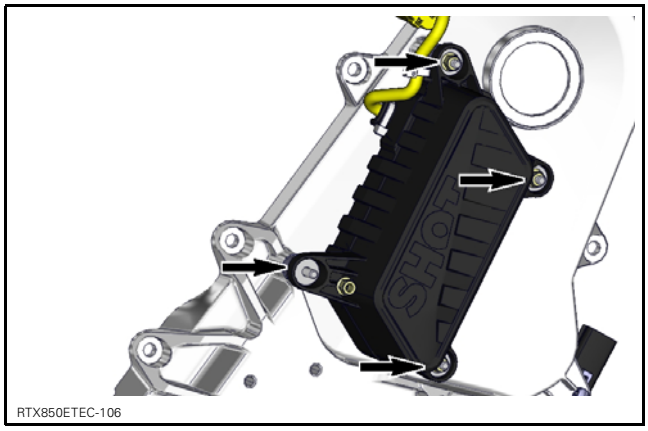
ULTRA CAPACITOR

Removing the Ultra Capacitor

1. Remove the locking tab on the electrical connector.
2. Disconnect the electrical connector.


RTX850ETEC-105

3. Remove the retaining screws and remove the ultra capacitor.


RTX850ETEC-106

Installing the Ultra Capacitor

1. Install the ultra capacitor and install the retaining screws.
2. Connect the electrical connector.
3. Install the locking tab on the electrical connector.

TIGHTENING TORQUE	
Retaining nuts	5 N•m ± 0.5 N•m (44 lbf•**in** ± 4 lbf•**in**)

Testing the Charge Signal from ECM

This test checks that the ECM is signaling the ultra capacitor to charge.

1. Start the engine.
2. Measure voltage while engine is running. Backprobe on the ECM side.

UCAP CONNECTOR (ECM SIDE) 55 VOLT WIRE	UCAP CONNECTOR (ECM SIDE) GROUND WIRE	MEASUREMENT
Pin 4	Pin 1	55 Volts

If 55 volts is not present there is a charging system problem. Check the 55 volt system. Refer to the *POWER DISTRIBUTION AND GROUNDS*, and the *MAGNETO AND STARTER* subsections.

3. Check for a ground signal when within approximately 10 seconds following the engine start.

UCAP CONNECTOR (ECM SIDE) CHARGE SIGNAL WIRE	UCAP CONNECTOR (ECM SIDE) GROUND WIRE	MEASUREMENT
Pin 5	Pin 1	Close to 0 volts

If the magneto charging system is working properly and, no ground within 10 seconds of engine start, replace the ECM.

Testing the Discharge Signal from ECM

This test checks that the ECM is signaling the ultra capacitor to discharge.

1. Start and idle the vehicle for 2 minutes.
2. Measure voltage while engine is running. Backprobe on the ECM side.

UCAP CONNECTOR (ECM SIDE) 55 VOLT WIRE	UCAP CONNECTOR (ECM SIDE) GROUND WIRE	MEASUREMENT
Pin 4	Pin 1	55 Volts

If 55 volts is not present there is a charging system problem. Check the 55 volt system. Refer to the *POWER DISTRIBUTION AND GROUNDS*, and the *MAGNETO AND STARTER* subsections.

3. Turn off the engine.
4. Set emergency stop switch to RUN.
5. Install D.E.S.S. key on D.E.S.S. post.
6. Check for a ground signal when pushing on the SHOT button.

UCAP CONNECTOR (ECM SIDE) DISCHARGE SIGNAL WIRE	UCAP CONNECTOR (ECM SIDE) GROUND WIRE	MEASUREMENT
Pin 2	Pin 1	Close to 0 volts

If no discharge signal, ensure that the SHOT button is working properly, refer to the *ROTAX ELECTRONIC REVERSE (RER)* subsection.

If the SHOT button is working, replace the ECM.

Testing the 55 Volt Output Circuit

This test checks that the ultra capacitor outputs 55 volts when discharged.

1. Set emergency stop switch to RUN.
2. Install D.E.S.S. key on D.E.S.S. post.
3. Start and idle the vehicle for 2 minutes.
4. Check for a 55 volts when pushing on the SHOT button. Backprobe on the ECM side.

UCAP CONNECTOR (ECM SIDE) 55 VOLT OUTPUT	UCAP CONNECTOR (ECM SIDE) GROUND WIRE	MEASUREMENT
Pin 4	Pin 1	Close to 55 volts

Measuring the 12 Volt ECM Wake-up Voltage from Ultra Capacitor

This test checks that the ECM receives the necessary 12 volts from the ultra capacitor to wake up and signal the ultra capacitor to discharge.

1. Start and idle the vehicle for 2 minutes.
2. Turn off the engine.
3. Measure the voltage. Backprobe on the UCAP side.

UCAP CONNECTOR (UCAP SIDE) 12 VOLTS WIRE	UCAP CONNECTOR (ECM SIDE) GROUND WIRE	MEASUREMENT
Pin 3	Pin 1	Close to 12 volts

If voltage is under 9 volts, replace the ultra capacitor.

Testing the Ability to Maintain Charge

1. Start and idle the vehicle for 2 minutes.
2. Turn off the engine.
3. Wait 30 minutes.
4. Measure the voltage available while pressing the SHOT button. Backprobe on the UCAP side.

UCAP CONNECTOR (UCAP SIDE) 55 VOLT WIRE	UCAP CONNECTOR (UCAP SIDE) GROUND WIRE	MEASUREMENT
Pin 4	Pin 1	Above 48 volts

If voltage drops below 48 volts within 30 minutes, the UCAPs ability to maintain a charge has decreased. The success rate of the SHOT starting system will decrease.

If the SHOT button is working, and the charge and discharge signal circuits are good, replace the ultra capacitor.

ECM

Aligning the SHOT System Automatically with BUDS2

Align the SHOT system if any components listed in (except button and UCAP *GENERAL DESCRIPTION* are replaced.

1. Fully charge the ultra capacitor by running the engine for a minimum of 2 minutes.

The rest of this procedure must be completed within 20 minutes.

2. Remove both spark plugs.
3. Install the D.E.S.S. key on the D.E.S.S. post.
4. Set the emergency stop switch to the RUN position.
5. Connect the vehicle to the BRP diagnostic software (BUDS2).
6. In BUDS2, select:
   - **Settings** page
   - **ECM** button
   - Initialization - Align SHOT Automatically
7. Click Start.
8. Press and hold the SHOT button. The alignment sequence will start.

NOTE: It may take up to 5 seconds for the sequence to start after pressing the SHOT button.

9. When BUDS2 displays that the alignment sequence is complete, release the SHOT button.

If the procedure was interrupted, power off the vehicle and power it back on. Then, start the procedure again.

The crankshaft will make about one full rotation.

10. Reinstall all removed components.

Reasons for a Failed Alignment

Problem with ACPS

Problem with stator windings, or magneto charging system.

Engine starting conditions not met (emergency stop switch, DESS Key).

Defective or discharged ultra capacitor.

Blank ECM (new service part).

Defective ECM or has been programmed to a non-SHOT model.

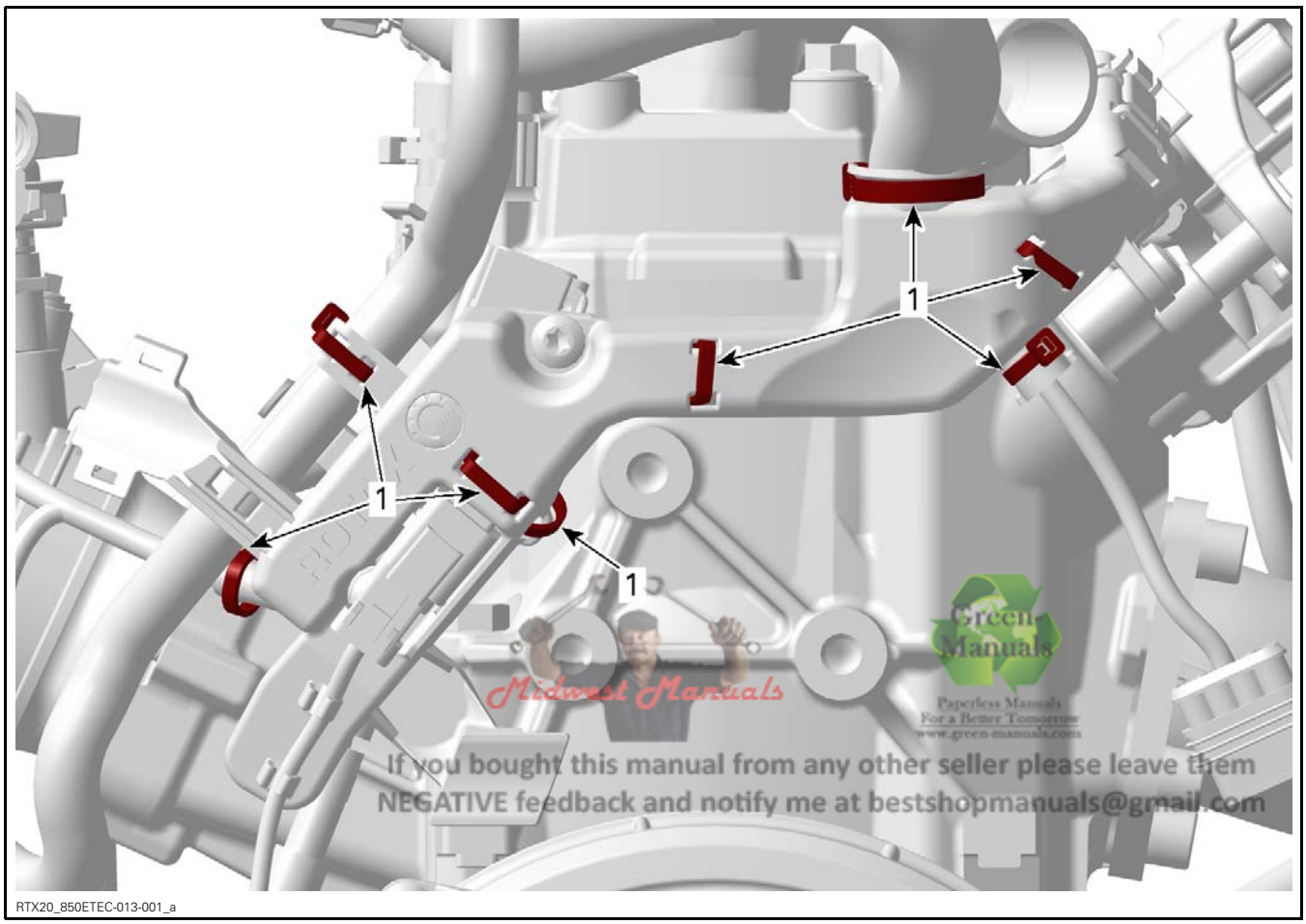
ENGINE HARNESS

GENERAL

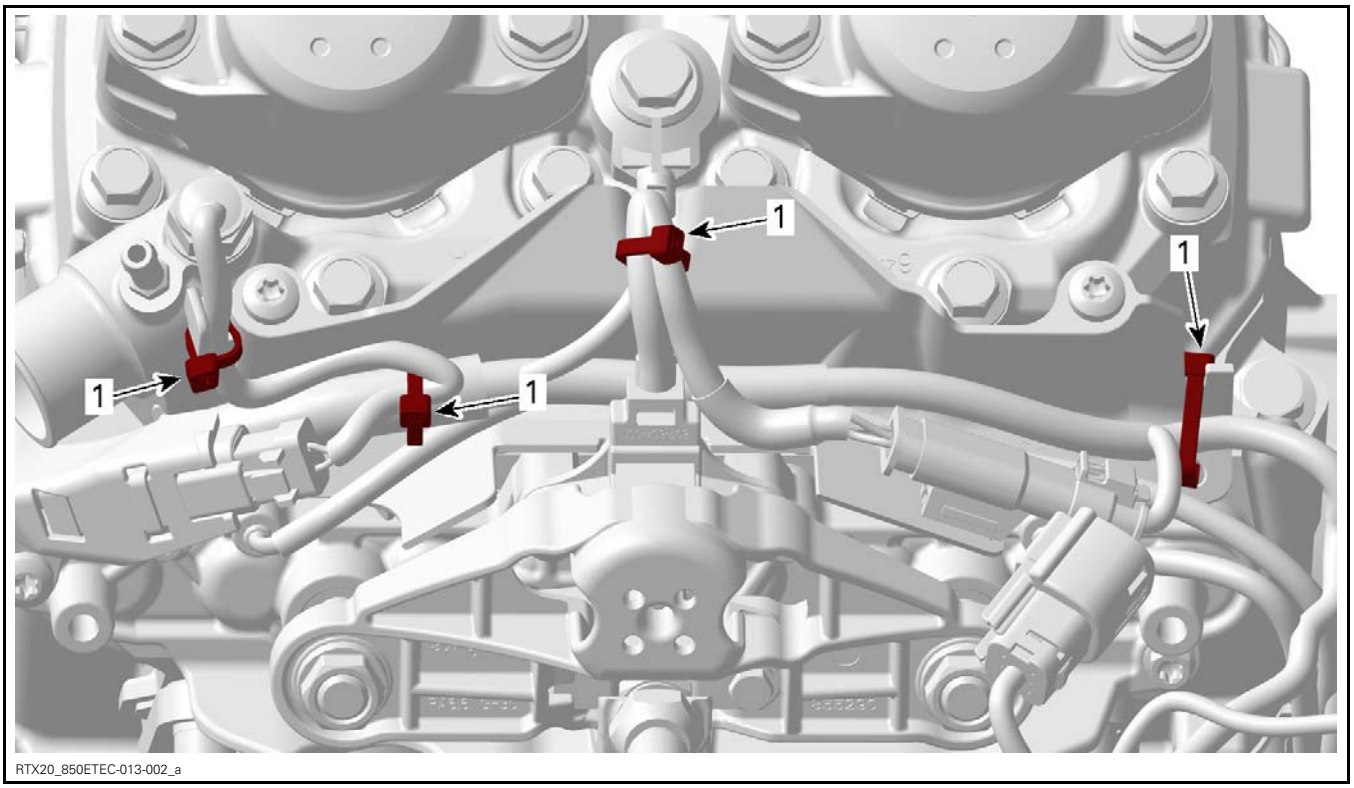
For connector replacement or wire repair procedures refer to *WIRING HARNESS AND CONNECTORS* subsection.

The adequate installation of the engine harness into the front and lateral harness supports is important to avoid electrical problems. The position of the wires, connectors and locking ties must be done as per the following illustrations.

To install the engine harness properly, the following parts are required:



RTX20_850ETEC-013-001_a



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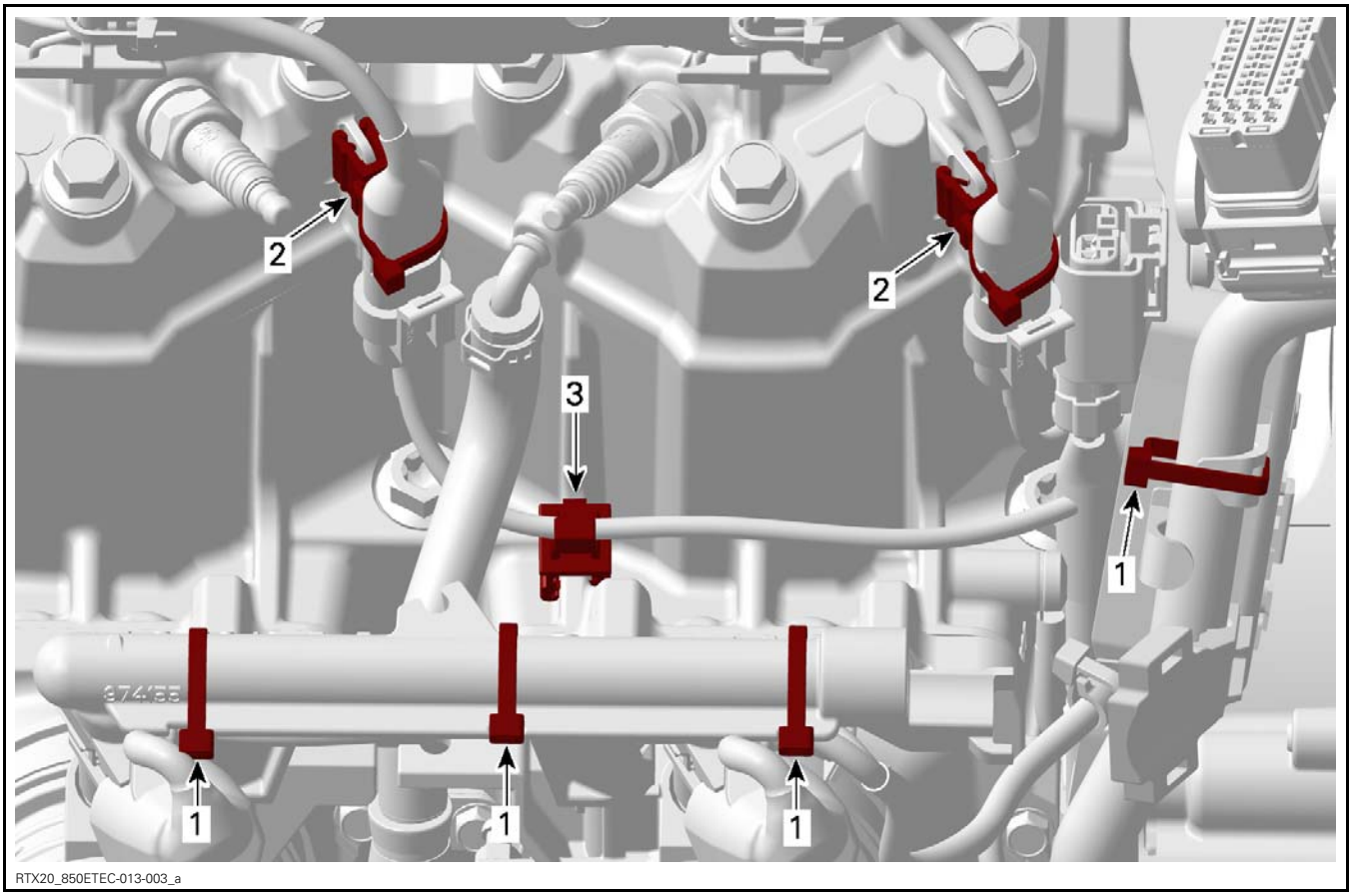


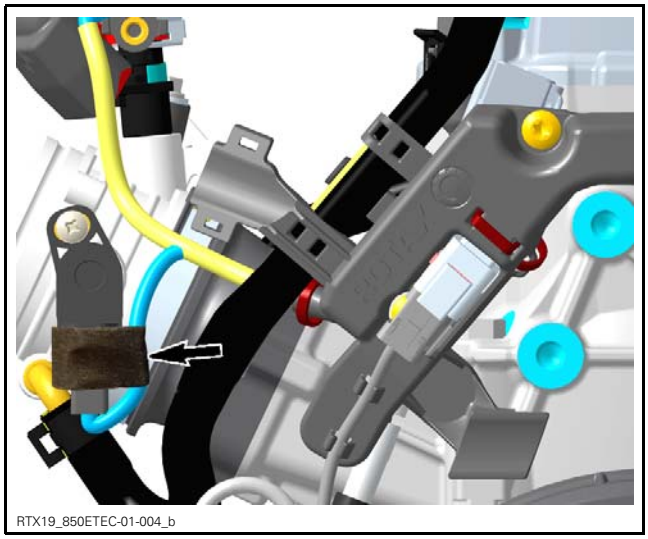
RTX20_850ETEC-013-003_a

ITEM	DESCRIPTION
1	Locking tie 175 mm (6-29/32 in) x 4 mm (5/32 in)
2	Locking tie with mount 150 mm (6 in) x 4.6 mm (3/16 in)
3	Locking tie with mount 150 mm (6 in) x 4.6 mm (3/16 in)

PROCEDURES

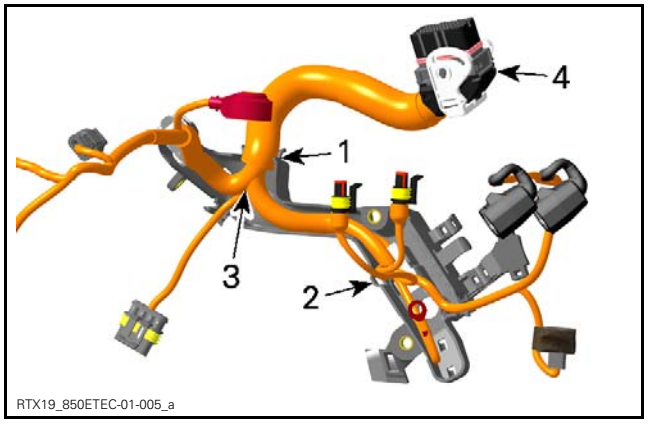
REMOVING THE ENGINE WIRING HARNESS

NOTICE The TPS connector can be disconnected without cutting the tape.


RTX19_850ETEC-01-004_b

ENGINE WIRING HARNESS ASSEMBLY

1. Position the "Y" of the engine harness inside the molded recess of the harness support.
   – The ECM connector upwards.
   – The branch having 5 connectors and the ECM ground towards the right side of the harness support.



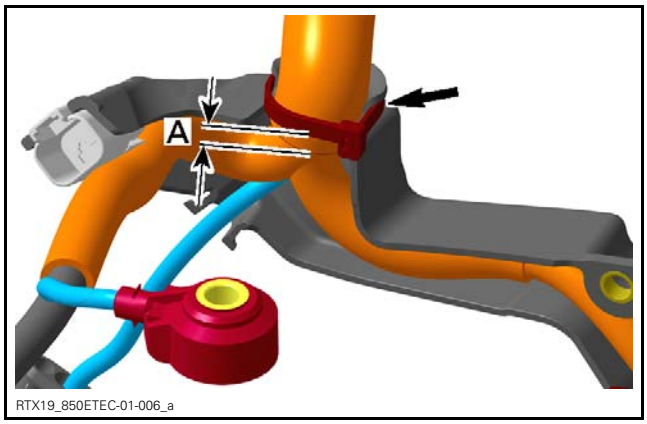
RTX19_850ETEC-01-005_a

HARNESS SUPPORT

1. Recess of harness support
2. Right side of harness support
3. "Y" of engine harness
4. ECM connector

2. Secure the ECM connector harness to the harness support.

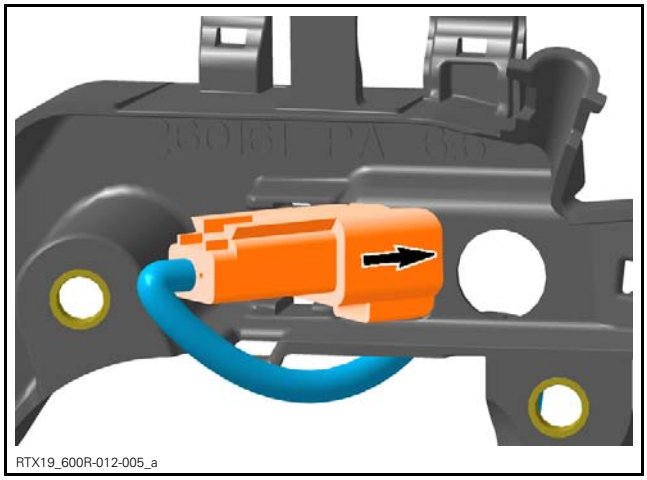
NOTICE Make sure head of the locking tie is correctly positioned and in the proper direction.



RTX19_850ETEC-01-006_a

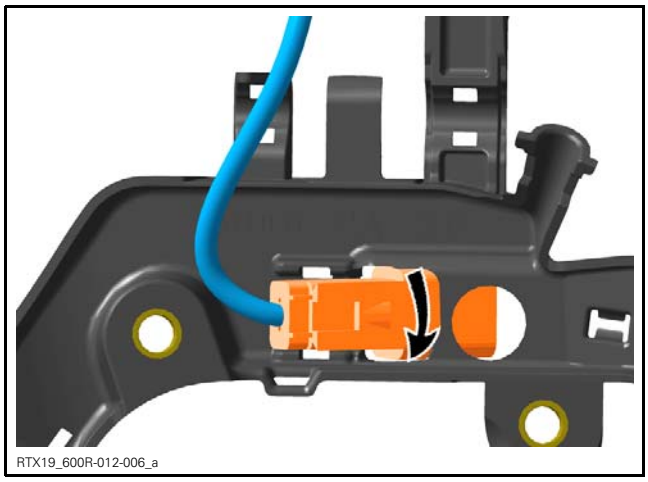
A. 5 mm (.2 in)

3. Engage CPS connector to the harness support:
   3.1 Lead connector through harness support.


RTX19_600R-012-005_a

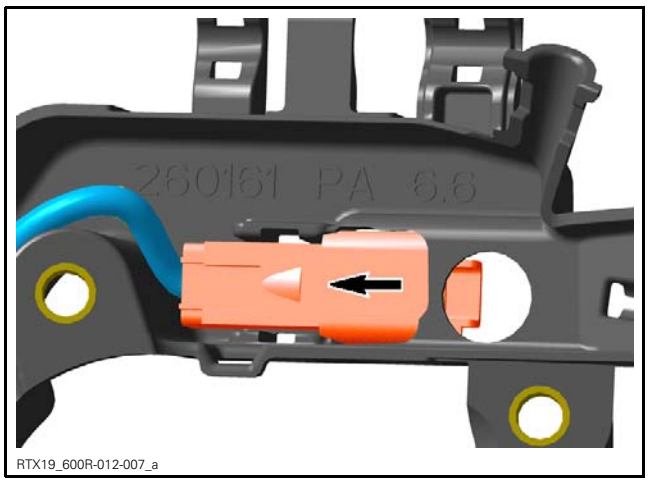
TYPICAL

   3.2 Turn connector


RTX19_600R-012-006_a

TYPICAL

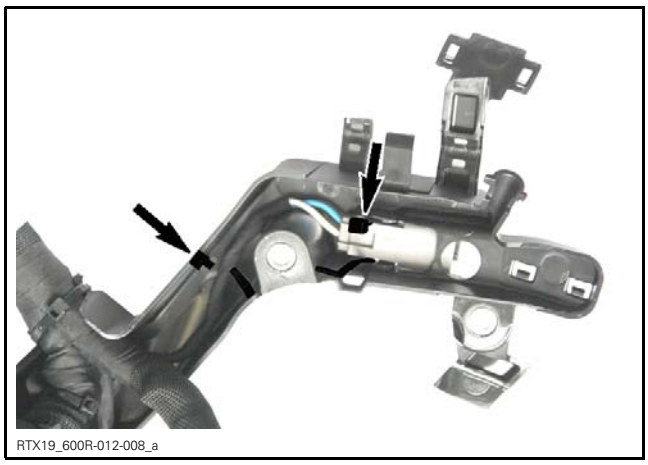
3.3 Move connector backwards to engage it proper in the harness support.



RTX19_600R-012-007_a

TYPICAL

4. Install locking ties in harness support but do not lock yet.

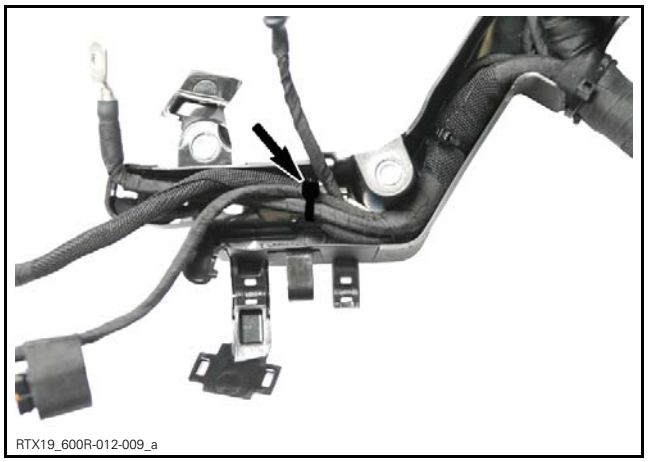

RTX19_600R-012-008_a

TYPICAL

5. Route the rear side portion of the harness into the harness support and secure it.

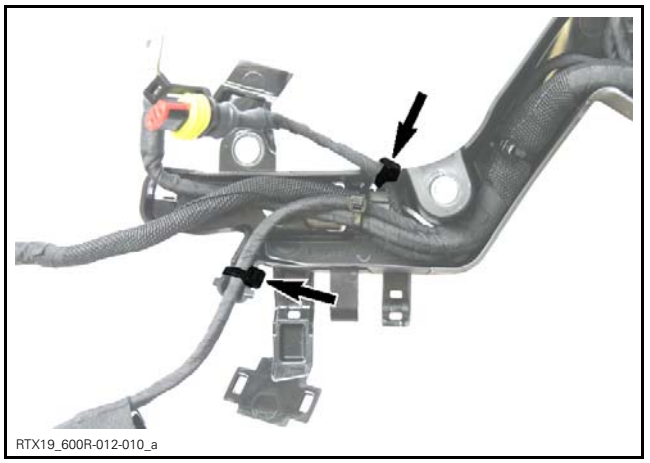
Secure following:
- GND cable
- E-TEC direct fuel injector cable (PTO injector)
- TPS/Throttle body injector cable.

NOTICE **E-TEC direct fuel injector cable (MAG injector) is not secured by the locking tie.**


RTX19_600R-012-009_a

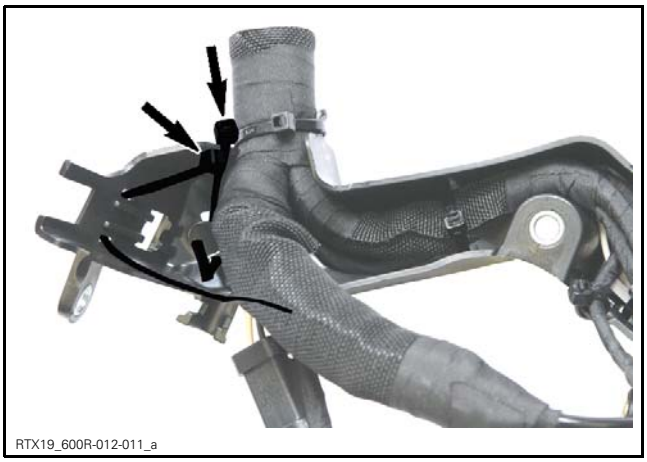
TYPICAL

6. Using a locking tie to secure:
   - TPS/Throttle body injector cable
   - E-TEC direct fuel injector cable (MAG injector).


RTX19_600R-012-010_a

TYPICAL

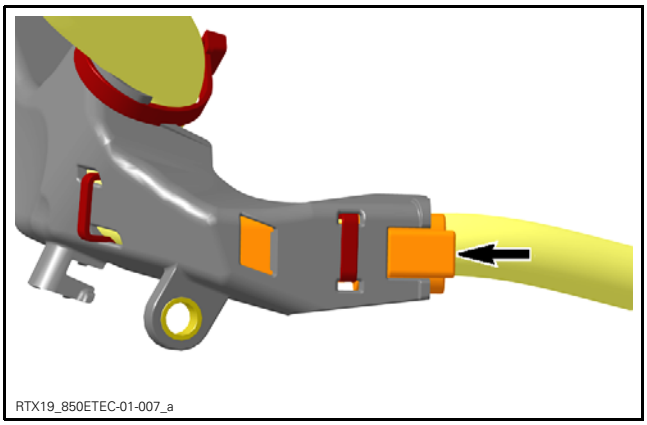
7. Place locking ties in harness support.


RTX19_600R-012-011_a

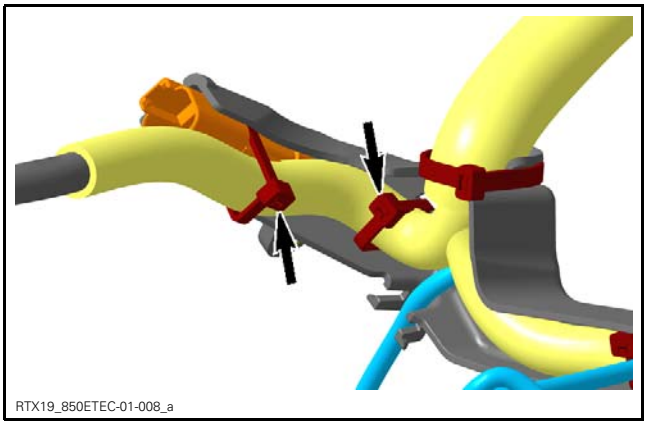
TYPICAL

8. Engage CTS connector in harness support.

NOTICE **Ensure connector is properly locked.**

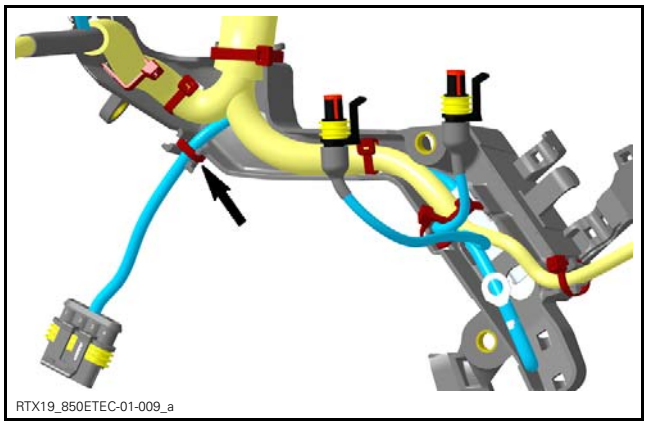

RTX19_850ETEC-01-007_a

9. Secure CTS connector and wiring harness to harness support


RTX19_850ETEC-01-008_a

SHOT models

10. Secure Absolute CPS cable to harness support.

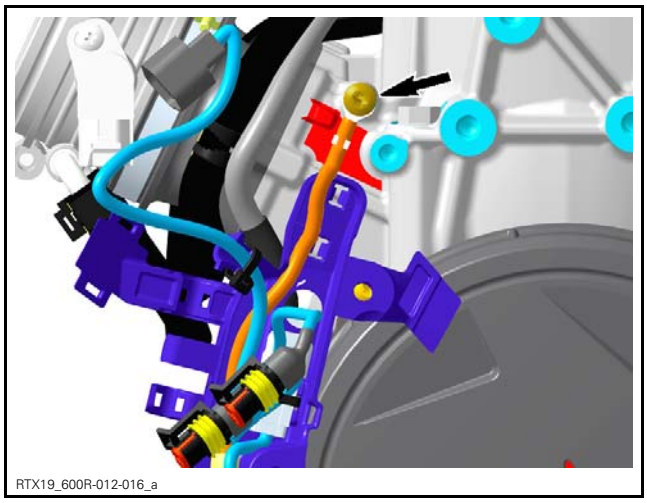

RTX19_850ETEC-01-009_a

INSTALLING THE ENGINE WIRING HARNESS

1. Install the ground cable.

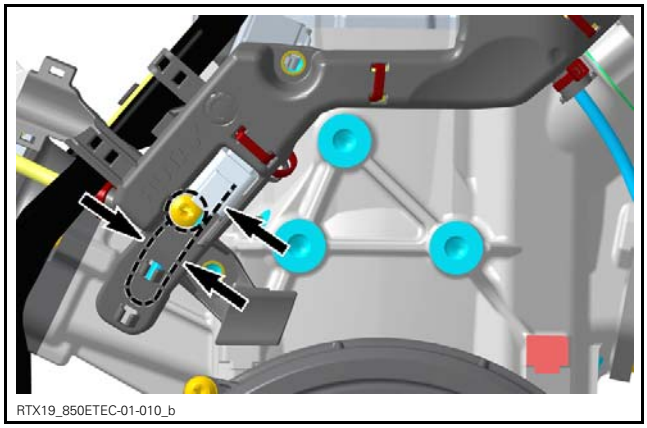
Tighten the ground cable screw to specification.

TIGHTENING TORQUE	
Ground cable screw	8 N•m ± 0.5 N•m (71 lbf•**in** ± 4 lbf•**in**)

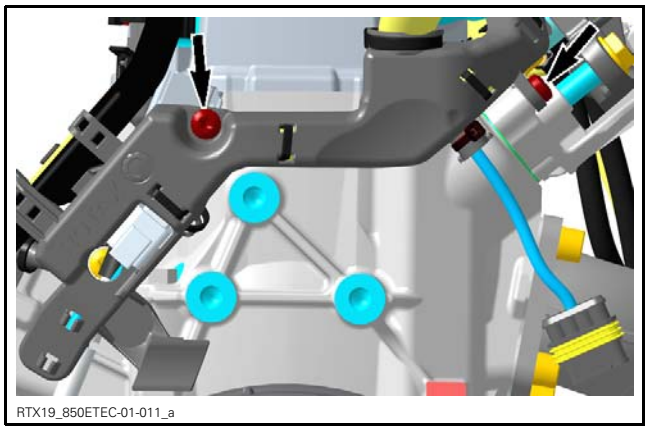

RTX19_600R-012-016_a

2. Place pre-assembled engine wiring harness with harness support on the engine MAG side.

NOTICE **Ensure that GND cable is placed proper underneath harness support.**


RTX19_850ETEC-01-010_b

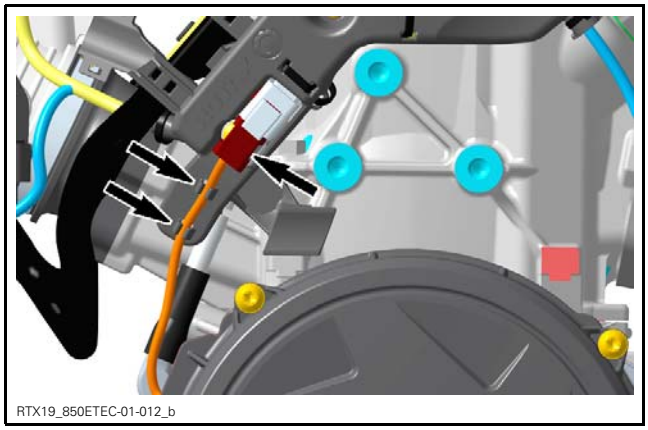
3. Tighten the harness support retaining screws to specification.


RTX19_850ETEC-01-011_a

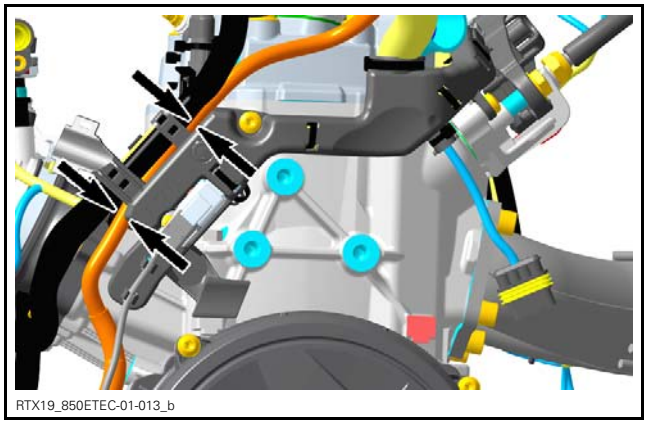
TIGHTENING TORQUE	
Harness support retaining screws	8 N•m ± 0.5 N•m (71 lbf•**in** ± 4 lbf•**in**)

4. Connect the CPS connector.

Engage CPS cable in harness support.

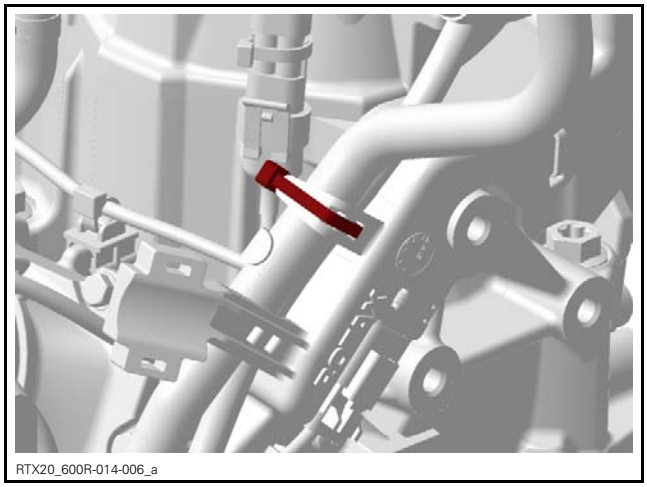

RTX19_850ETEC-01-012_b

5. Route stator wire in the cable harness support.

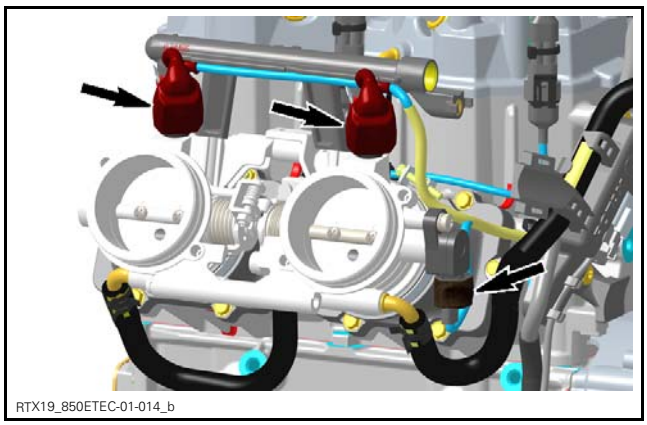

RTX19_850ETEC-01-013_b

NOTICE **The stator wire is routed underneath the throttle body heating hose.**

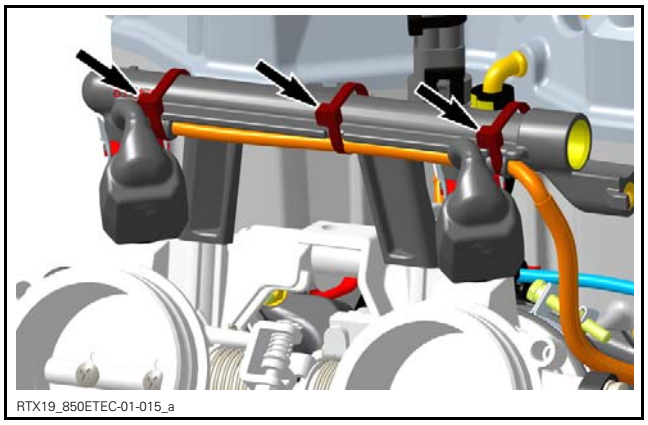
6. Secure throttle body heating hose to harness support.


RTX20_600R-014-006_a

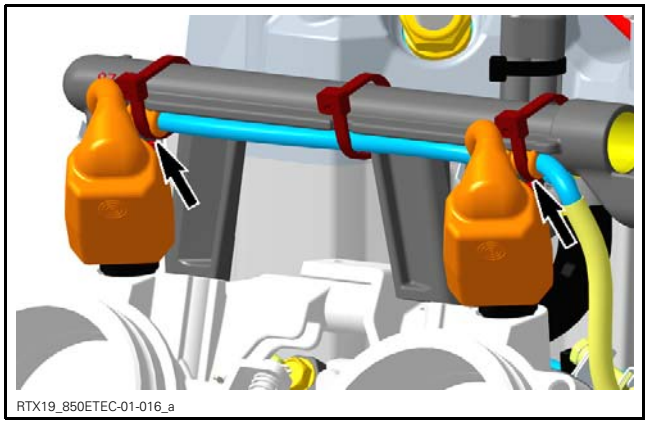
7. Route TPS wire behind the throttle body heating hose.
8. Connect wiring harness connectors to
   - TPS
   - Throttle body injectors.


RTX19_850ETEC-01-014_b

9. Secure the engine wiring harness to the fuel rail.

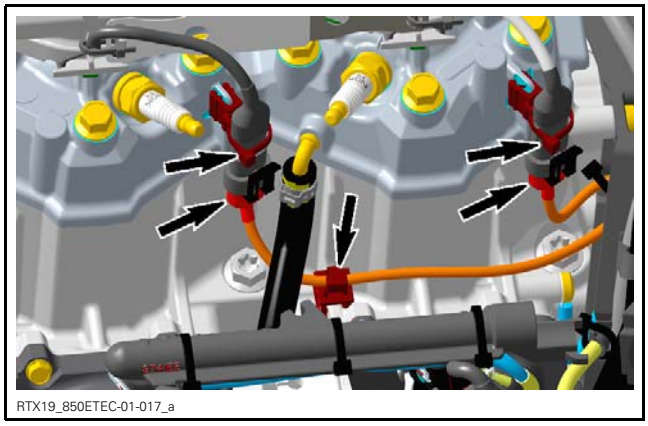

RTX19_850ETEC-01-015_a

NOTICE Ensure to install the locking ties in the grooves of the injector connector protecting covers.


RTX19_850ETEC-01-016_a

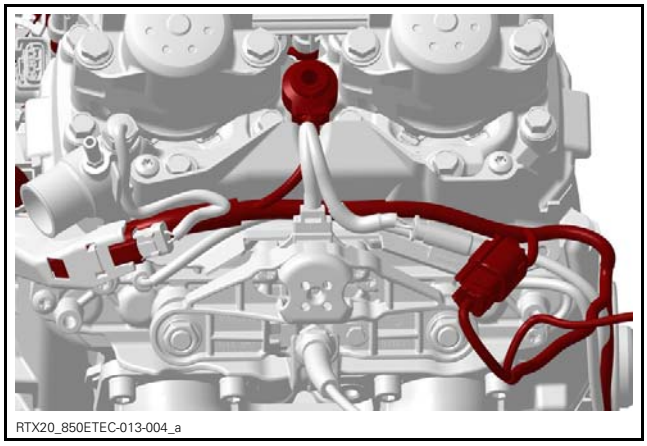
10. Connect E-TEC direct fuel injector connectors.
11. Secure both E-TEC direct fuel injector cables.

Route fuel injector cable (PTO injector) underneath the throttle body heating hose.


RTX19_850ETEC-01-017_a

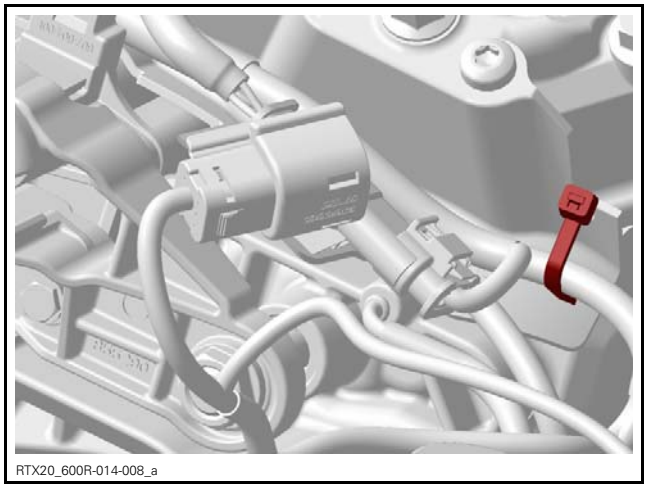
12. Clean contact surface of knock sensor (KS) on cylinder head
13. Place the engine harness into the front harness support.

NOTICE Engine harness must not cross the RAVE oil line after harness installation.


RTX20_850ETEC-013-004_a

14. Secure engine wiring harness using a locking tie.

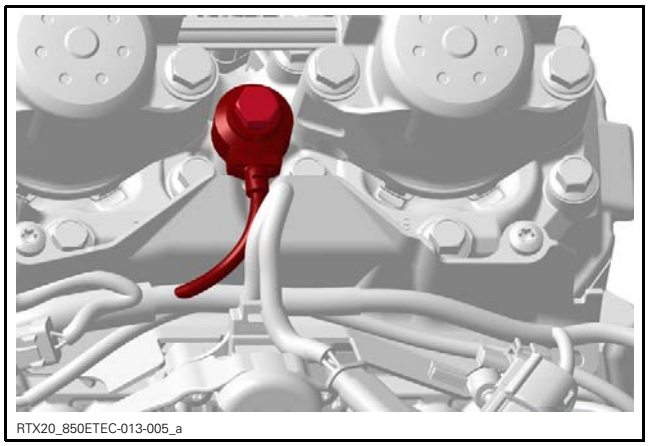
NOTICE Make sure head of the locking tie is correctly positioned and in the proper direction.


RTX20_600R-014-008_a

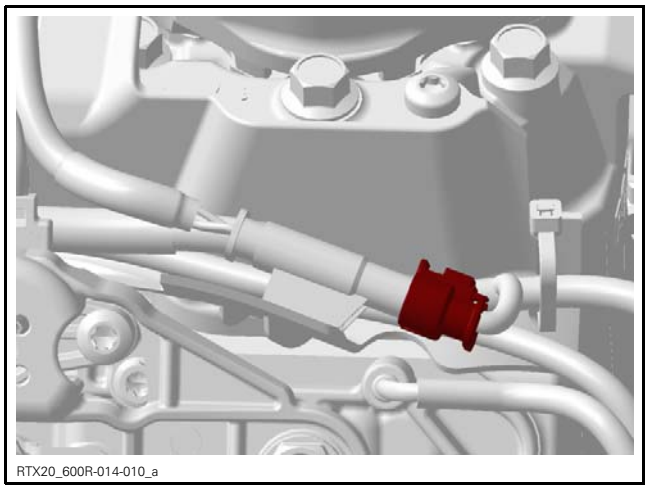
15. Put KS in place and tighten KS screw to specification.

TIGHTENING TORQUE	
Knock sensor screw	24 N•m ± 1 N•m (18 lbf•ft ± 1 lbf•ft)

NOTICE Improper torque may prevent sensor from functioning properly possibly leading to severe internal engine component damage.


RTX20_850ETEC-013-005_a

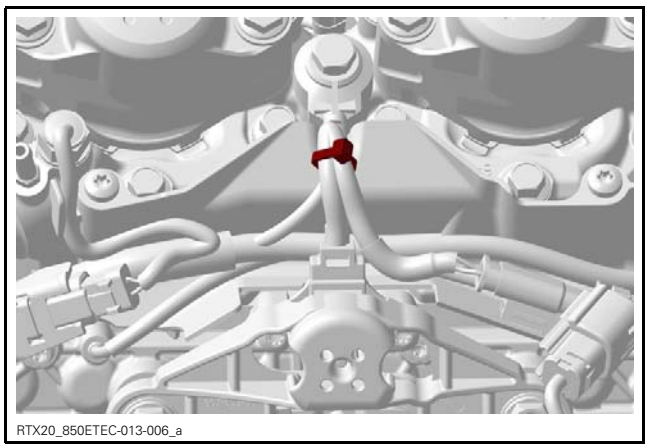
16. Connect wiring harness connector to 3D Rave Valve Position Sensor and engage connector on harness support.


RTX20_600R-014-010_a

17. Route the 3D Rave Valve Position Sensor wire and secure it to the KS wire.

Position locking tie behind protection tape and make sure head of the locking tie is correctly positioned.

NOTICE Ensure to route 3D Rave Valve Position Sensor wire free from tension.

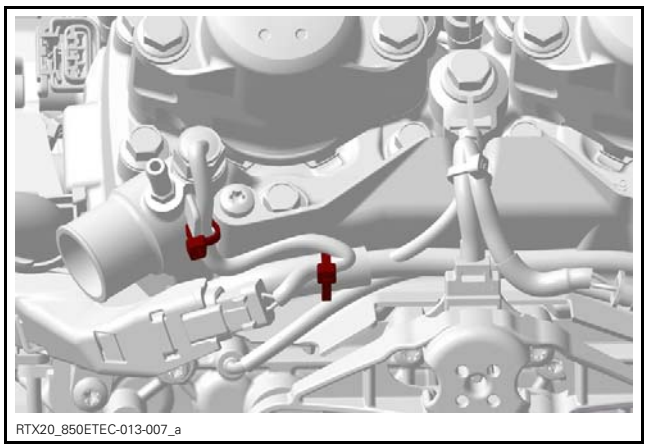

RTX20_850ETEC-013-006_a

18. Connect CTS connector to the wiring harness.
19. Secure the CTS wire to the engine wiring harness.

NOTICE Ensure not to tie in RAVE oil line.

20. Secure the CTS wire to the harness support.

NOTICE Ensure to route CTS wire free from tension.


RTX20_850ETEC-013-007_a

ROTAX ELECTRONIC REVERSE (RER)

SERVICE TOOLS

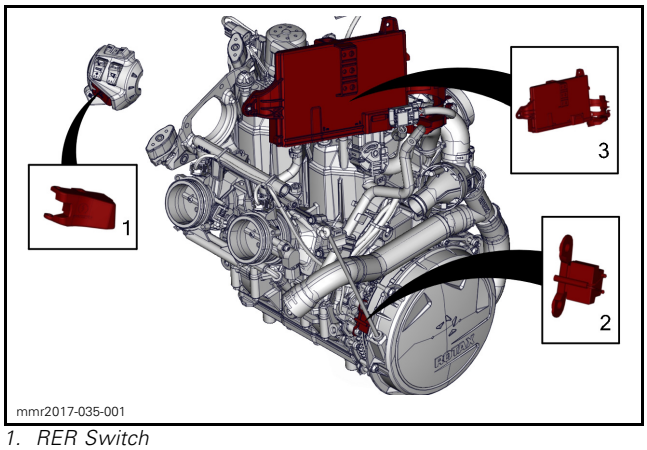
Description	Part Number	Page
12 V BATTERY SUPPLY CABLE	529 035 997	2
DIAGNOSTIC CABLE	710 000 851	2
ECM ADAPTER TOOL	529 036 166	2–3
FLUKE 115 MULTIMETER	529 035 868	2
MPI-2 INTERFACE CARD	529 036 018	2
MPI-3 INTERFACE CARD	529 036 353	2
POWER INTERFACE	515 177 223	2

SERVICE TOOLS – OTHER SUPPLIER

Description	Part Number	Page
OPTIONAL MALE-FEMALE EXTENSION SERIAL CABLE	(DB9)	2

GENERAL

The main components of the RER system are:



1. *RER Switch*
2. *Crankshaft position sensor (CPS)*
3. *ECM*

The ECM receives signals from the CPS for forward and reverse engine rotation.

The ECM recognizes a signal sent by the RER switch.

When the RER switch is activated and the engine is running at or near idle speed, the ECM cuts off ignition, therefore causing the engine RPM to drop off gradually.

When the engine reaches a predetermined low RPM (approximately 450 RPM), the ECM initiates an ignition spark that is greatly advanced in timing, creating a thrust which reverses engine rotation.

If the following condition are not meet, the RER function is disabled and nothing takes place when the RER button is pressed.

– RPM between 1000 and 4300 RPM
– Throttle lever released (TPS opening below 2%)
– Vehicle speed below 25 km/h (16 MPH).

NOTE: Refer to *E-TEC DIRECT FUEL INJECTION* subsection for crankshaft position sensor (CPS) testing.

TROUBLESHOOTING

DIAGNOSTIC TIPS

RER Does Not Respond When Depressing RER Button

Check the following:

– RER fuse condition
– Check if the vehicle is properly configured in B.U.D.S. (with Mechanical Reverse check box not selected)
– *TESTING RER SWITCH SIGNAL WITH B.U.D.S.*

Engine Stops after Pressing RER Button

This confirms that RER control circuits function normally. Check the following:

– CPS
– Engine compression, refer to *TOP END* subsection.
– Reed valves leaking, refer to applicable *TOP END* subsection

– RAVE valve adjustment or sticking, refer to *RAVE* subsection
– Drive belt adjustment, refer to *DRIVE SYSTEM AND BRAKE* subsection
– ECM
– Stator, refer to *MAGNETO SYSTEM* subsection
– Capacitor, refer to *CHARGING SYSTEM* subsection.

Ensure 55V system is in good condition at idle.

RER Functions Erratically

1. Check engine compression.

NOTE: A low compression resulting in loss of engine power may cause the RER to function erratically, leading you to believe the problem is in the electronic control system.

2. Low compression may be due to the following items:
   – REED valves leaking or broken
   – RAVE valves sticking
   – Worn engine parts.
3. Check piston condition through the intake and exhaust ports.

NOTE: Look for scoring on piston skirts. Scored piston skirts or other mechanical problems resulting in excessive friction which may cause the RER to function erratically.

4. Also check the following:
   – RER switch for intermittent operation, refer to *TESTING RER SWITCH CONTINUITY* in this subsection
   – Loose (intermittent) electrical connections
   – Drive belt adjustment, refer to *DRIVE SYSTEM AND BRAKE* subsection
   – ECM.

PROCEDURES

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

RER SWITCH

Testing RER Switch Signal with BUDS2

1. Connect vehicle to BUSD2.Download from *KNOWLEDGE CENTER*. Refer to *COMMUNICATION TOOLS AND B.U.D.S.* subsection for proper connection instructions.

REQUIRED TOOLS	
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)	
POWER INTERFACE (P/N 515 177 223)	
12 V BATTERY SUPPLY CABLE (P/N 529 035 997)	
OPTIONAL MALE-FEMALE EXTENSION SERIAL CABLE (P/N (DB9))	

NOTE: A 12 volt battery is required to activate the electrical system.

2. In BUDS2, select the **Scan** button.
3. Select the **Measurements** tab.
4. Raise track and start the engine.
5. Press vehicle RER button and look for the **START/RER Button** status to change.

If the **START/RER Button** status changes, it indicates the RER switch, ECM and wiring are functioning properly. Test CPS. Refer to *E-TEC DIRECT FUEL INJECTION* subsection.

If the**START/RER Button** status does not change, carry out the RER switch tests that follow.

NOTE: When the B.U.D.S. RER test is carried out with engine running and reverse engages, the RER light on the **ECM Monitoring** page and the reverse light on the **Cluster Monitoring** page should both turn ON.

Testing RER Switch Continuity

1. Measure continuity of RER switch as per following table.

Models with multifunction switch on handlebar

2. Disconnect the RER switch (SH) connector.

SWITCH POSITION	SH CONNECTOR		RESISTANCE
Released	SH-1	SH-2	Continuity (0.4 Ω max.)
Press and held	SH-8	SH-2	Continuity (0.4 Ω max.)

Models with console switches

3. Disconnect the RER connector.

SWITCH POSITION	RER CONNECTOR		RESISTANCE
Release	RER-1	RER-2	O.L.
Press and hold	RER-1	RER-2	Continuity (0.4 Ω max.)

If continuity test fails, replace switch.

If continuity tests were good, measure voltage as per *TESTING RER SWITCH CIRCUIT*.

Testing RER Switch Circuit

Models with multifunction switch on handlebar

1. Backprobe SH2 connector pins as per table.
2. Lift track and idle vehicle.

(SH) CONNECTOR		SPECIFICATION
SH-1	Chassis ground	0Ω
SH-2	START / RER SIGNAL	Chassis ground when switch is released
		12 volts when switch is pressed and held
SH-8	Chassis ground	Unswitched 12 Vdc

If chassis ground SH-1 and 12 volts SH-8 measurements are good **but** START / RER SIGNAL SH-2 measurements are incorrect, replace switch.

If chassis ground is not measured, repair the wire between chassis ground and SH connector.

If 12 votls is not measured, repair the wire between RER fuse and SH connector.

Testing RER Switch Circuit

Models with console switches

1. Set multimeter to Vdc.
2. Backprobe RER connector pins as per table.
3. Lift track and idle vehicle.

(RER) CONNECTOR		SPECIFICATION
RER-2	Chassis ground	12 Vdc
RER-1	Chassis ground	No voltage when switch is released
		12 volts when switch is pressed and held

If no voltage is present at RER-1 when switch is pressed and held, replace switch.

If no voltage is present at RER-2, repair the wire between RER fuse and RER-2 connector.

Testing RER Switch Signal to ECM

Models with electric starter

1. If applicable, ensure the (SD) starter solenoid connector is disconnected.

All models

2. Disconnect ECMB connector and install the ECM ADAPTER TOOL (P/N 529 036 166).
3. Test wire continuity between the RER fuse and the ECMB connector as follows.

RER FUSE (F1)	ECMB CONNECTOR	RESISTANCE
FB-H	ECMB-A3	RER switch pressed and held Continuity (0.2 Ω max.)
FB-H	ECMB-A3	RER switch released Infinite (OL)

If continuity test is good, try a new ECM.

If test fails, repair or replace wiring.

BEEPER (REVERSE ALARM)

The reverse alarm (beeper) is integrated in the gauge cluster and is also used for emitting the vehicle beep codes. Refer to applicable *GAUGE* subsection for the testing procedure.

LIGHTS

SERVICE TOOLS

Description	Part Number	Page
12 V BATTERY SUPPLY CABLE	529 035 997	1
POWER INTERFACE	515 177 223	1

GENERAL

Refer to *WIRING HARNESS AND CONNECTORS* for electrical connector locations.

⚠ WARNING

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

SYSTEM TESTING

All vehicle lights are powered from the primary 12 Vdc circuit. This circuit is powered from and controlled by the ECM when the engine reaches 800 RPM. Refer to *POWER DISTRIBUTION AND GROUNDS* subsection for more information on how power is distributed to various systems.

For models without a battery, connect the following tools in order to provide electrical power to the vehicle.

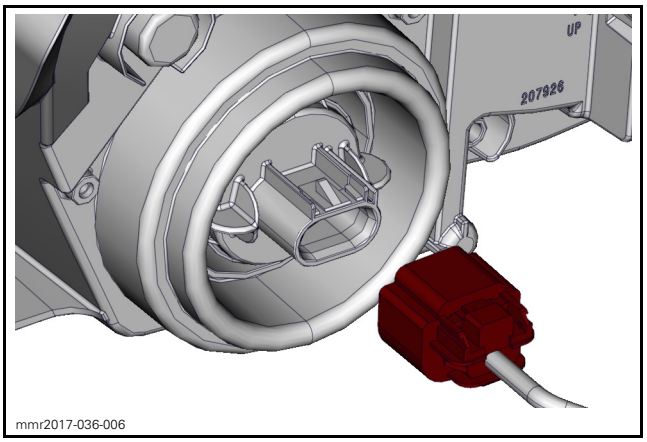
REQUIRED TOOLS
– POWER INTERFACE (P/N 515 177 223) – 12 V BATTERY SUPPLY CABLE (P/N 529 035 997) – 12-volt battery

PROCEDURES

HEADLIGHTS

Removing Headlight Bulb

1. Remove gauge and trim. Refer to *BODY* subsection.
2. Remove front glove box. Refer to *BODY* subsection.
3. Unplug electrical connector.



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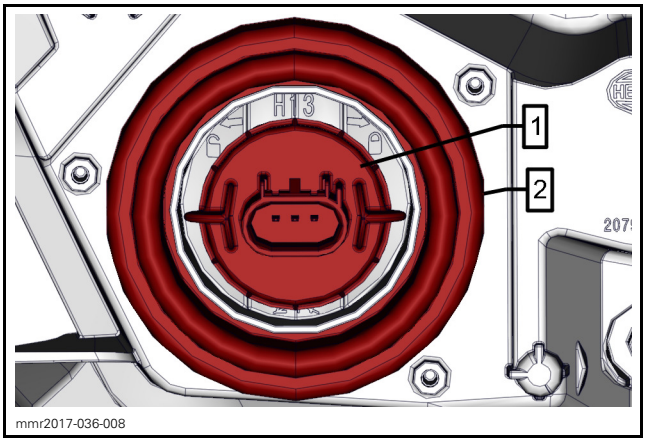
4. Turn bulb socket to unlock and remove bulb.

NOTE: Ensure bulb seal stays in place.



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1. Bulb socket
2. Bulb seal

Installing Headlight Bulb

NOTICE **Never touch glass portion of a halogen bulb with bare fingers, it shortens its operating life. If glass is touched, clean it with isopropyl alcohol which will not leave a film on the bulb.**

Reverse removal procedure.

Measuring Headlight Input Voltage

1. Disconnect headlight connector(s).
2. Provide electrical power to the headlights for testing.

3. Read voltage at headlight connector as follows.

SWITCH POSITION	WIRE COLOR (HEADLIGHT CONNECTOR)		VOLTAGE
LO beam	GY/OG	BK	Battery voltage (Vdc)
HI beam	GY/WH	BK	

If voltage is inadequate, carry out the following to find the source of the problem:
- Test headlights dimmer switch.
- Test wiring harness and connectors.
- Test primary 12 Vdc system. Refer to *CHARGING SYSTEM*.

Testing Headlight Dimmer with BUDS2

The headlight dimmer switch status can be monitored using BUDS2.

Testing Headlight Dimmer Switch Continuity

1. Disconnect the applicable connector depending on gauge, refer to following tables.
2. Test switch circuits on applicable connector on switch side as per table.

MODELS WITH COMPACT DIGITAL GAUGE			
SWITCH POSITION	DIMMER PINS		SPECIFICATION
HIGH	2	4	Close to 0 Ω
	2	1	Infinite (OL)
LOW	2	4	Infinite (OL)
	2	1	Close to 0 Ω

MODELS WITH ANALOG/DIGITAL GAUGE			
SWITCH POSITION	SH PINS		SPECIFICATION
HIGH	12	7	Close to 0 Ω
	6	7	Infinite (OL)
LOW	12	7	Infinite (OL)
	6	7	Close to 0 Ω

If tests were good, switch is functioning properly.

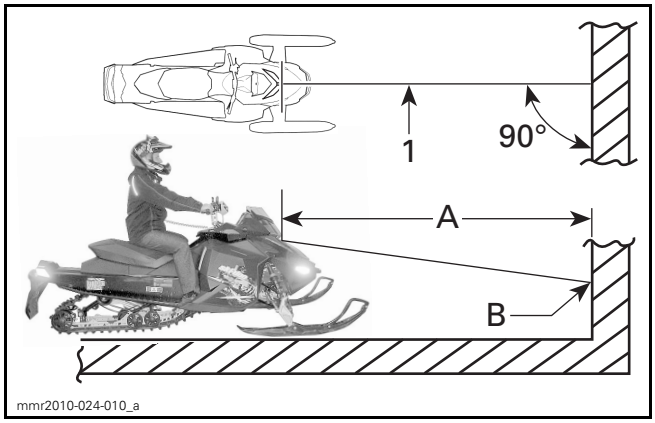
If any test failed, check wiring and connections going to switch.

If test of wiring and connections was good, replace switch.

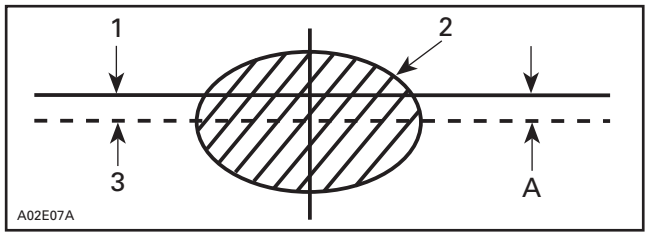
Aiming Headlight Beam

Beam aiming is correct when center of high beam is 25 mm (1 in) below the headlight horizontal center line, scribed on a test surface, 381 cm (12 ft 6 in) away.

1. Place the vehicle on a flat surface perpendicular to test surface (wall or screen) and 381 cm (12 ft 6 in) away from it.
2. Ask rider to sit on vehicle seat, or apply equivalent weight on the vehicle.
3. Select **high** beam.
4. Measure headlight center distance from ground. Scribe a line at this height on test surface (wall or screen). Light beam center should be 25 mm (1 in) below scribed line.



TYPICAL
1. Headlight center line
A. 381 cm (12 ft 6 in)
B. 25 mm (1 in) below center line



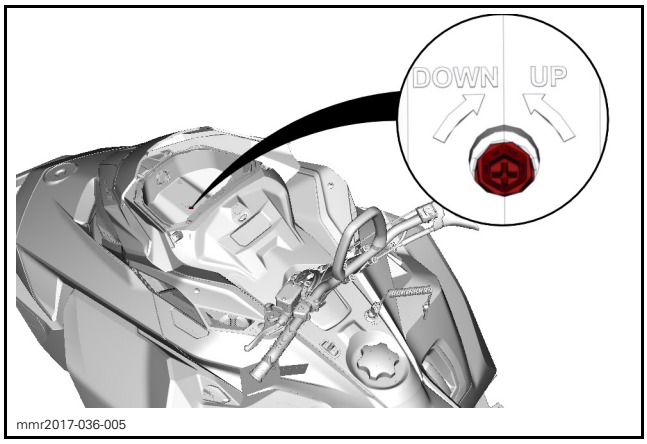
1. Headlight horizontal
2. Light beam (high beam) (projected on the wall)
3. Light beam center
A. 25 mm (1 in)

Adjusting Beam

Open the front storage compartment.

Turn knob to adjust the beam height.

NOTE: Avoid reaching extreme adjustments as the headlight assembly might move out of position.



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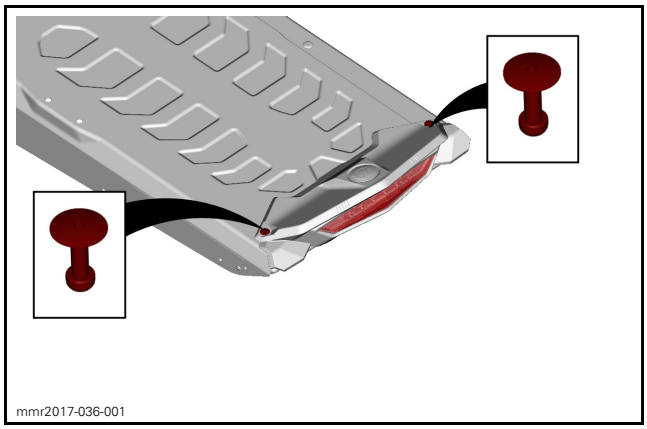
TAILLIGHT / BRAKE LIGHT

Replacing Taillight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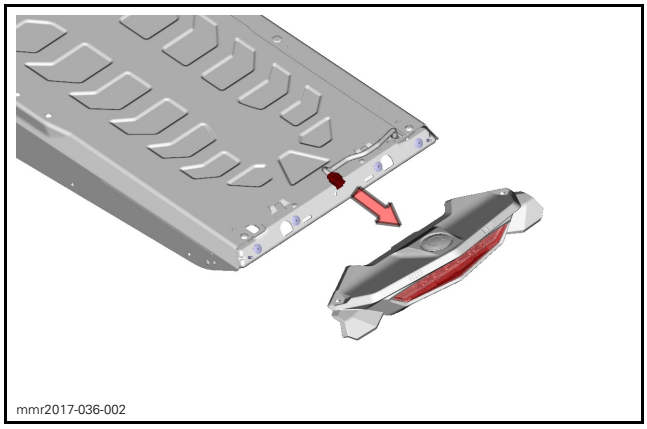
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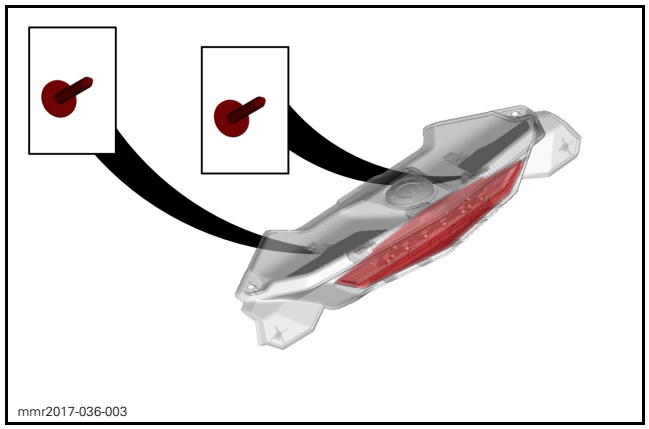
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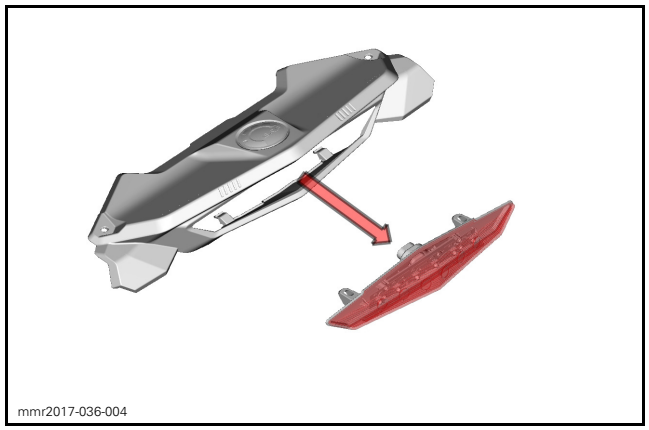
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Replace taillight.

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

TIGHTENING TORQUE	
Taillight retaining screw	0.4 N•m (4 lbf•**in**)

GAUGE 7.2" DIGITAL DISPLAY

SERVICE TOOLS

Description	Part Number	Page
FLUKE 115 MULTIMETER	529 035 868	1

GENERAL

Most of the electrical tests require the following tool.

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

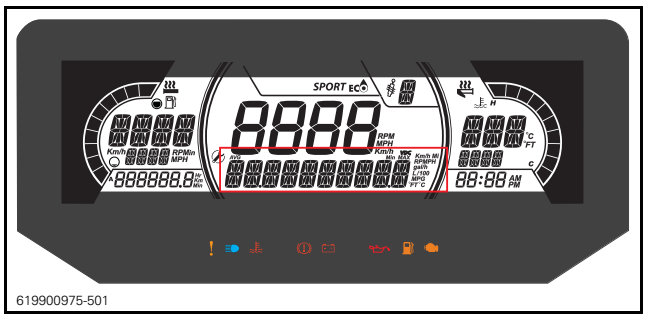
Refer to *WIRING DIAGRAM INFORMATION* subsection for diagnostic tips on troubleshooting electrical problems.

NOTICE It is recommended to always disconnect the battery when replacing any electrical component. Always disconnect battery as specified, BLACK (-) cable first.

INDICATOR LAMPS DESCRIPTION

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.

Important information messages can also be displayed temporarily in the lower display to assist indicator lamps.



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NOTE: Depending on the vehicle, not all the indicator lamps and messages will be applicable.

INDICATOR LAMPS (MALFUNCTIONS)			
INDICATOR LAMP(S)	DIGITAL WARNING	CAUSE	WHAT TO DO
None	BAD KEY	Wrong or defective key	- Use the right key for the vehicle. - Program a new key if the previous key is defective. - Check wiring and connectors. Refer to the *WIRING DIAGRAM*.
None	BELT OVERLOAD	Belt reached its limit	- Stop vehicle. - Inspect drive belt. Replace as required.
ON	HIGH ENGINE TEMPERATURE	Engine is overheating	- Stop and wait for engine to cool off. - Check for leaks. - Check and adjust the coolant level.

INDICATOR LAMPS (MALFUNCTIONS)			
INDICATOR LAMP(S)	DIGITAL WARNING	CAUSE	WHAT TO DO
ON	LO BATT VOLT or HI BATT VOLT	Low or high battery voltage	- Recharge battery. - Check battery connections. - Check the charging system.
ON	BRAKE	Throttle lever is applied when park brake is on	- Disengage park brake.
ON	CHECK ENGINE	Engine management component malfunction	- Stop the engine. The cluster must be completely shut down.
FLASHING	LIMP HOME MODE	Important engine management component	- Connect the vehicle to the BRP diagnostic software (BUDS2). Check faults codes and perform recommended actions.
ON	STOP ENGINE (ACE engines)	Low oil pressure	- Check for oil leaks.
	LOW OIL (E-TEC engines)	Low oil tank level	- Check and adjust the engine .
ON	Variable messages - The message changes in accordance with the defective component.		

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.

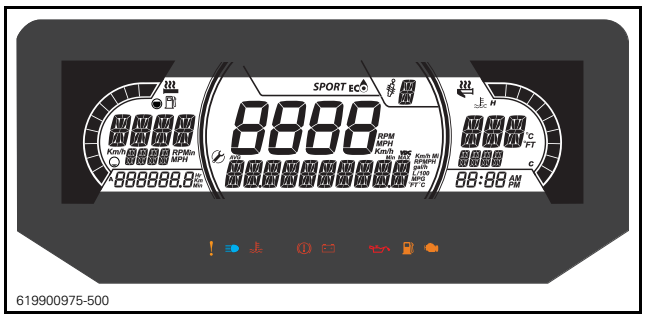
MULTIFUNCTION GAUGE TROUBLESHOOTING

GAUGE FUNCTIONS INOPERATIVE OR WORKING INTERMITTENTLY

1. Power supply or ground problem
   - *Check power supply and ground circuits.*

PROCEDURES

MULTIFUNCTION GAUGE



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 the vehicle to the BRP diagnostic software (BUDS2).

In BUDS2, go to:

– **Functions** page
– **Cluster** button
– **Routines - Execute Cluster WOW test**.

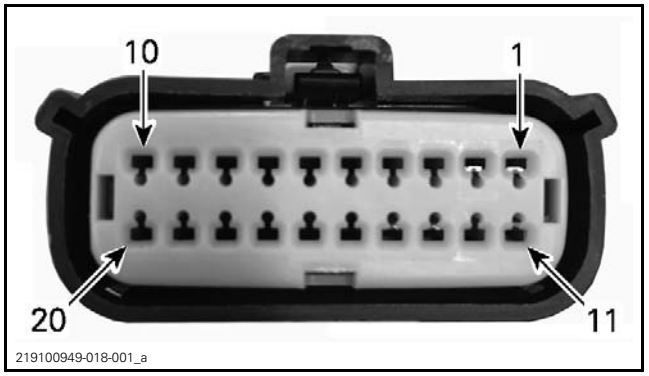
All indications will come and stay ON so that you can verify each indication.

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.
2. Perform the test 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	RESULTS
Multifunction connector pin 1	Negative (-) post	Any	Close to battery voltage
Multifunction connector pin 11		ON	Close to battery voltage

If there is no power at pin 1, check fuse F4 and the related circuit.

If there is no power at pin 11, in check fuse F2 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 CONNECTOR	BATTERY	RESULT
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 WIRE 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 CONNECTOR	DLC	RESULTS
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.

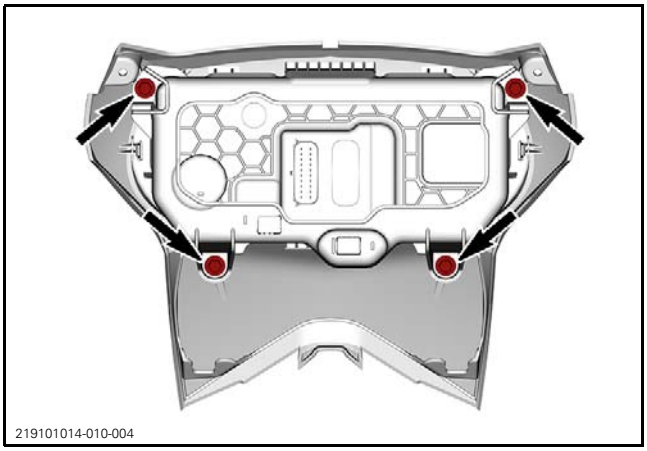
If the multifunction gauge functions, however there is a suspected communication problem with another component, perform this test between the multifunction gauge and that component.

If the multifunction gauge power, ground and CAN verification tests are all to specifications and the multifunction gauge is inoperative, replace the multifunction gauge.

Removing the Multifunction Gauge

Remove gauge support. Refer to procedure in *BODY* subsection

Disconnect the gauge connector. Remove following fasteners.



TYPICAL

Installing the Multifunction Gauge

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

TIGHTENING TORQUE	
Multifunction gauge retaining screws	1 N•m ± 0.2 N•m (9 lbf•**in** ± 2 lbf•**in**)

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.

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

SERVICE TOOLS

Description	Part Number	Page
12 V BATTERY SUPPLY CABLE	529 035 997	1
FLUKE 115 MULTIMETER	529 035 868	6
POWER INTERFACE	515 177 223	1

GENERAL

On multifunction analog/digital gauge, heated grips and heated throttle lever are limited at 50% output when idling.

NOTE: It is a good practice to check for fault codes using BUDS2 software as a first troubleshooting step. Refer to *DIAGNOSTIC AND FAULT CODES* subsection.

⚠ WARNING

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

SYSTEM TESTING

For models without a battery, connect the following tools in order to provide electrical power to the vehicle.

REQUIRED TOOLS
– POWER INTERFACE (P/N 515 177 223) – 12 V BATTERY SUPPLY CABLE (P/N 529 035 997) – 12-volt battery

SYSTEM DESCRIPTION (HEATED THROTTLE LEVER)

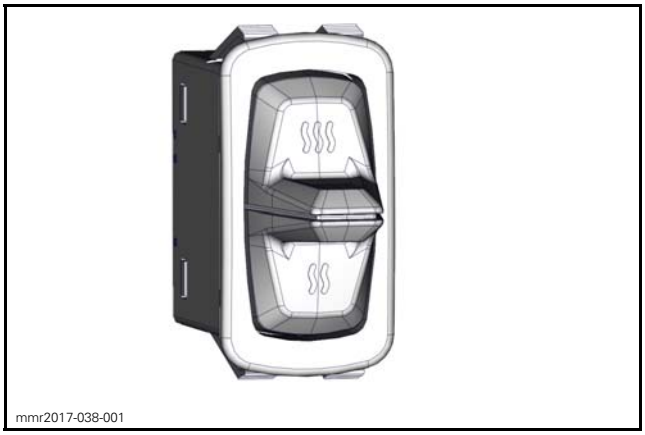
Power to the heated throttle lever is controlled through the gauge.

A three position switch allows the selection various heat levels, which are displayed in the gauge.

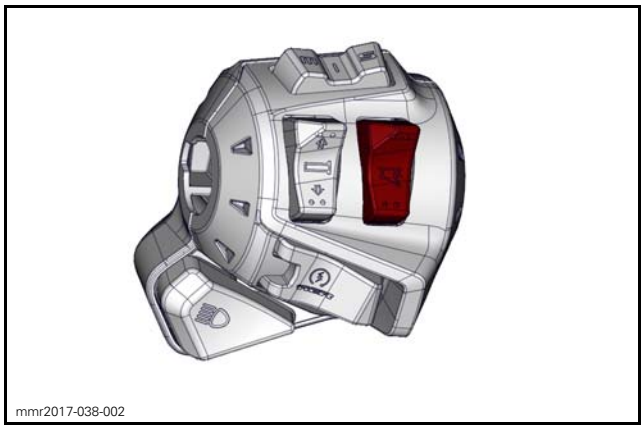
NOTE: The heated handlebar grips and the heated throttle lever are controlled by the same 3 position switch when used with the console switch. Refer to *SETTING THE HEATED THROTTLE LEVER RATIO*.

NOTE: The heating intensity is displayed via the gauge with the activation of the heated throttle lever switch.

The switch selection sends a signal to the gauge to increase or decrease heat.



HEATER SWITCH - MODELS WITH CONSOLE SWITCH



HEATER SWITCH - MODELS WITH MULTIFUNCTION SWITCH

The gauge then applies the appropriate amount of current to the heater according to the selection.

To turn OFF the heaters, select heat down until there is no more indication on the bar graph.

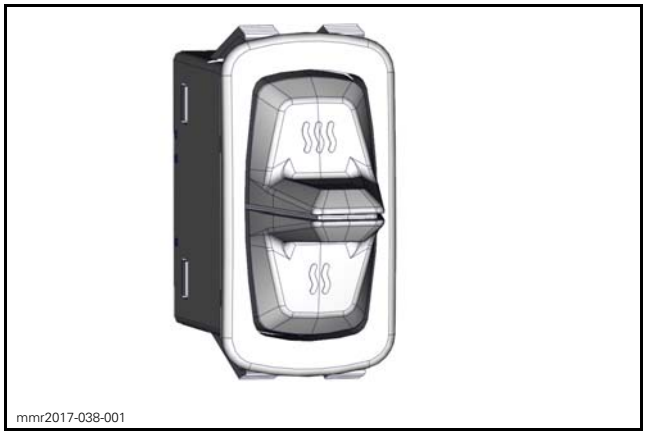
When released, the 3 position switch springs back to the center neutral position.

SYSTEM DESCRIPTION (HEATED HANDLEBAR GRIPS)

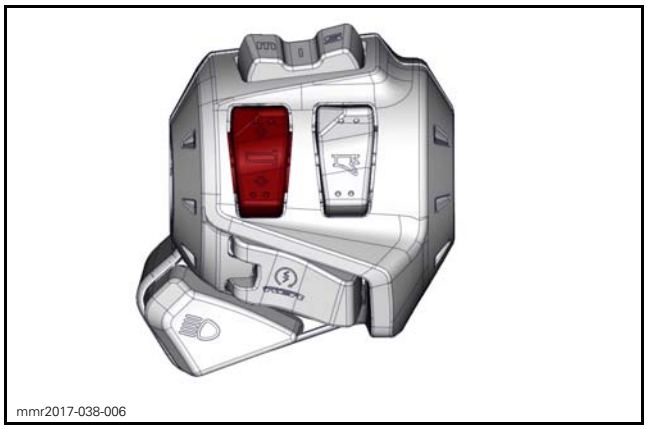
The grip heat is controlled through the gauge.

A three position switch allows the selection of various heat levels, which are displayed in the gauge.

NOTE: The heated handlebar grips and the heated throttle lever are controlled by the same 3 position switch when used with the console switch. Refer to *SETTING THE HEATED THROTTLE LEVER RATIO*.



HEATER SWITCH - MODELS WITH CONSOLE SWITCHES



HEATER SWITCH - MODELS WITH MULTIFUNCTION SWITCH

NOTE: The heating intensity is displayed via the gauge with the activation of the heated grips switch.

The gauge then applies the appropriate amount of current to the heater according to the selection.

To turn OFF the heaters, select heat down until there is no more indication on the bar graph.

When released, the switch springs back to the center neutral position.

SETTING THE HEATED THROTTLE LEVER RATIO

On models where one switch simultaneously controls the heated grip temperature and the throttle lever, use BUDS2 to set the heated throttle grip ratio.

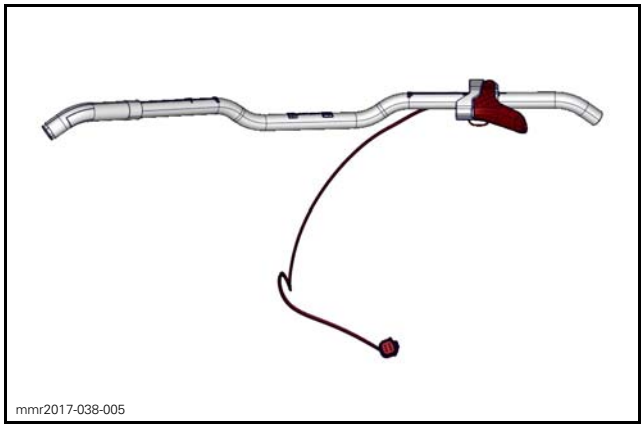
A higher ratio will increase the heated throttle temperature compared to the heated grips.

A lower ratio will lower the heated throttle temperature compared to the heated grips.

1. Connect BUDS2. Refer to *COMMUNICATION TOOLS AND BUDS* subsection.
2. Navigate to the settings page.
3. Change the **Heated Throttle Lever Ratio**.
4. Write the changes to the cluster.

PROCEDURES

HEATED THROTTLE LEVER



On multifunction analog/digital gauge heaters are limited to 50% under 2000 RPM.

For troubleshooting:

– Start engine and rev above 800 RPM for at least 2 seconds
– Use BUDS2 to activate the applicable heater.

NOTE: On models with console switches, there is only one switch that controls both the heated grips and heated throttle lever. Refer to *SYSTEM DESCRIPTION* and *SETTING THE HEATED THROTTLE LEVER RATIO*.

Testing Heated Throttle Lever Switch with BUDS2

Heating elements are permanently connected to ground. Positive voltages are supplied by gauges.

1. Provide electrical power to the gauge for testing.
2. Using BUDS2, select the **Measurements** page.
3. Alternately increase or decrease heat using heated throttle lever switch.
4. Look for the applicable value to change to confirm the gauge receives the signal.

If test is good, refer to *TESTING GAUGE HEATED THROTTLE LEVER POWER OUTPUT* in this subsection.

If test failed, refer to *TESTING THROTTLE LEVER HEAT SWITCH* in this subsection.

Testing Gauge Heated Throttle Lever Power Output

1. Provide electrical power to the gauge for testing.
2. Using BUDS2, select the **Functions** page..
3. In BUDS2, turn on the heated throttle grip.
4. Touch throttle lever to confirm it heats up.
5. Backprobe gauge **no. MG** connector as per following table.

MODELS WITH COMPACT DIGITAL GAUGE	
TERMINAL	SPECIFICATION
MG-7	2.7 to 14.5 Vdc depending on heated throttle lever ratio

MODELS WITH ANALOG/DIGITAL GAUGE	
TERMINAL	SPECIFICATION
MG-4	12 Vdc

6. If test is good, the gauge output to throttle lever heater is good. Proceed with *TESTING THROTTLE LEVER HEATING ELEMENT* in this subsection.
7. If the test failed, replace the gauge.

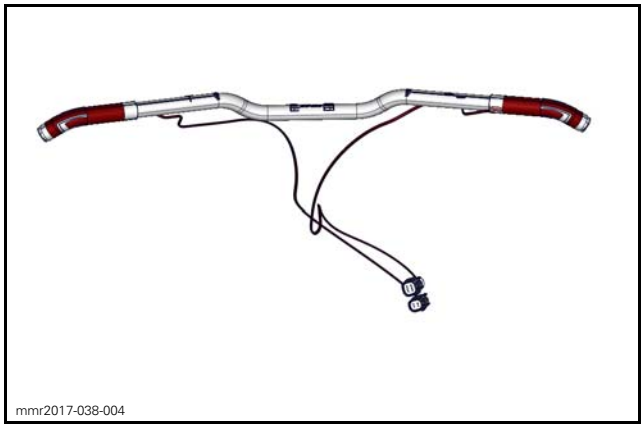
Testing Throttle Lever Heating Element

Refer to *WIRING HARNESS AND CONNECTORS* subsection for connector location.

STR 6P CONNECTOR		RESISTANCE @ 20°C (68°F)
STR 6P-5	STR 6P-2	1.73 - 4.22 Ω

1. If readings are out of specifications, replace throttle lever.
2. If heating element readings are within specifications, check wiring and connections to gauge.
3. Reconnect connectors.

HEATED HANDLEBAR GRIPS



Testing Handlebar Heated Grip Switch with BUDS2

Heating elements are permanently connected to ground. Positive voltages are supplied by gauges.

1. Provide electrical power to the gauge for testing.
2. Using the BUDS2, navigate to the **Measurements** page.
3. Press on the vehicle handle grip heat switch to alternately increase or decrease heat.
4. In BUDS2, look for the applicable to change.

If test is good, proceed with *TESTING GAUGE HEATER GRIPS POWER OUTPUT WITH BUDS2* in this subsection.

If test failed, proceed with *TESTING HANDLEBAR GRIP HEAT SWITCH* in this subsection.

Testing Gauge Heater Grips Power Output with BUDS2

1. Provide electrical power to the gauge for testing.
2. Using the BUDS2, navigate to the **Functions** page.
3. In BUDS2, turn the heated grips on.

MODELS WITH COMPACT DIGITAL GAUGE	
TERMINAL	SPECIFICATION
MG-1	12 Vdc

MODELS WITH ANALOG/DIGITAL GAUGE	
TERMINAL	SPECIFICATION
MG-5	12 Vdc

4. If test is good, the gauge heater to handlebar grip heater is good. Proceed with *TESTING HANDLEBAR GRIP HEATING ELEMENT* in this subsection.
5. If the test failed, replace the gauge.

Testing Handlebar Grip Heating Element

If you cannot feel the temperature increase of a hand grip heating element, carry out the following steps.

1. Disconnect heated grip connector.
2. Test heating elements on either side as per following specifications.

Refer to *WIRING HARNESS AND CONNECTORS* subsection for connector location.

RIGHT HEATED GRIP		RESISTANCE @ 20°C (68°F)
STR 6P-4	STR 6P-1	5.3 - 6.6 Ω

LEFT HEATED GRIP		RESISTANCE @ 20°C (68°F)
STR 6P-3	STR 6P-1	5.3 - 6.6 Ω

3. If readings are out of specifications, replace applicable handle grip heating element.
4. If heating element readings are within specifications, check wiring and connections.
5. Reconnect connectors.

Removing Heater Element

NOTICE Heater wire routing may vary significantly due to different type handlebars and vehicles. Its highly important to take note of exact positioning of grip heaters, locking ties, and wire routing before removing them from the handlebars. Failure to properly route wires may lead to equipment damage or failure.

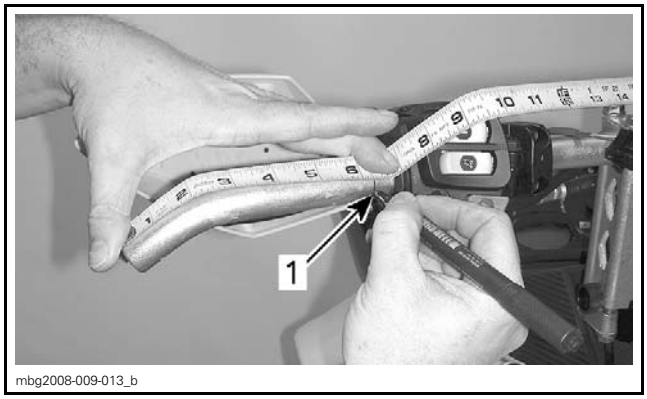
1. Disconnect the connector, Refer to *WIRING DIAGRAM AND CONNECTORS* subsection for connector location.
   1.1 STR 4P for left hand handlebar heater
   1.2 STR 6P for right hand handlebar heater

Use procedures for *MOLEX* connectors in the *WIRING DIAGRAM AND CONNECTORS* subsection.

2. Cut locking ties securing heater wires to handlebars.
3. Pull wires from harness protective sheath, multifunction switch housing or throttle lever housing.
4. Cut and remove black electrical tape from heater element and remove heater from cork insulator.
5. If damaged, remove cork insulator from handlebar and clean all adhesive residue from the handlebar.

Installing Heated Grips Heater Element

1. Measure 159 mm (6.25 in) from the end of the handlebar, and across the top of the bend in the bar. Trace a reference line with a marker at that point on the handlebar.



TYPICAL — MEASURING FOR HEATER POSITION
1. Trace reference line

2. Align the edge of the cork insulator with the reference line centered with the handlebar folding axis as illustrated.

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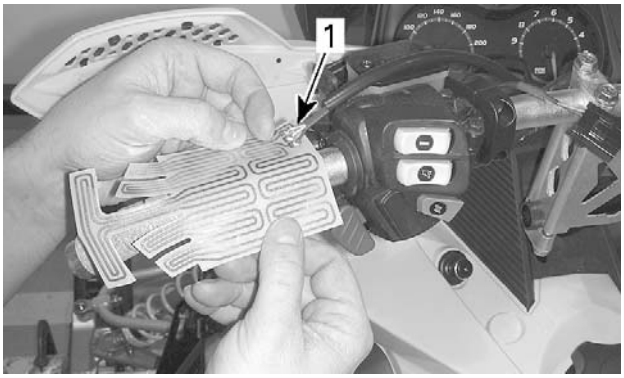
TYPICAL — CORK INSULATOR ALIGNMENT

3. Apply firm pressure to cork insulator to assure proper adherence to handlebar.
4. Align the film heater element with the cork insulator and center of handlebar folding axis as illustrated.



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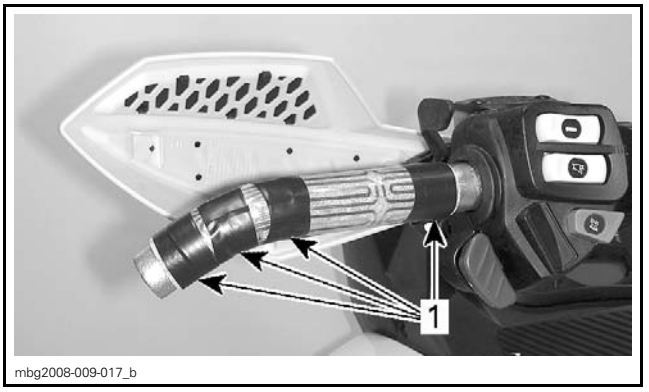
TYPICAL — HEATER ALIGNMENT
1. Heater wire position (LH front, RH rear)

5. Apply firm pressure to heater to assure proper adherence to cork insulator.

NOTE: The same heater element is used for both the LH and RH sides. Therefore, the electrical wiring will be in front of the handlebar on the LH side, and behind the handlebar (towards driver) on the RH side.

6. Apply two turns of black electrical tape at each of the four locations illustrated so that it covers the edges of the heater element and prevents snagging and damage to the element during rubber grip installation.



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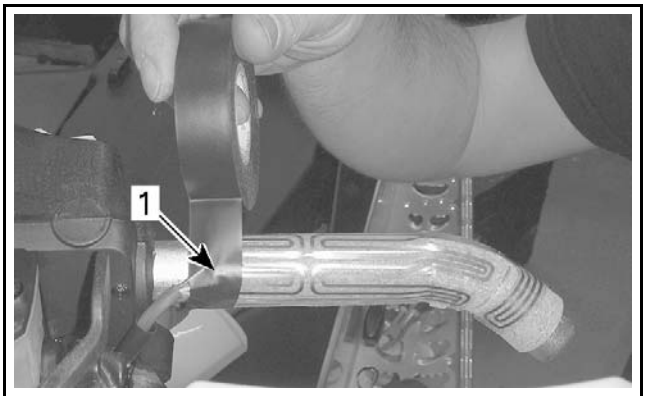
TYPICAL
1. Electrical tape application (4x)

NOTE: It is highly important to apply tape so that it fully secures the electrical wire connections. This will ease installation of the rubber hand grip and prevent undue stress to the connections.



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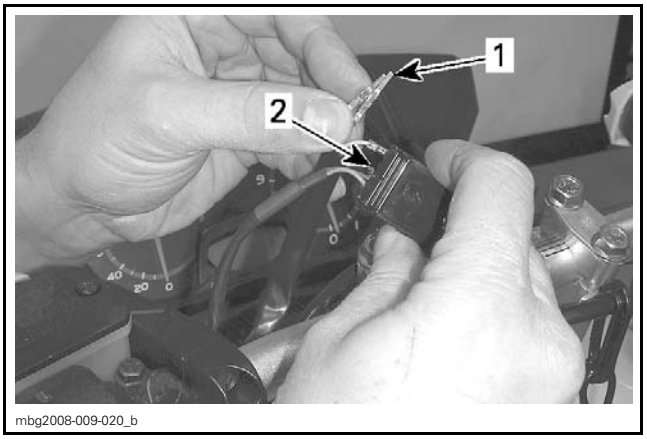
TYPICAL — IMPORTANT
1. Tape application over wire connections

7. Install rubber hand grip, refer to *STEERING SYSTEM* subsection for detail.
8. Route wiring as noted during the removal procedure.
9. Insert wire in housing, refer to *WIRING DIAGRAM* for wire color and pin number locations.

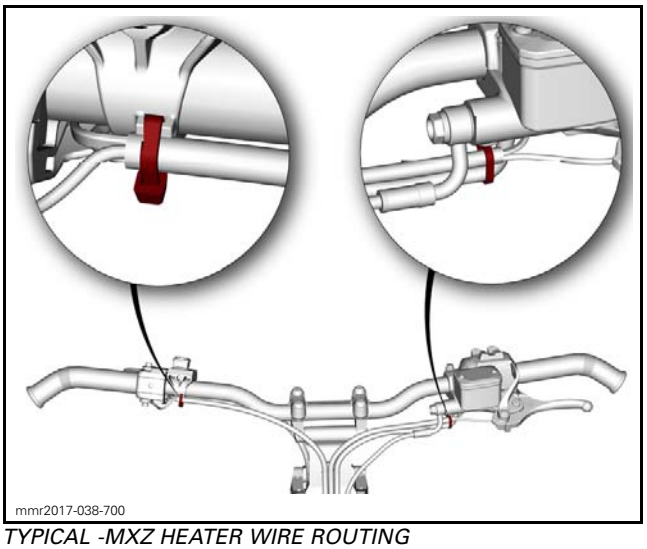


TYPICAL
1. *Heater wire terminals*
2. *Insertion through back of connector*

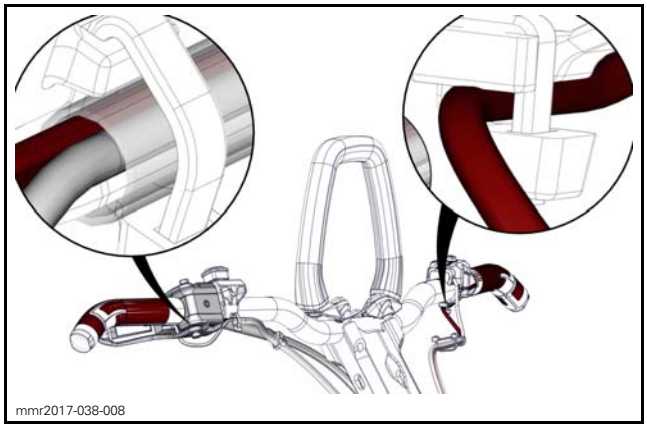
10. Install locking ties to secure the heater wire as it was routed originally..

⚠ WARNING

To ensure RH heater wires does not prevent smooth operation of throttle lever, it must be passed straight through the housing without any slack, and secured with a locking tie on the emergency engine cut-off switch housing.



TYPICAL -MXZ HEATER WIRE ROUTING



TYPICAL - SUMMIT HEATER WIRE ROUTING

NOTICE **Ensure LH heater wires are properly routed through multifunction switch housing to prevent them from being pinched when installing housing cover. Pinched or damaged wires may result in a short circuit.**

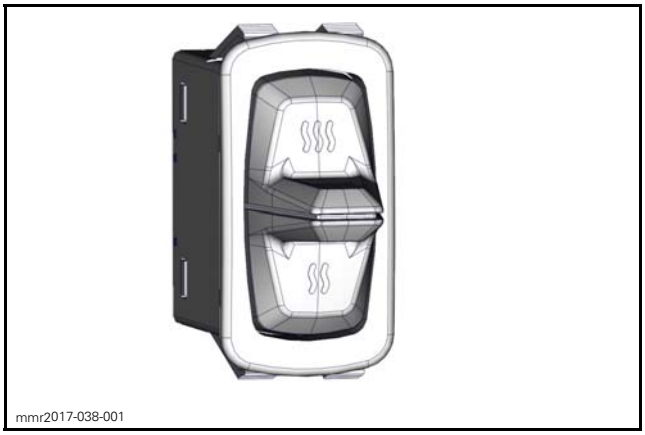
11. Provide electrical power to the heaters for testing.
12. Using the hand grip heat switch, turn on the hand grip heaters and ensure they are functioning correctly.

TESTING THROTTLE LEVER HEAT SWITCH

NOTE: On models with the compact digital gauge, there is only one switch that controls both the heated grips and heated throttle lever.

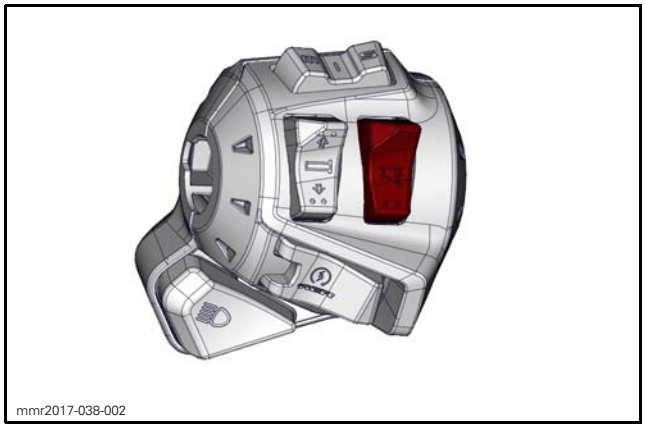
1. Using the FLUKE 115 MULTIMETER (P/N 529 035 868), select the Ω position.
2. Test throttle lever heat switch and circuits as per table.

Models with console switches



THROTTLE LEVER HEAT SWITCH TEST			
SWITCH SELECTION	TERMINAL		RESISTANCE
UP	GRIP-6	GRIP-8	Close to 0 Ω
	GRIP-6	GRIP-5	Infinite (OL)
DOWN	GRIP-6	GRIP-8	Infinite (OL)
	GRIP-6	GRIP-5	Close to 0 Ω

Models with multifunction switches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THROTTLE LEVER HEAT SWITCH TEST			
SWITCH SELECTION	TERMINAL		RESISTANCE
UP	SH-1	SH-9	Close to 0 Ω
	SH-1	SH-3	Infinite (OL)
DOWN	SH-1	SH-9	Infinite (OL)
	SH-1	SH-3	Close to 0 Ω

If continuity test is as per specification, check wiring to gauge connector.

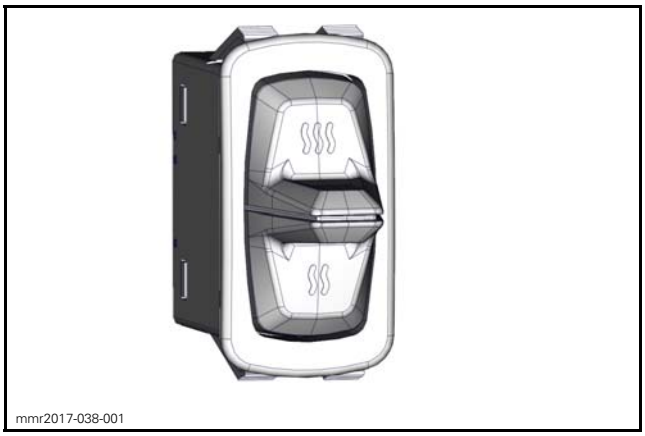
If continuity test is out of specification, check switch circuit as per wiring diagram. If good, replace switch.

TESTING HANDLEBAR HEATED GRIP SWITCH

NOTE: On models with the compact digital gauge, there is only one switch that controls both the heated grips and heated throttle lever.

1. Test throttle lever heat switch and circuits as per table.

Models with console switches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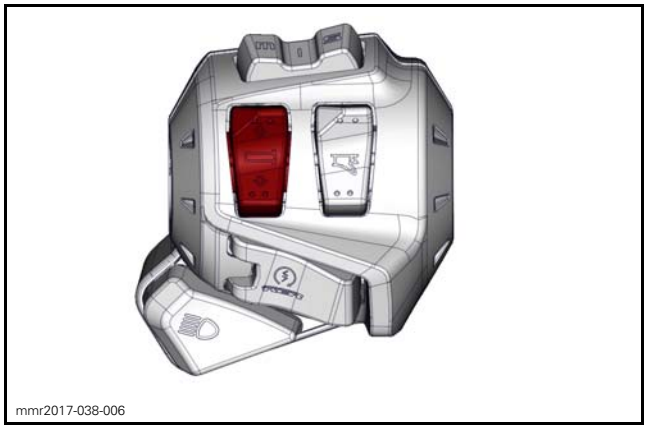
HEATED GRIP HEAT SWITCH TEST			
SWITCH SELECTION	TERMINAL		RESISTANCE
UP	GRIP-6	GRIP-8	Close to 0 Ω
	GRIP-6	GRIP-5	Infinite (OL)
DOWN	GRIP-6	GRIP-8	Infinite (OL)
	GRIP-6	GRIP-5	Close to 0 Ω

Models with multifunction switches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HEATED GRIP HEAT SWITCH TEST			
SWITCH SELECTION	TERMINAL		RESISTANCE
UP	SH-1	SH-10	Close to 0 Ω
	SH-1	SH-4	Infinite (OL)
DOWN	SH-1	SH-10	Infinite (OL)
	SH-1	SH-4	Close to 0 Ω

If continuity test is as per specification, check wiring to gauge connector.

If continuity test is out of specification, check switch circuit as per wiring diagram. If good, replace switch.

HEATED SEATS AND PASSENGER HEATED GRIPS

Testing Heated Seats

Unplug connector and measure resistance as per following table.

HEATED SEAT CONNECTOR - PROBE		RESISTANCE (APPROXIMATELY) @ 20°C (68°F)
YE wire	BK wire	32 Ω
RD wire		17.5 Ω

If resistance is not as specified, replace heated seat.

If resistance is as specified, continue testing.

Start and idle engine.

NOTE: On some models, you may need to increase RPM to above 2000 RPM in order to power this secondary 12v circuit.

Measure voltage at the heated seat connector as indicated in following table.

HEATED SEAT SWITCH POSITION	HEATED SEAT CONNECTOR - PROBE		VOLTAGE (APPROXIMATELY)
High (single seat) Front + rear (double seat)	YE wire	BK wire	12Vdc
	RD wire		
Low (single seat) Rear only (double seat)	YE wire		12Vdc
	RD wire		0Vdc

If voltage is not as indicated, test switch and/or wires from element to switch. Refer to *WIRING DIAGRAM*.

Testing Passenger Heated Grips (Left or Right)

Unplug connector and measure resistance as per following table.

PROBE		RESISTANCE (APPROXIMATELY) @ 20°C (68°F)
OG wire	BK wire	9.5 Ω
OG/VT wire	BK wire	19 Ω

If resistance is not as specified, replace heated grip.

If resistance is as specified, continue testing.

Start and idle engine.

NOTE: On some models, you may need to increase RPM to above 2000 RPM in order to power this secondary 12v circuit.

Measure voltage at the heated grip connector as indicated in following table.

HEATED GRIP SWITCH POSITION	PROBE		VOLTAGE (APPROXIMATELY)
High	OG wire	BK wire	12Vdc
	OG/VT wire		0Vdc
Low	OG wire		0Vdc
	OG/VT wire		12Vdc

If voltage is not as indicated, test switch and/or wires from element to switch. Refer to *WIRING DIAGRAM*.

Testing Heated Seat and Grip Switches

Measure switch resistance as per following table.

SWITCH POSITION	PROBE		RESISTANCE
High	Pin 6	Pin 8	Close to 0 Ω
Off	Pin 6	Pin 8	O.L.
		Pin 5	O.L.
Low	Pin 6	Pin 5	Close to 0 Ω

If resistance is not as specified, replace switch.

If resistance is as specified, continue testing.

Start and idle engine.

NOTE: On some models, you may need to increase RPM to above 2000 RPM in order to power this secondary 12v circuit.

Measure voltage at the switch connector as indicated in following table.

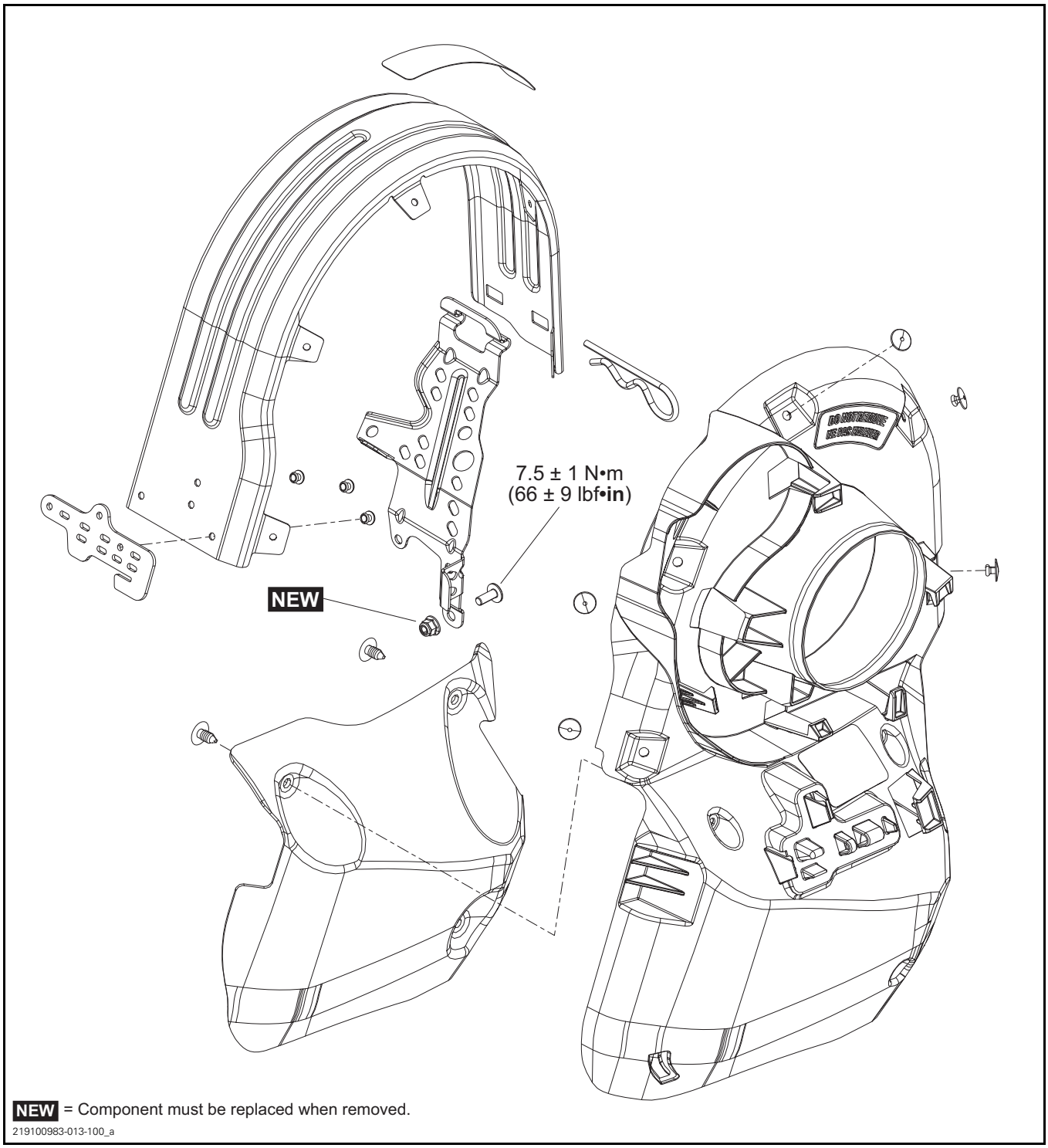
SWITCH POSITION	PROBE		VOLTAGE (APPROXIMATELY)
Any	Pin 6	Chassis ground	12Vdc

If voltage is not as indicated, test power distribution circuit to switch. Refer to *WIRING DIAGRAM*.

DRIVE BELT

SERVICE TOOLS

Description	Part Number	Page
TENSIOMETER	414 348 200	5



NEW = Component must be replaced when removed.

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GENERAL

DRIVE BELT APPLICATION

Always use the drive belt specified in the BRP *PARTS CATALOG* as applicable to vehicle and engine model.

TROUBLESHOOTING

VEHICLE CREEPS FORWARD AT IDLE

1. Improper drive belt height (too high)
   - *Refer to ADJUSTING THE DRIVE BELT HEIGHT procedure in this subsection.*

ENGINE STALLS WHEN ENGAGING RER

1. Improper drive belt height (too high)
   - *Refer to ADJUSTING THE DRIVE BELT HEIGHT procedure in this subsection.*

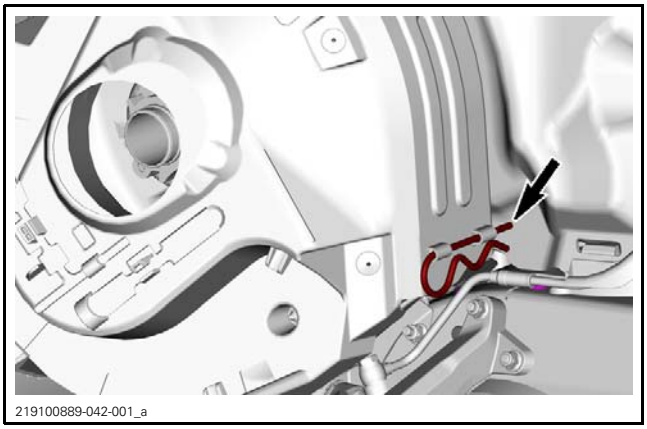
PROCEDURES

DRIVE BELT GUARD

NOTE: Belt guard is purposely made slightly oversize to maintain tension on its pins and retainers preventing undue noise and vibration.

Removing the Drive Belt Guard

1. Remove LH side panel.
2. Remove retaining pin.



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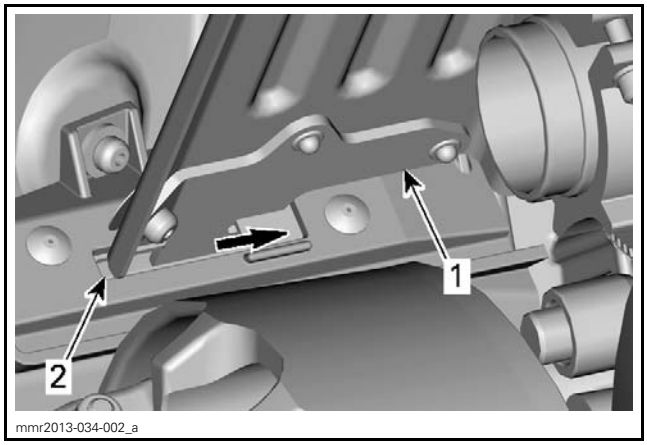
3. Lift rear portion of guard then release from front tabs.

Installing the Drive Belt Guard

1. Insert belt guard tab in front support slot.



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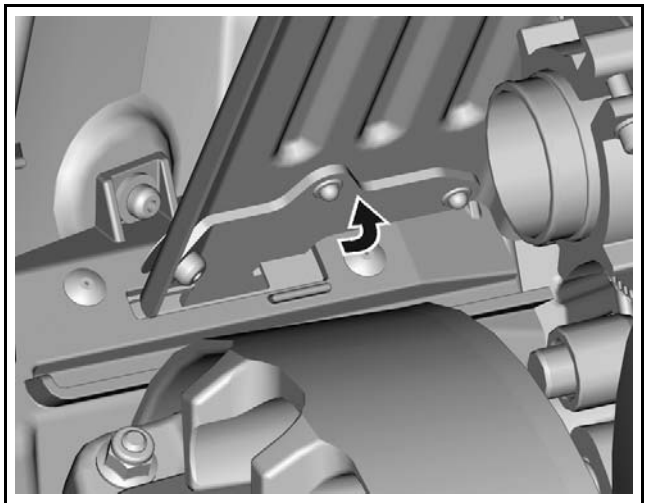
1. Belt guard tab
2. Front support slot

2. Push drive belt guard toward engine then toward front of vehicle.



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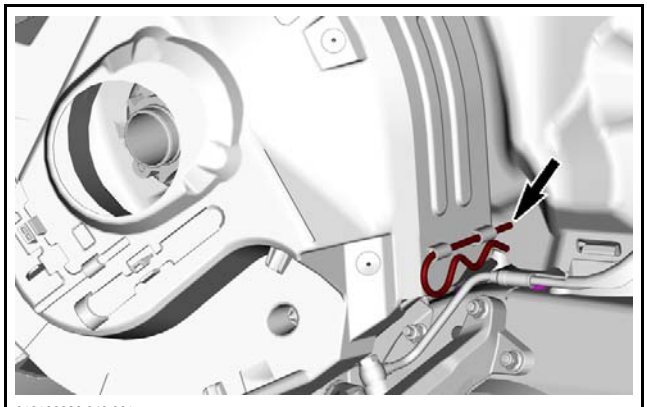
3. Position rear portion of the drive belt guard over the retainer and secure it using the retaining pin.



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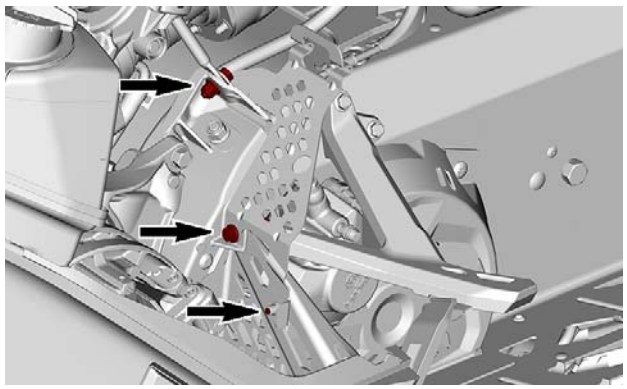
DRIVE BELT GUARD SUPPORT

Removing the Drive Belt Guard Support

1. Remove the drive belt guard.
2. Remove screws securing the support to vehicle.



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Installing the Drive Belt Guard Support

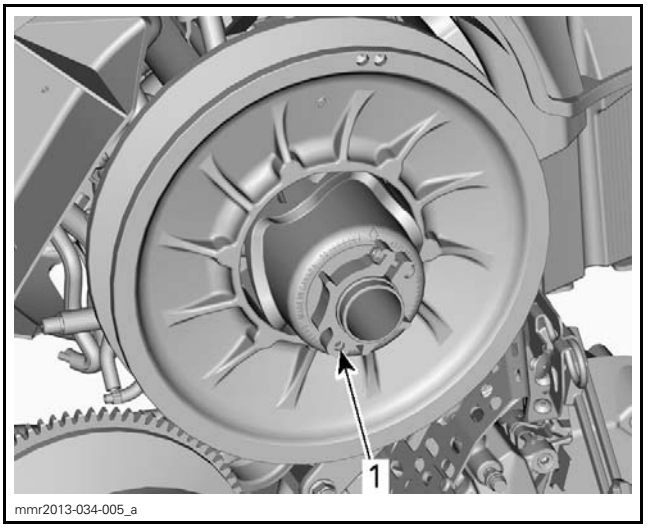
The installation is the reverse of the removal procedure. However pay attention to the following.

TIGHTENING TORQUE	
Drive belt guard support Torx screw	7.5 N•m ± 1 N•m (66 lbf•**in** ± 9 lbf•**in**)
Hexagonal flange elastic nut	10 N•m ± 2 N•m (89 lbf•**in** ± 18 lbf•**in**)

DRIVE BELT

Removing the Drive Belt

1. Remove tether cord cap from engine cut-off switch.
2. Remove LH side panel.
3. Remove drive belt guard, refer to *REMOVING THE DRIVE BELT GUARD*.
4. Insert the driven pulley expander provided in the tool kit in the threaded hole on the adjuster hub as illustrated.



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1. PULLEY expander to be installed here - on Adjuster hub

5. Open the driven pulley by screwing the tool in.
6. Remove the belt by slipping it over the top of the driven pulley, then out of the drive pulley.

Inspecting the Drive Belt

Inspect belt for:
- Cracks
- Fraying
- Abnormal wear (uneven wear, wear on one side, missing cogs, torn fabric).

If abnormal wear is noted, the probable cause could be:
- Pulley misalignment
- Excessive RPM with frozen track
- Fast starts without warm-up period
- Scratched or rusty sheave
- Oil on belt
- Distorted spare belt.

Check drive belt width. Replace the drive belt if its width is under minimum recommended specification.

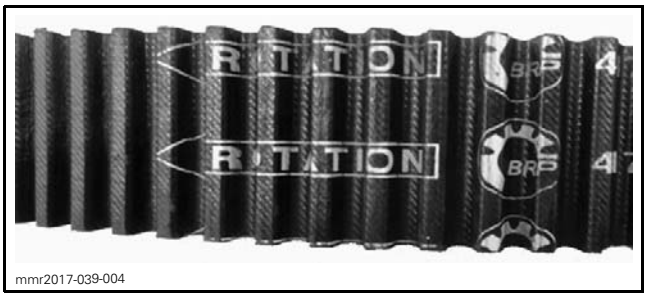
DRIVE BELT WIDTH	
NEW	WEAR LIMIT
38.3 mm (1.508 in)	35.9 mm (1.413 in)

Installing the Drive Belt

1. If necessary, open the driven pulley, refer to *REMOVING THE DRIVE BELT*.
2. Insert drive belt in the drive pulley, then pull it over the driven pulley.

NOTICE **Do not force or use tools to pry the belt into place, as this could cut or break the cords in the belt.**

NOTE: The maximum drive belt life span is obtained when the belt is installed with the arrows on the belt pointing in the direction of rotation.



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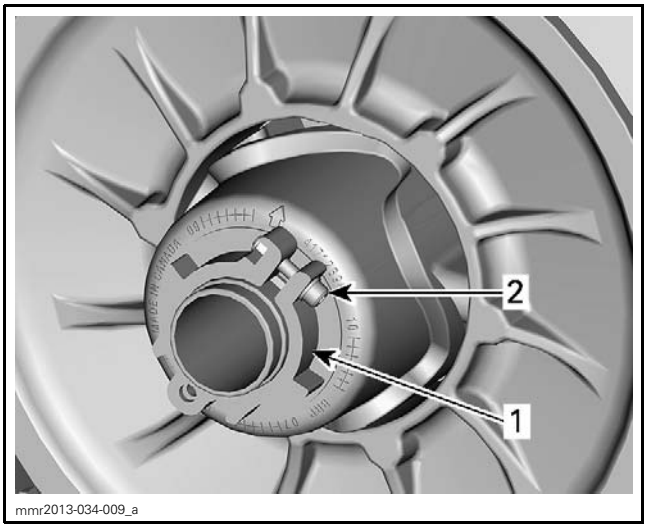
3. Unscrew and remove the driven pulley expander from the driven pulley.
4. Rotate the driven pulley several times to properly set the belt between the sheaves.
5. Adjust drive belt height. Refer to *ADJUSTING THE DRIVE BELT HEIGHT* procedure.
6. Install drive belt guard, refer to *INSTALLING THE DRIVE BELT GUARD*.
7. Install LH side panel.

Adjusting the Drive Belt Height

1. Remove tether cord cap from engine cutout switch.
2. Remove LH side panel.
3. Remove drive belt guard, refer to *REMOVING THE DRIVE BELT GUARD*.
4. Loosen the clamping screw.



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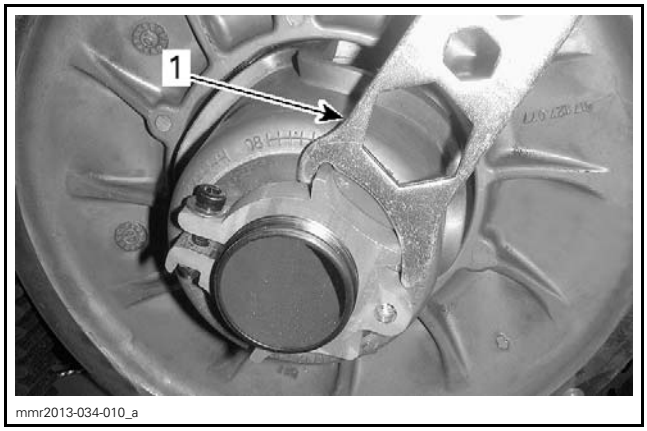
1. Adjustment ring
2. Clamping screw

5. Using the suspension adjustment tool provided in the tool kit, turn the adjustment ring 1/4 turn at a time then rotate the driven pulley to properly set the belt between the pulley sheaves.



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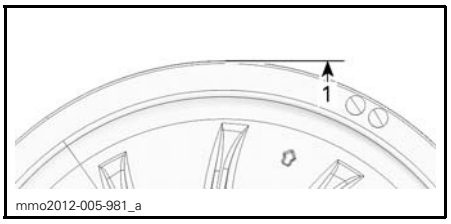
1. Suspension adjustment tool

NOTE: The adjustment ring has left hand treads.

600 EFI

Repeat step 5 until the drive belt outer surface is even with the driven pulley edge.



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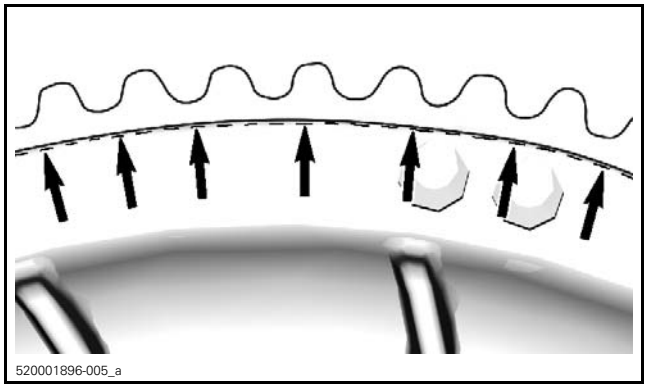
600 EFI - PRELIMINARY SETTING
1. Drive belt outer surface is even with the driven pulley edge

850 E-TEC

Repeat step 5 until the cord of drive belt is just hidden by the driven pulley edge.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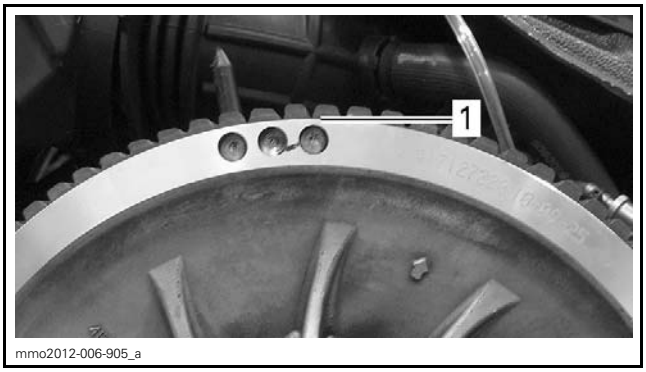
850 E-TEC - PRELIMINARY SETTING

600R E-TEC

Repeat step 5 until the lowest portion of the cogs on the external surface of drive belt is even with the driven pulley edge.



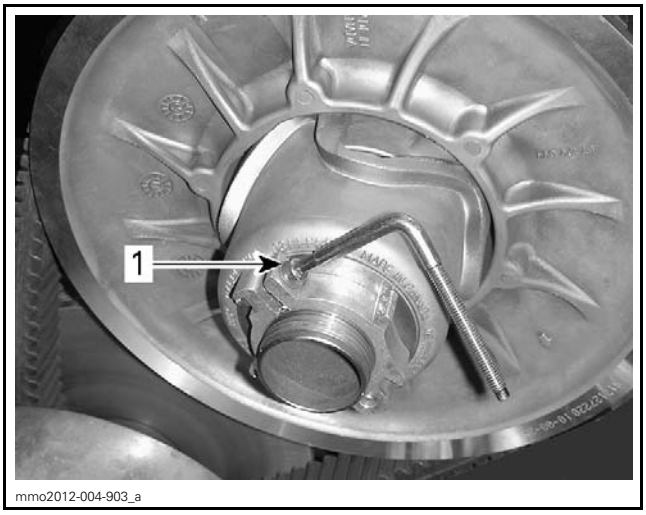
600R E-TEC - PRELIMINARY SETTING
1. Lowest portion of cogs even with external surface of drive belt

All engines

NOTE: Turning the adjustment ring counterclockwise lowers the belt in the pulley. Turning the ring clockwise raises the belt in the pulley.

6. Tighten the adjustment ring clamping screw.

TIGHTENING TORQUE	
Adjustment ring clamping screw	5.5 N•m ± 0.5 N•m (49 lbf•**in** ± 4 lbf•**in**)



1. Clamping screw

7. Install belt guard, refer to *INSTALLING THE DRIVE BELT GUARD*.
8. Install LH side panel.
9. Start engine and check if vehicle creeps.
   - 9.1 If vehicle does not creep, adjustment is complete.
   - 9.2 If vehicle creeps, check the drive belt deflection.

Reverse Activation

Reverse may not activate or may be harder to activate if the belt is positioned too high in the driven pulley. If reverse activation does not work properly, ensure the drive belt is properly adjusted.

Adjust the drive belt lower in the driven pulley if needed.

Verifying the Drive Belt Deflection

1. Make sure drive belt height is adjusted (preliminary setting).
2. Position a reference rule on drive belt.
3. Use the TENSIOMETER (P/N 414 348 200) as explained below.
4. Set deflection as per following table using bottom O-ring.

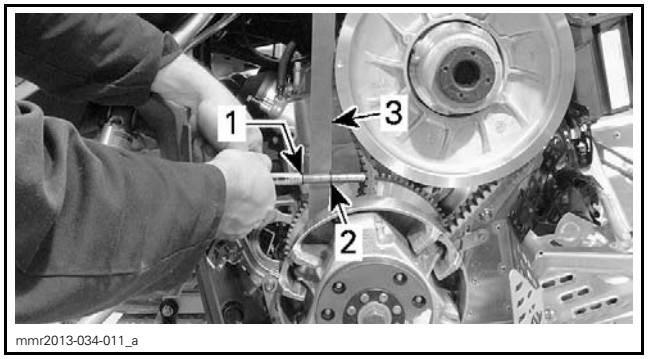
DRIVE BELT DEFLECTION	
DRIVE BELT DEFLECTION SETTING	32 mm ± 5 mm (1.26 in ± .2 in)

DEFLECTION SETTING
1. Bottom O-ring

5. Place upper O-ring to 0 kgf (0 lbf).

LOAD READING
1. Upper O-ring

6. Apply pressure until bottom O-ring (deflection) is flush with edge of rule.



TYPICAL
1. Upper O-ring — load
2. Bottom O-ring — deflection
3. Reference rule

7. Read drive belt load. Compare result with the following table.

DRIVE BELT DEFLECTION	
DRIVE BELT LOAD READING	11.30 kgf (25 lbf)

8. If deflection is within specification, drive belt is properly adjusted.
9. If deflection is out of specification, try the following:
   – Lower drive belt height from initial setting.
   – Try another drive belt.
10. If proper load still cannot be obtained, check the following:
   – Inspect engine supports.
   – Inspect countershaft and bearing.
   – Inspect chassis for damages.

pDRIVE PULLEY

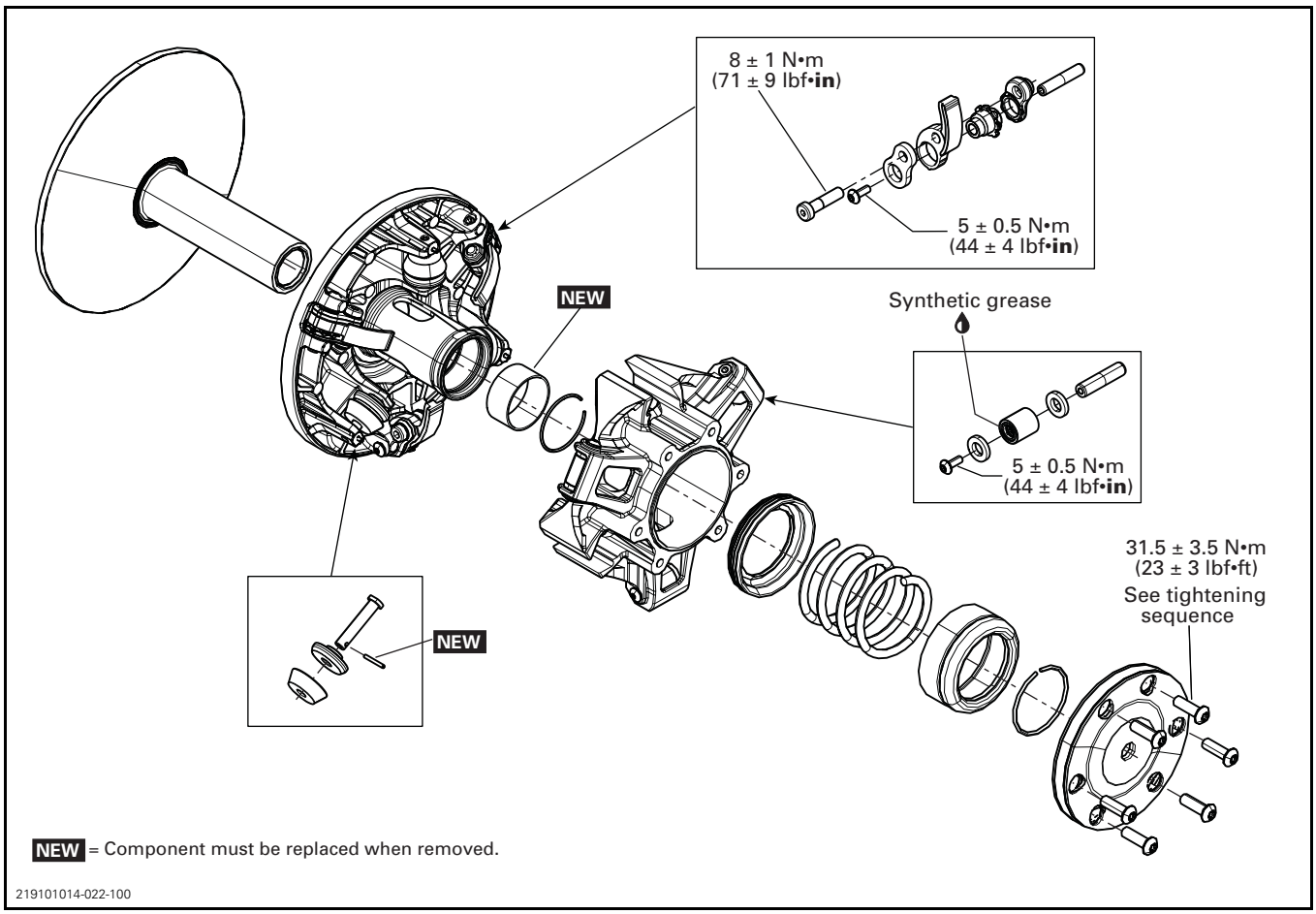
SERVICE TOOLS

Description	Part Number	Page
CIRCLIP INSTALLER/REMOVER	529 036 375	4–5
CLUTCH HOLDER	529 036 369	3, 12
DRIVE PULLEY OPENING TOOL	529 036 378	4, 8
DRIVE PULLEY SUPPORT	529 036 371	4–5, 7
GREASE INJECTOR	529 036 376	10
PDRIVE PULLER	529 036 370	3–4
PULLEY SPRING COMPRESSOR TOOL	529 036 373	4–5, 7–8
REMOVING AXLE TOOL	529 036 372	4, 6–8

SERVICE PRODUCTS

Description	Part Number	Page
CLUTCH AND PULLEY FLANGE CLEANER PRO S1	779244	9
ISOFLEX GREASE TOPAS NB 52	293 550 021	10

WITH CLICKER



GENERAL

The pDrive pulleys are lubrication-free drive pulleys. Only the needle bearings inside the rollers need to be lubricated when replaced.

Always refer to appropriate *PARTS CATALOG* for replacement parts.

NOTICE Never use any type of impact wrench for drive pulley removal and installation. The use of impact wrench could damage the drive pulley and modify the calibration.

Some drive pulley components (like the spring and ramps) can be changed to improve vehicle performance in high altitude regions. A Service Bulletin provides information about calibration according to altitude.

NOTICE Such modifications should only be performed by experienced mechanics since they can greatly affect vehicle performance. Verify spring specifications before installation. Do not only refer to the spring color code.

⚠ WARNING

Any drive pulley repairs must be performed by an authorized Ski-Doo dealer. Subcomponent installation and assembly tolerances require strict adherence to procedures detailed.

During assembly/installation, use torque values as in the exploded view.

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

⚠ WARNING

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

ADJUSTMENT

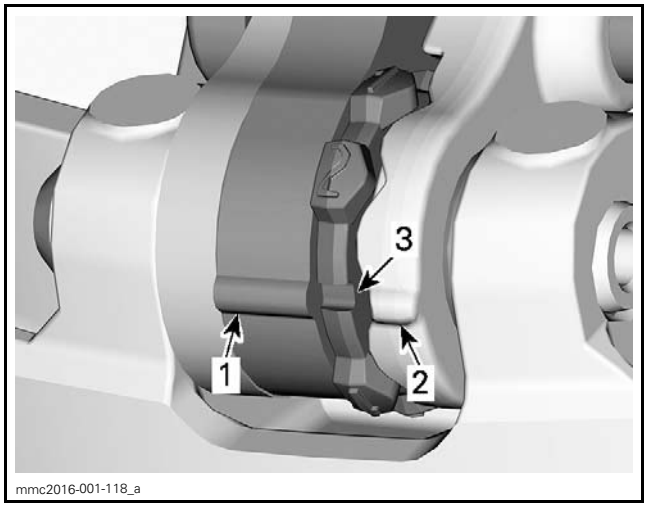
The drive pulley is factory calibrated to transmit maximum engine power at a predefined RPM. Factors such as ambient temperature, altitude or surface condition may vary this critical engine RPM thus affecting snowmobile efficiency.

This adjustable drive pulley allows setting maximum engine RPM in the vehicle to maintain maximum power. The adjustment has an effect on high RPM only.

Ramp cam should be adjusted so that actual maximum engine RPM in vehicle matches the maximum horsepower RPM given in *TECHNICAL SPECIFICATIONS*.

To adjust, modify ramp end position by turning ramp cams (3x).

The ramp and the right lever have a notch while ramp cam has 5 positions numbered 1 to 5.



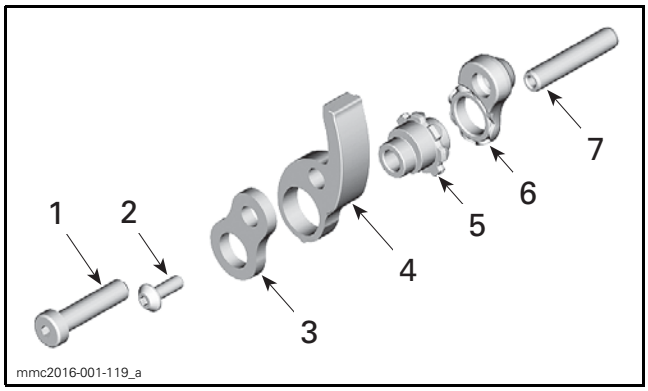
1. *Ramp notch*
2. *Right lever notch*
3. *Cam position (here #3)*

Each number modifies maximum engine RPM by about 200 RPM.

Lower numbers decrease engine RPM in steps of 200 RPM and higher numbers increase it in steps of 200 RPM.

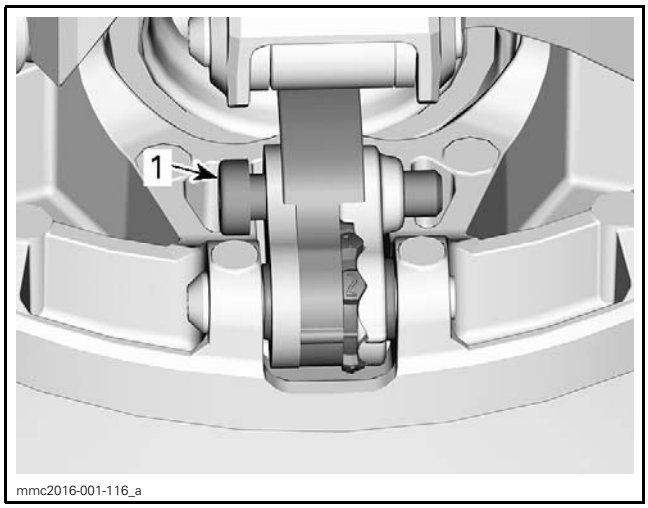
For example: If ramp cam is set at position 3 and is changed to position 5, the maximum engine RPM is increased by about 400 RPM.

MODIFYING THE RAMP CAM SETTING



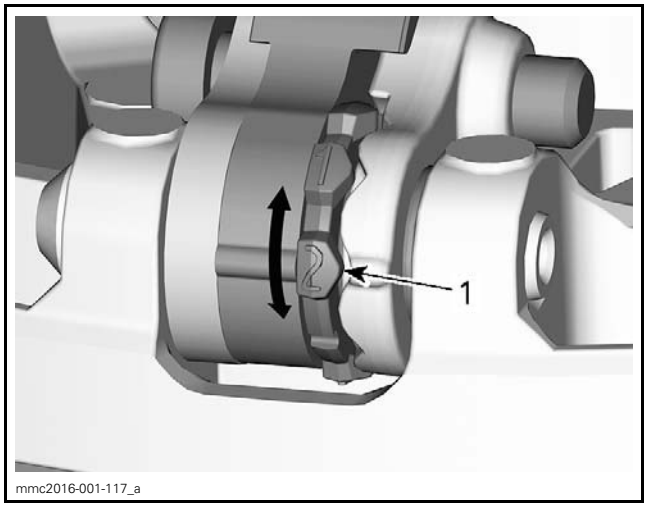
1. *Pivot*
2. *Axle retaining screw*
3. *Left lever*
4. *Ramp*
5. *Cam*
6. *Right lever*
7. *Axle*

1. Loosen the pivot.



1. *Pivot*

2. Move right lever aside to be able to turn the cam.
3. Turn cam to the desired position.



1. *Desired cam position (here #2)*

TIGHTENING TORQUE	
Pivot	8 N•m ± 1 N•m (71 lbf•**in** ± 9 lbf•**in**)

For factory setting, refer to *SPECIFICATIONS (VEHICLE)*.

NOTICE Always adjust all 3 cams and make sure they are all set at the same number.

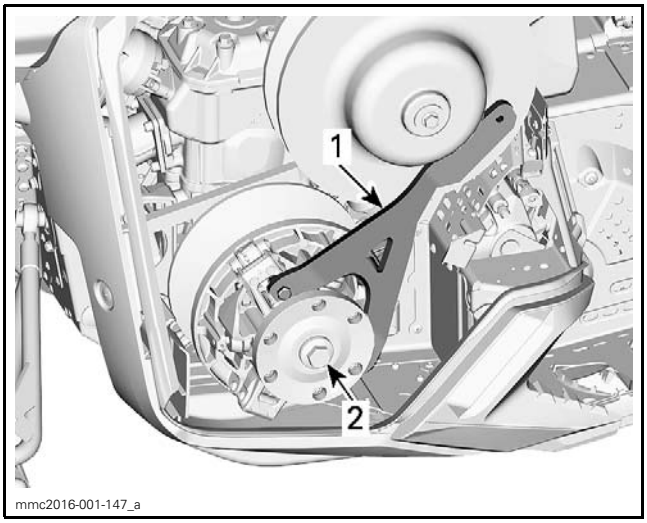
PROCEDURES

DRIVE PULLEY

Removing the Drive Pulley

REQUIRED TOOLS	
CLUTCH HOLDER (P/N 529 036 369)	
PDRIVE PULLER (P/N 529 036 370)	

1. Remove drive belt. Refer to *DRIVE BELT* subsection.
2. Remove the drive pulley bolt.
   2.1 Secure the drive pulley with the clutch holder.
   2.2 Using a breaker bar, remove the drive pulley bolt and its conical spring washer.



1. Clutches holder
2. Drive pulley bolt

3. Remove the drive pulley from engine.
   3.1 Make sure the clutches holder is properly installed.
   3.2 Screw the pDrive puller in place of the drive pulley bolt.
   3.3 Tighten the pDrive puller until pulley is disengaged from the crankshaft end.

NOTICE These pulleys have metric threads. Do not use a puller with ANS (American National Standard) or IS (International Standard) type threads. Always tighten puller by hand to ensure that the drive pulley has the same type of threads (metric vs ANS or IS) prior to fully tightening.

Disassembling the Drive Pulley

REQUIRED TOOLS	
PDRIVE PULLER (P/N 529 036 370)	
DRIVE PULLEY SUPPORT (P/N 529 036 371)	
PULLEY SPRING COMPRESSOR TOOL (P/N 529 036 373)	

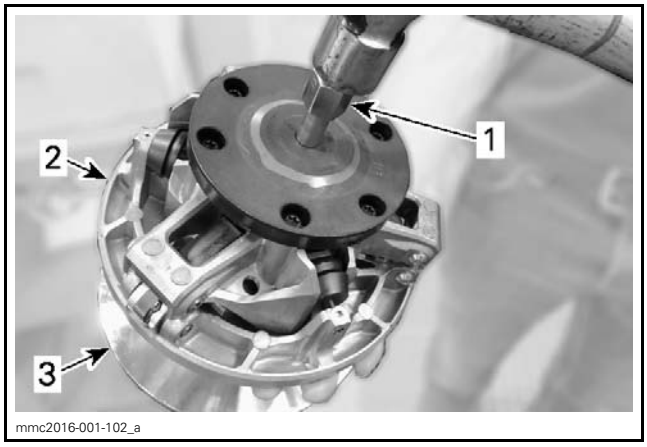
REQUIRED TOOLS	
CIRCLIP INSTALLER/REMOVER (P/N 529 036 375)	
REMOVING AXLE TOOL (P/N 529 036 372)	
DRIVE PULLEY OPENING TOOL (P/N 529 036 378)	

Separating Fixed and Sliding Sheaves

To separate fixed sheave from sliding sheave, screw puller into fixed sheave shaft about 13 mm (1/2 in).

Raise drive pulley and hold it by the sliding sheave while knocking on puller head to disengage fixed sheave.

NOTICE NEVER tap on spider.



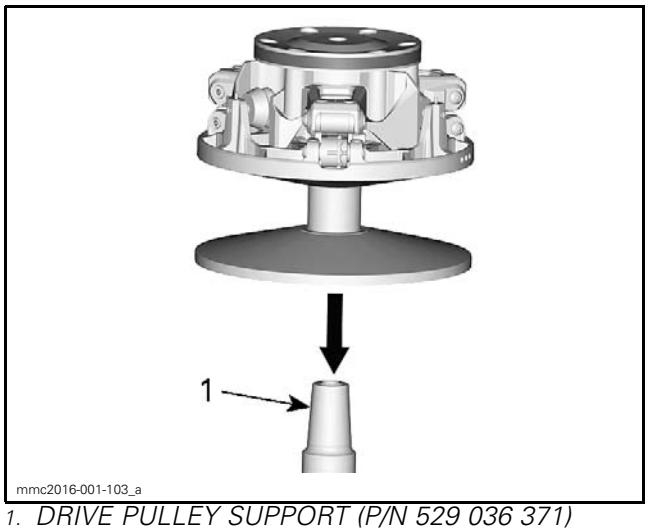
1. Puller screwed 13 mm (1/2 in) in fixed sheave
2. Sliding sheave
3. Fixed sheave

NOTE: No component marking is required before disassembly. This drive pulley features factory apposed index marks as references.

NOTICE Never use any type of torch to heat spider.

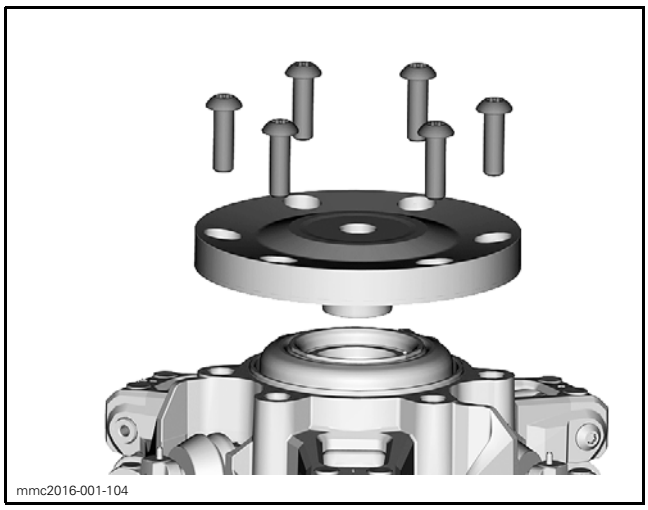
Removing the Damper

1. Secure the drive pulley support in a vice.
2. Install the drive pulley on the support.

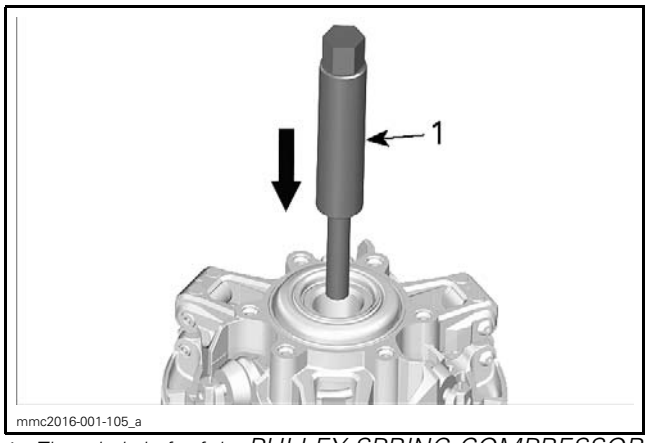


1. DRIVE PULLEY SUPPORT (P/N 529 036 371)

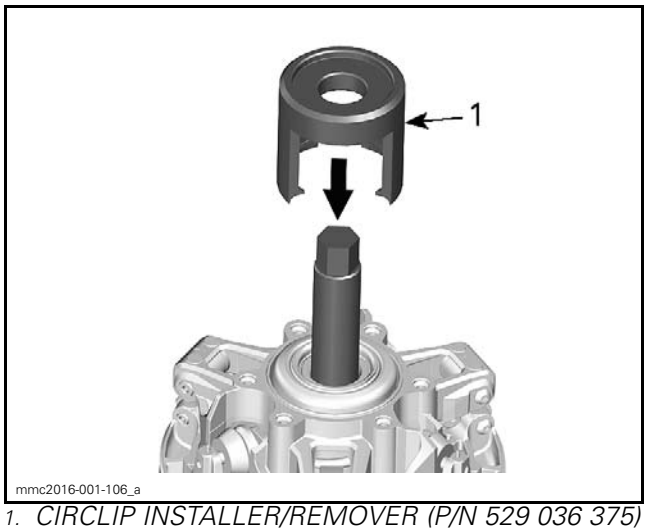
3. Loosen the damper screws.
4. Separate fixed and sliding sheaves. Refer to procedure above.
5. Remove the damper.



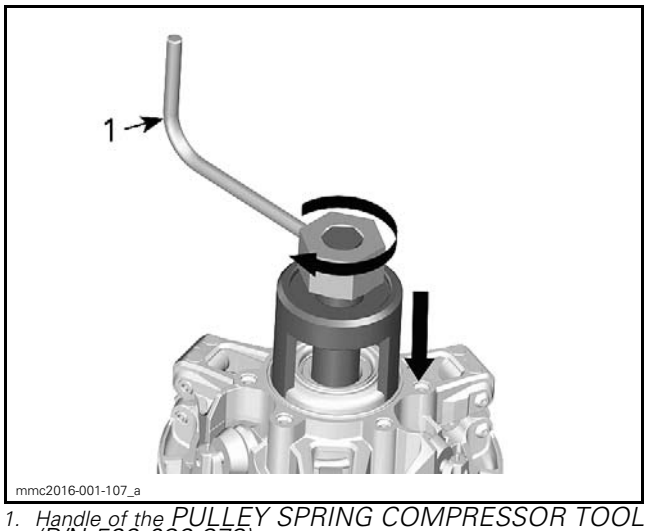
Removing the Spring



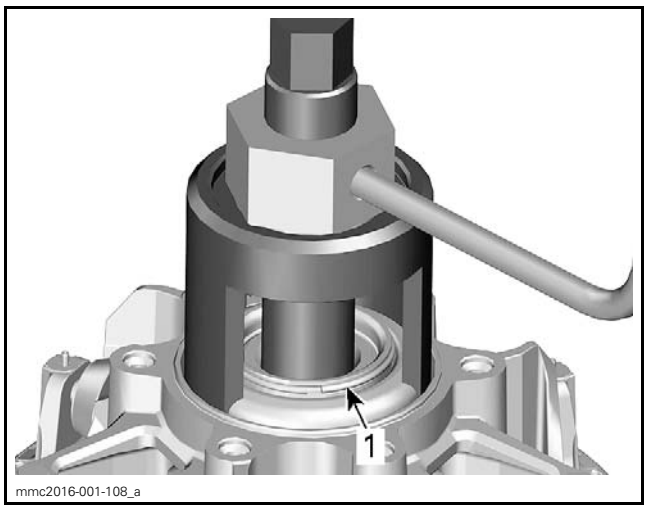
1. Threaded shaft of the PULLEY SPRING COMPRESSOR TOOL (P/N 529 036 373)



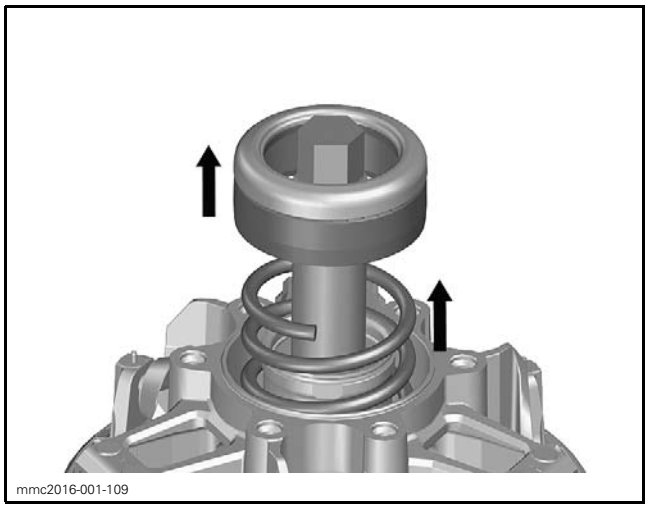
1. CIRCLIP INSTALLER/REMOVER (P/N 529 036 375)



1. Handle of the PULLEY SPRING COMPRESSOR TOOL (P/N 529 036 373)

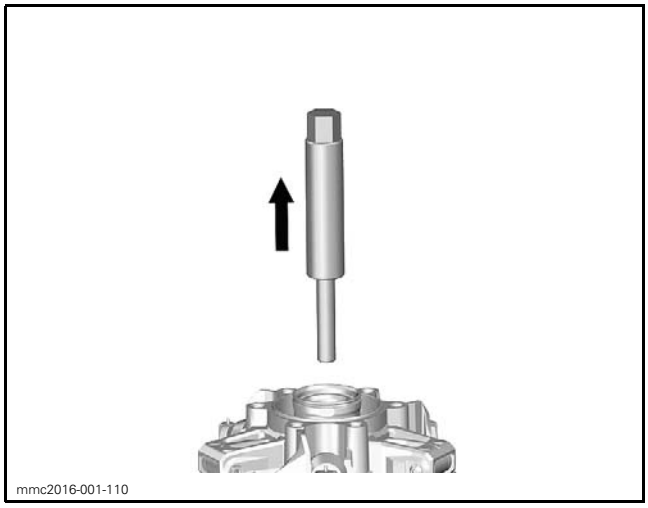


1. Remove the circlip


mmc2016-001-109

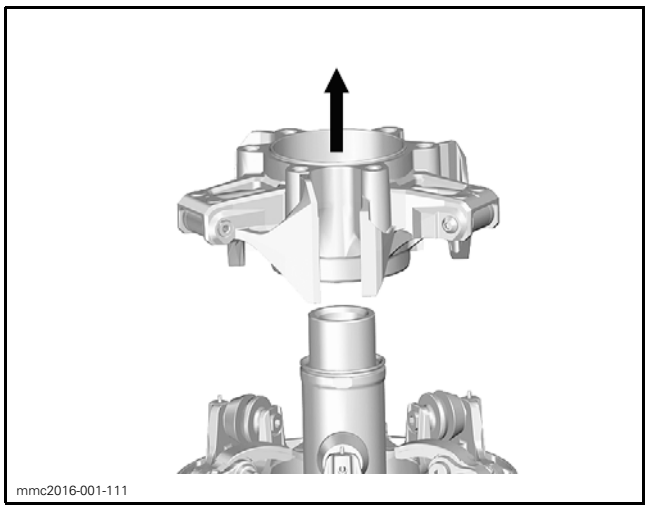
Removing the Spider

1. Remove the threaded shaft.


mmc2016-001-110

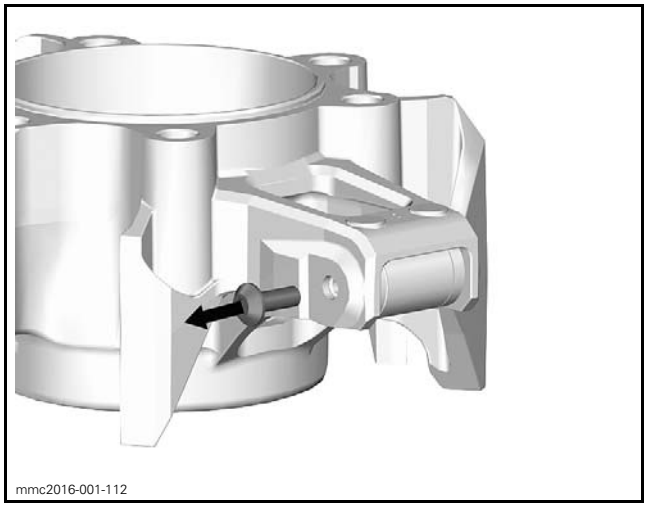
NOTICE Remove the threaded shaft to avoid damaging the bushings inside the spider.

2. Remove the spider.

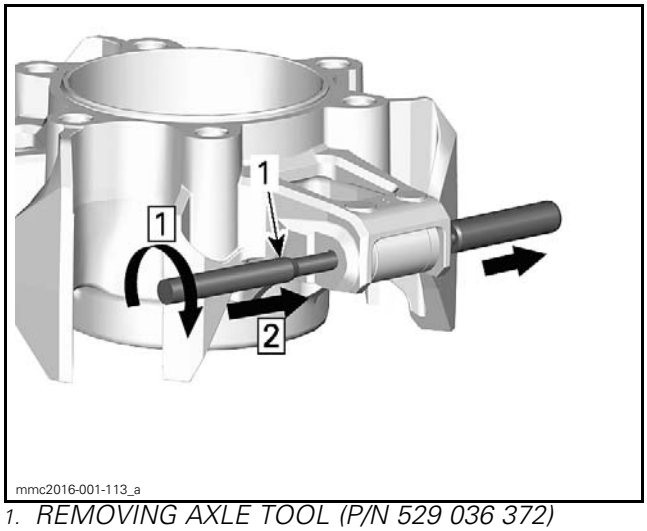

mmc2016-001-111

Removing the Roller

1. Remove axle retaining screw.


mmc2016-001-112

2. Remove the axle.

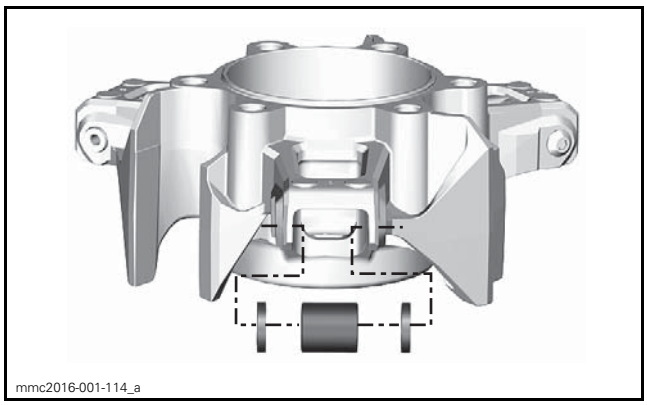


mmc2016-001-113_a

1. REMOVING AXLE TOOL (P/N 529 036 372)

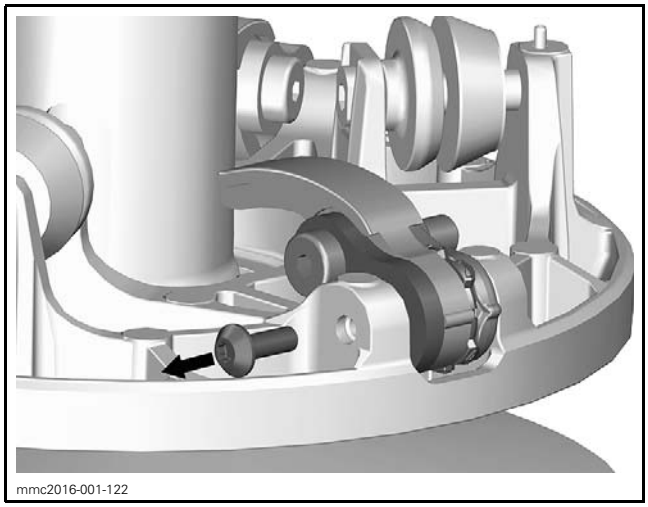
Step 1: Screw the tool into the axle
Step 2: Push axle to the right side

3. Remove the roller and its thrust washers.


mmc2016-001-114_a

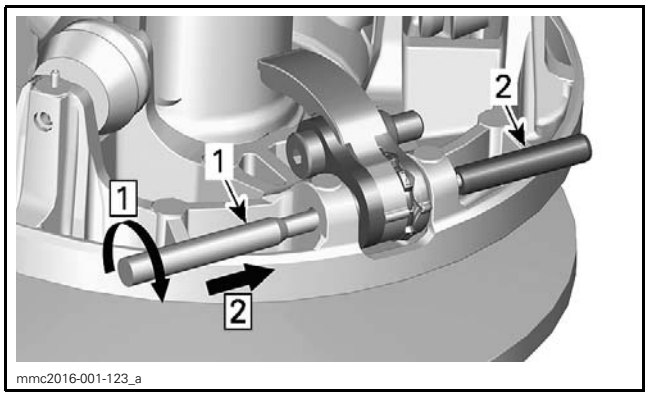
Removing the Ramp (without Spider)

1. Remove axle retaining screw.



TYPICAL

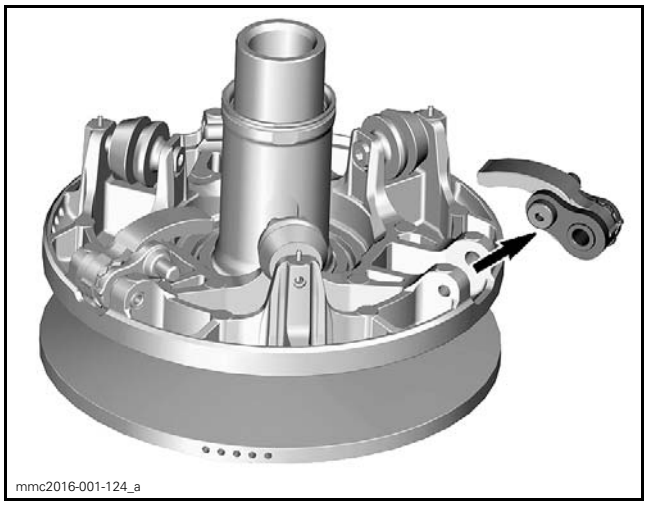
2. Remove the axle.



TYPICAL
1. REMOVING AXLE TOOL (P/N 529 036 372)
2. Axle

Step 1: Screw the tool into the axle
Step 2: Push axle to the right side

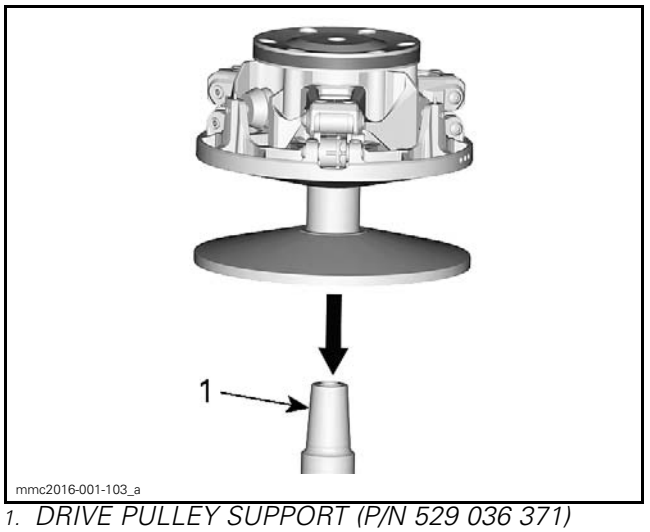
3. Remove ramp assembly.



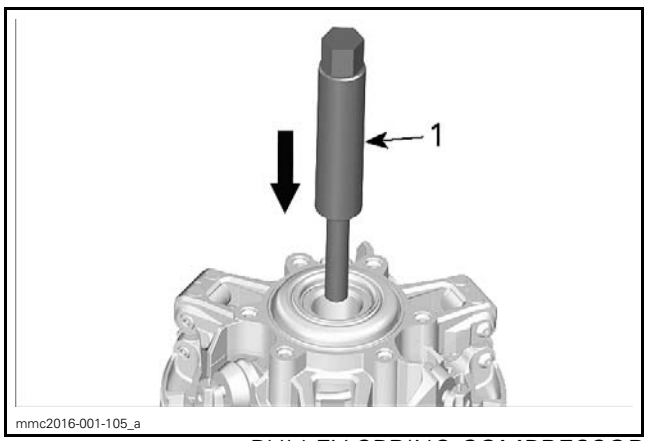
TYPICAL

Removing the Ramp (Spider Installed)

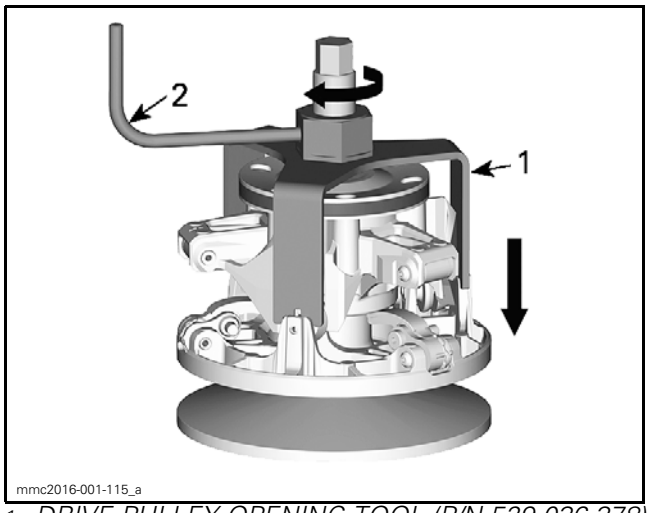
1. Lower the sliding sheave.
   1.1 Secure the drive pulley support in a vice.
   1.2 Install the drive pulley over the support.
   1.3 Install the drive pulley opening tool.



1. DRIVE PULLEY SUPPORT (P/N 529 036 371)

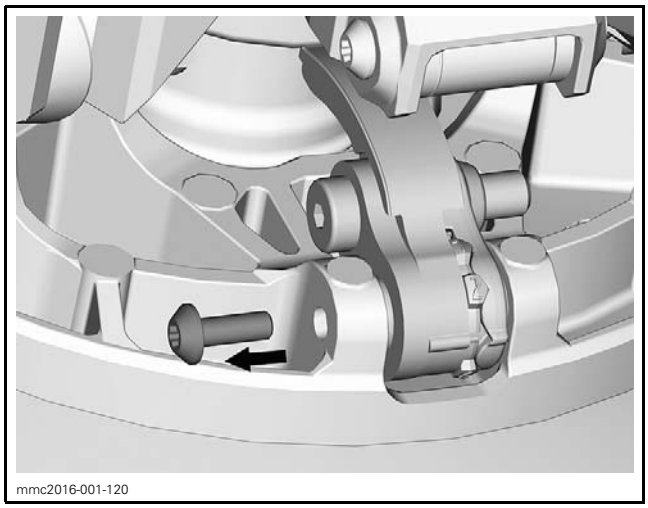


1. Threaded shaft of the PULLEY SPRING COMPRESSOR TOOL (P/N 529 036 373)

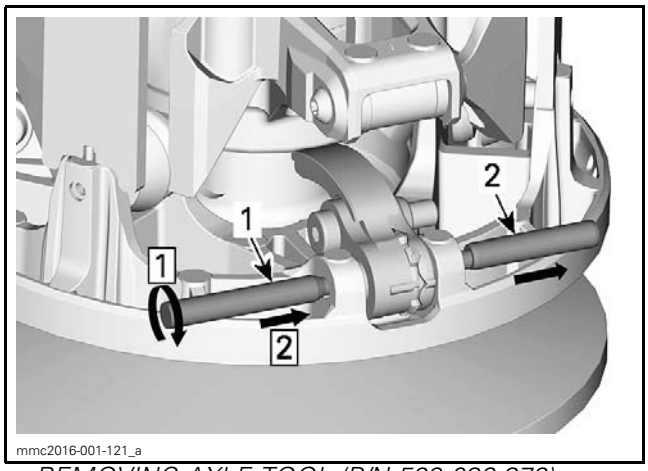


1. *DRIVE PULLEY OPENING TOOL (P/N 529 036 378)*
2. *Handle of the PULLEY SPRING COMPRESSOR TOOL (P/N 529 036 373)*

2. Remove axle retaining screw.



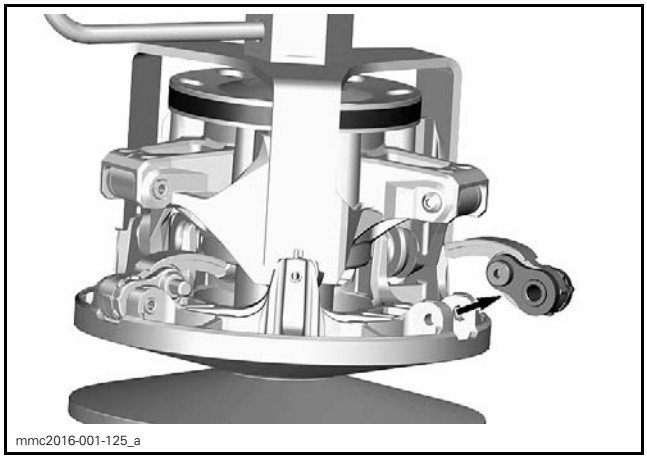
3. Remove the axle.



1. *REMOVING AXLE TOOL (P/N 529 036 372)*
2. *Axle*

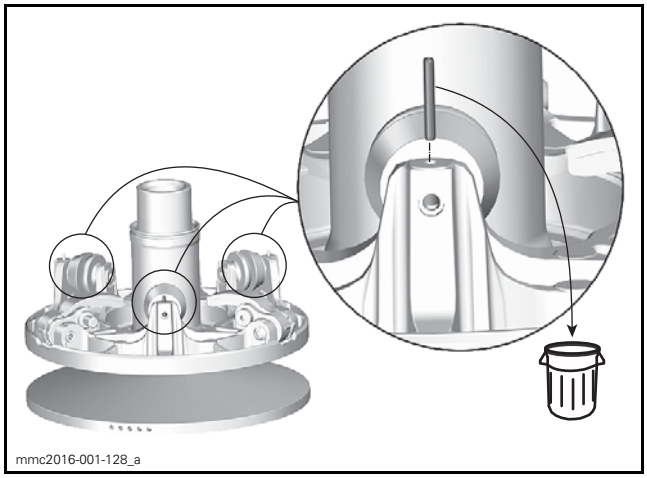
Step 1: Screw the tool into the axle
Step 2: Push axle to the right side

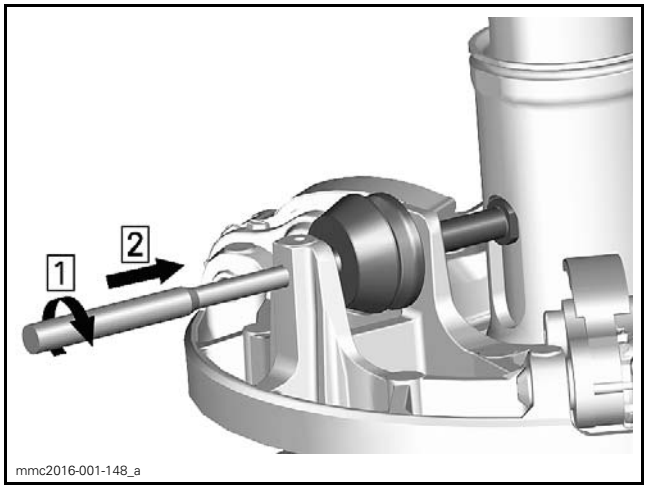
4. Remove ramp assembly.



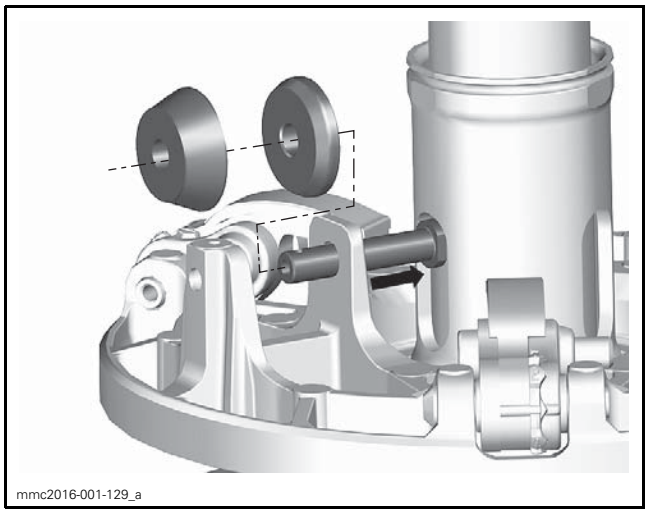
TYPICAL

Removing the Torque Rollers





Step 1: Screw the tool into the axle
Step 2: Push axle towards the center of the pulley


mmc2016-001-129_a

Replacing the Sliding Sheave Bushing

In case of worn out bushing, it is advisable to replace whole sliding sheave assembly as replacing just the bushing may reduce drive pulley performance.

Cleaning the Drive Pulley

NOTE: Parts must be at room temperature before cleaning.

Clean pulley sheaves and shaft with fine steel wool and dry cloth.

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

Clean the following components.
- Crankshaft tapered end
- Taper inside fixed sheave of drive pulley
- Crankshaft threads
- Retaining screw threads.

NOTICE Avoid contact between cleaner and crankshaft seal because damage may occur.

Remove all hardened oil deposits that are baked on crankshaft and pulley tapered surfaces with coarse or medium steel wool and/or sand paper no. 600.

NOTICE Do not use any other type of abrasive.

Reclean mounting surfaces with paper towel and cleaning solvent.

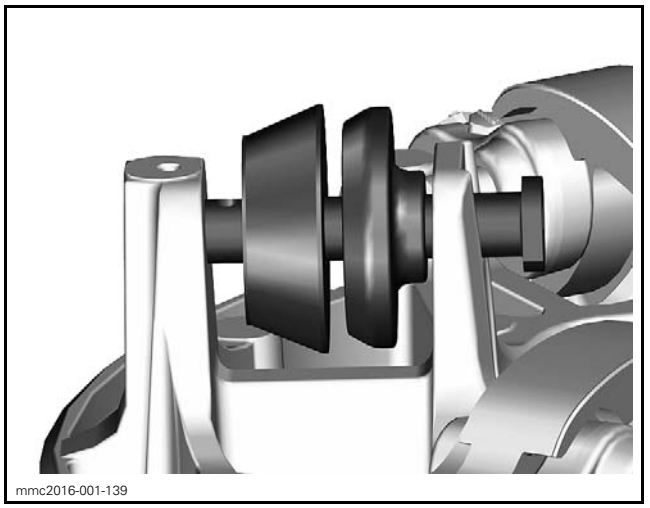
Wipe off the mounting surfaces with a clean, dry paper towel.

NOTICE Mounting surfaces must be free of any oil, cleaner or towel residue.

Assembling the Drive Pulley

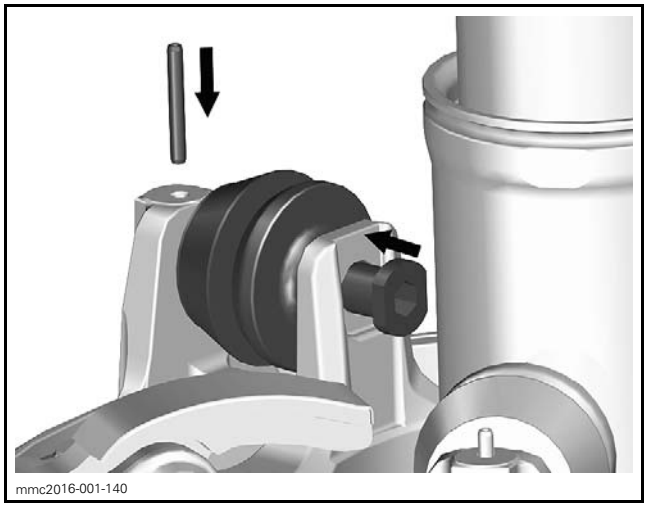
Torque Rollers

Position torque rollers as illustrated.


mmc2016-001-139

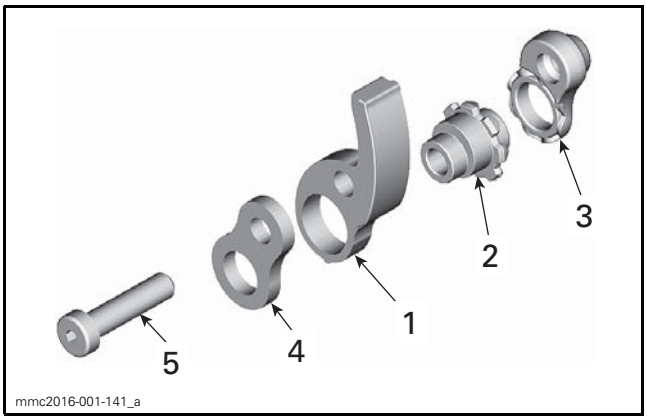
Position the flat sides of the axle head inside the slot of the mounting lug.

Install a new spring pin.


mmc2016-001-140

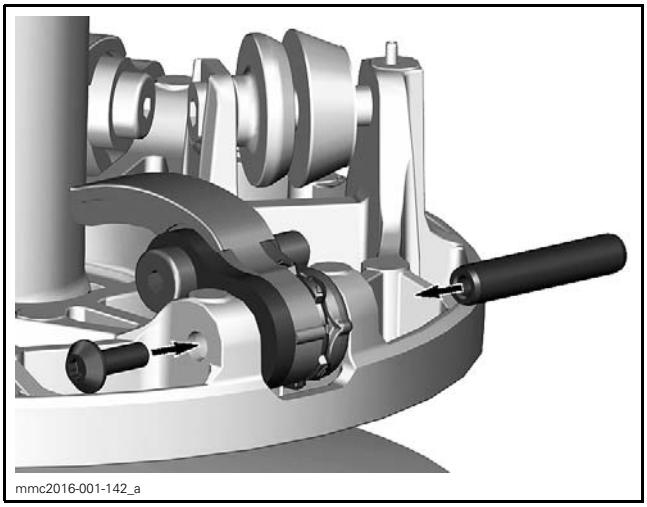
Ramp

Assemble the ramp as illustrated. Do not torque the pivot yet.



1. *Ramp*
2. *Cam*
3. *Right lever*
4. *Left lever*
5. *Pivot*

Install the ramp assembly on the sliding sheave.



TIGHTENING TORQUE	
Axle screw	5 N•m ± 0.5 N•m (44 lbf•**in** ± 4 lbf•**in**)

Position the cam to the desired position.

For factory setting, refer to *SPECIFICATIONS (VEHICLE)*.

NOTICE **Make sure all cams are set at the same number.**

TIGHTENING TORQUE	
Pivot	8 N•m ± 1 N•m (71 lbf•**in** ± 9 lbf•**in**)

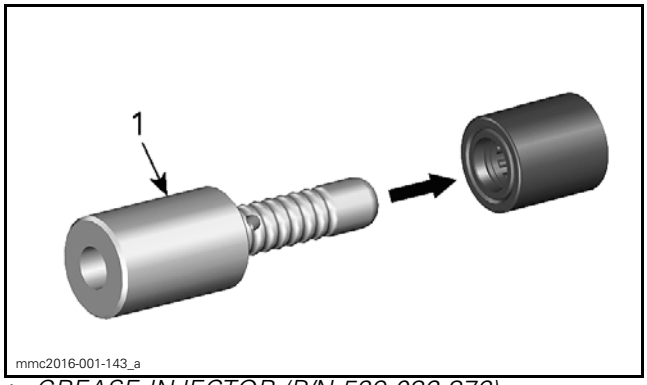
Roller

Lubricate the roller bearing.

SERVICE PRODUCT
ISOFLEX GREASE TOPAS NB 52 (P/N 293 550 021)

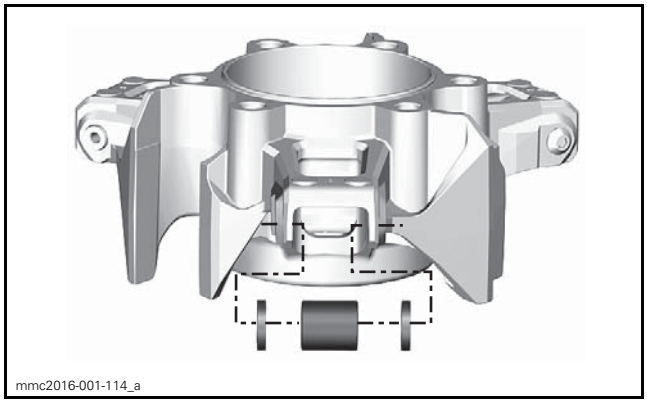
REQUIRED TOOL	
GREASE INJECTOR (P/N 529 036 376)	

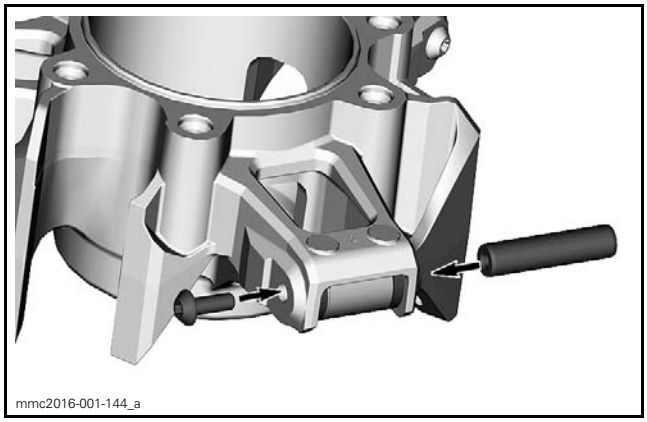
NOTE: A threaded end is required on the grease gun for using the grease injector.



1. *GREASE INJECTOR (P/N 529 036 376)*

Install roller.



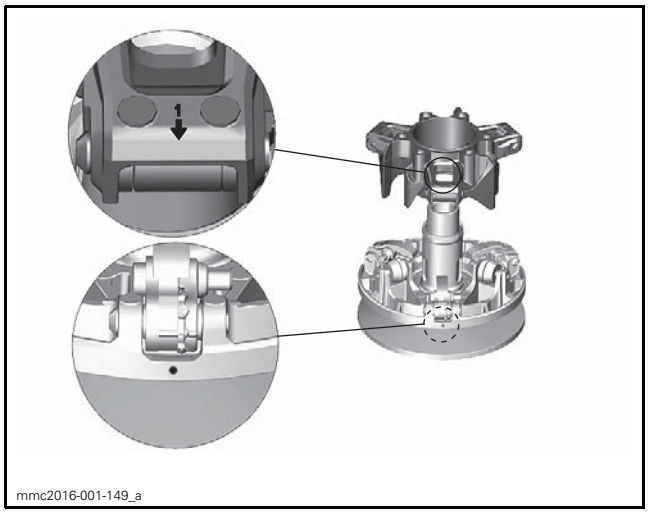


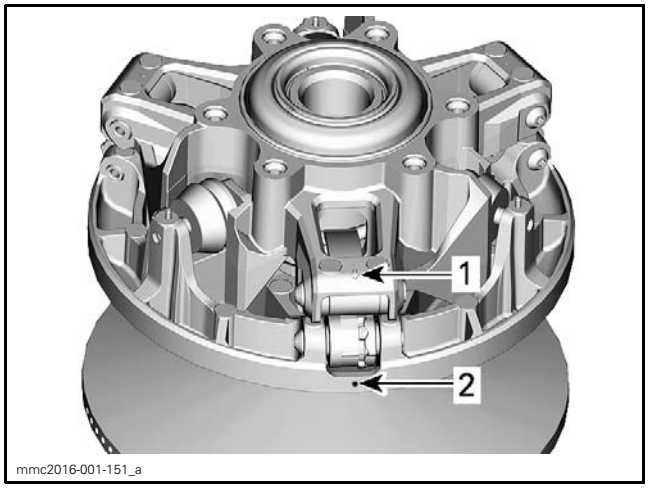
TIGHTENING TORQUE	
Roller axle screw	5 N•m ± 0.5 N•m (44 lbf•**in** ± 4 lbf•**in**)

Spider

Install the spider on the sliding sheave by aligning the indexing marks.

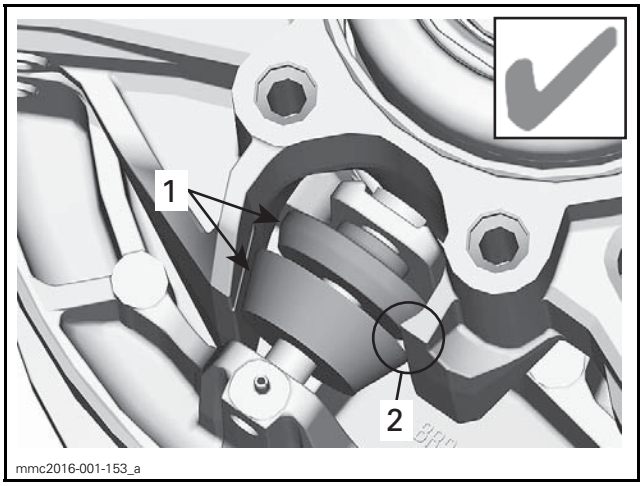
– Spider - the arrow on the arms #1, just above the roller.
– Sliding sheave - the dot on the external side of the sheave.



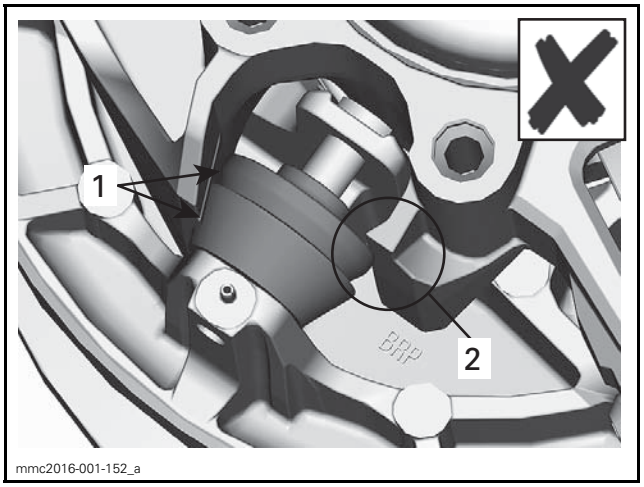


FINAL POSITION
1. *Arrow - spider arm*
2. *Dot - sliding sheave*

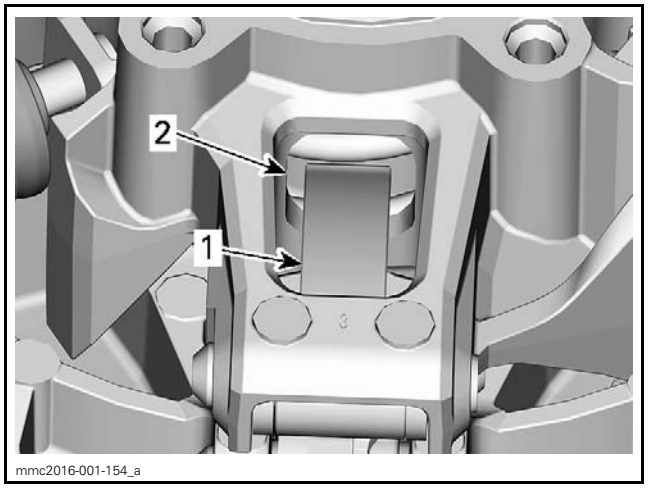
NOTICE During installation of the spider, make sure to position the three spurs of spider legs between torque rollers and ensure that ramps are positioned inside the openings of the spider.



ROLLER - GOOD INSTALLATION
1. *Torque rollers*
2. *Spur of the spider leg*



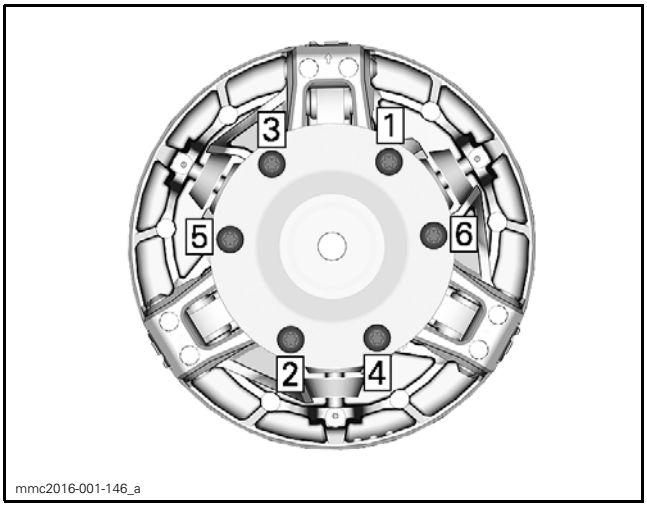
ROLLER - WRONG INSTALLATION
1. *Torque rollers*
2. *Spur of the spider leg*



RAMP POSITIONING

Damper

Install the damper using the following sequence.



TIGHTENING TORQUE	
Damper screws	31.5 N•m ± 3.5 N•m (23 lbf•ft ± 3 lbf•ft)

Sliding Sheave and Fixed Sheave Assembly

Index sliding sheave with fixed sheave by aligning index marks.

– Sliding sheave - the arrow on the spider arms #1, just above the roller.
– Fixed sheave- the dot on the external side of the sheave.

Installing the Drive Pulley

REQUIRED TOOLS	
CLUTCH HOLDER (P/N 529 036 369)	

1. Clean mounting surfaces as described in *DRIVE PULLEY CLEANING* above.

NOTICE Do not apply antiseize or any lubricant on crankshaft and drive pulley tapers.

2. Install drive pulley on crankshaft end.

NOTE: The drive pulley can be installed in one position only. Drive pulley and crankshaft are indexed.

3. Install a NEW conical spring washer with its concave side towards drive pulley.
4. Install drive pulley bolt.

NOTICE Always use BRP genuine parts for conical spring washer and bolt.

5. Secure the drive pulley with the clutch holder.
6. Using a torque wrench, tighten the drive pulley bolt. Refer to *TIGHTENING THE DRIVE PULLEY* for the completed procedure.

Tightening the Drive Pulley

Tighten the drive pulley bolt.

TIGHTENING TORQUE		
Drive pulley bolt	First torque	120 N•m (89 lbf•ft)

Before starting engine, perform drive pulley adjustment. Refer to *ADJUSTMENT*, at the beginning of this subsection.

Install drive belt and guard.

Raise the rear of the vehicle and support it with a mechanical stand.

⚠ WARNING

Ensure that the track is free of particles which could be thrown out while track is rotating. Keep hands, tools, feet and clothing clear of track. Ensure nobody is standing near the vehicle.

Accelerate the vehicle at low speed (maximum 32 km/h (20 MPH) and apply the brake, repeat 5 times.

Tighten the drive pulley bolt again.

TIGHTENING TORQUE		
Drive pulley bolt	Final torque	120 N•m (89 lbf•ft)

⚠ WARNING

After 10 hours of operation the transmission system of the vehicle must be inspected to ensure drive pulley bolt is still properly torqued.

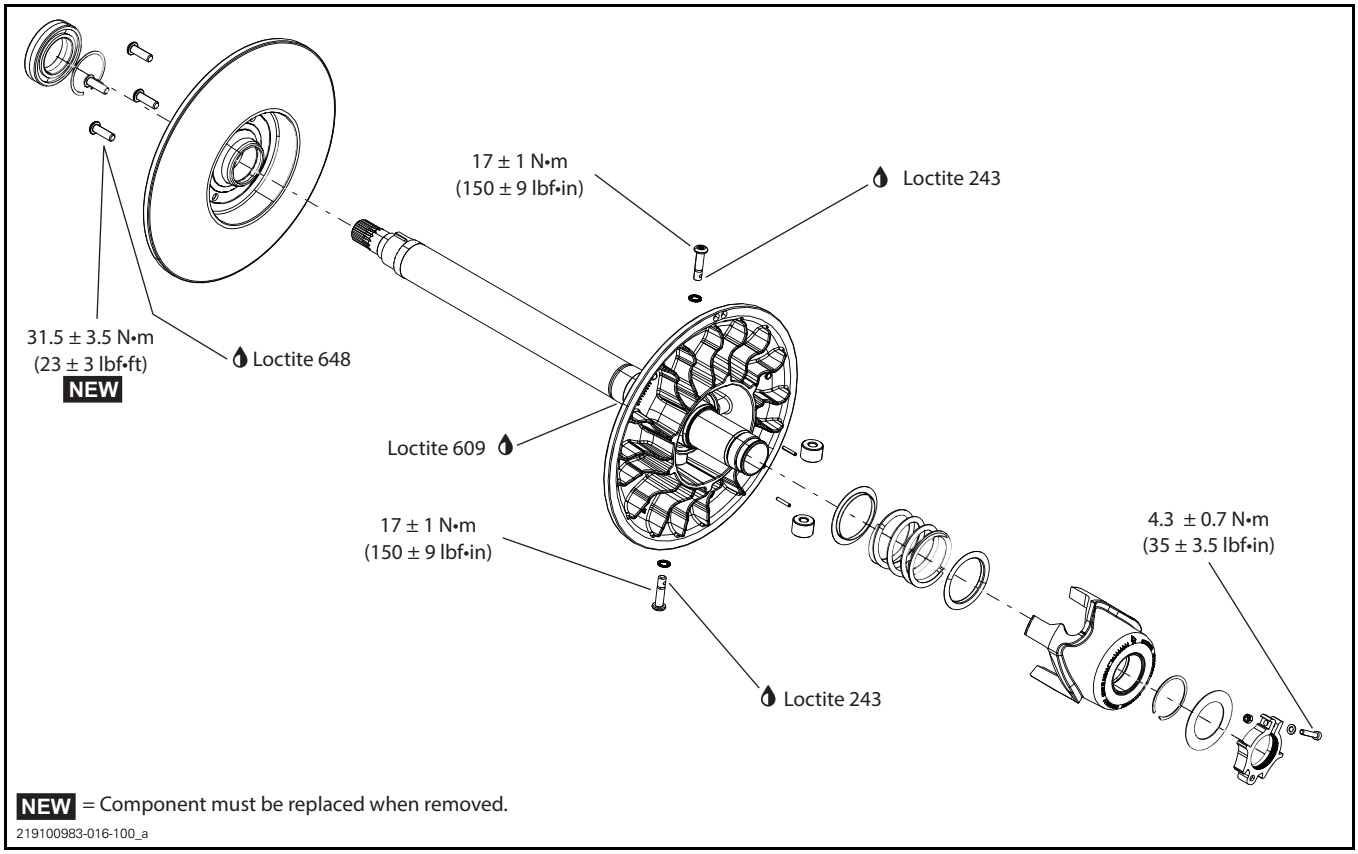
DRIVEN PULLEY AND COUNTERSHAFT

SERVICE TOOLS

Description	Part Number	Page
BEARING PULLER DRIVEN SUPPORT	529 036 485	3
COUNTERSHAFT ADAPTER	529 036 424	9
COUNTERSHAFT BEARING INSTALLER	529 036 066	10
COUNTERSHAFT BEARING REMOVER	529 036 065	9
COUNTERSHAFT SUPPORT	529 036 067	9
DRIVEN PULLEY SPRING COMPRESSOR	529 036 182	3
UPPER GEAR RETAINING TOOL	529 036 110	2

SERVICE PRODUCTS

Description	Part Number	Page
CLUTCH AND PULLEY FLANGE CLEANER PRO S1	779244	7, 10
LOCTITE 243 (BLUE)	293 800 060	7
LOCTITE 609	413 703 100	10
LOCTITE 648 (GREEN)	413 711 400	8
LOCTITE 7649 (F)	619 600 100	10
LOCTITE 7649 (PRIMER)	293 800 041	10
LOCTITE 767 (ANTI-SEIZE LUBRICANT)	293 800 070	9
PULLEY FLANGE CLEANER (F)	619 600 022	7, 10



GENERAL

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

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

⚠ WARNING

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

⚠ WARNING

Never start engine when the pulley guard is removed.

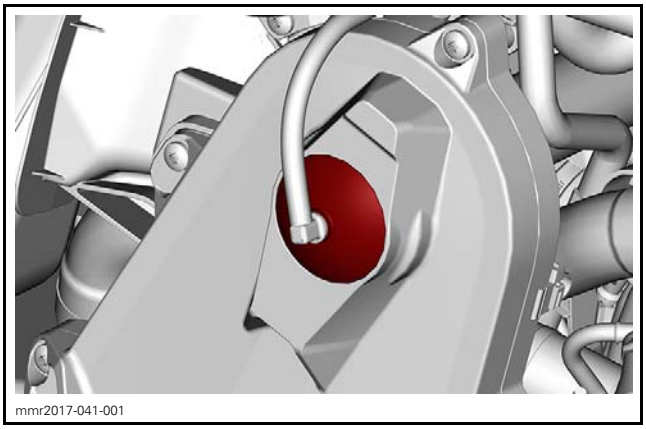
PROCEDURES

DRIVEN PULLEY

Removing the Driven Pulley

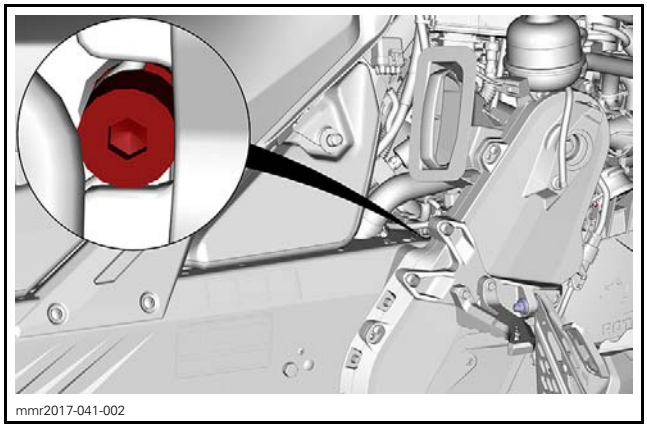
NOTE: The driven pulley is removed with the countershaft.

1. Remove the muffler. Refer to *EXHAUST SYSTEM* subsection.
2. Remove the filling plug on the chaincase cover.



mmr2017-041-001

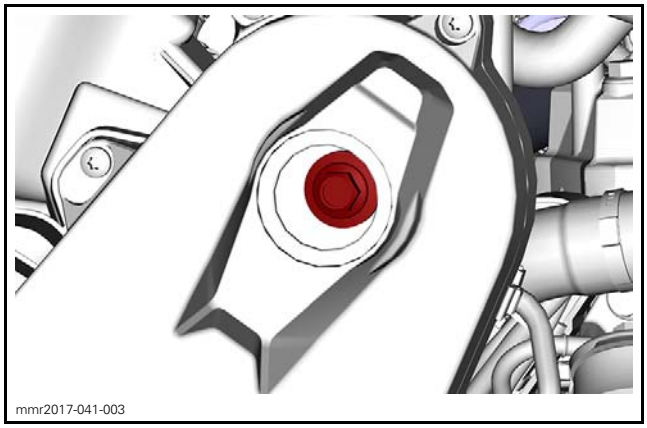
3. Release drive chain tension by unscrewing tensioner adjustment screw.



mmr2017-041-002

4. Remove the upper gear screw and the conical spring washer.

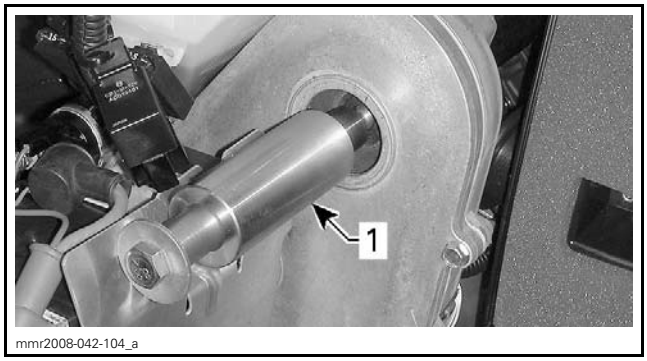
NOTE: Slightly tilt the bolt to avoid dropping washer inside chaincase.



mmr2017-041-003

5. Install the gear retaining tool on countershaft end.

REQUIRED TOOL	
UPPER GEAR RETAINING TOOL (P/N 529 036 110)	

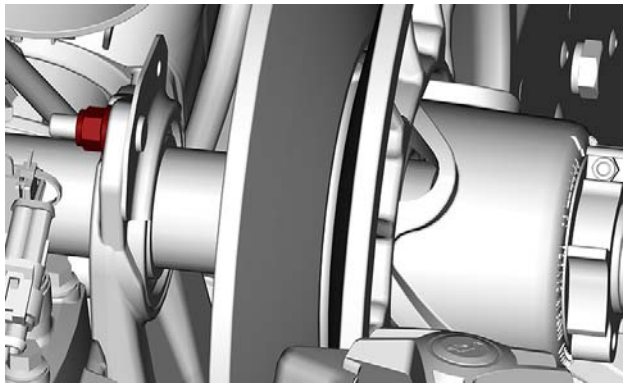


mmr2008-042-104_a

TYPICAL
1. Upper gear retaining tool

6. Remove the drive belt. Refer to *DRIVE BELT* subsection.

7. Behind driven pulley, remove nut securing the countershaft bearing flange.

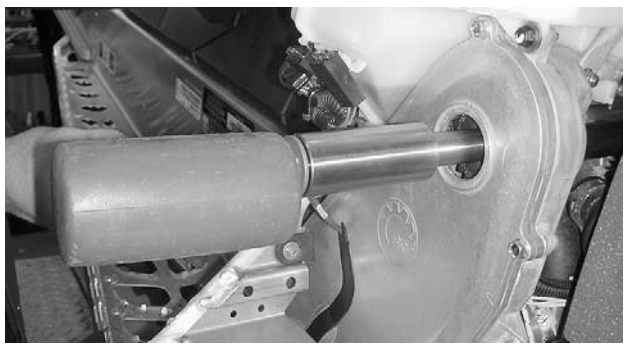

mmr2017-041-004

8. Pull out bearing flange.
9. Use the bearing puller to extract the bearing from the support.

REQUIRED TOOL	
BEARING PULLER DRIVEN SUPPORT (P/N 529 036 485)	

10. Pull the driven pulley to disengage countershaft and upper gear.

NOTE: If necessary, tap the upper gear retaining tool with a plastic hammer.


mmr2008-042-106

TYPICAL

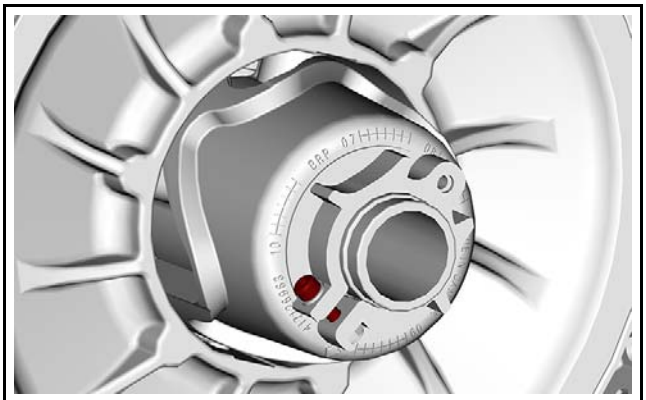
11. Unscrew countershaft from the upper gear retaining tool. **Do not** remove tool.

NOTE: While countershaft is removed from vehicle, the upper gear retaining tool maintains the drive chain and the upper gear in position inside chaincase.

Driven Pulley Disassembly

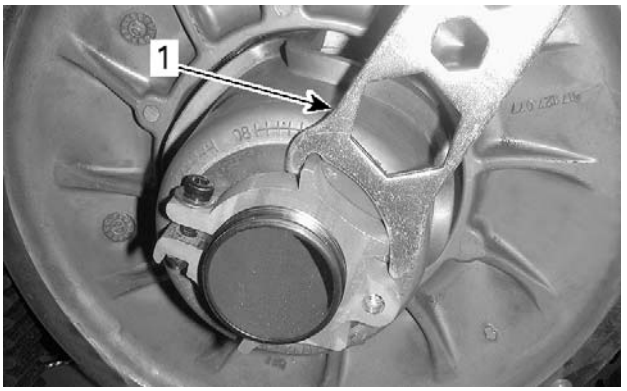
Removing Cam and Spring

1. Loosen the clamping screw.


mmr2017-041-005

2. Unscrew the adjuster hub **clockwise** using the suspension adjustment tool provided in the vehicle tool kit.

NOTE: The adjuster hub has LH treads.

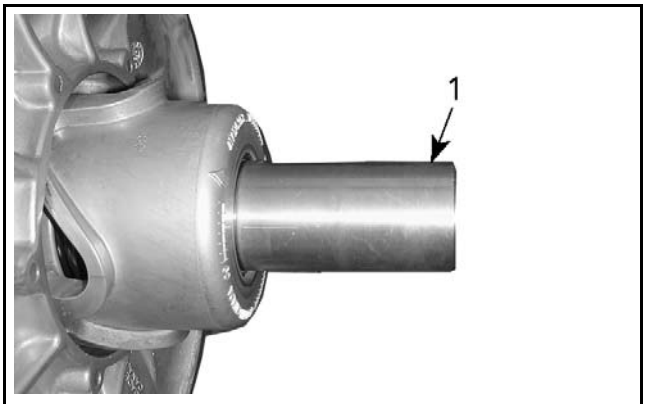


mmr2013-034-010_a

1. Suspension adjustment tool shown

REQUIRED TOOL	
DRIVEN PULLEY SPRING COMPRESSOR (P/N 529 036 182)	

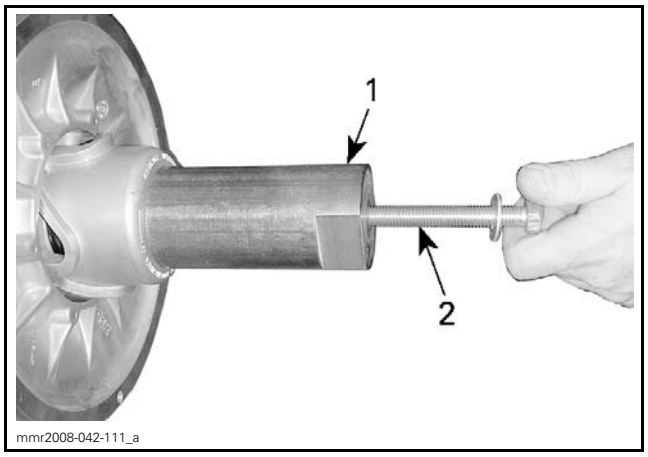
3. Install the threaded adapter of the spring compressor on the countershaft.



mmr2008-042-110_a

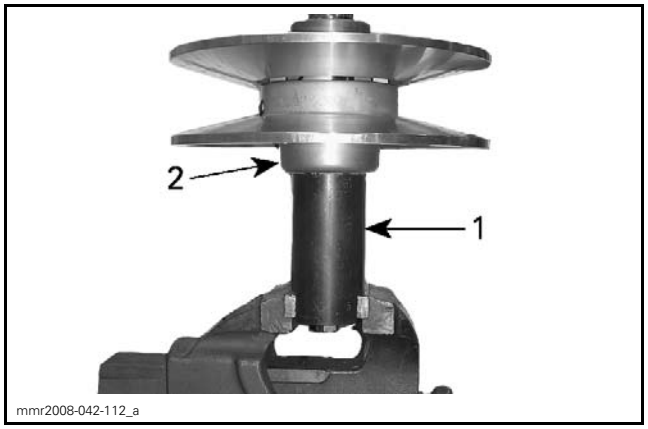
1. Threaded adapter

4. Install the external sleeve over the threaded adapter and secure sleeve with the tool screw.



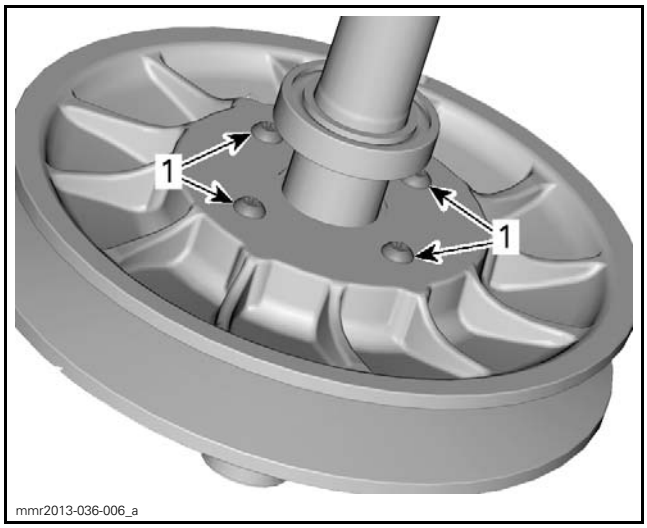
1. External sleeve
2. Driven pulley spring compressor screw

5. Tighten the tool screw to compress the cam.
6. Install the tool in a vice.



1. Driven pulley spring compressor
2. Driven pulley

7. Using a heat gun, heat cam screws to break the thread locker.

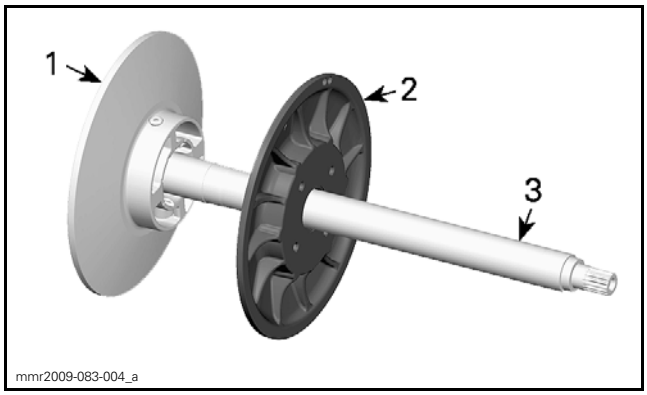


1. Heat cam screws

8. Remove and discard cam screws.
9. Unscrew the tool screw completely.
10. Remove cam, spring stoppers and spring.

Removing the Sliding Sheave

1. Remove the cam and spring. Refer to procedure in this subsection.
2. Remove the countershaft bearing. Refer to procedure in this subsection.
3. Remove sliding sheave.



1. Fixed sheave
2. Sliding sheave
3. Countershaft

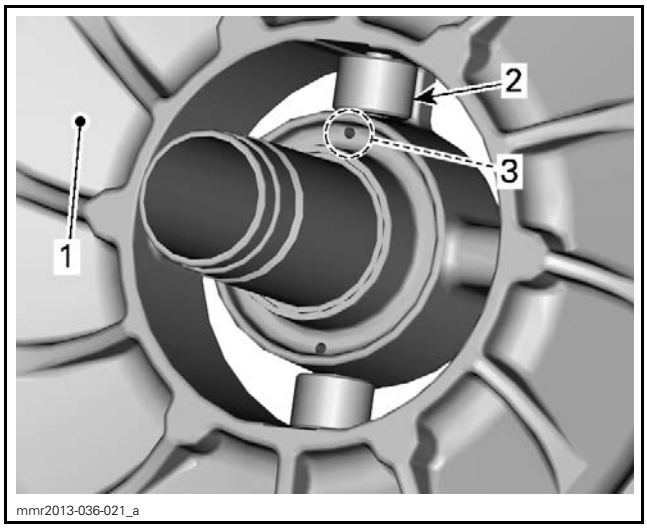
Removing the Fixed Sheave

The fixed sheave and countershaft are sold as an assembly. They are not available separately.

Removing the Driven Pulley Rollers

1. Move sliding and fixed sheaves apart.
2. Remove spring pins used to lock pivot screws.
   2.1 Use tap wrench to start removing spring pin.

2.2 Once spring pin is accessible to pliers, pull pin out using pliers.

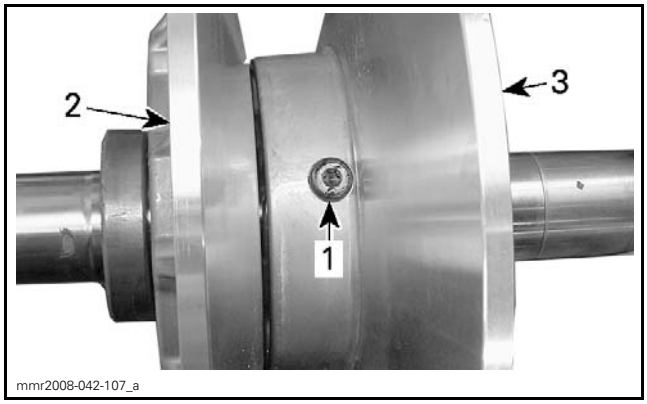


mmr2013-036-021_a

1. *Fixed sheave outer face*
2. *Roller*
3. *Spring pin location*

3. Identify pivot screws location before removal.
4. Remove pivot screw and ribbed lock washer; **keep both for reuse**.

NOTICE **Make sure not to damage or lose pivot screws. If screws need to be replaced, replace fixed sheave assembly.**

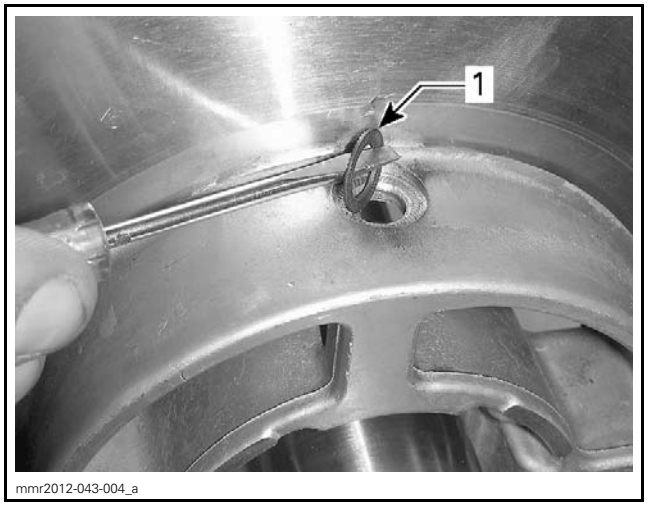


mmr2008-042-107_a

1. *Pivot screw*
2. *Sliding sheave*
3. *Fixed sheave*

mmr2012-043-003

PIVOT SCREW REMOVAL



mmr2012-043-004_a

1. *Ribbed lock washer*

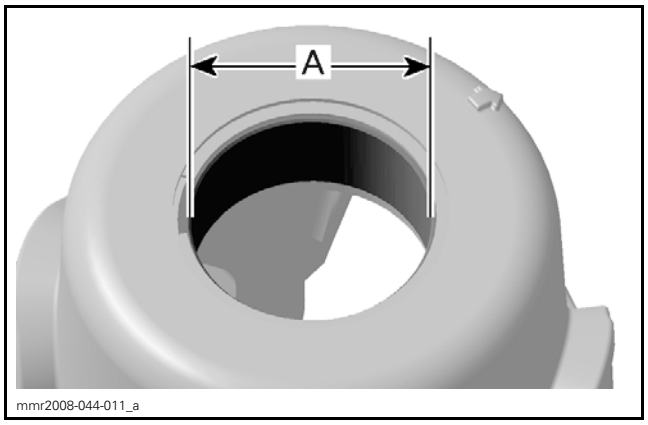
5. Remove roller.
6. Proceed with removal of other roller.

IMPORTANT: For proper fit, each pivot screw must be reinstalled where originally mounted in the fixed sheave.

Inspecting the Driven Pulley

Inspecting Cam and Spring

1. Verify contact surfaces of cam for visible damages. Ensure circlip properly locks the inner bushing. Replace part if necessary.
2. Using a dial bore gauge, measure the inner diameter of cam bushing. Measuring point must be at least 5 mm (1/4 in) from bushing edge.



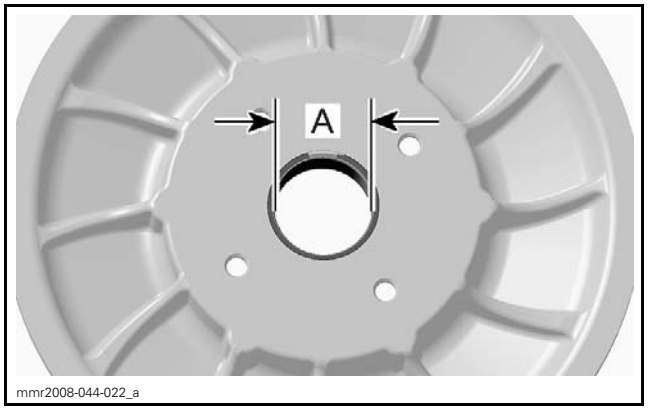
A. Inner diameter of cam bushing

CAM BUSHING	SERVICE LIMIT
Inner diameter	41.5 mm (1.634 in)

3. Replace the cam if the inner diameter of bushing is out of specification.

Inspecting the Sliding Sheave

1. Inspect pulley sheave for marks or scratches.
2. Ensure circlip properly locks the inner bushing. Replace part if necessary.
3. Using a dial bore gauge, measure the inner diameter of sliding sheave bushing. Measuring point must be at least 5 mm (1/4 in) from bushing edge.



A. Inner diameter of sliding sheave bushing

SLIDING SHEAVE BUSHING	SERVICE LIMIT
Inner diameter	41.5 mm (1.634 in)

4. Replace the sliding sheave if the inner diameter of bushing is out of specification.

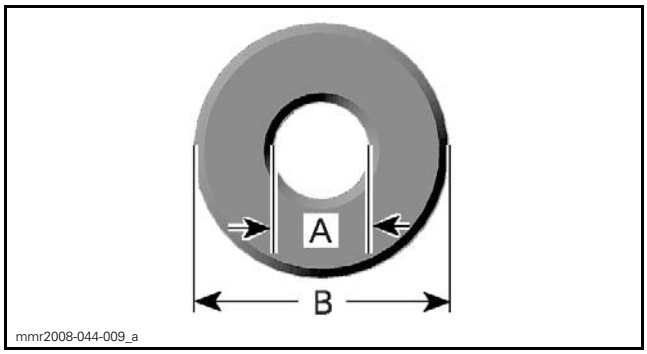
Inspecting the Fixed Sheave

Replace fixed sheave and countershaft if one of the following problem is detected:

– Marks or scratches on pulley sheave
– Bent, twisted or otherwise damaged countershaft
– Defective splines and threads at the end of countershaft.

Inspecting the Driven Pulley Roller

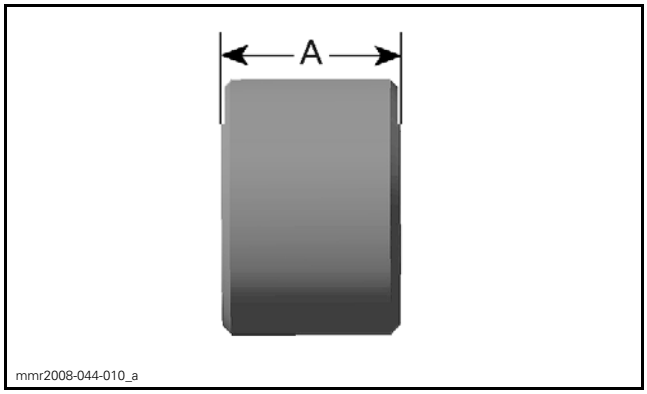
1. Check the rollers for flat spots, cracks or other visible damages. Replace if necessary (as a set).
2. Measure inner and outer diameter of rollers.



A. Inner diameter
B. Outer diameter

DRIVEN PULLEY ROLLER	SERVICE LIMIT
Inner diameter	8.5 mm (.335 in)
Outer diameter	21.5 mm (.846 in)

3. Measure the roller thickness.



A. Thickness of roller

DRIVEN PULLEY ROLLER	SERVICE LIMIT
Thickness	14.75 mm (.581 in)

4. If a roller is out of specifications, replace both rollers at the same time.

Cleaning the Driven Pulley

Use the a clean rag to clean pulley sheaves.

SERVICE PRODUCT	
Scandinavia	PULLEY FLANGE CLEANER (F) (P/N 619 600 022)
Other Countries	CLUTCH AND PULLEY FLANGE CLEANER PRO S1 (P/N 779244)

Cleaning Cam and Spring

During break-in period, teflon from bushing moves to cam or countershaft surface. A teflon over teflon running condition occurs, leading to low friction. So it is normal to see gray teflon deposit on cam or countershaft. Do not remove this deposit.

When a dust deposit has to be removed from the cam or the countershaft, use dry cloth to avoid removing transferred teflon.

Driven Pulley Assembly

Installing the Driven Pulley Roller

NOTE: Exceptionally, do NOT clean threaded hole to avoid changing the screw position when torqued.

1. Using a hand wire brush, clean pivot screw threads.

IMPORTANT: Do not use a thread die to clean pivot screw of threadlocker as this may alter the screw threads.

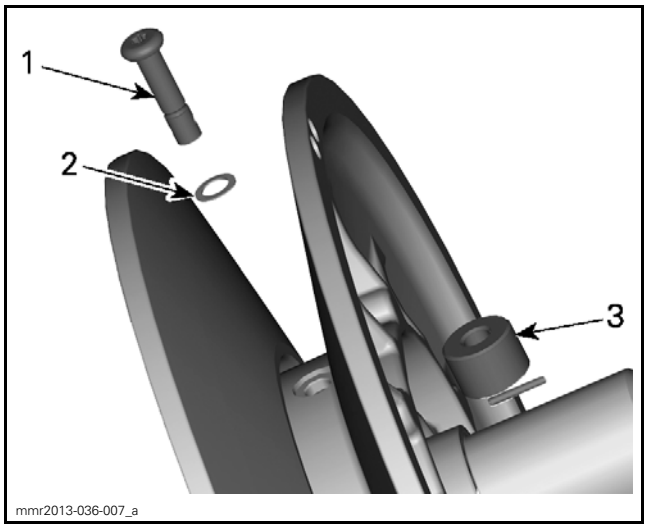
NOTE: Pivot screw and ribbed lock washer must be reused if in good condition. If damaged, replace fixed sheave assembly.

2. Apply the following threadlocker to the pivot screw threads.

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

3. Insert roller in fixed sheave, thread in pivot screw with ribbed lock washer.

NOTE: The ribbed locked washer must be installed with the concave side towards the fixed sheave.



1. Pivot screw
2. Ribbed lock washer (concave side towards fixed sheave)
3. Roller

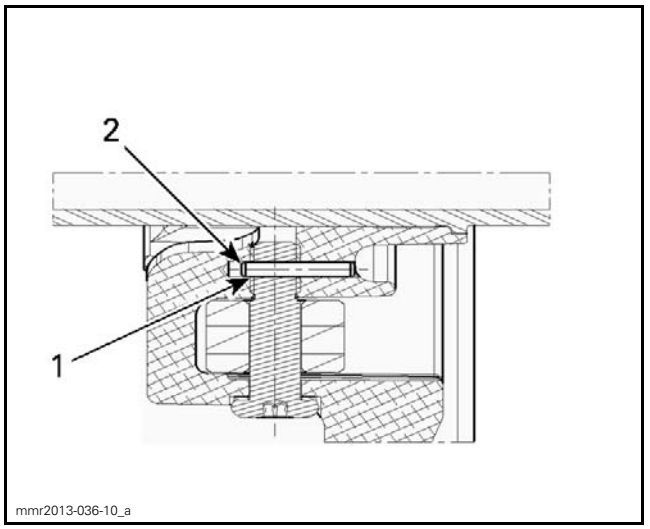
IMPORTANT: For proper fit, each pivot screw must be reinstalled where originally mounted in the fixed sheave.

4. Torque pivot screw as specified.

TIGHTENING TORQUE	
Pivot screws	17 N•m ± 1 N•m (150 lbf•**in** ± 9 lbf•**in**)

NOTE: Spring pin hole in the fixed sheave and pivot screw must perfectly line up when torque is applied.

NOTICE **If not properly aligned, spring pin will not insert in pivot screw hole and spring pin threads in fixed sheave will be damaged.**

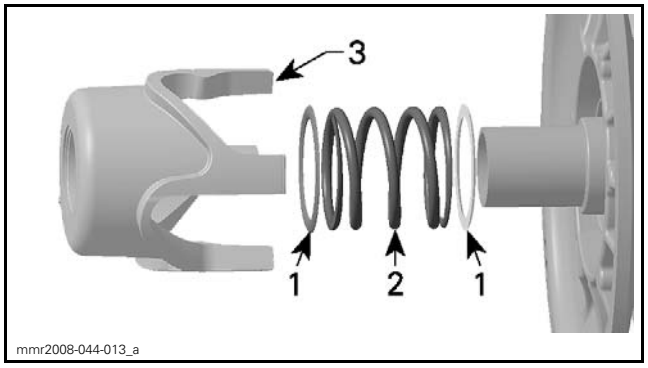


1. Hole in pivot screw
2. Spring pin

5. Install spring pin.

Installing Cam and Spring

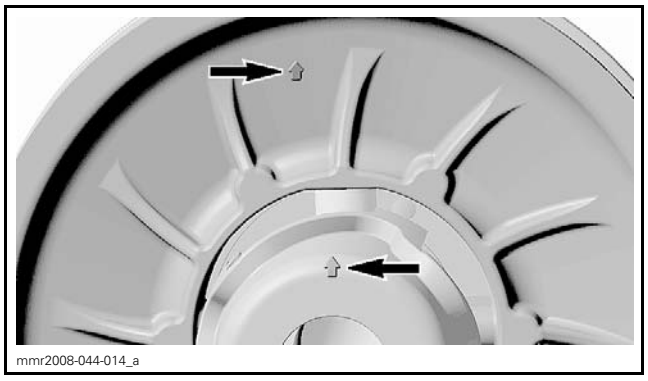
1. Install a spring stopper, the spring, the other spring stopper and the cam.



1. Spring stopper
2. Spring
3. Cam

2. Align the arrow on the cam with the arrow on the fixed sheave.

NOTE: On completion of cam installation, the arrow on the cam should have moved clockwise (approximately 30°).



3. Install the driven pulley spring compressor sleeve and tighten the tool screw until the cam is completely pressed against the sliding sheave.
4. Apply threadlocker on the thread of 4 new cam screws.

RECOMMENDED SERVICE PRODUCT
LOCTITE 648 (GREEN) (P/N 413 711 400)

5. From the back of the sliding sheave, install the 4 new cam screws.
6. Torque cam screws as specified.

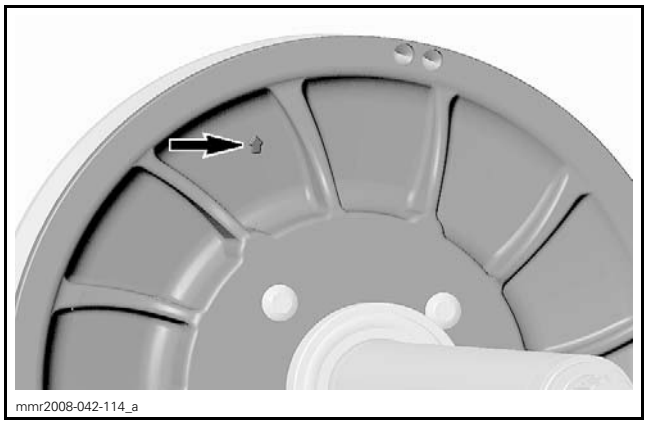
TIGHTENING TORQUE	
Cam screw	31.5 N•m ± 3.5 N•m (23 lbf•ft ± 3 lbf•ft) + LOCTITE 648 (GREEN) (P/N 413 711 400)

7. Remove the tool.

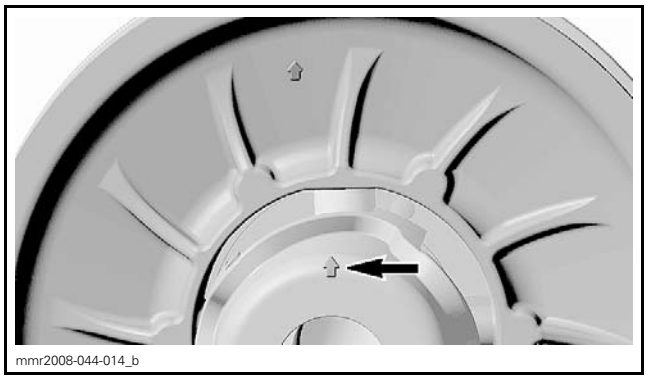
Installing the Sliding Sheave

The assembly of sliding sheave is the reverse of the disassembly. However, pay attention to the following.

When installing sliding sheave, make sure to align its arrow with the arrow on cam.



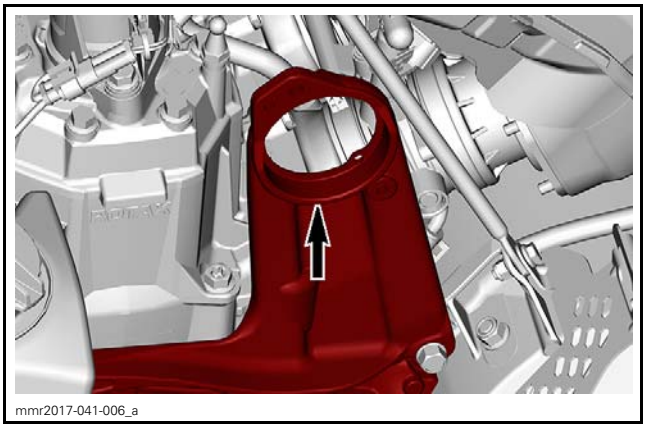
SLIDING SHEAVE ARROW



CAM ARROW

Installing the Driven Pulley

1. Using sand paper (600-grit or 1000-grit) or steel wool, remove any rust on bearing shoulder of countershaft bearing support.



BEARING SUPPORT SHOULDER

2. Apply a thin layer of antiseize lubricant on bearing shoulder.

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

3. Insert countershaft through countershaft bearing support.
4. Fasten the end of countershaft to upper gear retaining tool.
5. Align countershaft splines with upper gear splines.
6. Using the upper gear retaining tool as a puller, Engage countershaft splines in upper gear splines. Ensure countershaft bearing is installed properly in countershaft bearing support.
7. Remove the upper gear retaining tool.
8. Install the upper gear screw and the conical spring washer.

NOTE: The conical spring washer must be installed with its concave side towards upper gear.

9. Torque upper gear screw.
10. Install chaincase filler plug.
11. On LH side, install the bearing flange. Torque nut as specified.

TIGHTENING TORQUE	
Bearing flange nut	15.5 N•m ± 1.5 N•m (137 lbf•**in** ± 13 lbf•**in**)

12. Install the adjuster hub onto the countershaft end and temporarily tighten.
13. Install and adjust drive belt. Refer to *DRIVE BELT* subsection.
14. Install all other removed parts.

COUNTERSHAFT

The countershaft and the fixed sheave are sold as an assembly. They are not available separately.

Removing and Installing the Countershaft

Refer to *DRIVEN PULLEY* in this subsection for the procedures.

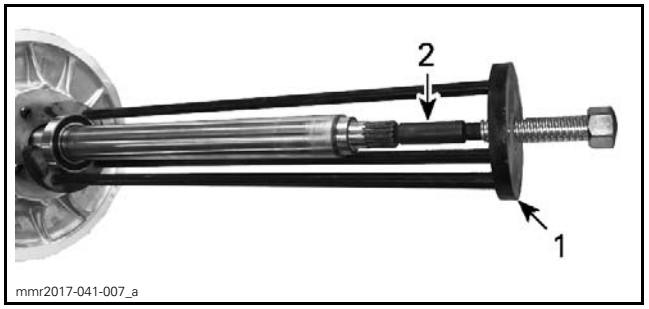
COUNTERSHAFT BEARING

Removing the Countershaft Bearing

Remove the driven pulley. Refer to procedure in this subsection.

Install the bearing remover on countershaft.

REQUIRED TOOL	
COUNTERSHAFT BEARING REMOVER (P/N 529 036 065)	
COUNTERSHAFT ADAPTER (P/N 529 036 424)	



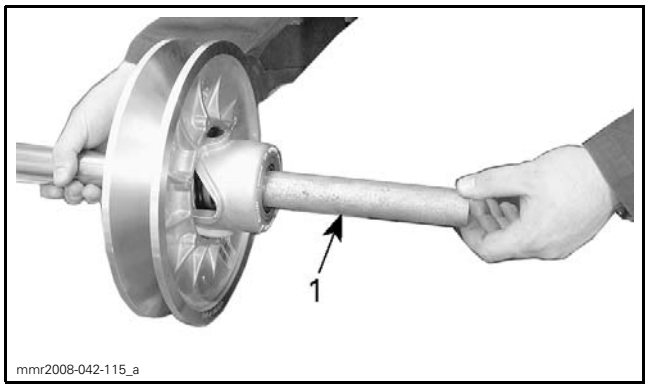
1. *Countershaft adapter*
2. *Countershaft bearing remover*

Tighten the screw at the end of tool to extract the bearing. Discard bearing.

Installing the Countershaft Bearing

1. Remove the adjuster hub from the cam.
2. Insert the countershaft support in the countershaft.

REQUIRED TOOL
COUNTERSHAFT SUPPORT (P/N 529 036 067)



1. Countershaft support

NOTICE The countershaft support is mandatory to avoid damaging the countershaft threaded end and the cam during bearing installation.

3. Clean residues on countershaft bearing surface.

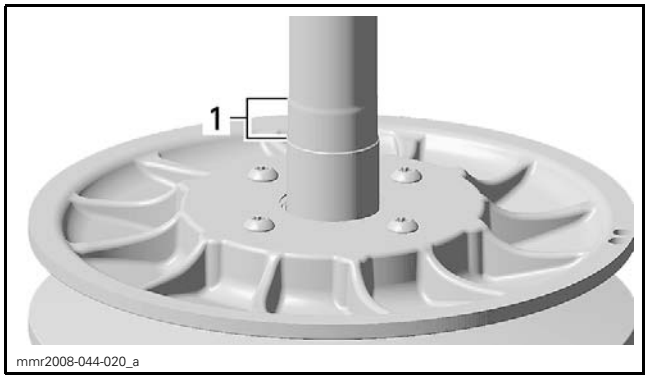
SERVICE PRODUCT	
Scandinavia	PULLEY FLANGE CLEANER (F) (P/N 619 600 022)
Other Countries	CLUTCH AND PULLEY FLANGE CLEANER PRO S1 (P/N 779244)

4. Check countershaft bearing surface for wear.
5. Apply Loctite 7649 on countershaft bearing surface and let dry 5 minutes.

SERVICE PRODUCT	
Scandinavia	LOCTITE 7649 (F) (P/N 619 600 100)
Other Countries	LOCTITE 7649 (PRIMER) (P/N 293 800 041)

6. Apply Loctite 609 on primer.

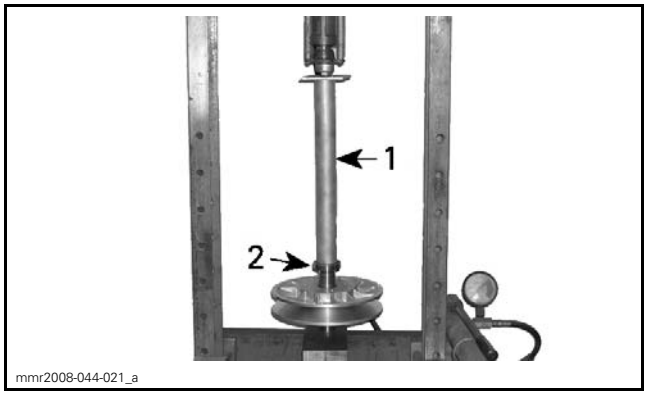
SERVICE PRODUCT
LOCTITE 609 (P/N 413 703 100)



1. Apply Loctite 7649 (Primer) before Loctite 609 in this region

7. Using a press and the bearing installer, install the new bearing on countershaft.

REQUIRED TOOL
COUNTERSHAFT BEARING INSTALLER (P/N 529 036 066)



1. Countershaft bearing installer
2. New bearing

NOTICE Use a press only, never tap on countershaft bearing installer with an hammer to avoid damaging bearing and countershaft.

8. Clean the surplus Loctite with a rag to avoid having Loctite on sliding sheave bushing.

COUNTERSHAFT BEARING SUPPORT

For countershaft bearing support removal and installation, refer to *COUNTERSHAFT BEARING SUPPORT* in *FRAME*.

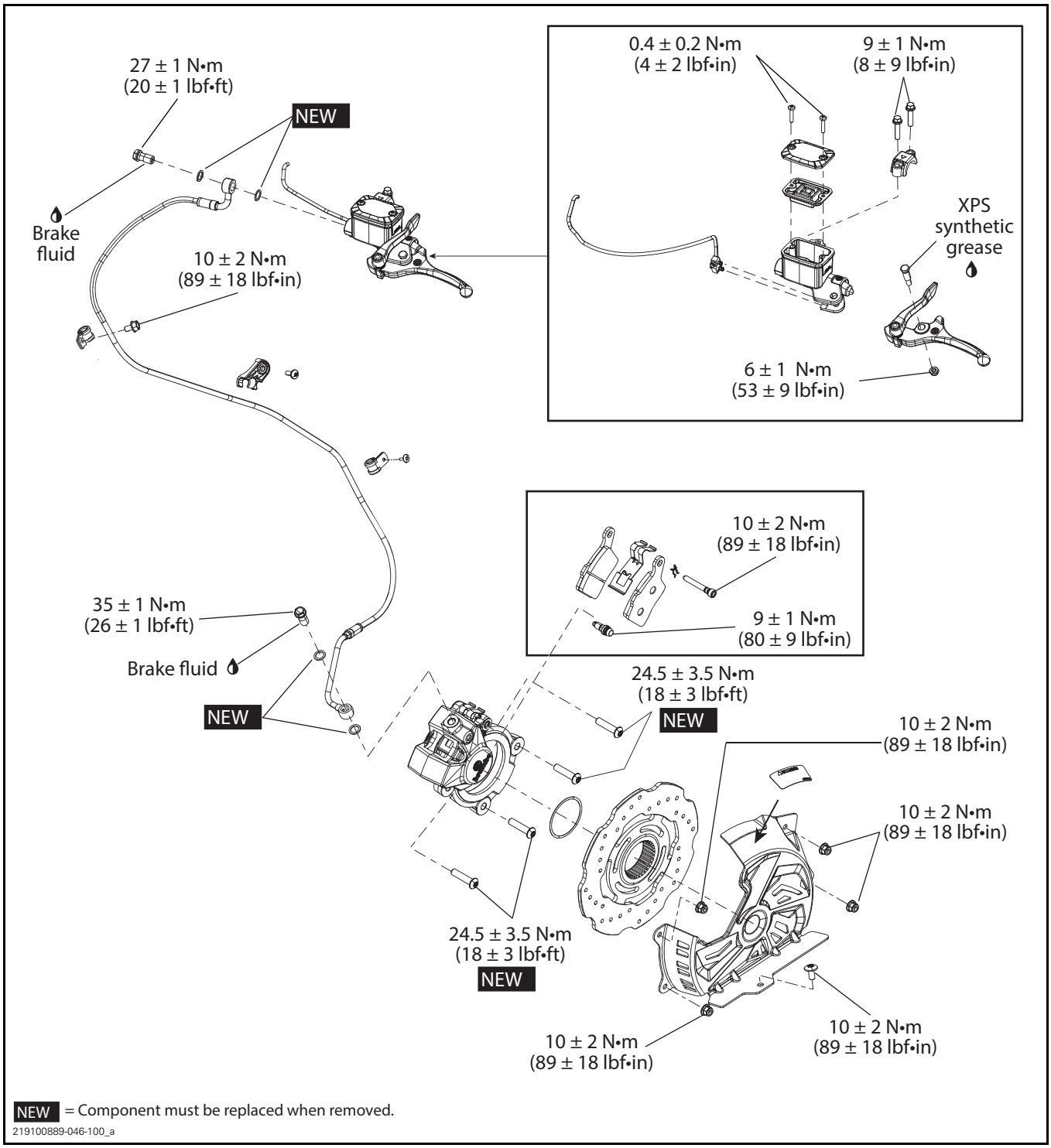
BRAKE

SERVICE TOOLS

Description	Part Number	Page
CALIPER PULLER	529 036 145	6
PROTECTIVE CAP	529 036 150	6

SERVICE PRODUCTS

Description	Part Number	Page
BRAKE FLUID DOT 4	779151	11
LOCTITE 767 (ANTISEIZE LUBRICANT)	293 800 070	6
SYNTHETIC GREASE	779162	9, 12



NEW = Component must be replaced when removed.

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GENERAL

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

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

⚠ WARNING

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

Hoses or cables removed or disconnected must be installed and routed as per factory specifications.

NOTICE Locking ties removed must be replaced as per factory specifications.

⚠ WARNING

Never apply any product to brake fittings, The use of thread sealant or Teflon tape could cause brake system failure.

⚠ WARNING

A contaminated brake disc or pad reduces braking efficiency. Discard contaminated pads and clean contaminated disc with a high quality brake degreasing agent.

NOTICE Avoid spilling brake fluid on plastic, rubber or painted parts. Protect these parts with a rag when servicing the brake system.

NOTICE Wipe up any brake fluid spillage.

NOTICE To avoid serious damage to the brake system, use only DOT 4 brake fluid from a sealed container. Do not use brake fluid taken from an old or already opened containers, or mix different fluids for topping up the system.

NOTICE Sealing washers must be discarded and replaced with NEW ones every time a Banjo fitting is unscrewed.

Dispose of brake fluid as per your local environmental regulation.

PROCEDURES

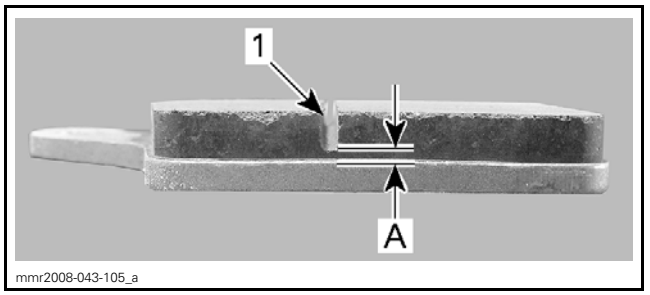
BRAKE PADS

Inspecting the Brake Pads

1. Measure brake pad lining thickness.

SERVICE LIMIT	
Brake pad thickness A	1 mm (1/32 in)

NOTICE Brake pads must always be replaced in pairs.



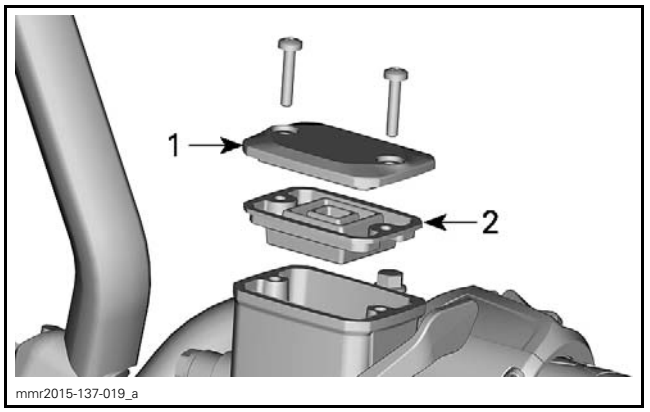
1. Groove on pad lining

2. Also inspect the brake disc, refer to *INSPECTING THE BRAKE DISC* in this subsection.

Replacing the Brake Pads

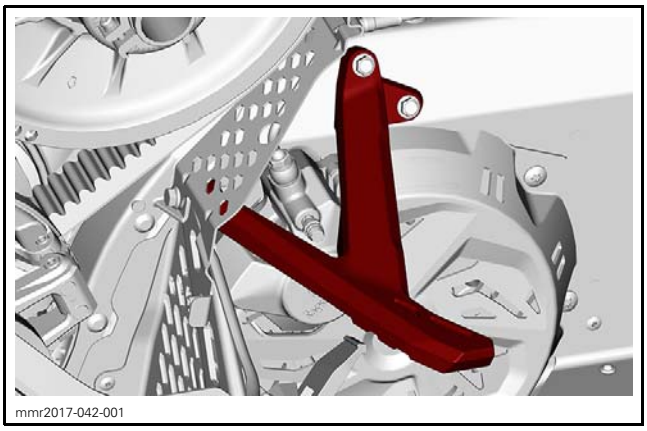
Removing the Brake Pads

1. Place the vehicle on a level surface.
2. Cover the plastic parts under and near master cylinder in the event that brake fluid would be spilled.
3. Remove reservoir cover with its diaphragm seal.



1. Reservoir cover
2. Diaphragm

4. Open the LH side panel.
5. Remove the LH toe hook.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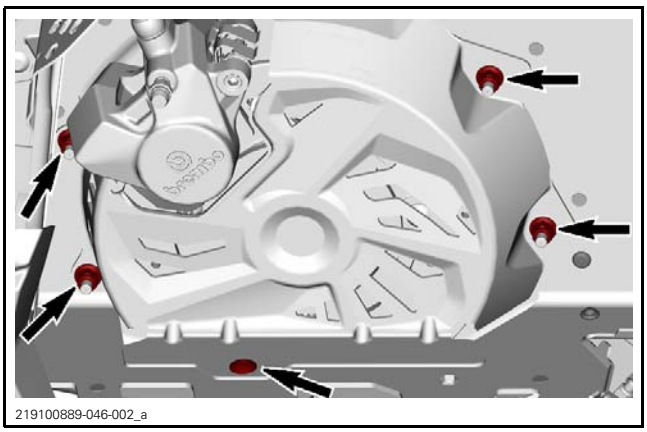
6. Remove the disc brake protective cover.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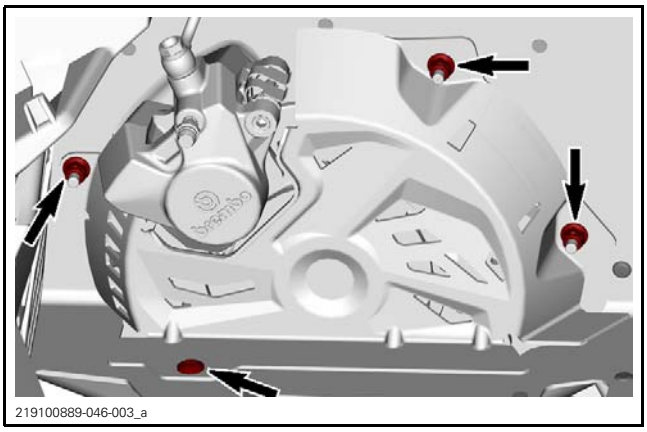
5 HOLES MOUNT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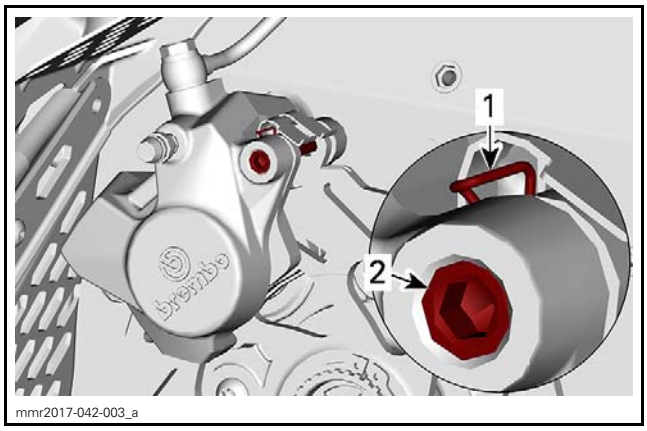
4 HOLES MOUNT

7. Remove the clip securing brake pad pin.
8. Unscrew and remove the brake pad pin.



mmr2017-042-003_a

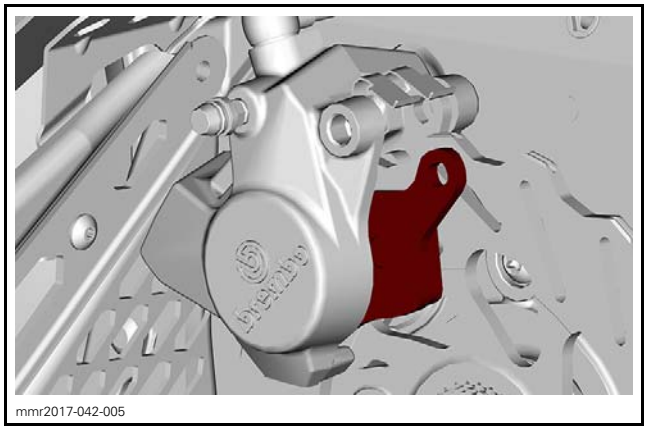
1. Clip
2. Brake pad pin

9. Using a flat screwdriver, depress caliper pistons into their bores. Pay attention for pistons to go back in straight. Insert screwdriver alternatively backwards and forwards and move pistons by small steps.

NOTICE **Pay attention to avoid scratching brake disc.**

10. Remove brake pads.

10.1 Remove the external pad first.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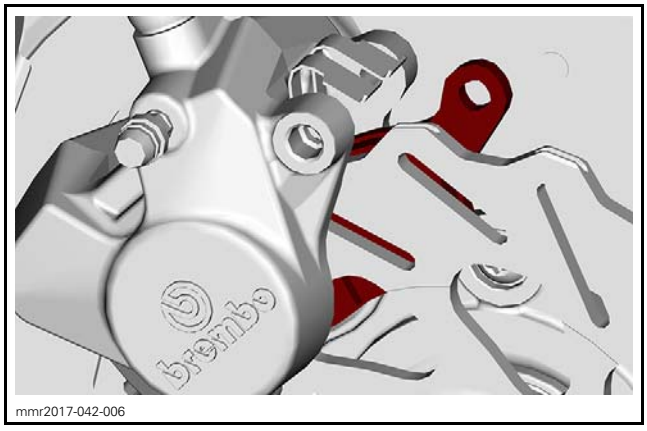
10.2 Pull the brake disc outward and remove the internal pad.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Installing the Brake Pads

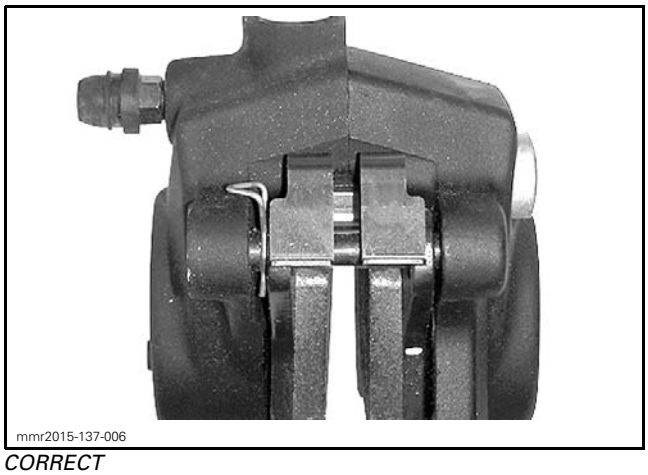
The installation is the reverse of the removal. However, pay attention to the following.

1. Install new brake pads with tabs facing upward.
2. Install brake pad pin and tighten to specification.

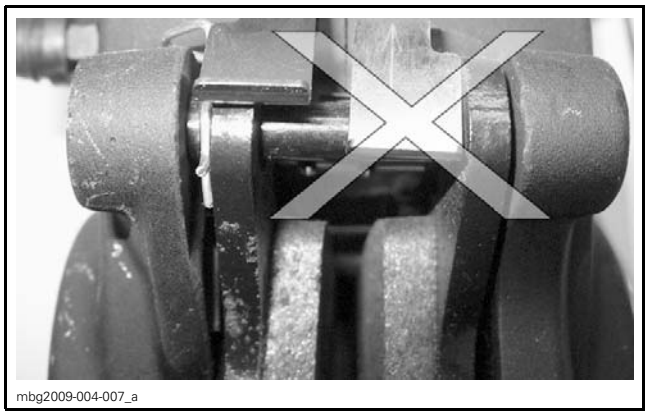
TIGHTENING TORQUE	
Brake pad pin	10 N•m ± 2 N•m (89 lbf•**in** ± 18 lbf•**in**)

3. Install spring clip on brake pad pin. If the clip seems loose, replace it with a new one.

NOTE: Make sure anti-rattle spring ends on brake pads tabs are correctly installed as per following pictures.



CORRECT



INCORRECT (RIGHT SIDE SPRING CLIP)

4. Operate the brake lever several times to bring the brake pads into contact with the disc brake.
5. Check brake fluid level in master cylinder and refill if necessary.
6. Reinstall the diaphragm and the cover.
7. Ride the vehicle a few minutes to make sure the repair is successful.

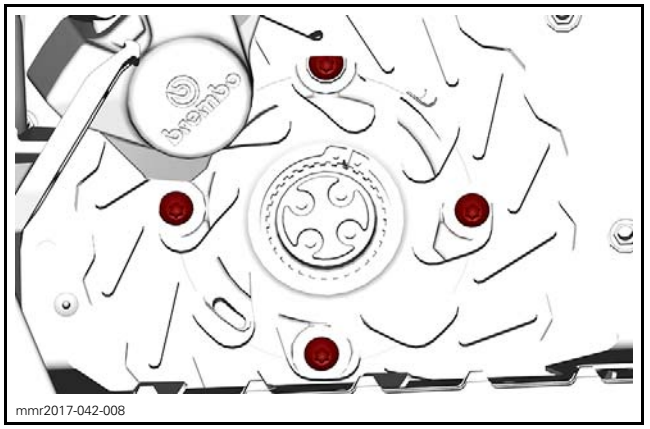
CALIPER

Removing the Caliper

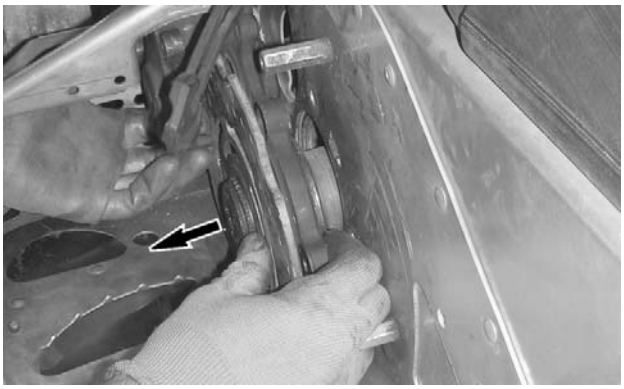
1. Open the RH side panel.
2. Refer to *CHAINCASE* subsection and carry the following steps.
   - 2.1 Remove chaincase cover.
   - 2.2 Loosen drive chain.
   - 2.3 Remove lower sprocket.
3. Open LH side panel.
4. Remove drive belt guard support. Refer to *DRIVE BELT* subsection.
5. Remove the LH toe hook.

NOTE: If the caliper is not replaced, omit steps 5 and 6 concerning the brake system draining and brake hose removal.

6. Remove the brake pads, Refer to procedure in this subsection.
7. Lift the rear of vehicle and release track tension completely.
8. Turn track to align brake disc slots with caliper bracket screws.
9. Remove caliper screws (4) behind brake disc.



10. Pull the assembly (brake disc, caliper, bearing, and drive axle) from LH side in order to make room for the caliper puller.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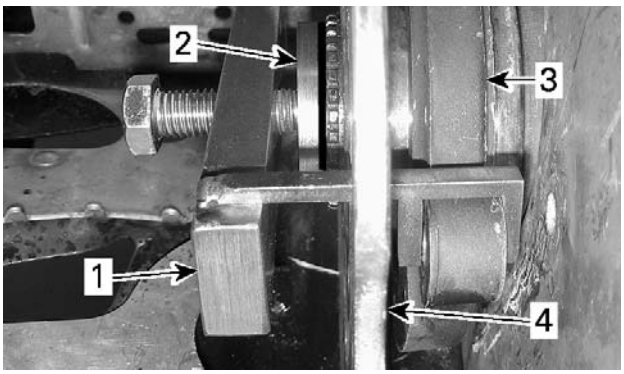
TYPICAL

REQUIRED TOOL	
CALIPER PULLER (P/N 529 036 145)	
PROTECTIVE CAP (P/N 529 036 150)	

11. Install the caliper puller on the brake caliper through brake disc slots.

NOTE: Make sure puller tabs are correctly engaged on caliper.

12. Install the protective cap between caliper puller bolt and plastic cap in drive axle end.



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TYPICAL
1. *Caliper puller*
2. *Protective cap*
3. *Caliper bracket*
4. *Brake disc*

13. Tighten caliper puller bolt to separate caliper from drive axle bearing.

NOTICE Never use an impact tool to operate caliper puller. The caliper or the puller could break.

14. When brake disc is out of splines, remove it.

15. Remove caliper.

NOTICE Do not let caliper hang by the hose and do not stretch or twist the hose.

Inspecting the Caliper

1. Check caliper pistons for:
   - Proper operation
   - Rust
   - Scratches
   - Leaks.
2. Check caliper bracket for:
   - Cracks
   - Rust on bearing shoulder (clean with a steel wood).
3. Replace caliper if required.

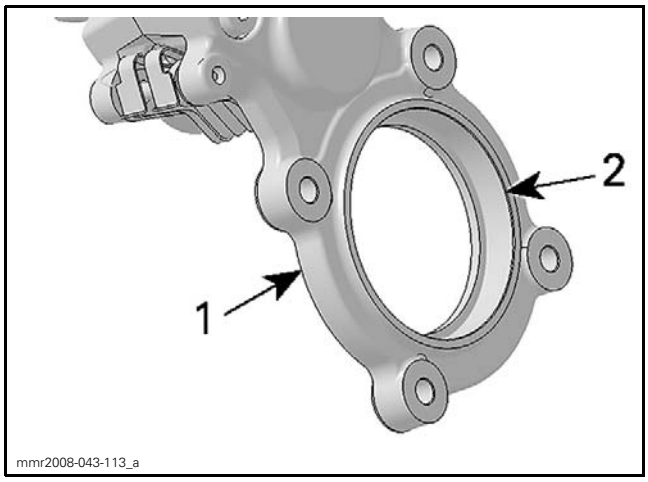
Installing the Caliper

1. Using your fingers or a small piece of wood, push both pistons into their bores.
2. Clean brake caliper bearing shoulder with fine steel wool.
3. Apply antiseize lubricant on drive axle splines and on bearing shoulder of caliper bracket.

SERVICE PRODUCT
LOCTITE 767 (ANTISEIZE LUBRICANT) (P/N 293 800 070)

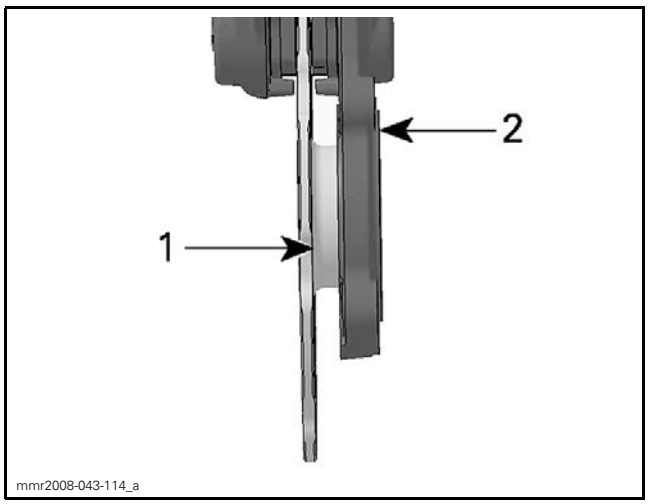
mmr2017-042-009

DRIVE AXLE SPLINES



1. *Caliper bracket*
2. *Bearing shoulder*

4. Insert brake disc in the caliper. The brake disc collar must be inserted in the caliper bracket.

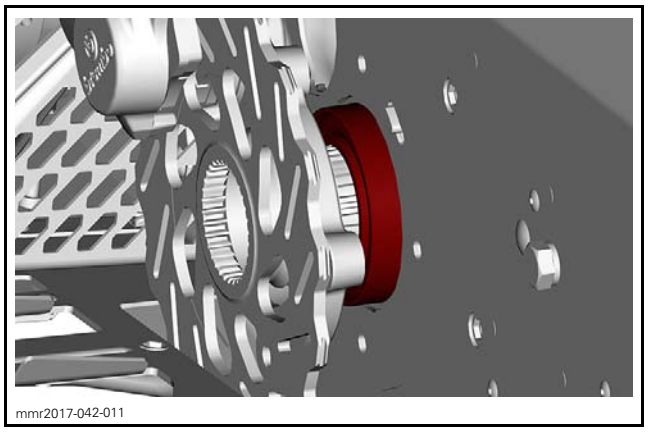


1. *Brake disc collar*
2. *Caliper bracket*

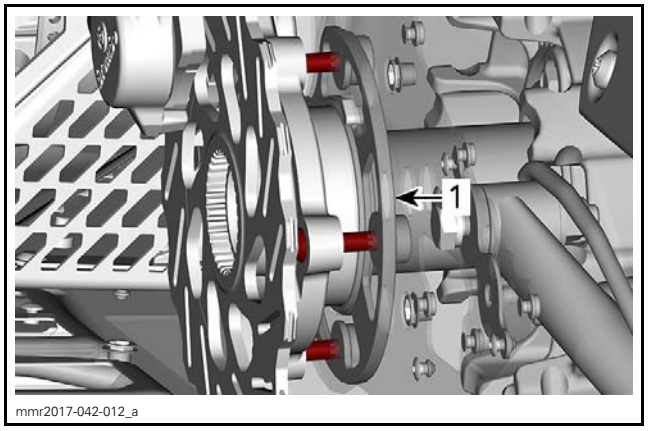
5. Ensure bearing flange is properly locked in the frame. Tabs must be properly inserted in frame slots.

VIEW FROM OUTSIDE FRAME

6. Align brake disc splines with drive axle splines and push brake disc onto drive axle.
7. Push the caliper bracket over the drive axle bearing.



8. Align caliper bracket holes with bearing flange holes and install caliper screws.



TYPICAL - TUNNEL IS TRANSPARENT FOR CLARITY

1. *Bearing flange (inside frame)*

9. HAND TIGHTEN each caliper bracket screw evenly in a criss-cross pattern until bracket is correctly positioned against frame.

NOTICE **Never use an air tool to tighten caliper screws. The caliper bracket could crack.**

10. Install the brake pads. Refer to procedure in this subsection.
11. Install the brake disc circlip.
12. Tighten the brake caliper screws to specification.

TIGHTENING TORQUE	
Caliper screws	24.5 N•m ± 3.5 N•m (18 lbf•ft ± 3 lbf•ft)

13. Apply brake fluid on Banjo fitting threads.
14. Install the Banjo fitting with two new sealing washers.
15. Tighten Banjo fitting to specification.

TIGHTENING TORQUE	
Banjo fitting	35 N•m ± 1 N•m (26 lbf•ft ± 1 lbf•ft)

16. Fill and bleed the brake system. Refer to *PERIODIC MAINTENANCE PROCEDURES* subsection.
17. Install all other removed parts.
18. Check the operation of the brake carefully before riding the snowmobile.

BRAKE DISC

Inspecting the Brake Disc (Not Removed)

1. Remove the disc brake protective cover.
2. Check for scoring, cracking or bending, replace as required.
3. Measure brake disc thickness. If the brake disc is out of specification, replace it with a new one.

NOTICE **Brake disc should never be machined.**

BRAKE DISC SPECIFICATION	
Minimum thickness	4.5 mm (.177 in)

Inspecting the Brake Disc (Removed)

1. Check brake disc splines and drive axle splines for wear or other damages. Replace defective parts.

Removing and Installing the Brake Disc

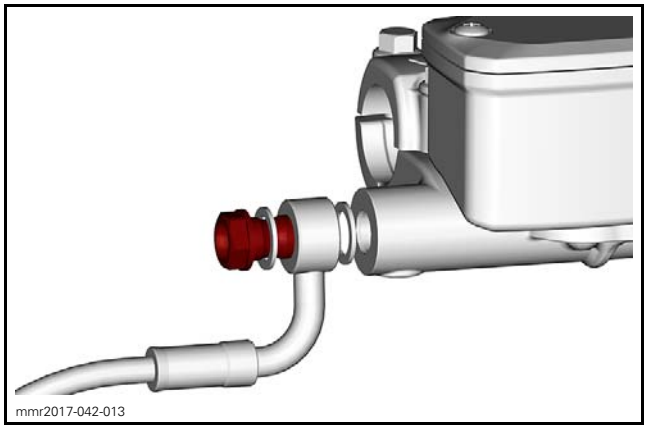
Follow procedures for caliper removal and installation.

MASTER CYLINDER

Removing the Master Cylinder

NOTE: If the master cylinder is not replaced, omit the steps concerning brake system draining and brake hose removal.

1. Drain brake system, Refer to *PERIODIC MAINTENANCE PROCEDURES* subsection.
2. Remove the Banjo fitting and discard the sealing washers.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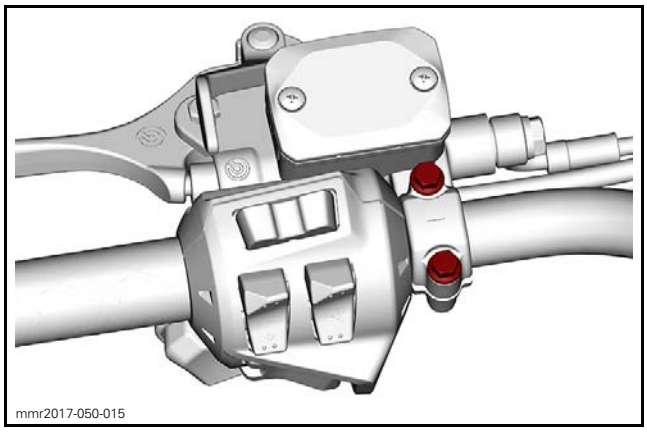
3. Remove screws and clamp securing master cylinder to handlebar.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4. Remove master cylinder.

NOTICE **Do not let master cylinder hang by the hose and do not stretch or twist the hose.**

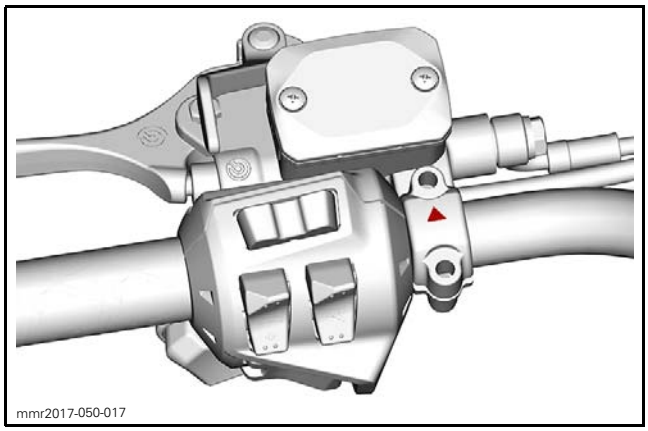
Inspecting the Master Cylinder

1. Discard all remaining fluid inside master cylinder reservoir.
2. Check if the reservoir cap seal is brittle, hard or damaged. Replace as necessary.
3. If the reservoir is damaged or leaking, replace master cylinder.

4. Check if brake lever is bent, cracked or otherwise damaged. Replace brake lever if required.

Installing the Master Cylinder

1. Place the master cylinder on the handlebar.
2. Install master cylinder retaining clamp with its arrow pointing toward the front of vehicle.



3. Install master cylinder clamp screws and tighten loosely.
4. With the handlebar in the straight ahead position, place the reservoir parallel to the ground.
5. Tighten master cylinder clamp screws to specification.

TIGHTENING TORQUE	
Master cylinder clamp screws	9 N•m ± 1 N•m (80 lbf•**in** ± 9 lbf•**in**)

6. Install the Banjo fitting with two new sealing washers.
7. Tighten Banjo fitting to specification.

TIGHTENING TORQUE	
Banjo fitting	27 N•m ± 1 N•m (20 lbf•ft ± 1 lbf•ft)

8. Fill and bleed the brake system. Refer to *PERIODIC MAINTENANCE PROCEDURES* subsection.
9. Install brake light switch.
10. Install steering cover.

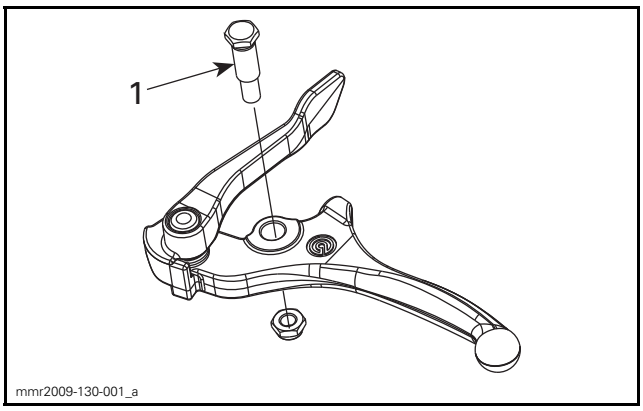
BRAKE LEVER

Lubricating the Brake Lever

After using brake cleaner in the brake lever area or after adding brake oil in reservoir, check brake lever pivot lubrication. Add SYNTHETIC GREASE (P/N 779162) on brake lever pivot as necessary.

Replacing the Brake Lever

Lubricate brake lever pivot using SYNTHETIC GREASE (P/N 779162).



TYPICAL
1. Lubricate brake lever pivot

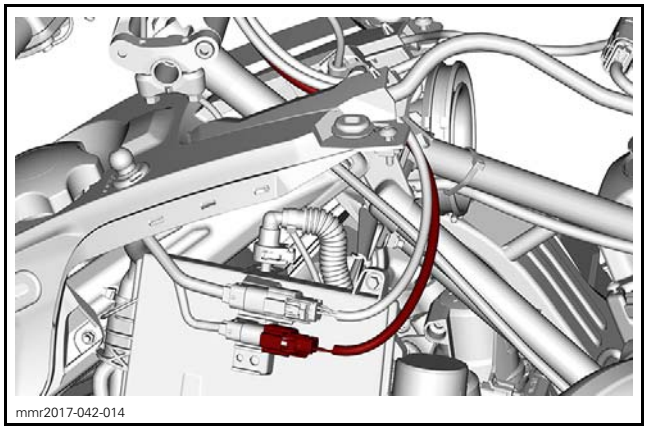
Tighten the pivot nut of brake lever to specification.

TIGHTENING TORQUE	
Brake lever pivot nut	6 N•m ± 1 N•m (53 lbf•**in** ± 9 lbf•**in**)

BRAKE LIGHT SWITCH

Testing the Brake Light Switch Resistance

1. Remove the upper body module. Refer to *BODY* subsection.
2. Disconnect the brake light switch connector located on the ECM.



3. Validate switch operation with an ohmmeter as follows.

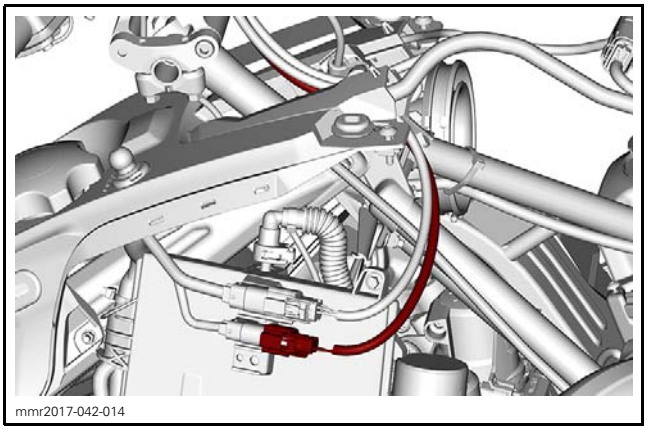
LH HANDLEBAR CONNECTOR (4-PIN)		
SWITCH	WIRE	RESISTANCE
Released	Pin 2 and pin 4	Infinite (OL)
Squeezed and held		Close to 0 Ω

If readings do not correspond to the above specifications, replace switch.

If readings correspond to the above specifications, check fuse, wiring and connectors going to switch. Repair or replace defective part(s).

Removing the Brake Light Switch

1. Remove the upper body module. Refer to *BODY* subsection.
2. Disconnect the brake light switch connector located on the ECM.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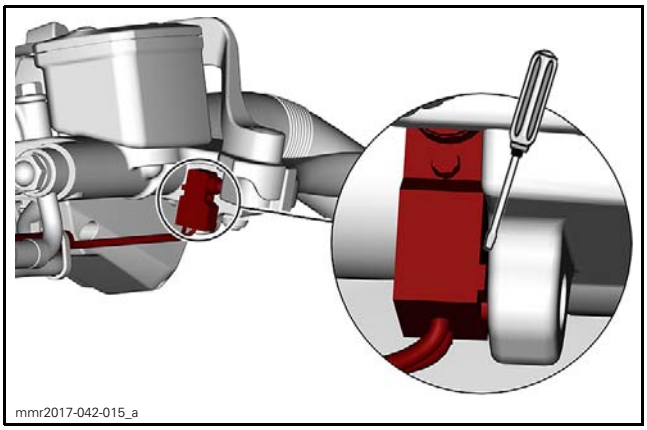
3. Slip a small screwdriver between brake light switch and master cylinder housing and separate them.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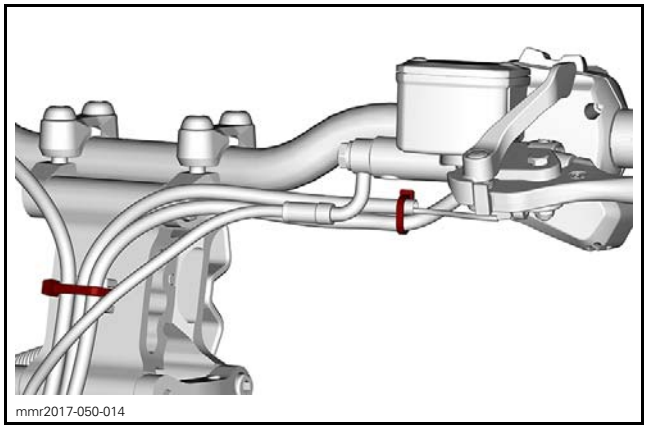
4. Cut all locking ties securing switch wires.


mmr2017-050-014

TYPICAL

5. Remove switch wires from connector. Refer to *WIRING HARNESS AND CONNECTORS*.

NOTE: Check wires location for reinstallation.

Installing the Brake Light Switch

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

Plug switch wires into connector as per following tables.

LH HANDLEBAR CONNECTOR (4-PIN)	
WIRE	CONNECTOR
GRAY	Pin 4
BROWN	Pin 2

Check if switch is working properly.

Install new locking ties.

BRAKE HOSE

Replacing the Brake Hose

1. Remove the console. Refer to *BODY* subsection.
2. Drain the brake system, refer to *PERIODIC MAINTENANCE PROCEDURES* subsection.
3. Remove Banjo fittings at both ends of hose. Refer to *REMOVING THE MASTER CYLINDER* and *REMOVING THE CALIPER*.
4. Remove fasteners that secure the hose clamps to the frame.

NOTICE **Take care not to overdrill the lower clamp rivet. The fuel tank could be damaged.**

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

Install new sealing washer.

TIGHTENING TORQUE	
Middle clamp nut	2.3 N•m ± 0.2 N•m (20 lbf•**in** ± 2 lbf•**in**)
Caliper Banjo fitting	35 N•m ± 1 N•m (26 lbf•ft ± 1 lbf•ft)
Master cylinder Banjo fitting	27 N•m ± 1 N•m (20 lbf•ft ± 1 lbf•ft)

MAINTENANCE PROCEDURES

Recommended Brake Fluid

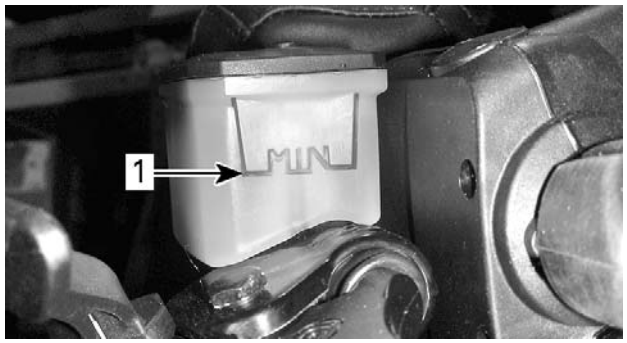
Always use brake fluid meeting the DOT 4 specification.

RECOMMENDED SERVICE PRODUCT
BRAKE FLUID DOT 4 (P/N 779151)

Verifying the Brake Fluid Level

With the vehicle on a level surface, position steering in the straight-ahead position to ensure reservoir is level.

Brake fluid must always be above the MIN. line when brake lever is squeezed.



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TYPICAL
1. MINIMUM line

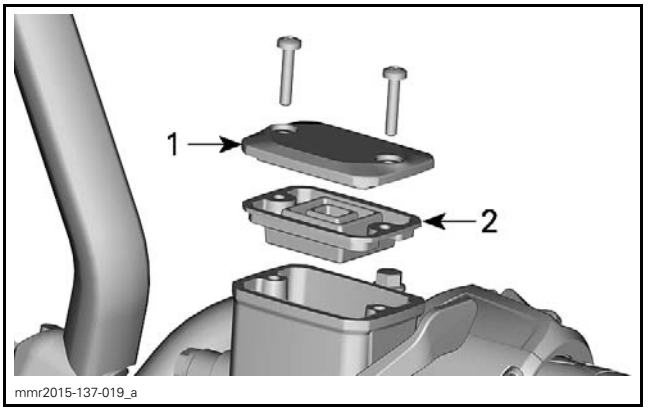
Add fluid as required. Do not overfill.

NOTE: A low level may indicate leaks or worn brake pads.

Replacing the Brake Fluid

Draining the Brake Fluid

1. Place vehicle on a level surface.
2. Remove reservoir cover with its diaphragm.



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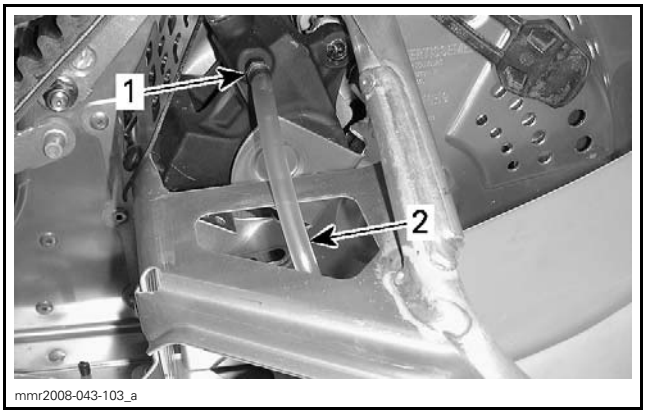
1. Reservoir cover
2. Diaphragm

3. Connect a clear hose to caliper bleeder.
4. Place the other end of hose in a container.
5. Loosen bleeder and pump brake lever until no more fluid flows out of bleeder.



mmr2008-043-103_a

TYPICAL
1. Bleeder
2. Clear hose to catch used brake fluid

NOTE: To drain the fluid trapped in the caliper, push the pistons in.

Filling the Brake Fluid

To fill brake circuit when it is empty do the following:

1. Ensure reservoir cover is removed.
2. Using a large syringe and a suitable tube, push brake fluid slowly into the caliper.

mmr2008-043-104

TYPICAL

3. Continue to push brake fluid until master cylinder reservoir is half full.
4. Close bleeder.
5. Fill up reservoir and install diaphragm and cover.
6. Squeeze brake lever.
   6.1 If brake lever is firm, the brake system does not require bleeding. Torque bleeder as specified.

TIGHTENING TORQUE	
Brake caliper bleeder	8.5 N•m ± 1.5 N•m (75 lbf•**in** ± 13 lbf•**in**)

   6.2 If brake lever is spongy, bleed brake system as per following procedure.

Bleeding the Brake System

1. Install a clear hose on bleeder.
2. Place the other end in a container partially filled with clean brake fluid.
3. Remove reservoir cover and diaphragm.
4. Pump up circuit pressure with brake lever until lever resistance is felt.
5. Squeeze brake lever and open bleeder. When lever touches the handlebar, do not release lever and close bleeder.
6. Release brake lever slowly.
7. Repeat the procedure until no more air bubbles appear in hose.

NOTE: Check fluid level often to prevent air from being pumped into the circuit.

8. Install cover and diaphragm on reservoir.
9. Squeeze brake lever.
   9.1 If brake lever is firm, bleeding procedure is completed. Torque bleeder as specified.
   9.2 If brake lever is still spongy, repeat step 2 to step 6.
10. Torque bleeder as specified.

TIGHTENING TORQUE	
Brake caliper bleeder	8.5 N•m ± 1.5 N•m (75 lbf•**in** ± 13 lbf•**in**)

11. Refill reservoir.
12. Install diaphragm and cover on reservoir.

Inspecting the Brake Hose, Pads and Disc

Break-In Inspection

Visually inspect the brake hose for leaks or any damage.

Visually inspect pads and disc for abnormal wear or any damage.

Scheduled Maintenance and Preseason

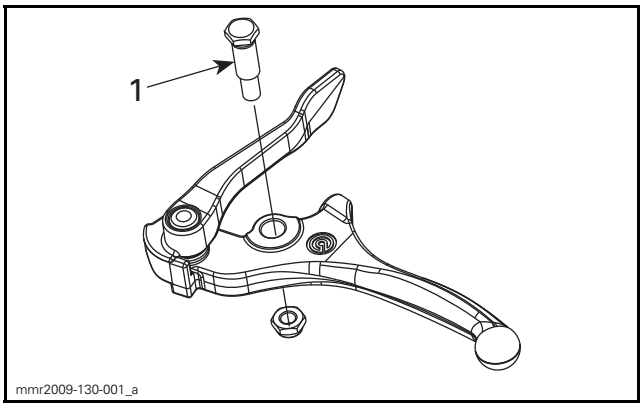
Visually inspect the brake hose for leaks or any damage.

Refer to *BRAKE* subsection and carry out:
– *INSPECTING THE BRAKE PAD*
– *INSPECTING THE BRAKE DISC*.

Lubricating the Brake Lever Pivot

1. Remove brake lever pivot.
2. Lubricate brake lever pivot using recommended product.

SERVICE PRODUCT
SYNTHETIC GREASE (P/N 779162)



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1. Lubricate this surface

3. Install brake lever pivot.
4. Torque pivot nut of brake lever as specified.

TIGHTENING TORQUE	
Brake lever pivot nut	6 N•m ± 1 N•m (53 lbf•**in** ± 9 lbf•**in**)

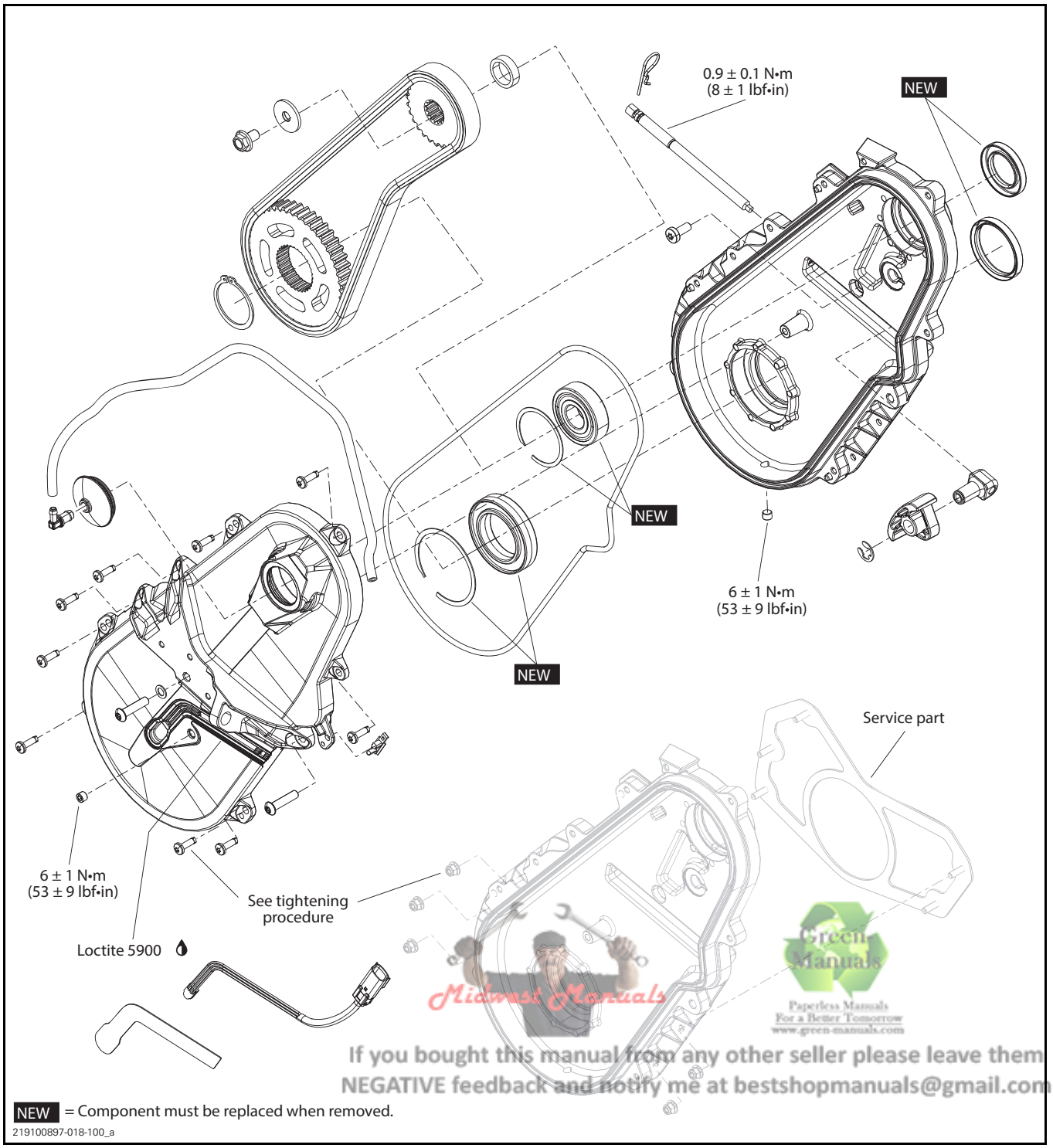
CHAINCASE

SERVICE TOOLS

Description	Part Number	Page
BEARING PULLER/PUSHER	529 036 111	6
BEARING PULLER/PUSHER	529 036 112	6

SERVICE PRODUCTS

Description	Part Number	Page
LOCTITE 5900	293 800 066	12
SYNTHETIC CHAINCASE OIL	779156	3



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GENERAL

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

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

⚠ WARNING

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

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

MAINTENANCE

CHAINCASE OIL

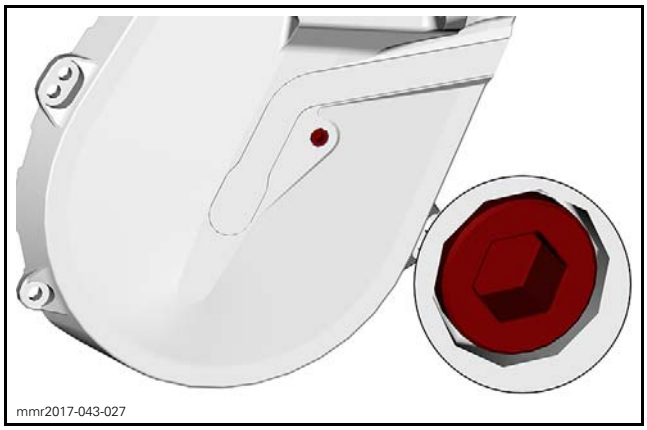
Recommended Chaincase Oil

RECOMMENDED SERVICE PRODUCT
SYNTHETIC CHAINCASE OIL (P/N 779156)

NOTICE **Use only the recommended type oil when servicing. Do not mix synthetic oil with other types of oil.**

Verifying the Chaincase Oil Level

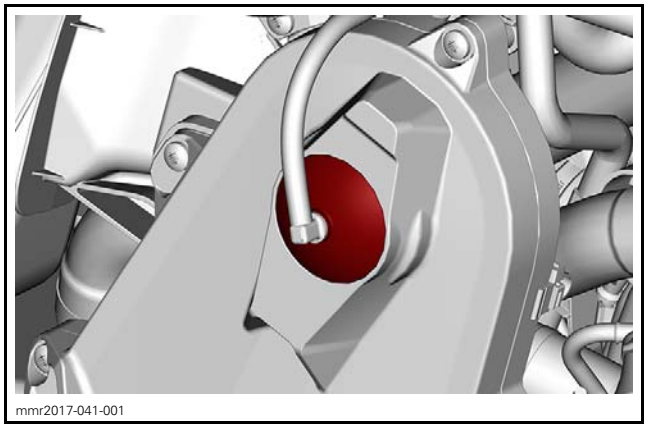
1. Place vehicle on a level surface.
2. Remove the check plug beside the speed sensor on the chaincase cover. Oil level must be equal with the lower edge.


mmr2017-043-027

3. Remove metal particles from magnetic check plug.

NOTE: It is normal to find metallic particles stuck to magnetic check plug. If bigger pieces of metal are found, remove the chaincase cover and inspect the chaincase parts.

4. To add oil, remove the filler cap on top of chaincase cover.

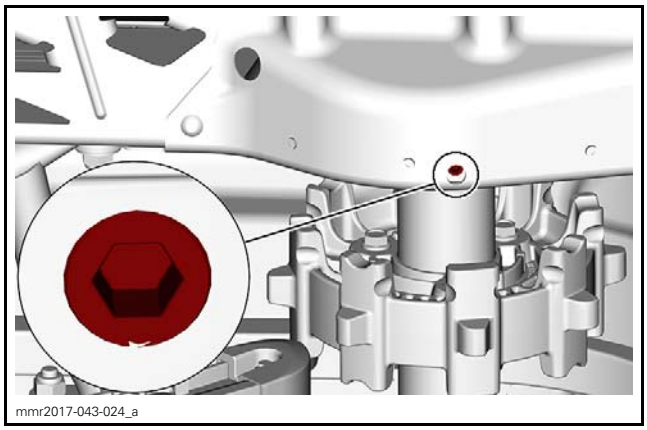

mmr2017-041-001

5. Pour recommended oil in chaincase by the filler hole until oil comes out by the magnetic check plug hole.
6. Reinstall magnetic check plug and torque to specification.

TIGHTENING TORQUE	
Magnetic check plug	6 N•m ± 1 N•m (53 lbf•**in** ± 9 lbf•**in**)

Replacing the Chaincase Oil

1. Place vehicle on a level surface.
2. Place a container under vehicle in line with chaincase to catch chaincase oil.
3. Remove the drain plug on the bottom of the chaincase.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4. Reinstall the drain plug.

TIGHTENING TORQUE	
Drain plug	6 N•m ± 1 N•m (53 lbf•**in** ± 9 lbf•**in**)

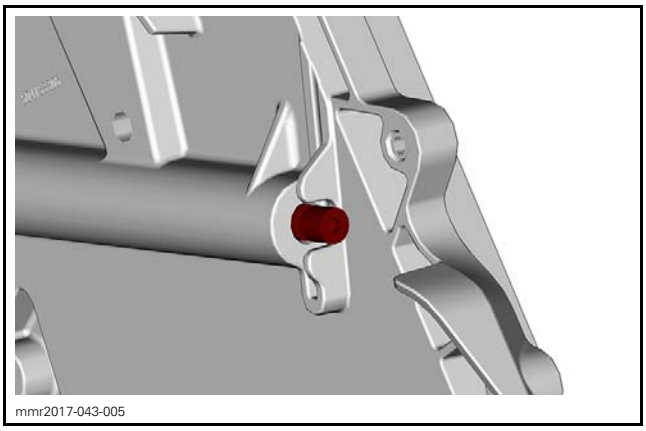
5. Remove the magnetic check plug
6. Pour approximately 350 ml (12 U.S. oz) of recommended oil in chaincase through the filler hole until oil comes out by the magnetic check plug hole.
7. Clean the magnetic check plug. Refer to *CHAINCASE OIL LEVEL VERIFICATION*, see procedure in this subsection.

DRIVE CHAIN

Adjusting the Drive Chain

1. Tighten tensioner adjustment screw **BY HAND**.

NOTE: Turn adjustment screw until resistance is strong enough that it can not be turned by hand.


mmr2017-043-005

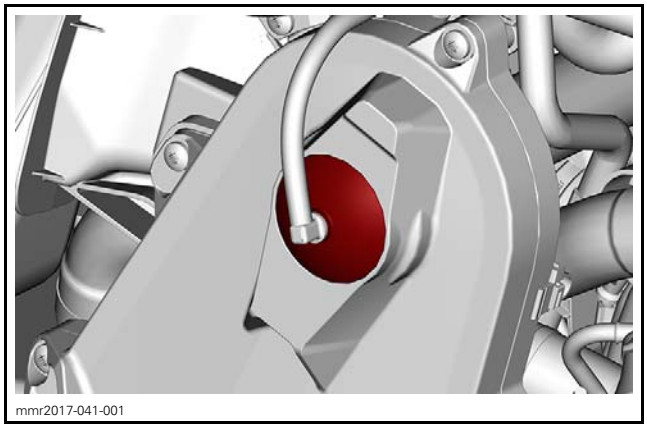
PROCEDURES

CHAINCASE

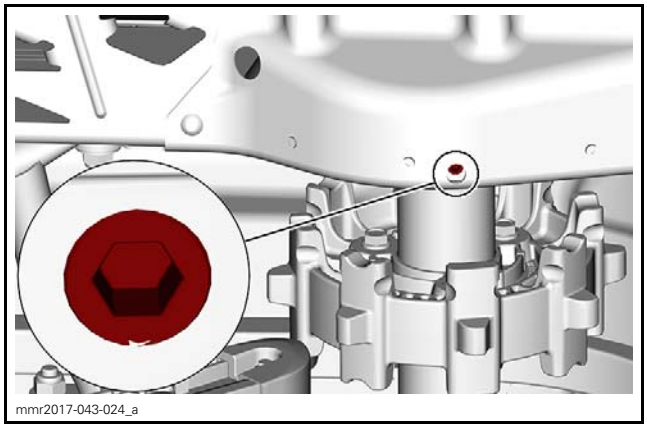
Chaincase Disassembly

Removing the Chaincase Cover

1. Apply parking brake.
2. Remove the muffler. Refer to *EXHAUST SYSTEM* subsection.
3. Remove the filler plug on the chaincase cover.


mmr2017-041-001

4. Place a container under vehicle in line with chaincase to catch chaincase oil.
5. Remove the drain plug on the bottom of the chaincase.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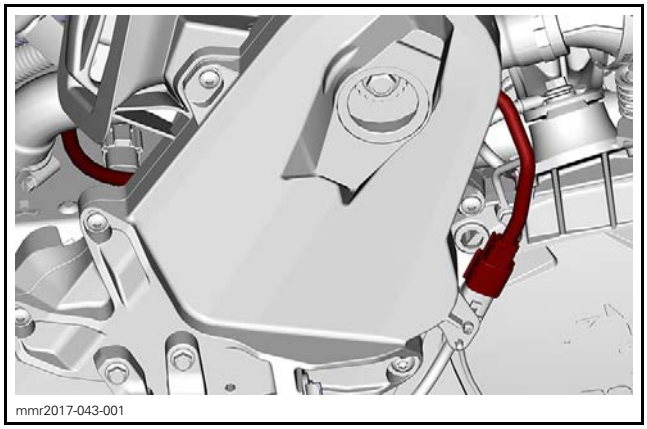
6. Disconnect speed sensor connector.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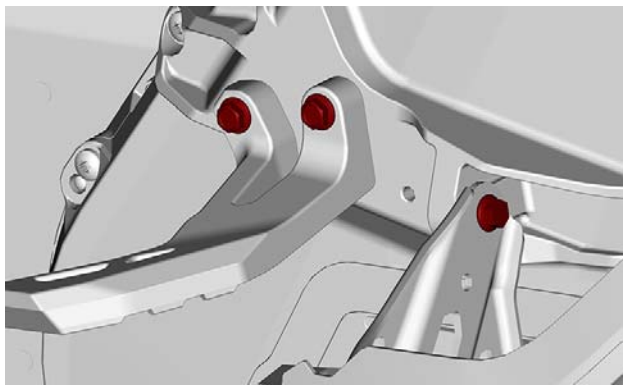
7. Remove the RH side toe hook and the screw securing the cover to the footrest.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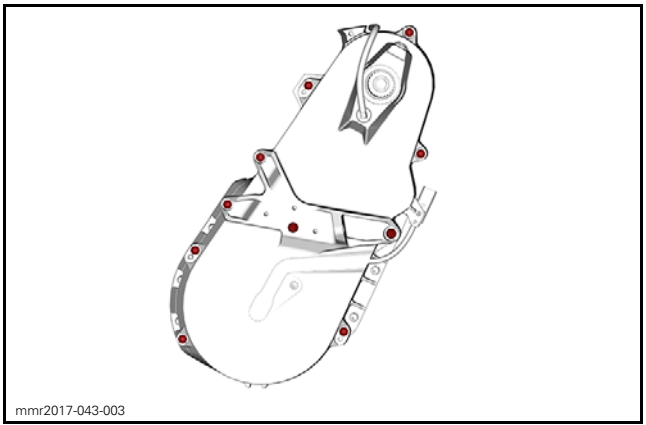
8. Remove chaincase cover screws.

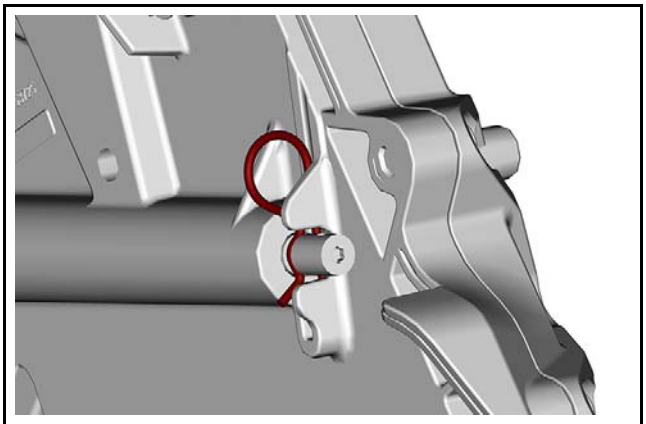

mmr2017-043-003

TYPICAL

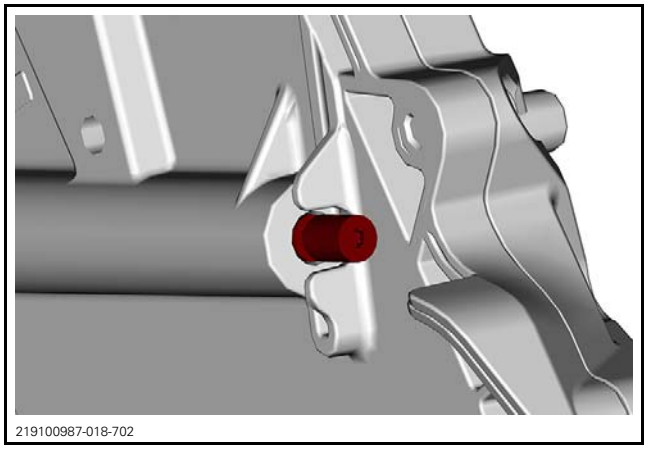
9. Pull on bottom of chaincase cover to drain oil.
10. Wait a moment then remove the cover completely.

Removing the Chain Tensioner

1. Remove the hair pin from behind the chaincase.


219100987-018-703

2. Remove the tensioner adjustment screw.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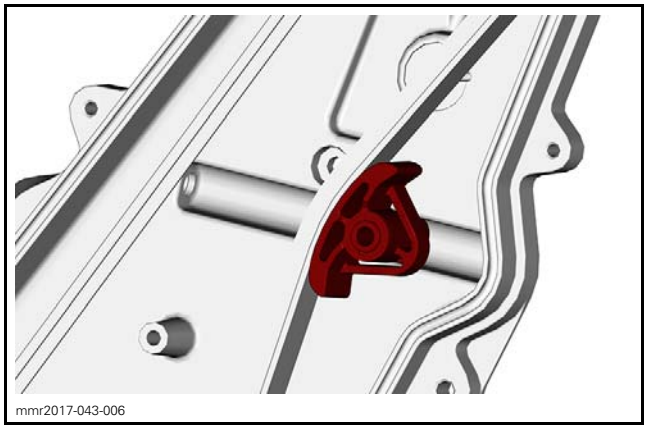
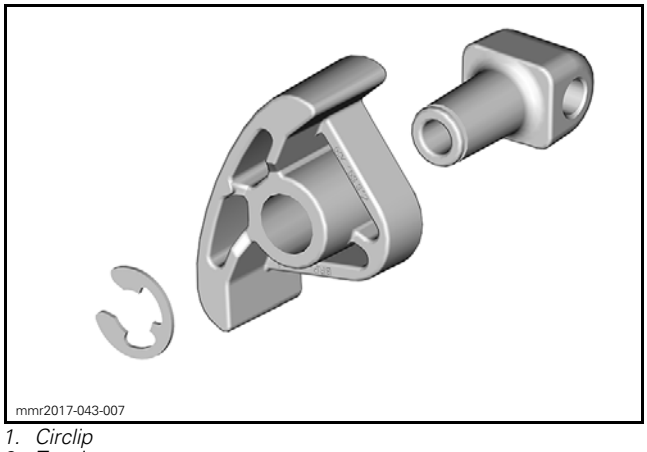
3. Remove tensioner.


mmr2017-043-006

NOTE: The following steps are required only if the tensioner or the slider is defective.

4. Remove the circlip securing the slider to tensioner.

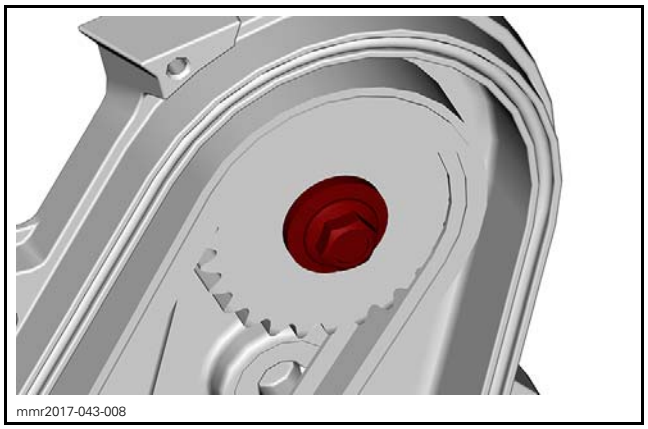

mmr2017-043-007

1. Circlip
2. Tensioner
3. Slider

Removing the Drive Chain and Sprocket

NOTE: Prior to removing the drive chain, check the drive chain deflection.

1. Remove the upper sprocket screw and its conical spring washer.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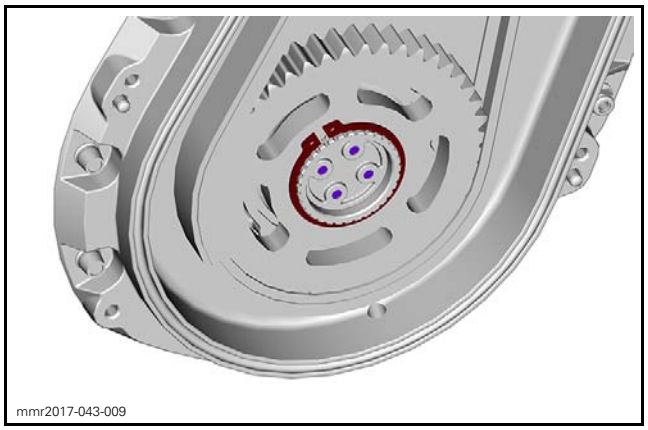
2. Remove the lower sprocket circlip.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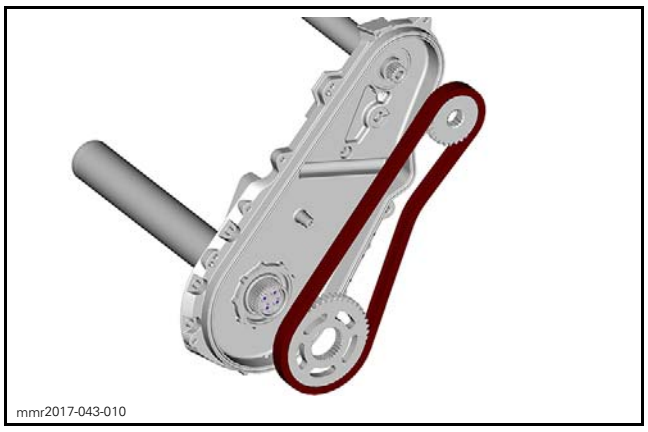
3. Remove the upper sprocket, lower sprocket and drive chain simultaneously.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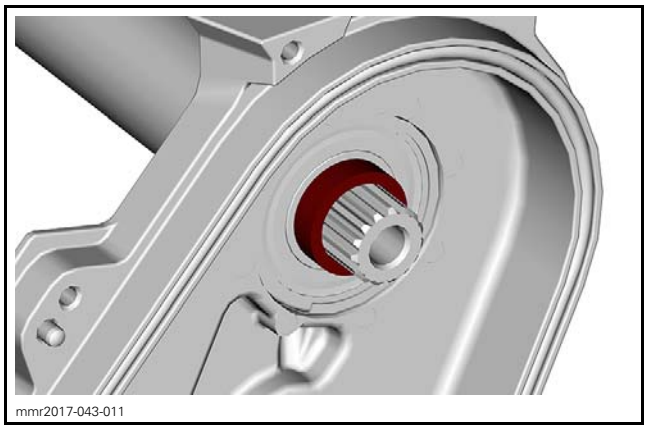
4. Remove the countershaft spacer.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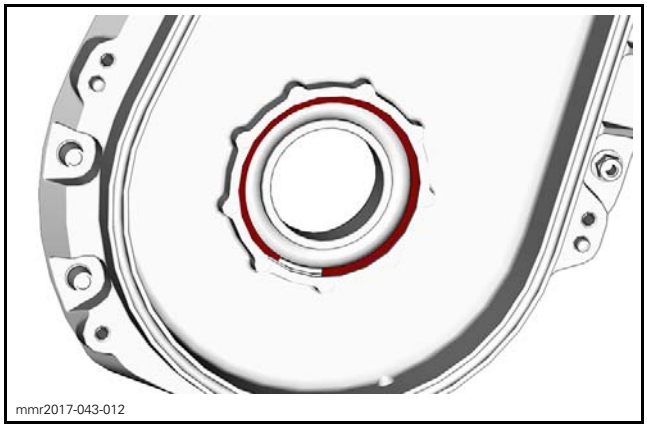
Removing the Chaincase Bearing

1. Remove countershaft or drive axle, depending which bearing is replaced. Refer to the appropriate subsection, *DRIVEN PULLEY AND COUNTERSHAFT* or *DRIVE AXLE*.
2. Remove snap ring securing bearing into chaincase.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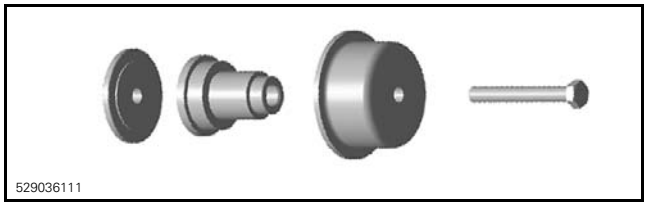
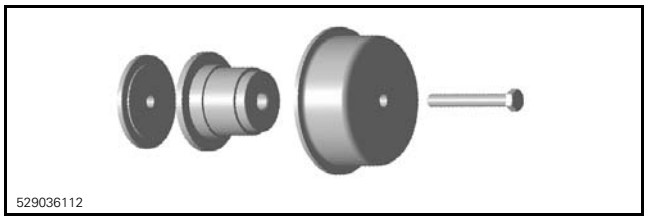
3. Install the appropriate bearing extractor:

BEARING	REQUIRED TOOL
Countershaft	BEARING PULLER/PUSHER (P/N 529 036 111)
Drive axle	BEARING PULLER/PUSHER (P/N 529 036 112)

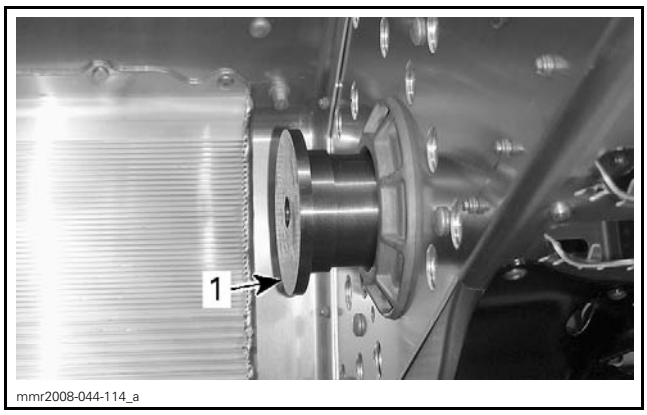

529036111

COUNTERSHAFT



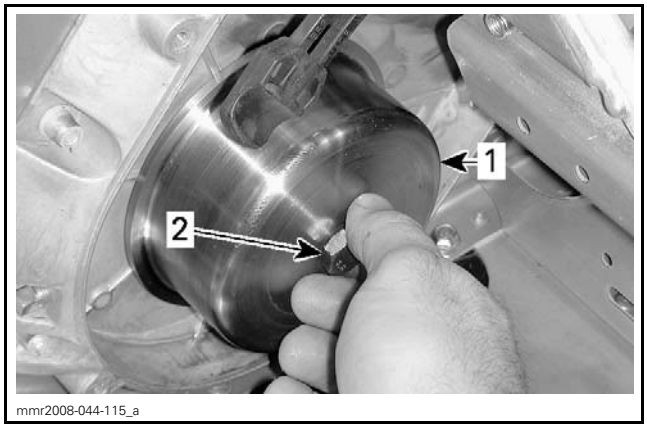
DRIVE AXLE

4. Install the extractor/installer tool behind the bearing.



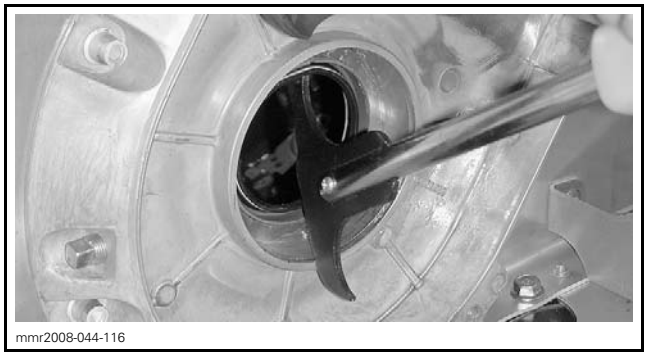
TYPICAL
1. Extractor/installer tool

5. Install the extractor cup over bearing.
6. Tighten the extractor/installer tool screw to remove the bearing.



TYPICAL
1. Extractor cup
2. Tighten to remove bearing

7. Using a seal puller, remove and discard the oil seal.

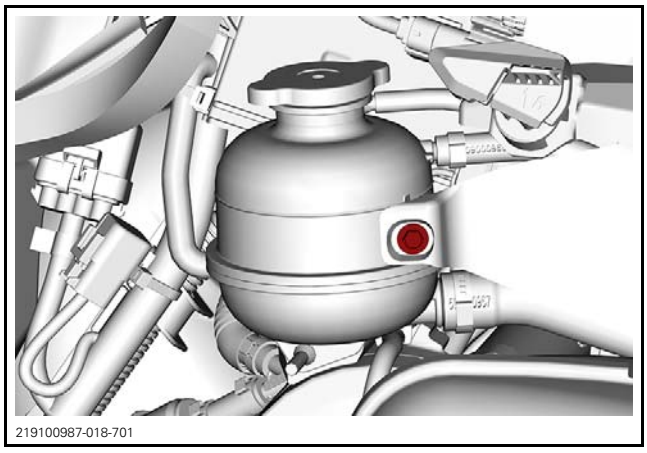


TYPICAL

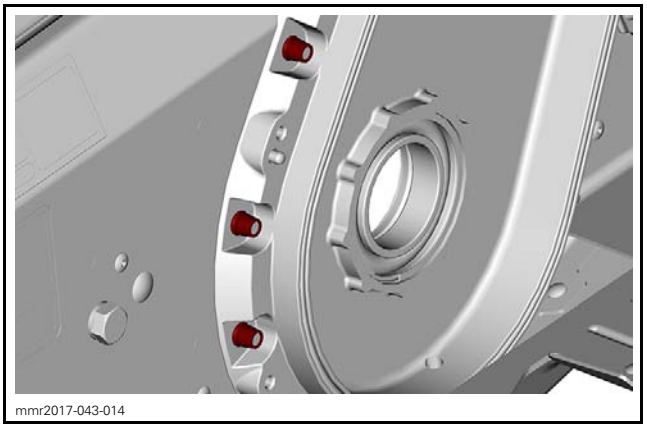
Removing the Chaincase Housing

IMPORTANT:Ensure you have a new mounting plate on hand along with the 5 attachment nuts before removing the chaincase assembly. Refer to the appropriate *ELECTRONIC PARTS CATALOG* that fits your model to determine required part number.

1. Remove the drive axle. Refer to *DRIVE AXLE* subsection.
2. Remove the countershaft. Refer to *DRIVEN PULLEY AND COUNTERSHAFT* subsection.
3. Remove the screw securing the coolant reservoir.



4. Remove the Huck rivets. Refer to *FRAME* subsection for proper removal procedure.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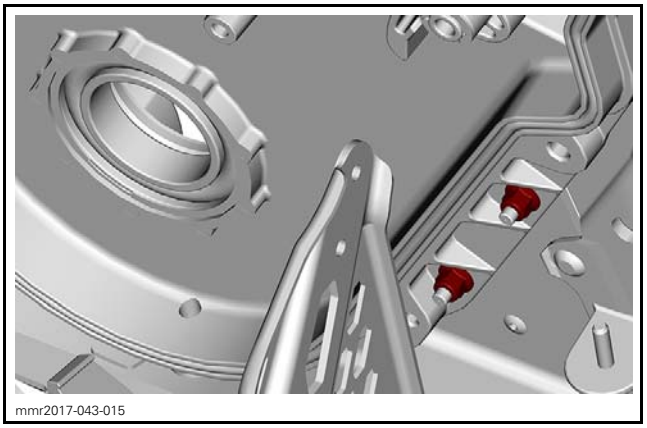
5. Remove nuts beside the footrest.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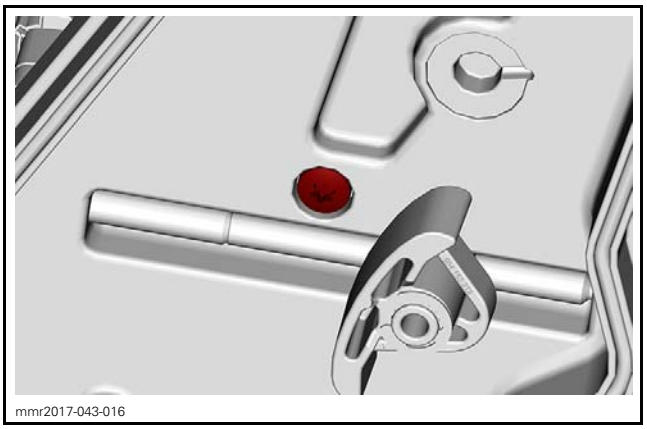
6. Remove the screw above the tensioner.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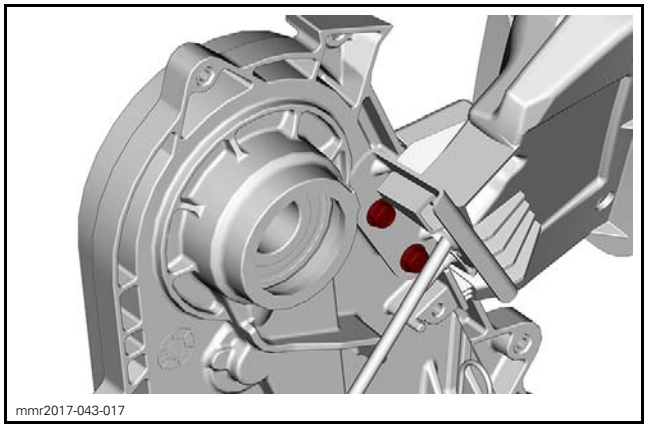
7. Using 2 large pry bars inserted between chaincase and frame, pry chaincase out of vehicle.
8. Remove the rewind starter rope guide screws.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Inspecting the Chaincase

Inspecting the Chaincase Cover

Check the cover for cracks or other damages. Replace it if necessary.

Check if O-ring inside cover is brittle, hard or damaged. Replace it if necessary.

Inspecting the Chain Tensioner

Check chain tensioner slider for wear or other damages. A longitudinal groove in the slider indicate a broken chain link. Replace if necessary.

Check threads of tensioner adjustment screw for damages or wear.

Check straightness of adjustment screw. Replace screw if necessary.Check chaincase for damages.

Inspecting the Drive Chain and Sprockets

Visually inspect the drive chain and sprockets for:
- Wear
- Cracks
- Damages teeth
- Missing or broken links.

If a problem is detected, replace drive chain and sprockets as an assembly.

Check the drive chain deflection.

If the deflection is greater than 38 mm (1-1/2 in) without the chain tensioner, replace the drive chain.

Inspecting the Chaincase Bearing

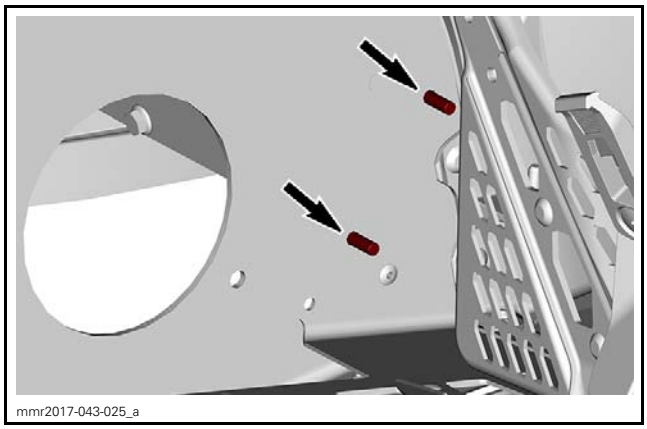
Check for worn or defective bearings.

Chaincase Assembly

Installing the Chaincase Housing

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

Remove the clinch studs from the frame.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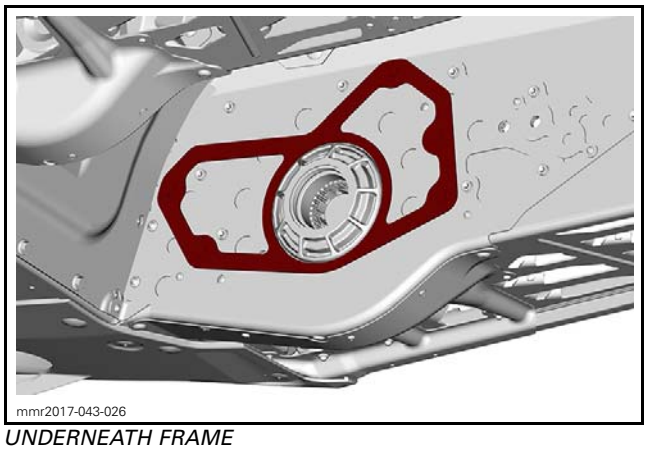
Use a suitable box to support the frame around the stud head and hit the stud from the outside with a hammer.

Install the new mounting plate underneath the frame.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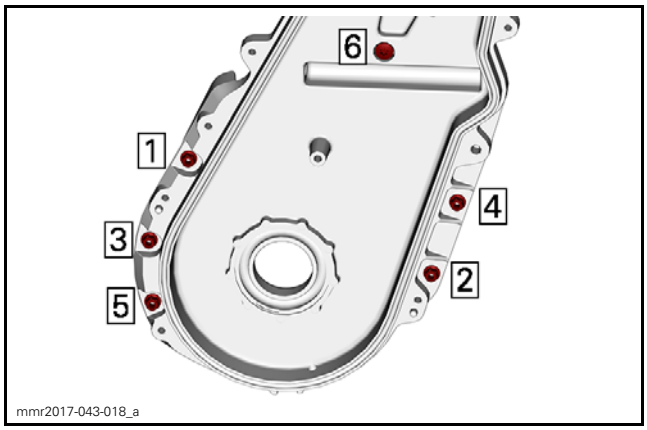
UNDERNEATH FRAME

Install 5 elastic flanged nuts to secure chaincase on mounting plate.

Tighten fasteners as per the following sequence.



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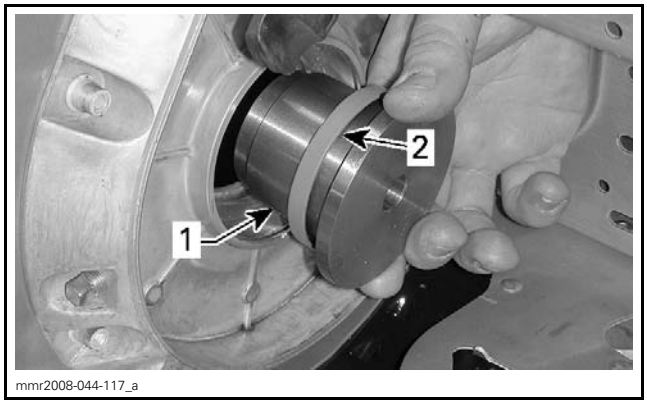
Proceed with drive chain adjustment. Refer to *PERIODIC MAINTENANCE PROCEDURES* subsection.

Refill chaincase with recommended oil. Refer to *REPLACING THE CHAINCASE OIL* in *PERIODIC MAINTENANCE PROCEDURES* subsection.

Installing Chaincase Bearing

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

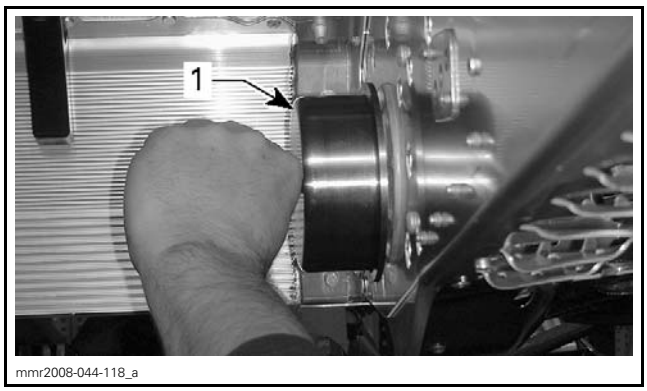
Install the new oil seal on the extractor/installer tool. Position the lips toward bearing.



mmr2008-044-117_a

TYPICAL
1. *Extractor/installer tool*
2. *Oil seal lips on this side*

Install the extractor cup inside frame.

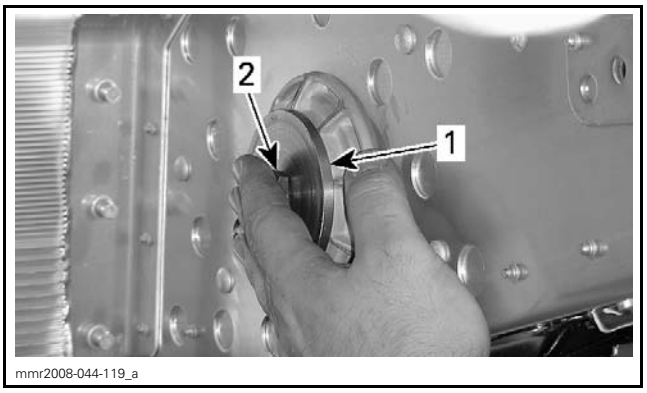


mmr2008-044-118_a

TYPICAL
1. *Extractor cup*

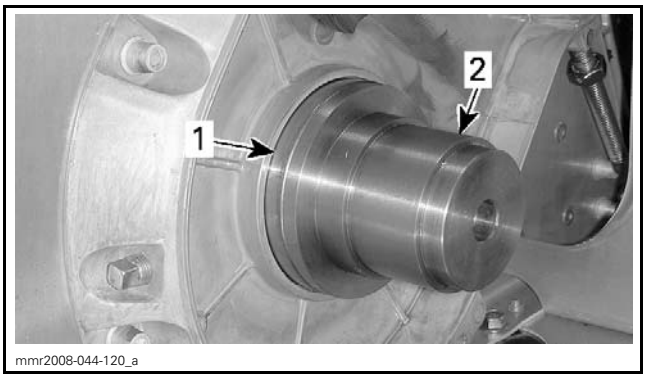
Tighten the extractor/installer tool screw to install the oil seal.

Install the large washer and the extractor/installer tool screw inside frame.



TYPICAL
1. *Large washer*
2. *Extractor/installer tool screw*

In chaincase, install new bearing and the extractor/installer tool.



TYPICAL
1. *Bearing*
2. *Extractor/installer tool*

Tighten the extractor/installer tool screw to install the bearing.

Install new snap ring.

Installing the Drive Chain and Sprockets

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

Make sure to install sprockets with their inscriptions outward.

Install the conical spring washer on the upper sprocket with its concave side toward sprocket.

Installing the Chain Tensioner

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

If the tensioner has been disassembled, make sure circlip turns freely and slider moves easily.

Proceed with drive chain adjustment. Refer to *PERIODIC MAINTENANCE PROCEDURES* subsection.

Installing the Chaincase Cover

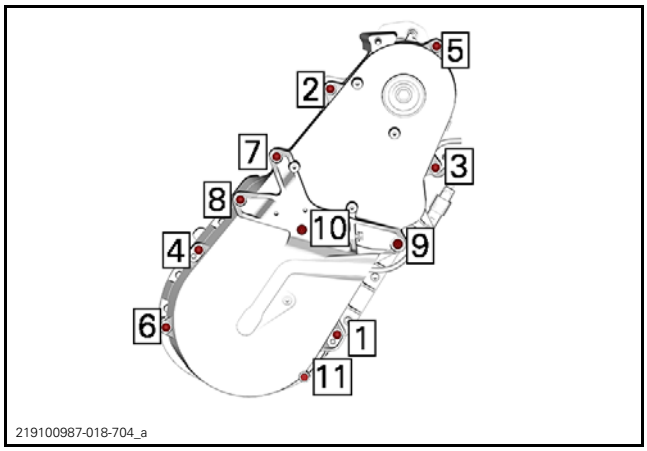
The installation is the reverse of the removal procedure. However, pay attention to the following.

Ensure cover seal is positioned correctly in its groove.

Install new sealing washer with screw no.10. See next illustration.

Tighten chaincase cover screws in accordance with the following sequence.

Screw 11 is present on long chaincase only.



TIGHTENING TORQUE		
Screws 1 to 8 and 11 (long chaincase)	Same chaincase	10 N•m ± 2 N•m (89 lbf•**in** ± 18 lbf•**in**)
	New chaincase	15 N•m ± 1 N•m (133 lbf•**in** ± 9 lbf•**in**)
Screw 9		24.5 N•m ± 3.5 N•m (18 lbf•ft ± 3 lbf•ft)
Screw 10		16 N•m ± 2 N•m (142 lbf•**in** ± 18 lbf•**in**)

Refill chaincase with recommended oil. Refer to *CHAINCASE OIL REPLACEMENT* in *PERIODIC MAINTENANCE PROCEDURES* subsection.

Reinstall all other removed parts.

SPEED SENSOR (VSS)

The speed sensor is a hall effect sensor.

Speed Sensor Location

The speed sensor is mounted in the chaincase cover.

Testing the Speed Sensor Signal

1. Ensure speed sensor is properly connected.
2. Wake up ECM.

3. Back-probe VSS connector as per table and test for proper specification.

NOTICE Be careful not to damage connector seals when back probing.

SPEED SENSOR (VSS) CONNECTOR	SPECIFICATION
Pin 2	Ground
Pin 3	5 Vdc reference voltage

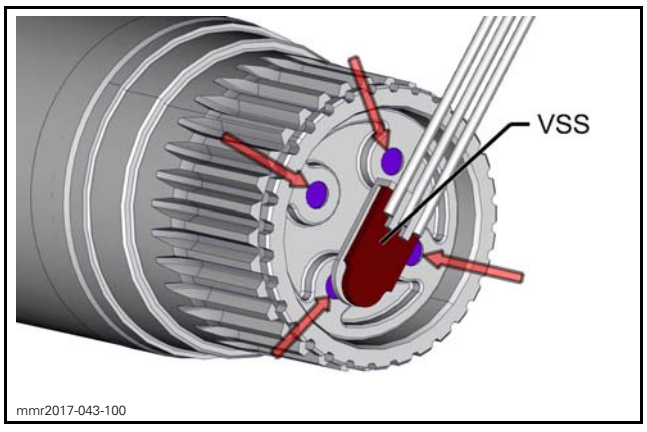
If test failed, check wiring harness going to ECM.

4. Lift and support rear of vehicle.
5. Back-probe VSS connector as per table and test for proper specification.
6. Rotate track/driven pulley.

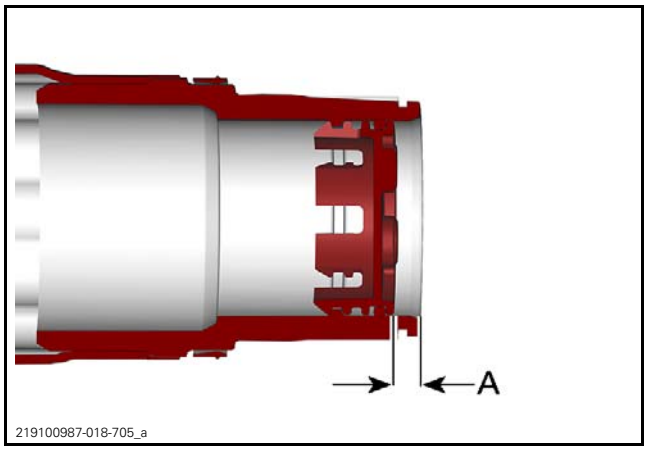
SPEED SENSOR SIGNAL TEST			
ROTATE DRIVEN PULLEY	SPEED SENSOR CONNECTOR (SENSOR SIDE)		VOLTAGE
	Pin 1	Pin 2	Alternate 7 Vdc and 0 Vdc

If reference voltage and ground are available at sensor, but no signal, replace sensor.

NOTE: During chaincase disassembly, ensure magnets are intact on shaft.



Measure the distance between magnetic cap and end of shaft. It must be as specified.



A. Distance to measure

DISTANCE SPECIFICATION	
no. A Measured between magnetic cap and shaft end	5 mm (.2 in)

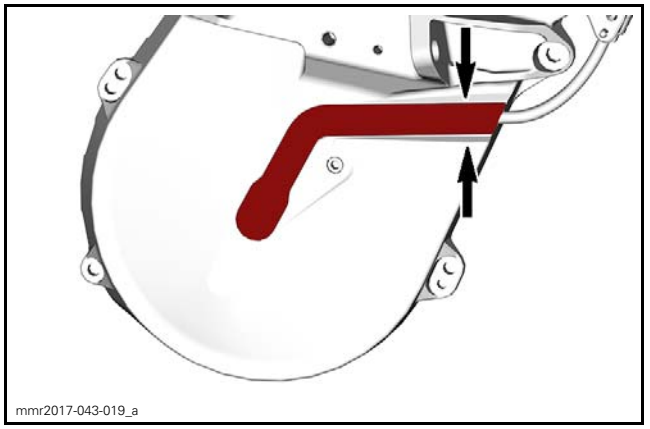
Replacing the Speed Sensor

The sensor can be replaced with the chaincase cover as an assembly. In such a case, refer to *CHAINCASE* subsection.

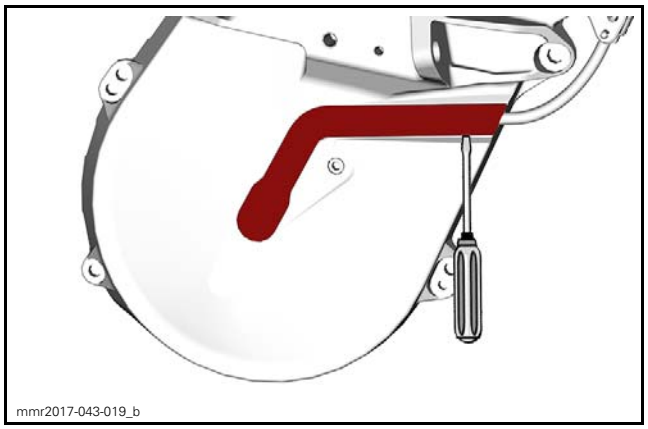
To replace sensor only, proceed as follows.

Removing the Speed Sensor

1. Remove chaincase cover. Refer to procedure in this subsection.
2. Heat the upper end of the speed sensor protective plate with a heat gun.



3. Use a flat screwdriver to pry out the end of the protective plate from chaincase cover.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NOTICE Use care when prying out the plate not to damage the chaincase cover.

4. Heat the next section of the plate.
5. Pry out the heated section using the flat screwdriver.
6. Repeat steps 4 and 5 until the protective plate is completely removed.
7. Remove the speed sensor.
8. Use the flat screwdriver to remove the remaining sealant from the chaincase cover.

NOTICE Do not apply excessive pressure when removing the remaining sealant not to damage the chaincase cover.

9. Rub the sealant using a scouring pad.

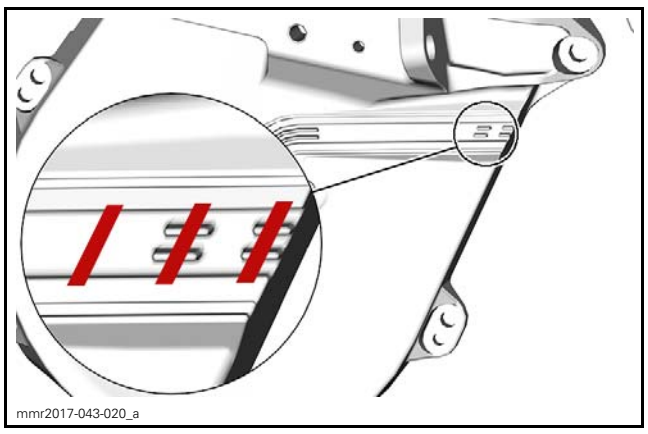
Installing the Speed Sensor

Make sure surface is clean and free of grease.

The assembly must be watertight.

PRODUCT REQUIRED
LOCTITE 5900 (P/N 293 800 066)

1. Apply 3 beads of sealant in the chaincase cover as per the following illustration.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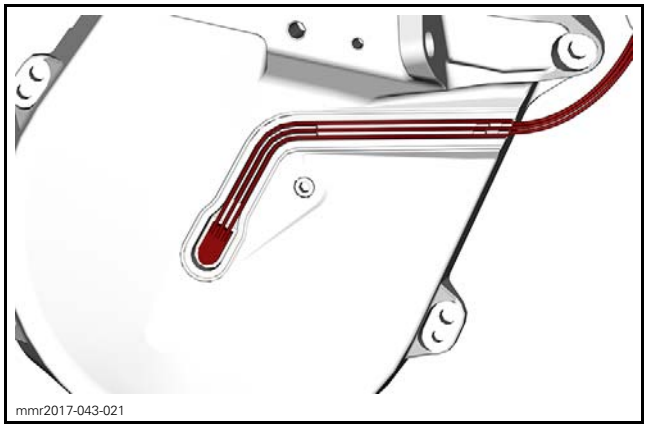
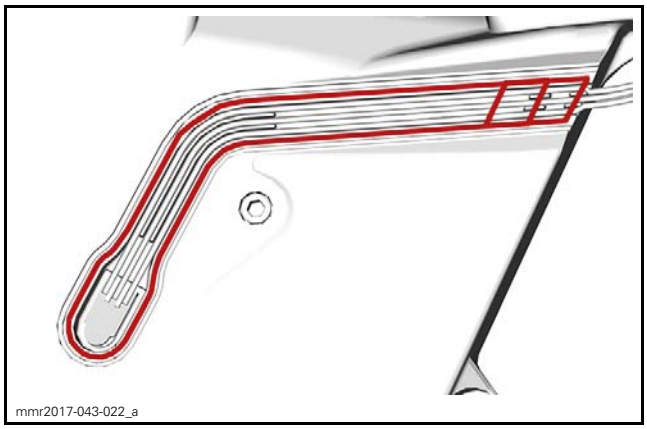
2. Install the speed sensor in the chaincase cover.


mmr2017-043-021

3. Apply sealant all around the protective plate bed on the chaincase cover.

Follow the pattern shown on the next picture.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4. Place the protective plate in position and firmly push in order to evacuate all the surplus sealant. Keep pressure for at least 1 minute.
5. Wipe off all the sealant surplus.
6. Once cleaned up, inspect all the circumference for sealant lacks.

NOTE: Sealant must be visible all around.

7. Place some adhesive tape on the protective plate to maintain a pressure for at least 24 hours.

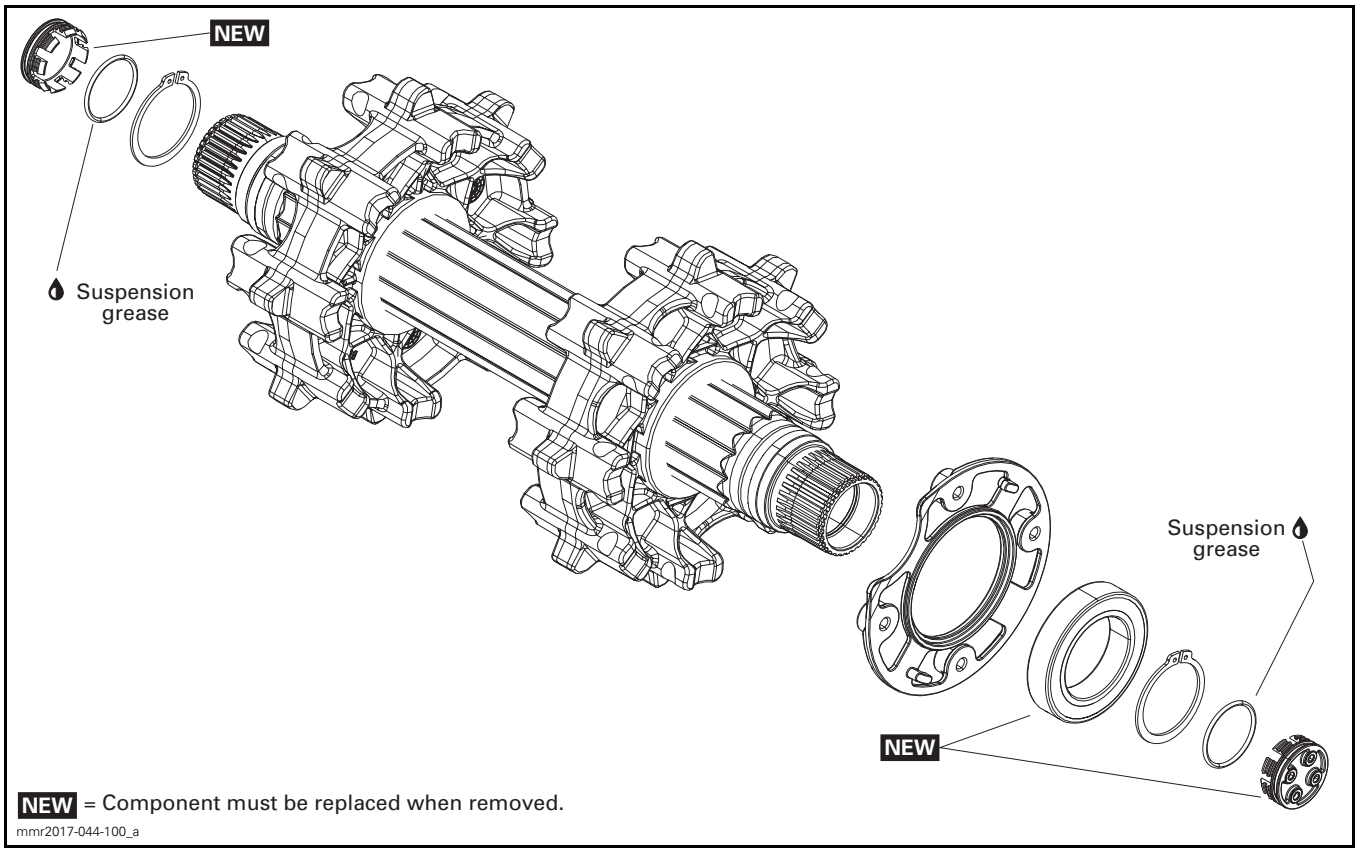
NOTE: Wait for at least 1 hour before exposing vehicle to cold temperature.

8. Reinstall chaincase cover. Refer to procedure in this subsection.

DRIVE AXLE

SERVICE PRODUCTS

Description	Part Number	Page
SYNTHETIC SUSPENSION GREASE	779163	3



NEW = Component must be replaced when removed.

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GENERAL

During assembly or installation, use torque values and service products as in the exploded view.

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

⚠ WARNING

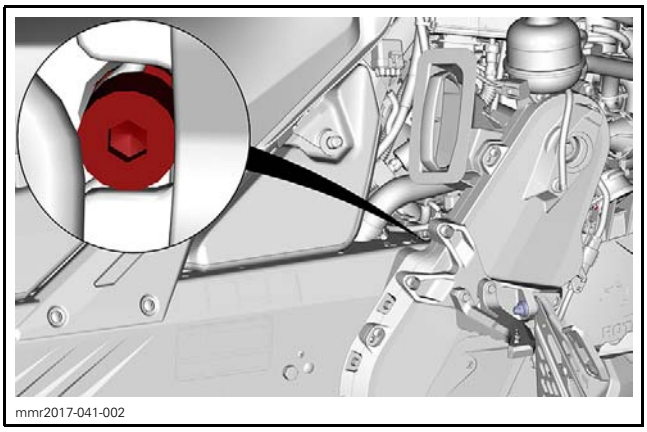
Torque wrench tightening specifications must be strictly adhered to.
Locking devices must be replaced with new ones when removed (e.g.: locking tabs, elastic stop nuts, cotter pins, etc.).

PROCEDURES

DRIVE AXLE

Removing the Drive Axle

1. Remove the rear suspension. Refer to *REAR SUSPENSION* subsection.
2. Remove the chaincase cover. Refer to *CHAINCASE* subsection.
3. Release tension from drive chain by unscrewing the tensioner adjustment screw.



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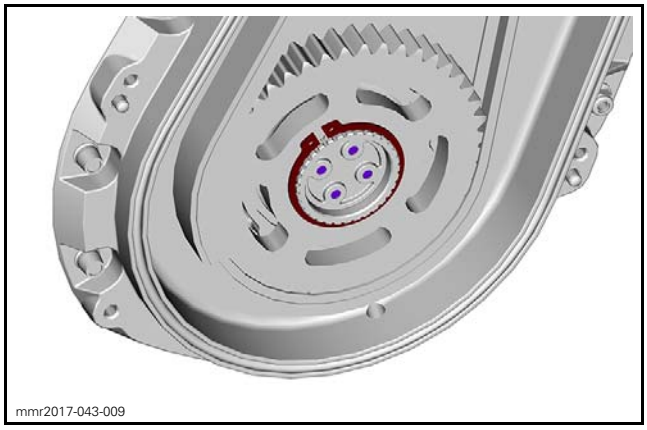
4. Remove the lower sprocket circlip.



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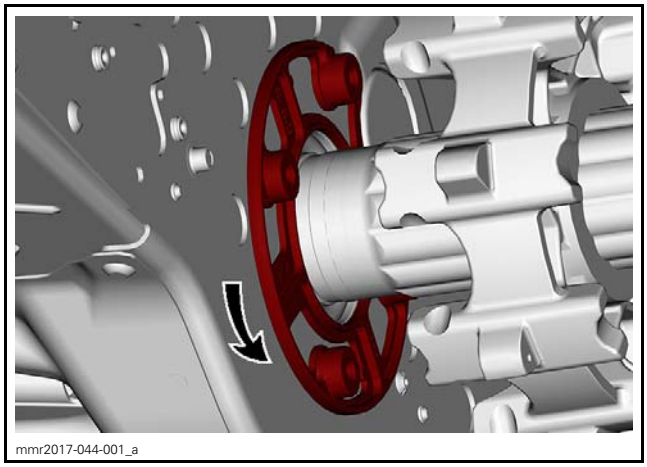
5. Remove lower gear and drive chain.
6. Remove the caliper. Refer to *BRAKE* subsection.
7. From underneath of vehicle, turn the LH bearing flange counterclockwise to unlock it from frame.



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8. Release drive axle sprockets from track and at the same time, push the drive axle towards left side until it comes out of the chaincase.
9. Move the drive axle towards the right side to remove it from vehicle.

Inspecting the Drive Axle

Check if bearing turns smoothly and freely. Replace bearing if necessary.

Check if bearing seals are damaged. Replace bearing if necessary.

Check if the bearing flange is cracked, bent or otherwise damaged. Replace if required.

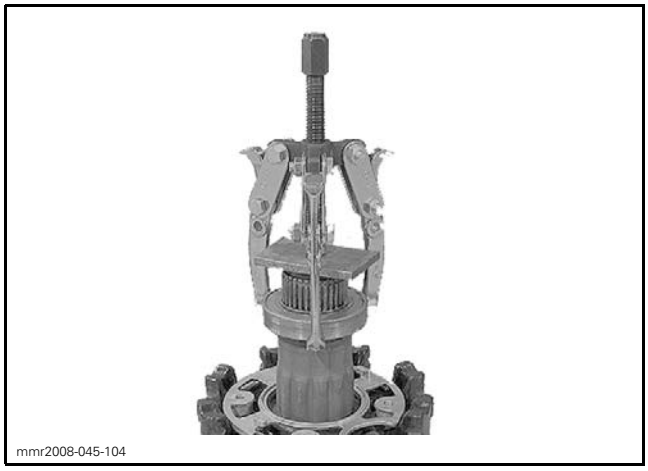
Replace drive axle if one of the following situations is detected:

– Cracked, worn or damaged drive axle
– Worn or damaged drive axle splines

– Worn or damaged sprockets
– Worn bearing journal.

Removing the Drive Axle Bearing

1. Use a 3-jaw puller to remove the drive axle bearing.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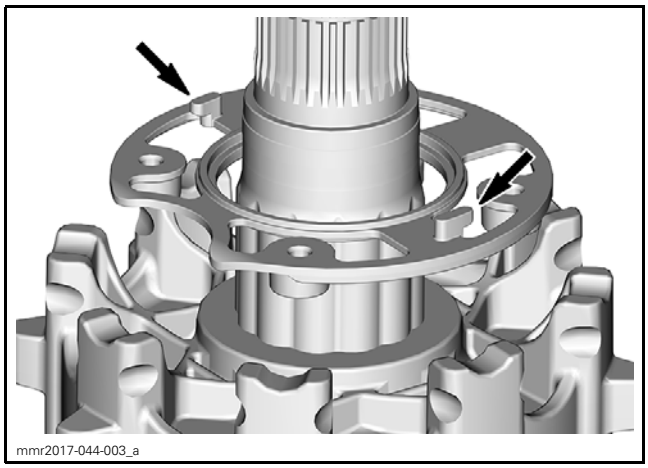
2. Remove the bearing flange.

Installing the Drive Axle Bearing

1. Install bearing flange on drive axle with locking tabs outwards.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2. Using a press and a suitable pipe, push the bearing onto drive axel.

NOTICE **Always push the bearing by inner race.**

Installing the Drive Axle

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

Insert drive axle and lock the bearing flange on frame.

NOTE: Ensure bearing flange is properly locked. Tabs must be properly inserted in frame slots.

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VIEW FROM OUTSIDE FRAME

Install the caliper and the disc brake. Refer to *BRAKE* subsection for the specific procedure.

Install all other removed parts. Refer to appropriate subsections.

MAGNETIC CAPS

Removing the Magnetic Cap

1. For the LH cap, remove brake disc protective cover. Refer to *BRAKE* subsection.
2. For the RH cap, remove the chaincase cover. Refer to *CHAINCASE* subsection.
3. By screwing a large screw in the middle of the cap, pry or pull the magnetic cap out of drive axle end.
4. To remove the other cap, push through axle with a long metal bar or wood stick.
5. Discard the magnetic cap.

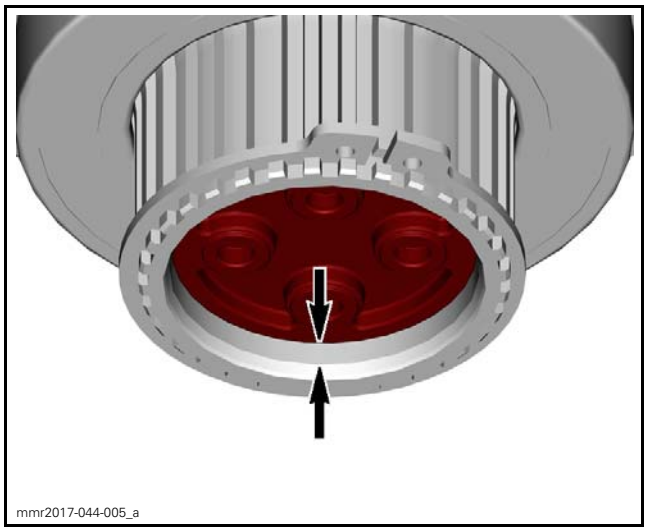
Installing the Magnetic Cap

1. Apply grease on O-ring.

SERVICE PRODUCT
SYNTHETIC SUSPENSION GREASE (P/N 779163)

2. Insert new magnetic cap in drive axle, Push until caps is secure into groove.

NOTE: Cap should have outside contour face 5 mm (.197 in) inwards.



5 MM (.197IN) INWARDS

3. Install all other removed parts.

TRACK

SERVICE TOOLS

Description	Part Number	Page
TENSIOMETER	414 348 200	1
TRACK CLEAT INSTALLER	529 036 044	3

MAINTENANCE

INSPECTING THE TRACK

Visually inspect track for:
- Cuts and abnormal wear
- Broken rods
- Broken or missing track cleats
- Perforations in the track
- Tears in the track (particularly around traction product holes)
- Lugs that are broken or torn off, exposing portion of rods
- Delamination of the rubber
- Missing track guide(s).

If track is damaged or rods are broken, replace track. For damaged or missing cleats, replace by new ones.

⚠ WARNING

Do not operate a snowmobile with a cut, torn or damaged track.

ADJUSTING AND ALIGNING THE TRACK

Track tension and alignment are interrelated. Do not adjust one without checking the other. Track tension procedure must be carried out prior to track alignment.

Verifying the Track Tension

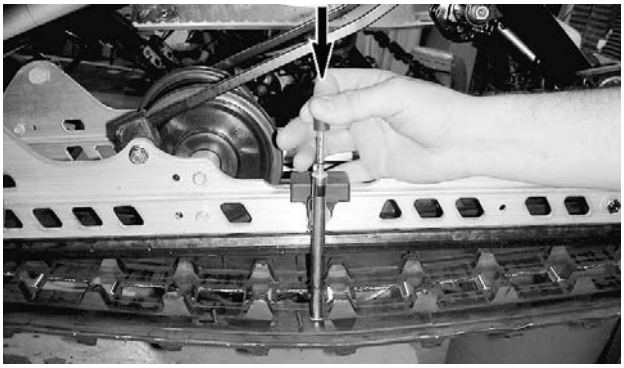
1. Lift rear of vehicle and support it off the ground.
2. Allow rear suspension to fully extend.
3. Use a tensiometer.

REQUIRED TOOL	
TENSIOMETER (P/N 414 348 200)	

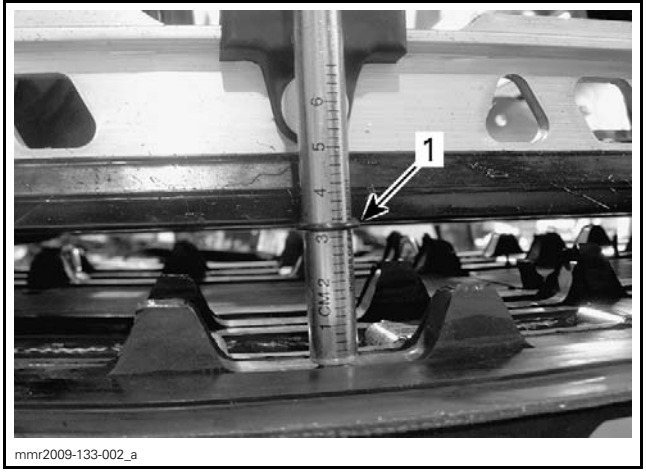
4. Set deflection to 3.2 cm (1.26 in) using bottom O-ring.

DEFLECTION SETTING
1. Bottom O-ring

5. Place upper O-ring to 0 kgf (0 lbf).
6. Position the tensiometer on track, halfway between runner ends.
7. Push the tensiometer downwards until bottom O-ring (deflection) is aligned with the bottom of slider shoe.



TYPICAL



1. Deflection O-ring aligned with slider shoe

8. Read load recorded by the upper O-ring on the tensiometer.

LOAD READING
1. Upper O-ring

Load reading must be as per the following table.

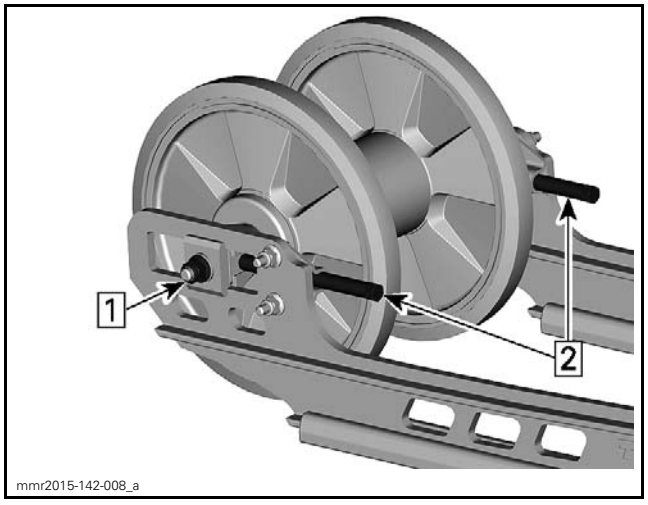
TRACK ADJUSTMENT SPECIFICATION	
Track deflection setting	3.2 cm (1.26 in)
Track load reading	6.0 kgf to 8.5 kgf (13 lbf to 19 lbf)

9. If load reading is not in accordance with the specification, adjust track tension. Refer to *ADJUSTING THE TRACK TENSION*.

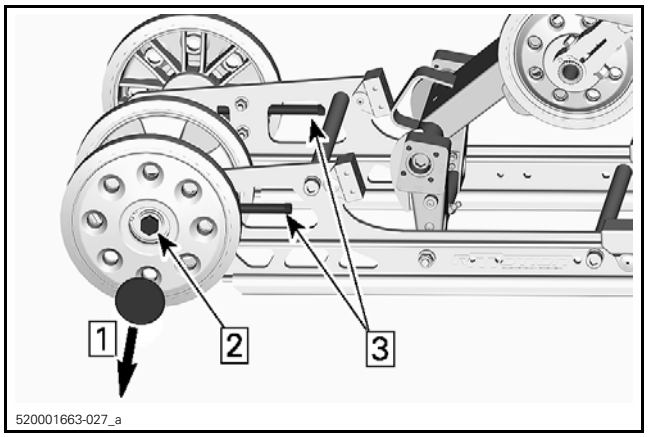
NOTICE Too much tension will result in power loss and excessive stresses on suspension components.

Adjusting the Track Tension

1. Lift rear of vehicle and support it off the ground.
2. Loosen rear axle
   2.1 Loosen nut on 2 wheel idler system
   2.2 Loosen screw on 3 or 4 wheel idler system
3. Tighten or loosen both adjustment screws to increase or decrease track tension.



TYPICAL - 2 IDLER WHEELS MODELS
Step 1: Loosen axle nut
Step 2: Tighten or loosen adjustment screws



TYPICAL - 3 OR 4 IDLER WHEELS MODELS
Step 1: Remove caps
Step 2: Loosen one the axle screw
Step 3: Tighten or loosen adjustment screws

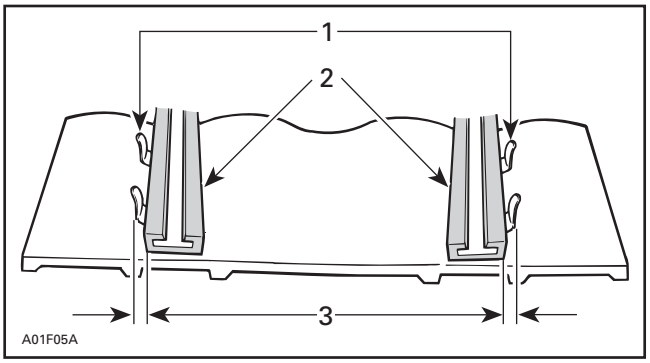
4. Verify track tension, refer to *VERIFYING THE TRACK TENSION*.
5. Ensure track is properly aligned, refer to *ALIGNING THE TRACK*.

Aligning the Track

⚠ WARNING

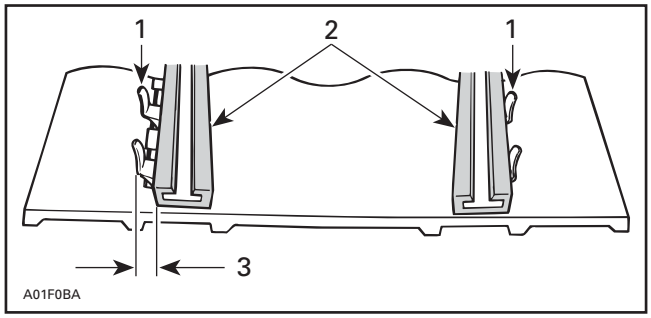
Before checking track alignment, ensure that the track is free of all particles which could be thrown out while track is rotating. Keep hands, tools, feet and clothing clear of track. Ensure no one is standing in close proximity to the vehicle. Never rotate at high speed.

1. Lift rear of vehicle and support it off the ground.
2. Start engine and accelerate slightly so that track barely turns. This must be done in a short period of time (10 seconds).
3. Check that the track is well centered; equal distance on both sides between edges of track guides and slider shoes.



1. Guides
2. Slider shoes
3. Equal distance

4. To correct track alignment:
   4.1 Stop engine.
   4.2 Loosen rear wheel nut.
   4.3 Tighten adjustment screw on side where the slider shoe is the farthest from the track insert guides.



1. Guides
2. Slider shoes
3. Tighten on this side

5. Restart engine.
6. Rotate track slowly and recheck alignment.
7. If satisfactory track alignment is achieved tighten idler wheels axle nut to specification:

TIGHTENING TORQUE	
Rear idler wheel retaining screws **(3 and 4 idler wheels system)**	48 N•m ± 6 N•m (35 lbf•ft ± 4 lbf•ft)
Rear idler wheel retaining nut and screw **(2 idler wheels system)**	24.5 N•m ± 3.5 N•m (18 lbf•ft ± 3 lbf•ft)

PROCEDURES

TRACK

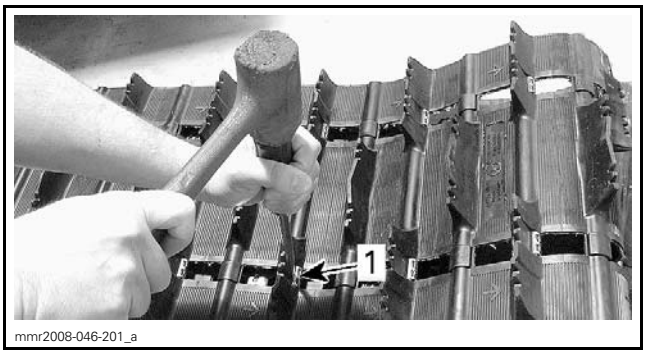
Replacing a Track Cleat

Raise rear of vehicle off the ground.

Lift snow guard.

Rotate track to expose a cleat to be replaced.

Remove cleat from track using plastic hammer and a big screwdriver.



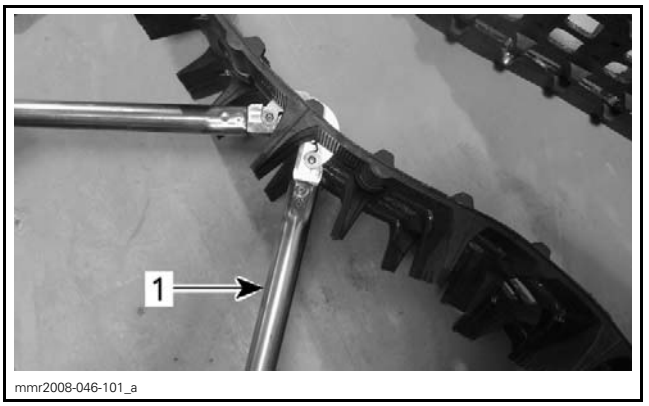
TYPICAL
1. Cleat

Place new cleat in position on the track.

Secure cleat with the cleat installer.

REQUIRED TOOL	
TRACK CLEAT INSTALLER (P/N 529 036 044)	

Bend cleat and push tabs into rubber.



TYPICAL
1. Narrow-cleat installer

Reopen narrow-cleat installer.

Position cleat tabs on open end of tool.

Squeeze tabs until they are indented in rubber.

Removing the Track

Remove rear suspension from vehicle. Refer to *REAR SUSPENSION*.

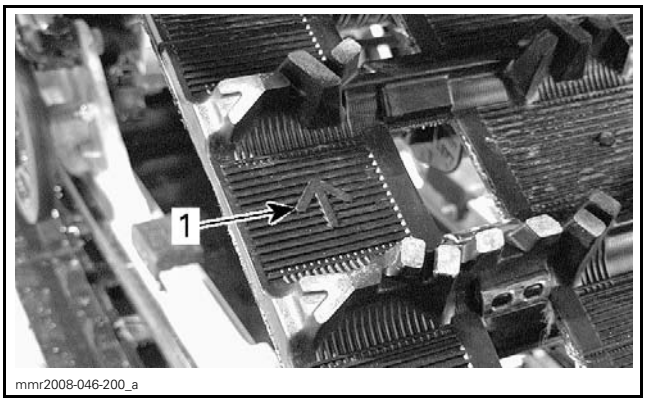
Remove drive axle. Refer to *DRIVE AXLE* subsection.

Remove track.

Installing the Track

Reverse the removal procedure.

NOTE: When installing the track, respect rotation direction indicated by an arrow on track thread.



1. Arrow pointing forwards

Adjusting and aligning the Track

Refer to *MAINTENANCE* in this subsection.

SUSPENSION ADJUSTMENT

GENERAL

NOTICE Whenever adjusting rear suspension, check track tension and adjust if necessary.

ADJUSTMENT

Choice of suspension adjustments vary with vehicle load, personal preference, riding speed and terrain condition.

The best way to set up the suspension, is to start from factory settings, then customize each adjustment one at a time.

Front and rear adjustments are interrelated. It may be necessary to readjust the rear shock absorbers after adjusting front shock absorbers for instance.

Test run the vehicle under the same conditions; trail, speed, load, etc. Change one adjustment and retest. Proceed methodically until you are satisfied.

Following are guidelines to fine-tune suspension.

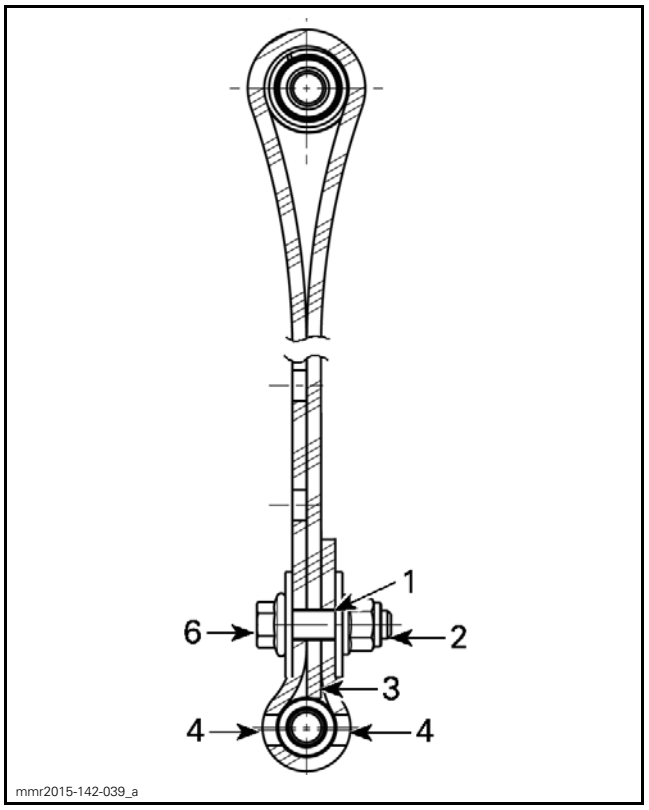
STOPPER STRAP

Stopper strap length has an effect on the amount of weight the center spring has to carry especially during acceleration, therefore on the front end uplift.

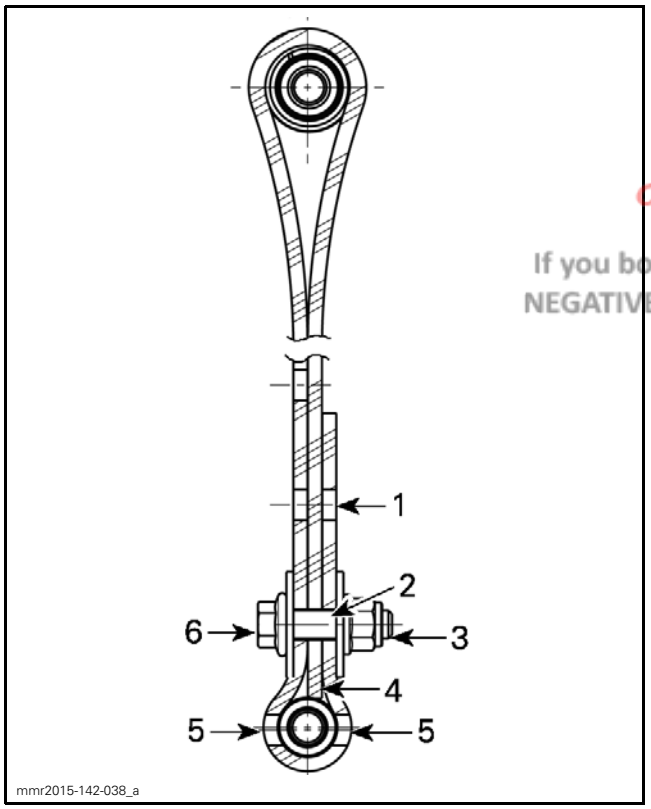
Stopper strap length also has an effect on center spring travel.

ACTION	RESULT
Increasing stopper strap length	Lighter ski pressure under acceleration
	More center spring travel
	More bump absorption capability
Decreasing stopper strap length	Heavier ski pressure under acceleration
	Less center spring travel
	Less bump absorption capability

NOTE: Stopper strap could be set to position 1, 2, 3, 4 and 5. Below are illustrations for position 1, 2, 3. Smaller numbers correspond to a longer strap setting.



STOPPER STRAP POSITION 1 (1ST HOLE, LONGEST)
1. *1st hole from end*
2. *Towards rear*
3. *Tip of strap touching strap axis*
4. *Two holes left open between screw head and nut*
5. *Towards front*



STOPPER STRAP POSITION 2 (2ND HOLE)
1. *Free hole*
2. *2nd hole from end*
3. *Towards rear*
4. *Tip of strap touching strap axis*
5. *Two holes left open between screw head and nut*
6. *Towards front*

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STOPPER STRAP POSITION 3 (3RD HOLE)
1. *Free holes*
2. *3rd hole from end*
3. *Towards rear*
4. *Tip of strap touching strap axis*
5. *Two holes left open between screw head and nut*
6. *Towards front*

NOTE: Always install stopper strap bolt as close as possible to the lower shaft.

When operating the snowmobile in deep snow or hill climbing, it may be necessary to vary stopper strap length and/or riding position, to change the angle at which the track rides on the snow. Operator's familiarity with the various adjustments as well as snow conditions will dictate the most efficient combination.

Generally, a longer stopper strap setting gives better performance on a flat landscape and a shorter setting will improve handling in steep hill climbing and deep snow conditions.

STOPPER STRAP SETTING	
POSITION	USE
1	Not used
2	Boon docking: – Better boon docking manoeuvrability – Better bump absorption – Better deep snow starts (forward and reverse)

STOPPER STRAP SETTING	
POSITION	USE
3	Factory setting: Best overall setting (General use)
4	Hill climb: – Better track attack angle for hill climbing
5	Steep hill climb: – Better track attack angle for hill climbing – Less transfer – Lower ride height

SPRING PRELOAD

Front Springs

Front springs preload has an effect on:
– front suspension firmness
– The steering behavior.

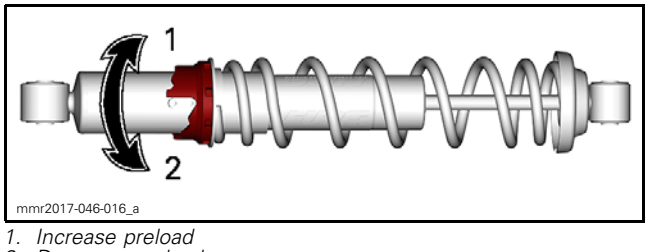
ACTION	RESULT
Increasing preload	Firmer front suspension
	Higher front end
	More precise steering
	More bump absorption capability
Decreasing preload	Softer front suspension
	Lower front end
	Lighter steering
	Less bump absorption capability

⚠ WARNING

Adjust both springs to the same preload. Uneven adjustment can cause poor handling and loss of stability, and/or control, and increase the risk of an accident.

Cam Type Adjuster

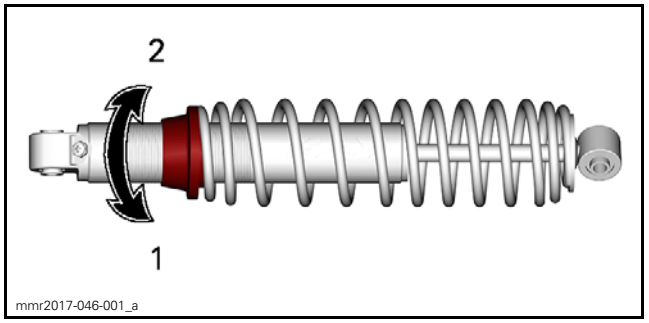
Using the suspension adjustment tool (included in the vehicle tool kit), turn the cam to increase or decrease spring preload.



1. Increase preload
2. Decrease preload

Ring Type Adjuster

Grab and turn the spring to increase or decrease spring preload.



1. Increase preload
2. Decrease preload

Center Spring

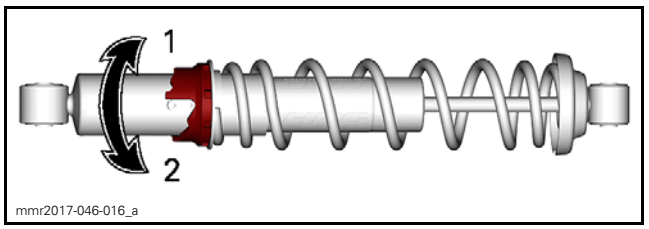
Center spring preload has an effect on steering effort, handling and bump absorption.

Also, since center spring preload adjustment puts more or less pressure on the front of the track, it has an effect on the performance in deep snow.

ACTION	RESULT
Increasing preload	Lighter steering
	More bump absorption capability
	Better deep snow starts
	Better deep snow performance and handling
Decreasing preload	Heavier steering
	Less bump absorption capability
	Better trail handling

Cam Type Adjuster

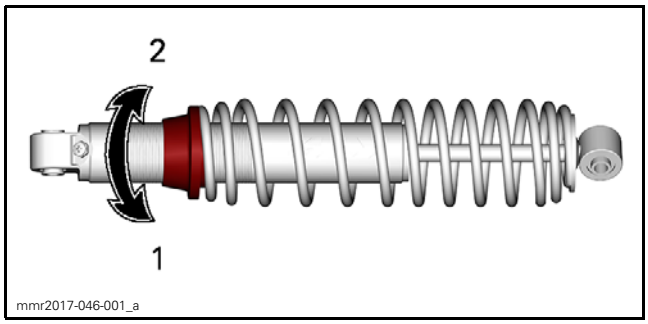
Using the suspension adjustment tool (included in the vehicle tool kit), turn the cam to increase or decrease spring preload.



1. Increase preload
2. Decrease preload

Ring Type Adjuster

Grab and turn the spring to increase or decrease spring preload.



1. Increase preload
2. Decrease preload

Rear Springs

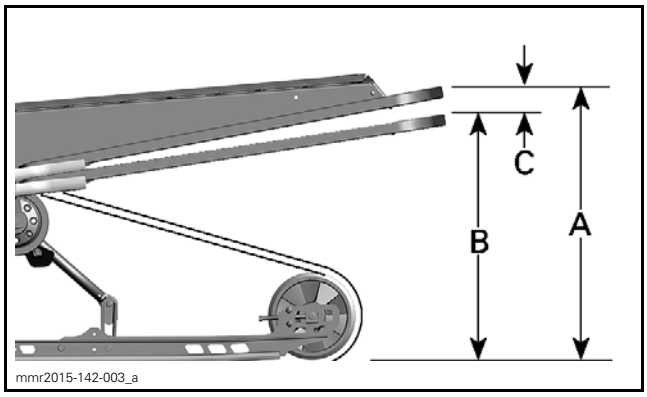
Rear spring preload has an effect on comfort, ride height and load compensation.

Also, adjusting rear spring preload shifts more or less weight to the snowmobile front end. As a result, more or less weight is applied to the skis. This has an effect on performance in deep snow, steering effort and handling.

Slight suspension bottoming occurring under the worst riding conditions indicates a good choice of spring preload.

ACTION	RESULT
Increasing preload	Firmer rear suspension
	Higher rear end
	More bump absorption capability
	Heavier steering
Decreasing preload	Softer rear suspension
	Lower rear end
	Less bump absorption capability
	Lighter steering
	Better deep snow performance and handling

Refer to the following to determine if preload is correct.



PROPER ADJUSTMENT
A. Suspension fully extended
B. Suspension has collapsed with operator, passenger and load added
C. Distance between dimension "A" and "B", see table below

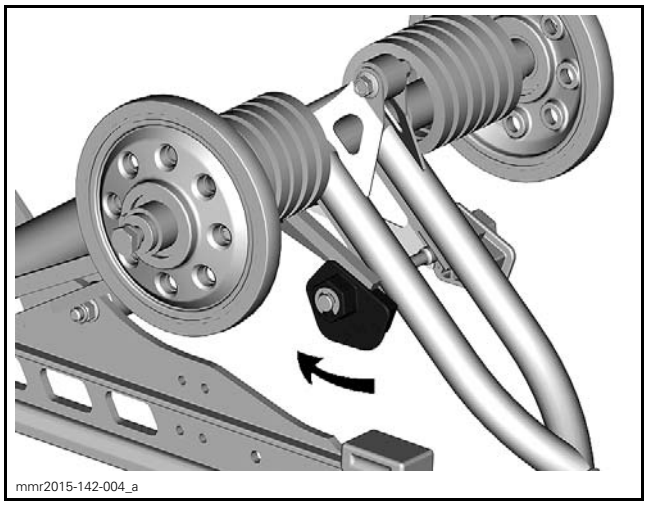
"C"	WHAT TO DO
65 mm to 100 mm (2.5 in to 4 in)	No adjustment required
More than 100 mm (4 in)	Adjusted too soft. Increase preload
Less than 65 mm (2.5 in)	Adjusted too firm. Decrease preload

If the specification is unattainable with the original springs, refer to the applicable *SPRING CHART* bulletin for other available springs.

NOTICE **To increase spring preload, always turn the left side adjustment cam in a clockwise direction, and the right side cam in a counterclockwise direction.**

⚠ CAUTION **Never set preload cams directly from position 5 to 1 or directly from position 1 to 5.**

The adjustment cams have 5 different settings, 1 being the softest.



Dampers

Compression Damping (KYB PRO Series)

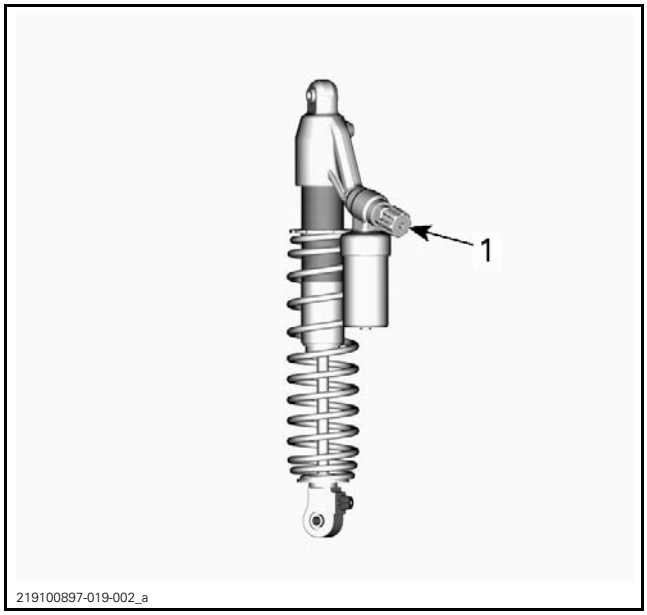
NOTE: Both low and high speed compression damping are adjusted simultaneously.

Low speed compression damping controls how the shock absorber reacts to a low suspension velocity (slow compression strokes, in most cases when riding at lower speeds).

High speed compression damping controls how the shock absorber reacts to a high suspension velocity (quick compression strokes, in most cases when riding at higher speeds).

ACTION	RESULT
Increasing compression damping force	Firmer compression damping
Decreasing compression damping force	Softer compression damping

To adjust, turn compression damping adjustment knob clockwise to increase compression damping force and counterclockwise to decrease compression damping force.



1. Compression damping adjustment knob

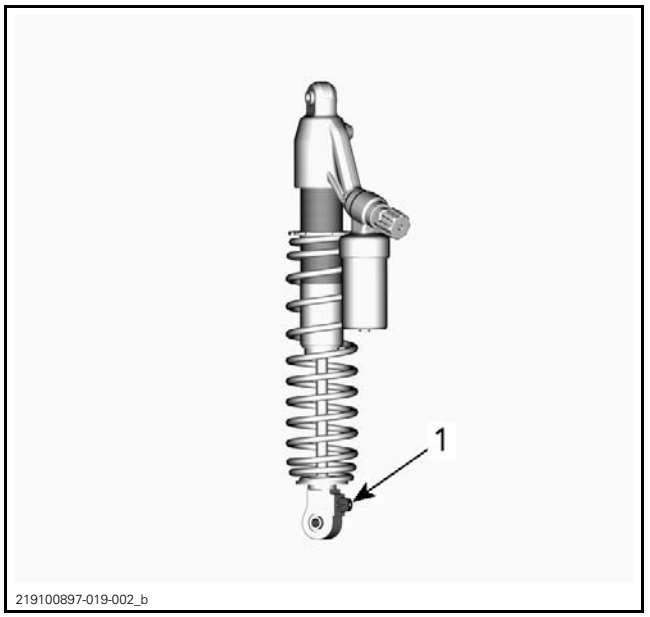
Rebound Damping (KYB PRO Series)

Rebound damping controls how the shock absorber restrains the extension stroke.

ACTION	RESULT
Increasing rebound damping force	Firmer rebound damping (slower extension speed)
Decreasing rebound damping force	Softer rebound damping (faster extension speed)

NOTE: In repetitive shorts small bumps (ripple), it is recommended to use a lower rebound damping setting.

To adjust, turn rebound adjustment knob clockwise to increase rebound damping force and counterclockwise to decrease rebound damping force.

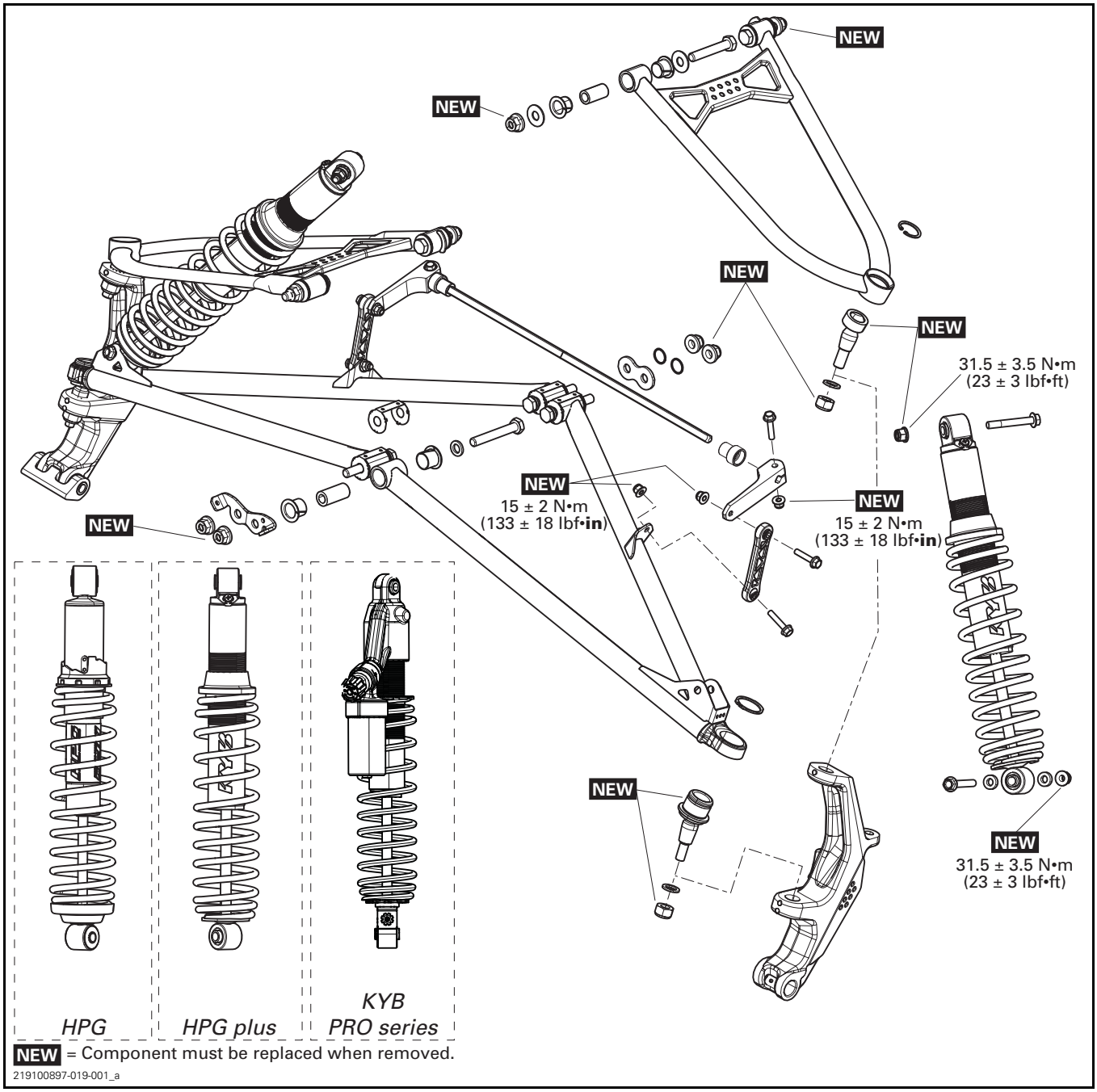


1. Rebound damping adjustment knob

FRONT SUSPENSION

SERVICE TOOLS

Description	Part Number	Page
BALL JOINT EXTRACTOR	529 035 827	5
BALL JOINT INSTALLER SUPPORT	529 036 398	8
BALL JOINT INSTALLER	529 036 399	8
BALL JOINT REMOVER SUPPORT	529 036 400	8
SPRING COMPRESSOR	529 036 184	4
SUSPENSION ARM SUPPORT	529 035 637	6



GENERAL

The procedure explained below is the same for the RH and LH sides unless otherwise noted.

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

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

⚠ WARNING

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

Check for loose, bent, worn out, rusted or otherwise damaged components. Replace the faulty components.

ADJUSTMENT

SPRINGS

Front spring preload has an effect on front suspension firmness.

Front spring preload also has an effect on the steering behavior.

ACTION	RESULT
Increasing preload	Firmer front suspension
	Higher front end
	More precise steering
	More bump absorption capability
Decreasing preload	Softer front suspension
	Lower front end
	Lighter steering
	Less bump absorption capability

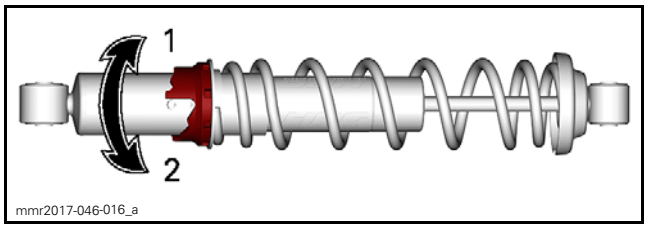
⚠ WARNING

Adjust both springs to the same preload. Uneven adjustment can cause poor handling and loss of stability, and/or control, and increase the risk of an accident.

Spring Preload Adjustment

Cam Type Adjustment

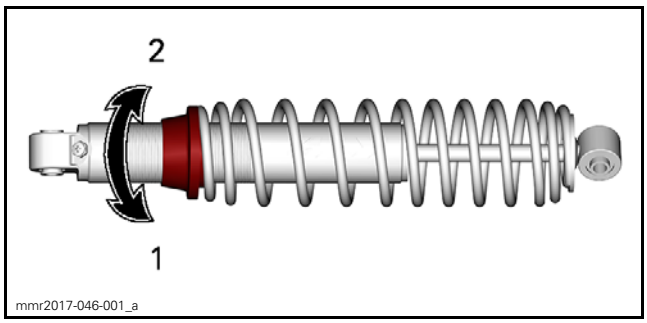
Using the suspension adjustment tool (included in the vehicle tool kit), turn the cam to increase or decrease spring preload.



1. Increase preload
2. Decrease preload

Ring Type Adjustment

Grab and turn the spring to increase or decrease spring preload.



1. Increase preload
2. Decrease preload

DAMPERS

Compression Damping (KYB PRO Series)

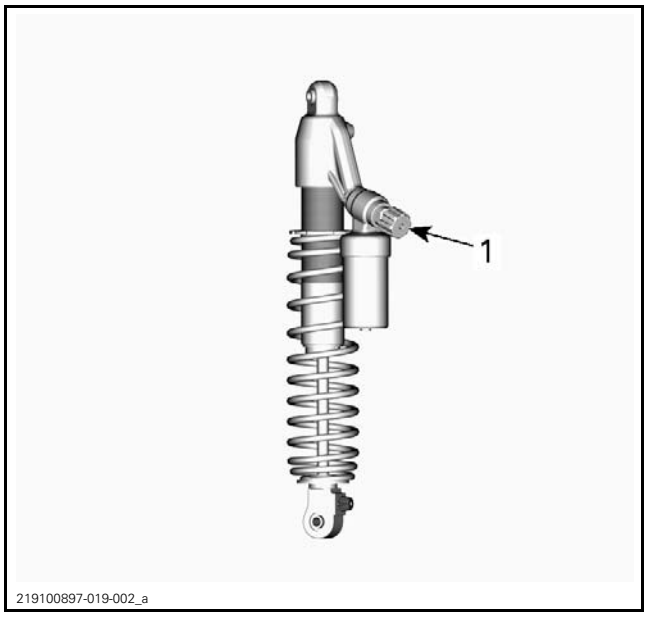
NOTE: Both low and high speed compression damping are adjusted simultaneously.

Low speed compression damping controls how the shock absorber reacts to a low suspension velocity (slow compression strokes, in most cases when riding at lower speeds).

High speed compression damping controls how the shock absorber reacts to a high suspension velocity (quick compression strokes, in most cases when riding at higher speeds).

ACTION	RESULT
Increasing compression damping force	Firmer compression damping
Decreasing compression damping force	Softer compression damping

To adjust, turn compression damping adjustment knob clockwise to increase compression damping force and counterclockwise to decrease compression damping force.



1. Compression damping adjustment knob

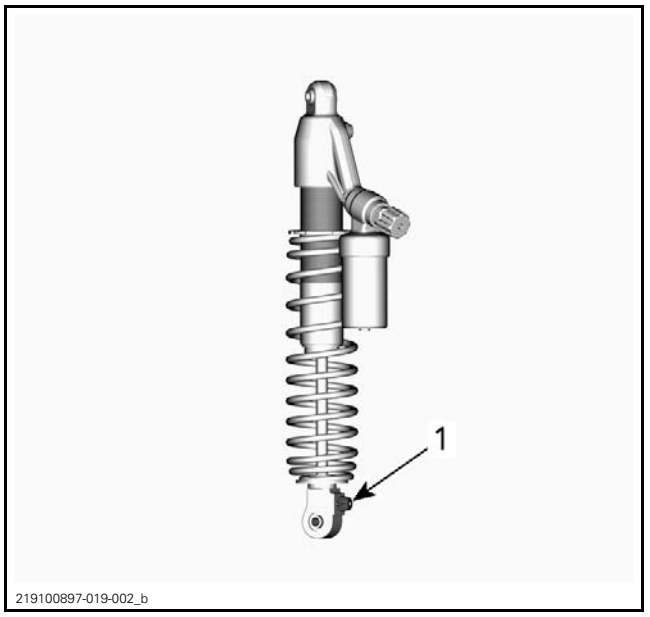
Rebound Damping (KYB PRO Series)

Rebound damping controls how the shock absorber restrains the extension stroke.

ACTION	RESULT
Increasing rebound damping force	Firmer rebound damping (slower extension speed)
Decreasing rebound damping force	Softer rebound damping (faster extension speed)

NOTE: In repetitive shorts small bumps (ripple), it is recommended to use a lower rebound damping setting.

To adjust, turn rebound adjustment knob clockwise to increase rebound damping force and counterclockwise to decrease rebound damping force.



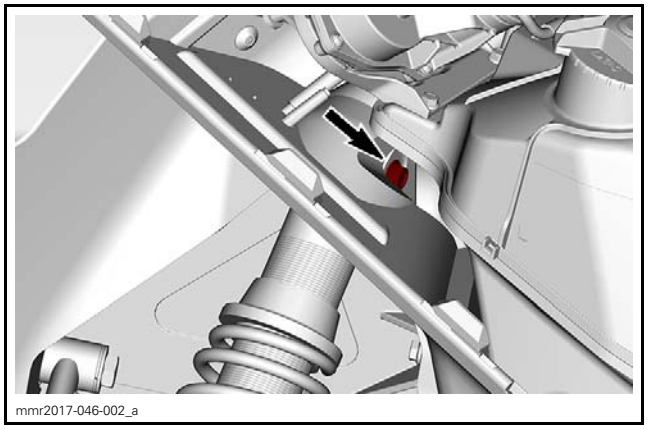
1. Rebound damping adjustment knob

PROCEDURES

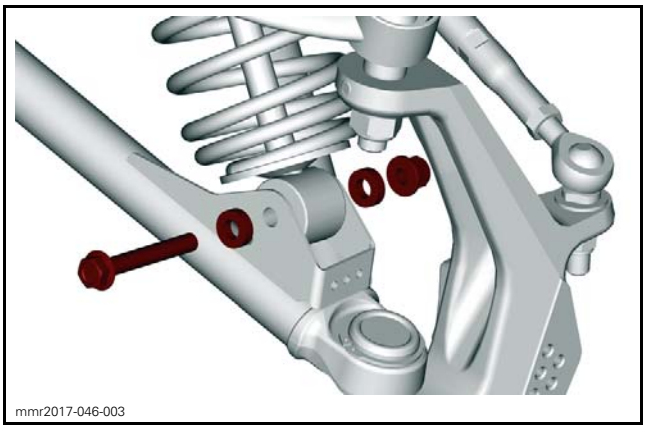
SHOCK ABSORBER

Removing the Shock Absorber

1. Remove the side panel. Refer to *BODY* subsection.
2. Lift the front of vehicle until skis are off the ground.
3. Remove the shock absorber upper bolt.



4. Remove the shock absorber lower bolt, nut, and spacers.


mmr2017-046-003

5. Remove the shock absorber.

Inspecting the Shock Absorber

Refer to *REAR SUSPENSION (RMOTION)* subsection.

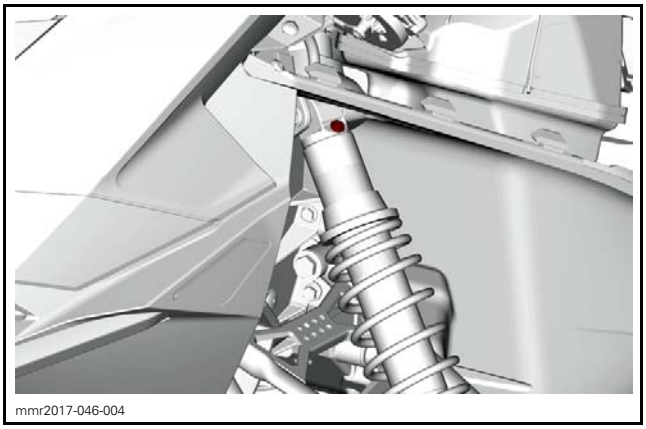
Installing the Shock Absorber

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

Install upper bolt first while shock absorber lower mount is not engaged into the bracket.

Install shock absorber with body up and valve (if equipped) towards outside.

Make sure to install both of the lower spacers.

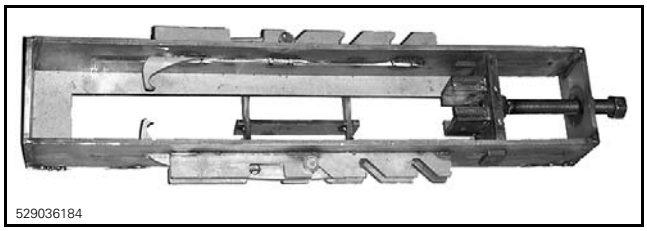

mmr2017-046-004

TIGHTENING TORQUE	
Front shock absorber retaining nuts	31.5 N•m ± 3.5 N•m

SPRING

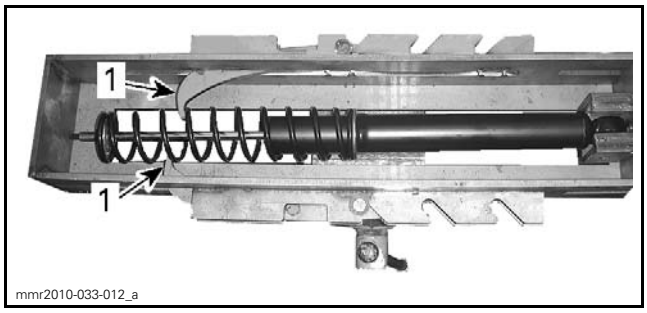
Removing the Spring

1. Secure the SPRING COMPRESSOR (P/N 529 036 184) in a vise.


529036184

SPRING COMPRESSOR

2. Position the shock absorber in the tool and install the spring compressor hooks.



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TYPICAL
1. Spring compressor hooks

3. Tighten the spring compressor tool screw until the spring is sufficiently compressed to remove spring stopper.
4. Release the spring compressor tool screw.
5. Remove spring from shock absorber.

Inspecting the Spring

Inspect spring for apparent damage, any defect such as scratches or rust can affect the spring durability.

When the adjustment is at the lowest preload, ensure that adjustment cam and spring stopper are not loose. They must be under spring pressure. Otherwise, the spring stopper might fall off.

Installing the Spring

For installation, reverse the removal procedure.

UPPER SUSPENSION ARM

Inspecting the Upper Suspension Arm

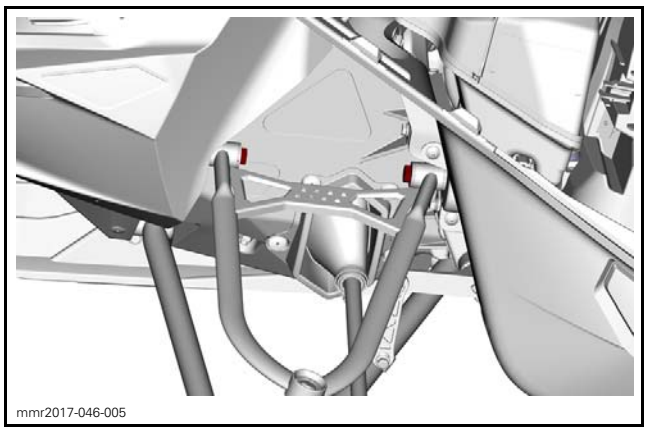
1. Check suspension arm for distortion or damage. Replace if necessary.
2. Lift the front of vehicle until skis are off the ground.
3. Move suspension arm from side to side.
4. Lower vehicle to the ground.
5. Move suspension up and down.
6. There should be no noticeable looseness. Replace bushings and/or sleeves if necessary.

NOTE: A play of 2 mm is acceptable when the suspension arm is moved forward and backward.

7. Check sleeves inside suspension arm attachments for wear or damage.

Removing the Upper Suspension Arm

1. Lift the front of vehicle until skis are off the ground.
2. Remove muffler and tuned pipe. Refer to *EXHAUST SYSTEM* subsection.
3. Remove shock absorber. See procedure in *REMOVING THE SHOCK ABSORBER* in this subsection.
4. Remove the upper suspension arm bolts.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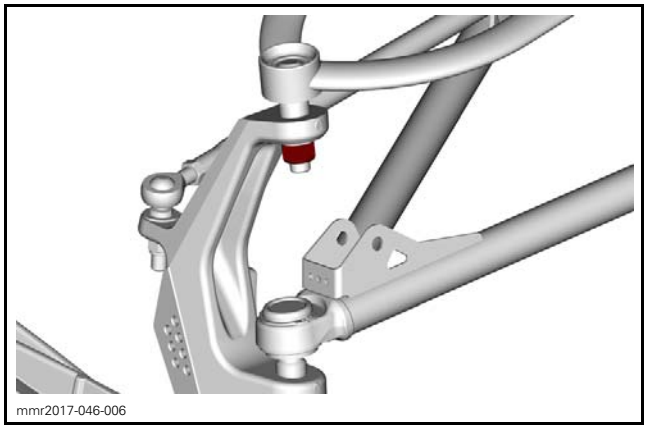
5. Detach ball joint from ski leg as follows.
   5.1 Remove nut securing ball joint to ski leg.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   5.2 Use the extractor to detach ball joint from ski leg.

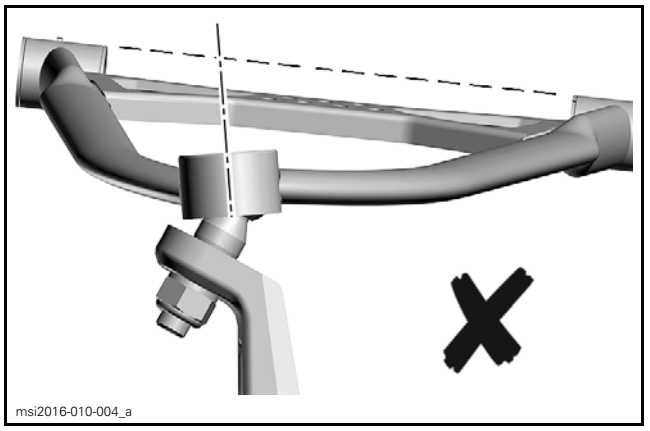
REQUIRED TOOL	
BALL JOINT EXTRACTOR (P/N 529 035 827)	

6. Remove upper suspension arm.

Installing the Upper Suspension Arm

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

NOTICE **Make sure not to invert LH and RH arm.**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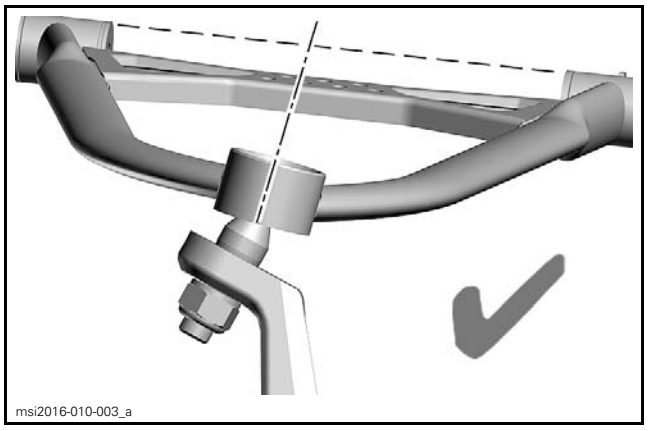
RH UPPER ARM INSTALLED ON LH SIDE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LH UPPER ARM INSTALLED ON LH SIDE

UPPER BALL JOINT

Inspecting the Upper Ball Joint

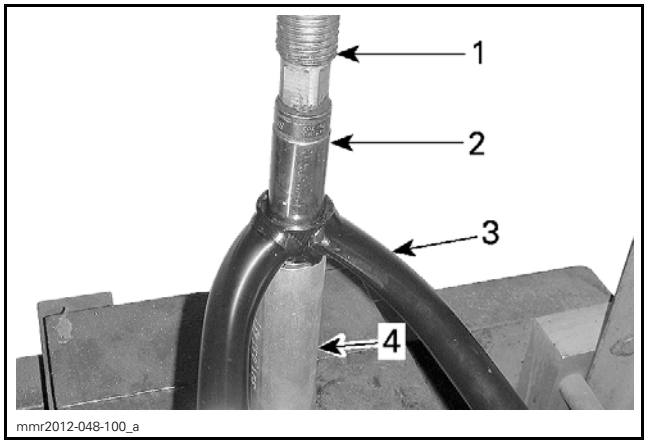
Check both upper ball joints for damage, pitting, looseness and roughness. If so, replace with a new one.

Removing the Upper Ball Joint

1. Remove the *UPPER SUSPENSION ARM*, see procedure in this subsection.
2. Remove circlip securing ball joint to suspension arm.

3. Press ball joint out of the suspension arm.

REQUIRED TOOLS	
Shop press	
SUSPENSION ARM SUPPORT (P/N 529 035 637)	
Suitable socket	



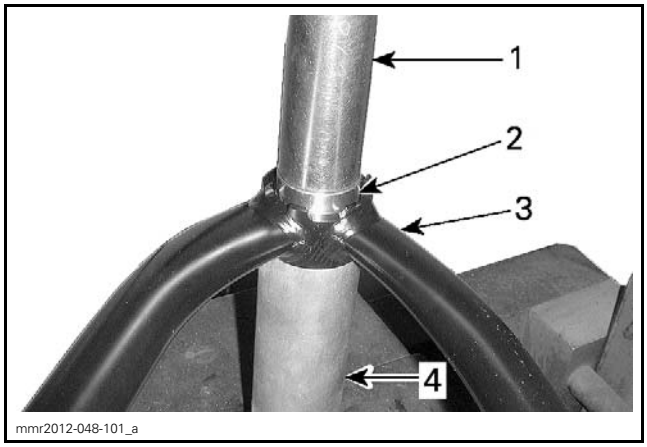
TYPICAL
1. Press rod
2. Socket
3. Suspension arm
4. Suspension arm support

Installing the Upper Ball Joint

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

1. Press ball joint into the suspension arm.

REQUIRED TOOLS	
Shop press	
SUSPENSION ARM SUPPORT (P/N 529 035 637)	
Suitable socket	



TYPICAL
1. Socket
2. Ball joint
3. Suspension arm
4. Suspension arm support (P/N 529 035 637)

2. Reinstall the circlip. If it seems loose, replace it with a new one.

LOWER SUSPENSION ARM

Inspecting the Lower Suspension Arm

1. Check suspension arm for distortion or damage. Replace if necessary.
2. Lift the front of vehicle until skis are off the ground.
3. Detach shock absorber and stabilizer bar link from lower suspension arm.
4. Move suspension arm from side to side.
5. Lower vehicle to the ground.
6. Move suspension up and down.
7. There should be no noticeable loose. Replace bushings and/or sleeves if necessary.

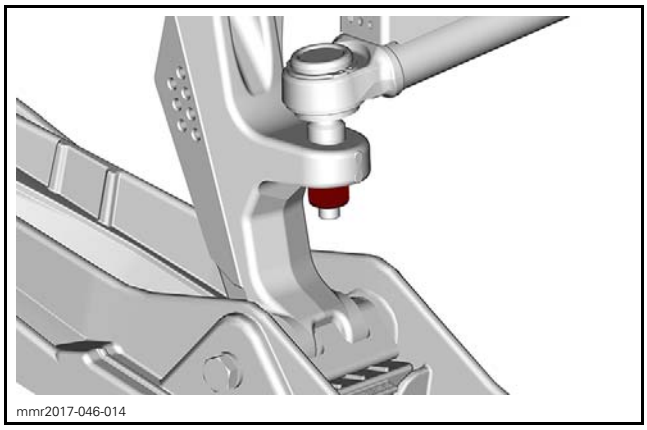
NOTE: A play of 2 mm is acceptable when the suspension arm is moved forward and backward.

8. Check sleeves inside suspension arm attachments for wear or damage.

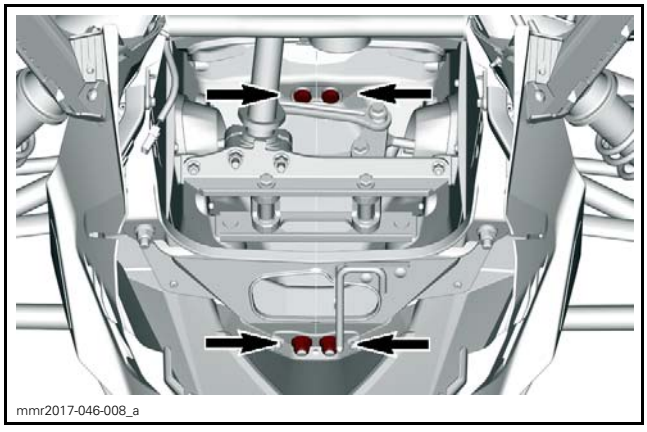
Removing the Lower Suspension Arm

1. Lift the front of vehicle until skis are off the ground.

2. Remove the tune pipe. Refer to *EXHAUST SYSTEM* subsection.
3. Remove shock absorber lower bolt.
4. Detach stabilizer bar link from lower suspension arm. Refer to *STABILIZER BAR* further in this subsection.
5. Remove lower ball joint nut.


mmr2017-046-014

6. Using a suitable ball joint remover, detach lower ball joint from ski leg.
7. Remove suspension arm screws from inside the vehicle.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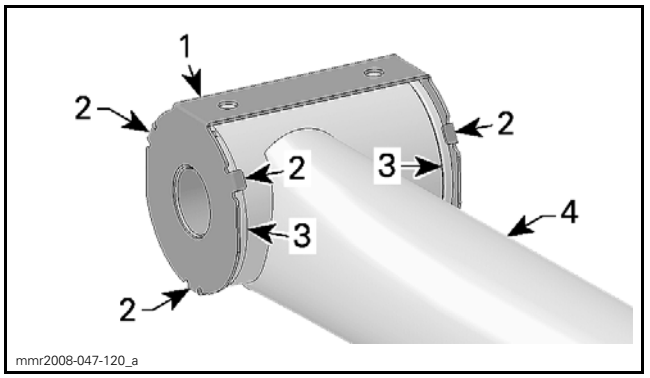
8. Remove lower suspension arm from vehicle.

Installing the Lower Suspension Arm

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

1. Install a wear plate over bushings.
2. Position the wear plate on top.
3. Fold all tabs against bushings.



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1. Wear plate
2. Wear plate tabs
3. Bushings
4. Lower suspension arm

Install all other removed parts.

LOWER BALL JOINT

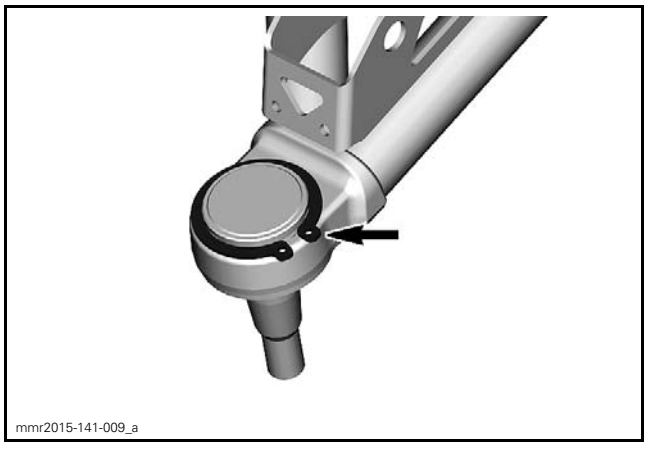
NOTE: The MX Z / Renegade lower ball joint is different from the Summit / Freeride lower ball joint.

Inspecting the Lower Ball Joint

Inspect ball joint end for damage. Ensure it's moving freely, a 0.3 mm axial play is acceptable. Replace ball joints as required.

Removing the Lower Ball Joint

1. Remove the *LOWER SUSPENSION ARM*, see procedure in this subsection.
2. Remove circlip securing ball joint to suspension arm.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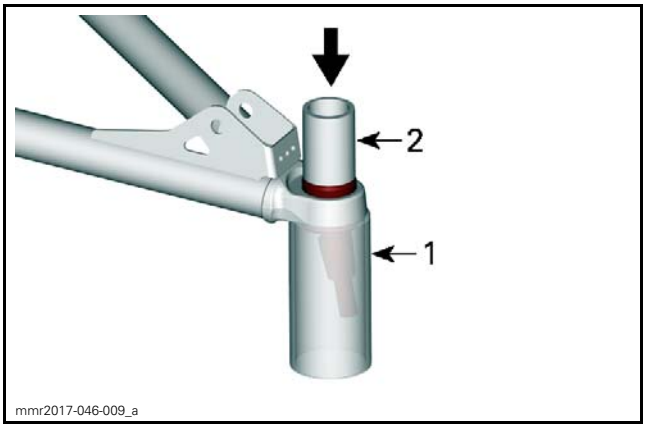
3. Use a shop press and the specified tools to press the ball joint out of the lower suspension arm.

REQUIRED TOOLS	
BALL JOINT REMOVER SUPPORT (P/N 529 036 400)	
Suitable box	

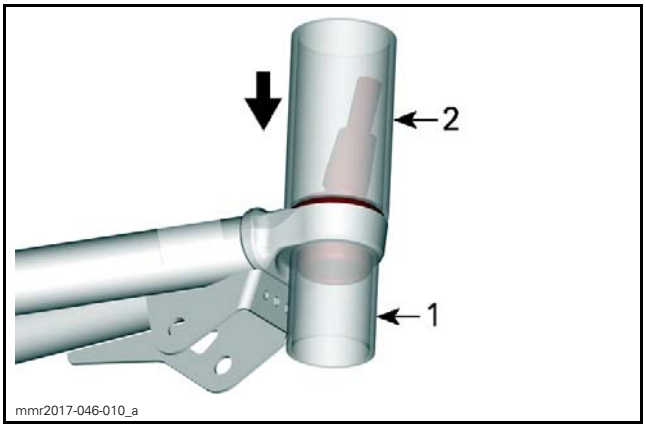


1. *Ball joint remover support*
2. *Suitable box*

Installing the Lower Ball Joint

1. Use a press and the specified tools to press the ball joint into the suspension arm end.

REQUIRED TOOLS	
BALL JOINT INSTALLER SUPPORT (P/N 529 036 398)	
BALL JOINT INSTALLER (P/N 529 036 399)	



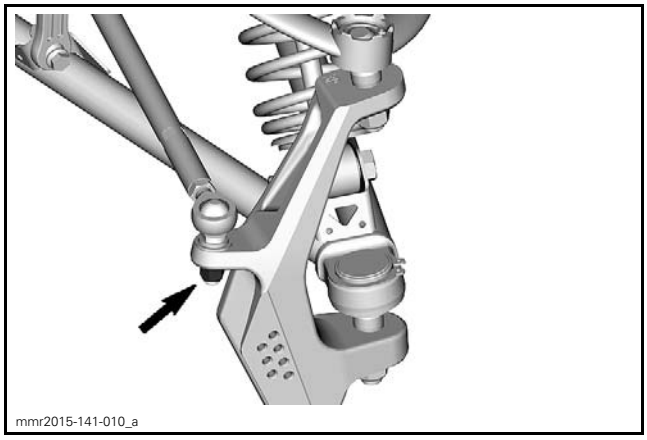
1. *Ball joint installer support*
2. *Ball joint installer*

2. Reinstall the circlip. If the circlip seems loose, replace it with a new one.
3. Install the *LOWER SUSPENSION ARM* on vehicle, see procedure in this subsection.

SKI LEG

Removing the Ski Leg

1. Remove ski from ski leg.
2. Detach tie-rod end from ski leg.



3. Remove upper and lower ball joints from ski leg. Refer to *UPPER BALL JOINT* and *LOWER BALL JOINT* in this subsection.

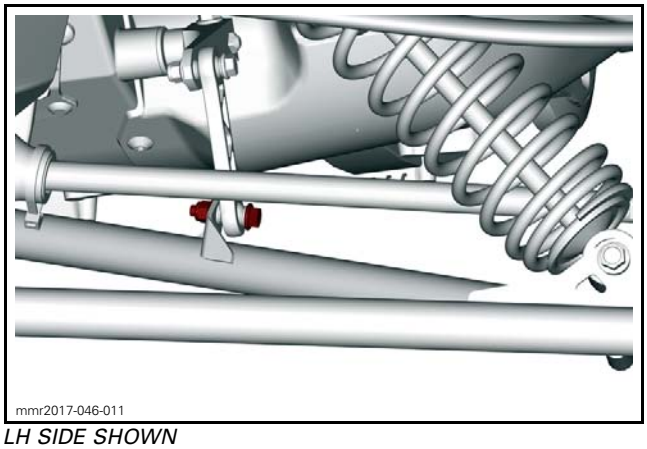
Installing the Ski Leg

The installation is the reverse of the removal procedure.

STABILIZER BAR

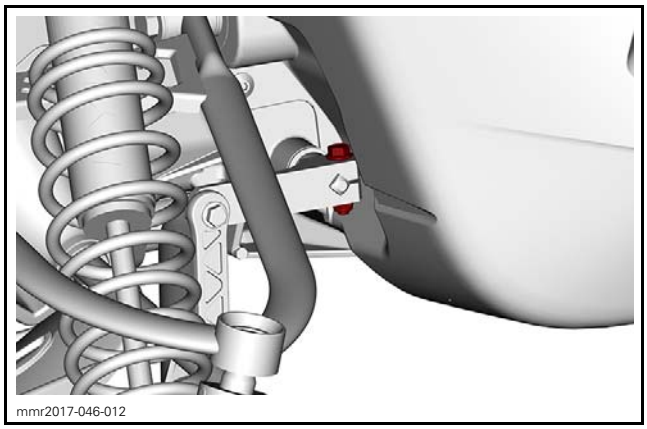
Removing the Stabilizer Bar

1. Remove bolts and nuts securing stabilizer links to lower suspension arms.



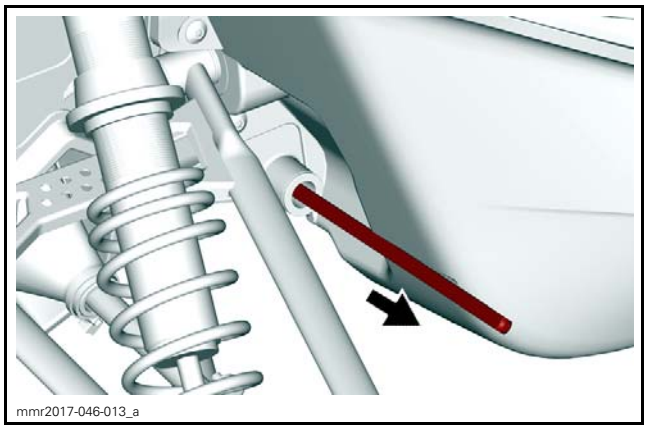
LH SIDE SHOWN

2. Remove stabilizer lever bolts and nuts.



LH SIDE SHOWN

3. Remove stabilizer levers and plastic bushings from stabilizer bar.
4. Slide stabilizer bar out of vehicle from the LH side.



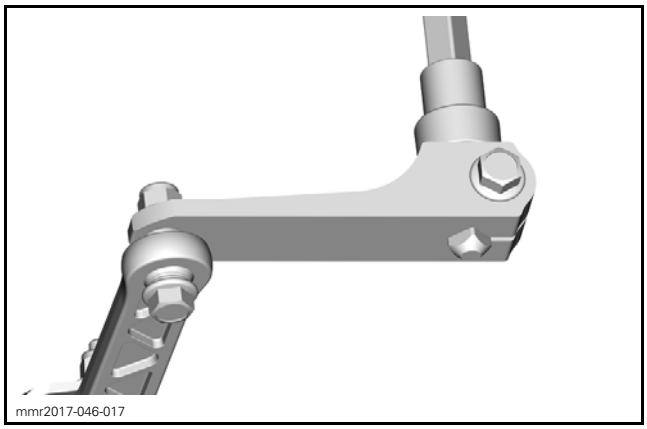
Installing the Stabilizer Bar

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

Ensure to install the flat side outwards.

Install the screw with the head upwards.

TIGHTENING TORQUE	
Stabilizer bar link nut	19 N•m ± 2 N•m



FLAT SIDE FACING OUTWARDS

REAR SUSPENSION (rMOTION)

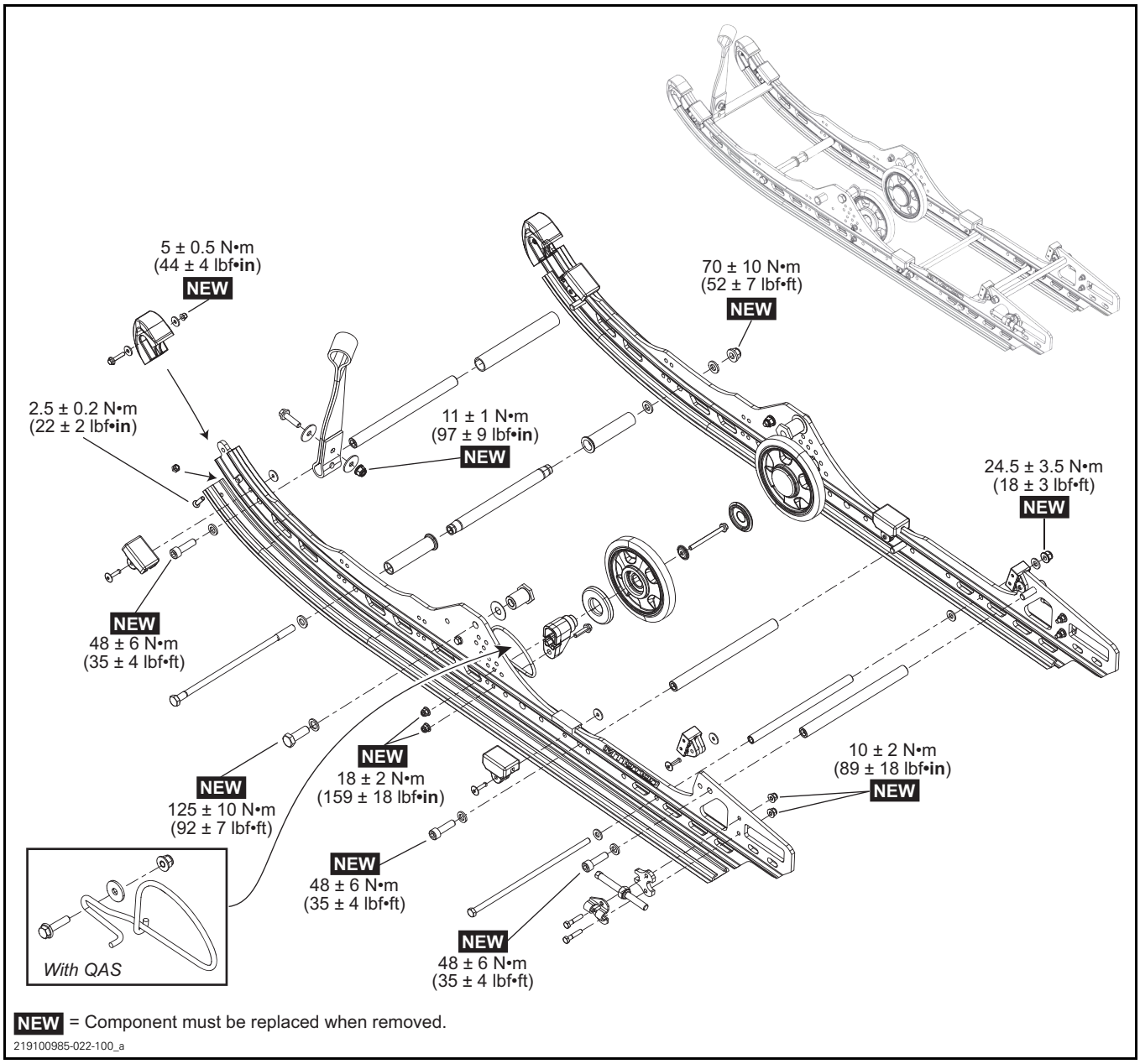
SERVICE TOOLS

Description	Part Number	Page
RMOTION MASTER CYLINDER KEY	529 036 254	13–14
RMOTION SOCKET	529 036 255	14
RMOTION SUSPENSION TOOL	529 036 234	8, 22
SHOCK ABSORBER SUPPORTS	529 036 186	20

SERVICE PRODUCTS

Description	Part Number	Page
LOCTITE 243 (BLUE)	293 800 060	12
SYNTHETIC SUSPENSION GREASE	779163	7

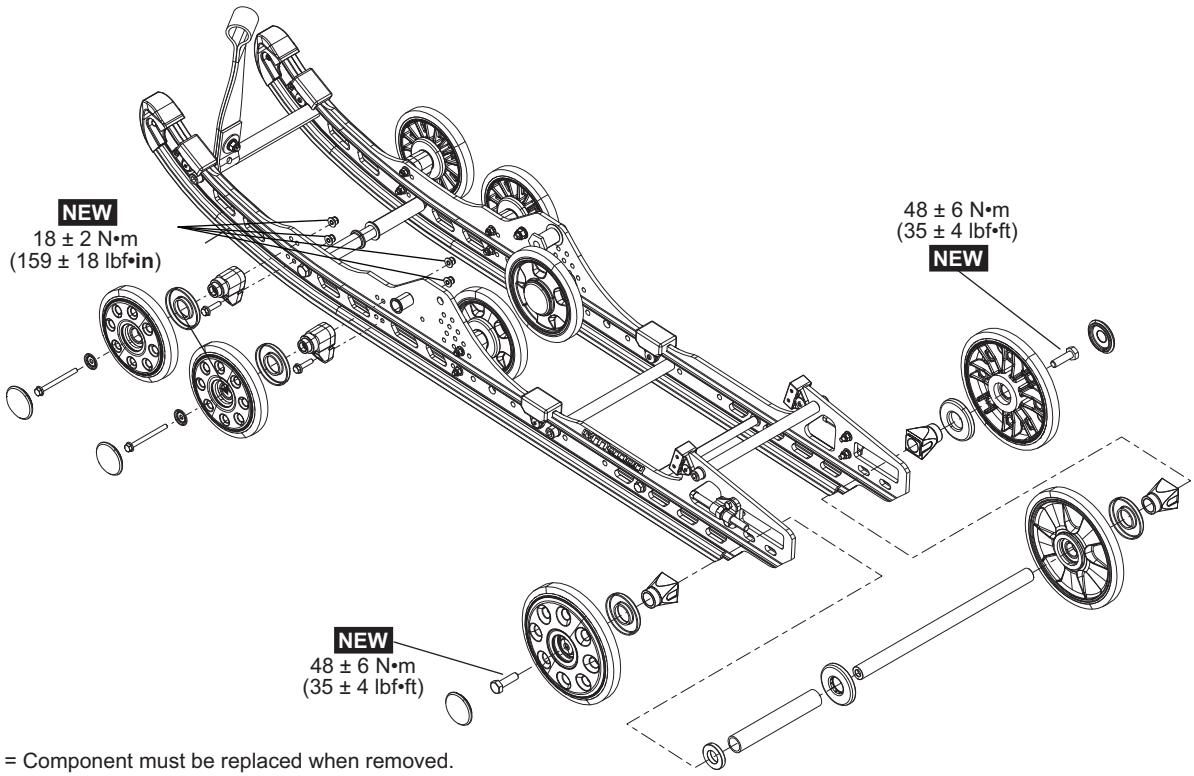
RAILS



NEW = Component must be replaced when removed.

219100985-022-100_a

WHEELS (3 IDLER WHEELS LAYOUT)



NEW = Component must be replaced when removed.

219100985-022-101_a

FRONT ARM

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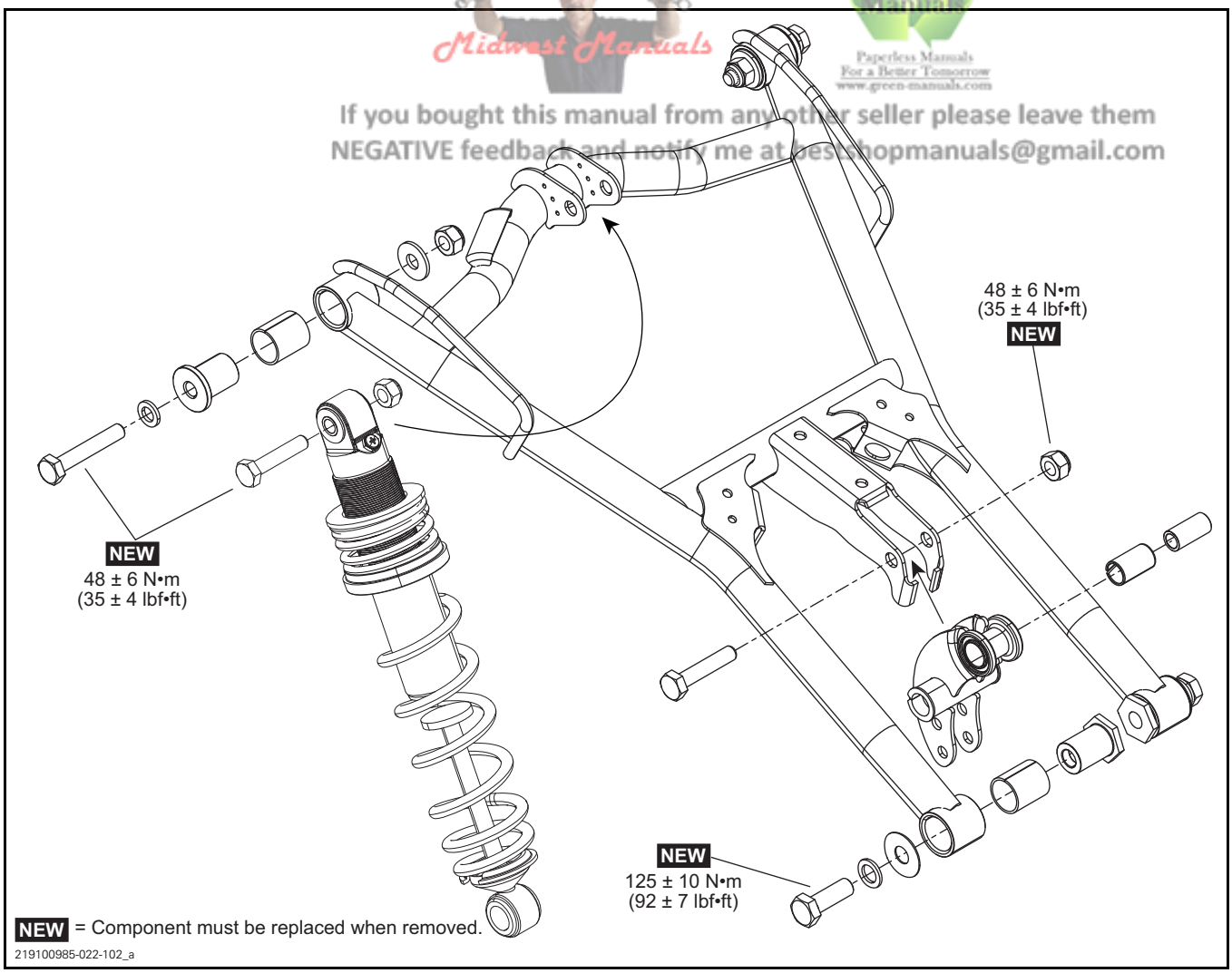
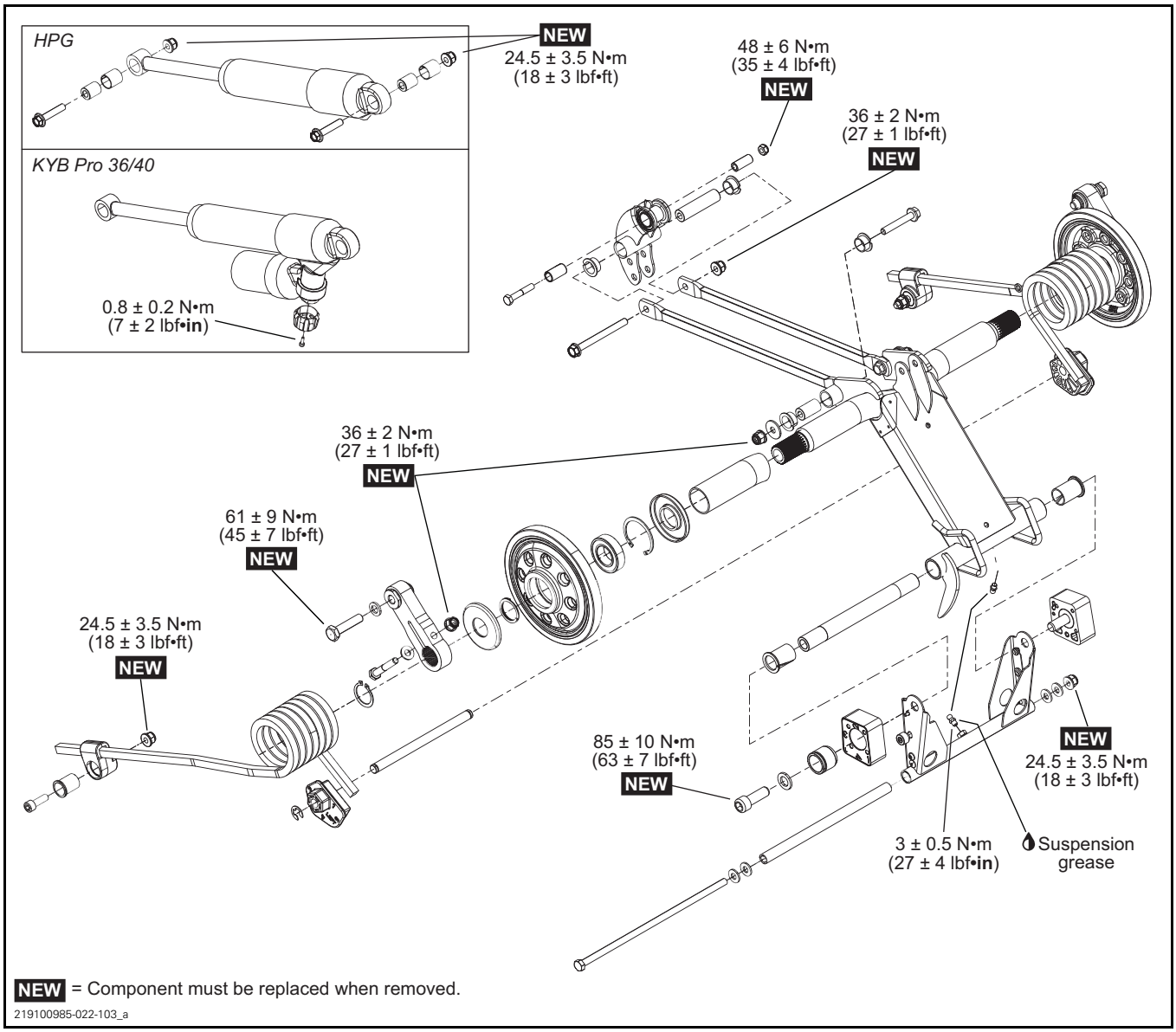
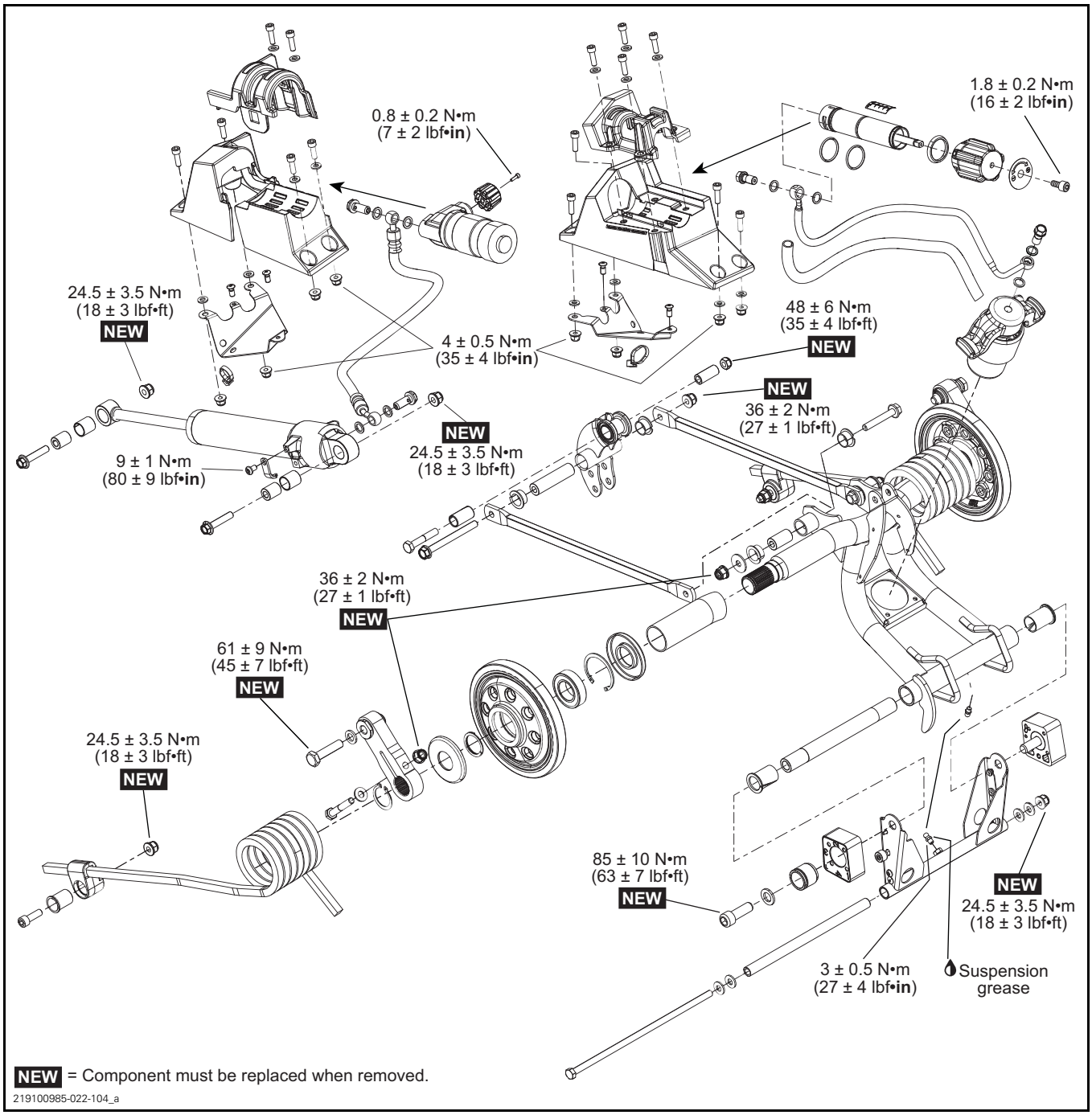


REAR ARM (MODELS WITHOUT ADJUSTABLE REAR SHOCK)



REAR ARM (MODELS WITH QUICK ADJUST SYSTEM)



GENERAL

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

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

⚠ WARNING

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

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

ADJUSTMENT

For suspension adjustment, refer to *SUSPENSION ADJUSTMENT* subsection.

MAINTENANCE

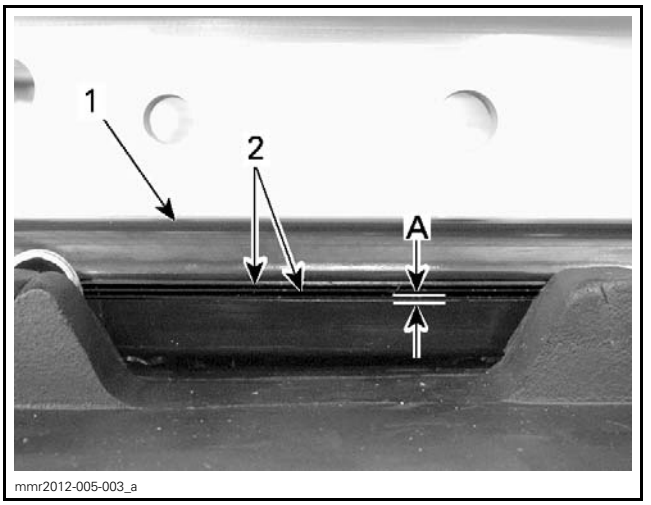
INSPECTING THE REAR SUSPENSION MECHANISM AND STOPPER STRAP

1. Inspect rear suspension components for wear, deterioration or damage, replace defective parts if necessary.
2. Inspect stopper strap(s) for wear or cracks.
3. Check bolt and nut securing strap(s) for tightness. If loose, inspect strap holes for deformation. Replace strap if necessary.

INSPECTING THE SLIDER SHOES

Slider shoes are worn out and must be replaced when remaining material exceeding the 2 molding lines is as specified.

MINIMUM SLIDER SHOE THICKNESS
1 mm (.04 in) material remaining exceeding the 2 molding lines



mmr2012-005-003_a

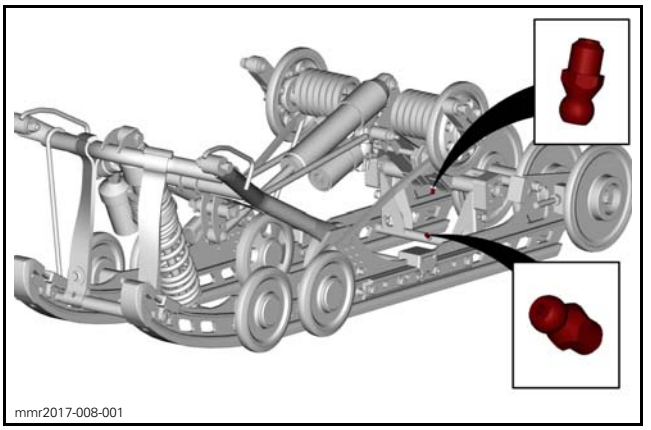
1. Slider shoe
2. Molding lines
A. Minimum thickness: 1 mm (.04 in)

NOTICE **Slider shoes must always be replaced in pairs.**

LUBRICATING THE REAR SUSPENSION

Lubricate the following suspension pivots at grease fittings.

SERVICE PRODUCT
SYNTHETIC SUSPENSION GREASE (P/N 779163)

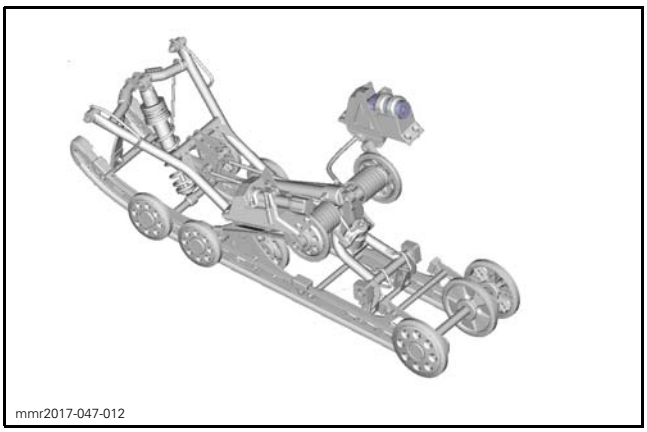

mmr2017-008-001

TYPICAL

PROCEDURES

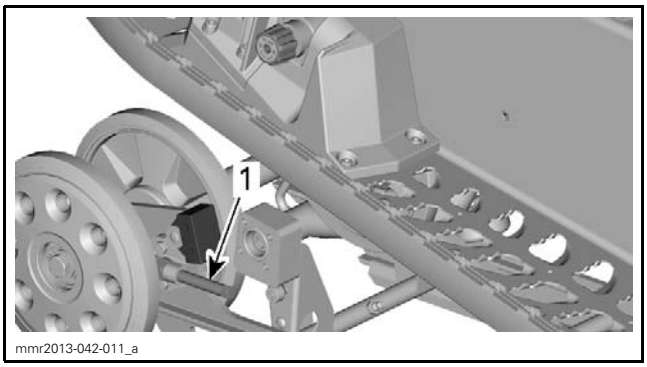
NOTE: Parts can be replaced without suspension removal, unless otherwise noted.

SUSPENSION ASSEMBLY


mmr2017-047-012

Removing Suspension Assembly

1. Lift rear of vehicle and support it off the ground.
2. Completely loosen track tension by unscrewing both adjustment screws.



mmr2013-042-011_a

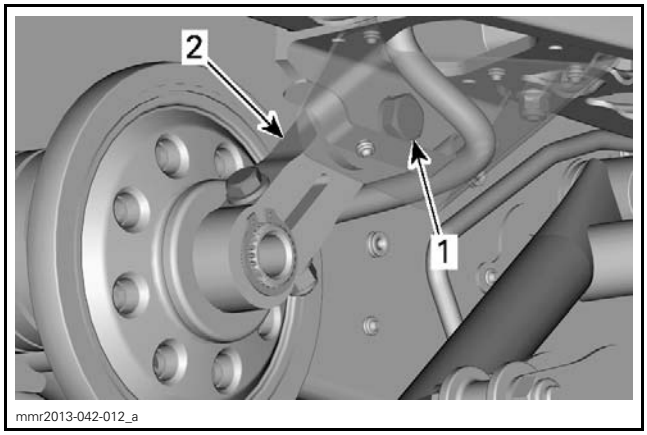
1. Adjustment screw

rMotion with Quick Adjust System

3. Remove quick adjuster control modules, refer to:
   - *SHOCK DAMPING QUICK ADJUSTER SYSTEM*
   - *SPRING PRELOAD QUICK ADJUSTER SYSTEM*.

All Models

4. Lower the rear of vehicle just enough to support suspension.
5. Remove rear arm connecting rods retaining screws.



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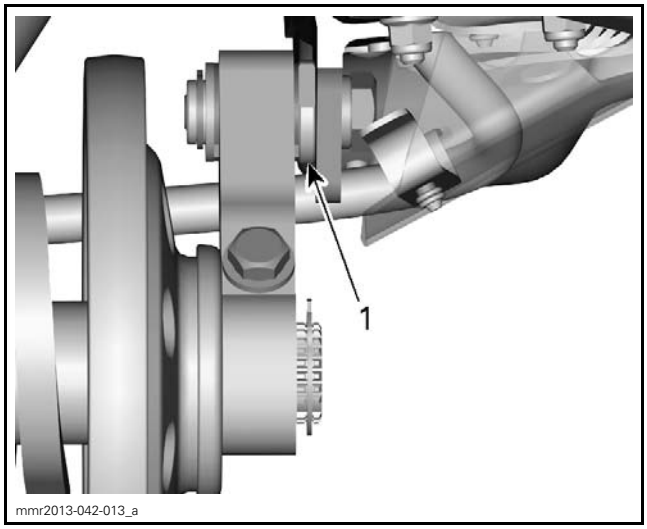
1. Retaining screw
2. Connecting rod

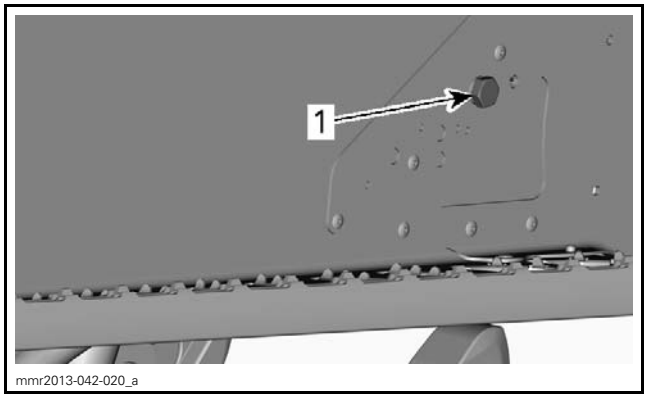
REQUIRED TOOL	
RMOTION SUSPENSION TOOL (P/N 529 036 234)	



mmr2013-042-013_a

1. rMotion suspension tool to be installed here

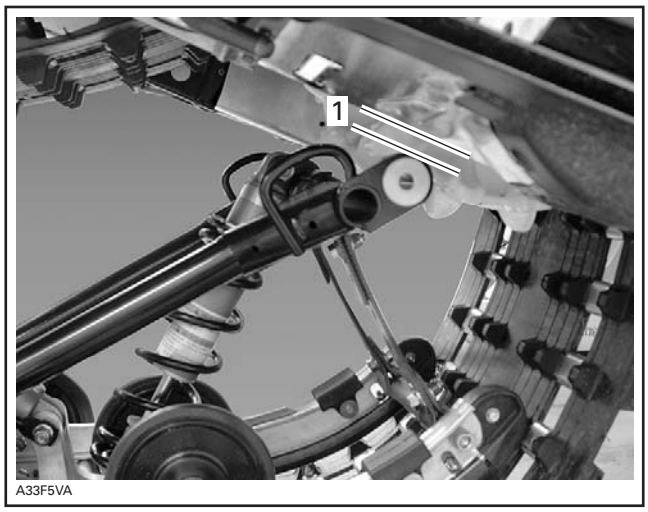
6. Remove front arm retaining bolts.



mmr2013-042-020_a

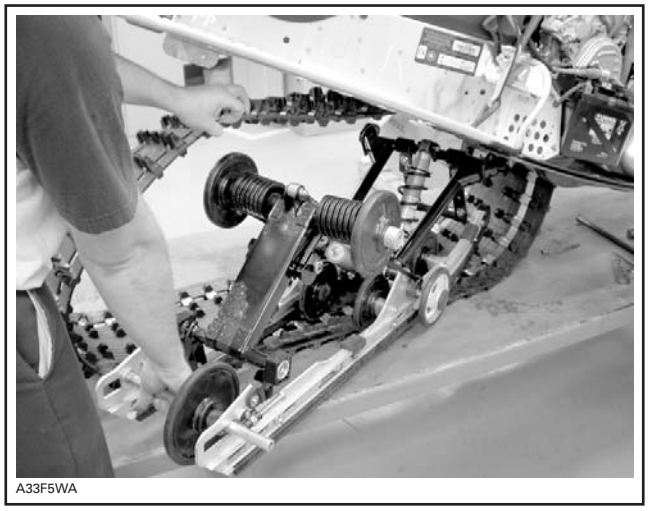
TYPICAL
1. Front arm bolt
2. Chaincase

7. Lift rear of vehicle until front arm as enough clearance to pass underneath tunnel.



TYPICAL
1. Enough clearance

8. Remove suspension assembly from vehicle.



TYPICAL — REMOVE SUSPENSION

Installing Suspension Assembly

Installation is the reverse of removal procedure. Pay attention to the following.

Install suspension into track with front portion first.

Tighten new screws to specification.

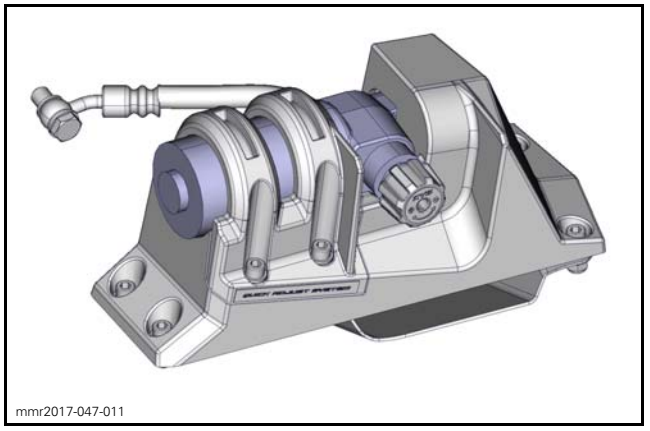
UPPER SUSPENSION ARM FASTENERS TIGHTENING TORQUE	
Front arm bolts	48 N•m ± 6 N•m (35 lbf•ft ± 4 lbf•ft)
Rear arm connecting rod screws	61 N•m ± 9 N•m (45 lbf•ft ± 7 lbf•ft)

Adjust track tension. Refer to *TRACK* subsection.

rMotion with Quick Adjust System

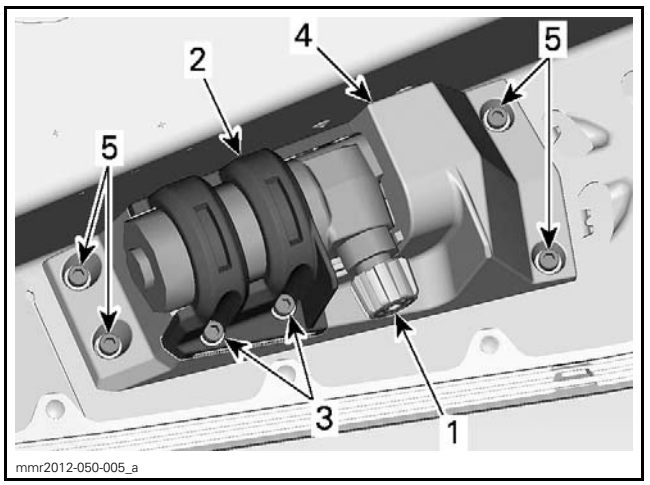
Install quick adjuster control modules, refer to:
– *SHOCK DAMPING QUICK ADJUSTER SYSTEM*
– *SPRING PRELOAD QUICK ADJUSTER SYSTEM*.

SHOCK DAMPING QUICK ADJUSTER SYSTEM



Removing Shock Damping Quick Adjuster Control Module

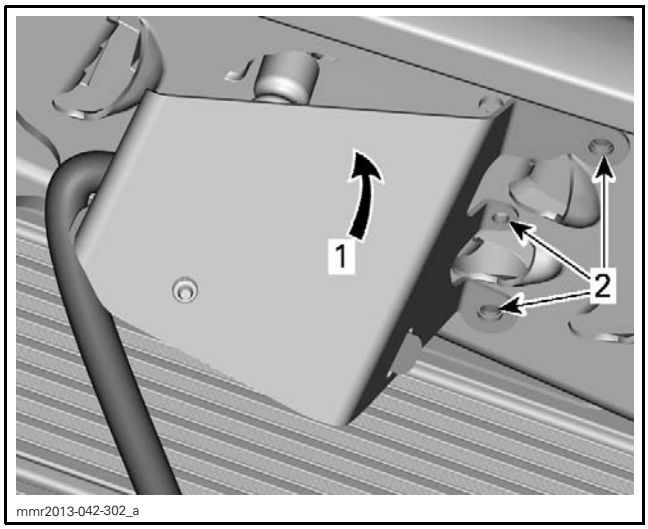
1. Remove the following parts:
   – Knob
   – Retaining clamp
   – Support.



CONTROL MODULE
1. Knob screw
2. Clamp
3. Clamp screws
4. Support
5. Support screws

2. Remove front fasteners from hose guard.

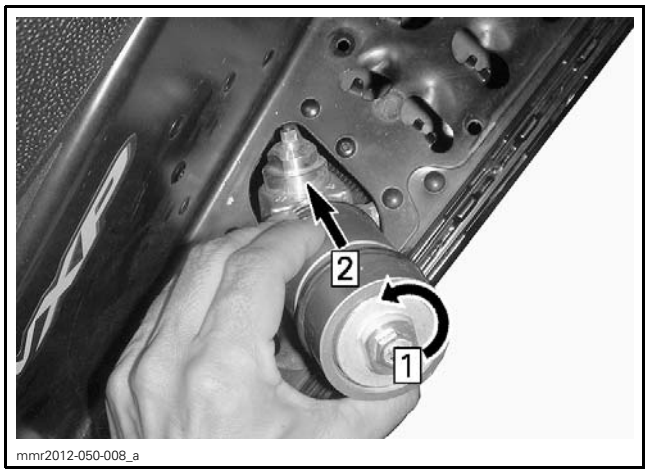
3. Remove hose from its retainer tab and rotate hose guard outwards around rear rivet.



mmr2013-042-302_a

1. Pivot outwards
2. Front fasteners

4. Remove shock remote reservoir as follows:
   – Rotate.
   – Pass through tunnel opening.



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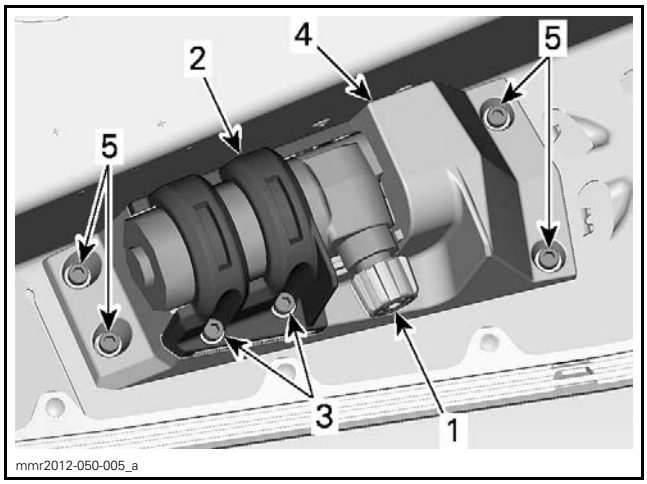
Step 1: Rotate
Step 2: Pass through tunnel opening

Installing Shock Damping Quick Adjuster Control Module

1. Align the hose guard front holes with the support front holes.

NOTE: No rivet needed at front of hose guard.

2. Install parts as follows:



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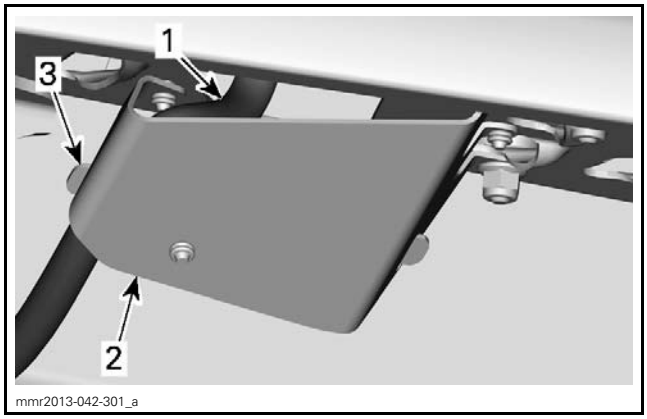
CONTROL MODULE
1. Knob screw
2. Clamp
3. Clamp screws
4. Support
5. Support screws

TIGHTENING TORQUE	
Support screws	5 N•m ± 1 N•m (44 lbf•**in** ± 9 lbf•**in**)
Clamp screws	2.5 N•m ± 0.5 N•m (22 lbf•**in** ± 4 lbf•**in**)
Knob screw	0.4 N•m ± 0.1 N•m (4 lbf•**in** ± 1 lbf•**in**)

3. Secure rear shock hose to hose guard bracket.



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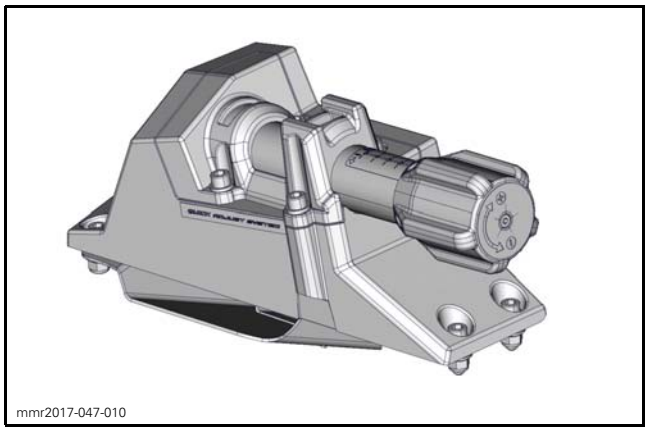
1. Hose
2. Hose guard
3. Hose guard bracket

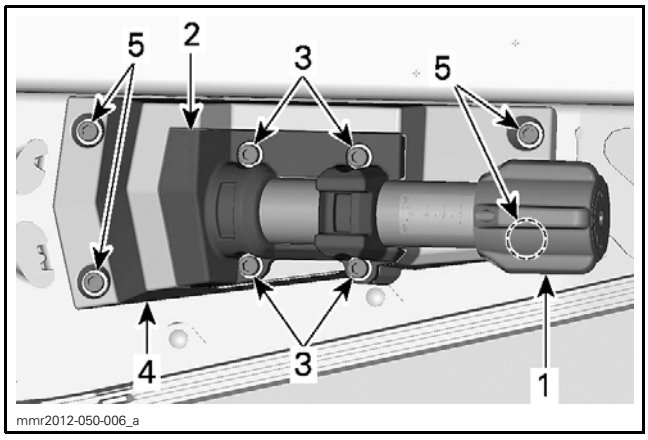
SPRING PRELOAD QUICK ADJUSTER SYSTEM


mmr2017-047-010

Removing Spring Preload Quick Adjuster Control Module

This procedure removes only the control module from the tunnel, without disconnecting the hose and will not necessitate bleeding the system.

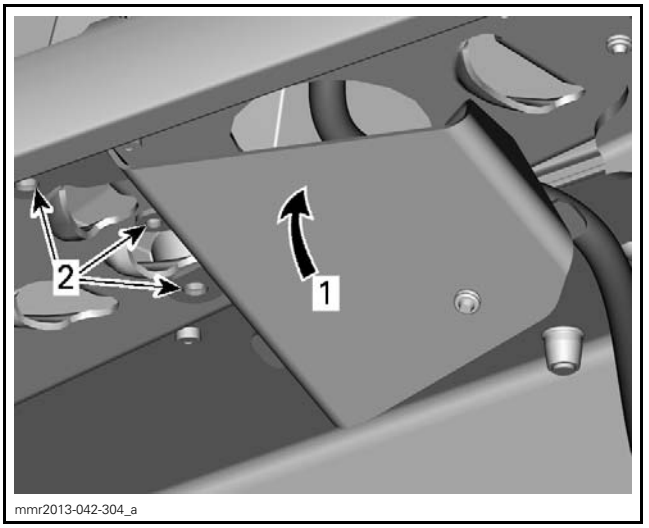
1. Remove the following parts:
   - Knob
   - Retaining clamp
   - Support.



mmr2012-050-006_a

SPRING PRELOAD QUICK ADJUSTER CONTROL MODULE
1. *Knob*
2. *Clamp*
3. *Clamp screws*
4. *Support*
5. *Support screws*

2. Remove front fasteners from hose guard.
3. Remove hose from its retainer tab and rotate hose guard outwards around rear rivet.



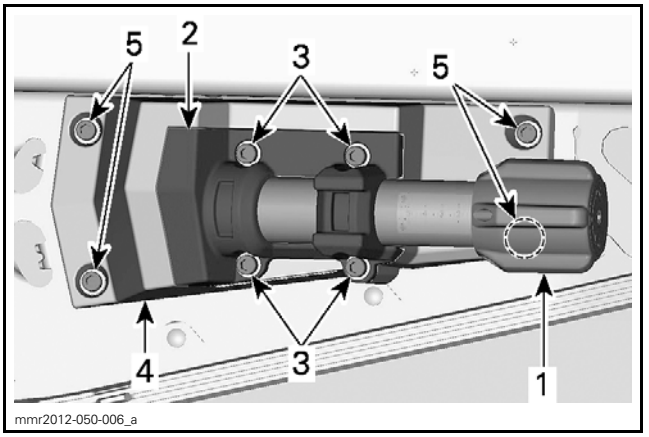
mmr2013-042-304_a

1. *Pivot outwards*
2. *Front fasteners*

4. Pass control cylinder through the opening in the tunnel.

Installing Spring Preload Quick Adjuster Control Module

1. Align the hose guard front holes with the support front holes.
2. Install parts as follows:



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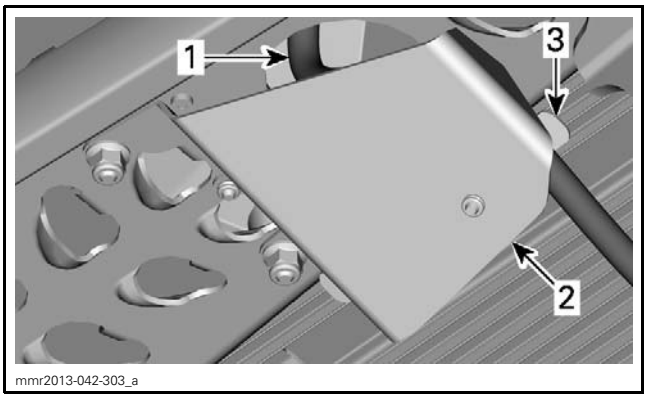
SPRING PRELOAD QUICK ADJUSTER CONTROL MODULE
1. *Knob*
2. *Clamp*
3. *Clamp screws*
4. *Support*
5. *Support screws*

TIGHTENING TORQUE	
Support screws	5 N•m ± 1 N•m (44 lbf•**in** ± 9 lbf•**in**)
Clamp screws	2.5 N•m ± 0.5 N•m (22 lbf•**in** ± 4 lbf•**in**)
Knob screw	1.5 N•m ± 0.5 N•m (13 lbf•**in** ± 4 lbf•**in**) + LOCTITE 243 (BLUE) (P/N 293 800 060)

3. Secure rear shock hose to hose guard bracket.



mmr2013-042-303_a

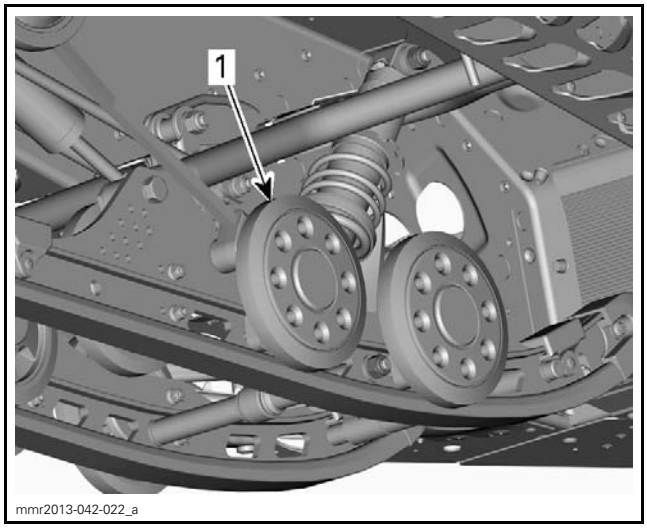
1. Hose
2. Hose guard
3. Hose guard bracket

Removing Spring Preload Quick Adjuster System

This procedure removes the following parts as an assembly and does not necessitate bleeding the system:

– Control module
– Hose
– Actuator.

1. Support the rear of vehicle just enough to remove load on the rear suspension.
2. Remove control module, refer to *SPRING PRELOAD QUICK ADJUSTER SYSTEM*.
3. Remove idler wheels to access spring support screws.



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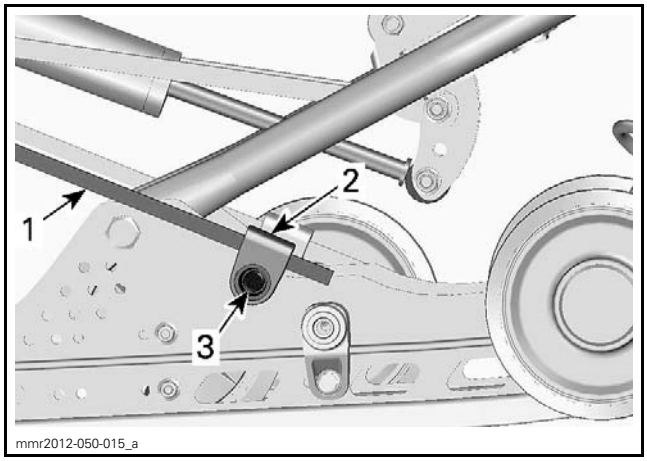
1. Idler wheel to be removed (on each side)

4. Firmly hold the spring supports and remove spring support bolts.

⚠ CAUTION Spring support are spring loaded.



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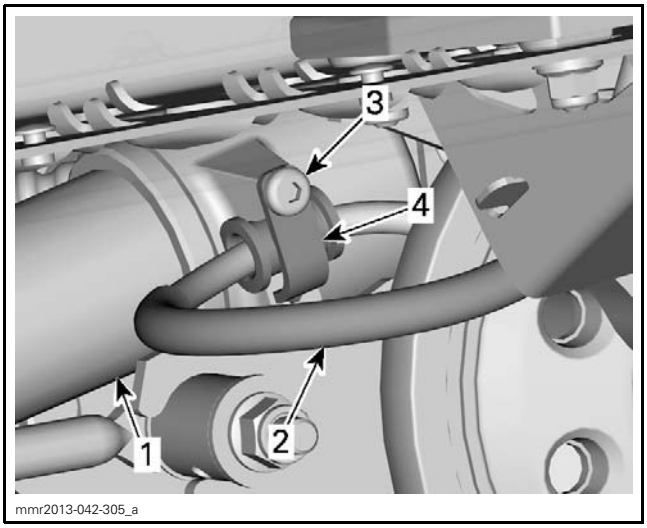
1. Spring
2. Spring support
3. Spring support bolt

5. Move spring supports with spring ends over the idler wheel supports and let them sit on the track.

NOTE: If the springs are still loaded, completely loosen track tension in order to make room to unload springs.

6. Move the other end of the springs off the spring adjuster actuator.
7. Remove hose retainer from shock assembly.



1. *Shock*
2. *Hose*
3. *Retaining screw*
4. *Hose retainer*

8. Remove actuator from rear arm.
9. Remove spring adjuster assembly.

Disassembling Spring Preload Quick Adjuster System

NOTE: System bleeding is required whenever the hose is disconnected.

NOTICE Thoroughly clean parts before disassembly. Work on a clean surface.

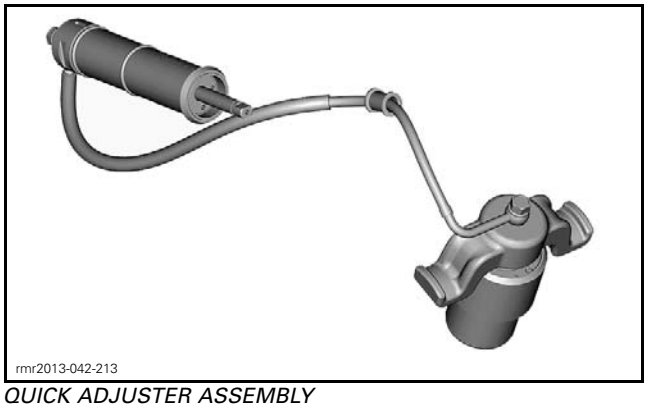
1. Set controller to the minimum preload.
2. Remove the banjo bolt(s) retaining the hose.
3. Drain fluid.

Replacing Spring Preload Quick Adjuster System Seals

NOTE: System bleeding is required whenever the hose is disconnected.

NOTICE Thoroughly clean parts before disassembly. Work on a clean surface.

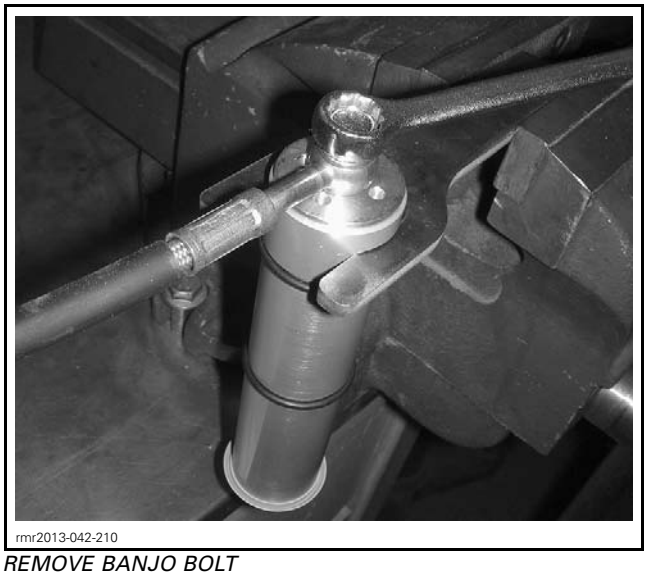
1. Remove quick adjuster assembly from vehicle. Refer to *REMOVING THE SPRING PRELOAD QUICK ADJUSTER CONTROL MODULE*.



QUICK ADJUSTER ASSEMBLY

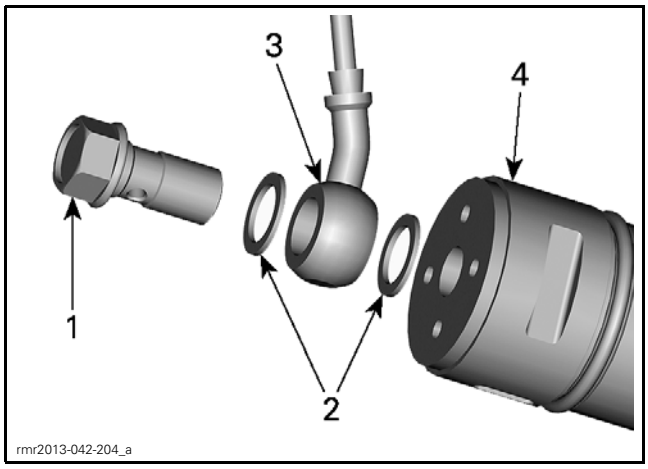
REQUIRED TOOL	
RMOTION MASTER CYLINDER KEY (P/N 529 036 254)	

2. Use retainer tool to hold cylinder while removing banjo bolt.



REMOVE BANJO BOLT

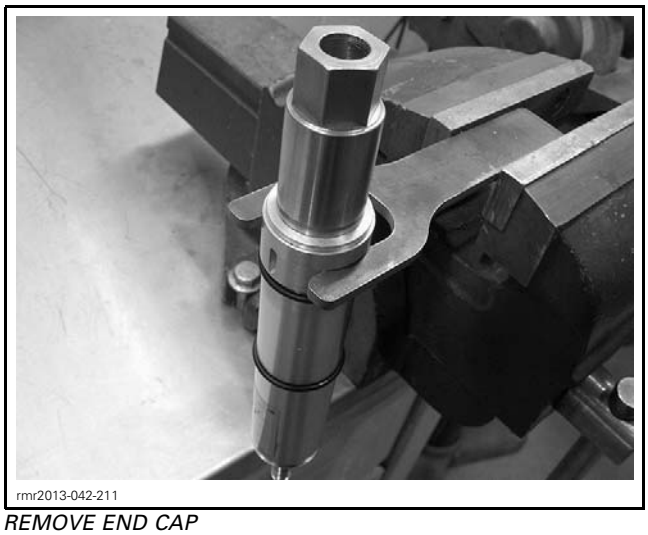
3. Remove banjo bolt, washers and hose from cylinder.



1. Banjo bolt
2. Washer
3. Hose fitting
4. Cylinder body

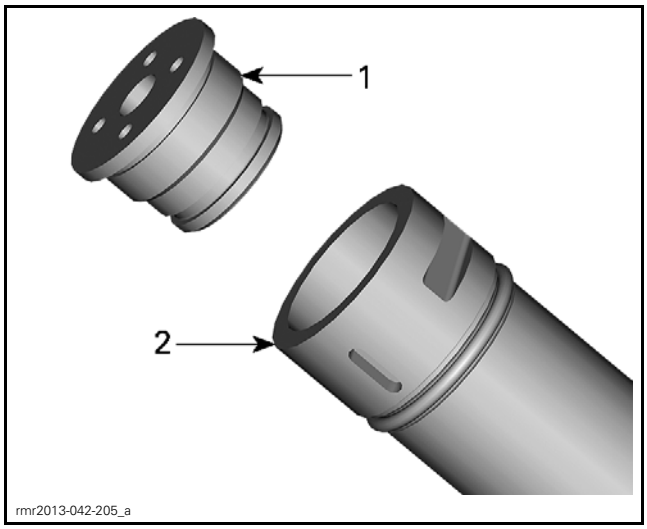
REQUIRED TOOL	
RMOTION MASTER CYLINDER KEY (P/N 529 036 254)	
RMOTION SOCKET (P/N 529 036 255)	

4. Hold cylinder body with tool and unscrew end cap using the rMotion socket.



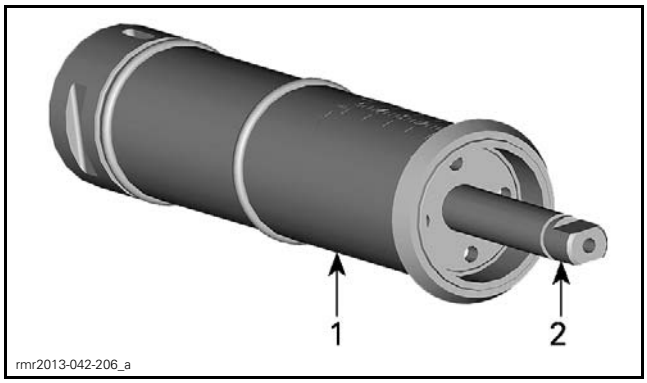
REMOVE END CAP

5. Remove end cap.



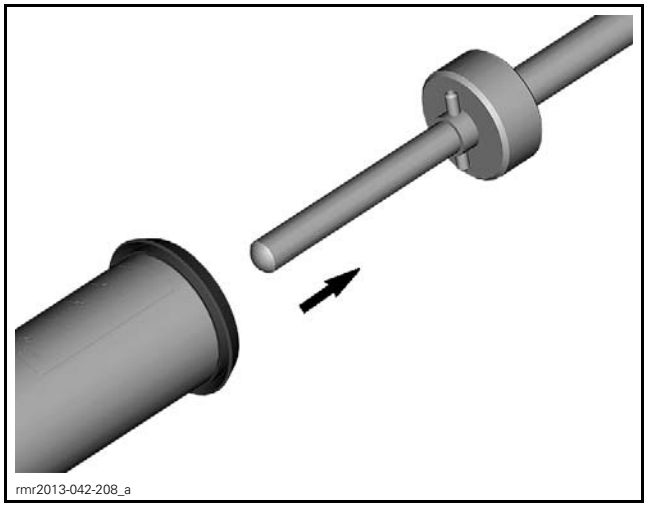
1. End cap
2. Cylinder body

6. At other end of cylinder, unscrew piston rod using same tools.



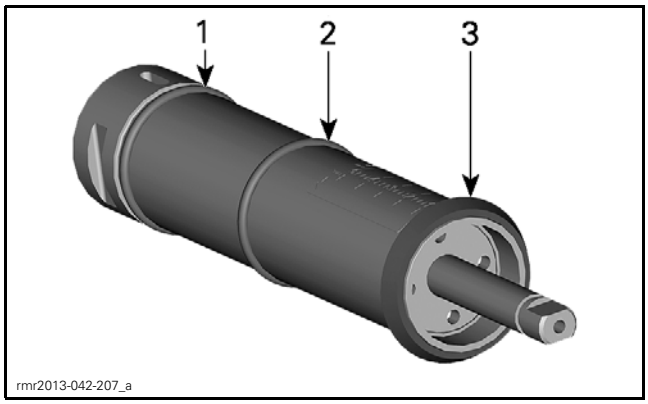
1. Cylinder body
2. Piston rod

7. Remove piston rod.



REMOVE PISTON ROD

8. Replace external seals if worn out or damaged.



1. Cylinder Body front seal
2. Cylinder body rear seal
3. Knob seal

9. Installation is the reverse of removal.

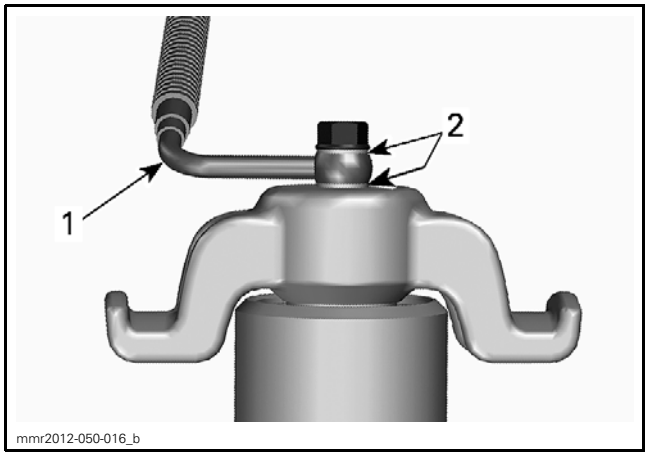
Bleeding and Reassembling Spring Preload Quick Adjuster System

NOTE: Actuator, control module and hose have to be separated from each other before carrying out bleeding procedure.

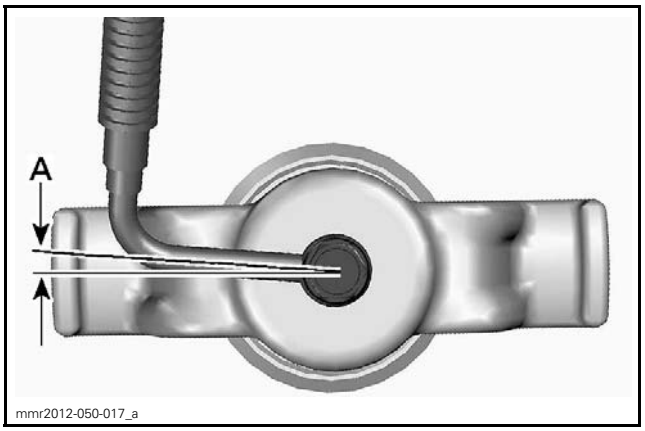
1. Fully extend the actuator by hand.
2. Add fluid in the actuator, see table.

ACTUATOR FILLING	
FLUID TYPE	QUANTITY
ATF Dexron III	Approximately 40 ml (1.35 U.S. oz)

3. Maintain actuator with threaded hole upwards and:
   - 3.1 Compress the actuator by precisely 15 mm (19/32 in).
   - 3.2 Fill until fluid reaches the top of the threads.
   - 3.3 Install hose with new sealing washers as shown.



1. Hose
2. Sealing washers



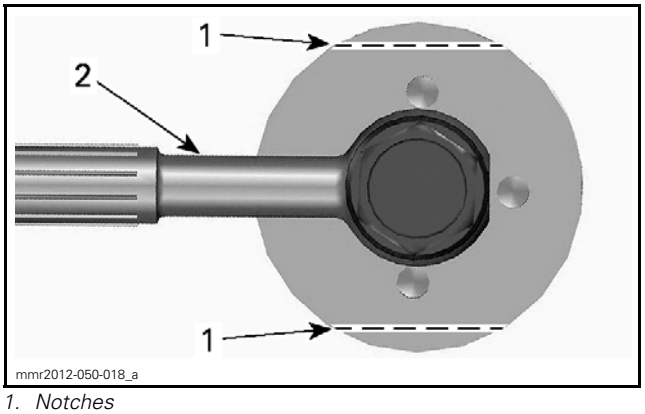
A. 5°

TIGHTENING TORQUE	
Banjo bolt	24.5 N•m ± 3.5 N•m (18 lbf•ft ± 3 lbf•ft)

4. With the hose open end up, compress the actuator by precisely 8 mm (5/16 in).

NOTE: Fluid should reach the open end of the hose.

5. Unscrew the control cylinder adjustment rod until it stops.
6. Using a small diameter punch through the M10 threaded hole, push the control cylinder piston all the way back.
7. With the threaded hole up, fill control cylinder until fluid reaches the top of the threads.
8. Install the hose on the control cylinder as shown.



1. Notches
2. Hose

NOTE: The hose must on be the opposite side of the decal on the control cylinder.

TIGHTENING TORQUE	
Banjo bolt	24.5 N•m ± 3.5 N•m (18 lbf•ft ± 3 lbf•ft)

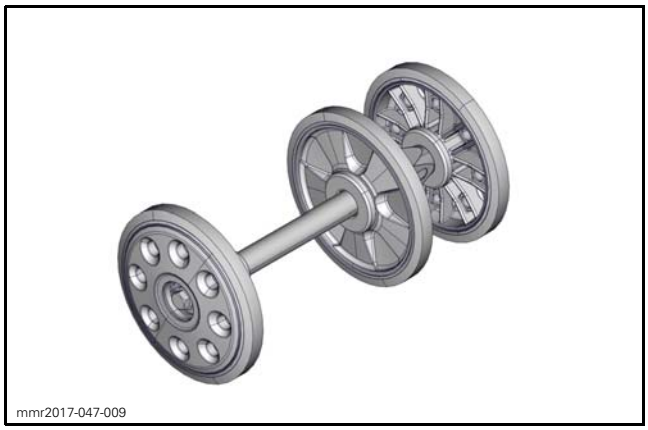
9. Verify system operation. The actuator full stroke should be 22 mm (7/8 in).

Installing Spring Preload Quick Adjuster System

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

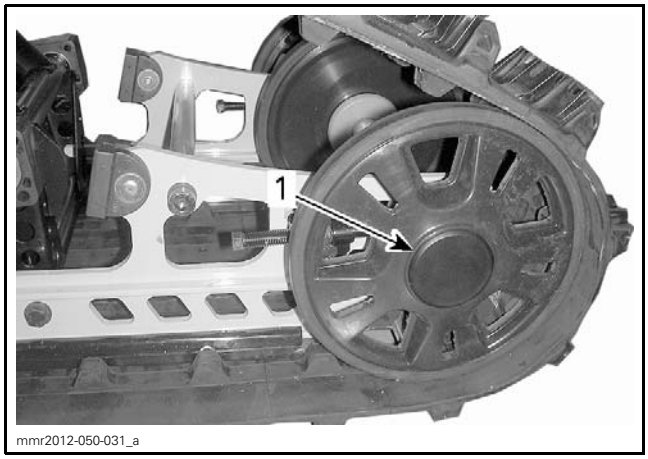
Set the preload to the minimum using the control cylinder adjustment rod first.

REAR AXLE


mmr2017-047-009

Removing Rear Axle

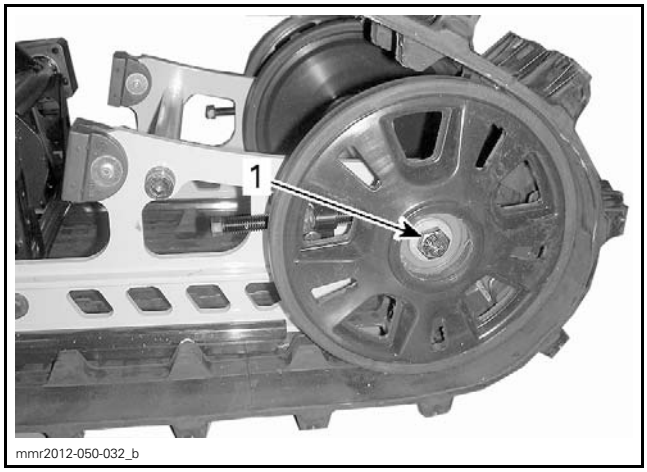
1. Lift rear of vehicle and support it off the ground.
2. Remove rear idler wheel caps.



mmr2012-050-031_a

1. RH rear idler wheel cap

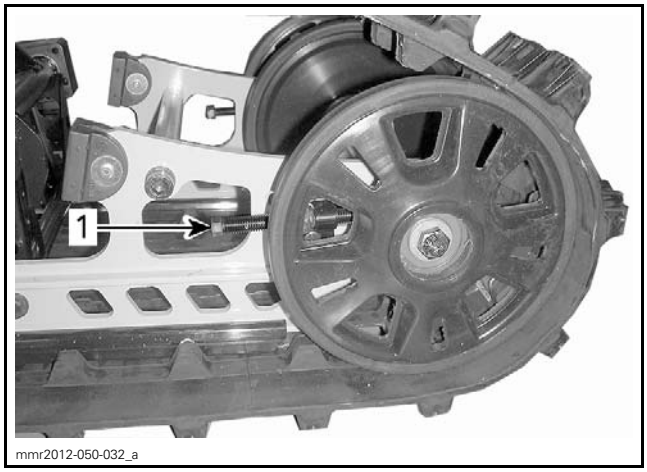
3. Loosen rear axle screws (one each side).



mmr2012-050-032_b

1. RH rear axle screw

4. Completely loosen track tension by unscrewing both adjustment screws.



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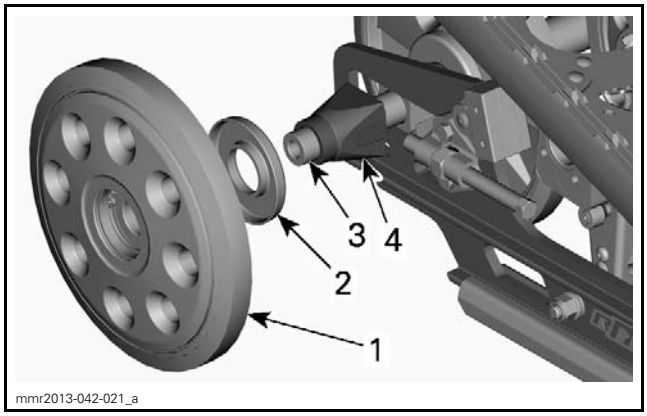
1. RH adjustment screw

5. Remove both rear axle screws.
6. Remove rear idler wheels, seals and wheel spacers.



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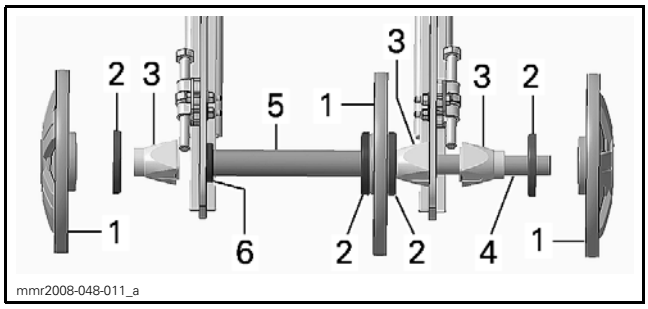
TYPICAL - RH SIDE SHOWN
1. Rear idler wheel
2. Seal
3. Rear axle
4. Wheel spacer

7. Pull out the rear axle.

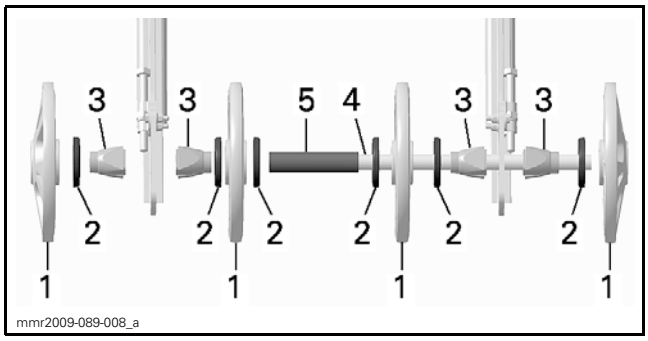
Installing Rear Axle

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

Make sure to position all parts correctly.

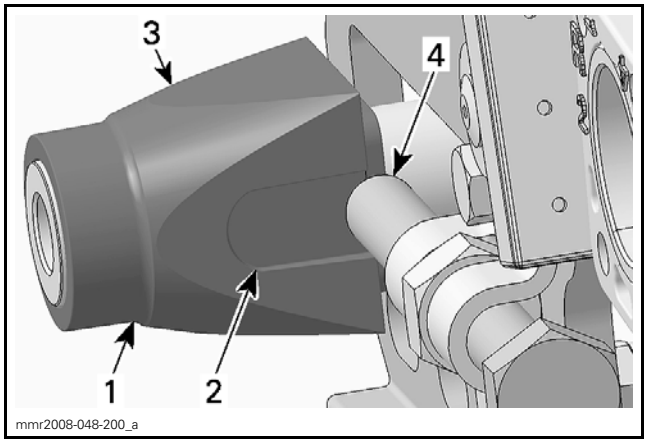


TYPICAL - 3 IDLER WHEELS LAYOUT
1. *Idler wheels*
2. *Seals*
3. *Wheel spacers*
4. *Rear axle*
5. *Rear axle spacer*
6. *Washer*



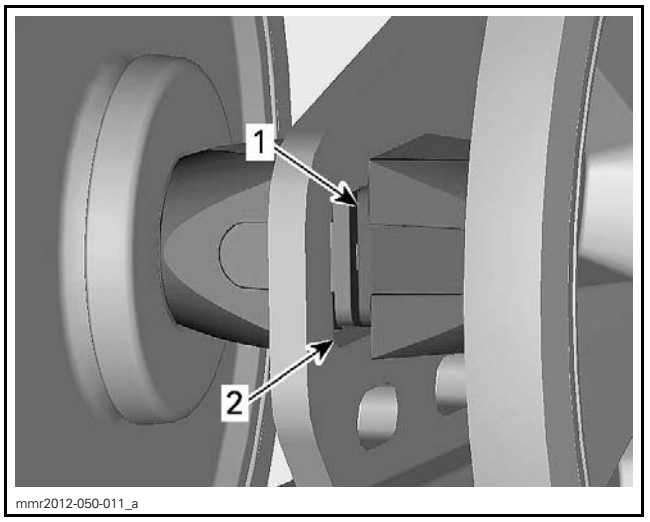
TYPICAL - 4 IDLER WHEELS LAYOUT
1. *Idler wheels*
2. *Seals*
3. *Wheel spacers*
4. *Rear axle*
5. *Rear axle spacer*

Position wheel spacers with a flat side up and a groove facing tensioner screw.



TYPICAL
1. *Wheel spacer*
2. *Groove*
3. *Flat side*
4. *Tensioner screw*

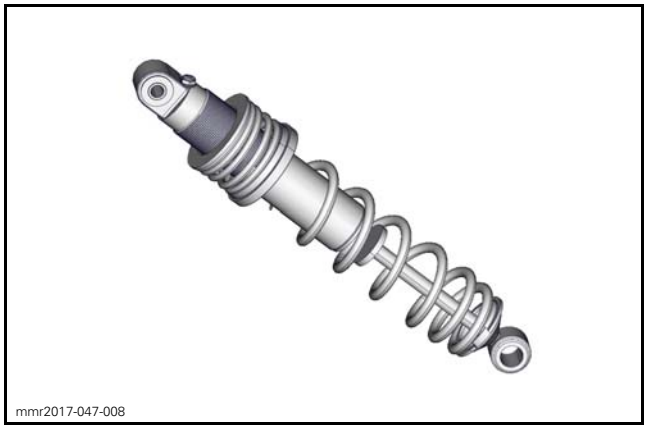
When tightening rear axle, make sure each wheel spacer protuberance is engaged into rail slot.



1. *Wheel spacer protuberance*
2. *Rail slot*

Adjust track tension. Refer to *TRACK* subsection.

SHOCK ABSORBERS



Removing Rear Shock Absorber

1. Lift rear of vehicle and support it off the ground.

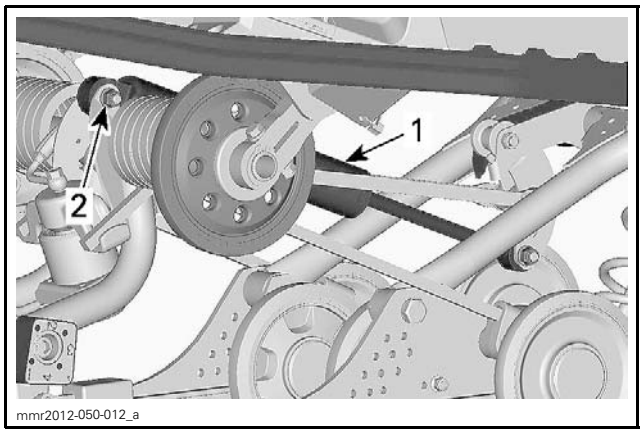
rMotion with Quick Adjust System

2. Carry out *REMOVING THE SHOCK DAMPING QUICK ADJUSTER CONTROL MODULE*, Refer to procedure in this subsection.

All Models

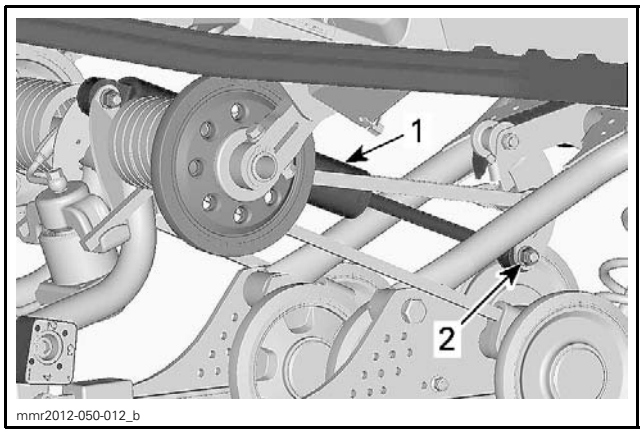
3. Remove the upper bolt.

NOTE: It may be necessary to lower the vehicle and slightly compress suspension to remove load.



TYPICAL
1. *Rear shock absorber*
2. *Upper bolt*

4. Remove the lower bolt.



TYPICAL
1. *Rear shock absorber*
2. *Lower bolt*

5. Remove rear shock absorber from the vehicle.

Installing Rear Shock Absorber

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

REAR SHOCK ABSORBER POSITIONING	
rMotion quick with adjust system	Body up hose on RH side
rMotion quick without adjust system	Body up reservoir downwards

Install new shock absorber retaining nuts and tighten to specified torque.

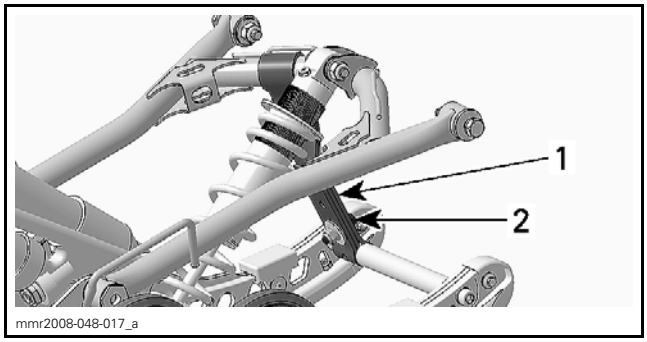
TIGHTENING TORQUE	
Shock absorber retaining bolts	24.5 N•m ± 3.5 N•m (18 lbf•ft ± 3 lbf•ft)

rMotion with Quick Adjust System

Carry out *INSTALLING THE SHOCK DAMPING QUICK ADJUSTER CONTROL MODULE*.

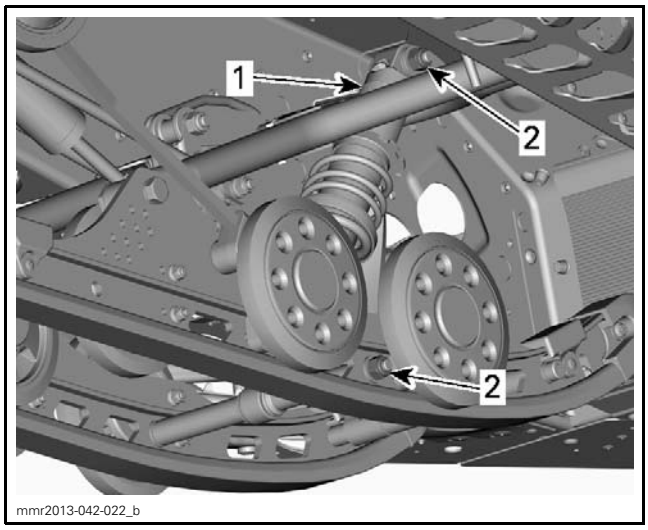
Removing Center Shock Absorber

1. Lift the rear of vehicle and support it off the ground.
2. Unfasten stopper strap.



TYPICAL
1. *Stopper strap*
2. *Stopper strap bolt*

3. Remove idler wheels to access lower retaining bolt.
4. Remove shock retaining bolts.



TYPICAL
1. *Center shock absorber*
2. *Retaining bolts*

5. Remove shock absorber from vehicle.

Inspecting Shock Absorber

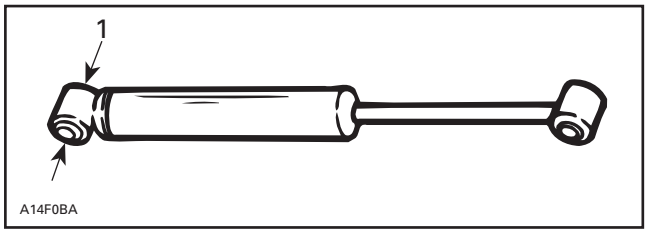
NOTE: All types of shock absorbers are covered in this topic, refer to *TECHNICAL SPECIFICATIONS* to identify the shock absorber relating to the vehicle model.

NOTE: Unless otherwise noted, shock absorber must be at normal room temperature (21°C ± 2°C (70°F ± 36°F)) during inspection.

MC Hydraulic Shock

1. Perform a visual inspection of the shock:
   - The shock must be exempt of any dent or scratch, especially on the rod.
   - Small dent on the shock body may not affect any performance or reliability of this shock.
   - Any defect on the rod, as small as it is, can lead to seal failure and oil leak.
   - If such defect (on rod) is detected, the shock must be replaced, and this will not be cover under warranty.
2. Secure the shock body end in a vise, clamping on eyelet, with its rod upward.

NOTICE **Do not clamp directly on shock body.**



1. Shock body eyelet

3. Examine shock for leaks. Extend and compress the piston at least 5 complete strokes with its rod upward.
4. Check that shock moves smoothly and with uniform resistance over its entire stroke.

NOTE: For the first 5 complete strokes, it could be normal to note uneven resistance.

5. Check the following conditions that will denote a defective shock:
   - A skip or a hang back when reversing stroke at mid travel.
   - Seizing or binding condition except at extreme end of either stroke.
   - Oil leakage.
   - A gurgling noise, after completing one full compression and extension strokes.
6. If suspecting a shock is freezing, place shock in a freezer (temperature below 0°C (32°F)) for 4 hours.
7. Push down on rod and note its resistance. If shock is frozen it will be much more difficult to compress than one in normal condition.
8. If any faults are present, replace shock.

All HPG™ Shock (Including KYB PRO Series)

1. Perform a visual inspection of the shock:
   - The shock must be exempt of any dent or scratch, especially on the rod.
   - Any defect on the rod, as small as it is, can lead to seal failure and oil leak.
   - If such defect is detected, the shock must be replaced and this will not be covered under warranty.
2. Completely push down shock rod into the body and check result as per table.

HPG SHOCK	RESULT
All except 551 mm (21-11/16 in) rear shock	The rod should completely get in the shock body
551 mm (21-11/16 in) rear shock	The stroke must be at least 138 mm (5-7/16 in)

NOTE: For the **HPG Variable Rate Shock**, it should be stiff for approximately the first 25 mm (1 in), then softer for about 50 mm (2 in), and stiffer again. This stiff/soft/stiff phenomenon shows the normal operation of VR shock.

3. Release shock from completely collapsed position and check result as per table.

HPG SHOCK EXCEPT VARIABLE RATE
– The shock should extend unassisted. – The rod must come out at a steady speed.

HPG VARIABLE RATE SHOCK
– The shock should extend unassisted. – Rod must come out slowly first, than faster and finally slow again for the last 25 mm (1 in).

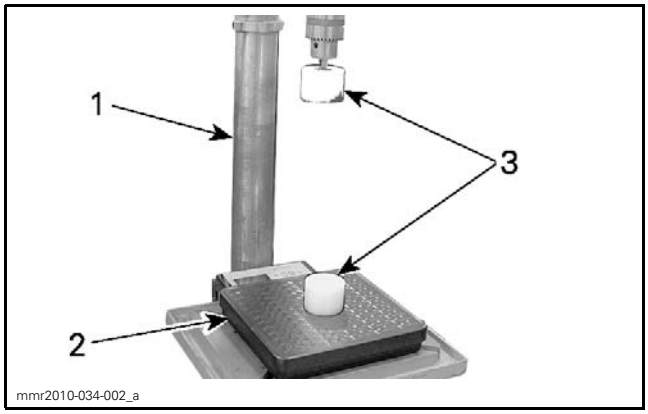
4. Proceed with *TESTING SHOCK ABSORBER COMPRESSION*. See procedure in this subsection.
5. If any faults are present, replace shock.

Testing Shock Absorber Compression

1. Ensure shock absorber is at normal room temperature (21°C ± 2°C (69.8°F ± 35.6°F).
2. Remove spring from shock absorber (if applicable).
3. Place a bench cale on a suitable drill press.

REQUIRED TOOL	
SHOCK ABSORBER SUPPORTS (P/N 529 036 186)	

4. Install the shock absorber support onto drill press.
5. Set bench scale units to **kg**.



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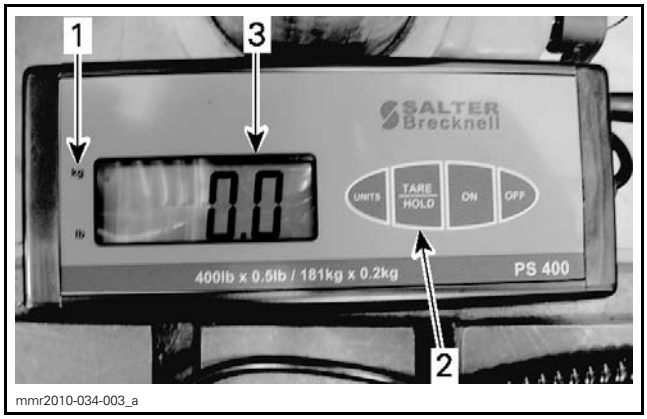
1. Drill press
2. Bench scale
3. Shock absorber supports

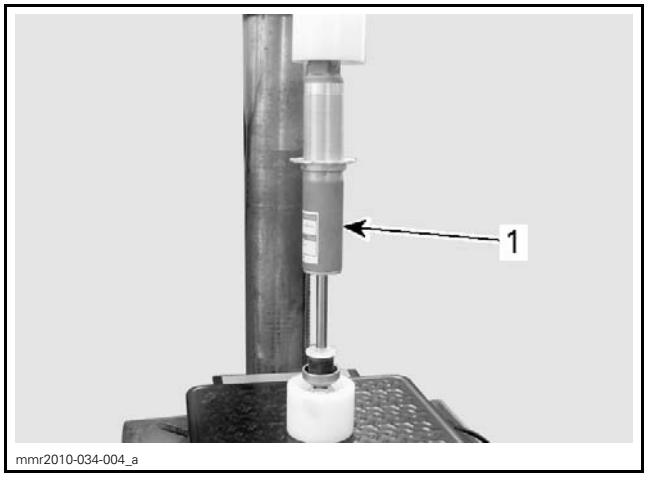
6. Press **TARE** to reset digits (must indicate zero).



mmr2010-034-003_a

1. Units indicator lamp
2. TARE button
3. Digits

7. Install shock absorber into support with shock body upwards.
8. Adjust drill press table height in order to set the upper shock support flush with the shock body end.
9. Ensure shock absorber is aligned with drill press axis.



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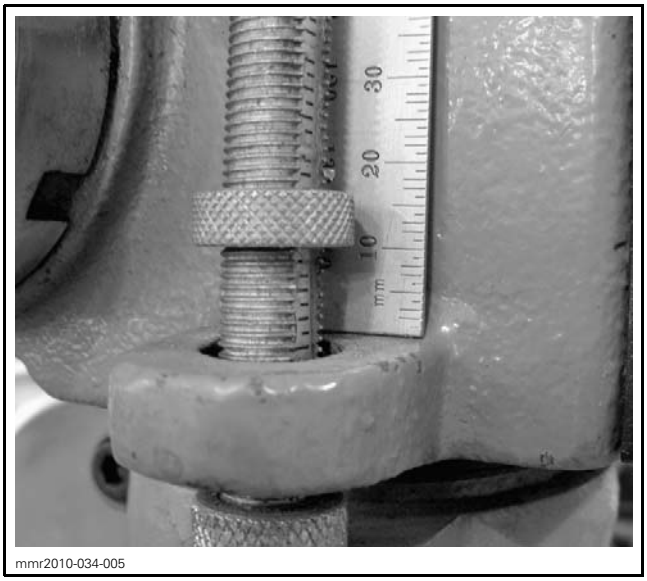
1. Shock body upwards

10. Set the drill press displacement to 10 mm (.394 in) using locking nut.



mmr2010-034-005

11. Compress shock absorber by 10 mm (.394 in) and hold it in position.
12. Read load recorded on the bench scale.

mmr2010-034-006

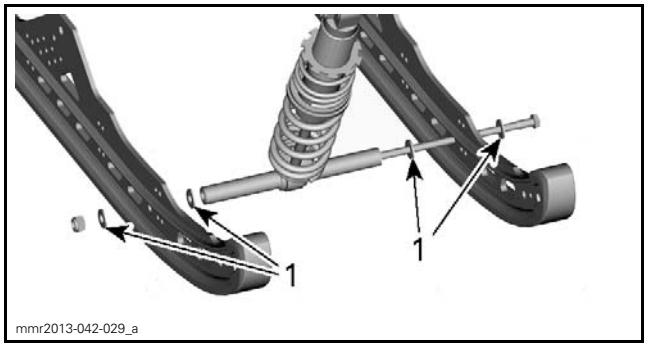
13. Load reading must be as per the following table.

MODEL	ROD DIAMETER	SERVICE RANGE
Every HPG (Plus/Plus R)	12.5 mm (1/2 in)	24 kgf ± 4 kgf (53 lbf ± 9 lbf)
All KYB PRO Series	16 mm (5/8 in)	39 kgf ± 5 kgf (86 lbf ± 11 lbf)

Installing Center Shock Absorbers

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

CENTER SHOCK ABSORBER POSITIONING	
HPG Plus	Body up Valve upwards
KYB PRO	Body up Reservoir on the RH side



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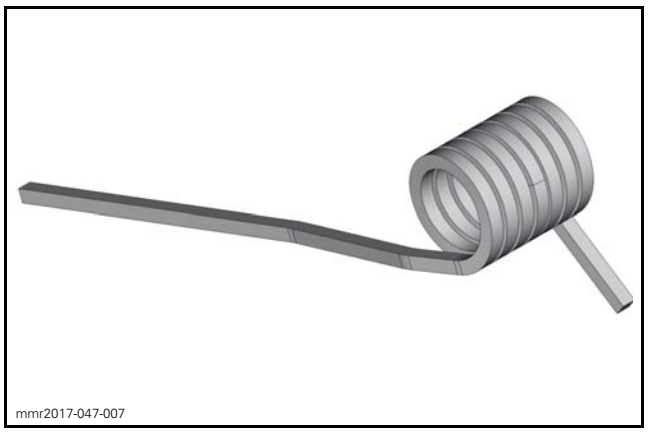
BOTTOM OF SHOCK ABSORBER
1. Washers location

REAR SPRINGS


mmr2017-047-007

Removing Rear Springs

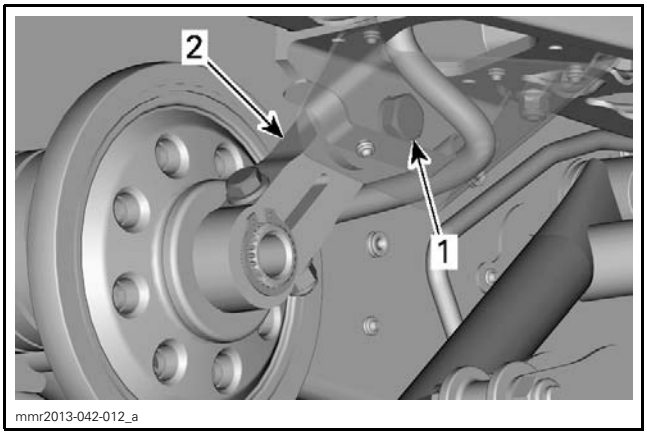
1. Support the rear of vehicle just enough to remove load on the rear suspension.
2. Set rear spring preload to the minimum.

rMotion with Quick Adjust System

3. Remove quick adjuster control modules, refer to:
   – *SHOCK DAMPING QUICK ADJUSTER SYSTEM*
   – *SPRING PRELOAD QUICK ADJUSTER SYSTEM*.

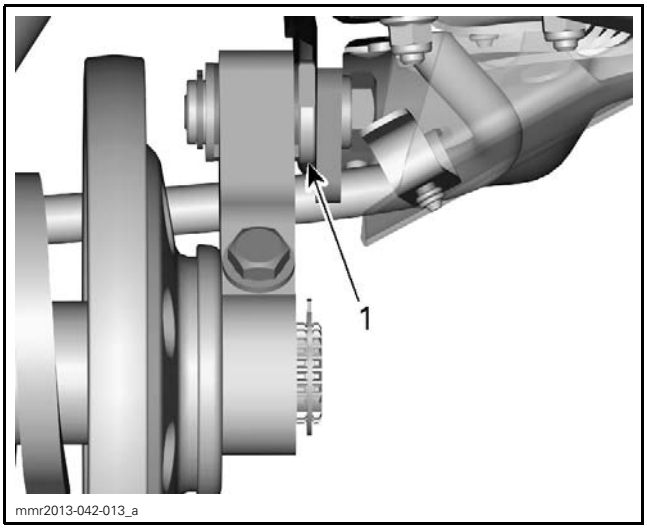
All Models

4. Remove rear arm connecting rod retaining screws.



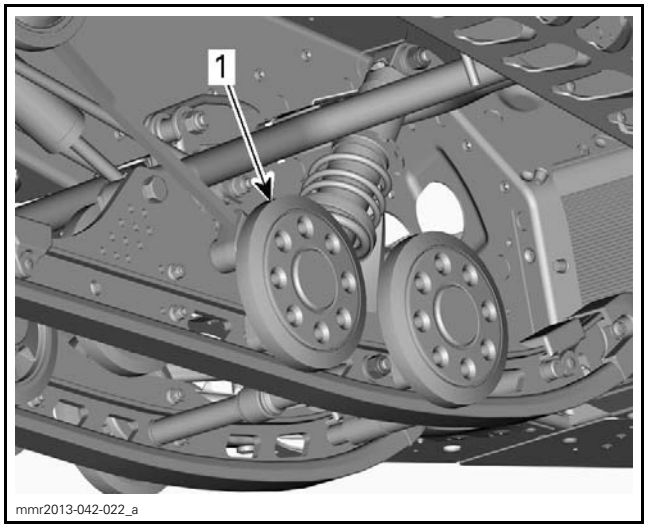
1. *Connecting rod retaining screw*
2. *Connecting rod*

REQUIRED TOOL	
RMOTION SUSPENSION TOOL (P/N 529 036 234)	



1. *rMotion suspension tool to be installed here*

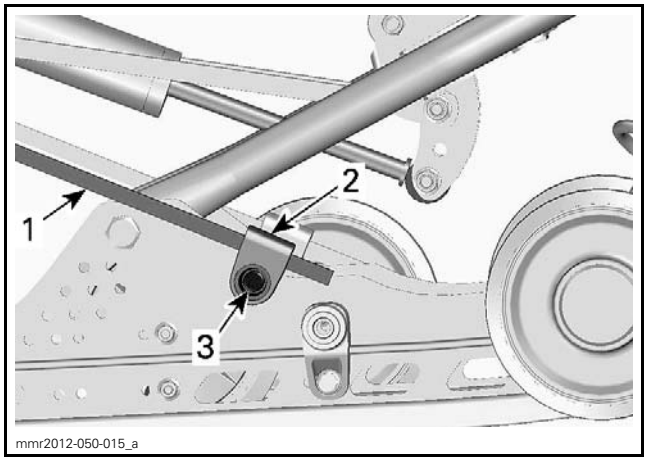
5. Remove idler wheels to have access to spring support screws.



1. *Idler wheel to be removed (on each side)*

6. Firmly hold the spring supports and remove spring support bolts.

⚠ CAUTION Spring support are spring loaded.



1. *Spring*
2. *Spring support*
3. *Spring support bolt*

7. Move spring supports with spring ends over the idler wheel supports and let them sits on the track.

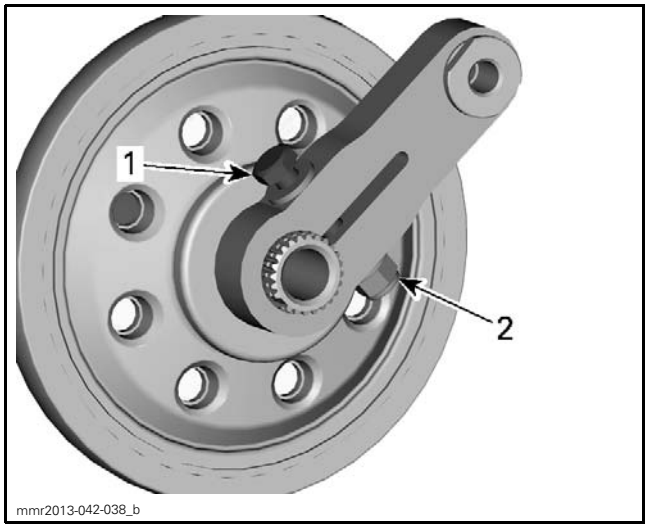
NOTE: If the springs are still loaded, completely loosen track tension in order to make room to unload springs.

8. Raise and support the rear of vehicle just enough to clear the rear arm connecting rods.

NOTICE **rMotion with Quick Adjust system: Avoid stretching the hoses.**

9. Remove connecting rods from the rear arm.
   - 9.1 Loosen bolt.
   - 9.2 Remove circlip.

9.3 Pull connecting rod off the rear arm.



1. Retaining screw
2. Bolt

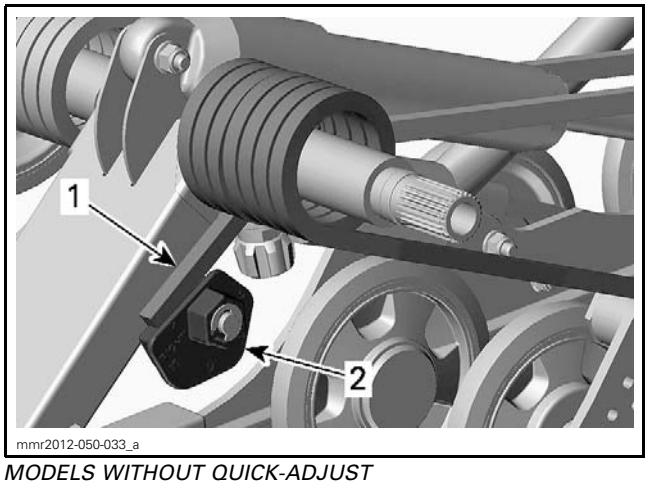
10. Remove upper idler wheels and hardware.

11. Remove rear spring from suspension.

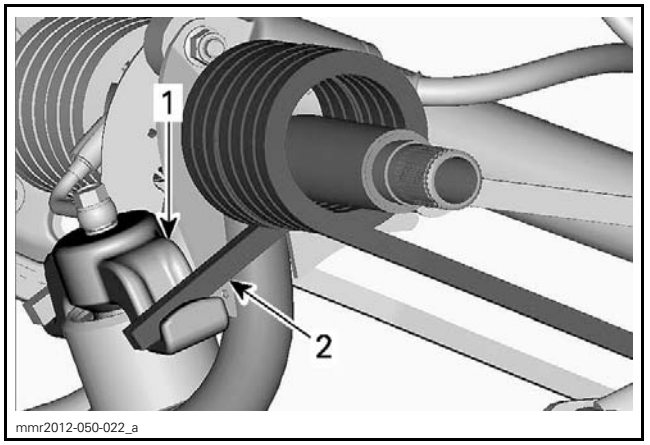
Installing Rear Springs

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

Make sure that spring end is in cam adjuster or actuator spring support.

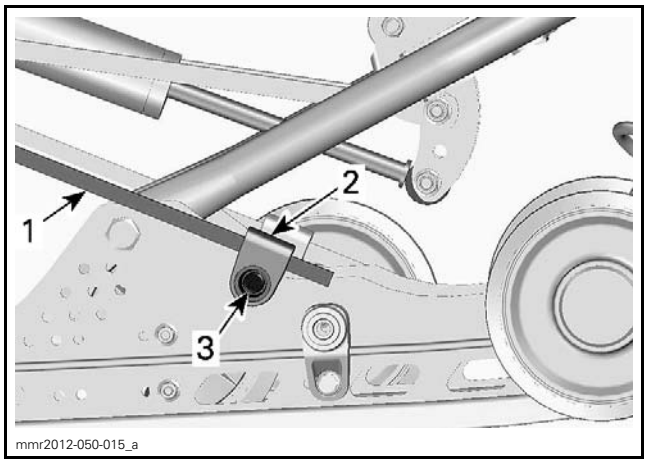


MODELS WITHOUT QUICK-ADJUST
1. Rear spring
2. Cams



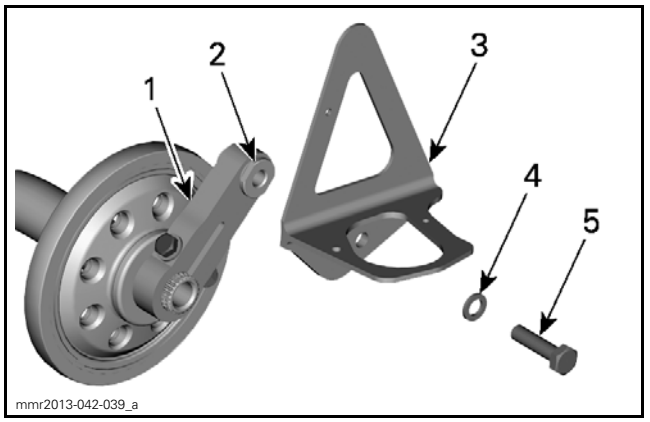
QUICK-ADJUST MODELS
1. Actuator spring support
2. Rear spring

Install spring supports upwards.



1. Spring
2. Spring support
3. Spring support bolt

Install rear arm connecting rod inserts with the shoulder outwards.

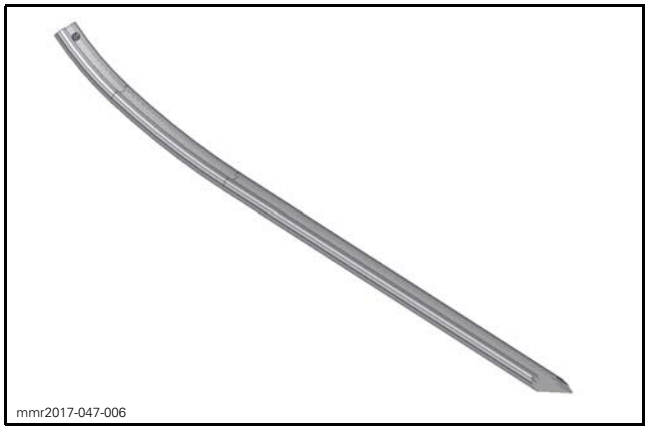


1. Connecting rod
2. Insert with the shoulder outwards
3. Support
4. Washer
5. Retaining screw

rMotion with Quick Adjust System

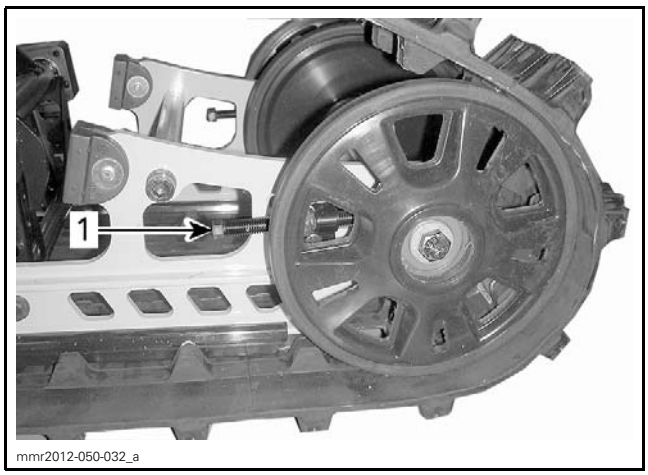
Install quick adjuster control modules, refer to:
- *SHOCK DAMPING QUICK ADJUSTER SYSTEM*
- *SPRING PRELOAD QUICK ADJUSTER SYSTEM*.

SLIDER SHOES


mmr2017-047-006

Removing Slider Shoes

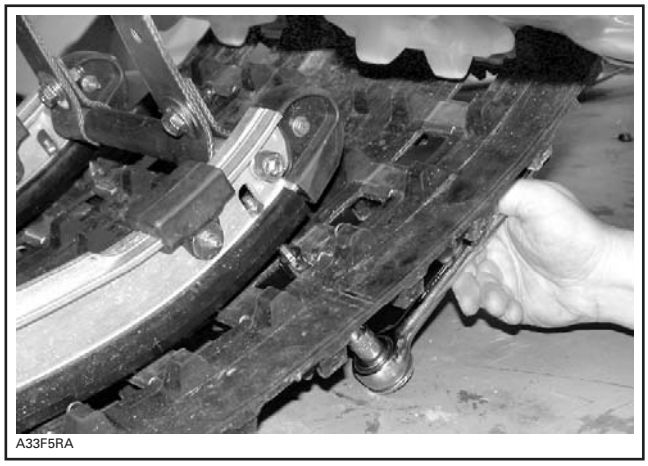
1. Lift rear of vehicle and support it off the ground.
2. Completely loosen track tension by unscrewing both adjustment screws.



mmr2012-050-032_a

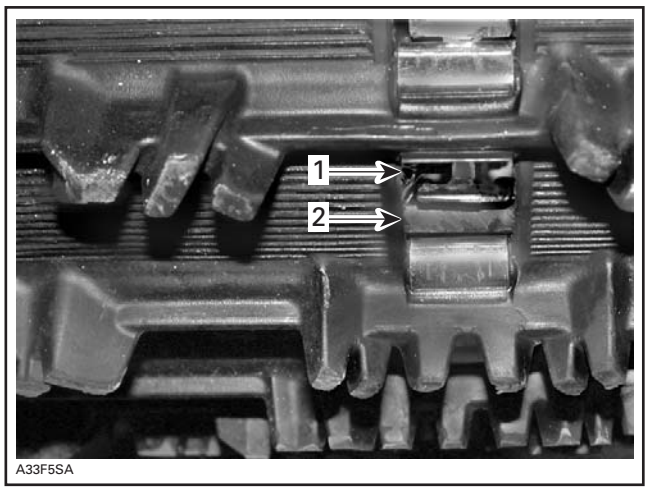
1. RH adjustment screw

3. Remove nut and screw of each runner.


A33F5RA

TYPICAL - REMOVE NUT AND SCREW OF EACH RUNNER

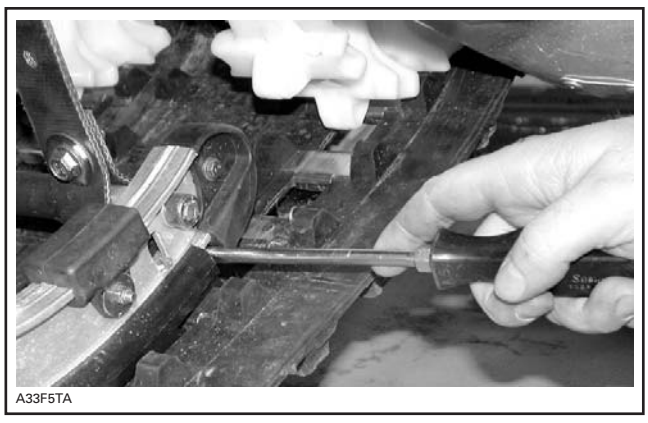
4. At the rear of vehicle, align a track window with slider shoe.



A33F5SA

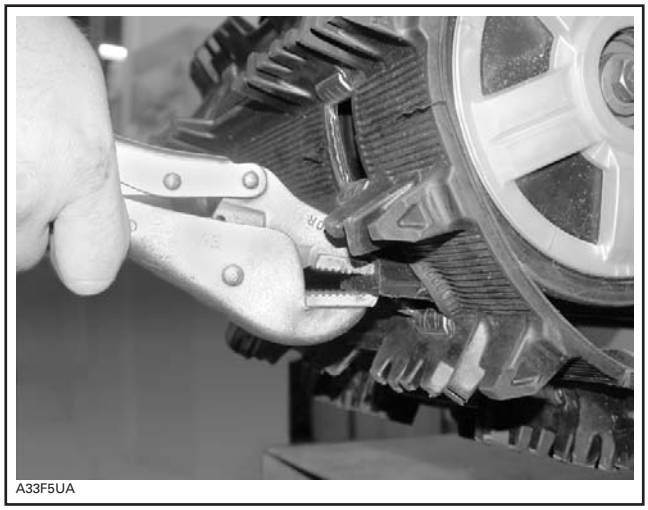
TYPICAL
1. Track window
2. Slider shoe

5. Lubricate widow edges.
6. Using a pry bar or a screwdriver, push slider shoe rearward until it comes in contact with track.


A33F5TA

TYPICAL - PUSH ON SLIDER SHOE

7. Using locking pliers, pull slider shoe through track window to remove.



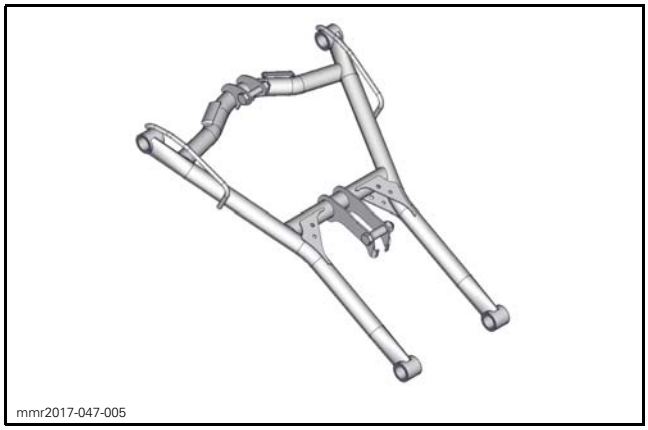
TYPICAL - PULL ON SLIDER SHOE TO REMOVE

Installing Slider Shoes

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

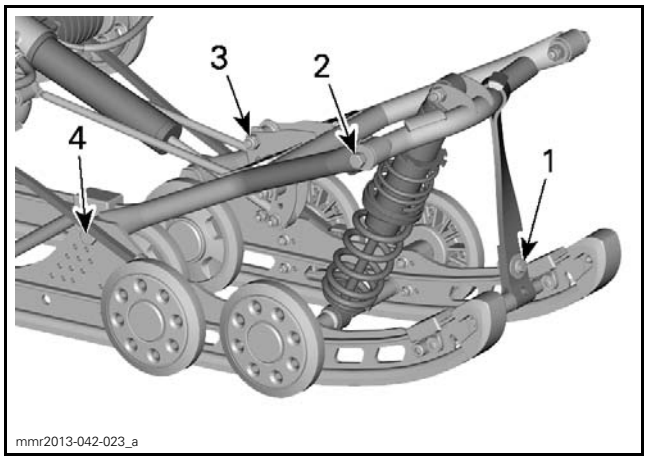
Make sure to insert slider shoe end with hole first.

FRONT ARM



Removing Front Arm

1. Proceed with *REMOVING THE SUSPENSION ASSEMBLY*. Refer to procedure in this subsection.
2. Unfasten stopper strap.
3. Remove the following fasteners:
   - Center shock to front arm
   - Front arm to rocker
   - Front arm to rail.



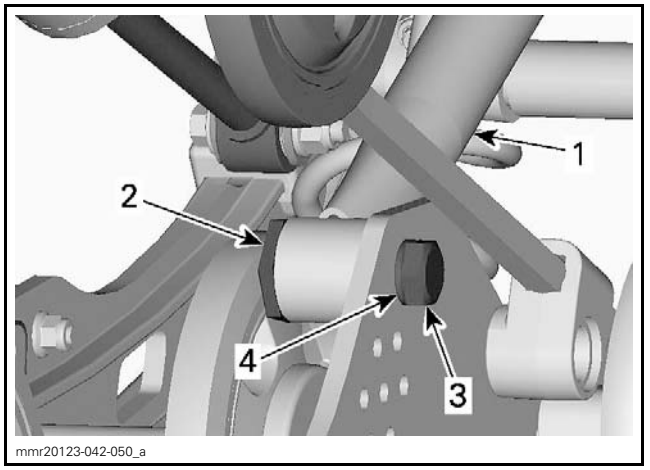
TYPICAL
1. *Stopper strap bolt*
2. *Center shock to front arm bolt*
3. *Front arm to rocker bolt*
4. *Front arm to rail screw*

4. Remove front arm from suspension assembly.

Installing Front Arm

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

Install front arm to rail fasteners as shown.

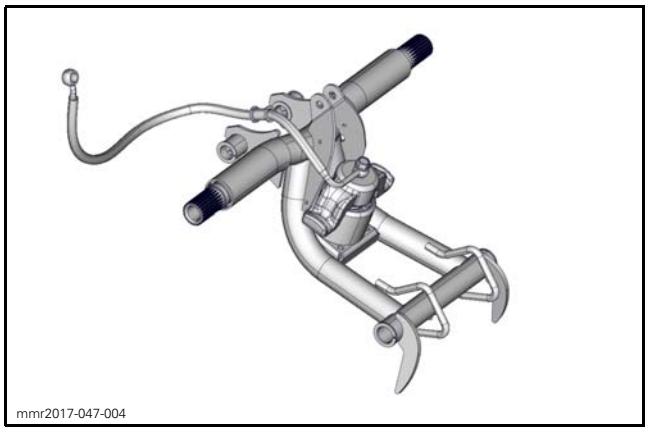


1. *Front arm*
2. *Insert (shoulder inward)*
3. *Front arm to rail screw*
4. *Washer*

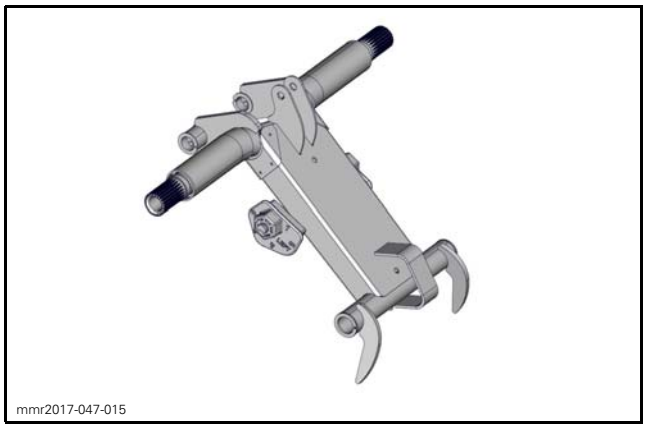
Install stopper strap on the LH side of the vehicle.

NOTICE **Incorrect stopper strap installation would cause suspension parts interference.**

REAR ARM



WITH QAS



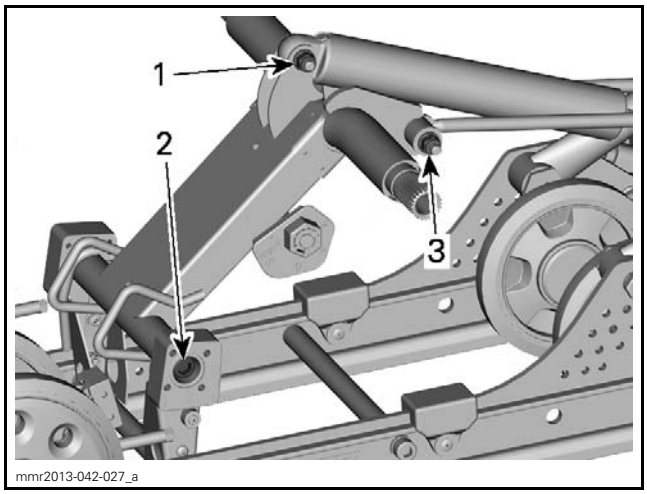
WITHOUT QAS

Removing Rear Arm

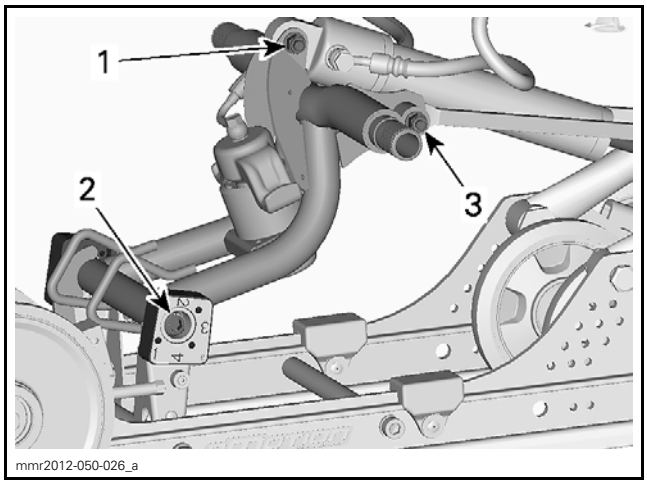
1. Remove rear springs, refer to *REMOVING REAR SPRINGS* in this subsection.

NOTE: On Quick Adjust models, set the spring preload actuator aside.

2. Remove the following fasteners:
   - Rear shock to rear arm
   - Rear arm to throttle rods
   - Coupling blocks retaining screws.



MODELS WITHOUT QUICK ADJUST SYSTEM
1. *Rear shock to rear arm bolt*
2. *Coupling blocks retaining screw*
3. *Rear arm to throttle rods bolt*



QUICK ADJUST SYSTEM
1. *Rear shock to rear arm bolt*
2. *Coupling blocks retaining screw*
3. *Rear arm to throttle rods bolt*

3. Remove rear arm from the vehicle.

Installing Rear Arm

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

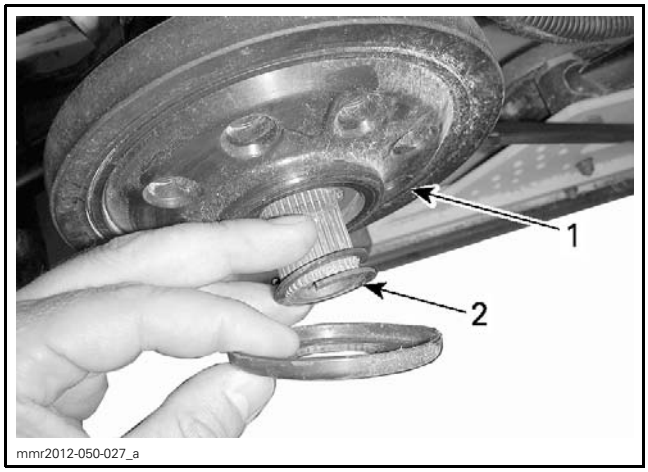
rMotion Without Quick Adjust System

Place rear arm grease fitting towards the front of the vehicle.

All Models

Install coupling block with new socket screws.

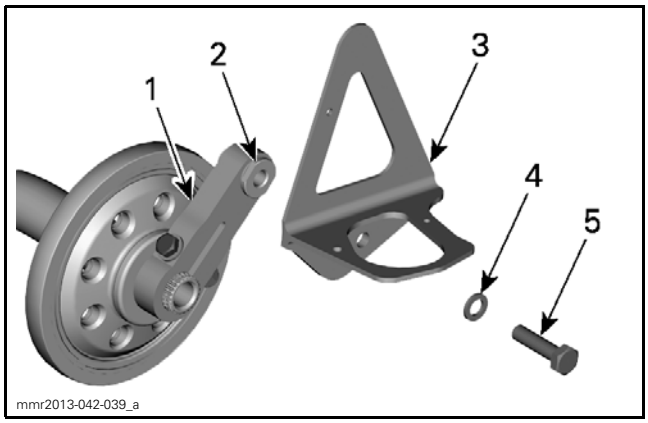
Install upper idler wheels as shown.



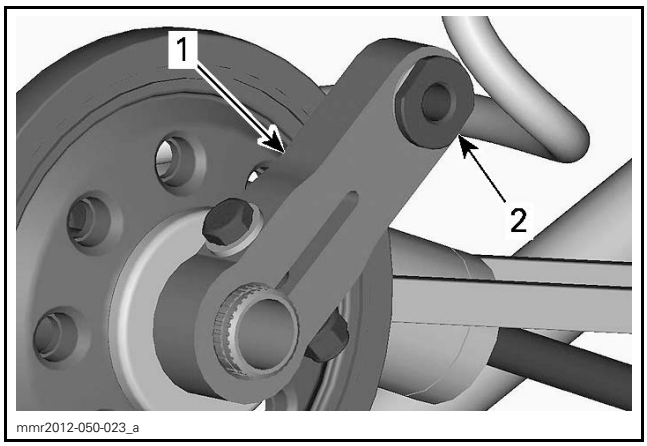
1. *Convex side out*
2. *Spring between wheel and plastic cover*

Install rear arm connecting rod inserts with the shoulder outwards.

Install circlip.



1. *Connecting rod*
2. *Shoulder outwards*
3. *Support*
4. *Washer*
5. *Retaining screw*

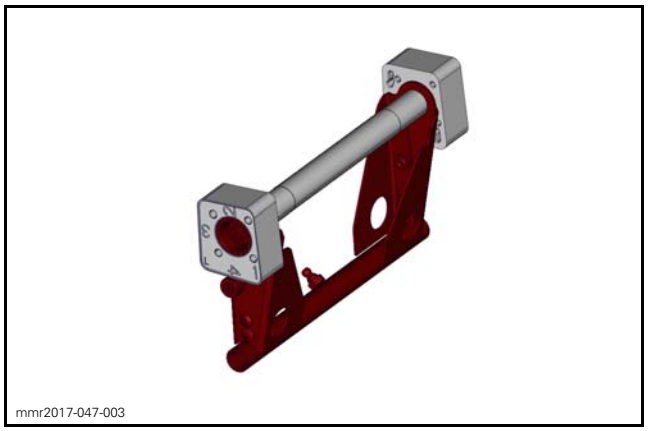


1. *Connecting rod*
2. *Shoulder outwards*

Install new connecting rod retaining screws.

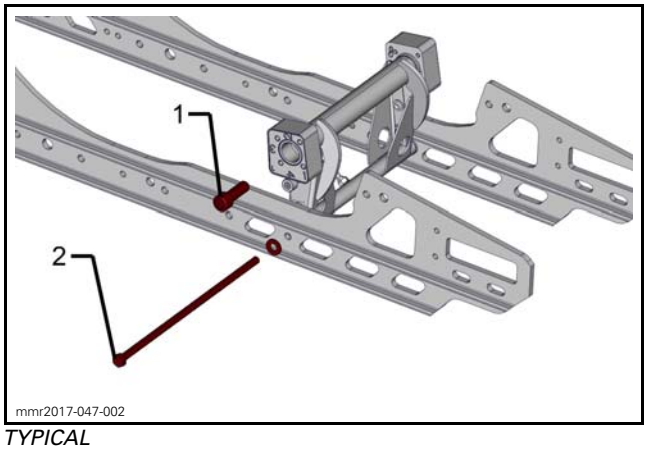
Lubricate rear arm pivot. Refer to *MAINTENANCE* in this subsection.

PIVOT ARM



Removing Pivot Arm

1. Lift rear of vehicle and support it off the ground.
2. Completely loosen track tension by unscrewing both adjustment screws.
3. Set the rear springs preload to the minimum.
4. Remove rear spring supports.
5. Remove the following fasteners:
   - Coupling blocks retaining screws
   - Pivot arm to rails bolt.



TYPICAL
1. *Coupling block screw*
2. *Pivot arm to rails bolt*

6. Carefully remove pivot arm from rear arm.

Installing Pivot Arm

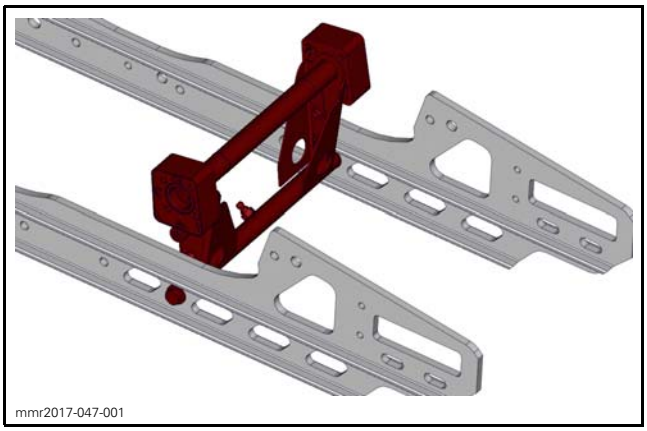
The installation is the reverse of the removal procedure. However, pay attention to the following.

Install new coupling block screws.

Install pivot arm with the grease fitting towards front of the vehicle.

Lubricate pivot arm. Refer to *MAINTENANCE* in this subsection.

COUPLING BLOCKS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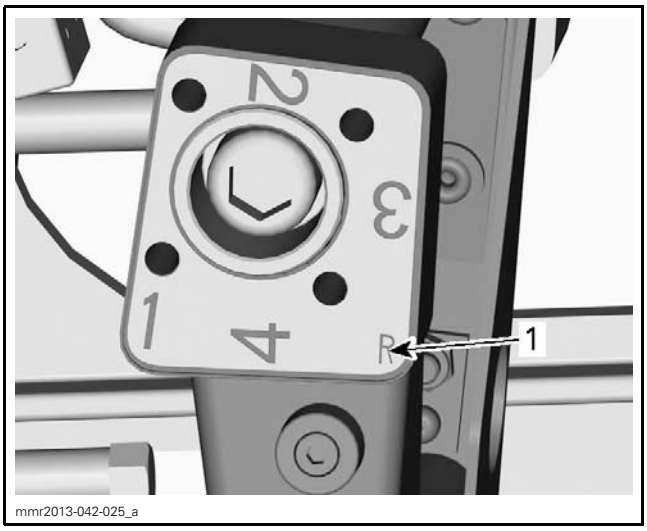
Replacing Coupling Blocks

LH and RH coupling blocks are different. There is a molded "R" (RH side) or "L" (LH side) on the back face of the coupling blocks.



mmr2013-042-025_a

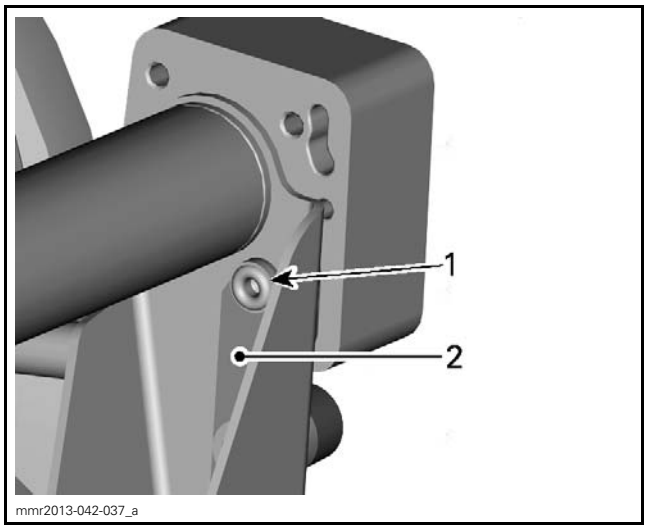
1. Side identification

Install new coupling block screws.

Set the coupling blocks to the same position on both sides.

MODELS	FACTORY BLOCK POSITION
All models	1

Fit riveted pin through coupling block.



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TYPICAL
1. Riveted pin
2. Spring pin

IDLER WHEELS AND SUPPORTS

Replacing Idler Wheels

Refer to the exploded views at the beginning of this subsection for parts layout and fasteners tightening torque.

STOPPER STRAP

Refer to the exploded views at the beginning of this subsection for parts layout and fasteners tightening torque.

NOTICE **Incorrect stopper strap installation would cause suspension parts interference.**

REAR SUSPENSION (tMOTION)

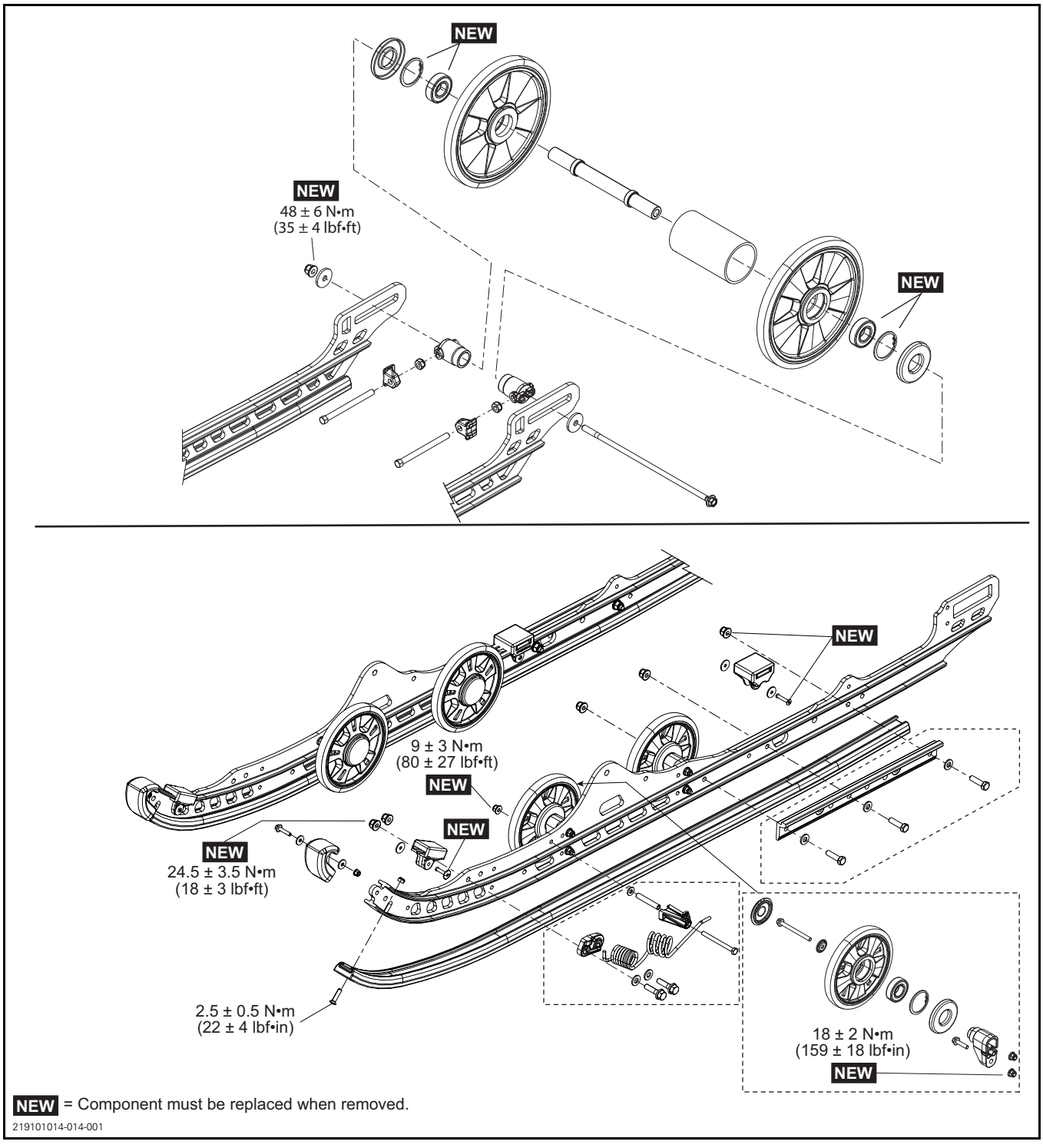
SERVICE TOOLS

Description	Part Number	Page
SHOCK ABSORBER SUPPORTS	529 036 186	11

SERVICE PRODUCTS

Description	Part Number	Page
LOCTITE 243 (BLUE)	293 800 060	14
SYNTHETIC SUSPENSION GREASE	779163	6

RAILS AND IDLER WHEELS



NEW = Component must be replaced when removed.

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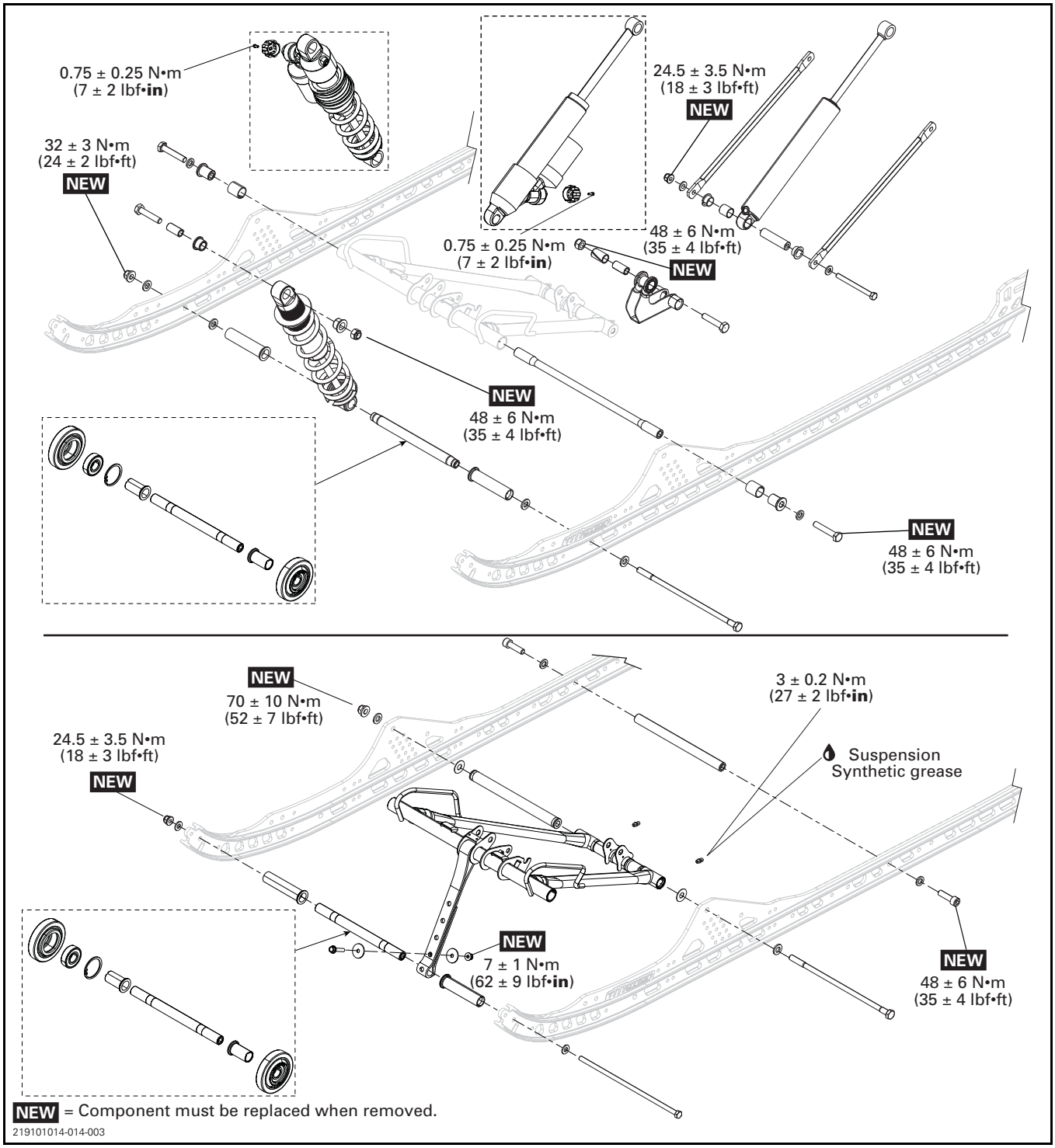
FRONT ARM

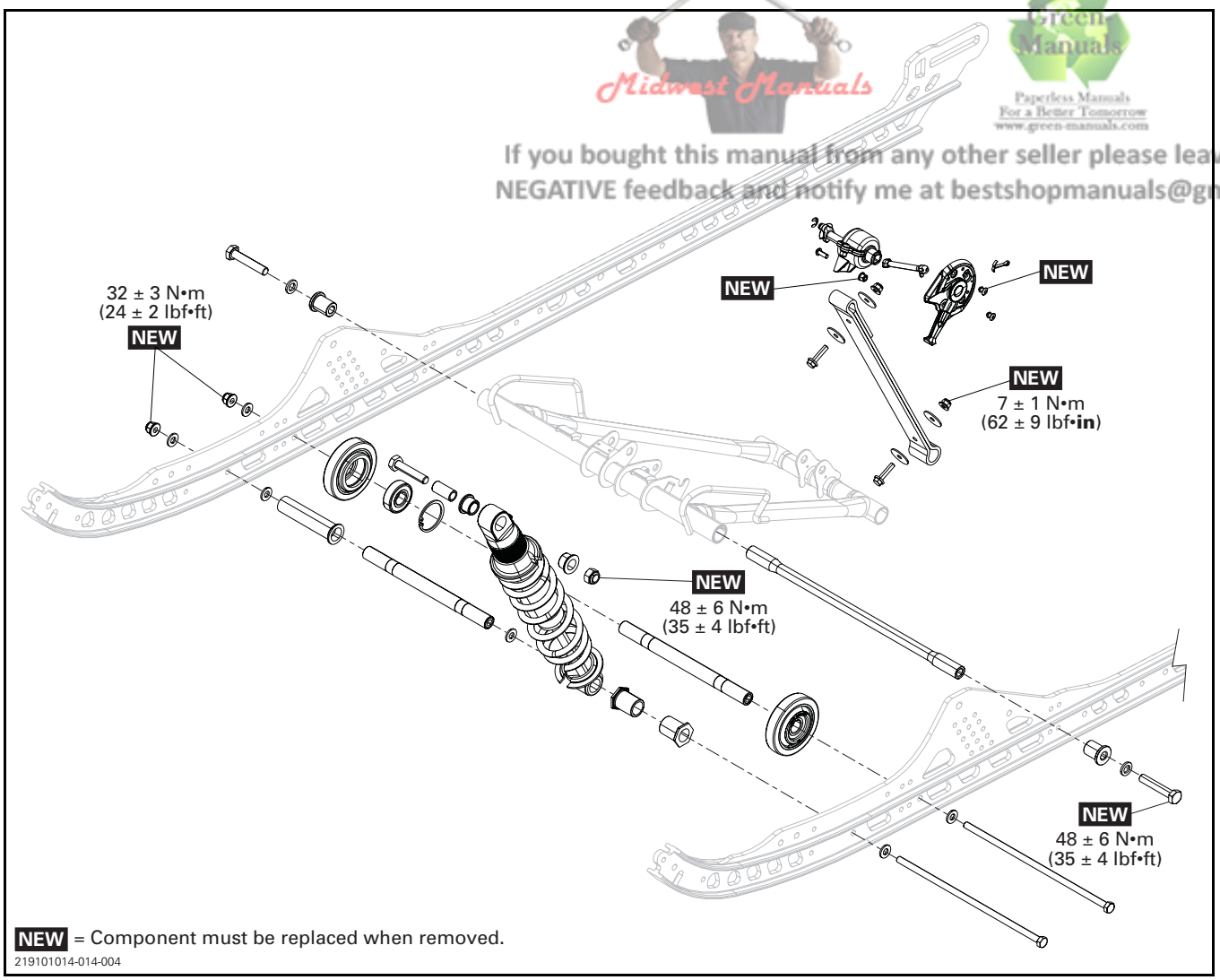
All Models Except Summit Expert



FRONT ARM

Summit Expert

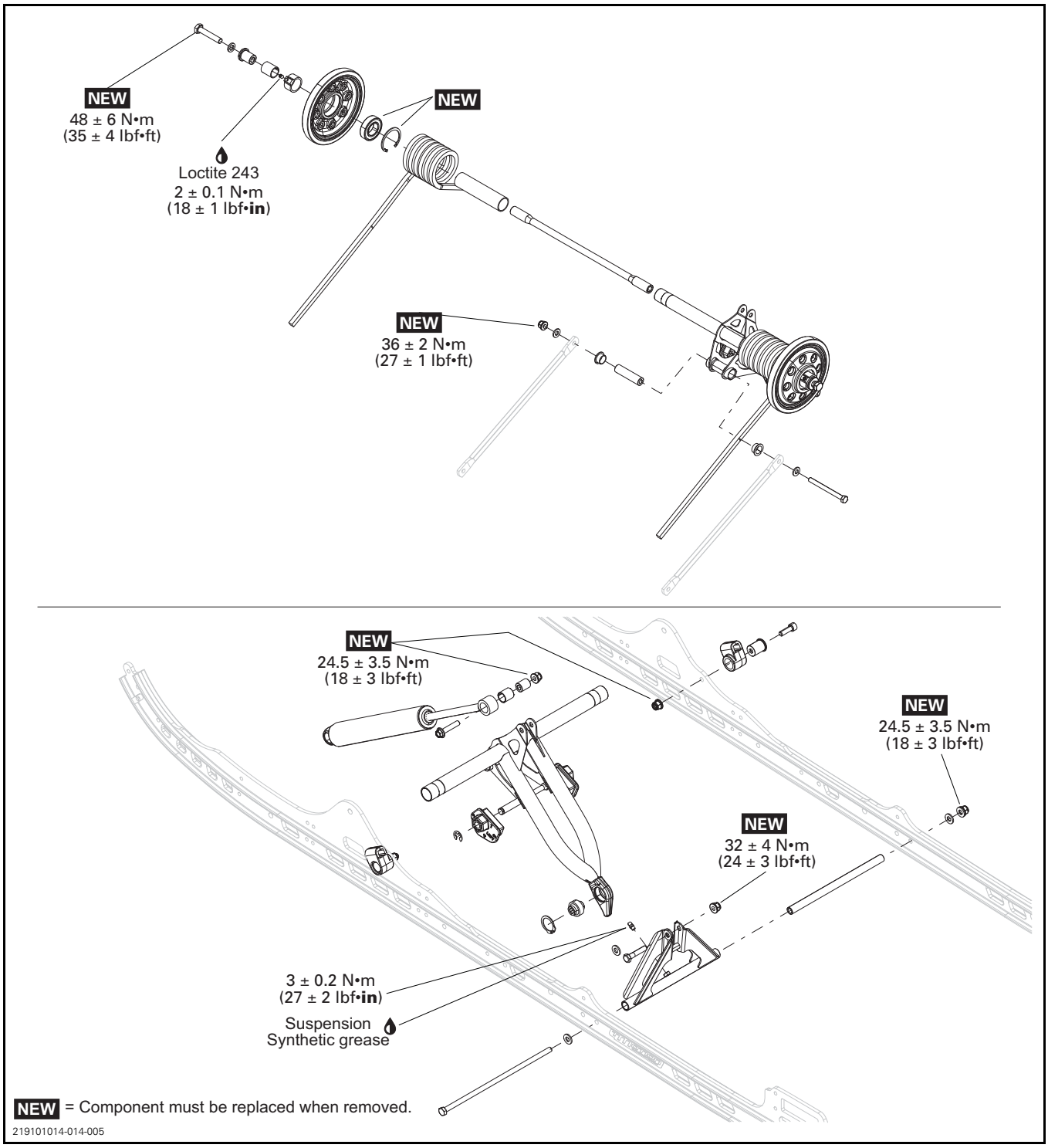
Midwest Manuals
Green Manuals
Paperless Manuals For a Better Tomorrow www.green-manuals.com
If you bought this manual from any other seller please leave them NEGATIVE feedback and notify me at bestshopmanuals@gmail.com



NEW = Component must be replaced when removed.

219101014-014-004

REAR ARM


NEW
48 ± 6 N•m
(35 ± 4 lbf•ft)
Loctite 243
2 ± 0.1 N•m
(18 ± 1 lbf•in)
NEW
NEW
36 ± 2 N•m
(27 ± 1 lbf•ft)
NEW
24.5 ± 3.5 N•m
(18 ± 3 lbf•ft)
NEW
24.5 ± 3.5 N•m
(18 ± 3 lbf•ft)
NEW
32 ± 4 N•m
(24 ± 3 lbf•ft)
3 ± 0.2 N•m
(27 ± 2 lbf•in)
Suspension
Synthetic grease
NEW = Component must be replaced when removed.
219101014-014-005

GENERAL

NOTE: Refer to *TECHNICAL SPECIFICATIONS* to identify the snowmobile suspension type.

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

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

⚠ WARNING

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

ADJUSTMENT

For suspension adjustments, refer to *SUSPENSION ADJUSTMENTS* subsection.

MAINTENANCE

For shock absorbers inspection, refer to *SHOCK ABSORBERS* in this subsection.

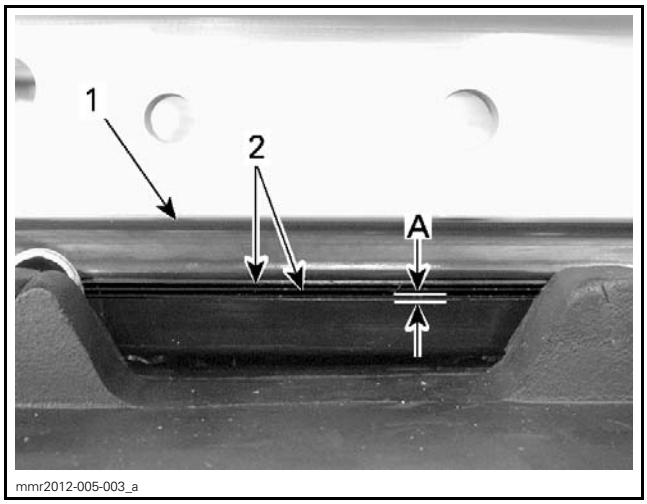
INSPECTING THE REAR SUSPENSION MECHANISM AND STOPPER STRAP

1. Inspect rear suspension components for wear, deterioration or damage, replace defective parts if necessary.
2. Inspect stopper strap(s) for wear or cracks.
3. Check bolt and nut securing strap(s) for tightness. If loose, inspect strap holes for deformation. Replace strap if necessary.

INSPECTING THE SLIDER SHOES

Slider shoes are worn out and must be replaced when remaining material exceeding the 2 molding lines is as specified.

MINIMUM SLIDER SHOE THICKNESS
1 mm (.04 in) material remaining exceeding the 2 molding lines



mmr2012-005-003_a

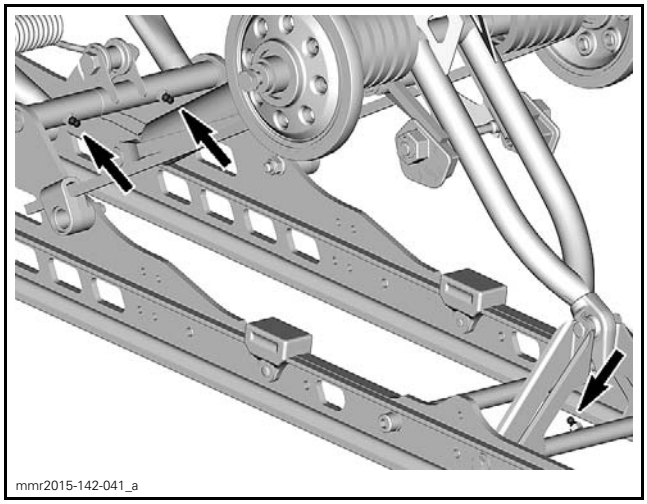
1. Slider shoe
2. Molding lines
A. Minimum thickness: 1 mm (.04 in)

NOTICE **Slider shoes must always be replaced in pairs.**

LUBRICATING THE REAR SUSPENSION

Lubricate the following suspension pivots at grease fittings.

SERVICE PRODUCT
SYNTHETIC SUSPENSION GREASE (P/N 779163)


mmr2015-142-041_a

TYPICAL

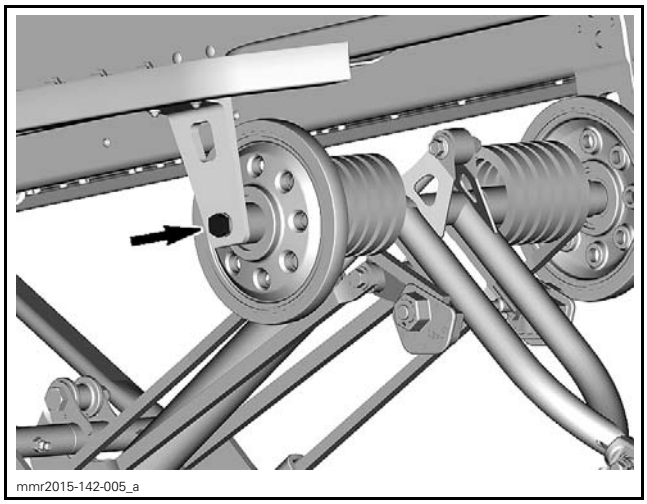
PROCEDURES

NOTE: Many parts can be changed with rear suspension in place. When specified, refer to *SUSPENSION ASSEMBLY* to remove rear suspension from vehicle.

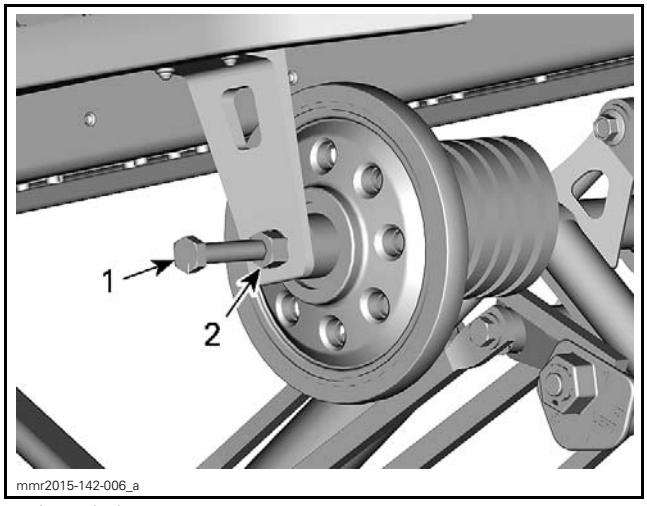
SUSPENSION ASSEMBLY

Removing Suspension Assembly

1. Lift rear of vehicle and support it off the ground.
2. Completely loosen track tension.
3. Remove and discard rear arm bolts from chassis. Use the following procedure to remove bolts easily.
   3.1 Remove one of the bolts securing the rear arm to frame.


mmr2015-142-005_a

   3.2 Replace this bolt with a longer one and a nut.
   3.3 Screw in by approximately 7 turns.
   3.4 Hold the bolt and tighten locking nut.

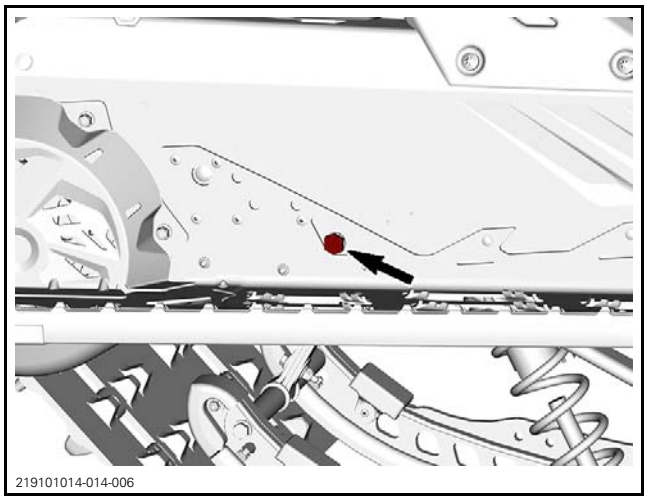


mmr2015-142-006_a

1. Long bolt
2. Locking nut

   3.5 Remove the bolt on the other side then unlock nut and remove the long bolt.
4. Remove bolts retaining front arm to tunnel the same way rear arm bolts have been removed.

NOTE: Discard the front arm bolts.


219101014-014-006

5. Lift rear of vehicle until front arm as enough clearance to pass underneath tunnel.
6. Remove suspension.

Installing Suspension Assembly

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

Inspect track thoroughly before reinstalling suspension. Refer to *TRACK* subsection.

Install suspension into track with front portion first.

Install new front and rear arm bolts.

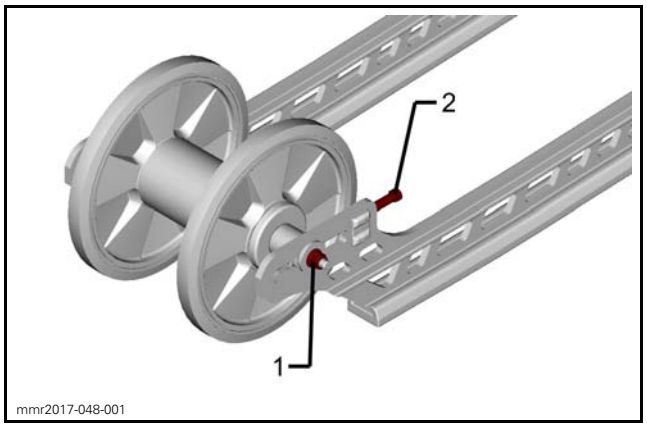
Tighten bolts to specification. Refer to the appropriate exploded view.

Adjust track tension, refer to *TRACK* subsection.

REAR AXLE

Removing Rear Axle

1. Lift rear of vehicle and support it off the ground.
2. Loosen rear axle fasteners.
3. Completely loosen track tension by unscrewing both adjustment screws.



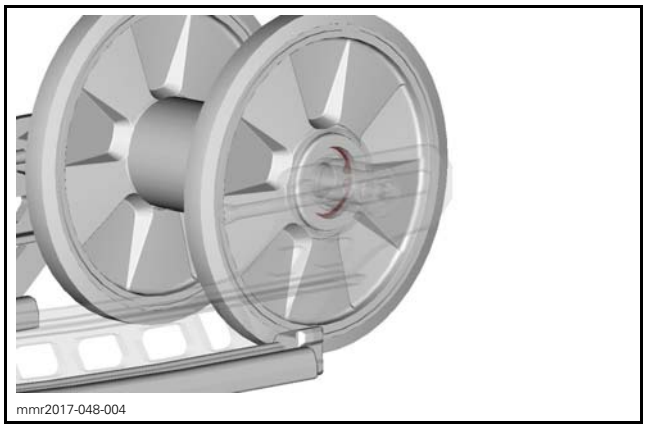
Step 1: Loosen axle nut
Step 2: Unscrew adjustment screws

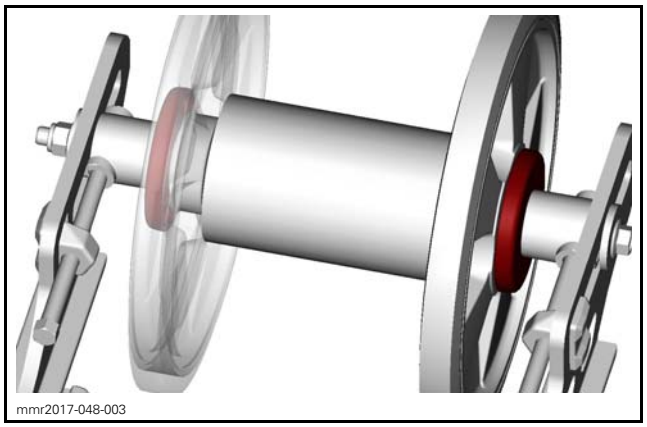
4. Remove rear axle fasteners and sliders.
5. Pull out the rear axle.

Installing Rear Axle

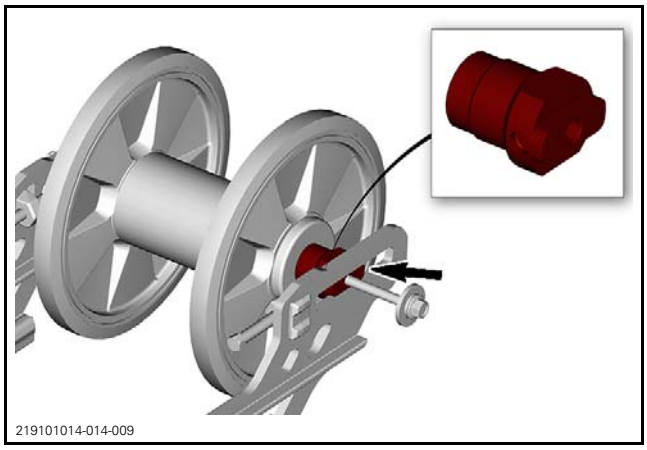
The installation is the reverse of the removal procedure. However, pay attention to the following.

Bearing circlip faces outward.





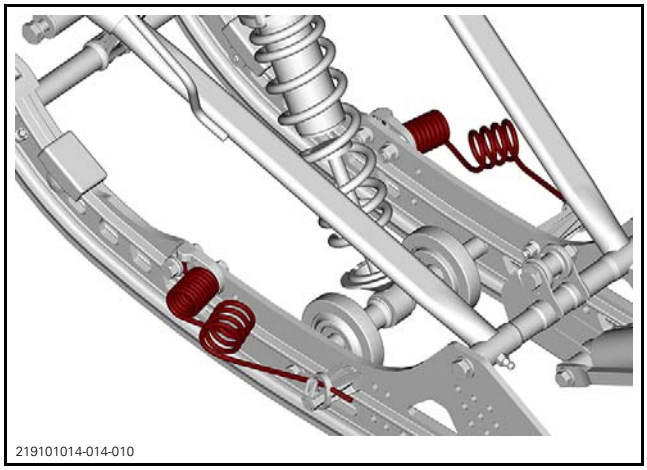
When tightening rear axle, make sure each wheel spacer protuberance is engaged into runner slot.

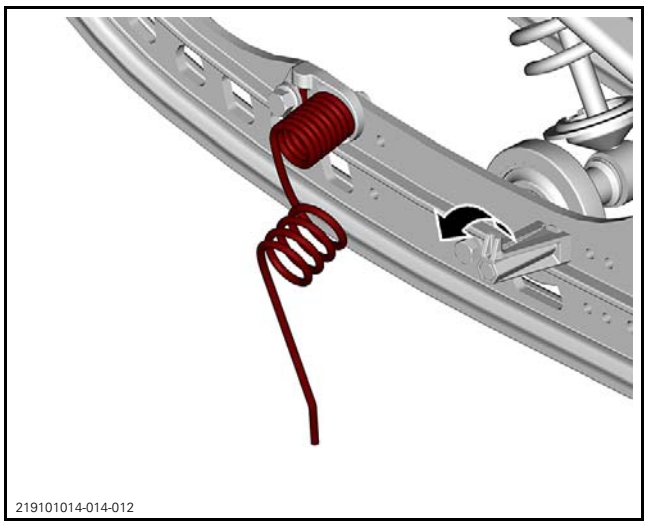


ICE SCRATCHERS

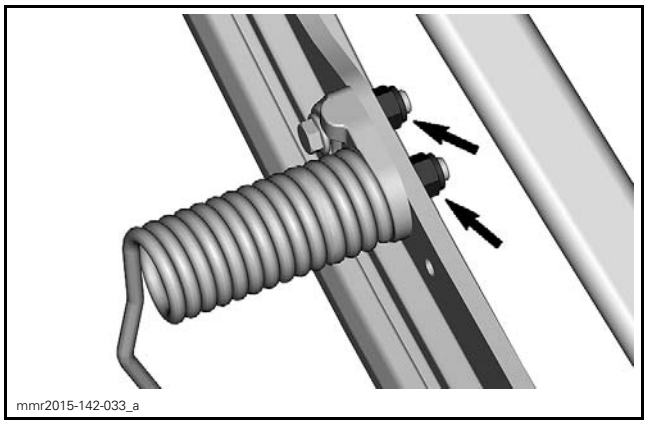
Removing Ice Scratchers

⚠ CAUTION Always remove ice scratchers from hooks before working on rear suspension.





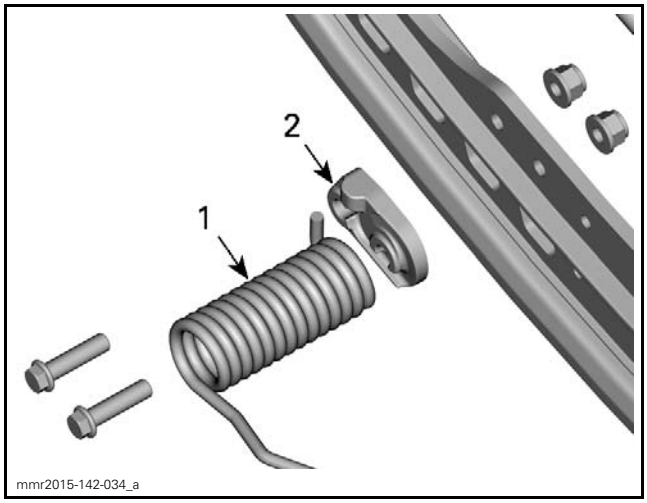
Remove spring holder nuts.



Installing Ice Scratchers

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

Make sure spring end is well inserted in holder.



1. Ice scratcher spring
2. Spring holder

Tighten retaining nuts to specification. Refer to the appropriate exploded view.

Install new locking ties.

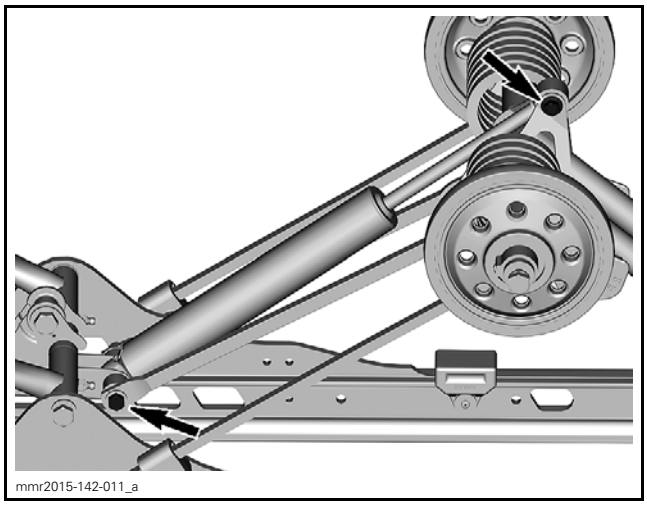
SHOCK ABSORBERS

Removing Rear Shock Absorber

1. Lift rear of vehicle and support it off the ground.

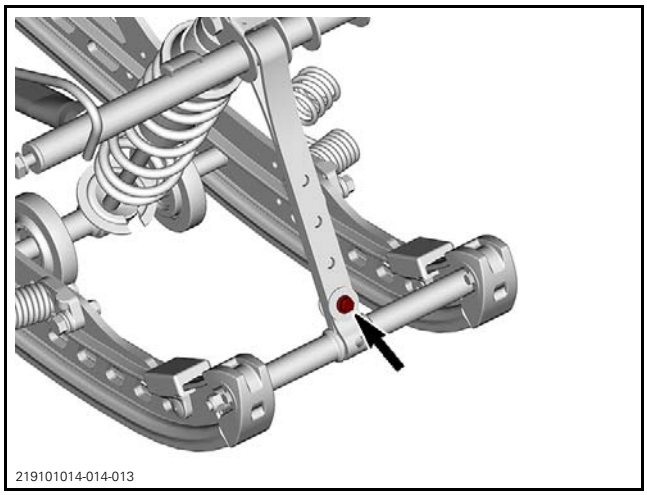
NOTE: If necessary, to ease shock removal, unfasten stopper strap to release shock pressure.

2. Remove bolts and nuts from shock.

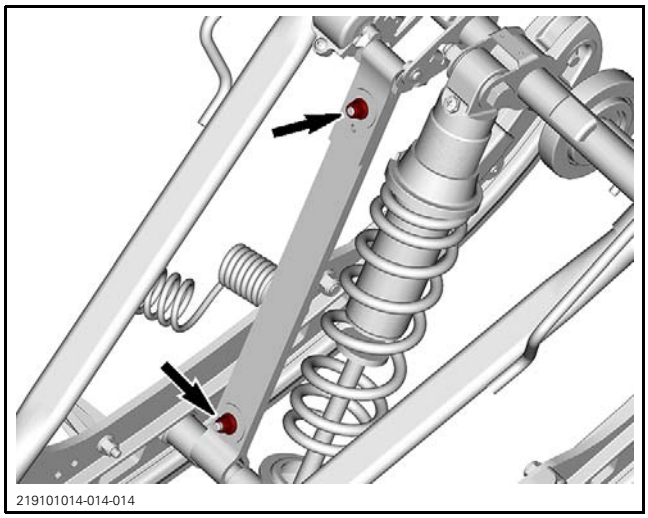


Removing Center Shock Absorber

1. Lift the rear of vehicle and support it off the ground.
2. Unfasten stopper strap.

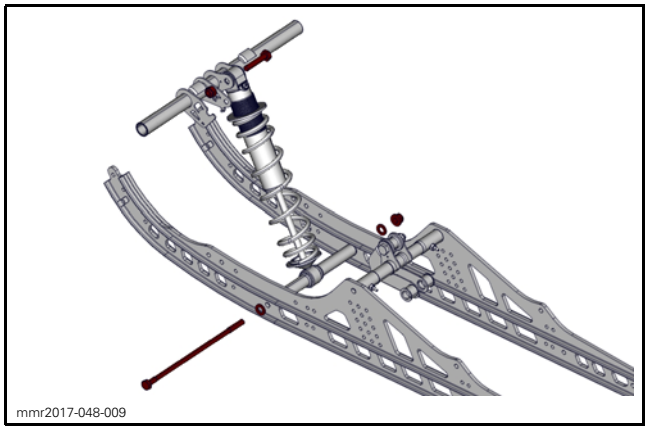


3. On Summit Expert models, remove adjustable stopper strap.

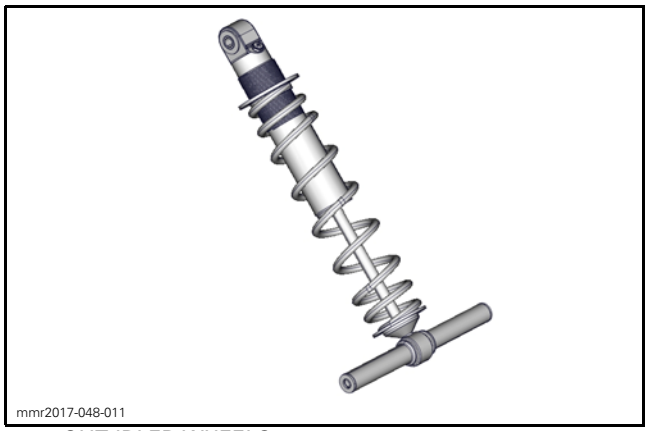


SUMMIT EXPERT MODELS ONLY

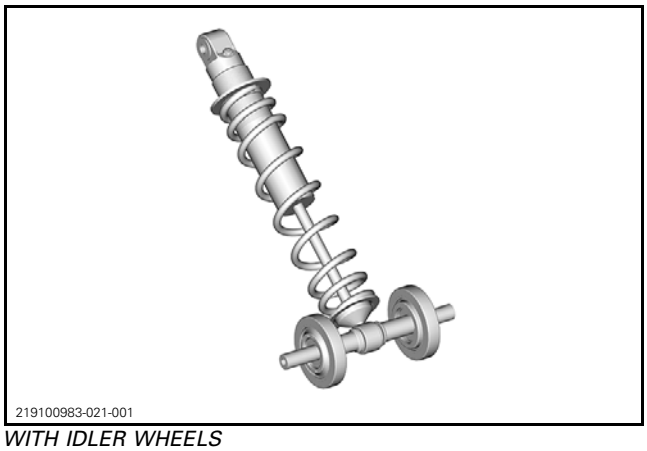
4. Remove lower and upper shock absorber nuts and bolts.



5. Remove shock absorber from vehicle.

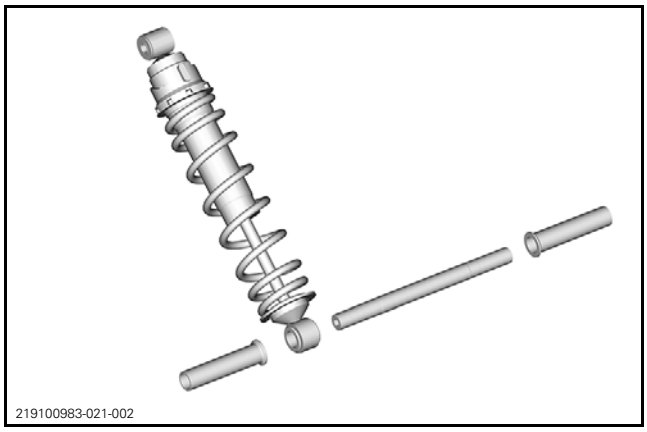


WITHOUT IDLER WHEELS



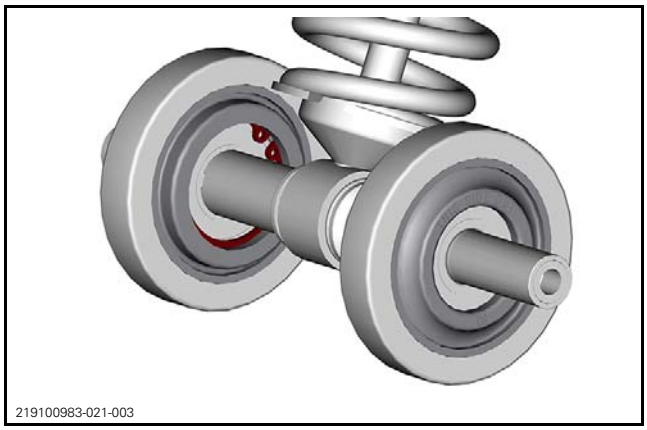
WITH IDLER WHEELS

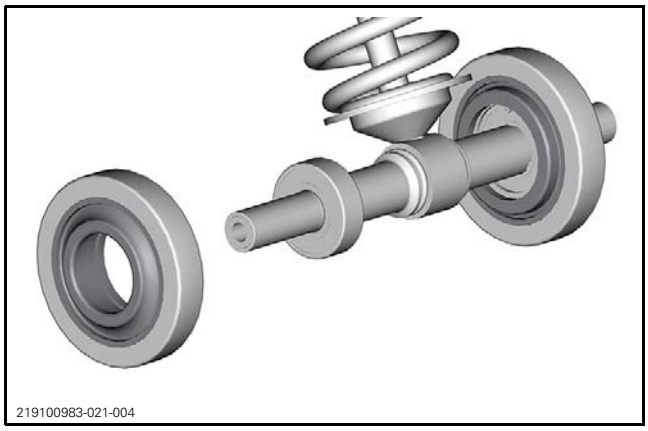
6. Remove spacers and shock shaft from shock absorber.



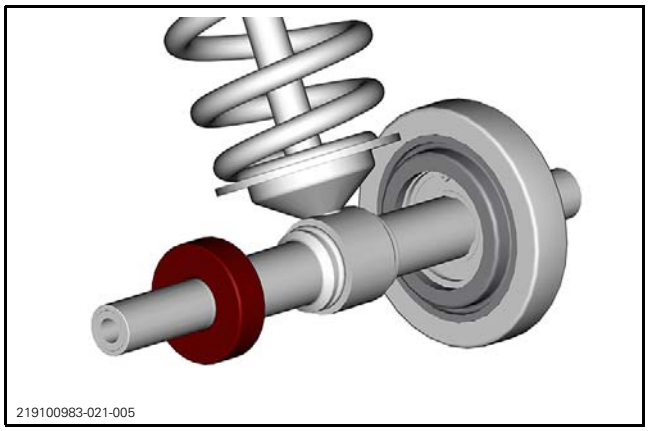
With Idler Wheels on Shaft

7. Remove one wheel from its bearing.




219100983-021-004

8. Use an appropriate puller to remove the bearing from the shaft.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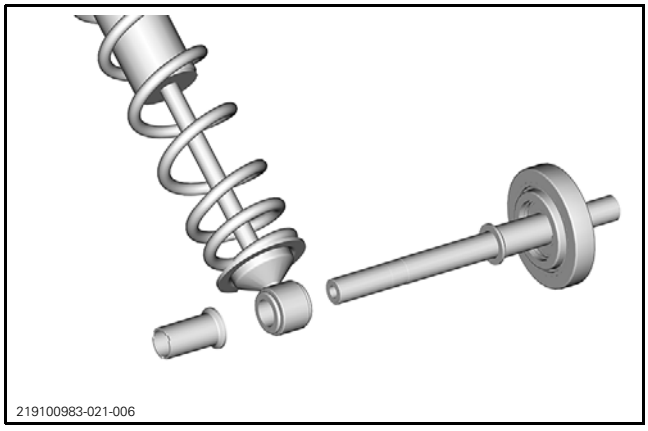
9. Slide the shaft out of the shock absorber.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Inspecting Shock Absorbers

NOTE: Unless otherwise noted, shock absorber must be at normal room temperature (21°C ± 2°C (70°F ± 36°F)) during inspection.

1. Perform a visual inspection of the shock:
   – The shock must be exempt of any dent or scratch, especially on the rod.
   – Any defect on the rod, as small as it is, can lead to seal failure and oil leak.
   – If such defect is detected, the shock must be replaced and this will not be covered under warranty.
2. Completely push down shock rod into the body and check result as per table.

HPG SHOCK	RESULT
All except 551 mm (21-11/16 in) rear shock	The rod should completely get in the shock body
551 mm (21-11/16 in) rear shock	The stroke must be at least 138 mm (5-7/16 in)

3. Release shock from completely collapsed position and check result as per table.

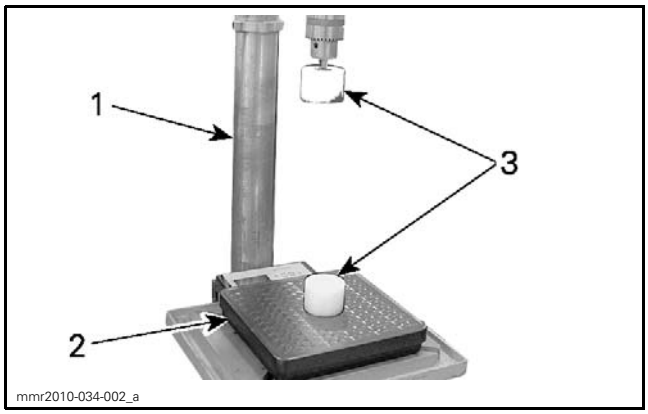
HPG SHOCK
– The shock should extend unassisted. – The rod must come out at a steady speed.

4. Proceed with *COMPRESSION TESTING SHOCK ABSORBERS*. See procedure in this subsection.
5. If any faults are present, replace shock.

Compression Testing Shock Absorbers

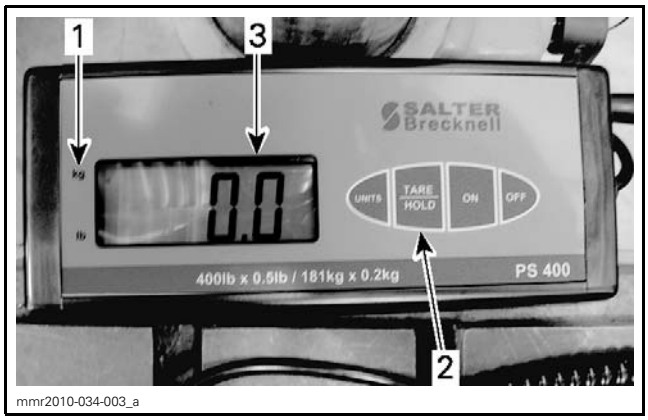
1. Ensure shock absorber is at normal room temperature (21°C ± 2°C (70°F ± 36°F)).
2. Remove spring from shock absorber (if applicable).
3. Place a bench scale on a suitable drill press.
4. Install the shock absorber supports onto drill press.

REQUIRED TOOL	
SHOCK ABSORBER SUPPORTS (P/N 529 036 186)	



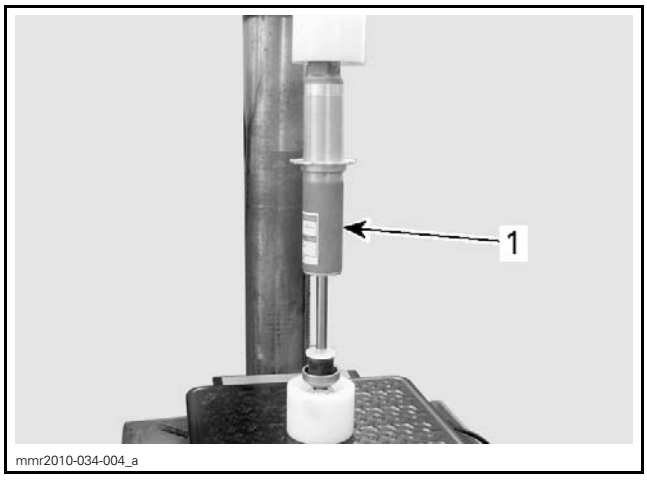
1. Drill press
2. Bench scale
3. Shock absorber supports

5. Set bench scale units to **kg** (or lb).
6. Press **TARE** to reset digits (must indicate (0) zero).



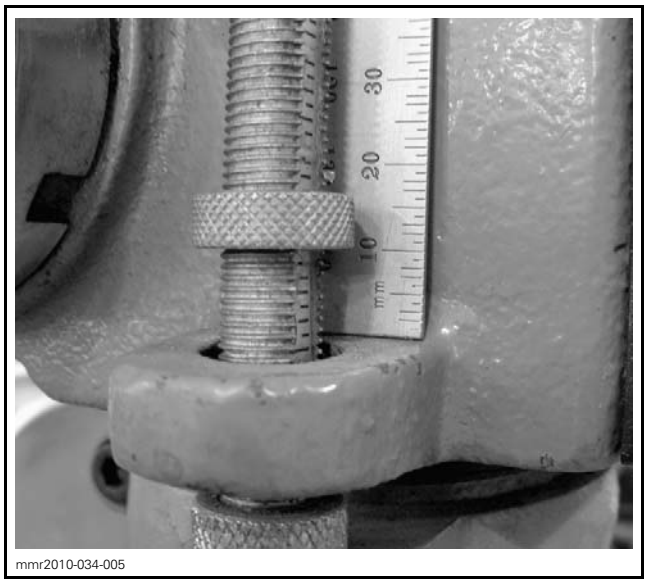
1. Units indicator lamp
2. TARE button
3. Digits

7. Install shock absorber into support with shock body upwards.
8. Adjust drill press table height in order to set the upper shock support flush with the shock body end.
9. Ensure shock absorber is aligned with drill press axis.



1. Shock body upwards

10. Set the drill press displacement to 10 mm (.394 in) using locking nut.



11. Compress shock absorber by 10 mm (.394 in) and hold it in position.
12. Read load recorded on the bench scale.

13. Load reading must be as per the following table.

ROD DIAMETER	SERVICE RANGE
12.5 mm (1/2 in)	24 kgf ± 4 kgf (53 lbf ± 9 lbf)

Installing Rear Shock Absorber

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

To ease shock installation, secure upper side of shock first.

Install new shock absorber retaining nuts and tighten to specification. Refer to the appropriate exploded view.

Installing Center Shock Absorber

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

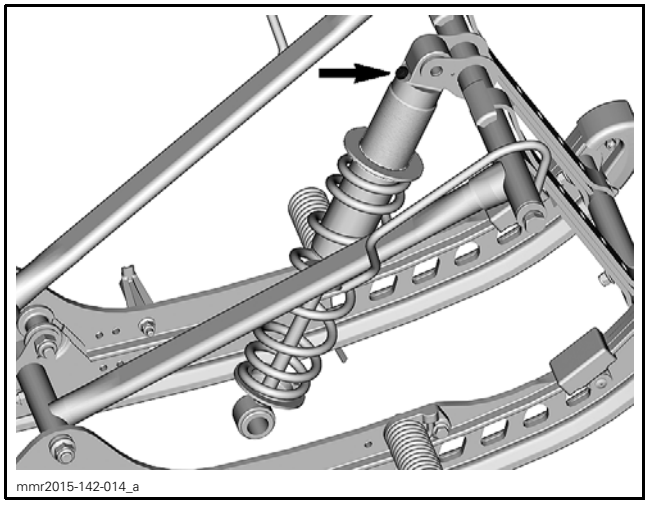
With Idler Wheels on Shaft

Using a press and a suitable support, press the bearing back in place.

Install the wheel and the circlip.

All Models

Position the adjustment ring upwards and the valve towards the tunnel.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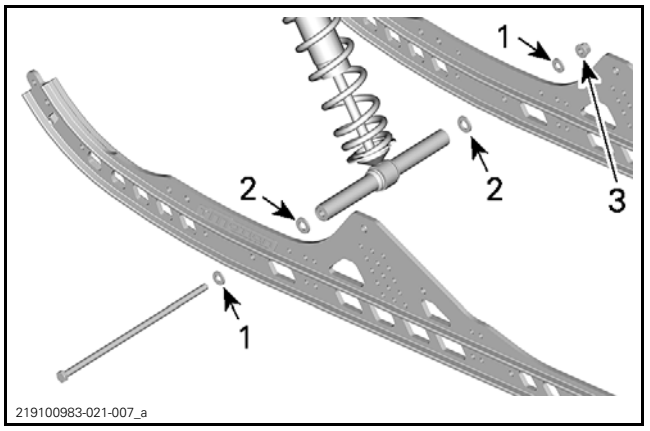
Using new nut, install shock shaft to runners.

Position washers in proper position.



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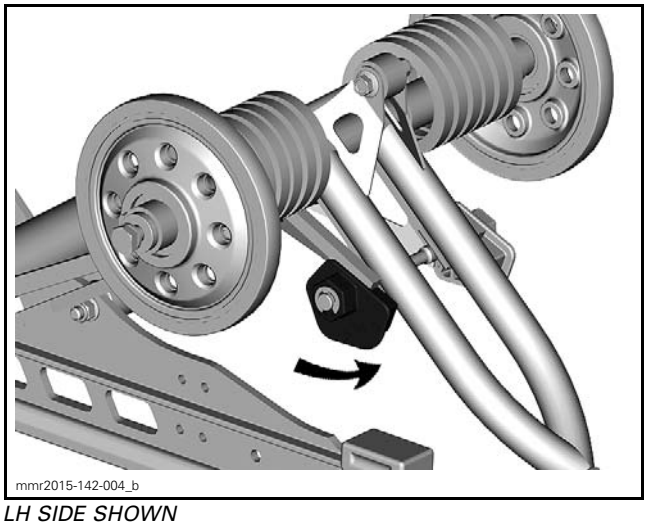
TYPICAL - BOTTOM OF SHOCK ABSORBER
1. *Smaller washers*
2. *Larger washers*
3. *New nut*

Tighten nut to the specification. Refer to exploded view.

REAR SPRINGS

Removing Rear Springs

1. Lift rear of vehicle and support it off the ground.
2. Completely loosen track tension by unscrewing both adjustment screws.
3. Decrease springs preload by turning cams accordingly.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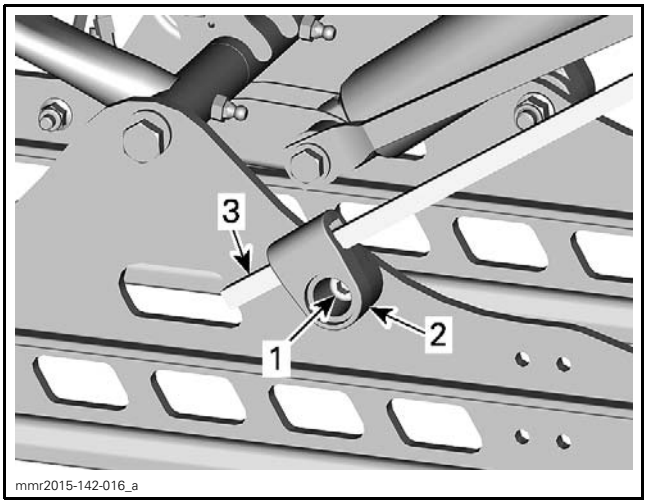
LH SIDE SHOWN

4. Firmly hold the spring support and unscrew its retaining bolt (one each side).

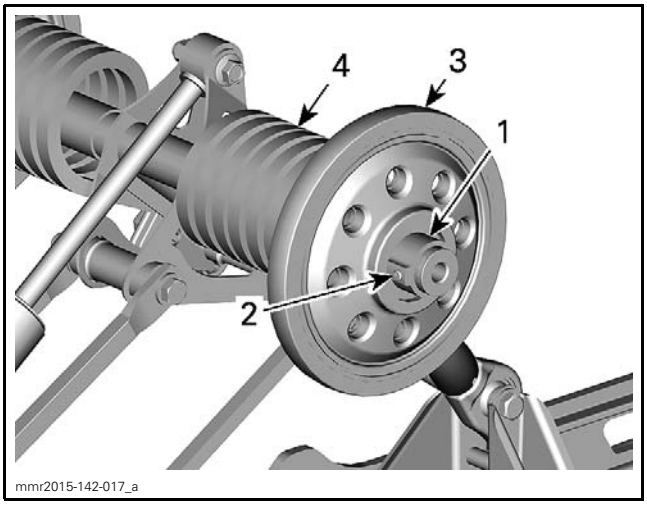
⚠ WARNING

Supports are spring loaded.



1. Spring support bolt
2. Spring support
3. Spring

5. Remove screws and washers from rear arm top axle. Refer to *REMOVING SUSPENSION ASSEMBLY* for procedure to remove the bolts.
6. Loosen set screw from locking rings.
7. Remove locking rings.
8. Remove upper idler wheels.
9. Remove springs.



LH SIDE SHOWN
1. Locking ring
2. Set screw
3. Upper idler wheel
4. Rear spring

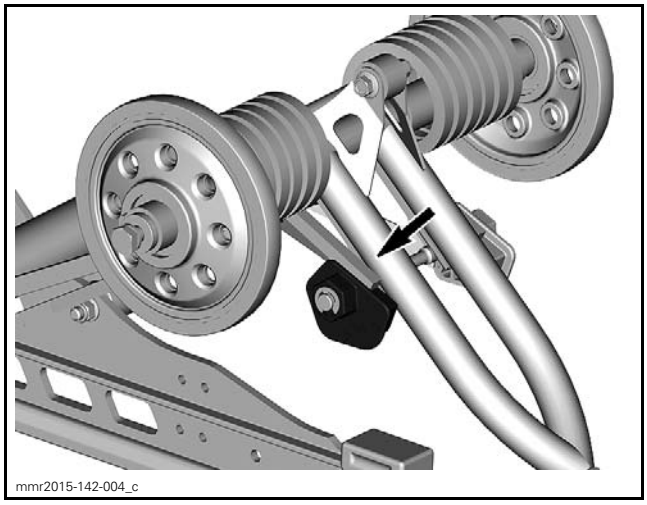
Installing Rear Springs

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

1. Respect THIS SIDE OUT inscription on top idler wheels.
2. Apply Loctite 243 (blue) on set screws.

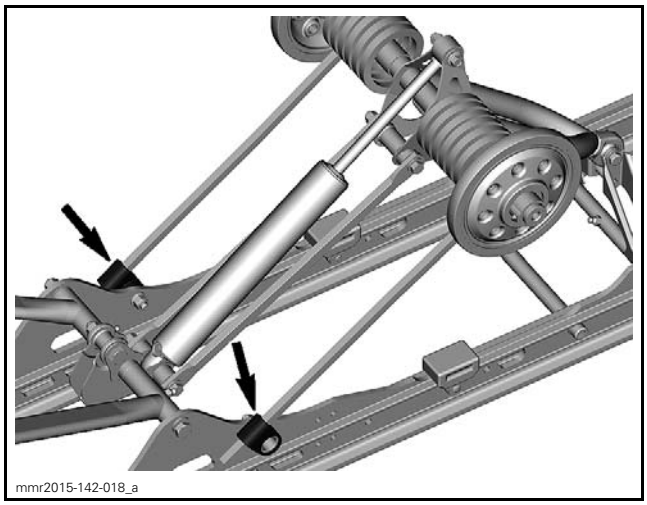
SERVICE PRODUCT
LOCTITE 243 (BLUE) (P/N 293 800 060)

3. Make sure that spring end is in cam adjuster.



LH SIDE SHOWN

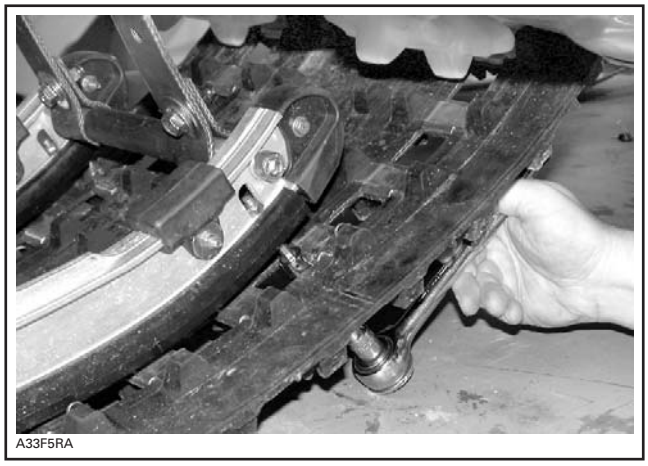
4. Install spring supports upwards.



SLIDER SHOES

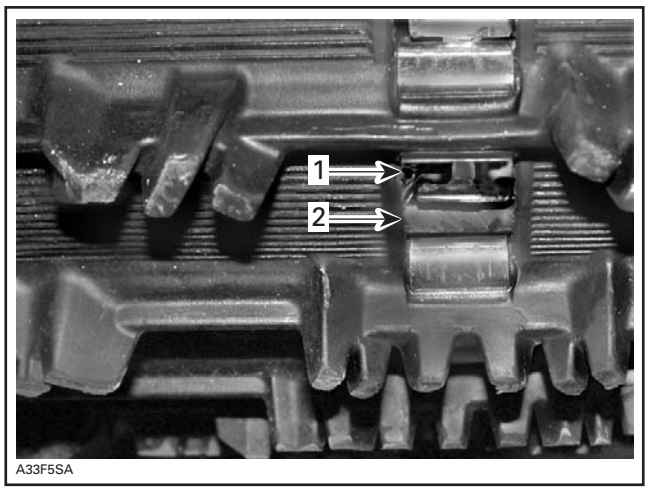
Removing Slider Shoes

1. Lift rear of vehicle and support it off the ground.
2. Completely loosen track tension.
3. Remove nut and screw of each runner.


A33F5RA

TYPICAL

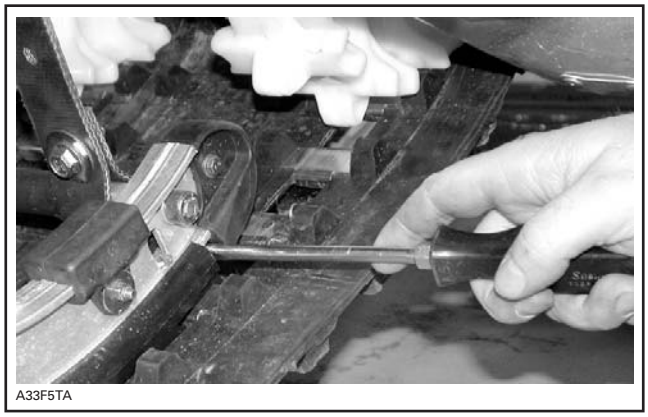
4. At the rear of vehicle, align a track window with slider shoe.



A33F5SA

TYPICAL
1. Track window
2. Slider shoe

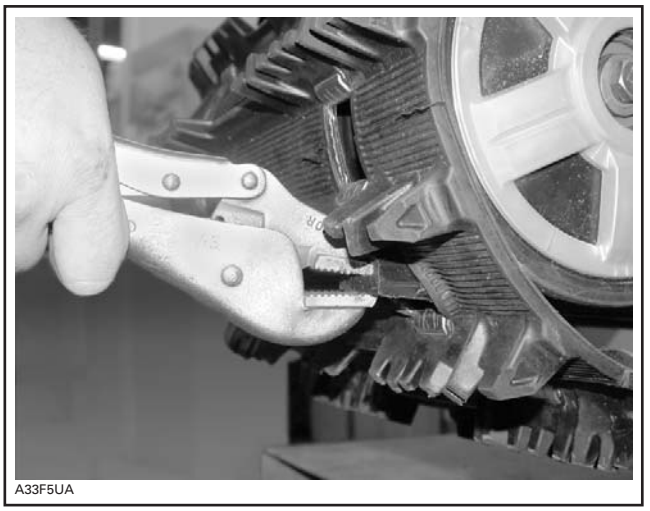
5. Using a pry bar or a screwdriver, push slider shoe rearward until it comes in contact with track.


A33F5TA

TYPICAL - PUSH ON SLIDER SHOE

6. Using locking pliers, pull slider shoe through track window to remove.

NOTE: If necessary, lubricate track window to facilitate slider shoe removal.


A33F5UA

TYPICAL - PULL ON SLIDER SHOE TO REMOVE

Installing Slider Shoes

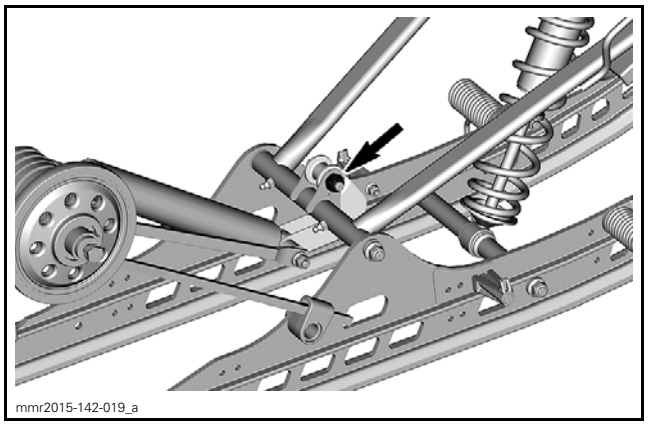
The installation is the reverse of the removal procedure. However, pay attention to the following.

Make sure to insert slider shoe end with hole first.

FRONT ARM

Removing Front Arm

1. Proceed with *REMOVING SUSPENSION ASSEMBLY*, see procedure in this subsection.
2. Remove nut and bolt securing rocker to front arm.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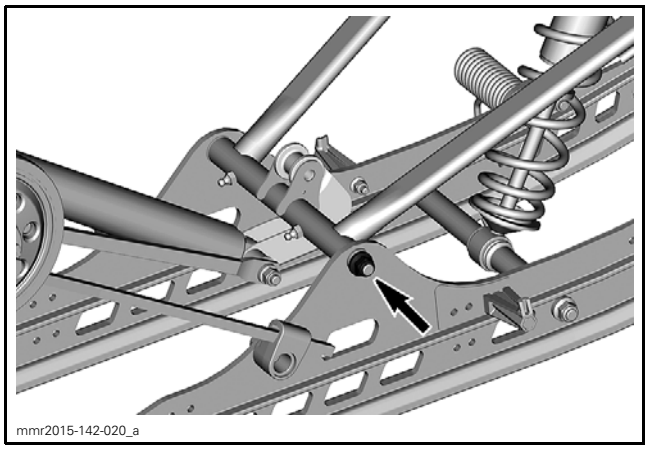
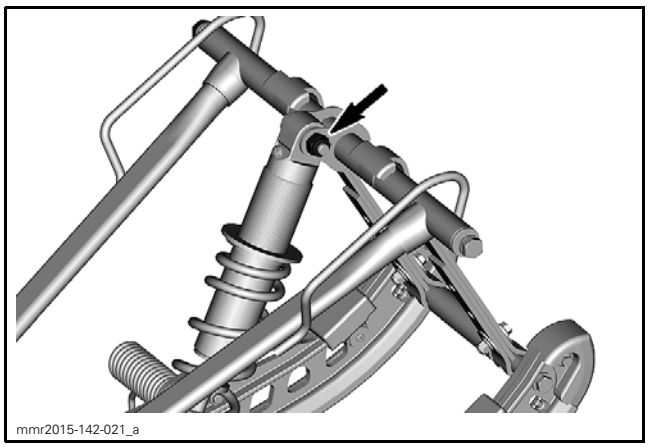
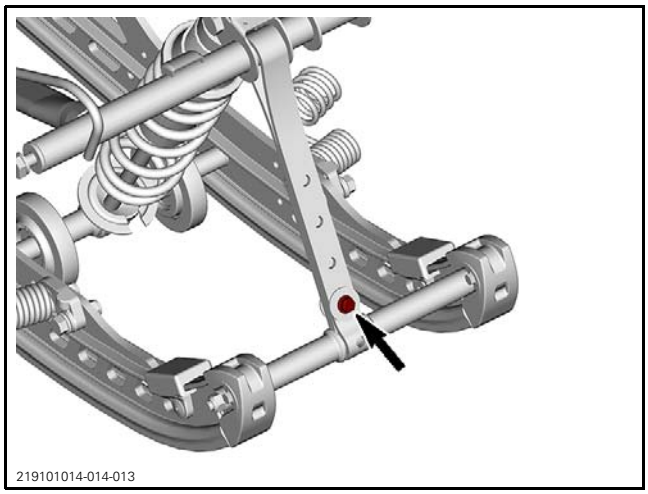
3. Remove the front arm lower bolt, nut and washers. Discard retaining nut.



4. Remove the shock absorber upper nut and bolt.

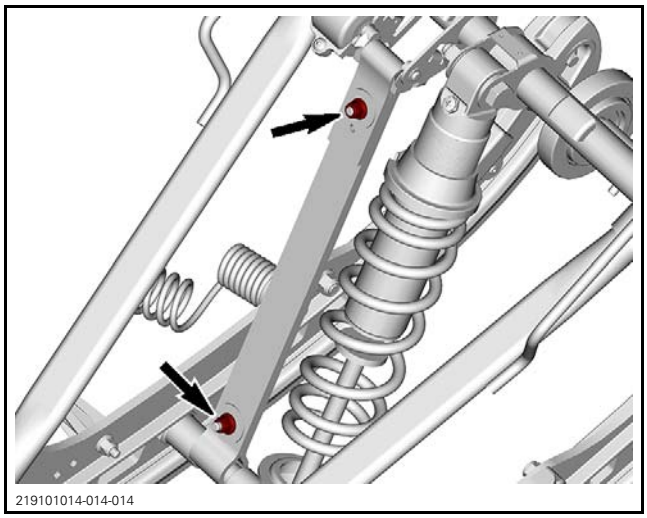


5. Unfasten stopper strap.



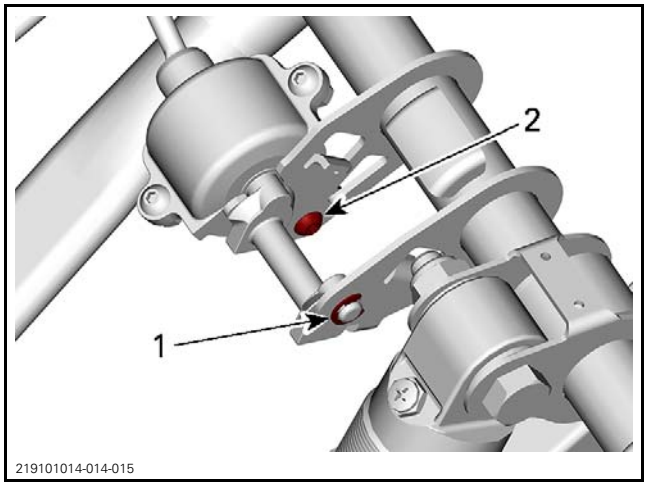
6. On Summit Expert models, proceed as follows.

6.1 Remove the adjustable stopper strap.



SUMMIT EXPERT MODELS ONLY

6.2 Remove the crankshaft.



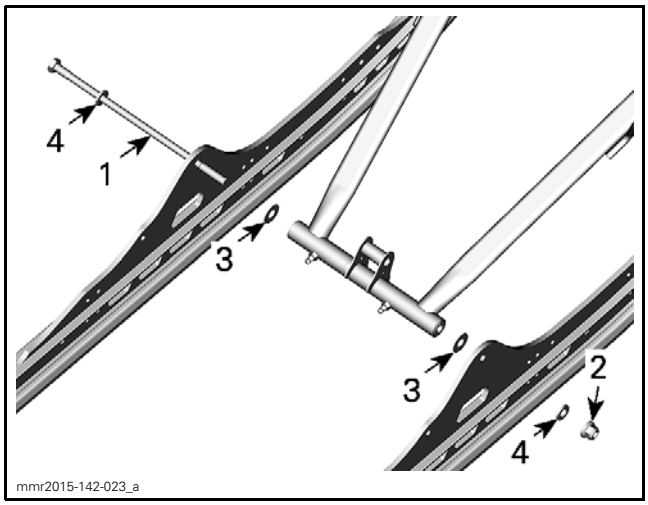
1. Remove circlip
2. Remove screw securing the crankshaft to the front arm

7. Remove front arm.

Installing Front Arm

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

1. Install new nuts.
2. Install new front arm upper bolts.



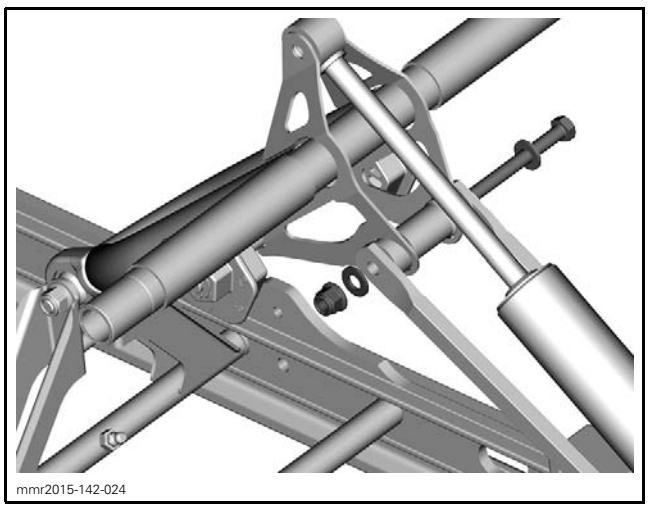
1. *Front arm lower bolt*
2. *Nut*
3. *Spacer washers*
4. *Washers*

3. See front arm exploded view for proper tightening torque.

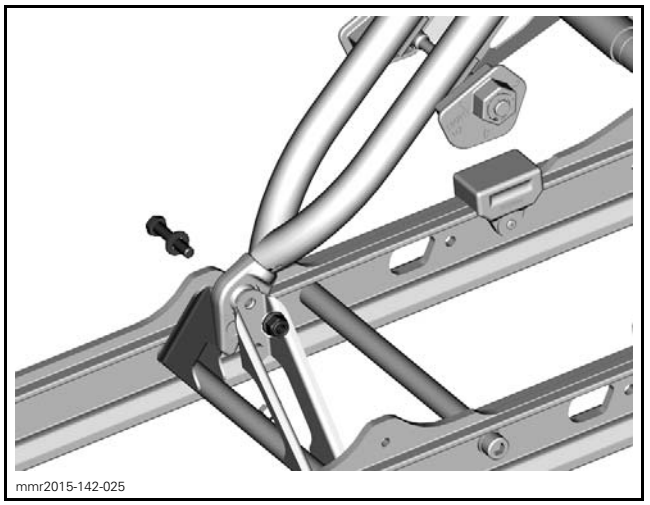
REAR ARM

Removing Rear Arm

1. Lift rear of vehicle and support it off the ground.
2. Completely loosen track tension.
3. Proceed with *REMOVING REAR SPRINGS*, see procedure in this subsection.
4. Remove the rear shock absorber upper bolt and nut.
5. Remove nut and bolt securing throttle rods to rear arm.



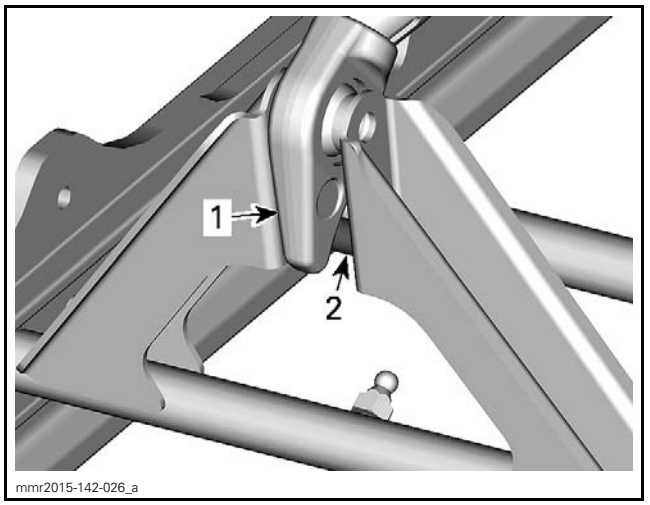
6. Remove bolt, nut and washer holding rear arm to pivot arm.



Installing Rear Arm

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

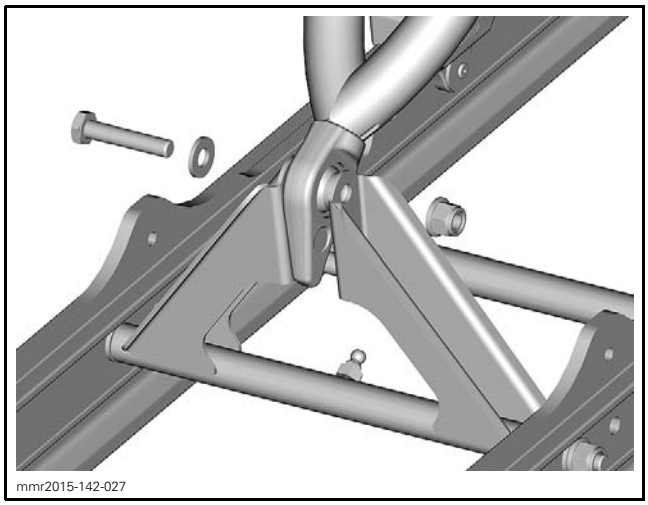
1. At installation, rear arm stroke limiter must be at rear.

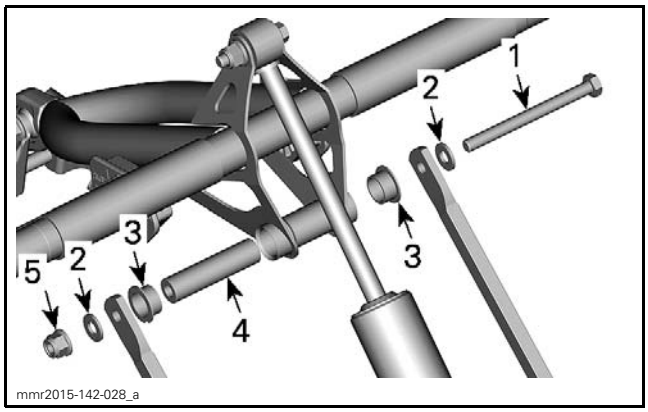


1. *Rear arm stroke limiter*
2. *Pivot arm stroke limiter*

2. Install new nuts and tighten to specifications. Refer to appropriate exploded view.

Assemble rear arm fasteners as per following illustrations.


mmr2015-142-027



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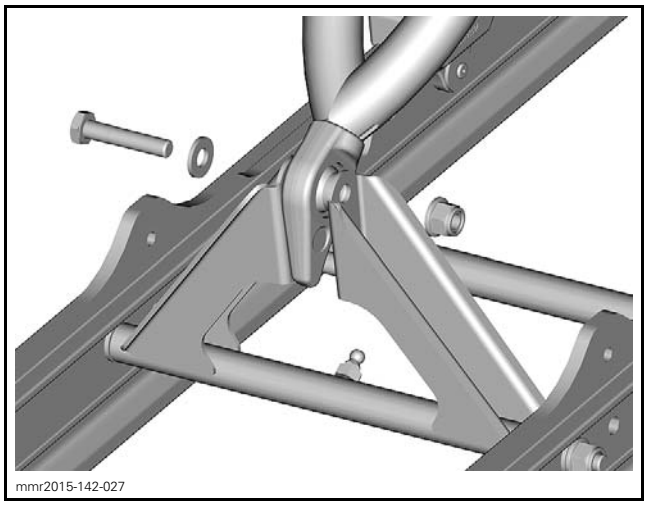
SOME PARTS REMOVED FOR CLARITY PURPOSES
1. *Throttle rod upper bolt*
2. *Washers*
3. *Bushings*
4. *Axle*
5. *Throttle rod upper nut*

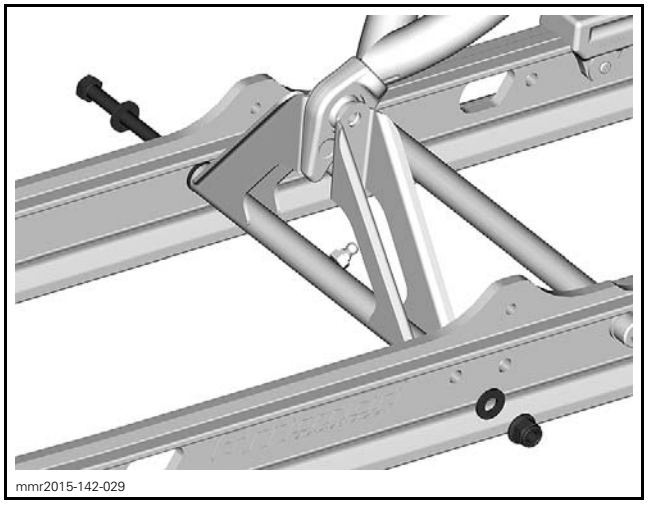
PIVOT ARM

Removing Pivot Arm

1. Lift rear of vehicle and support it off the ground.
2. Completely loosen track tension by unscrewing both adjustment screws.
3. Remove bolt, nut and washer retaining rear arm to pivot arm.


mmr2015-142-027

4. Remove bolt, nut and 4 washers retaining pivot arm to runners.


mmr2015-142-029

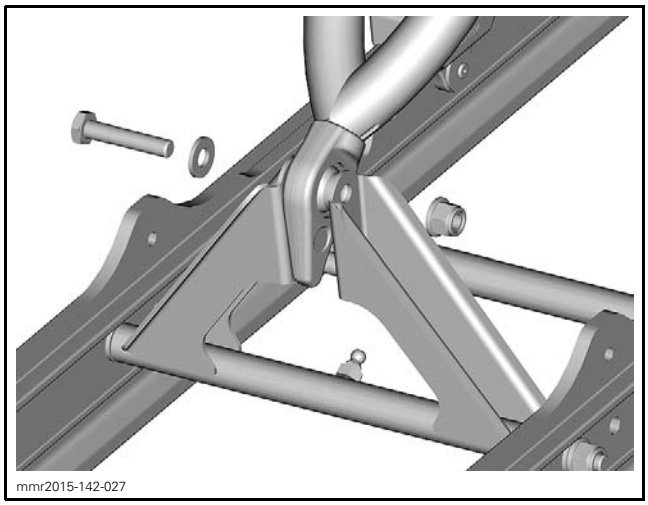
NOTE: Make sure inner washers are properly removed from assembly to avoid losing them.

5. Carefully remove pivot arm from rear arm.

Installing Pivot Arm

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

Assemble pivot arm fasteners as per following illustrations, with grease fitting towards front of vehicle.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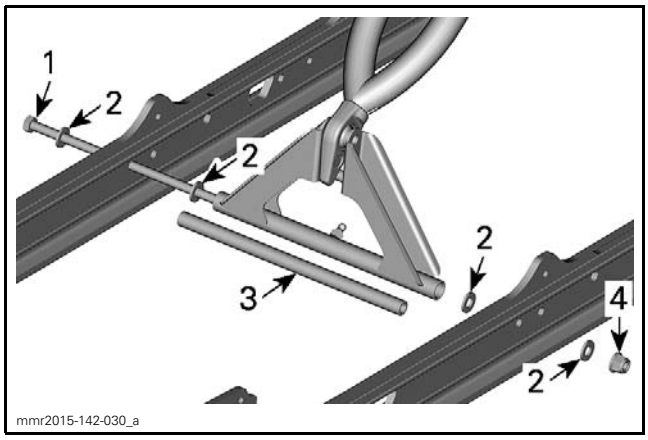

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PARTS REMOVED FOR CLARITY PURPOSE
1. *Pivot arm lower screw*
2. *Washers*
3. *Axle*
4. *Pivot arm nut*

Tighten pivot arm nuts to specification. Refer to appropriate exploded view.

Lubricate pivot arm. Refer to *MAINTENANCE* in this subsection.

STOPPER STRAP

Refer to the exploded views at the beginning of this subsection for parts layout and fasteners tightening torque.

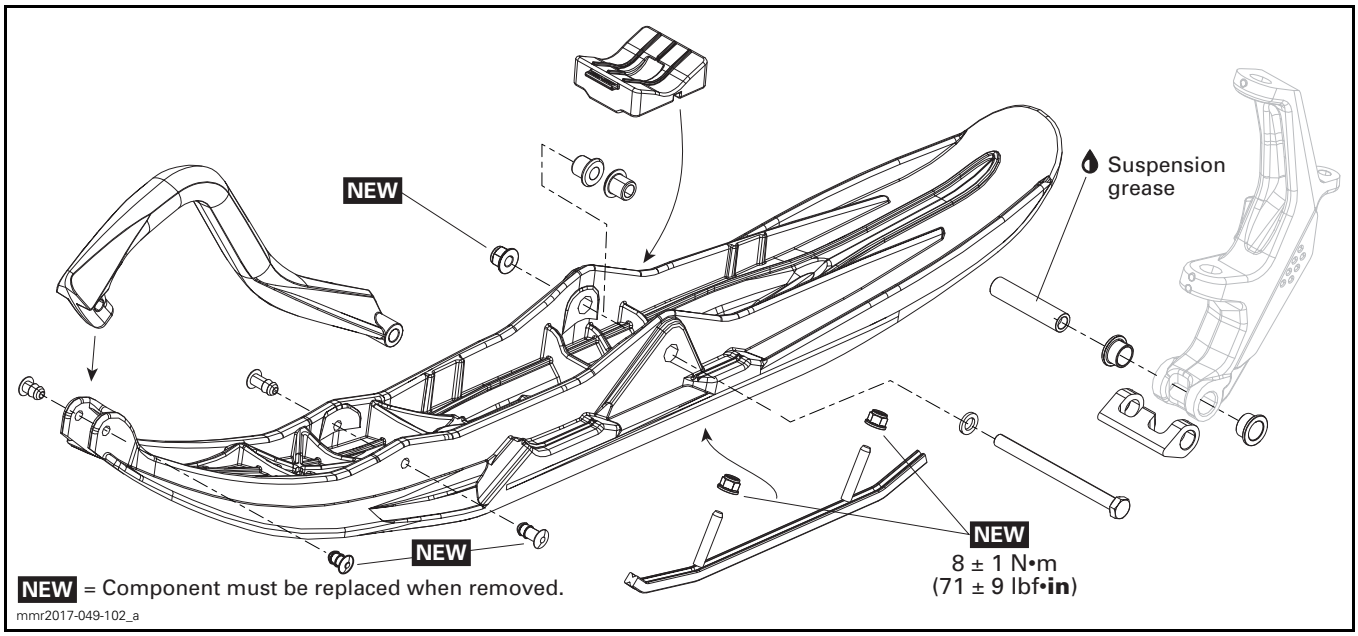
STEERING SYSTEM

SERVICE PRODUCTS

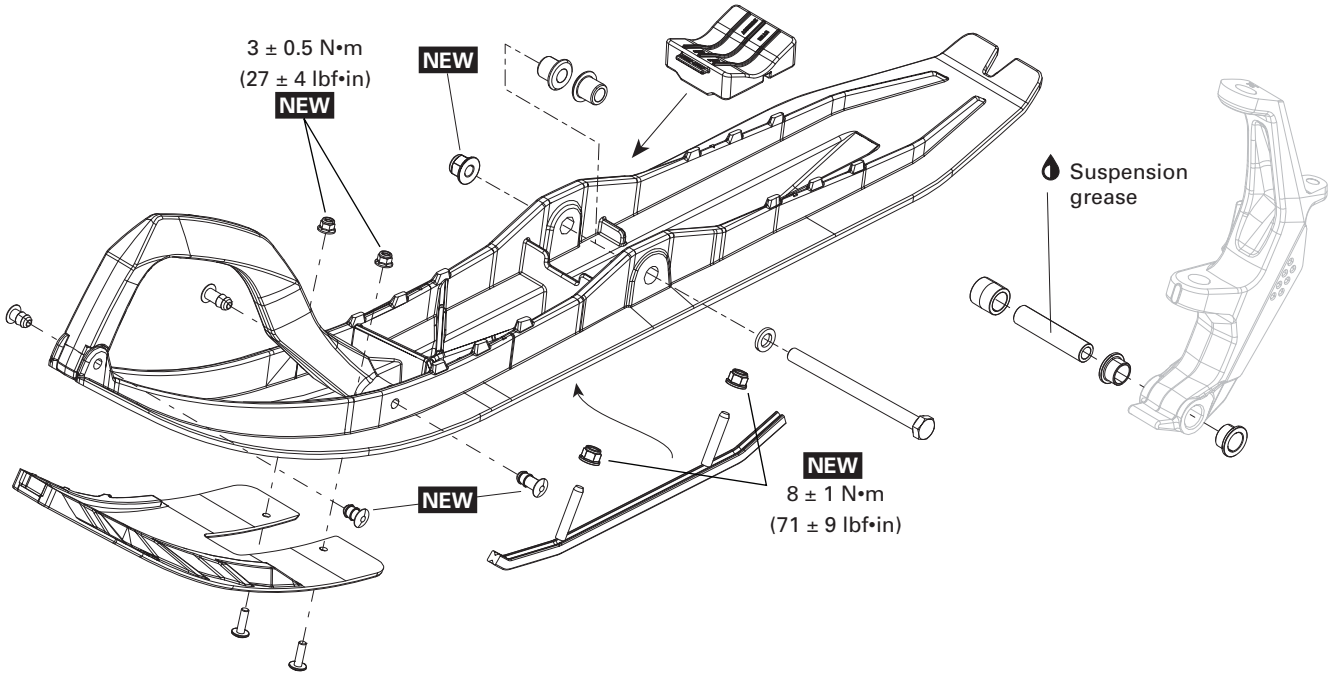
Description	Part Number	Page
SYNTHETIC GREASE	779162	13
SYNTHETIC SUSPENSION GREASE	779163	9, 26
XPS BRAKES AND PARTS CLEANER (USA)	219 701 705	12
XPS BRAKES AND PARTS CLEANER	219 701 776	12

SKIS (WITHOUT ADJUSTABLE RUNNER)

Trail and Crossover Models



Mountain Models



NEW = Component must be replaced when removed.

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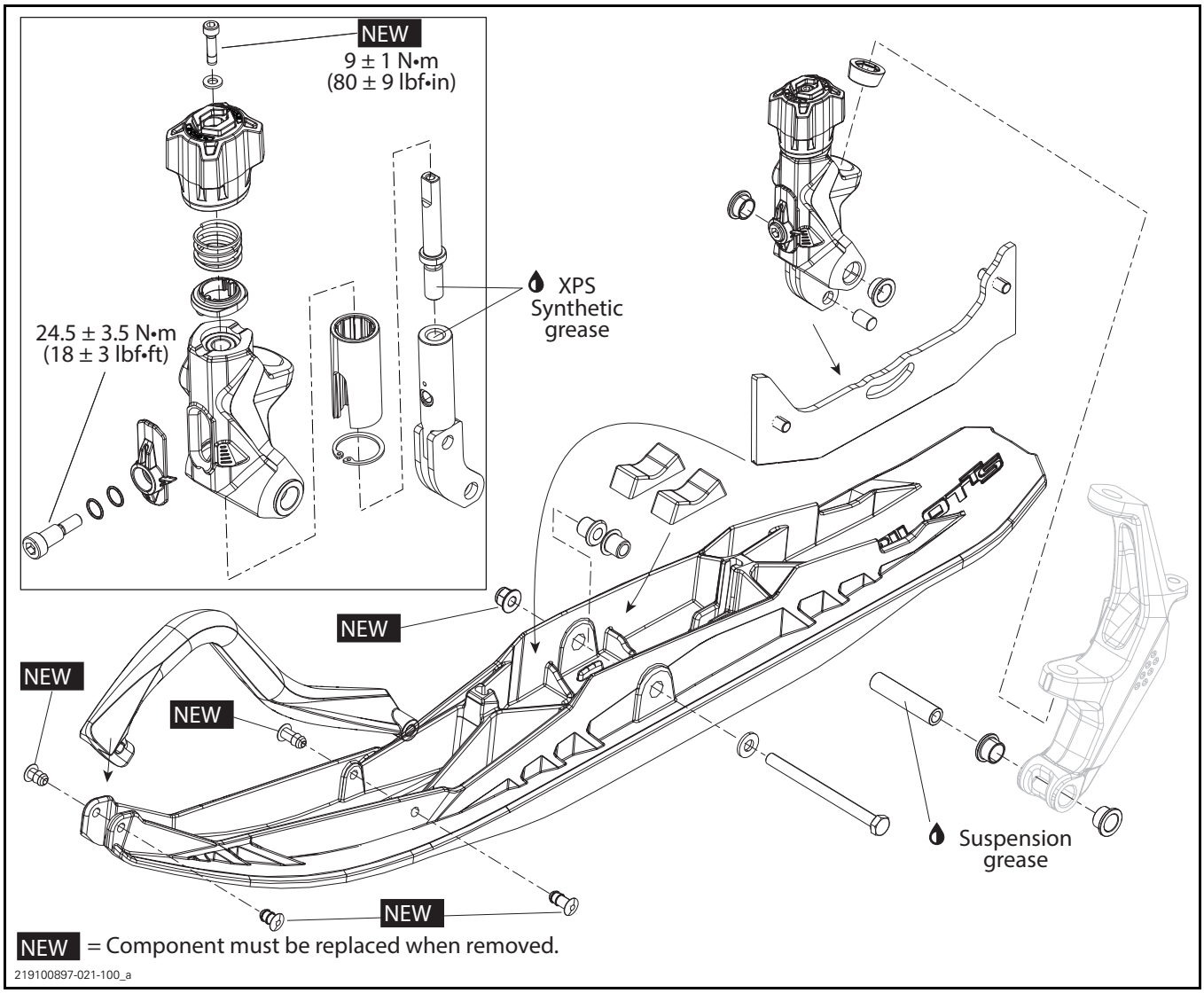
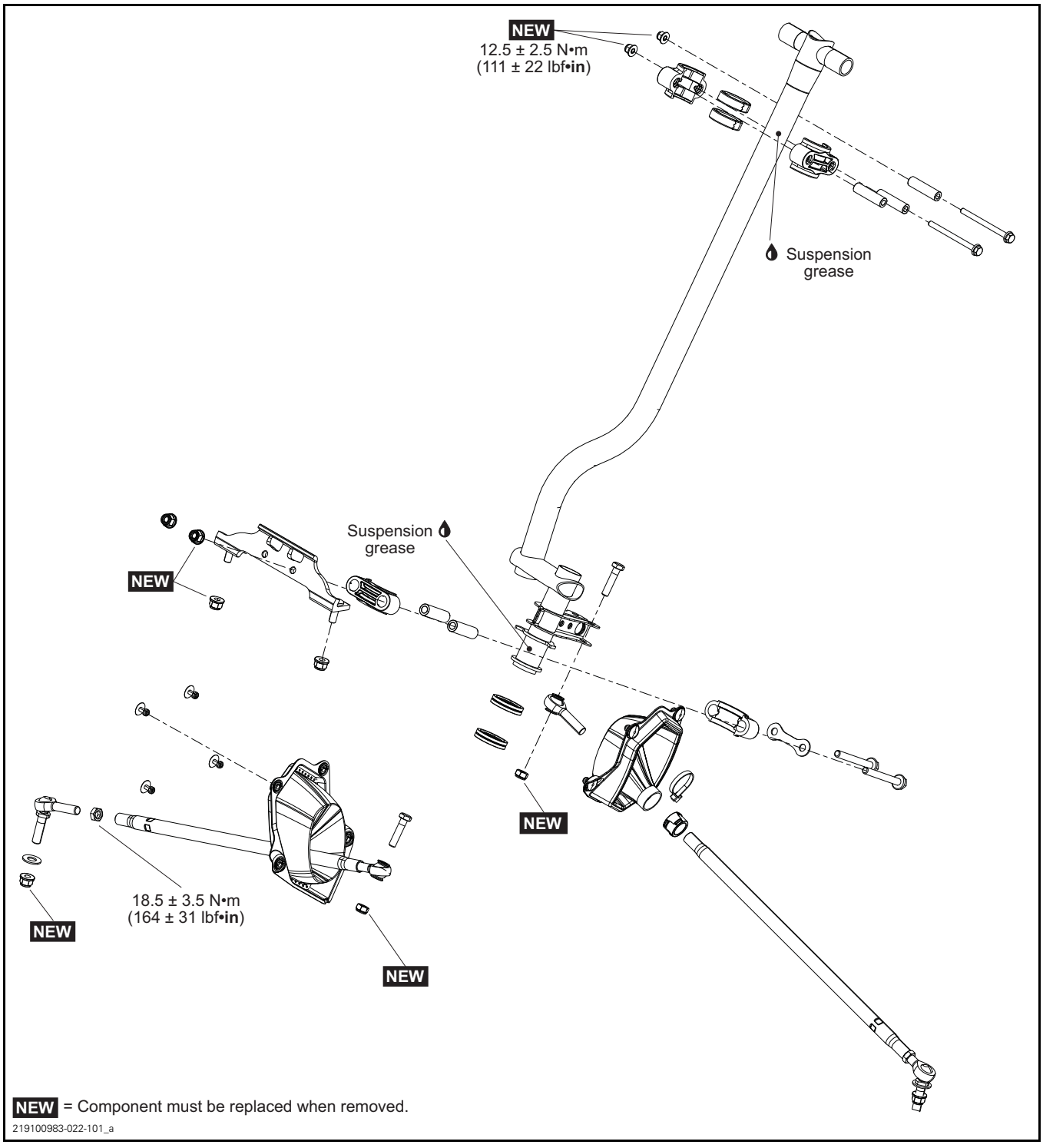
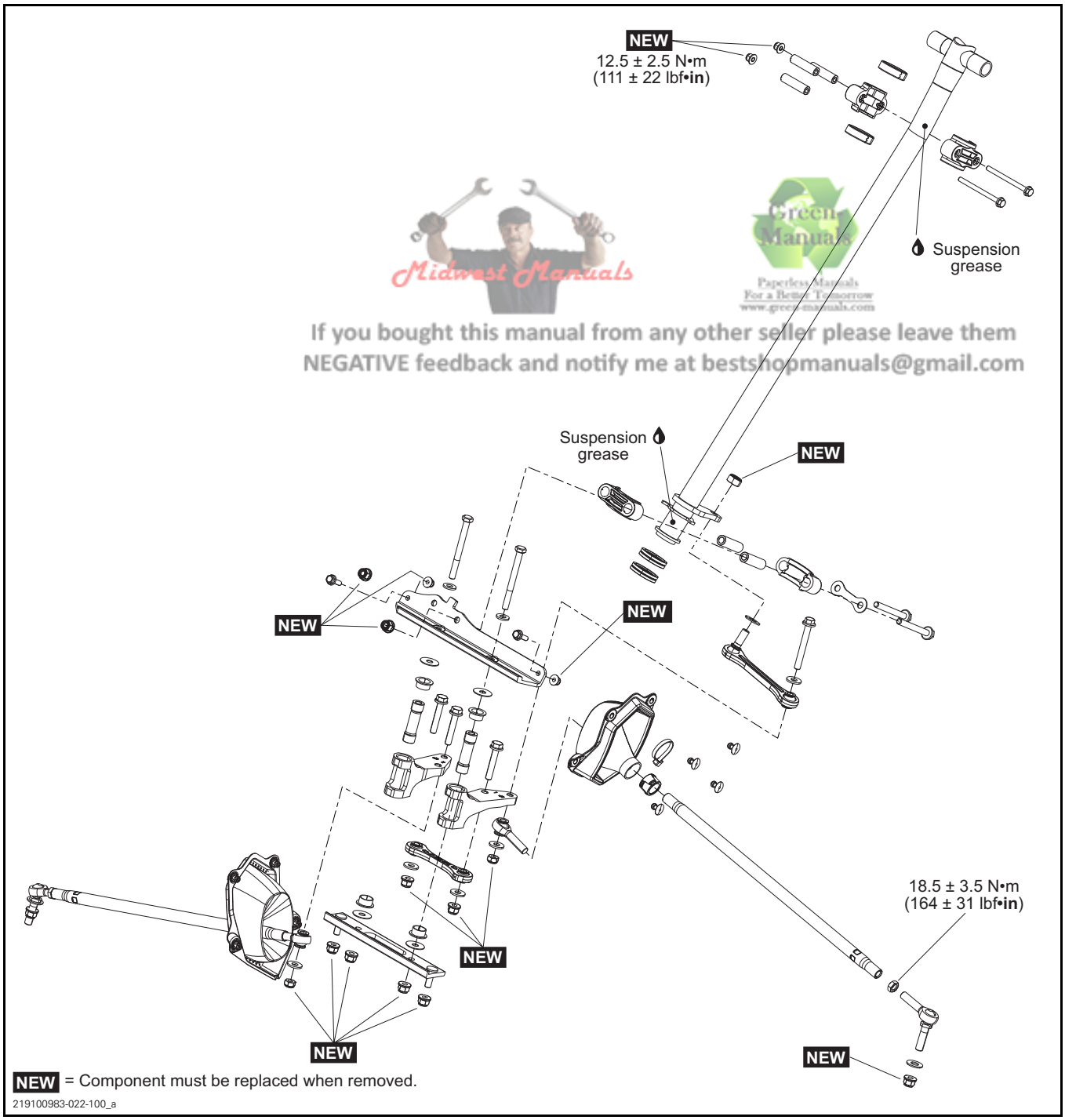
SKIS (WITH ADJUSTABLE RUNNER)



STEERING COLUMN AND TIE-RODS - PITMAN ARM



STEERING COLUMN AND TIE-RODS - RACK



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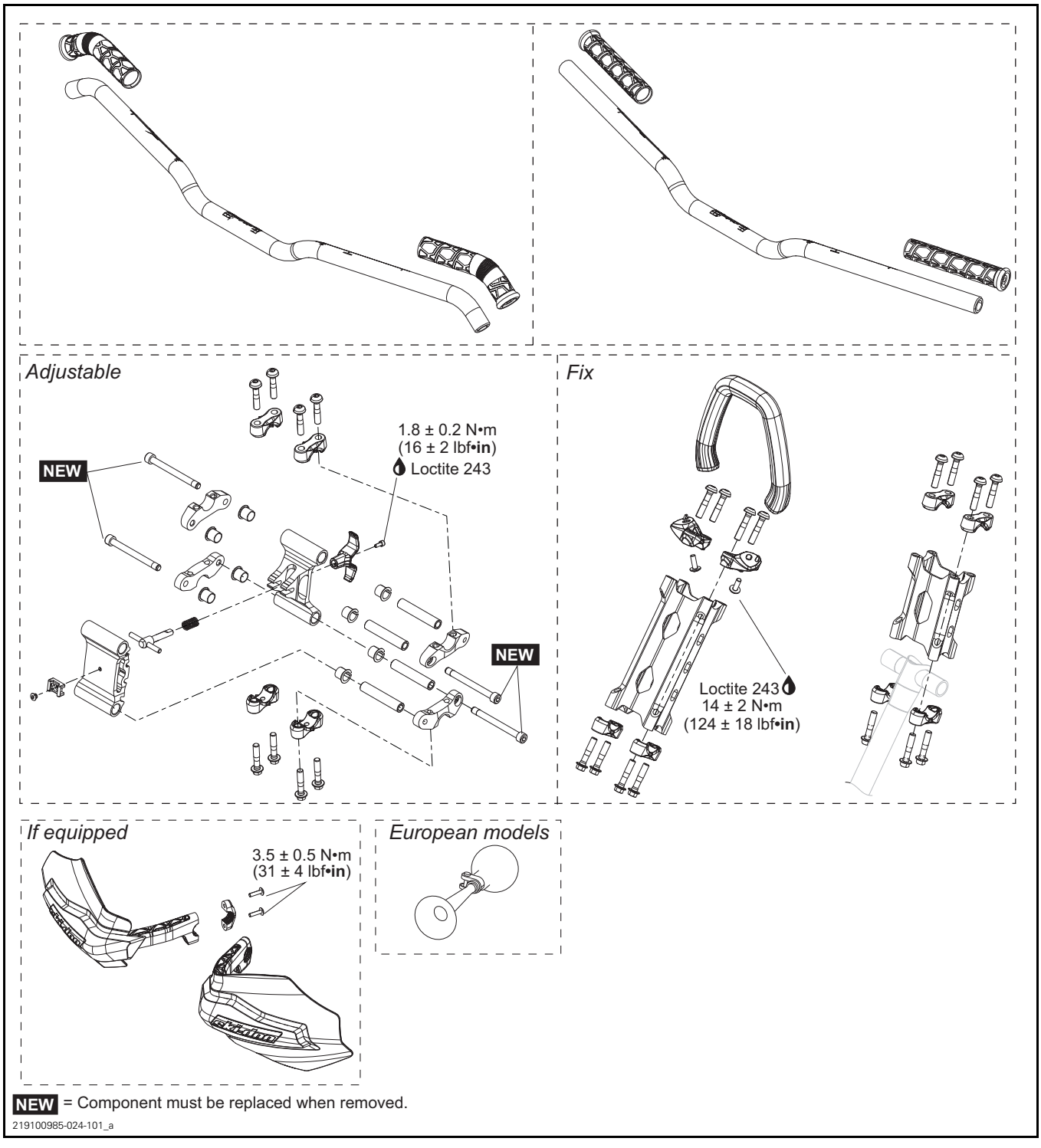
HANDLEBAR



NEW = Component must be replaced when removed.

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GENERAL

When removing or replacing a part of the steering mechanism, perform the steering alignment, refer to *ALIGNING THE STEERING* in this subsection.

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

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

⚠ WARNING

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

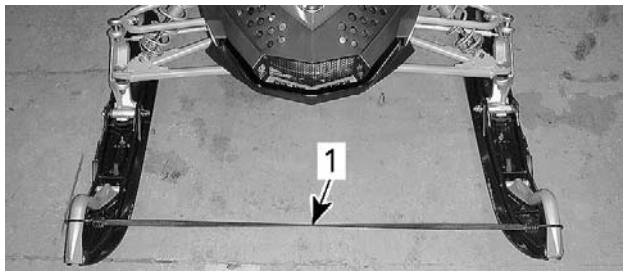
NOTICE **Hoses, cables and locking ties removed during a procedure must be reinstalled at the same location.**

ADJUSTMENT

ALIGNING THE STEERING

Ski alignment is performed by adjusting the length of left and right tie-rods.

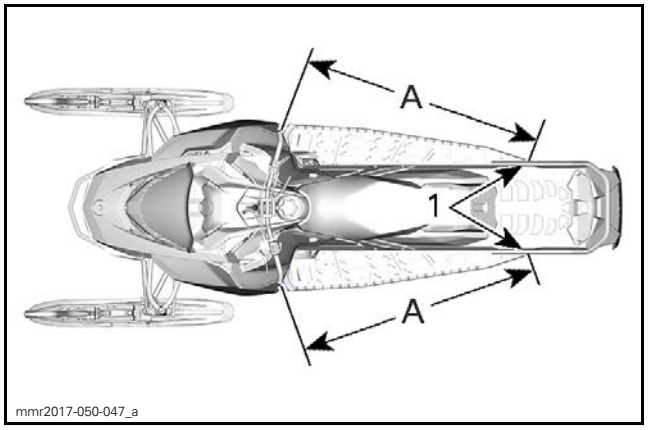
1. Leave the vehicle on the ground on its own weight.
2. Attach ski handles together with a bungee cord.



TYPICAL
1. Bungee cord

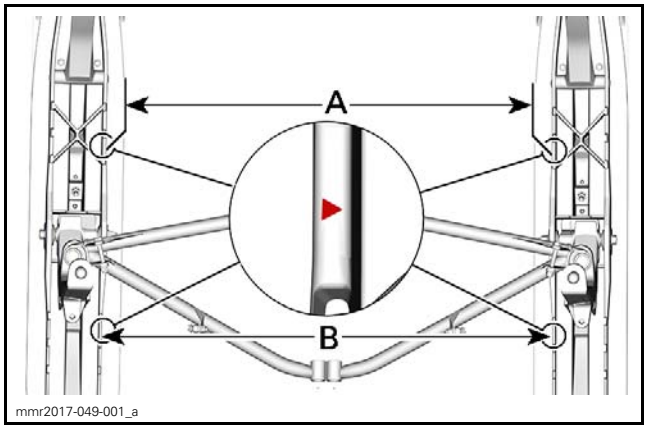
3. Position handlebar so that it is straight ahead position by measuring from the extremities of the grips to the rear most edge of the tunnel, as shown.

NOTE: The reference point must be the same to each side.



TYPICAL
1. Same reference point
A. Equal distance on each side

4. Ensure track is properly aligned.
5. Verify if skis are in straight-ahead position by placing a straight edge against track and measuring distance between front and rear ski bridges and straight edge.
6. With skis in straight ahead position, adjust the toe-out.
7. Measure the distance between front and rear ski bridges in line with arrows on skis.
8. Use the following illustration and this equation to determine the steering adjustment.



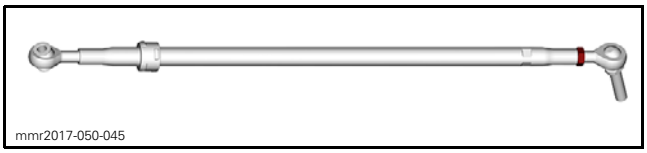
STEERING ALIGNMENT	
Toe-out	A – B = 5 mm (.197 in)

9. If adjustment is needed, loosen tie-rod jam nuts then turn tie-rods to change their length.

NOTE: There is no jam nut on the inner tie-rods.

10. Tighten jam nuts to specification.

TIGHTENING TORQUE	
Jam nut	18.5 N•m ± 3.5 N•m (164 lbf•**in** ± 31 lbf•**in**)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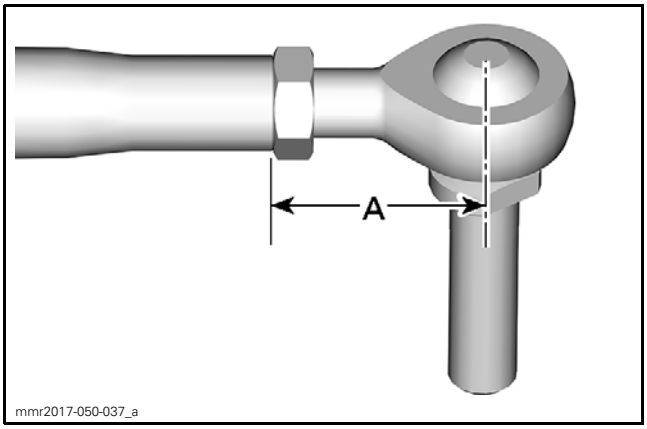
⚠ WARNING

The maximum tie-rod end length (A) not engaged in the tie rod must not exceed 34 mm (1.339 in).



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INSPECTION

INSPECTING THE SKI AND RUNNER

Lift the front of vehicle and check ski runners for wear or damage (missing or broken carbide). Replace if necessary.

Inspect ski for excessive wear or other damage. Replace if necessary.

Refer to *ADJUSTABLE RUNNER MECHANISM* in this subsection for adjustable ski mechanism inspection.

INSPECTING THE STEERING MECHANISM

Visually inspect steering mechanism for tightness of components (steering arms, tie rods, ski bolts, ski legs, etc.).

PROCEDURES

SKI RUNNER

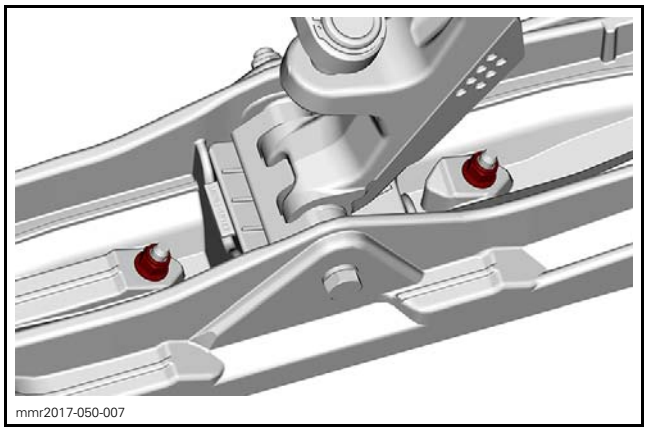
Inspecting the Ski Runner

Refer to *INSPECTION*.

Removing the Ski Runner

Ski Without Adjustable Runner

1. Lift the front of vehicle and support it off the ground.
2. Unscrew the ski runner nuts, then remove the ski runner.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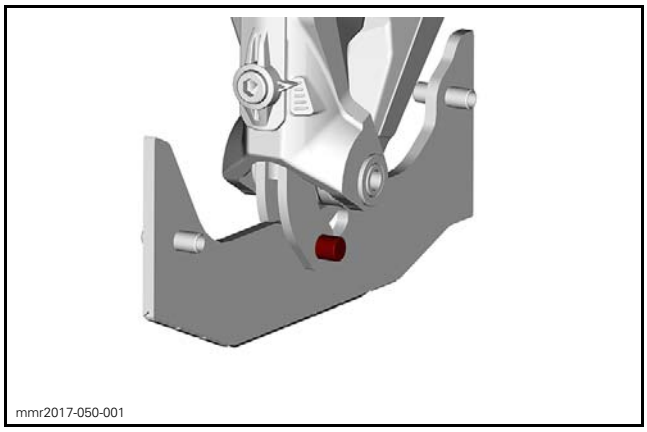
Ski With Adjustable Runner

1. Remove the ski.
2. Remove the pin.


mmr2017-050-001

Installing the Ski Runner

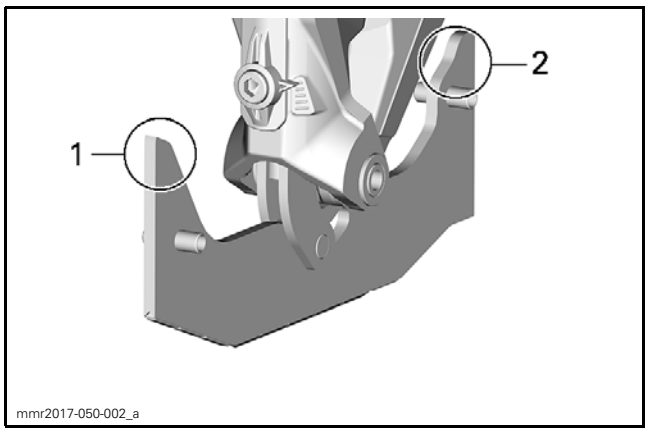
The installation is the reverse of the removal procedure. Pay attention to the following.

Ski Without Adjustable Runner

Tighten ski runner nuts to specification.

TIGHTENING TORQUE	
Runner nut	8 N•m ± 1 N•m (71 lbf•**in** ± 9 lbf•**in**)

Ski With Adjustable Runner



1. Towards front
2. Towards rear

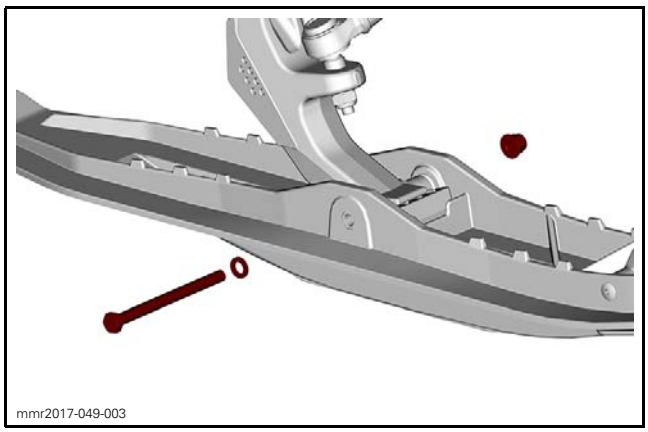
SKIS

Inspecting the Ski

Refer to *INSPECTION*.

Removing the Ski

1. Lift front of vehicle and support it off ground.
2. Unscrew nut then pull ski bolt out.

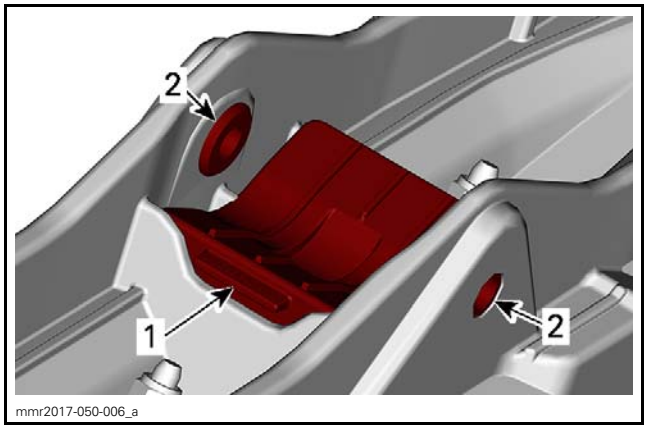


3. Remove ski from vehicle.

Installing the Ski - Without Adjustable Runner

Make sure bushings are installed in ski holes.

Install the ski stopper. Position indicator in front and make sure the bump in the ski is in the groove of the ski stopper.

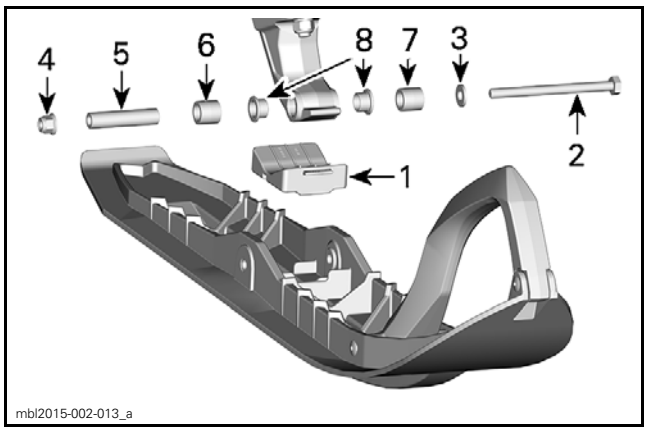


1. Ski stopper
2. Bushings

Apply grease on the ski axle.

SERVICE PRODUCT
SYNTHETIC SUSPENSION GREASE (P/N 779163)

Mountain Models

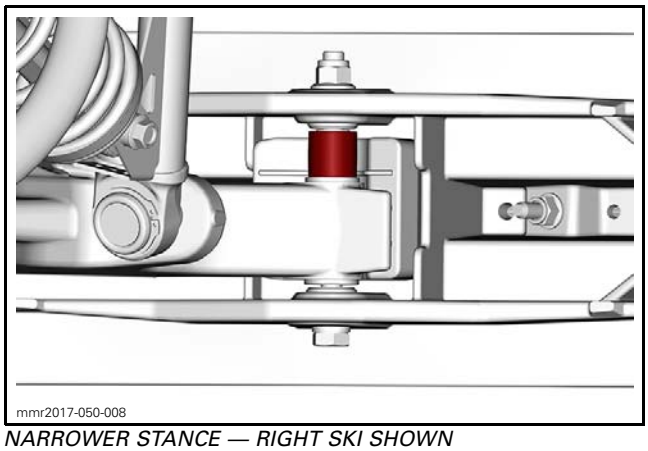


LH SIDE SHOWN
1. Ski stopper
2. M10 x 130 screw
3. M10 flat washer
4. M10 flanged nut
5. Ski axel
6. Narrow adjustment
7. Wide adjustment

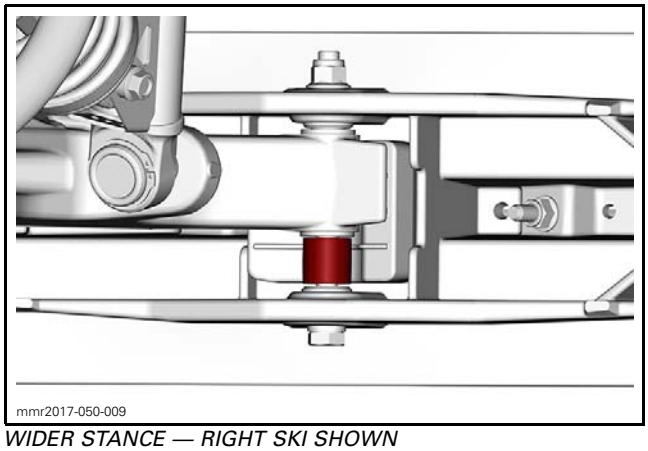
Install the spacer inside for the narrower stance and outside for the wider stance.

⚠ WARNING

Proceed to the same setting for both skis.



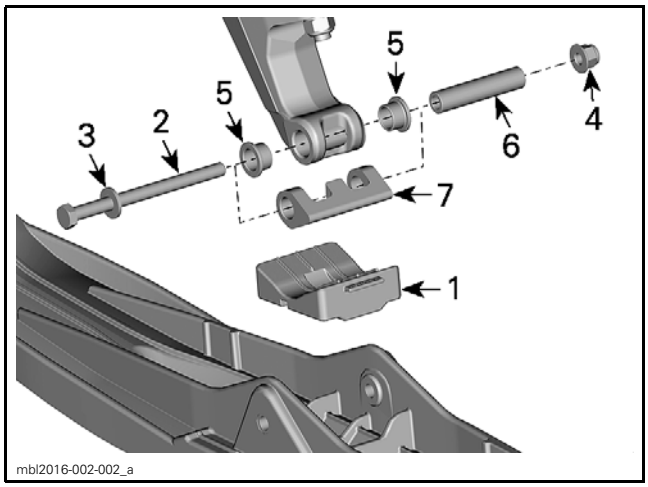
NARROWER STANCE — RIGHT SKI SHOWN



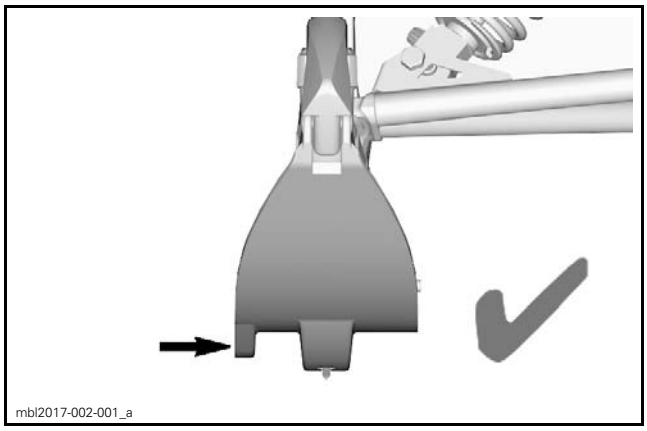
WIDER STANCE — RIGHT SKI SHOWN

Trail and Crossover Models

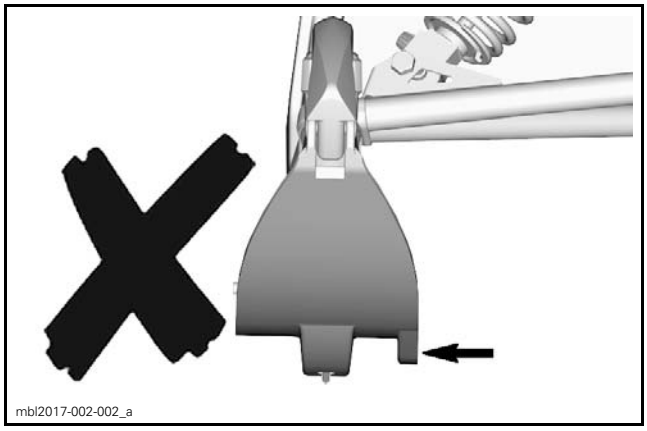
Install ski on ski leg as per the following illustrations.



1. *Ski stopper*
2. *M10 x 130 screw*
3. *M10 flat washer*
4. *M10 flanged nut*
5. *Ski leg bushings*
6. *Ski Axle*
7. *Ski leg stopper*



LATERAL SKI KEEL TOWARDS OUTSIDE (IF EQUIPPED) - CORRECT



LATERAL SKI KEEL TOWARDS INSIDE (IF EQUIPPED) - NOT CORRECT

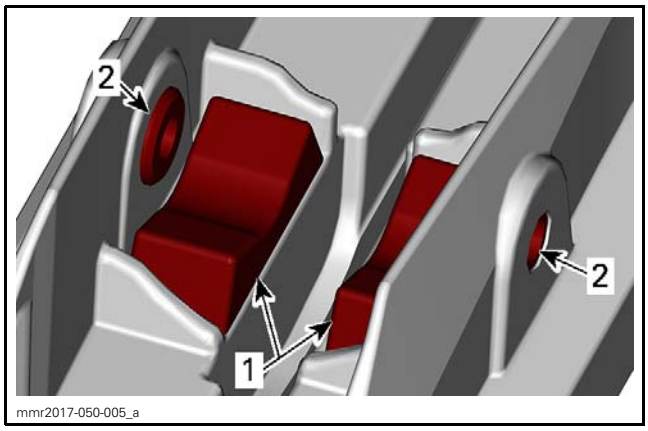
All Models

TIGHTENING TORQUE	
Ski nut	48 N•m ± 6 N•m (35 lbf•ft ± 4 lbf•ft)

Installing the Ski With Adjustable Runner

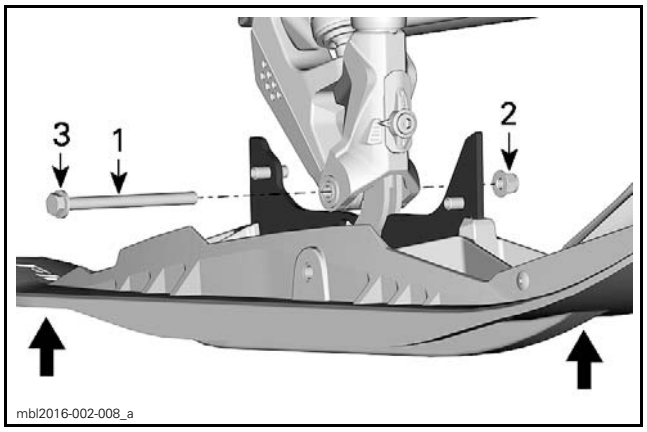
Make sure bushings are installed in ski holes.

Install the ski stopper.

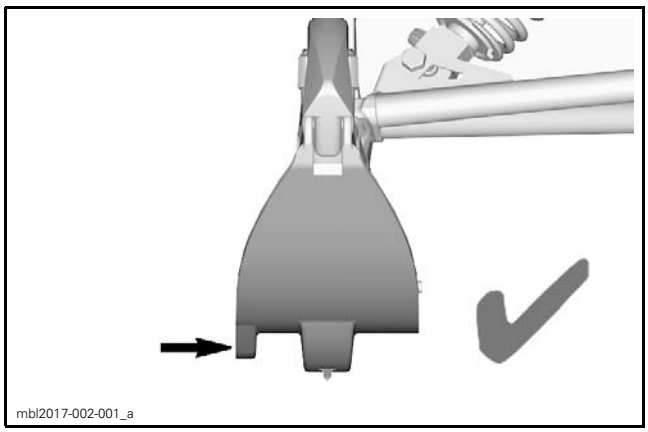


1. *Ski stopper*
2. *Bushings*

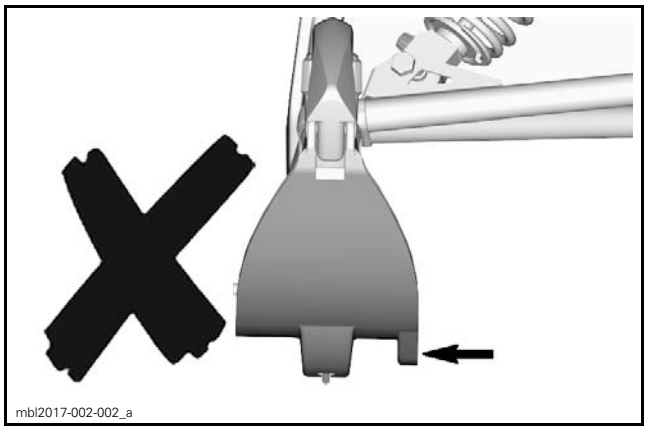
Install ski on ski leg as per the following illustrations.



1. *Ski screw*
2. *Nut*
3. *Washer*



LATERAL SKI KEEL TOWARDS OUTSIDE (IF EQUIPPED) - CORRECT



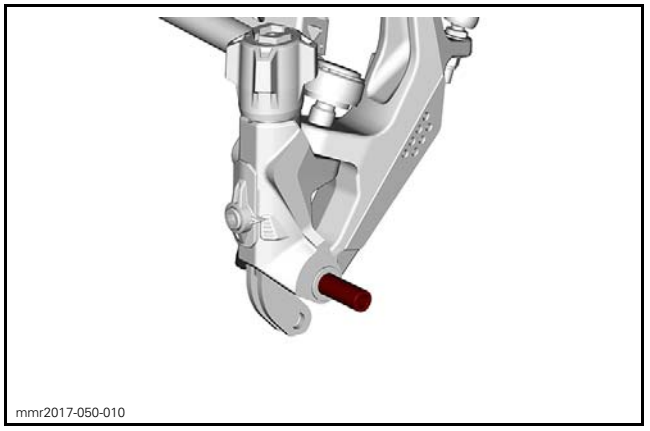
LATERAL SKI KEEL TOWARDS INSIDE (IF EQUIPPED) - NOT CORRECT

TIGHTENING TORQUE	
Ski nut	48 N•m ± 6 N•m (35 lbf•ft ± 4 lbf•ft)

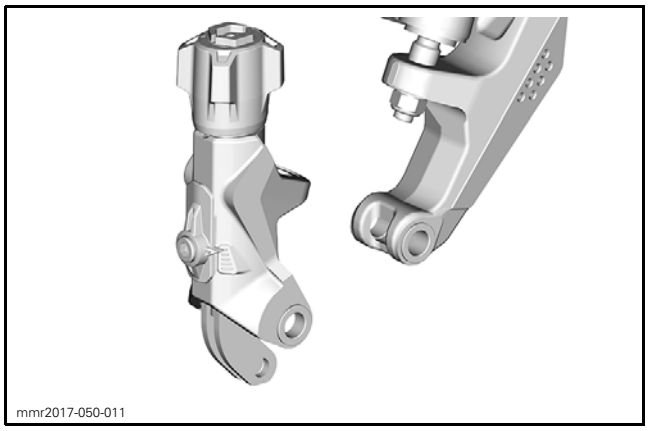
ADJUSTABLE RUNNER MECHANISM

Removing the Adjustable Runner Mechanism

1. Remove the ski and the runner.
2. Slide the sleeve out of the ski leg.



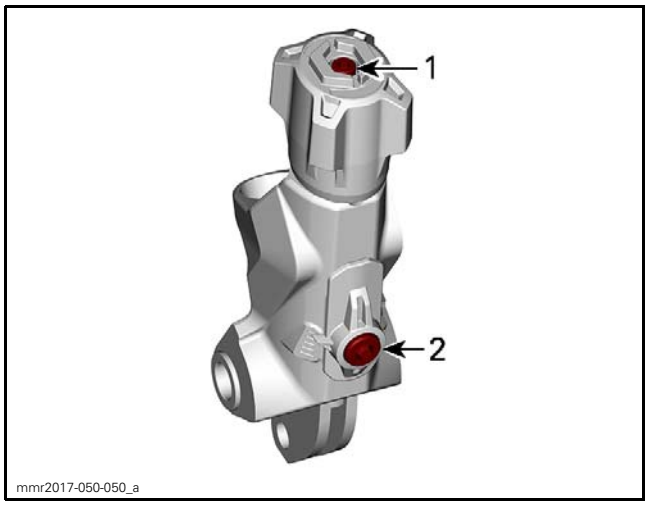
3. Remove the mechanism from the ski leg.


mmr2017-050-011

Disassembling the Adjustable Runner Mechanism

1. Remove the adjusting knob and the indicator screws.

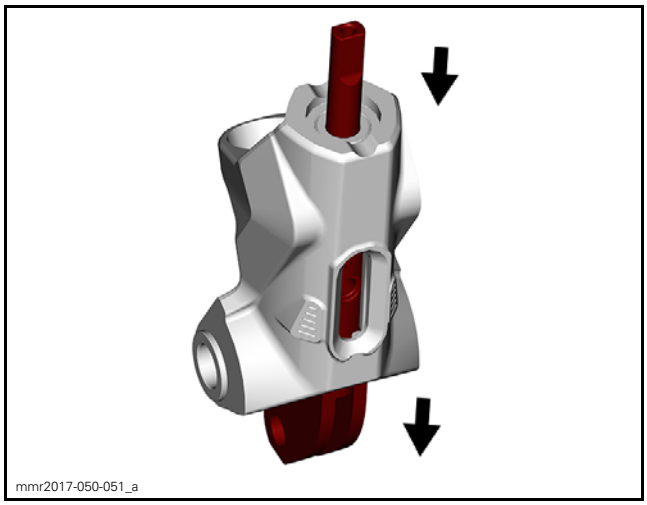
NOTE: There are two O-rings on the indicator screw.



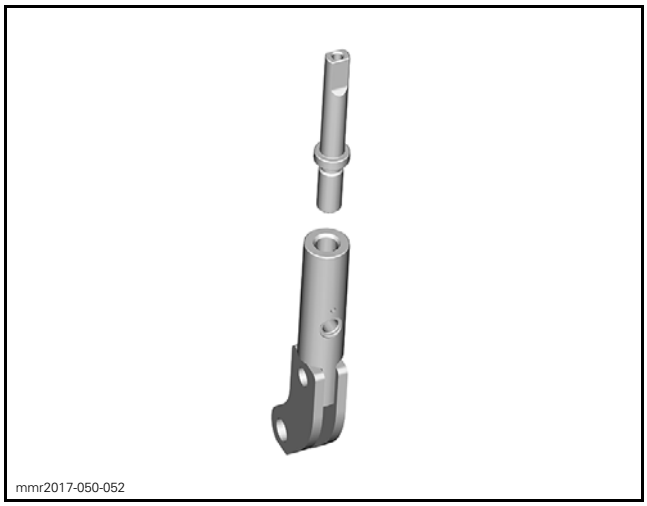
mmr2017-050-050_a

1. Adjusting knob screw
2. Indicator screw

2. Slide the adjusting screw and the adjusting shaft out of the body.

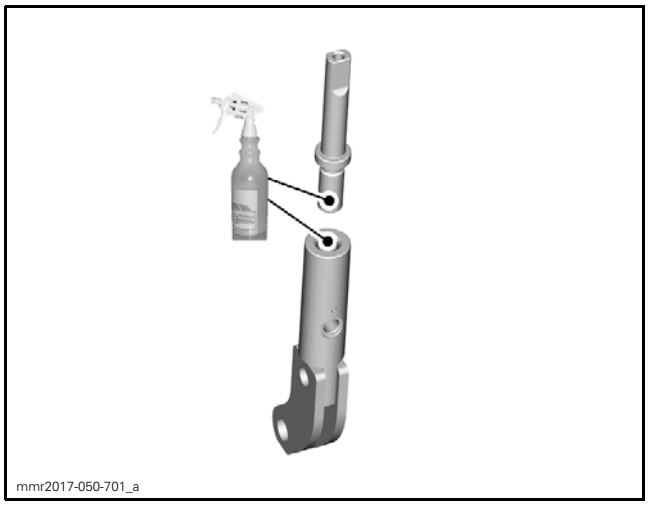

mmr2017-050-051_a

3. Remove the screw from the shaft.

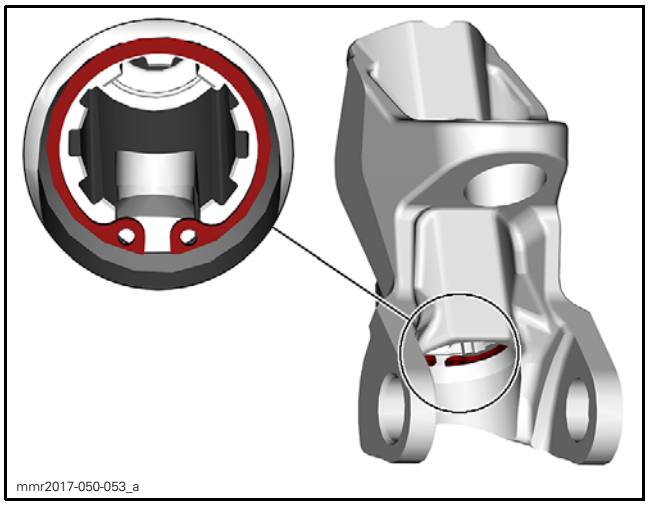

mmr2017-050-052

4. Clean the screw and the shaft inner threads with brake and parts cleaner and a small brush.

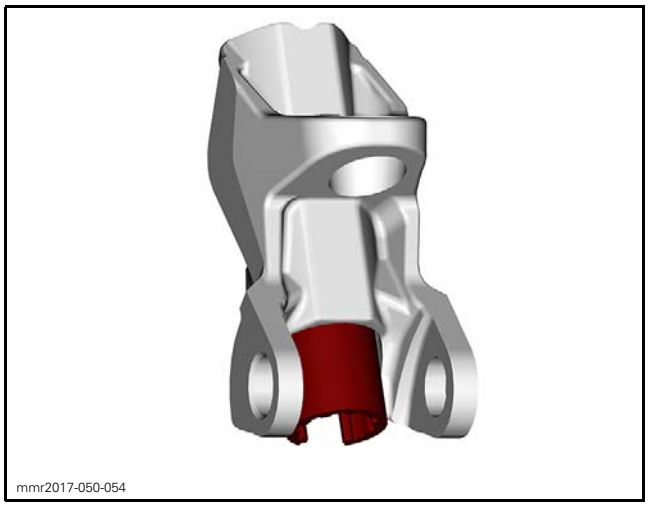
SERVICE PRODUCT
XPS BRAKES AND PARTS CLEANER (USA) (P/N 219 701 705) or XPS BRAKES AND PARTS CLEANER (P/N 219 701 776)


mmr2017-050-701_a

5. Remove the snap ring.


mmr2017-050-053_a

6. Slide the sleeve out of the body.


mmr2017-050-054

Inspecting the Adjustable Runner Mechanism

Inspect the mechanism body for cracks. Replace if required.

Inspect the adjusting screw and shaft for:
– Thread damages
– Bending.
Replace if required.

Inspect the sleeve for:
– Cracks
– Spline damages
Replace if required.

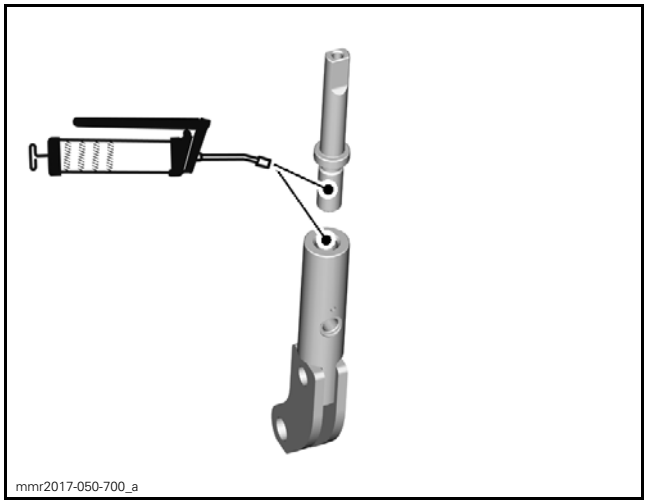
Inspect the ball bearing. It should turn freely and smoothly. If bearing needs to be replaced, replace the mechanism assembly.

Assembling the Adjustable Runner Mechanism

The assembly is the reverse of the disassembly procedure. However, pay attention to the following.

Apply grease on screw thread and shaft inner thread.

SERVICE PRODUCT
SYNTHETIC GREASE (P/N 779162)


mmr2017-050-700_a

Install a new knob screw.

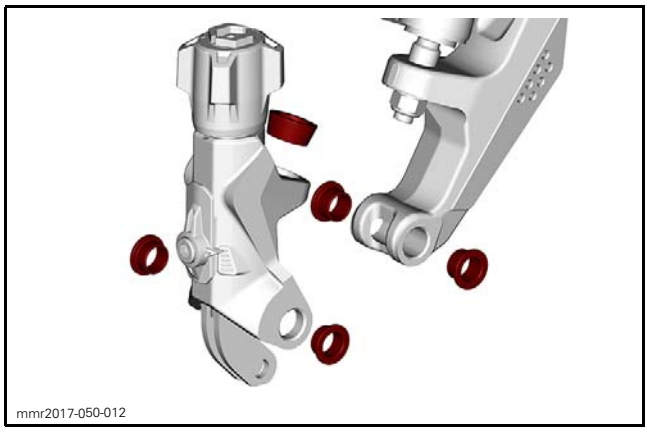
TIGHTENING TORQUE	
Adjusting knob screw	9 N•m ± 1 N•m (80 lbf•**in** ± 9 lbf•**in**)
Indicator screw	24.5 N•m ± 3.5 N•m (18 lbf•ft ± 3 lbf•ft)

Installing the Adjustable Runner Mechanism

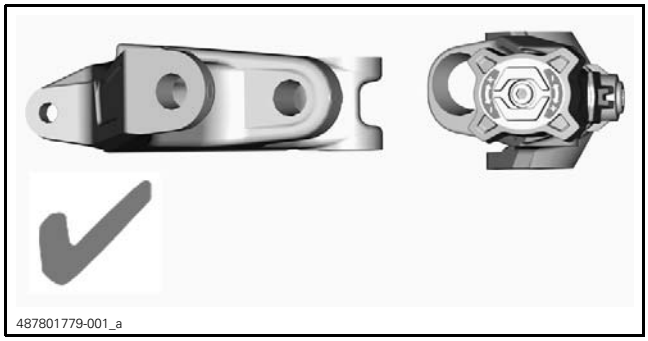
The installation is the reverse of the removing procedure. However, pay attention to the following.

Install rubber grommet on nut first. Align flat against flat.

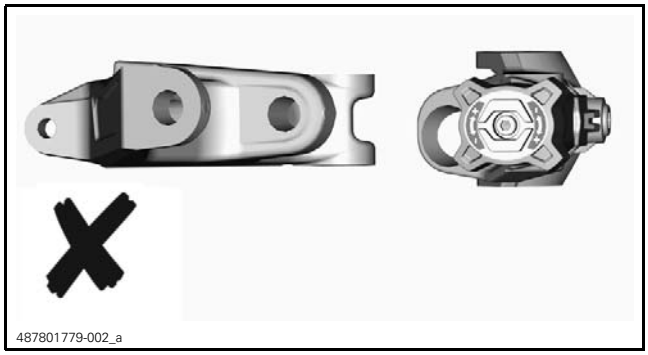
Ensure all bushings, and the grommet are in place and fully seated.



The mechanism is offset and has to be installed on the correct side.



RH SIDE SHOWN



RH SIDE SHOWN

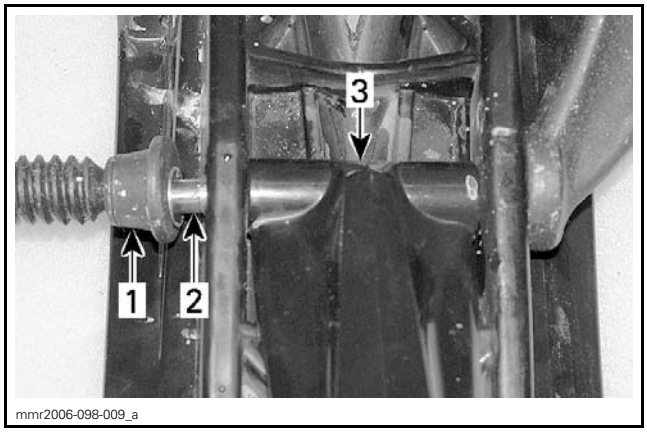
SKI HANDLES

Removing the Ski Handle

1. Remove ski from vehicle.
2. Using a 9 mm (3/8 in) drill bit, remove ski handle rivets. Only drill the head of rivet. Do not try to drill all the way through the rivet. Angle the drill bit to reduce the chance of spinning the rivet in the ski.
3. Remove handle from ski.
4. Place handle in hot water for 10 minutes then using a punch, drive the inner part of rivet out of handle.

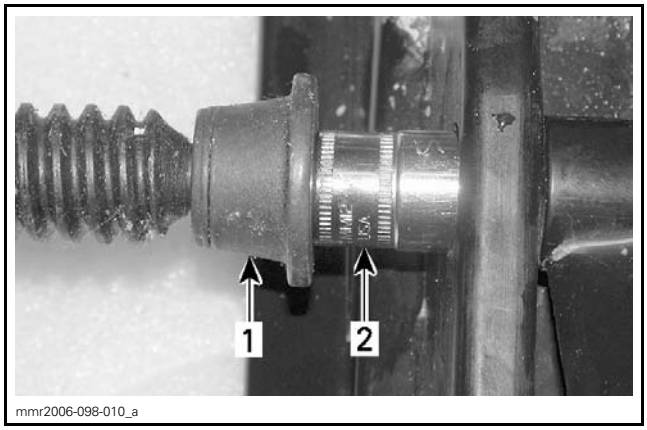
Installing the Ski Handle

1. To install rivets, use a C-clamp and a short 10 mm socket.
2. Place a rivet in position and insert it into ski and ski handle. Repeat the procedure for the other side.



1. C-clamp
2. Rivet
3. Handle

3. When both rivets are installed, use the short 10 mm socket to push rivet heads against the ski.



1. C-clamp
2. 10 mm socket

SKI FLOTATION EXTENSION (MOUNTAIN MODELS)

Condition Utilization

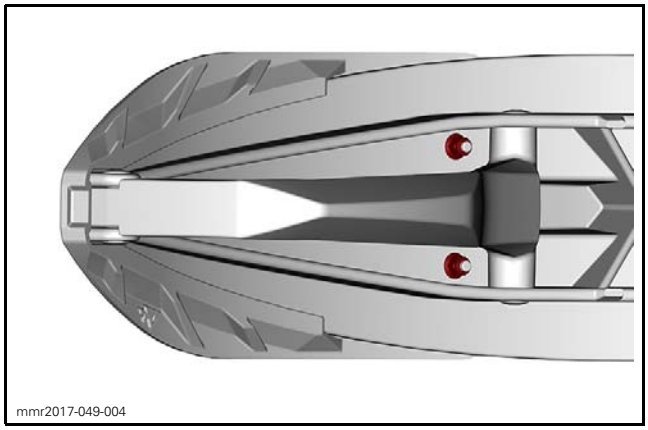
The key to the adjustable nose is to reduce the tip-hop that can slow down the vehicle.

In snow conditions with less than 41 cm (16 in) of fresh powder, specially when there is a crust, the narrow tip stays in the snow - which helps to maintain a carve. Also, when side hilling, and crossing a snowmobile rut, the narrow shape moves the impact point - where a change in snow density acts to tip-up the ski - more towards the spindle. This reduces kick back by 50% compared to the wider configuration, minimizing its impact on the attitude of the snowmobile holding a side hill.

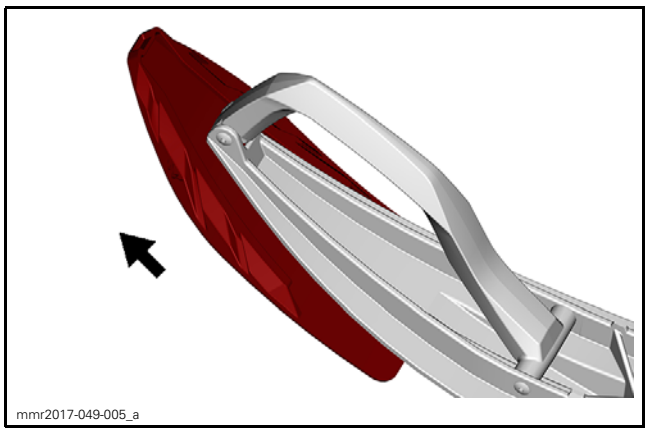
In snow conditions with more than 41 cm (16 in) of fresh powder, the wider tip configuration is desirable, as it increases flotation and will bring the nose of the snowmobile up.

Removing the Ski Flotation Extension

1. Remove nuts and screws securing the extension to ski.


mmr2017-049-004

2. Slide the extension off the ski.


mmr2017-049-005_a

Installing the Ski Flotation Extension

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

1. Install extension nuts towards up and tighten to specification.

TIGHTENING TORQUE	
Extension nuts	3 N•m ± 0.5 N•m (27 lbf•**in** ± 4 lbf•**in**)

SKI LEG

To replace a ski leg, refer to *FRONT SUSPENSION* subsection.

HANDLEBAR GRIP

To verify or replace heating elements, refer to *ACCESSORIES* subsection.

Removing the Handlebar Grip

Remove grips by pulling while using compressed air, which will inflate or loosen the fit between the grip and handlebar.

mmr2015-143-007

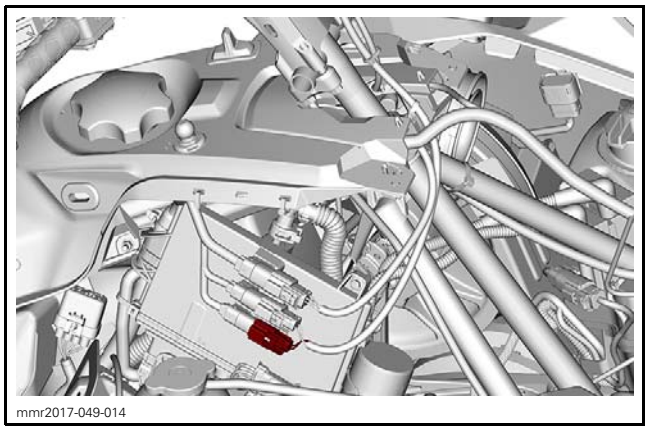
Installing the Handlebar Grip

Insert the handlebar grip on handlebar while blowing compressed air to inflate or loosen the fit between grip and handlebar.

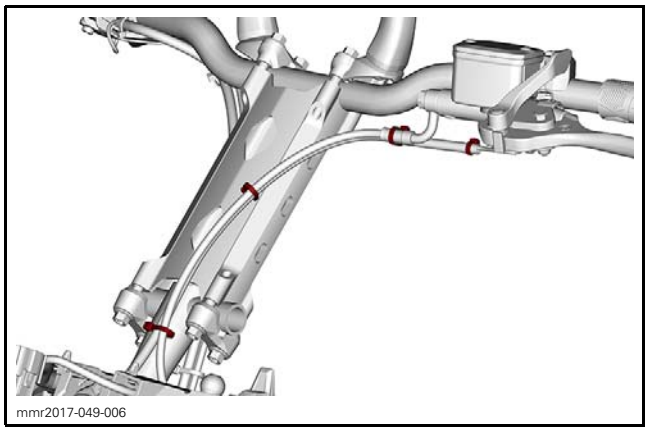
MULTIFUNCTION SWITCH

Removing the Multifunction Switch (Mountain models)

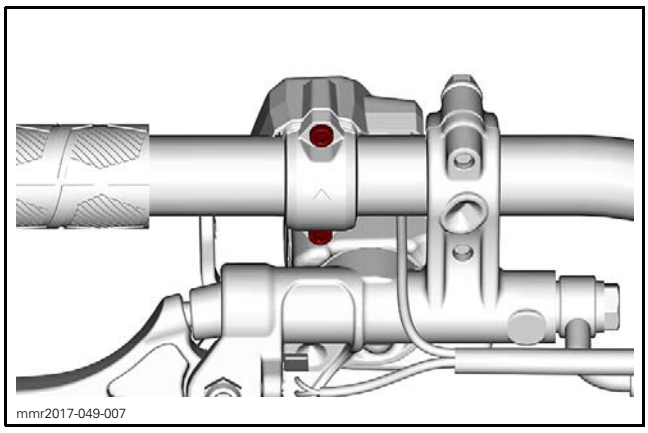
1. Remove the upper body module. Refer to *BODY* subsection.
2. Disconnect the multifunction switch connector (2-pin connector).


mmr2017-049-014

3. Cut locking ties securing multifunction switch harness.


mmr2017-049-006

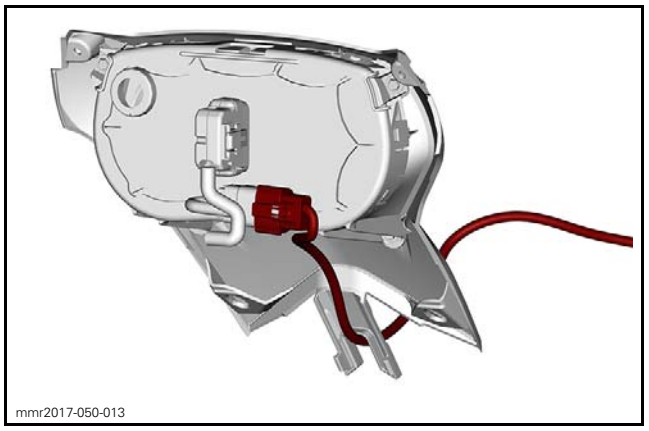
4. Remove multifunction switch screws.


mmr2017-049-007

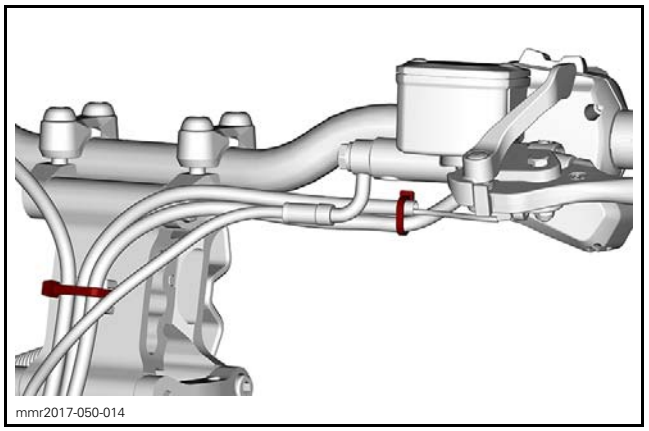
5. Remove multifunction switch from vehicle.

Removing the Multifunction Switch (Trail and Crossover models)

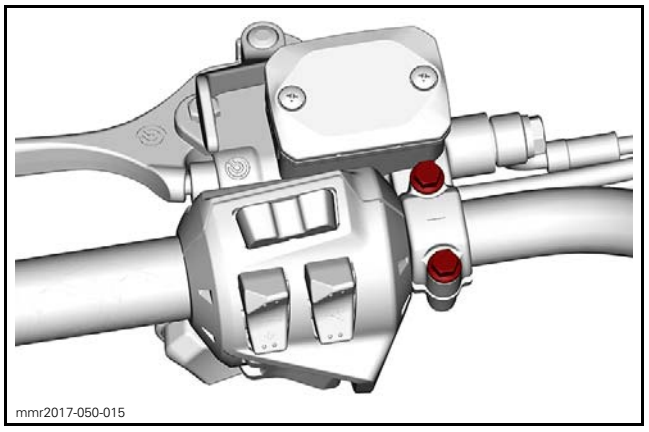
1. Remove the gauge support. Refer to *BODY* subsection.
2. Disconnect the multifunction switch connector.


mmr2017-050-013

3. Cut locking ties securing multifunction switch harness.


mmr2017-050-014

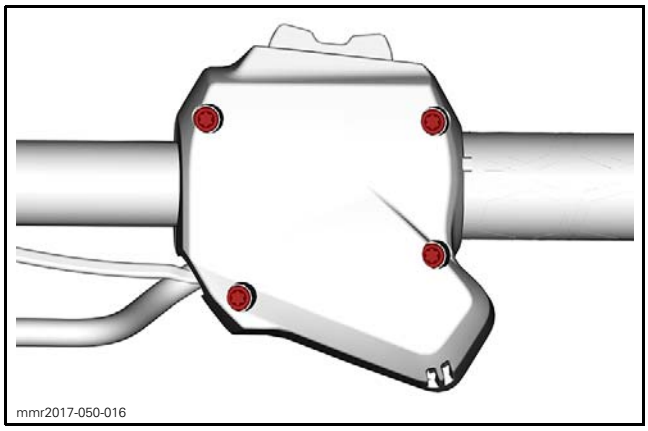
4. Unscrew master cylinder from handlebar.


mmr2017-050-015

5. Remove master cylinder.

NOTICE Do not let master cylinder hang by the hose and do not stretch or twist the hose.

6. Remove multifunction switch screws.


mmr2017-050-016

7. Remove multifunction switch from vehicle.

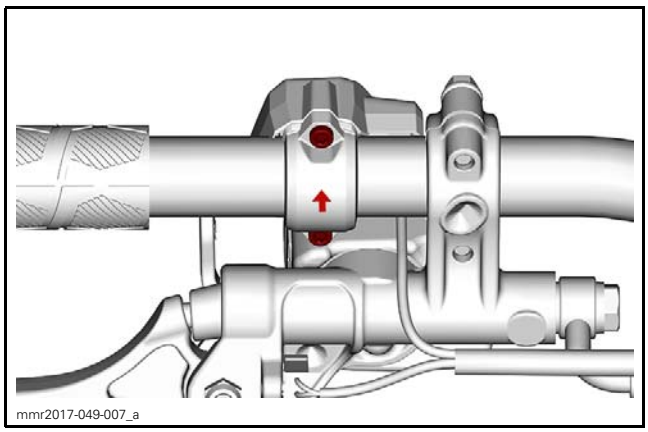
Installing the Multifunction Switch (Mountain models)

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

Install the multifunction switch clamp with the arrow towards rear.

Tighten multifunction switch screws to specification as per the following sequence.

TIGHTENING TORQUE	
Multifunction switch screws	2.4 N•m ± 0.2 N•m (21 lbf•**in** ± 2 lbf•**in**)


mmr2017-049-007_a

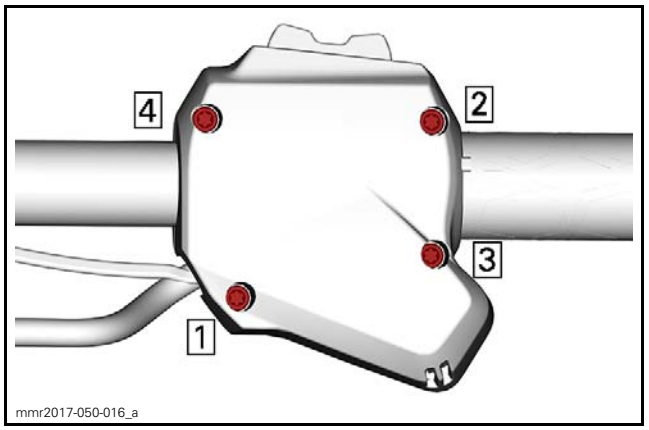
Turn handlebar completely from side to side making sure it does not exert unwanted tension on handlebar wires.

Installing the Multifunction Switch (Trail and Crossover Models)

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

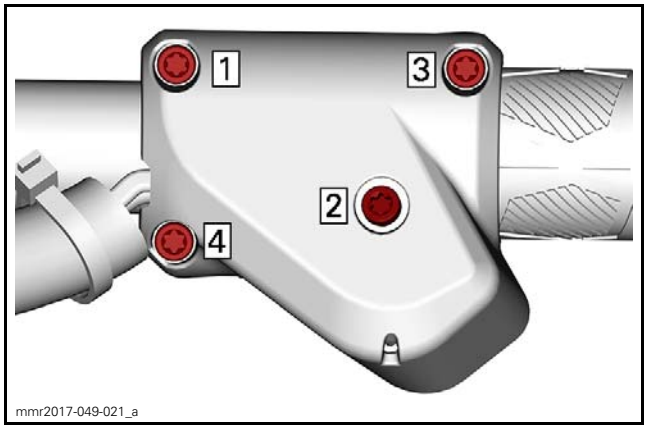
Tighten the multifunction switch screws to specification, as per the following sequence.

TIGHTENING TORQUE	
Multifunction switch screw	2.4 N•m ± 0.2 N•m (21 lbf•**in** ± 2 lbf•**in**)



mmr2017-050-016_a

TRAIL AND CROSSOVER MODELS



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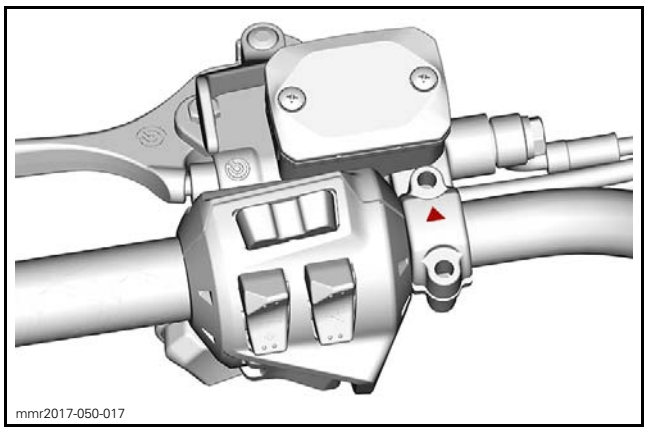
MOUNTAIN MODELS

Place the master cylinder on the handlebar.

Install master cylinder retaining clamp with its arrow pointing toward the front of vehicle.


mmr2017-050-017

Install master cylinder clamp screws and tighten loosely.

With the handlebar in the straight ahead position, place the reservoir parallel to the ground.

Tighten master cylinder clamp screws to specification.

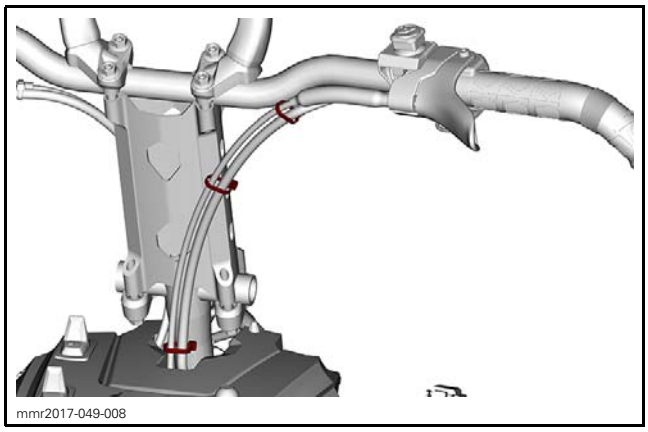
TIGHTENING TORQUE	
Master cylinder clamp screws	9 N•m ± 1 N•m (80 lbf•**in** ± 9 lbf•**in**)

Turn handlebar completely from side to side making sure it does not exert unwanted tension on handlebar wires.

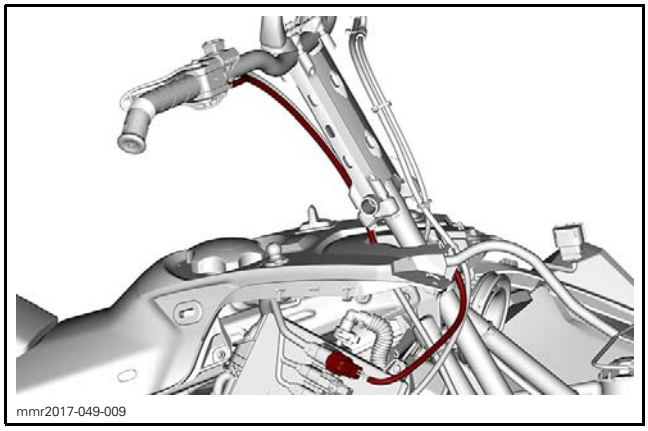
THROTTLE LEVER HOUSING

Removing the Throttle Lever Housing

1. Remove the upper body module. Refer to *BODY* subsection.
2. Cut the harness locking ties.


mmr2017-049-008

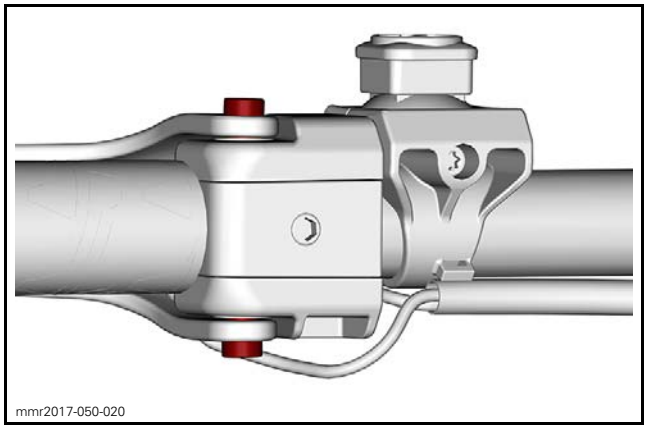
3. Disconnect the LH heater element connector (6-pin connector).


mmr2017-049-009

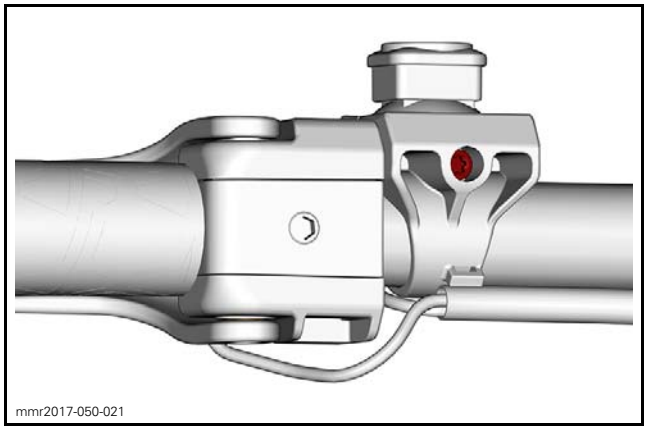
4. Remove the heater element wire terminals from connector. Refer to *WIRING HARNESS AND CONNECTORS* subsection.

NOTICE **Take note of exact positioning of multifunction wire before removing it from the connector.**

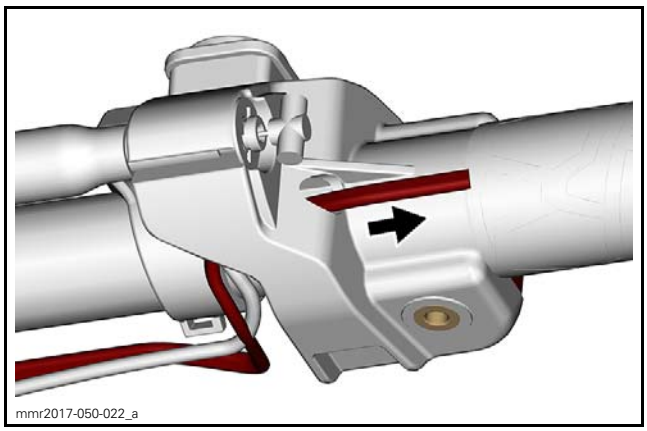
5. Disconnect throttle cable from throttle lever.
6. Remove both throttle lever pivot screws.


mmr2017-050-020

7. Loosen the emergency stop switch screw and slide the switch towards center of handlebar.


mmr2017-050-021

8. Pull the heater element wire out of the throttle lever housing.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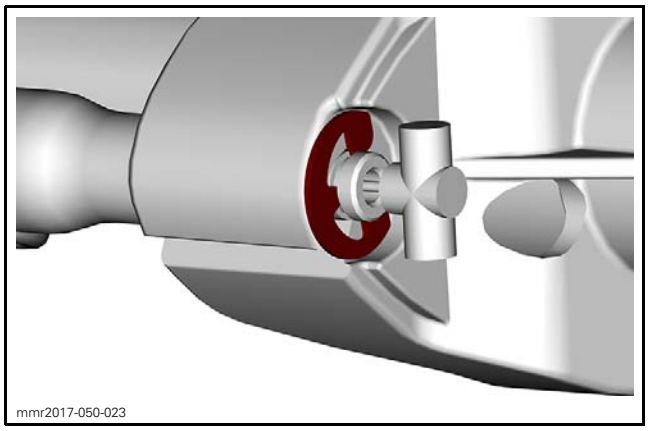
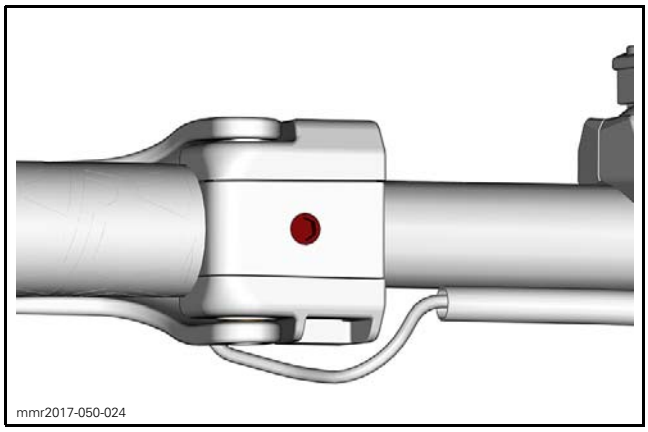
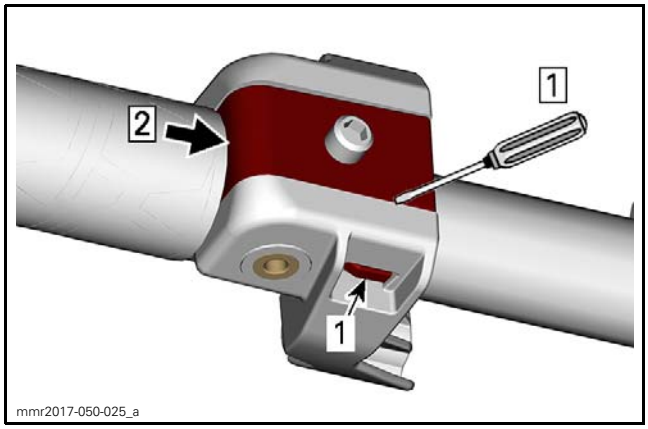
9. Remove throttle cable circlip.



10. Remove the throttle cable from the housing.
11. Loosen throttle lever housing retaining screw.

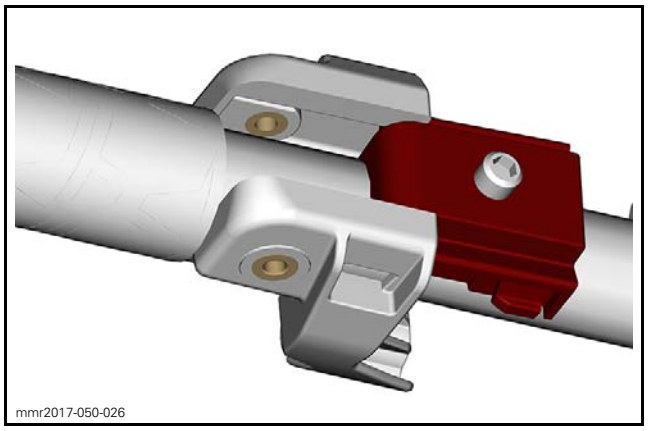


12. Insert a flat screwdriver between the housing and the clamp to release the tab.

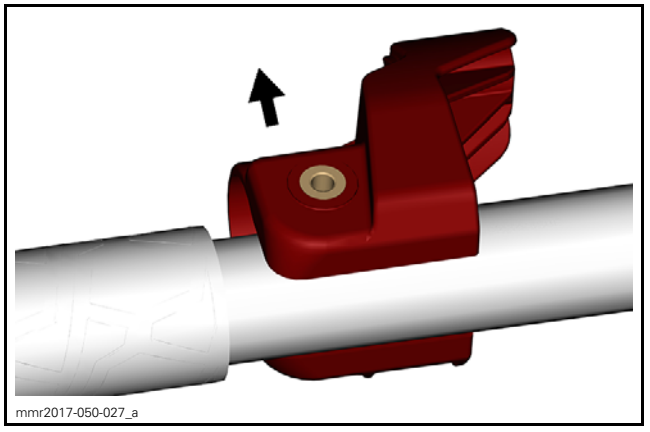


1. Tab

13. Slide the clamp out of the housing



14. Remove throttle lever housing from handlebar.



Installing the Throttle Lever Housing

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

Tighten throttle lever pivot screws to specification.

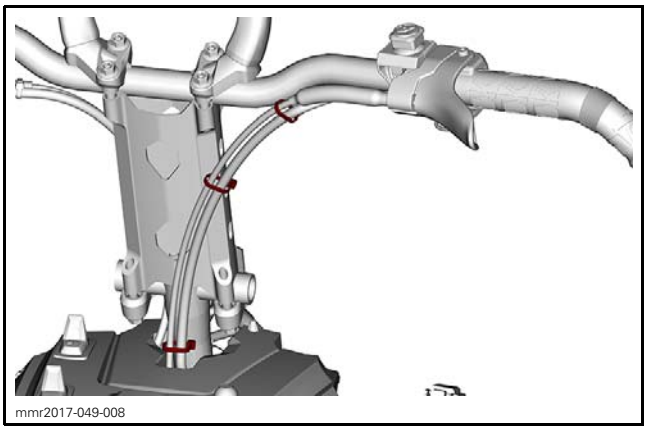
TIGHTENING TORQUE	
Throttle lever retaining screws	1.5 N•m ± 0.2 N•m (13 lbf•**in** ± 2 lbf•**in**)

Turn handlebar completely from side to side making sure it does not exert unwanted tension on handlebar wires.

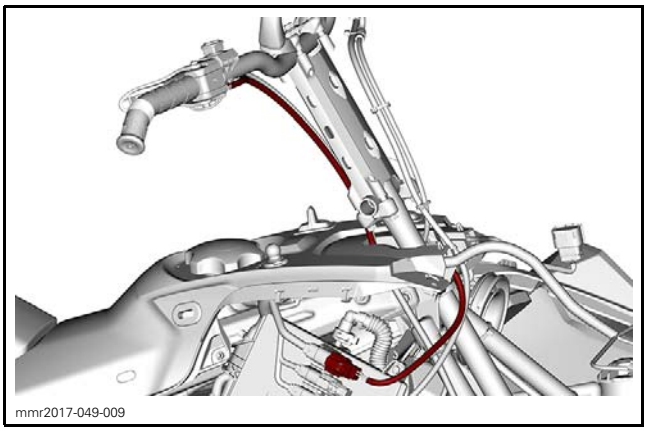
THROTTLE LEVER

Removing the Throttle Lever

1. Remove the upper body module. Refer to *BODY* subsection.
2. Cut the harness locking ties.


mmr2017-049-008

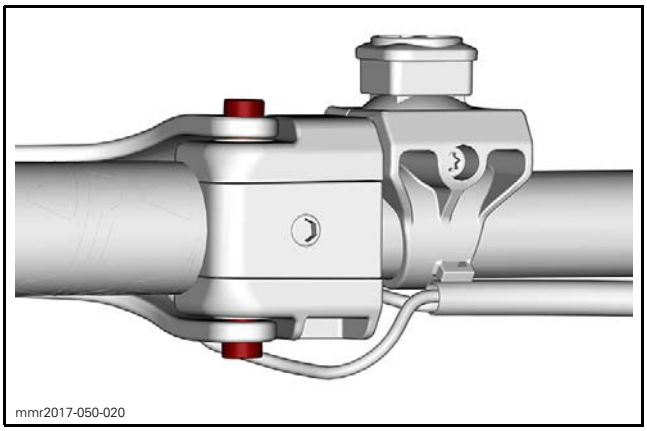
3. Disconnect the LH heater element connector.


mmr2017-049-009

4. Remove throttle lever heater wire terminals from connector. Refer to *CONNECTOR INFORMATION* subsection.

NOTICE **Take note of exact positioning of throttle lever heater before removing it from the connector.**

5. Disconnect throttle cable from throttle lever.
6. Remove throttle lever pivot screws.


mmr2017-050-020

7. Remove throttle lever and heater wires.

Installing the Throttle Lever

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

Tighten throttle lever pivot screws to specification.

TIGHTENING TORQUE	
Throttle lever pivot screws	1.5 N•m ± 0.2 N•m (13 lbf•**in** ± 2 lbf•**in**)

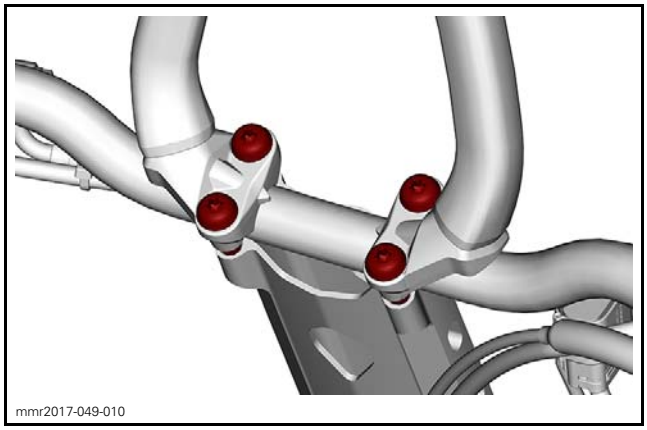
Turn handlebar completely from side to side making sure it does not exert unwanted tension on handlebar wires.

HANDLEBAR

Removing the Handlebar

NOTE: If the handlebar must be changed, remove all components (handlebar grip, throttle lever housing, etc.) before removing it from vehicle.

1. Remove handlebar retaining clamp screws.


mmr2017-049-010

2. Remove handlebar from handlebar extension.

Inspecting the Handlebar

1. Inspect the handlebar for:
   - Damages
   - Cracks
   - Bending.
2. Replace if any of these problems is detected.

⚠ WARNING

Do not try to repair a defective handlebar.

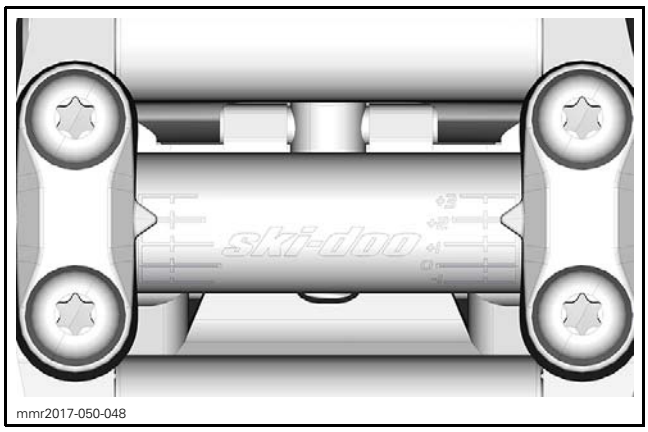
3. Check handlebar clamps for cracks or distortion, replace if necessary.

Installing the Handlebar

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

With Adjustable Handlebar

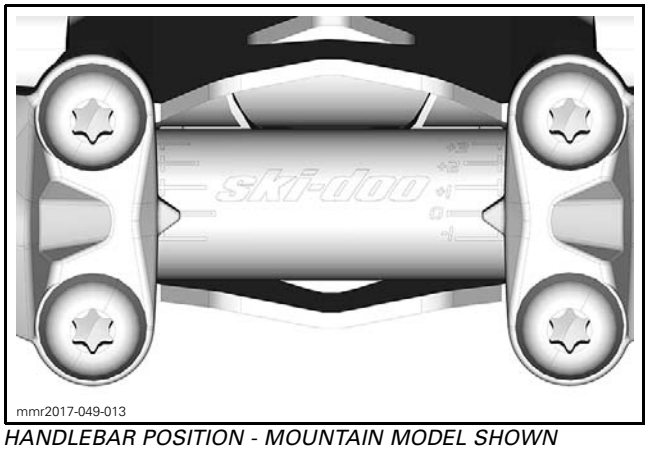
Position the handlebar at +2 with clamps.



Without Adjustable Handlebar

Position the handlebar with clamps, as per the following table.

MODEL	HANDLEBAR POSITION
Mountain	0
Trail and crossover	+1

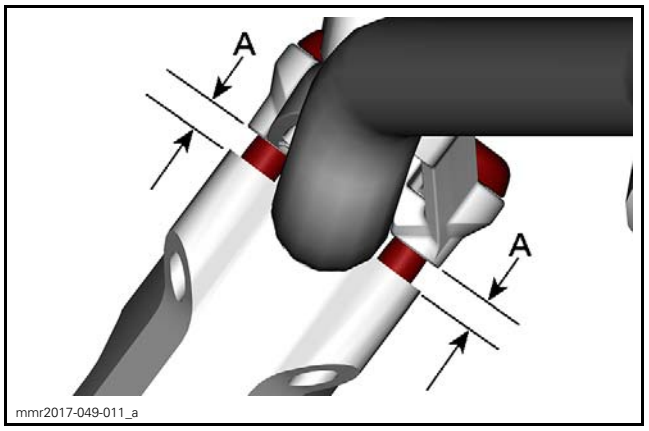


HANDLEBAR POSITION - MOUNTAIN MODEL SHOWN

Tighten handlebar clamps screws to specification.

TIGHTENING TORQUE	
Clamp screws	24.5 N•m ± 3.5 N•m (18 lbf•ft ± 3 lbf•ft)

Ensure handlebar clamps are parallel with handlebar extension.



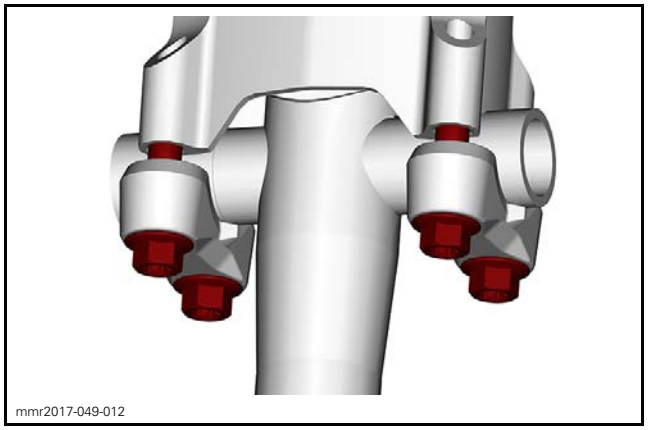
A. Must be equal on each side

Turn handlebar completely from side to side making sure it does not exert unwanted tension on handlebar wires.

HANDLEBAR EXTENSION

Removing the Handlebar Extension

1. Proceed with *REMOVING THE HANDLEBAR*, see procedure in this subsection.
2. Remove screws retaining the extension to steering column.



3. Remove handlebar extension from vehicle.

Inspecting the Handlebar Extension

1. Check handlebar extension for:
   - Cracks
   - Bending
   - Other damages.
2. Replace if any of these problems is detected.

⚠ WARNING

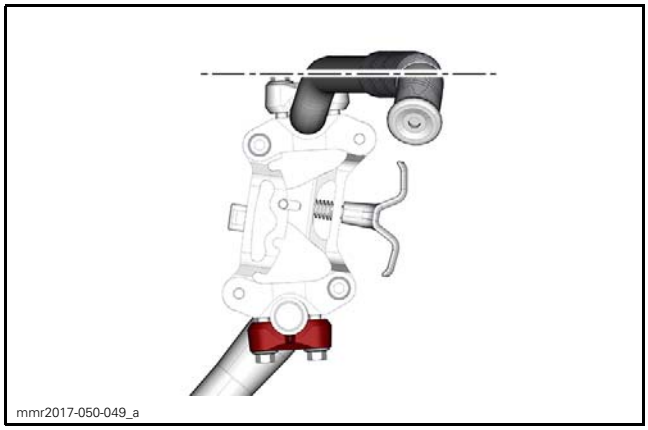
Do not try to repair a defective handlebar extension.

Installing the Handlebar Extension

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

With Adjustable Handlebar

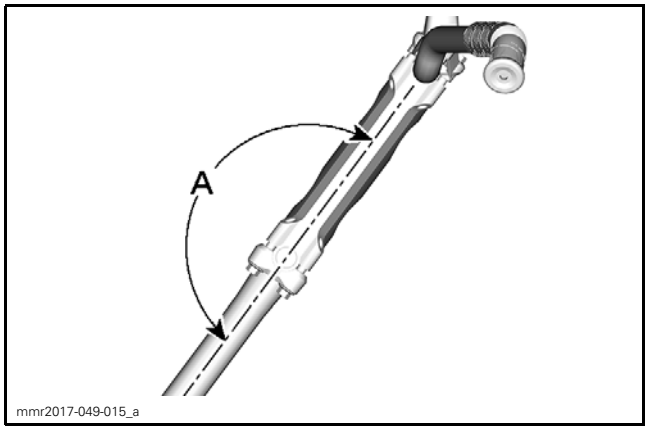
Position the extension in order to have the handlebar horizontal.



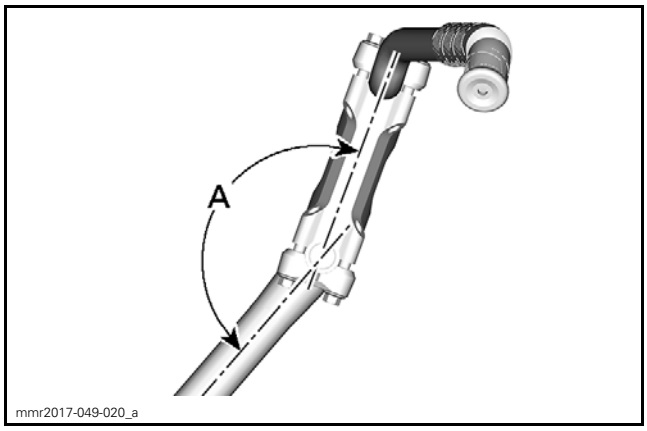
Without Adjustable Handlebar

Position the extension with the steering column, as per the following table.

MODEL	HANDLEBAR EXTENSION POSITION ANGLE
Mountain	180°
Trail and crossover	159°

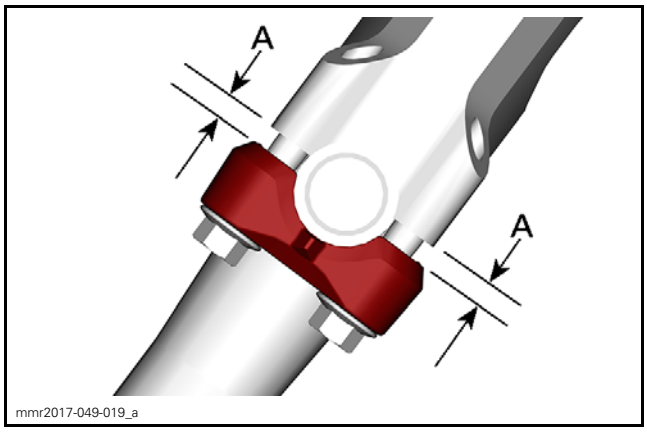


MOUNTAIN MODELS



TRAIL AND CROSSOVER MODELS

Ensure extension clamps are parallel with handlebar extension.



A. Must be equal on each side

⚠ WARNING

Handlebar and it's components must not get in contact with anything (windshield, fuel tank cap, etc.) when steering is turned.

TIE-RODS

NOTE: The same procedure is applied on RH and LH side.

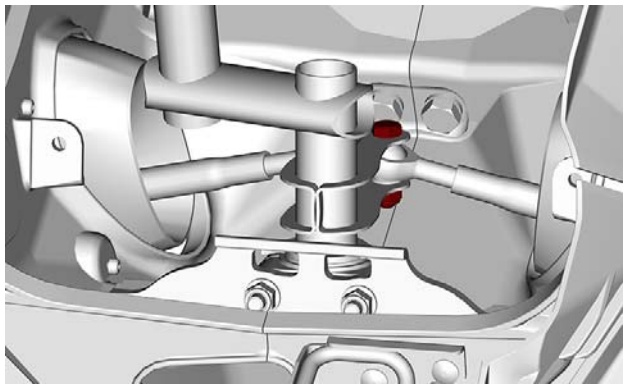
Inspecting the Tie-Rod

Check tie-rod ends for looseness. If play is excessive, replace tie-rod.

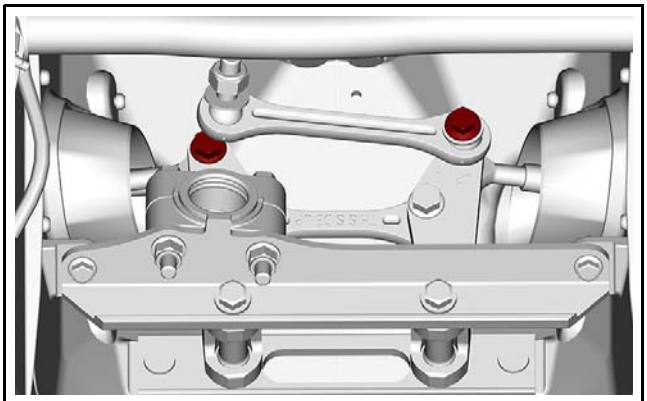
Check if the tie-rod is bent, cracked or otherwise damaged. Replace if necessary.

Removing the Tie-Rod

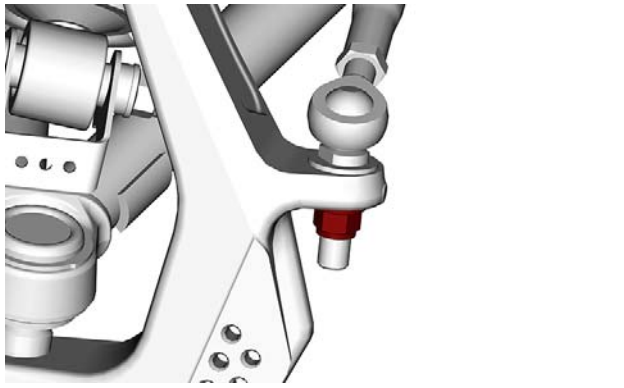
1. Remove the tuned pipe. Refer to *EXHAUST SYSTEM* subsection.
2. Remove the tie-rod end nuts and screws from the steering column and ski leg.


mmr2017-049-016

STEERING COLUMN WITH PITMAN ARM

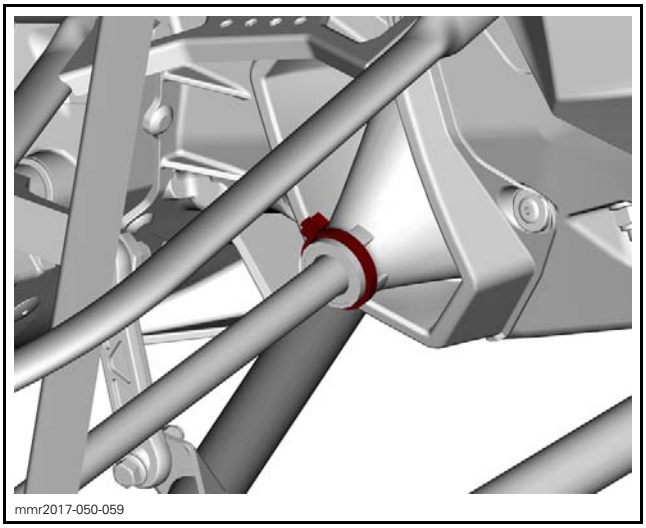

mmr2017-050-033

STEERING RACK - STEERING COLUMN REMOVED FOR CLARITY

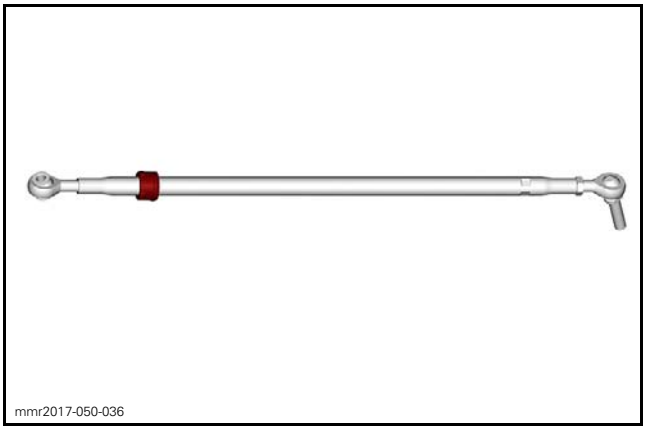

mmr2017-050-035

SKI LEG

3. Cut the locking tie on the steering boot.


mmr2017-050-059

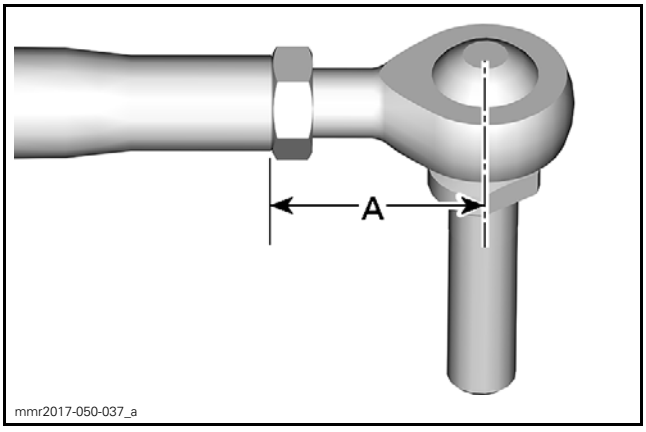
4. Remove tie-rod with ring from vehicle.


mmr2017-050-036

Installing the Tie-Rod

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

Adjust the length of all tie-rod end to specification without tightening the jam nuts.



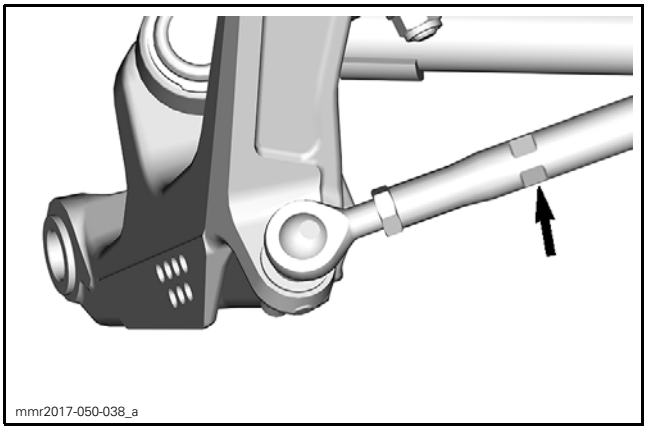
mmr2017-050-037_a

TIE-ROD LENGTH (A)
30 mm (1.181 in)

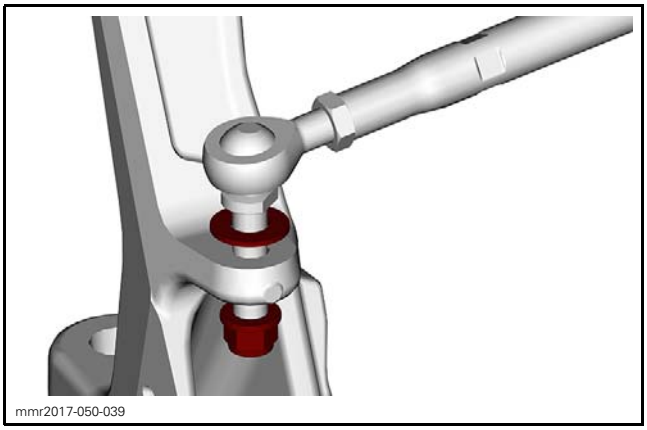
⚠ WARNING

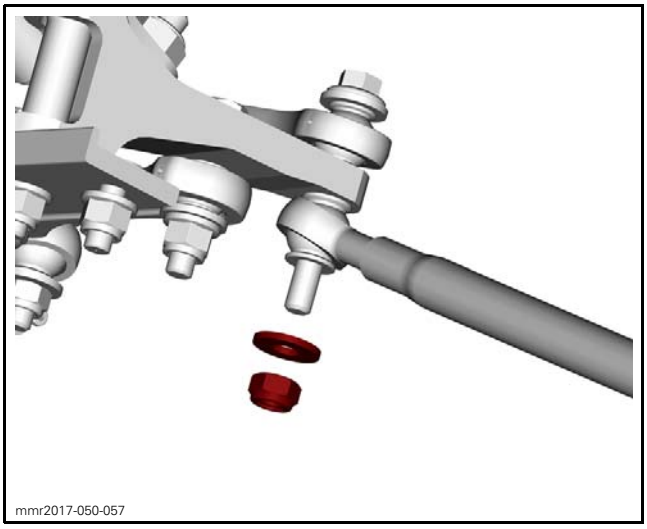
The maximum tie-rod end length (A) not engaged in the tie rod must not exceed 34 mm (1.339 in).

Install tie-rod with the groove on ski leg side.


mmr2017-050-038_a

Install the washer and the nut, and tighten to specification.

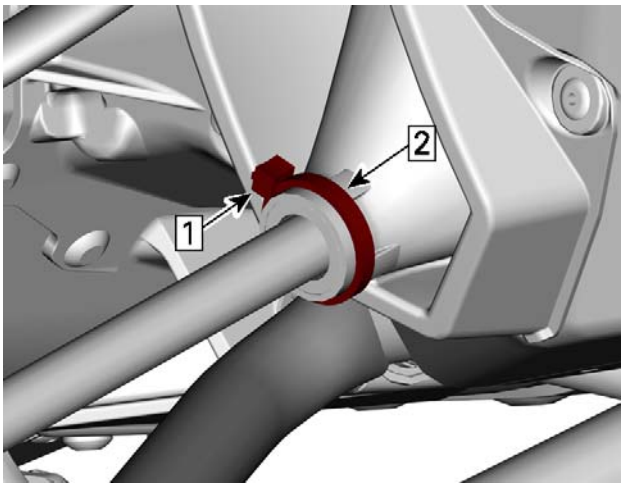

mmr2017-050-039


mmr2017-050-057

TIGHTENING TORQUE	
Outer tie-rod end nut	48 N•m ± 6 N•m (35 lbf•ft ± 4 lbf•ft)
Inner tie-rod end nut	24.5 N•m ± 3.5 N•m (18 lbf•ft ± 3 lbf•ft)

Ensure the new locking tie is fully seated and the head is positioned upwards.

NOTICE **To avoid bellows damage, make sure locking tie head is positioned upwards.**



mmr2017-050-702_a

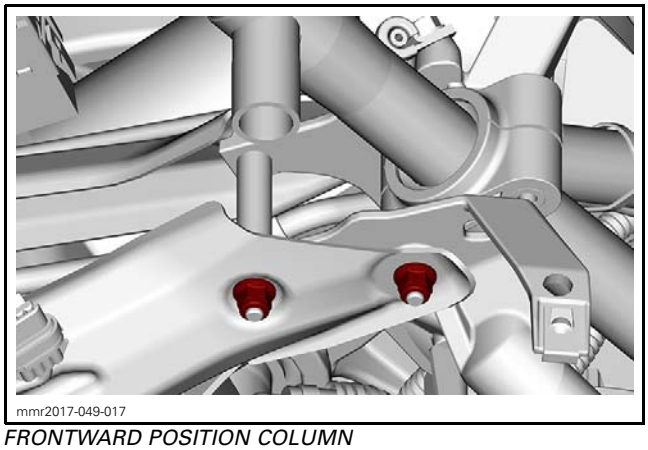
1. *Head up*
2. *Fully seated*

Perform the steering alignment, refer to *ALIGNING THE STEERING* in this section.

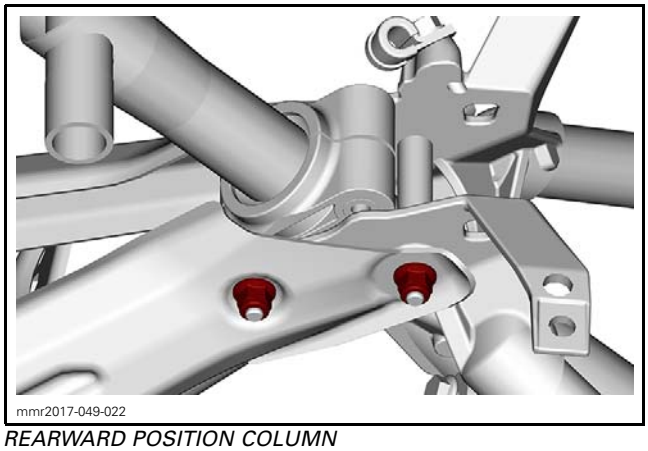
STEERING COLUMN

Removing the Steering Column - With Pitman Arm

1. Remove the tuned pipe. Refer to *EXHAUST SYSTEM* subsection.
2. Remove the rear console. Refer to *BODY* subsection.
3. Remove *HANDLEBAR EXTENSION* from steering column. Refer to the procedure in this subsection.
4. Remove the inner tie-rod end nuts and screws. Refer to *TIE-RODS* in this subsection.
5. Remove nuts and screws securing steering column upper support.

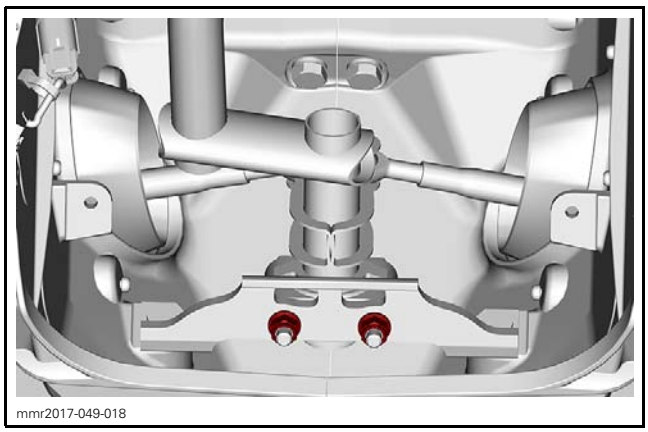

mmr2017-049-017

FRONTWARD POSITION COLUMN


mmr2017-049-022

REARWARD POSITION COLUMN

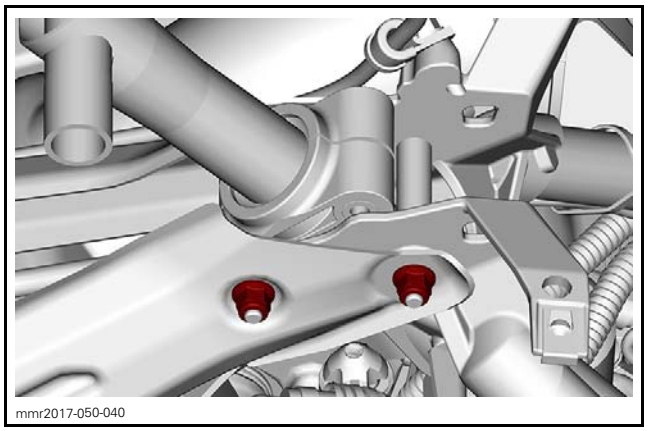
6. Remove nuts and screws securing the steering column lower support.


mmr2017-049-018

7. Pull steering column from top.

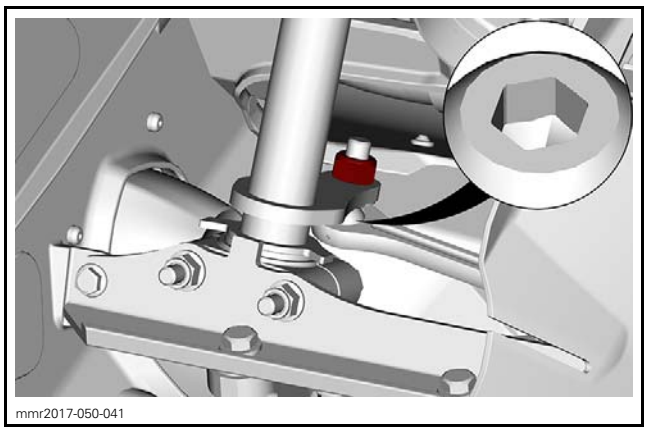
Removing the Steering Column - With Steering Rack

1. Remove the tuned pipe. Refer to *EXHAUST SYSTEM* subsection.
2. Remove the rear console. Refer to *BODY* subsection.
3. Remove *HANDLEBAR EXTENSION* from steering column. Refer to the procedure in this subsection.
4. Remove nuts and screws securing steering column upper support.

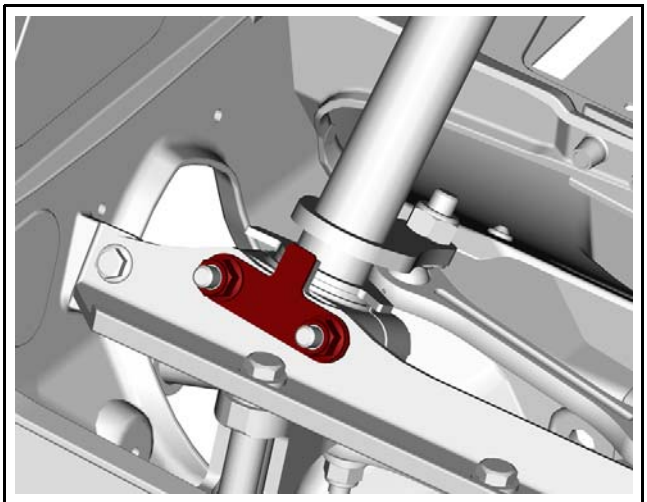

mmr2017-050-040

5. From inside engine compartment, remove the steering column pitman arm nut.

NOTE: Use an Allen key to lock the ball joint.


mmr2017-050-041

6. Remove nuts, stopper plate and screws securing the steering column lower support.


mmr2017-050-058

7. Pull steering column from top.

Inspecting the Steering Column

Check if steering column is:
– Cracked
– Bent
– Twisted
– Otherwise damaged.

Replace steering column if necessary.

⚠ WARNING

Do not try to repair a defective steering column.

Installing the Steering Column

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

1. Apply grease on vibration dampers before installing upper and lower supports.

SERVICE PRODUCT
SYNTHETIC SUSPENSION GREASE (P/N 779163)

2. Install new elastic nuts on the steering column retaining screws.
3. Tighten nuts to specification.

TIGHTENING TORQUE	
Upper steering column support nut	12.5 N•m ± 2.5 N•m (111 lbf•**in** ± 22 lbf•**in**)
Lower steering column support nut	23.5 N•m ± 3.5 N•m (17 lbf•ft ± 3 lbf•ft)

STEERING RACK

Inspecting the Steering Rack

Remove the tuned pipe. Refer to *EXHAUST SYSTEM* subsection.

Check if steering rack component are:
– Cracked
– Bent
– Twisted
– Otherwise damaged.

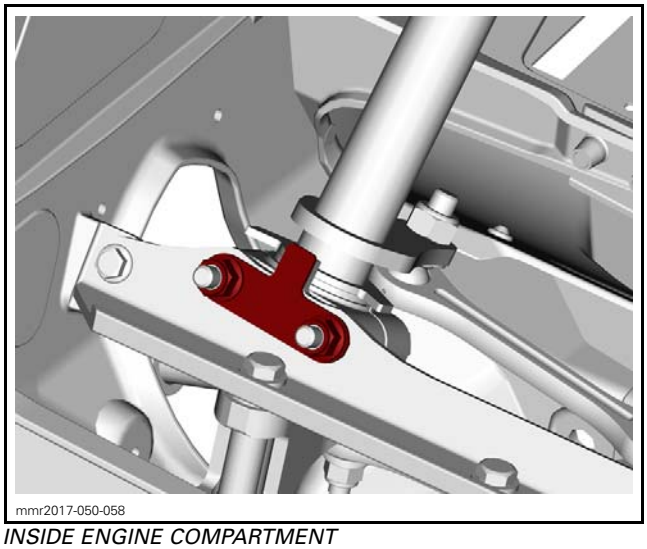
Check steering rack for looseness.

Check if stopper plate is deformed or otherwise damaged.

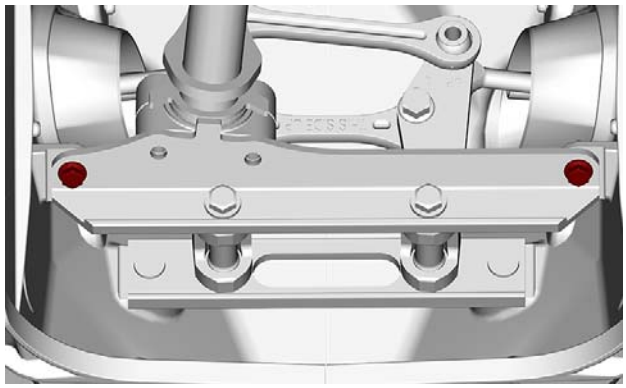
Replace component if necessary.

Removing the Steering Rack

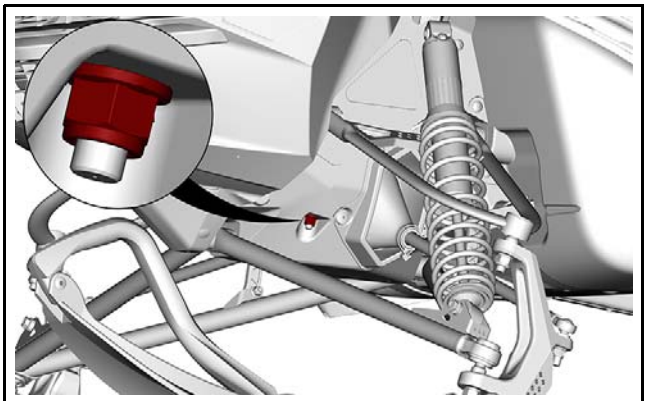
1. Remove the tuned pipe. Refer to *EXHAUST SYSTEM* subsection.
2. Remove inner tie-rod end nuts and screws.
3. Remove the nuts, stopper plate and screws as per the following illustrations.


mmr2017-050-058

INSIDE ENGINE COMPARTMENT


mmr2017-050-043

INSIDE ENGINE COMPARTMENT


mmr2017-050-044

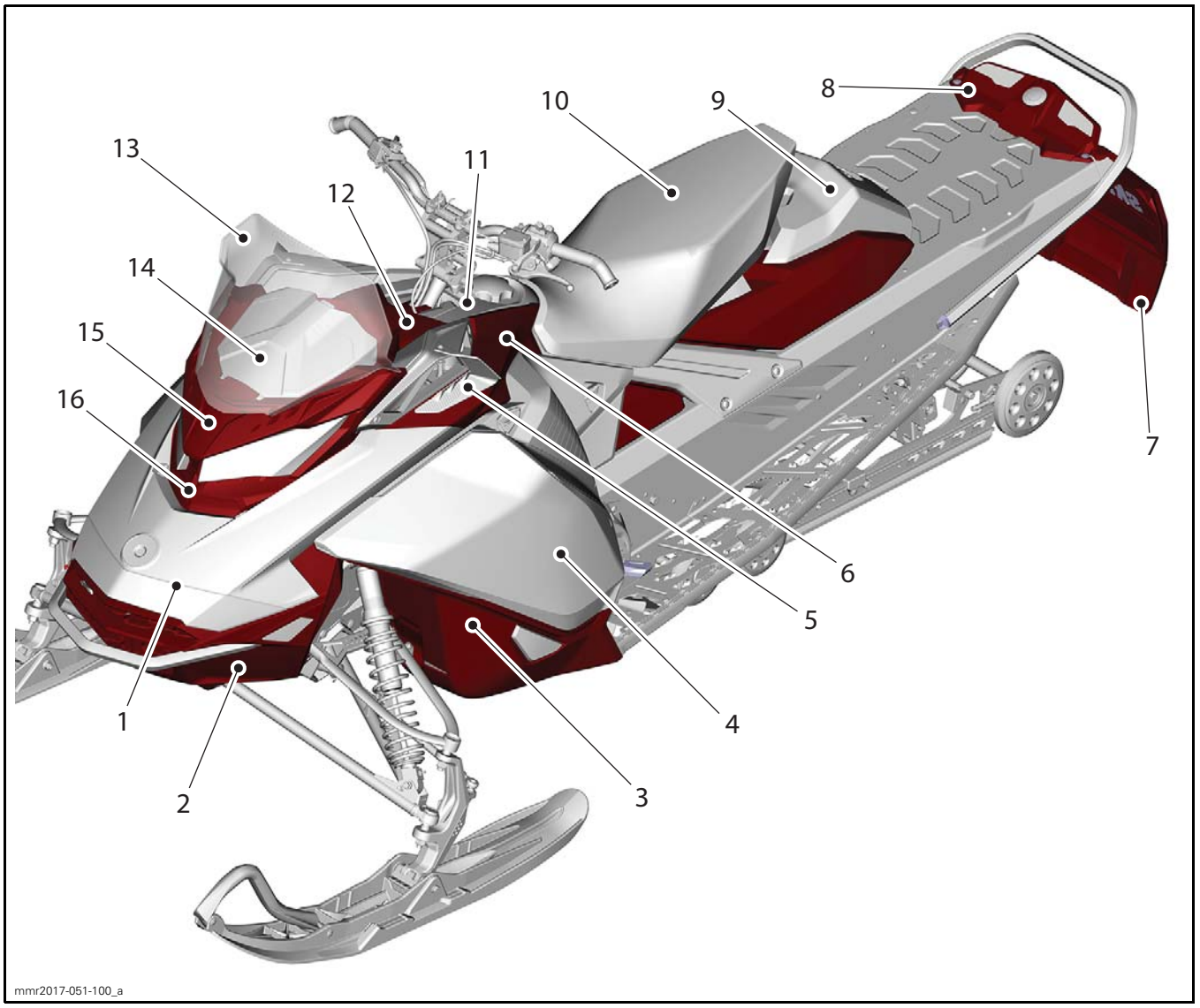
Installing the Steering Rack

The installation is the reverse of the removal procedure.

BODY

SERVICE TOOLS

Description	Part Number	Page
SUPERTANIUM DRILL BIT 3/16"	529 031 800	9



1. *Hood*
2. *Bottom pan*
3. *Side bottom pan*
4. *Side panel*
5. *Side wind deflector*
6. *Lateral hood*
7. *Snow guard*
8. *Taillight cover*
9. *Battery cover*
10. *Seat*
11. *Console*
12. *Gauge support*
13. *Windshield*
14. *Storage compartment cover*
15. *Windshield support*
16. *Headlight trim*

GENERAL

CLEANING

Cleaning the Seat

It is recommended to clean the seat with a solution of warm soapy water, using a soft clean cloth.

NOTICE Avoid use of harsh detergents such as strong soaps, degreasing solvents, abrasive cleaners, paint thinners, etc. that may cause damage to the seat cover.

Cleaning the Plastic

Clean the vehicle thoroughly, removing all dirt and grease accumulation.

To clean use a soft clean cloth and either soapy water or isopropyl alcohol.

To remove grease, oil or glue use isopropyl alcohol.

NOTICE Do not apply isopropyl alcohol or acetone directly on decals.

Follow these recommendations to protect the glossy finish of polypropylene parts.

Apply a non abrasive wax on glossy finish only.

Non Compatible Cleaning Products

NOTICE Polypropylene is not compatible with PETROLEUM BASE PRODUCTS. Contact with petroleum base products, such as cleaners or lubricants will permanently alter the glossy finish of polypropylene parts.

NOTICE The following products must not be applied on the plastic components used on the vehicles:

- Gasoline
- Brake fluid
- Kerosene
- Diesel fuel
- Lighter fluid
- Varsol
- Naphtha
- Acetone
- Strong detergents
- Abrasive cleaners
- Waxes containing an abrasive or a cleaning agent in their formula.

MATERIAL TYPE	NON-COMPATIBLE CLEANING PRODUCTS
Polypropylene	ANY PETROLEUM BASE CLEANING PRODUCTS
	XP-S ATV Finishing Spray (P/N 219 701 704)
	XP-S ATV Cleaning Kit (P/N 219 701 713) (it contains the above XP-S ATV Finishing Spray)

vbs2012-006-002_a

DO NOT USE ON POLYPROPYLENE

Compatible Cleaning Products

MATERIAL TYPE	COMPATIBLE CLEANING PRODUCT
Polypropylene	XPS ATV Wash (P/N 219 701 702)
	Soapy water

vbs2012-006-001

SAFE FOR POLYPROPYLENE

REPAIRING BODY PARTS

The very first step before repairing plastic materials is to find out exactly which type of material is involved.

On the inner surface of each part, the production date, part number, and material code are molded in.

PLASTIC PARTS	
CODE	MATERIAL
PP	Polypropylene
EMA+PA	Surlyn

NOTICE Some repair products are not compatible with certain plastics.

⚠ WARNING

Polycarbonate windshields must never be repaired by welding or otherwise.

The following company provides a complete line of products to repair plastic materials:

CREST INDUSTRIES, INC.
Trenton, MI 48183
Phone: 734 479-4141
Toll Free: 1 800 822-4100
Fax: 734 479-4040
E-Mail: info@crestauto.com
www.crestauto.com

PROCEDURES

NOTE: The same procedure applies for RH and LH side. Most of the time, only one side is described in this subsection.

DECAL

Replacing the Decal

1. To remove a decal; heat old decal with a heat gun (low temperature) and peel off slowly.
2. Using isopropyl alcohol, clean the surface and dry thoroughly.

NOTICE Do not apply isopropyl alcohol or solvent directly on decals. Use only in a well ventilated area.

3. Just before beginning to affix the new decals, wipe the surface with a clean damp cloth and allow to dry.
4. Use a pallet to affix the decal. Always work from the center towards the edges.

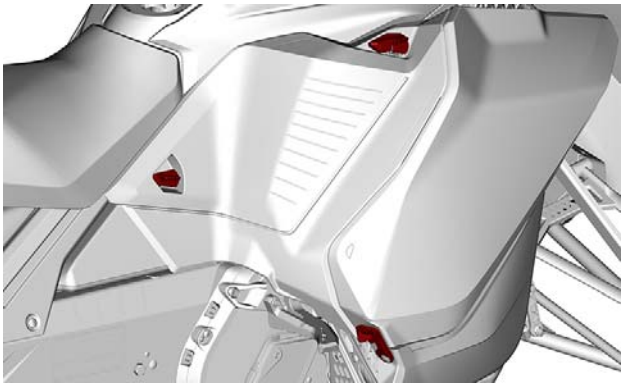
NOTICE Do not remove the pre-mask yet.

5. Once the decal is correctly affixed, carefully make a final pass with the pallet. Apply enough pressure to make sure the glue sticks well on the surface.
6. Remove the pre-mask.

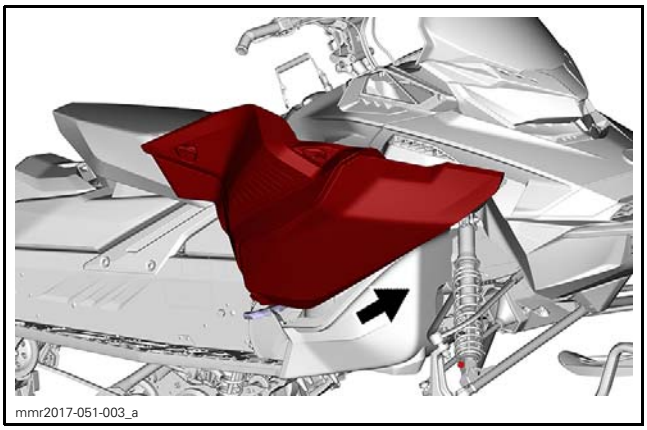
SIDE PANEL

Removing the Side Panel

1. Release all lock devices.


mmr2017-051-002

2. Open side panel.
3. Lift the side panel up and towards front.


mmr2017-051-003_a

NOTICE Make sure to place panels in a safe place to avoid scratching.

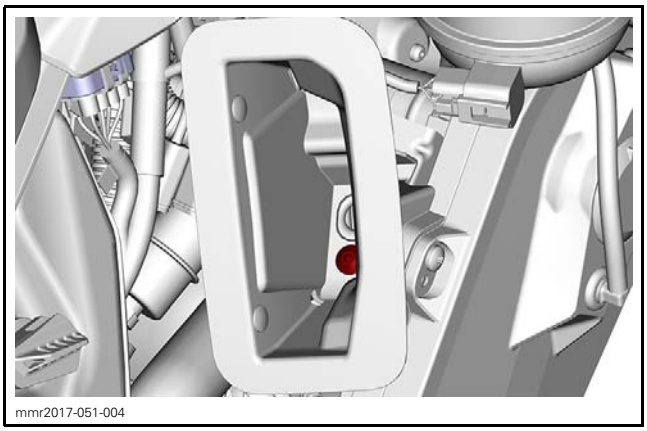
Installing the Side Panel

The installation is the reverse of the removal procedure.

REWIND STARTER HANDLE HOUSING

Removing the Rewind Starter Handle Housing

1. Open RH side panel.
2. Remove screw retaining housing to bracket.


mmr2017-051-004

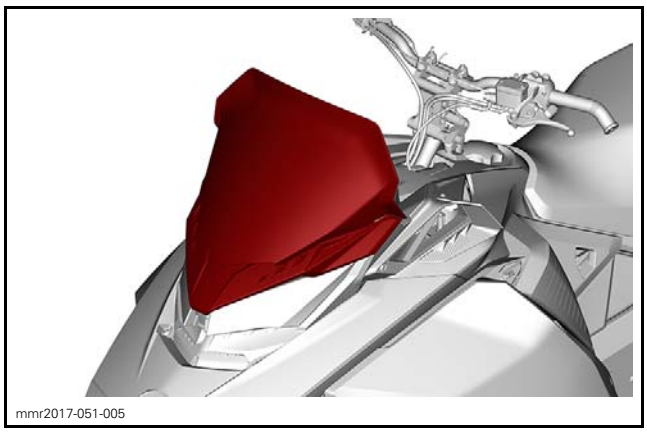
3. Remove rewind starter handle. Refer to *REWIND STARTER* subsection.

Installing the Rewind Starter Handle Housing

Installation is the reverse of removal procedure. Pay attention to the following.

TIGHTENING TORQUE	
Rewind starter handle housing screw	2.3 N•m ± 0.2 N•m (20 lbf•**in** ± 2 lbf•**in**)

WINDSHIELD


mmr2017-051-005

Removing the Windshield

Place your hands on each side of windshield.

Pull the windshield until its pins come out of rubber grommets then pull in the center to remove center pin from grommet.

Installing the Windshield

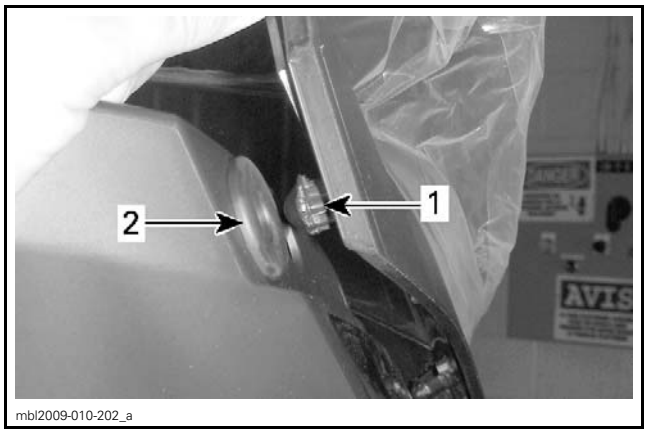
The installation is the reverse of removal procedure.

Lubricate the grommets using soapsuds.

NOTICE Do not lubricate grommets with any type of grease.

Secure windshield by inserting the windshield pins into the grommets.

NOTE: Make sure not to push grommets through gauge support holes.



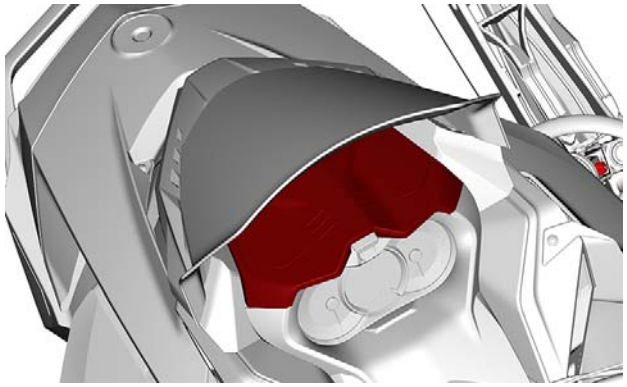
mbl2009-010-202_a

TYPICAL
1. *Windshield tab*
2. *Gauge support front grommet*

⚠ WARNING

Make sure that handlebar turns freely in both directions. Make sure that there is no contact at any time between handlebar wind deflectors (if so equipped) and windshield.

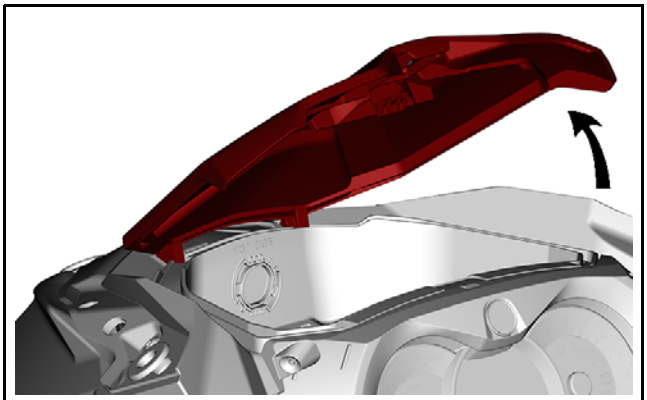
STORAGE COMPARTMENT COVER



mmr2017-051-006

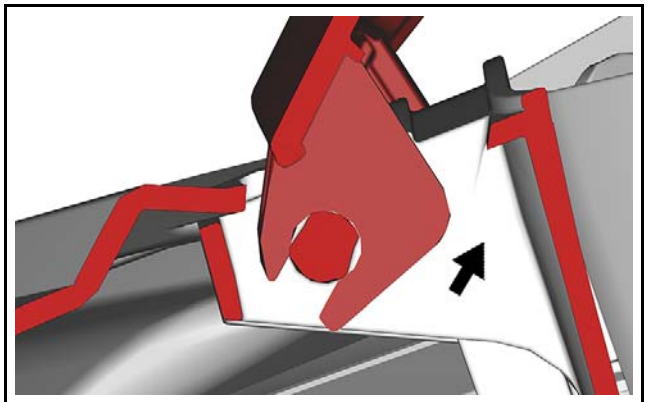
Removing the Storage Compartment Cover

1. Remove windshield.
2. Open storage cover until it is almost vertical.



mmr2017-051-007_a

3. Pull out storage cover.



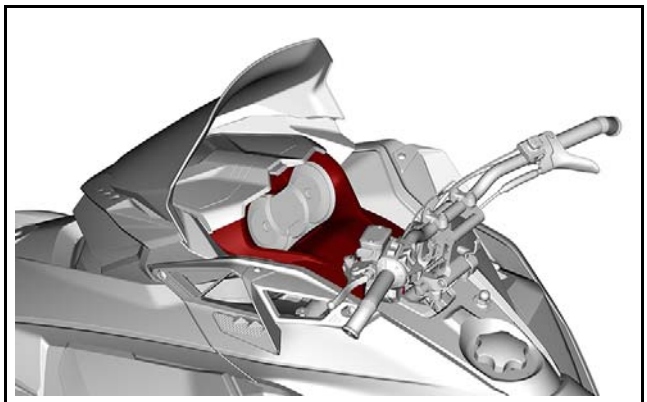
mmr2017-051-008_a

Installing the Storage Compartment Cover

The installation is the reverse of the removal procedure.

NOTICE **Ensure windshield is NOT installed. Otherwise, the storage cover could be damaged during installation.**

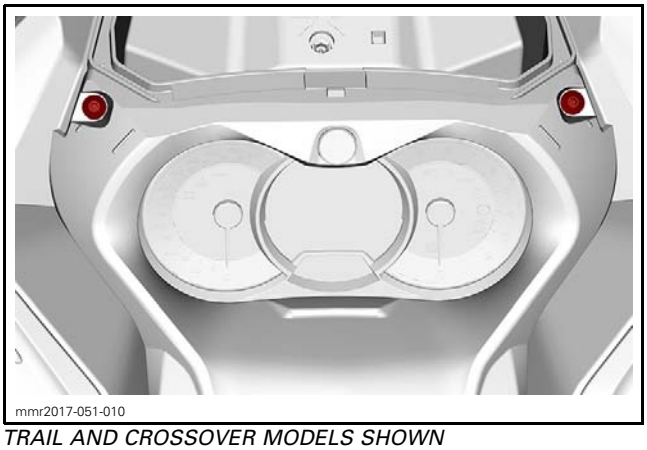
GAUGE SUPPORT



mmr2017-051-009

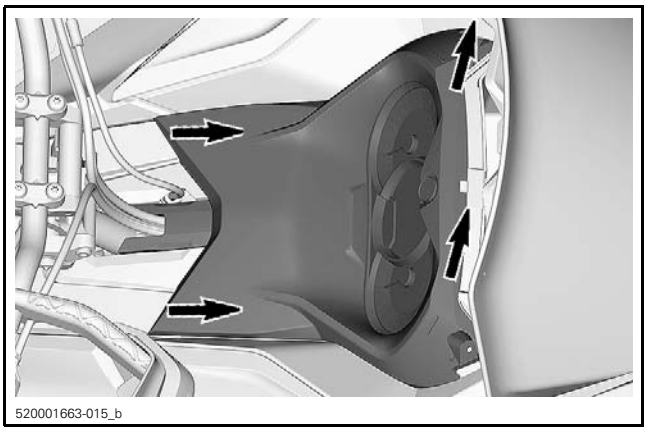
Removing the Gauge Support

1. Remove the windshield. Refer to procedure in this subsection.
2. Open the storage compartment cover
3. Remove the gauge support screws.


mmr2017-051-010

TRAIL AND CROSSOVER MODELS SHOWN

4. Lift the front of the gauge support, then slide it forward to remove it.


520001663-015_b

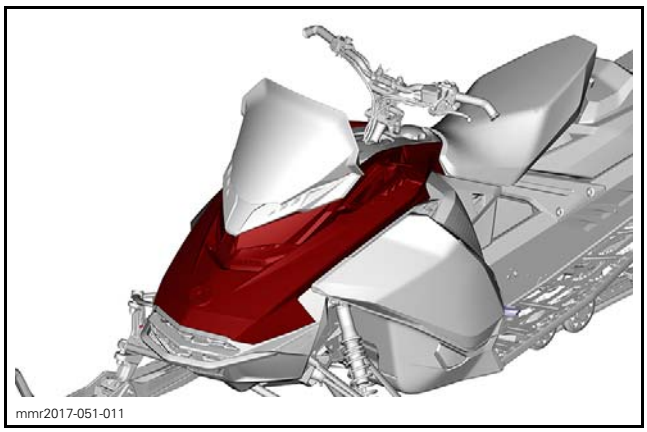
5. Remove the multifunction gauge from support. Refer to *GAUGE* subsection.

Installing the Gauge Support

The installation is the reverse of removal procedure.

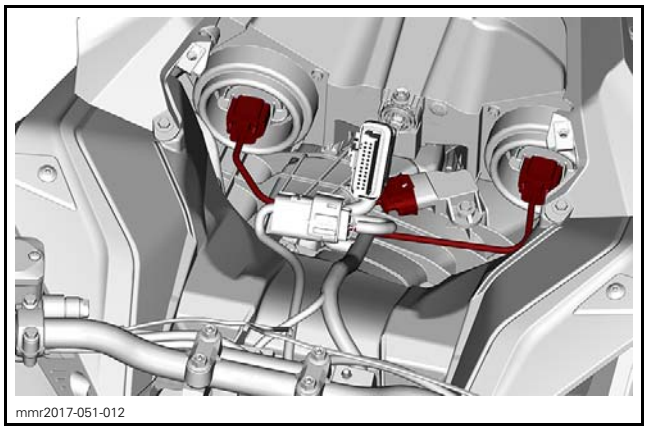
TIGHTENING TORQUE	
Gauge support screw	2.3 N•m ± 0.2 N•m (20 lbf•**in** ± 2 lbf•**in**)

UPPER BODY MODULE

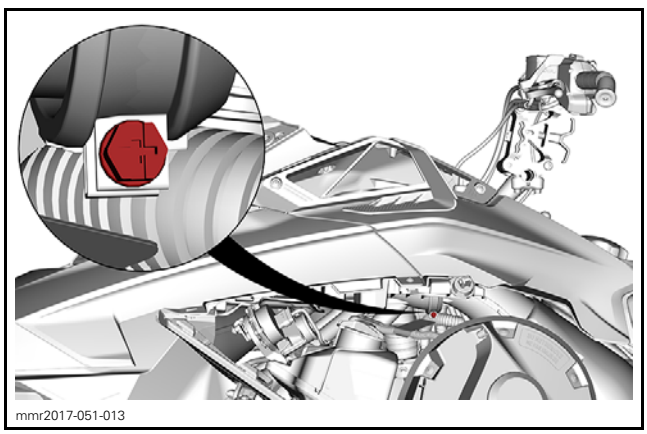

mmr2017-051-011

Removing the Upper Body Module

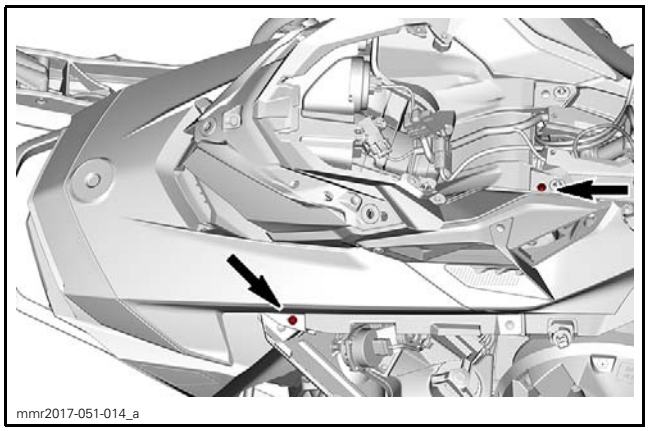
1. Refer to procedures in this subsection and remove:
   - Side panels
   - Gauge support
   - Storage compartment and its cover.
2. Disconnect the MAPTS and headlight connectors.


mmr2017-051-012

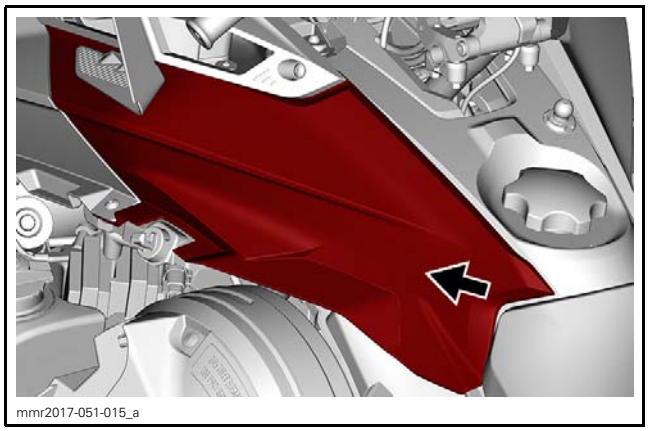
3. Loosen the air intake hose clamp.


mmr2017-051-013

4. Remove the upper body module retaining screws.


mmr2017-051-014_a

5. Pull on the rear end of both lateral hood until their tabs come out of the rear console.

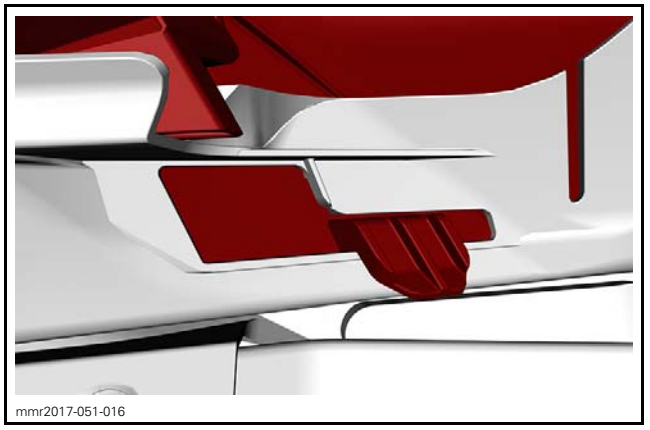

mmr2017-051-015_a

6. Remove the upper body module.
   6.1 Grab the upper body module in the gauge support section.
   6.2 Pull the module forward.
   6.3 Remove the module from the vehicle.

Installing the Upper Body Module

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

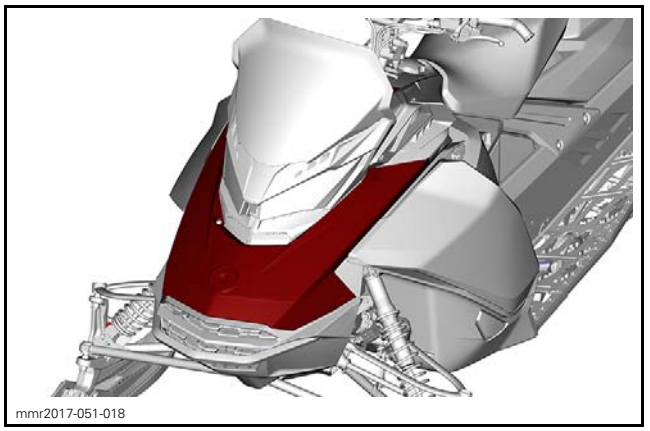
Ensure to engage rear hood tabs in rear console.


mmr2017-051-016

Ensure to connect the air intake hose.

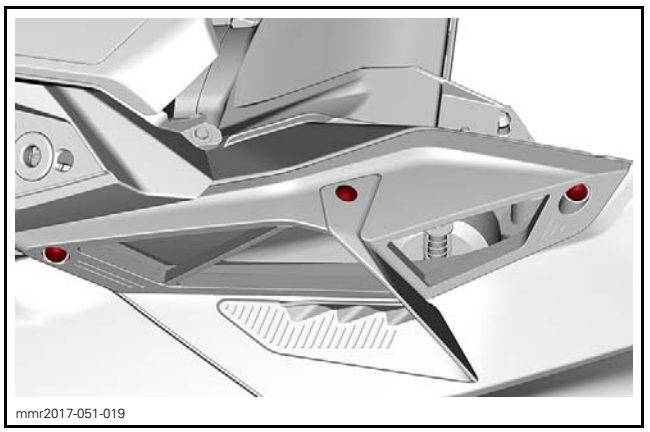
TIGHTENING TORQUE	
Upper body module screw	2.3 N•m ± 0.2 N•m (20 lbf•**in** ± 2 lbf•**in**)

HOOD

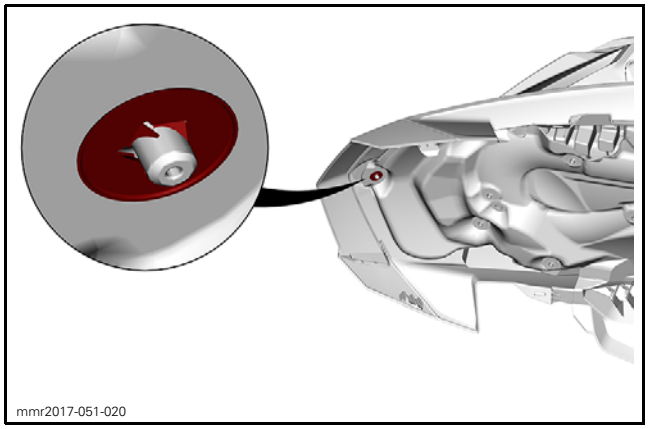

mmr2017-051-018

Removing the Hood

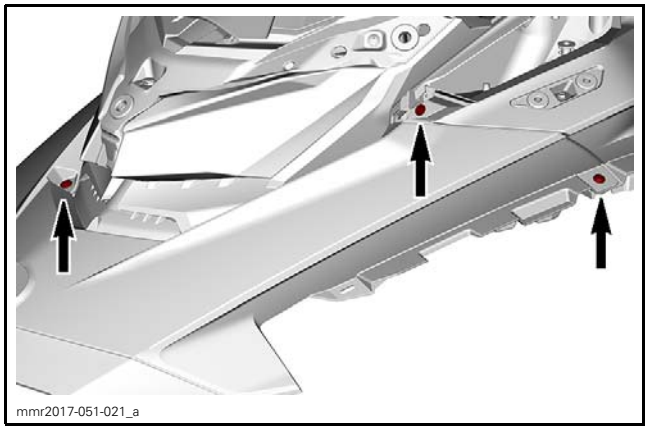
1. Remove the upper body module. Refer to procedure in this subsection.
2. Remove both sides air deflector and air intake filter.


mmr2017-051-019

3. Remove the front push nut under the hood.



4. Remove hood screws.



5. Pull out hood.

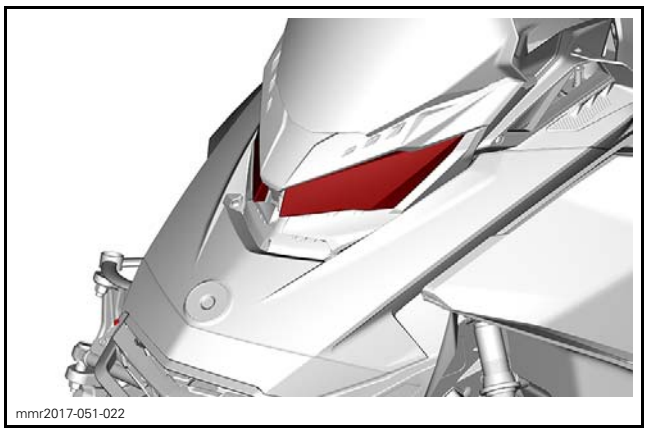
Installing the Hood

The installation is the reverse of removal procedure.

Install a new push nut.

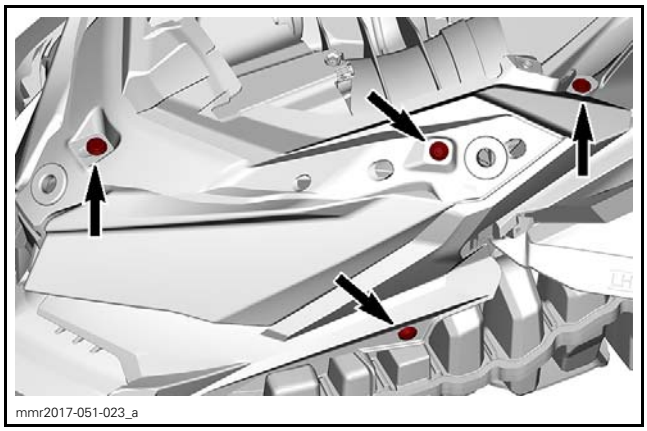
TIGHTENING TORQUE	
Hood hexagonal screw	1.8 N•m ± 0.2 N•m (16 lbf•**in** ± 2 lbf•**in**)
Hood Torx screw	2.3 N•m ± 0.2 N•m (20 lbf•**in** ± 2 lbf•**in**)

HEADLIGHT MODULE



Removing the Headlight Module

1. Remove the hood. Refer to procedure in this subsection.
2. Remove the headlight trim fasteners.



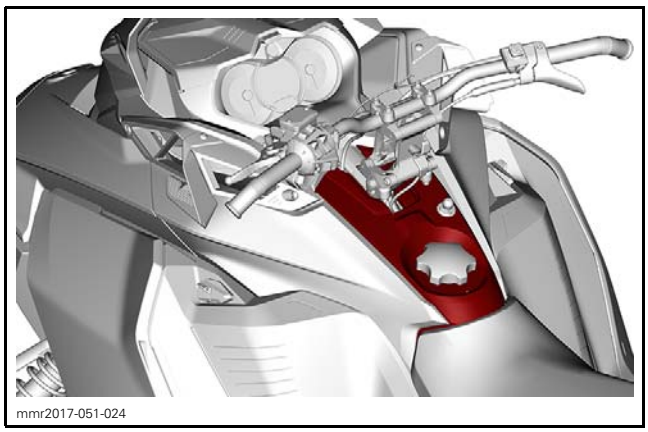
3. Pull out headlight housing and trim.

Installing the Headlight Module

The installation is the reverse of removal procedure.

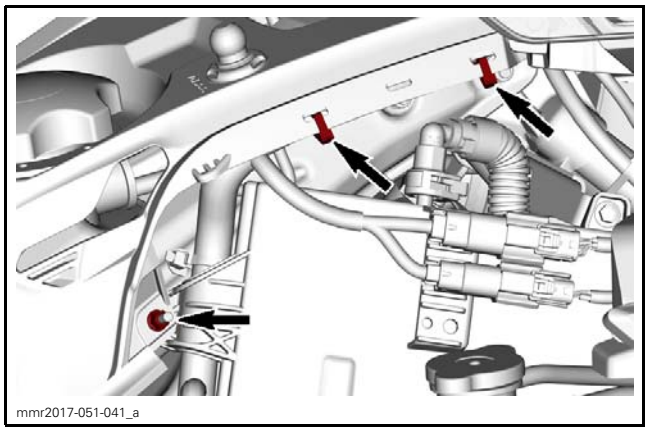
TIGHTENING TORQUE	
Headlight hexagonal screw	1.8 N•m ± 0.2 N•m (16 lbf•**in** ± 2 lbf•**in**)
Headlight Torx screw	2.3 N•m ± 0.2 N•m (20 lbf•**in** ± 2 lbf•**in**)

CONSOLE


mmr2017-051-024

Removing the Console

1. Remove *UPPER BODY MODULE*. Refer to procedure in this subsection.
2. Remove the seat. Refer to *SEAT* subsection.
3. Cut harness locking ties.
4. Remove console nuts.


mmr2017-051-041_a

5. Remove fuel tank cap.
6. Lift up the console and unplug all connectors.
7. Install fuel tank cap.

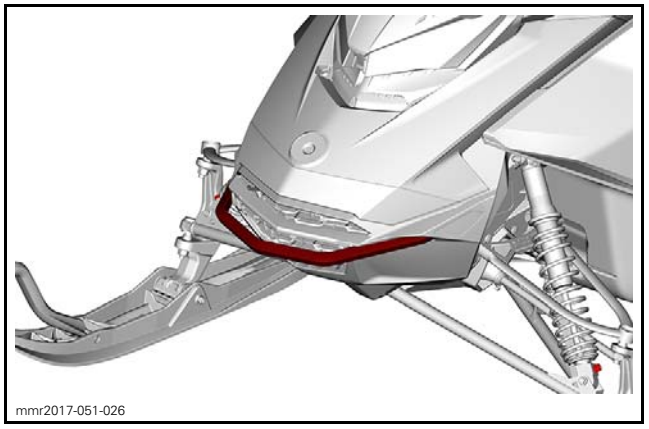
Installing the Console

The installation is the reverse of the removal procedure.

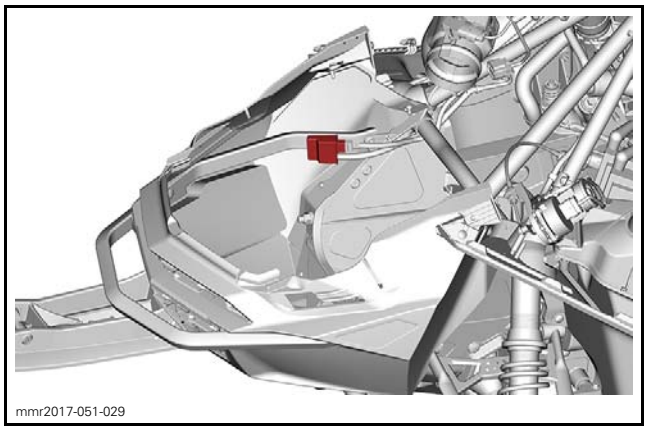
TIGHTENING TORQUE	
Console nut	2.3 N•m ± 0.2 N•m (20 lbf•**in** ± 2 lbf•**in**)

FRONT BUMPER

Removing the Front Bumper


mmr2017-051-026

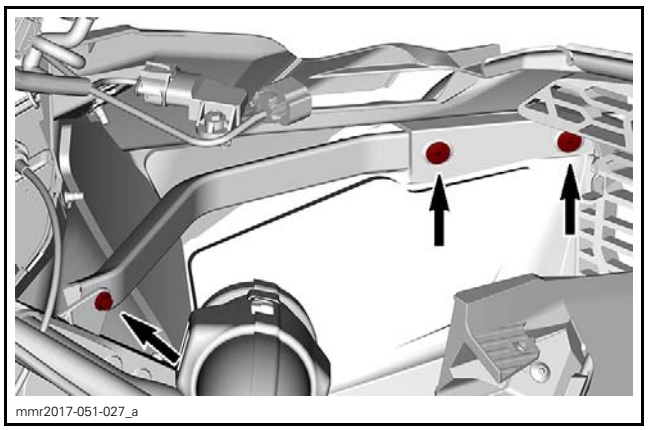
1. Remove tuned pipe. Refer to *EXHAUST SYSTEM* subsection.
2. Detach TCM from bumper.


mmr2017-051-029

3. Drill out rivets from front bumper.

REQUIRED TOOL
SUPERTANIUM DRILL BIT 3/16" (P/N 529 031 800)

4. Remove front bumper screws.

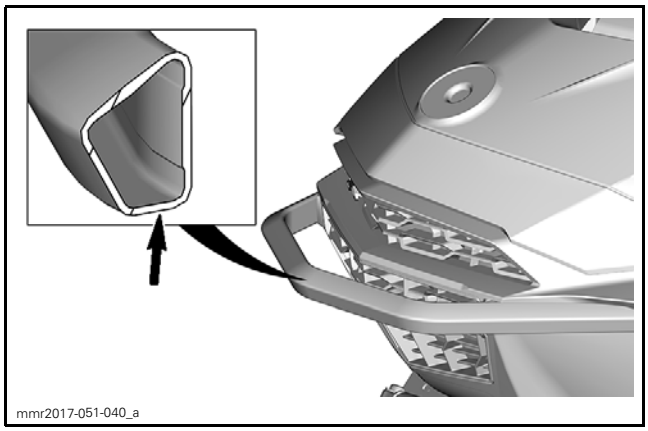

mmr2017-051-027_a

5. Pull out bumper towards front.

Installing the Front Bumper

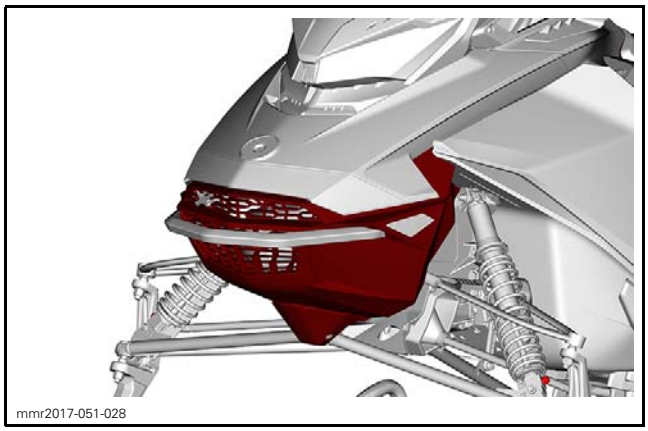
The installation is the reverse of the removal procedure.

Ensure the small surface of the bumper extrusion is facing downwards.



TIGHTENING TORQUE	
Front bumper nut	5 N•m ± 0.5 N•m (44 lbf•**in** ± 4 lbf•**in**)

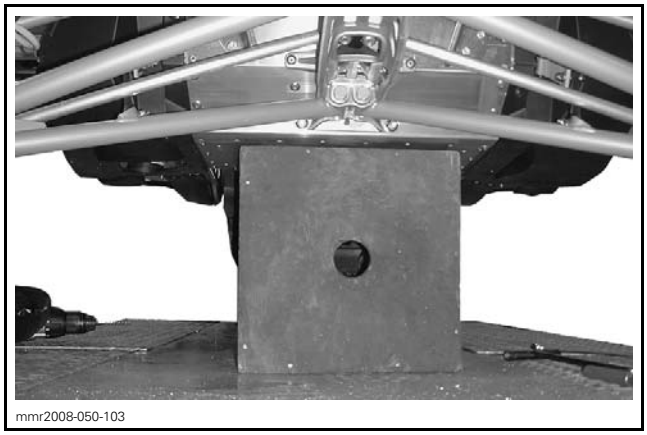
FRONT BOTTOM PAN



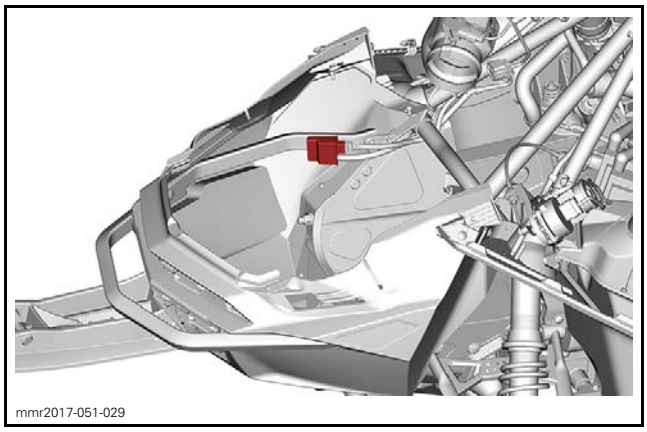
TYPICAL

Removing the Front Bottom Pan

1. Lift front of vehicle until skis are off the ground.
2. Place the front portion of frame on a wooden box to support it securely.



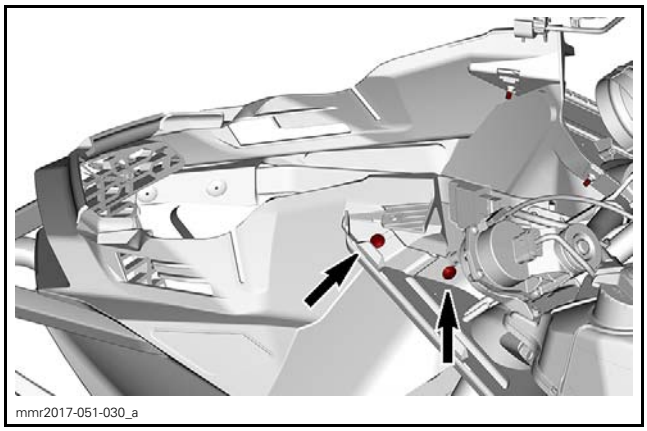
3. Remove the upper body module. Refer to procedure in this subsection.
4. Remove tuned pipe. Refer to *EXHAUST SYSTEM* subsection.
5. Detach TCM from bumper.



6. Remove *FRONT BUMPER*. See procedure in this subsection.

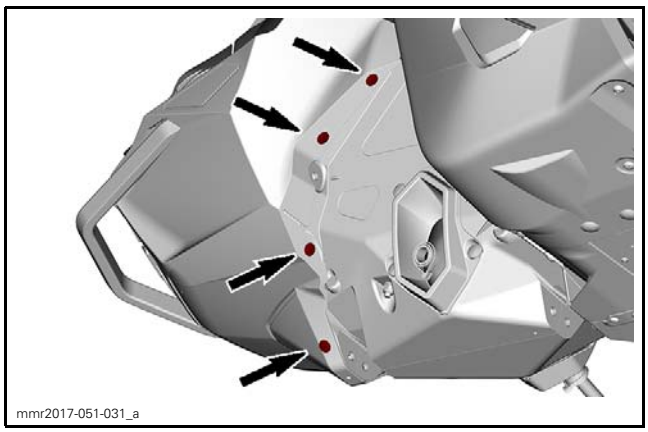
If the front bottom pan does not need to be replaced, the bumper may remain attached to bottom pan.

7. Remove bottom pan screws.



8. Remove front shock absorbers. Refer to *FRONT SUSPENSION* subsection.
9. Drill out all rivets retaining bottom pan.

NOTE: Refer to *FRAME* for proper procedure when drilling rivets retaining plastic parts.



LH SIDE SHOWN — SOME PARTS REMOVED FOR CLARITY

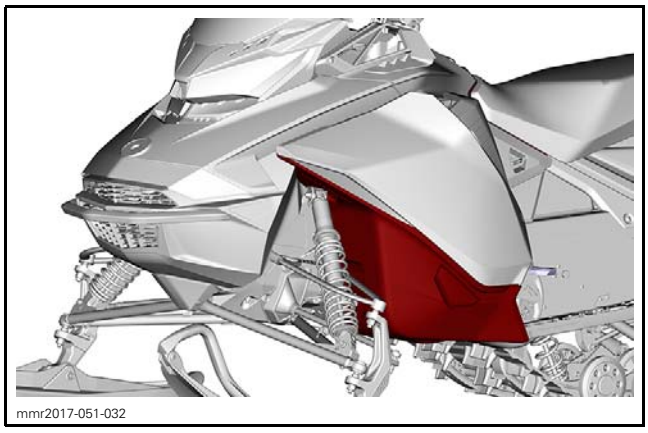
10. Remove bottom pan.

Installing the Front Bottom Pan

The installation is the reverse of the removal procedure.

TIGHTENING TORQUE	
Bottom pan screw	1.8 N•m ± 0.2 N•m (16 lbf•**in** ± 2 lbf•**in**)

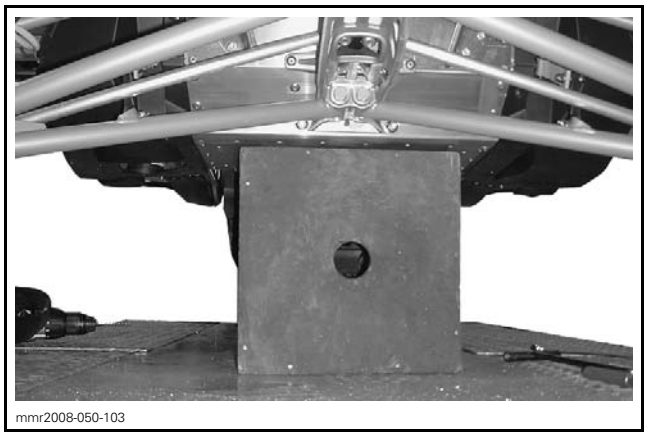
SIDE BOTTOM PAN



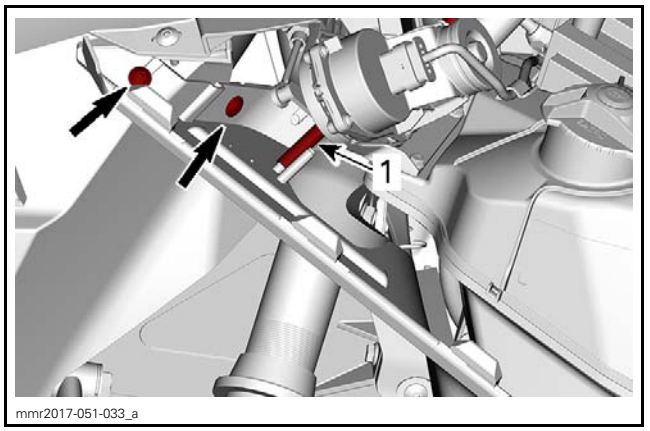
Removing the Side Bottom Pan

1. Remove the side panel. Refer to procedure in this subsection.
2. Lift front of vehicle until skis are off the ground.
3. Place the front portion of frame on a wooden box to support it securely.

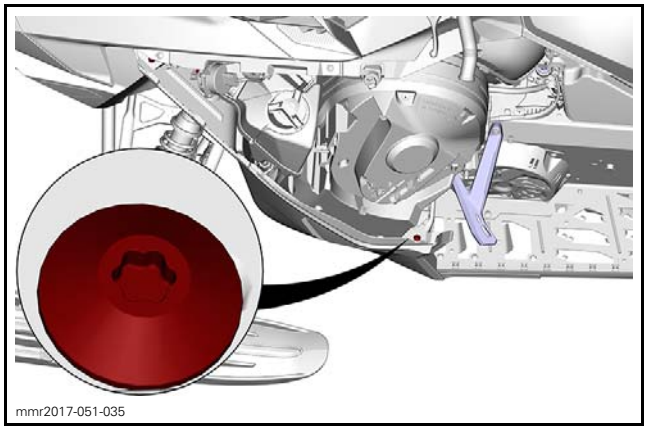
NOTE: Ensure to clear side bottom pans so they can move freely.



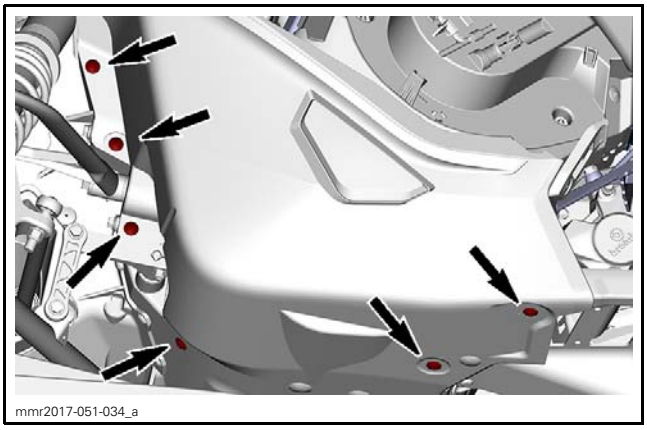
4. Disconnect vent tube from side bottom pan, and remove the screws.



1. Vent tube



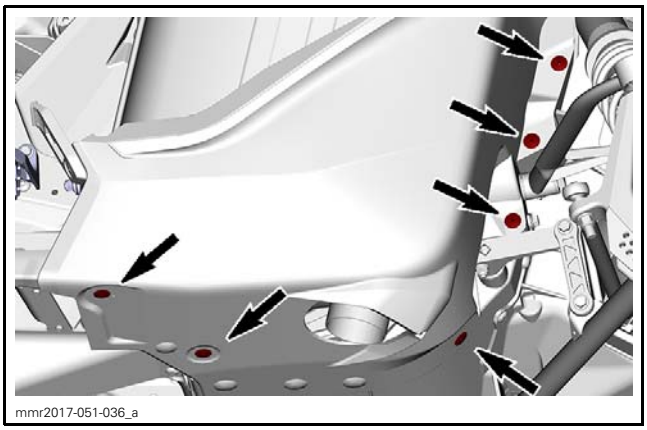
5. To remove the LH side bottom pan, remove the screws and washers.


mmr2017-051-034_a

6. To remove the RH side bottom pan, drill out all rivets

NOTE: Refer to *FRAME* for proper procedure when drilling rivets retaining plastic parts.

NOTICE Be careful not to drill through muffler.


mmr2017-051-036_a

RH SIDE SHOWN

Installing the Side Bottom Pan

The installation is the reverse of the removal procedure.

Reinstall the washers at the correct position.

TIGHTENING TORQUE	
Side bottom pan screw	2.8 N•m ± 0.2 N•m (25 lbf•**in** ± 2 lbf•**in**)

SEAT

Seat Removal (Summit and Freeride models)

Roll up the front of the foam.

While pushing seat forward, pull up the latch.

520001496-003_b

1. Seat latch

Slide seat rearwards to remove it.

Seat Installation

NOTICE Riding the vehicle with any objects between the seat and the fuel tank could damage the fuel tank. NEVER place any objects between seat and fuel tank.

Place seat over the hooks, then slide it forward.

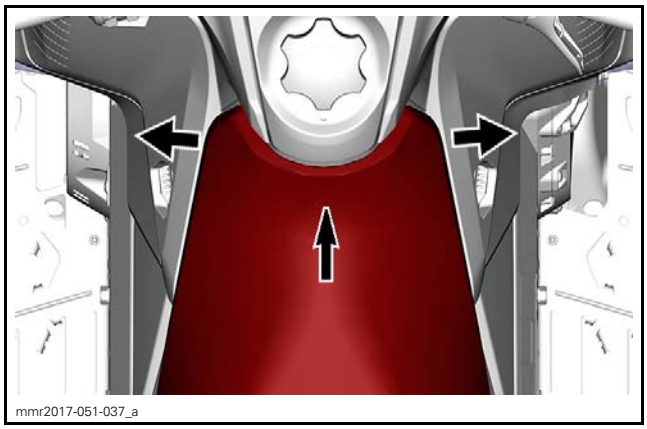
Securely engage latch.

⚠ WARNING

Make sure seat is securely latched before riding.

Removing and Installing the Seat (All models exc. Summit and Freeride)

1. While pushing in the center of the seat towards front, pull on both sides, to unlock, and slide rearwards.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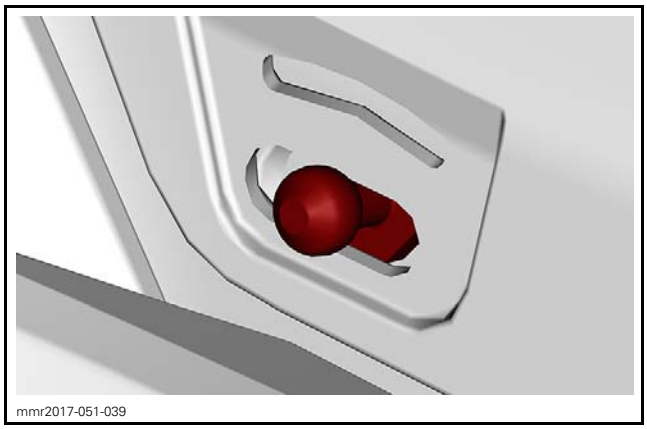
The Installation is the reverse of the removal procedure.

Ensure the seat is locked.



FOAM REMOVED FOR CLARITY

Replacing the Seat Cover

NOTE: We strongly reccommand the use of an electric stapler to recover the seat.

Remove seat.

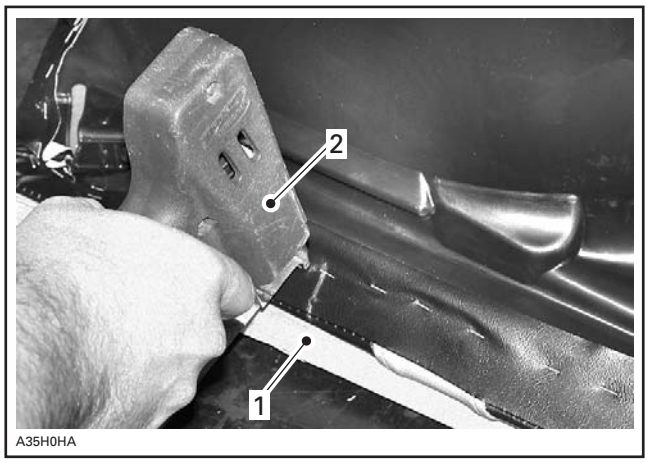
Remove the old seat cover. Check the foam and replace it if necessary.

Install the new seat cover with staples.

NOTICE **Ensure to use the proper length staples. Extra long staples would pierce the exposed side of the leatherette.**

NOTE: For an easier installation, it is highly recommended to use an electric tacker.

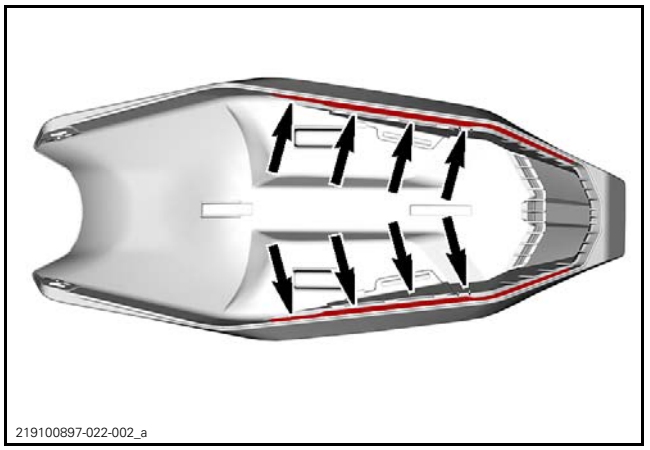
Ensure that the seat rest firmly against a hard surface such as a piece of wood. This is done to get the staples completely pushed in place.



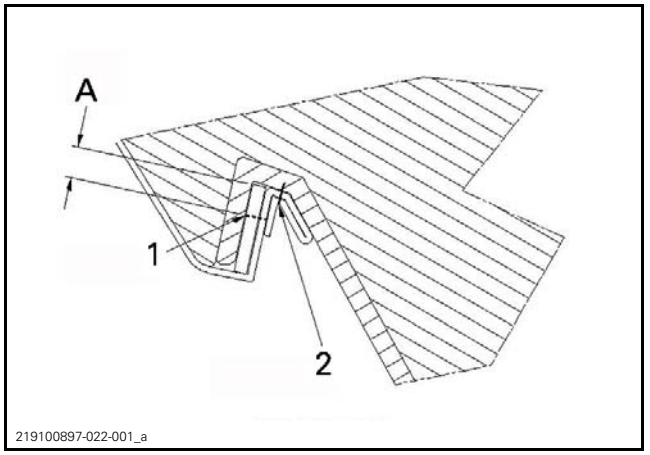
TYPICAL
1. *Piece of wood*
2. *Tacker*

All models except Summit and Freeride

The trail seat needs a special stapling procedure to ensure a strong and durable seat cover installation. Make sure the staples on the rear part of the seat are installed as shown.



The staples go inside the crease on each side of the seat.



A = 5 MM (1/4 IN)
1. *Sewing*
2. *Staple*

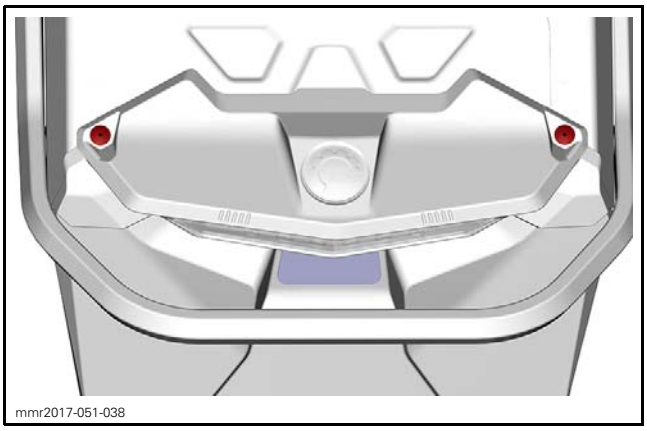
After seat cover installation, cut out excess material leaving 5 mm (1/4 in) between staple and edge.

REAR BUMPER

TIGHTENING TORQUE	
Rear bumper screws	16 N•m ± 2 N•m (142 lbf•**in** ± 18 lbf•**in**)

TAIL LIGHT HOUSING

Drill out the rivets.


mmr2017-051-038

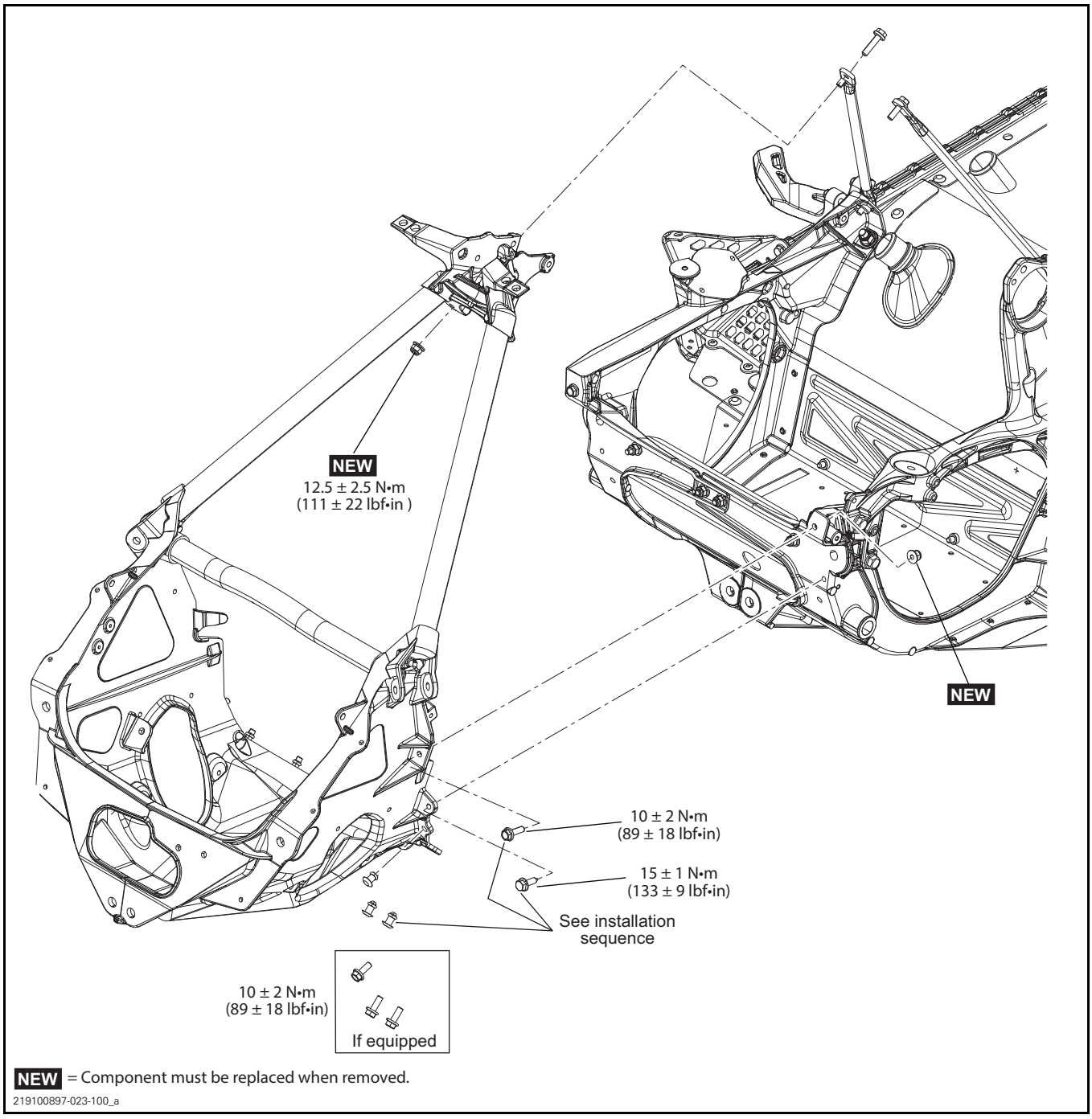
Pull housing towards rear.

FRAME

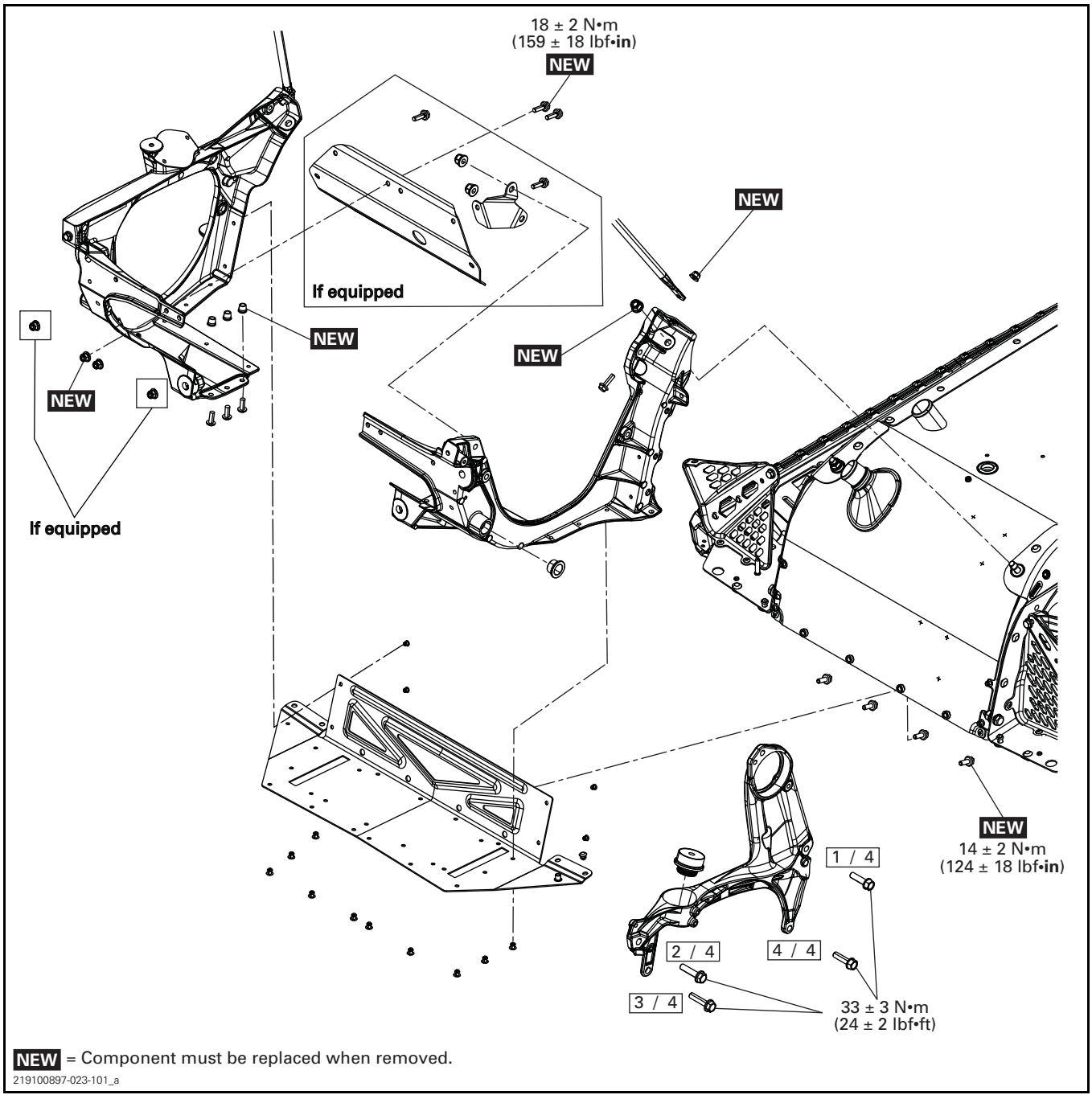
SERVICE TOOLS

Description	Part Number	Page
RADIATOR INSTALLATION GAUGES	529 036 422	13
SUPERTANIUM DRILL BIT 3/16"	529 031 800	4

SUSPENSION MODULE



ENGINE MODULE



NEW = Component must be replaced when removed.

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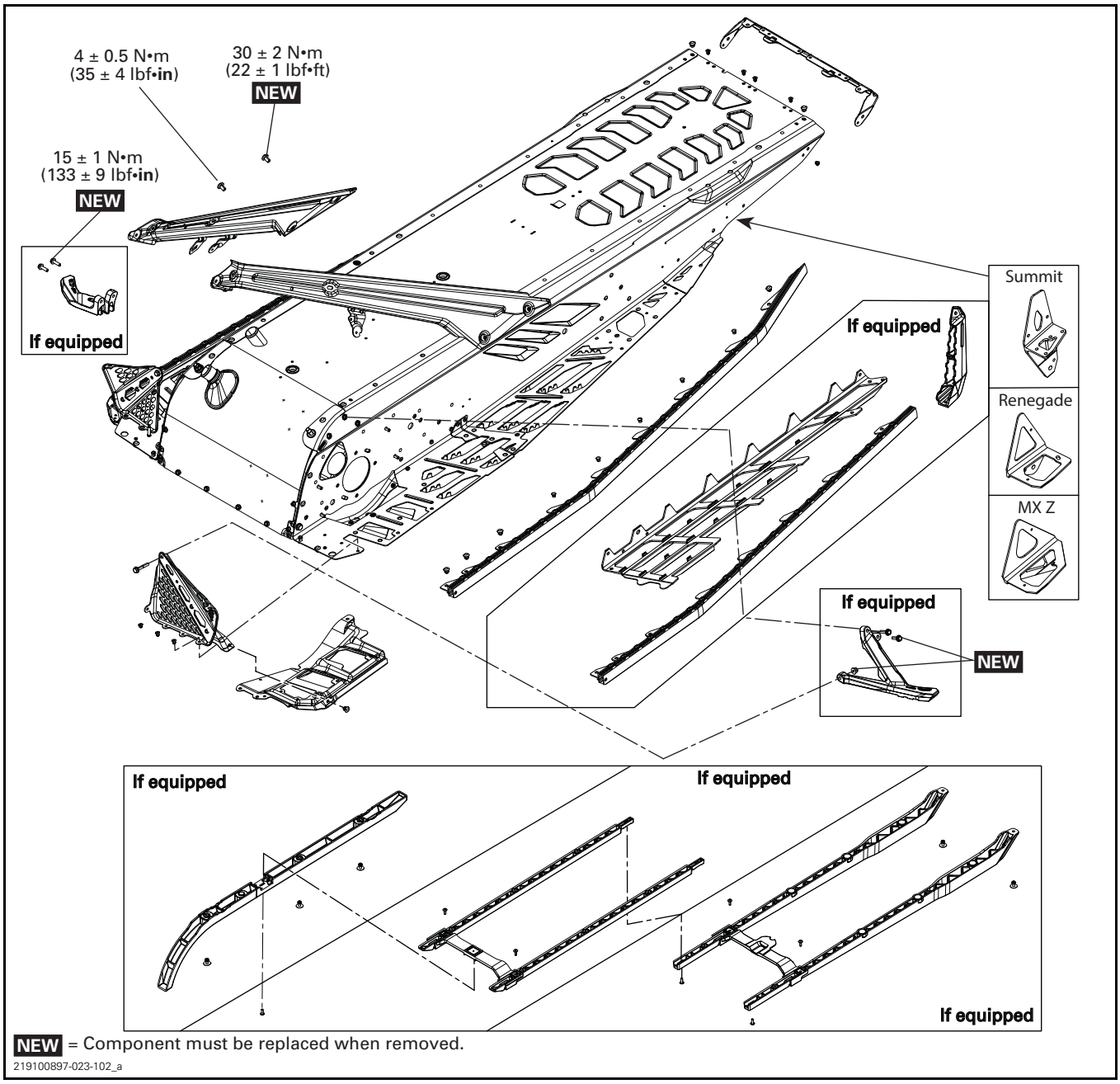
TUNNEL MODULE



GENERAL

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

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

⚠ WARNING

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

Check for loose, bent, worn out, rusted or otherwise damaged components. Replace the faulty components.

PROCEDURES

RIVETS

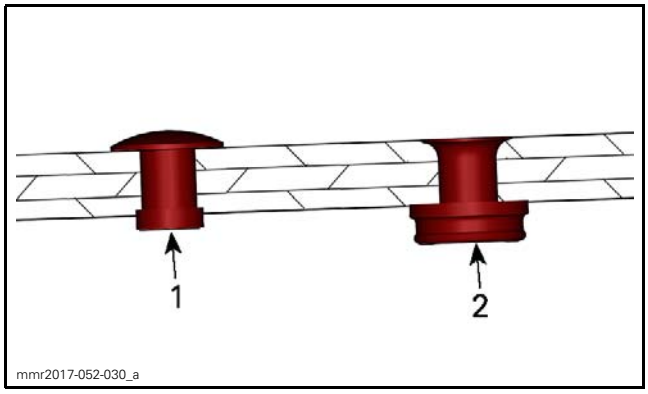
For proper drilling instructions and to prevent premature wear, follow the procedures as detailed.

NOTICE **When removing rivets, do not enlarge or deform the rivet holes in the frame.**

Removing a Self-Percing Rivet

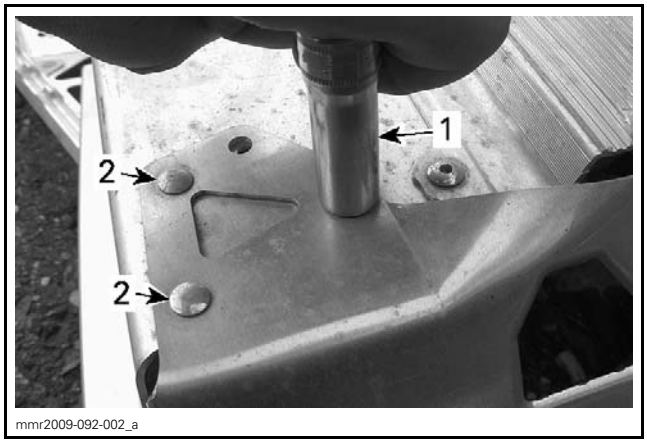
Henrob and Thomson rivets are self-piercing rivets. They are installed with specific robotized equipment.

1. Using a grinding disk, grind the rivet end.



1. Thomson rivet
2. Henrob rivet

2. Support the frame around the rivet head with a socket on the opposite side to avoid warpage.



TYPICAL
1. 11 mm socket over a rivet head
2. Rivet heads

3. Drive out remaining rivet using a punch.

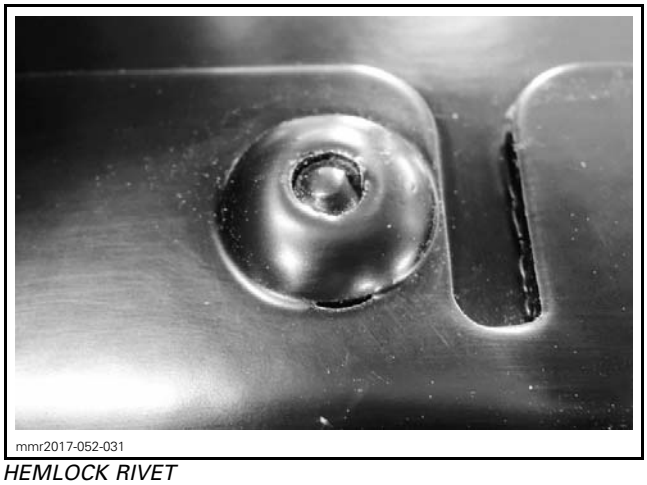
Removing a Pop Rivet

Stavex, Avibulb, and Hemlock rivets are standard pop rivets. They are installed with standard manual or pneumatic tool.

1. Drill rivet head sufficiently to cut through it.

NOTE: To drill a Hemlock rivet, remove the riveting nail using a punch first.

NOTICE **It is highly recommended to support the frame locally around a Hemlock rivet when punching its nail out.**



HEMLOCK RIVET

RECOMMENDED TOOL
SUPERTANIUM DRILL BIT 3/16" (P/N 529 031 800)

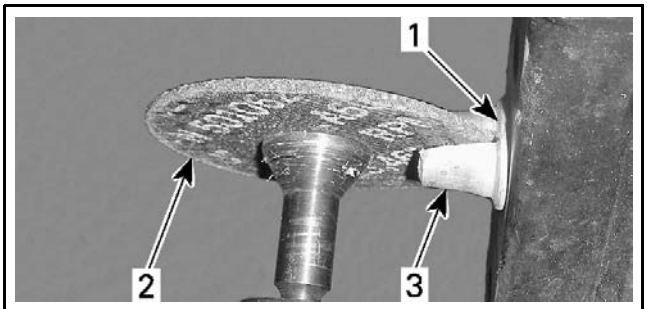
NOTICE **Drill only sufficiently to cut rivet head. Do not drill into frame material, or part secured using the rivet. When rivet is used to secure a plastic part, use pliers to avoid rotation of rivet with drill bit and heating or melting of the plastic part.**

2. Using a small punch, drive out the remaining rivet end.

Removing a HUCK Rivet

Huck rivet is a 2 parts type rivet. It is installed with a specific pneumatic tool.

1. Using a cut-off tool, cut the rivet retainer without touching the retainer's shoulder.



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1. Rivet retainer's shoulder
2. Cutter wheel
3. Rivet retainer

NOTE: Apply a thin layer of grease on cutter wheel to increase its durability.

2. Break the rivet retainer's shoulder using a chisel.
3. Use a small punch to drive out the rivet stem.

FRAME

Cleaning the Frame

Clean frame and tunnel with appropriate cleaners and rinse with high pressure hose.

NOTE: For bare aluminum frames use only aluminum cleaner and follow instructions on container.

NOTICE **Never direct high-pressure water jet towards decals. They will peel off.**

Welding the Frame

No welding is permitted unless it is specified on a BRP bulletin.

Repairing the Frame

NOTE: The following is specific information for aluminum chassis painting. Use common painting techniques.

1. Sand the area to be painted.
2. Clean and dry the area.
3. Apply a thin layer of paint of the appropriate color.
4. Allow paint to dry before re-coating.

NOTE: Paint takes approximately 15 minutes to dry following application.

5. Apply a thin coat of clear.

NOTE: Immediately after the clear coat application, apply a thin coat of HR50 blending solvent **around** the painted area.

6. Allow clear coat to dry.

NOTE: Clear coat takes approximately 2 hours to dry following application.

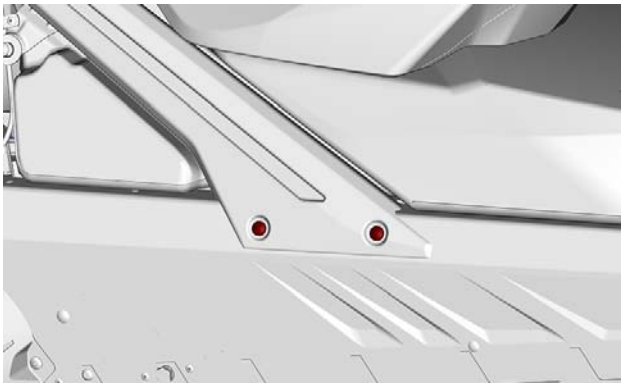
REAR BUMPER

Refer to *BODY* subsection for rear bumper removal and installation procedure.

REAR FRAME MEMBER

Removing the Rear Frame Member

1. Refer to *BODY* subsection to remove the following:
   – Seat
   – Upper body module
   – Rear console.
2. Remove fasteners as per the following illustrations.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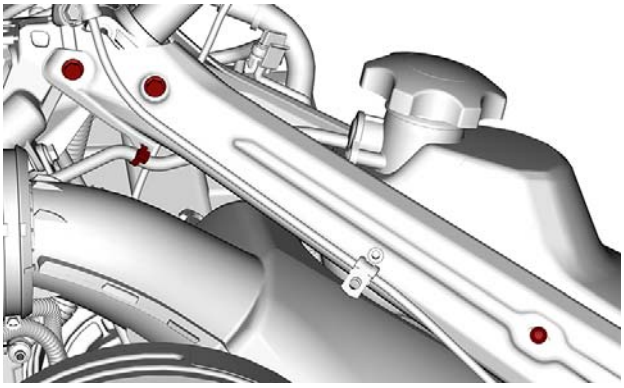

mmr2017-052-002

3. Remove rear frame member.

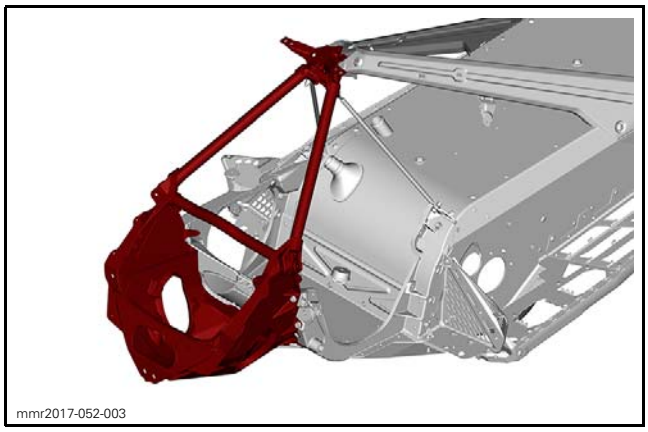
Installing the Rear Frame Member

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

NOTE: Install all screws and nuts before tightening them.

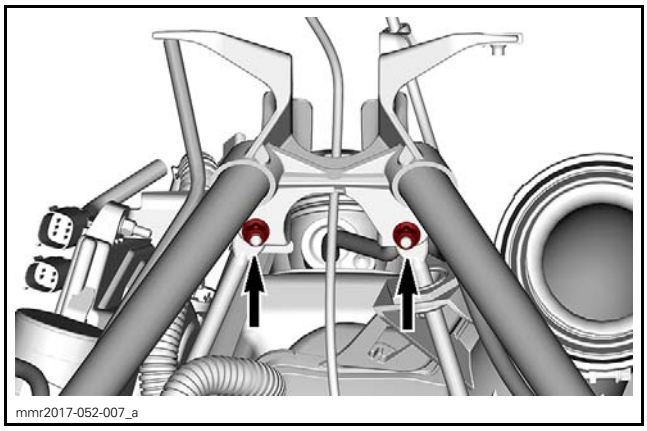
Refer to exploded view for proper tightening torque.

FRONT SUSPENSION MODULE


mmr2017-052-003

Removing the Front Suspension Module

1. Lift front of vehicle until skis are off the ground.
2. Place a wooden box under the engine module to support the frame securely.
3. Refer to the appropriate subsection and remove:
   – Engine
   – Steering column.
4. Detach the brake hose clamp next of the upper steering column support.
5. Detach side frame members from upper steering column support.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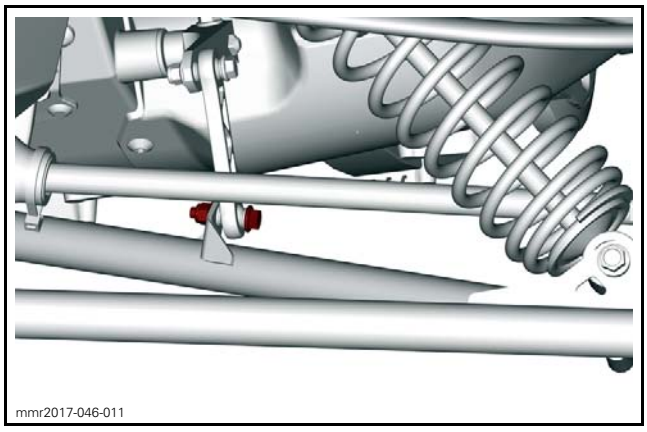
6. Remove the front suspension assembly in the following manner:
   6.1 Detach tie-rod ends from steering column.
   6.2 Remove upper shock absorber screws.
   6.3 Remove screw that secures stabilizer link to lower arm.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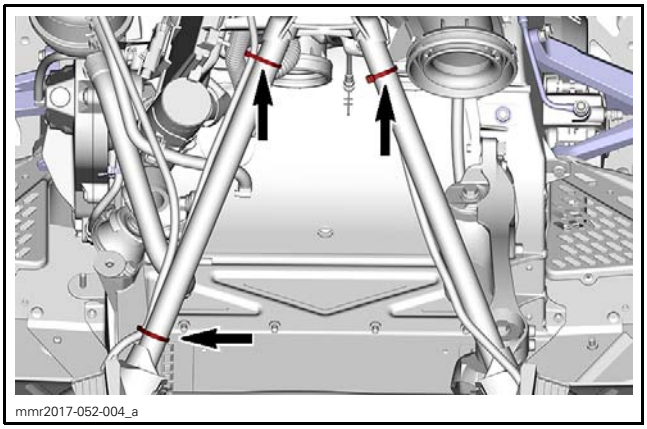
   6.4 Remove upper and lower suspension arms screws and nuts. Refer to *FRONT SUSPENSION* subsection.
   6.5 Remove front suspension assembly from vehicle.
7. Remove the stabilizer bar. Refer to *FRONT SUSPENSION* subsection.
8. Remove the front bottom pan. Refer to *BODY* subsection.

NOTE: Keep the front bumper installed on front bottom pan.

9. Cut locking ties that secure vents and electrical harness to module tubes.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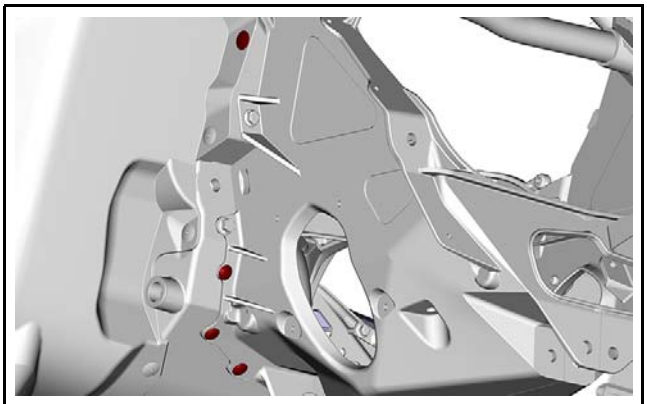
10. If the suspension module needs to be replaced, remove:
    – Steering rack / lower steering column support
    – Tie rod boots.
    Refer to *STEERING SYSTEM* subsection.
11. Remove the lower retaining fasteners.

For riveted models, refer to *REMOVING A POP RIVET* at the beginning of this subsection for procedure.

NOTICE It is highly recommended to support the frame locally around a Hemlock rivet when punching its nail out.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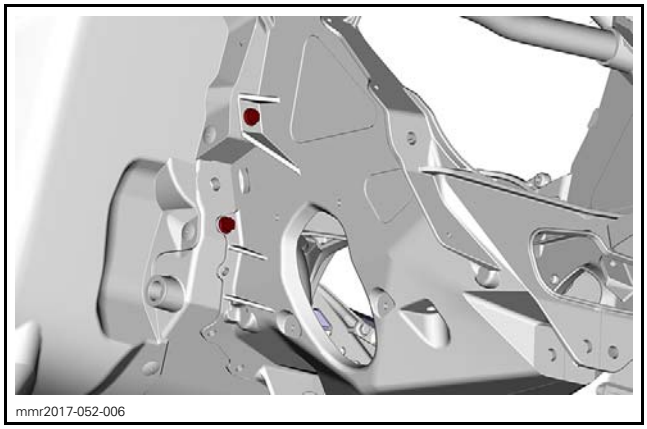
RH SIDE SHOWN

12. Remove the upper retaining fasteners.


mmr2017-052-006

RH SIDE SHOWN

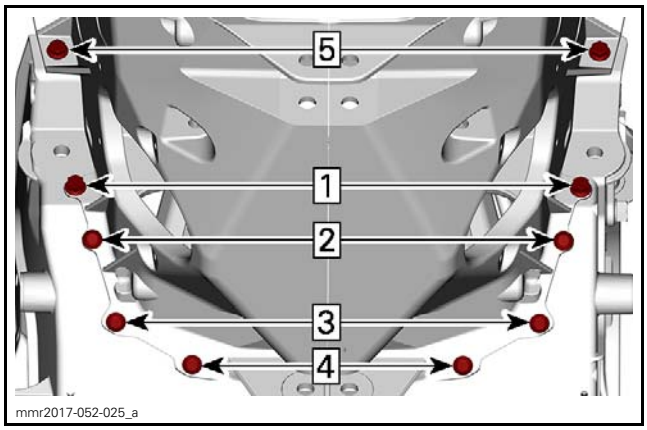
13. Remove the front suspension module.

Installing the Front Suspension Module

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

Refer to exploded view for proper tightening torque.

Install fasteners as per the following sequence.



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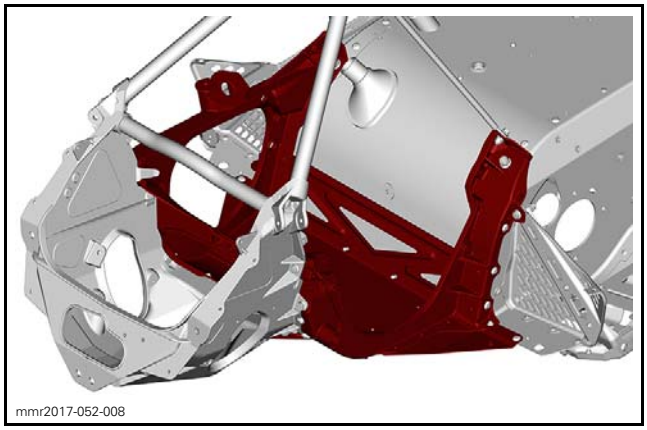
ENGINE MODULE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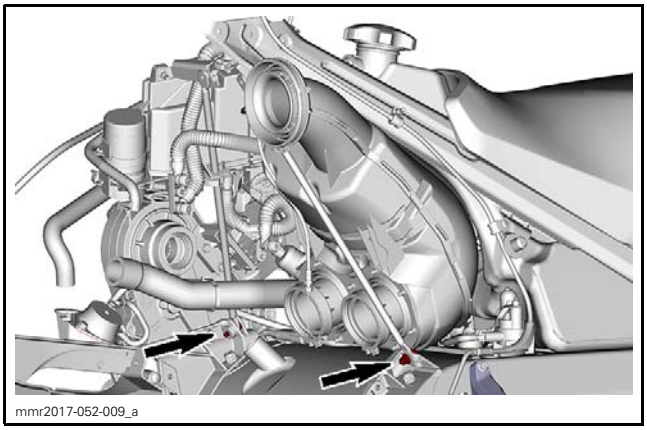
Removing the Engine Module

1. Remove the *FRONT SUSPENSION MODULE*, see procedure in this subsection.
2. Remove RH side bottom pan. Refer to *BODY* subsection.
3. Remove the RH side engine rubber mount. Refer to *ENGINE*.subsection.
4. Detach side frame members from engine module.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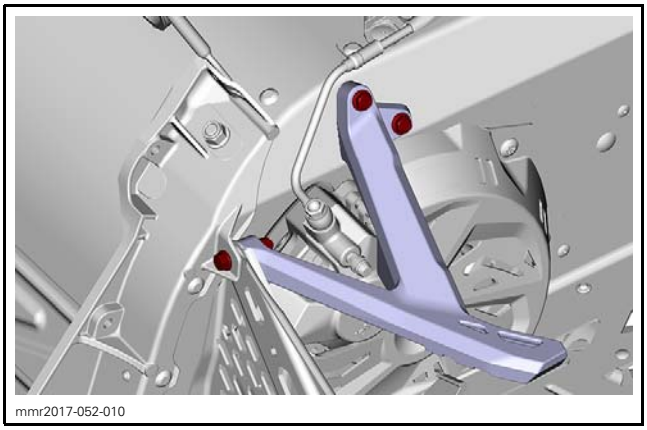
5. Remove toe hook fasteners, if equipped.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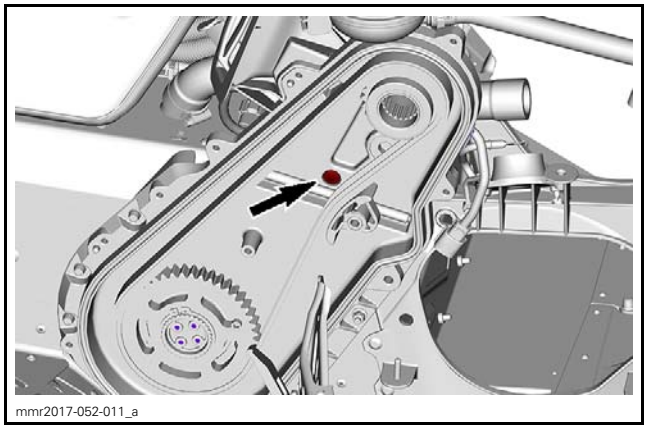
6. Remove the chaincase cover. Refer to *CHAINCASE* subsection.
7. Remove the screw that secure the chaincase to the engine module.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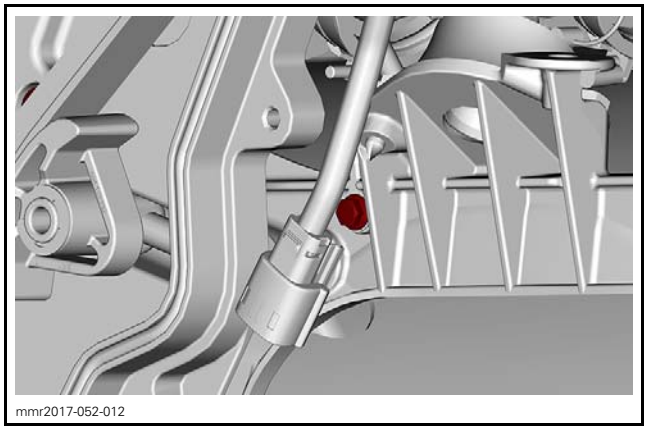
8. Remove the electrical ground screw located between the chaincase and the engine mount.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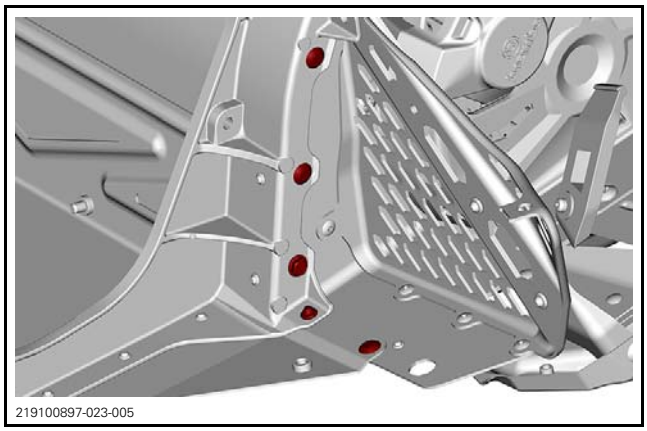
9. Remove rivets and bolts as per the following illustrations. Refer to *REMOVING A POP RIVET* in this subsection.

NOTICE **It is highly recommended to support the frame locally around a Hemlock rivet when punching its nail out.**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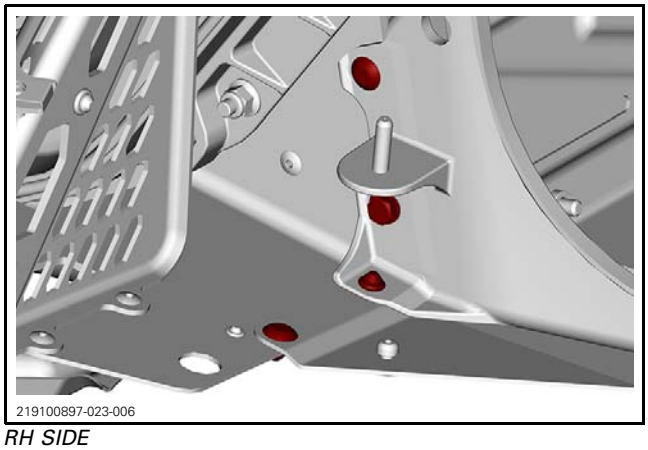
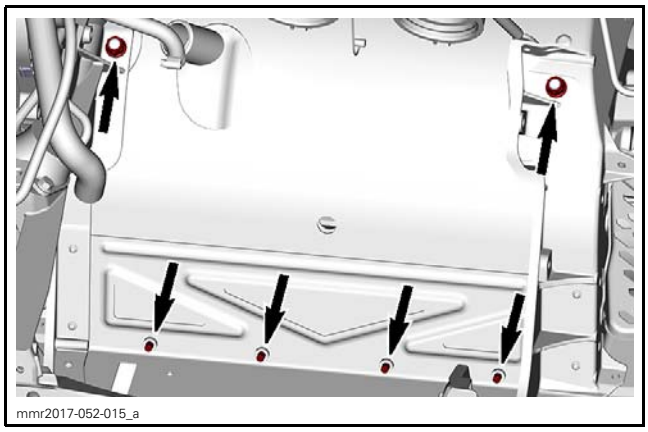
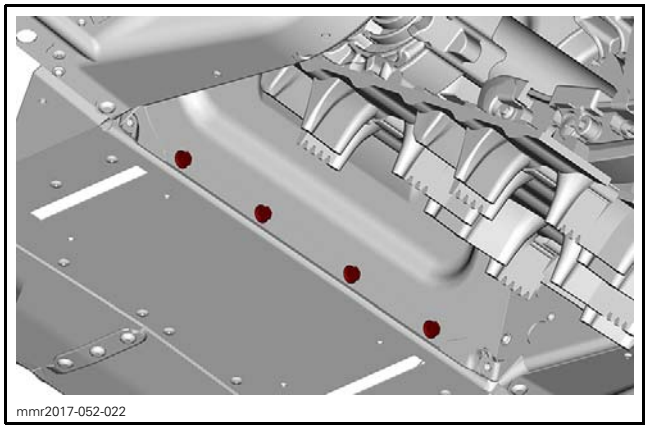
LH SIDE



RH SIDE

10. Remove nuts and screws securing the engine module to the tunnel.





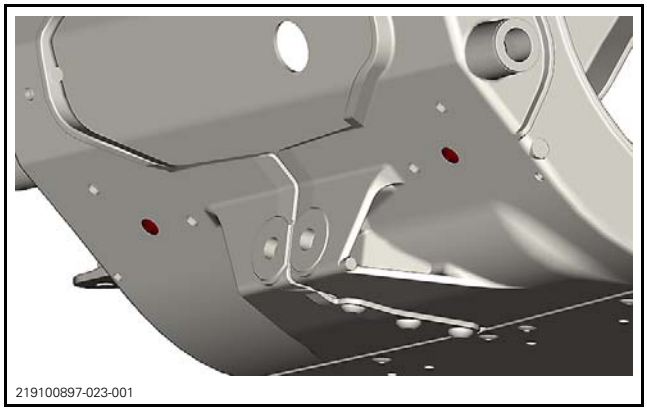
VIEW FROM INSIDE THE TUNNEL

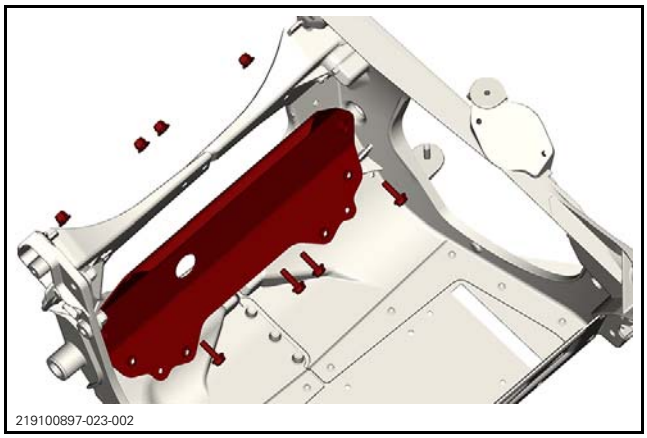
11. Remove the engine module.

If only one of the two side members is replaced:

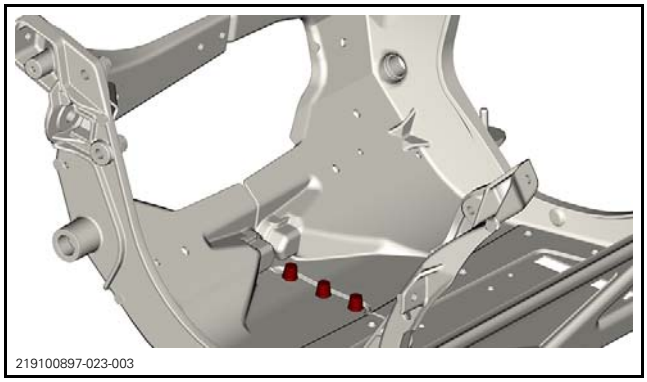
Models with Reinforcement Plate

Remove the rivets and bolts retaining the reinforcement plate.



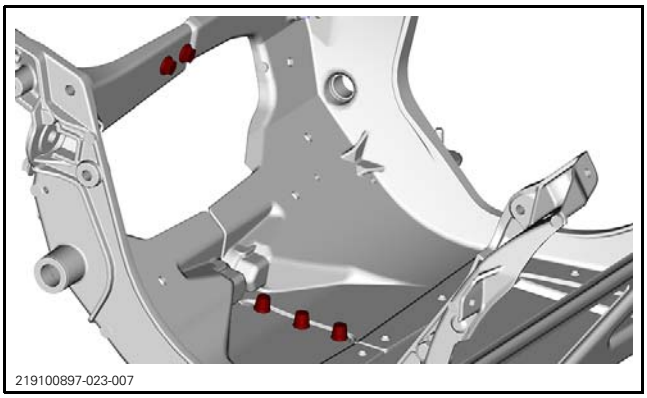


Remove HUCK rivets as per the procedure in this subsection.



Models without Reinforcement Plate

Remove HUCK rivets and bolts as per the procedure in this subsection.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Engine Module Installation

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

Assemble LH and RH side frame member before to fix on the tunnel module.

If the HUCK rivets were removed, replace with the following parts.

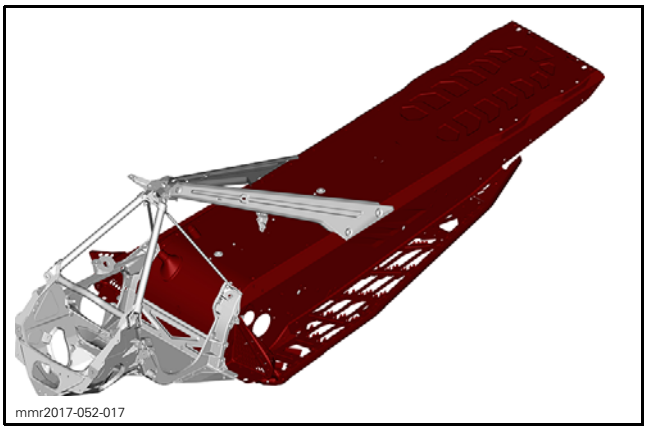
NEW FASTENERS	
Torx screw M6 x 20	(P/N 250000712)
Hexagonal flanged elastic stop nut M6	(P/N 233261414)

NOTE: Install the 3 bottom screws with heads downwards and the 2 upper screws with heads towards the engine.

Install all screws and rivets in there hole (including reinforcement fasteners) before tightening and riveting.

Refer to exploded view for proper tightening torque. Use standard tightening torque when not specified.

TUNNEL MODULE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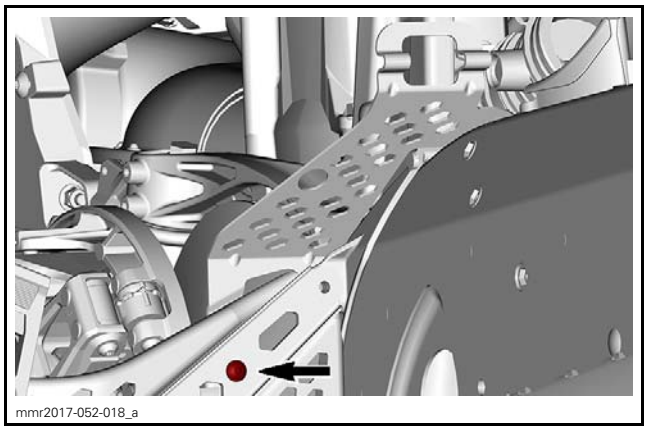
Removing the Tunnel Module

1. Drain cooling system, Refer to *COOLING SYSTEM DRAINING* in *PERIODIC MAINTENANCE PROCEDURES* subsection.
2. Place a wooden box under the engine module to support the frame.
3. Refer to the appropriate subsection and remove:
   - Driven pulley and countershaft
   - Fuel tank
   - Primary air intake silencer
   - LH bottom pan
   - Track
4. Remove the remaining drive belt guard bracket screw.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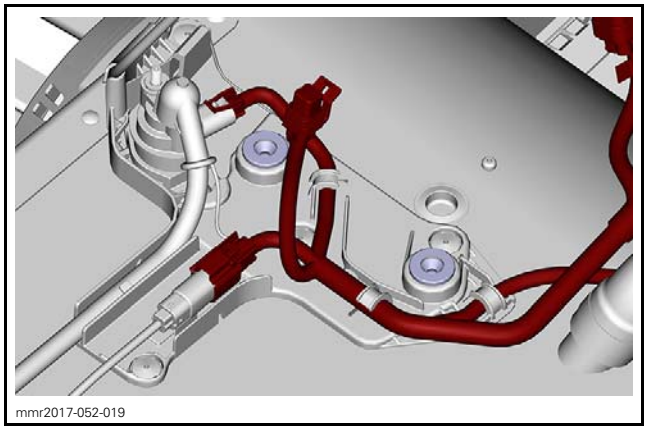
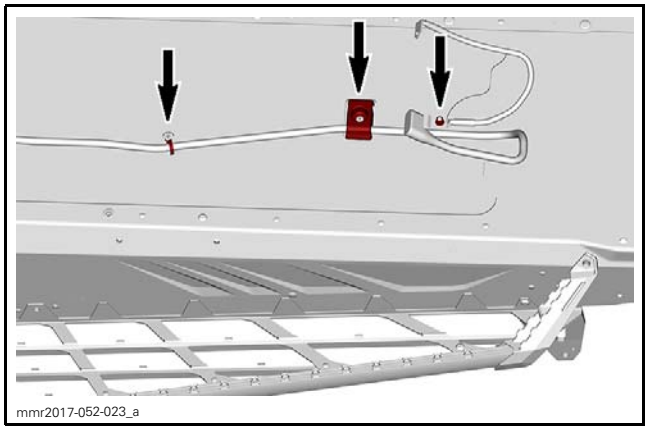
5. Disconnect the starter cable from the solenoid, if equipped.
6. Disconnect and remove the electric harness from the plastic bracket.


mmr2017-052-019

7. If the tunnel is replaced, remove:
   - Chaincase
   - The plastic bracket
   - Devices that retain the battery cable, if equipped

– Rear bumper
– Taillight
– Snowguard.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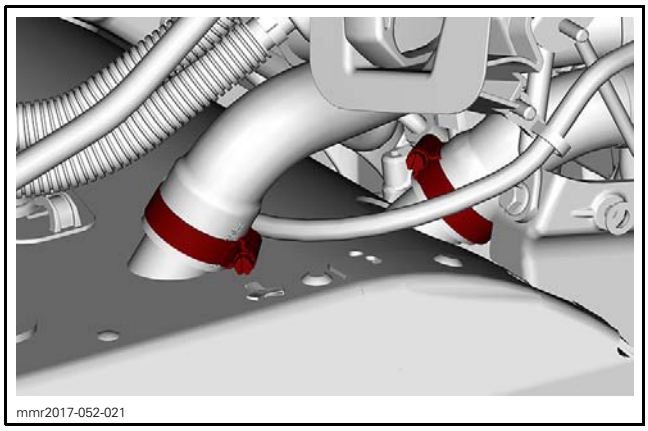
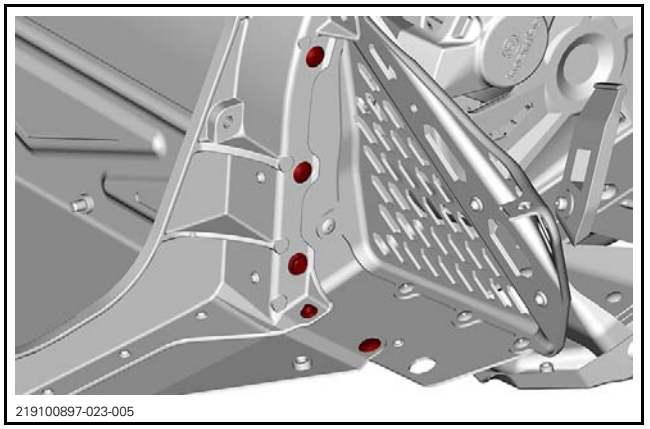
8. Move the plastic bracket, electrical harness, and fuel hoses aside to clear the tunnel.
9. Loosen the coolant hose clamps and disconnect hoses.

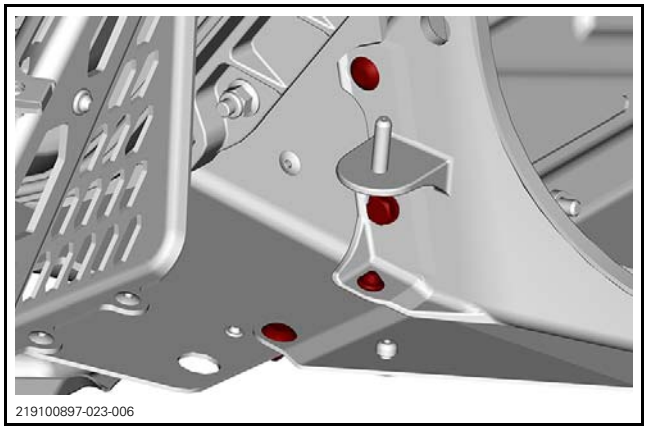

mmr2017-052-021

10. Remove rivets as per the following illustrations. Refer to *REMOVING A POP RIVET* in this subsection.

NOTICE **It is highly recommended to support the frame locally around a Hemlock rivet when punching its nail out.**

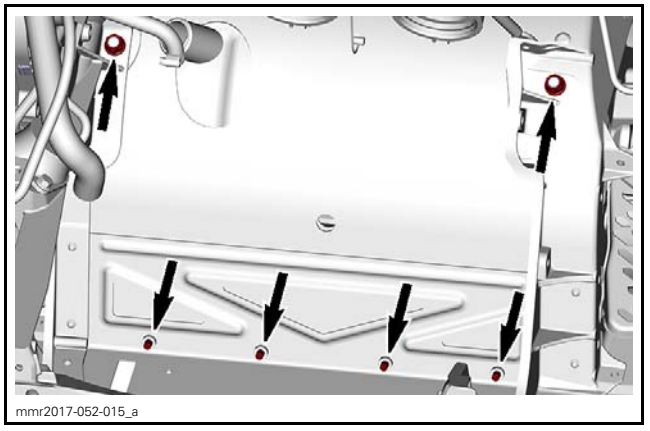

219100897-023-005

LH SIDE


219100897-023-006

RH SIDE

11. Remove nuts and screws securing the engine module to the tunnel.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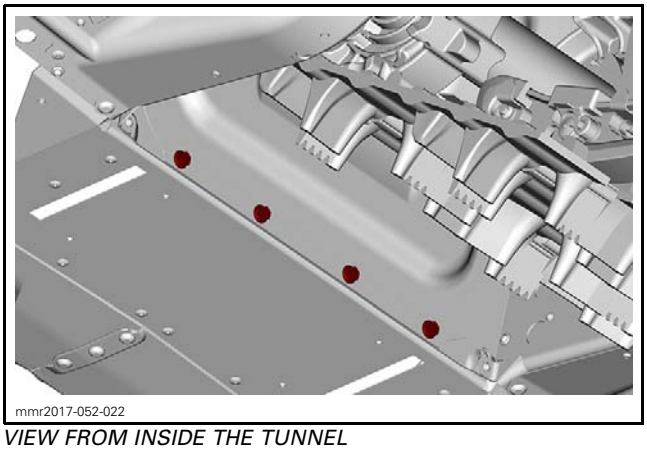
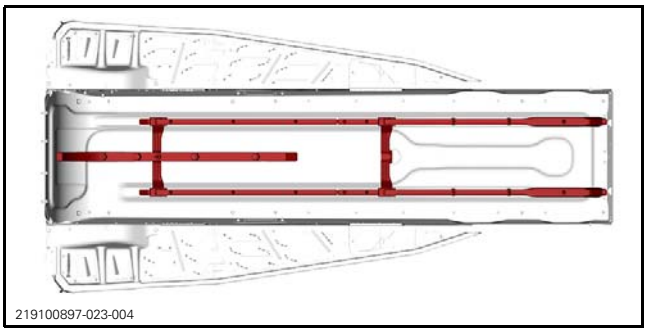

mmr2017-052-022

VIEW FROM INSIDE THE TUNNEL

12. Separate the tunnel module from the rest of the frame.
13. Remove the tunnel protectors under the tunnel, if equipped.


219100897-023-004

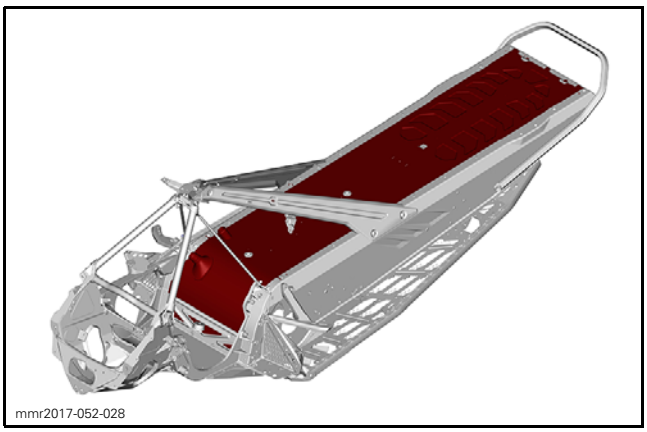
Installing the Tunnel Module

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

Refer to exploded views or appropriate subsections for proper tightening torque.

Properly refill cooling system. Refer to *COOLING SYSTEM REFILL AND BLEEDING* in *PERIODIC MAINTENANCE PROCEDURES* subsection.

HEAT EXCHANGER


mmr2017-052-028

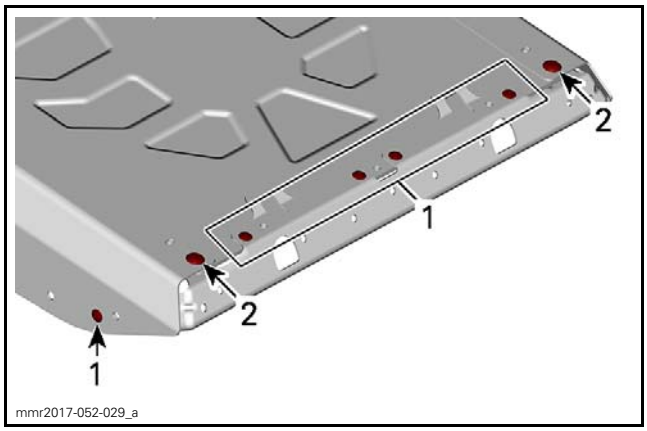
Replacing the Heat Exchanger

1. Remove the tunnel. Refer to the procedure in this subsection.

Do not remove the chaincase.

2. Remove the tunnel rear cap. Refer to *RIVETS* in this subsection.

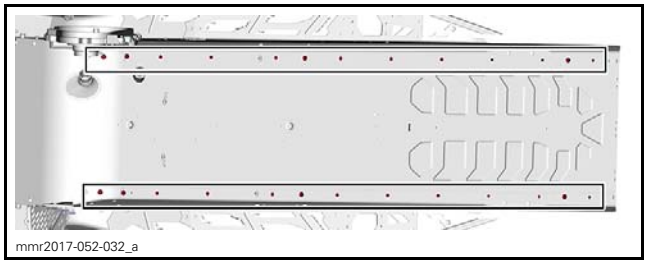
NOTICE **It is highly recommended to support the frame locally around a Hemlock rivet when punching its nail out.**



mmr2017-052-029_a

1. *Avibulb rivets (pop rivets)*
2. *Hemlock rivets (pop rivets)*

3. Remove the following rivets.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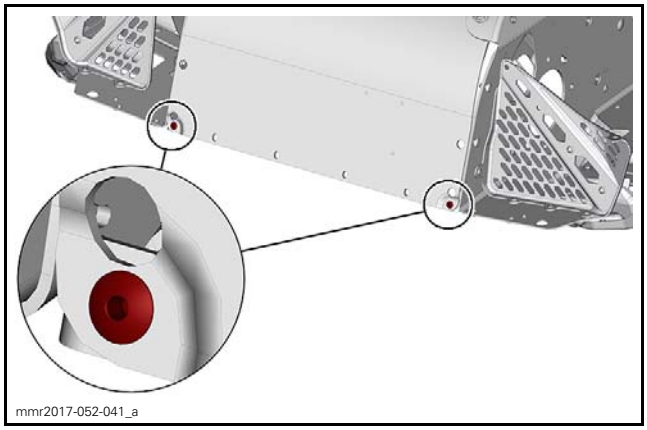
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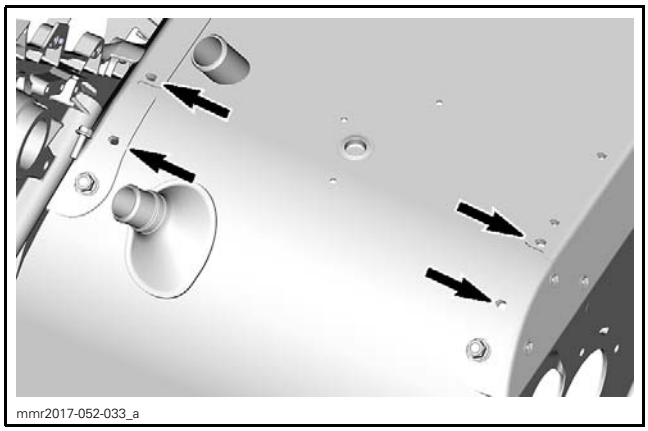
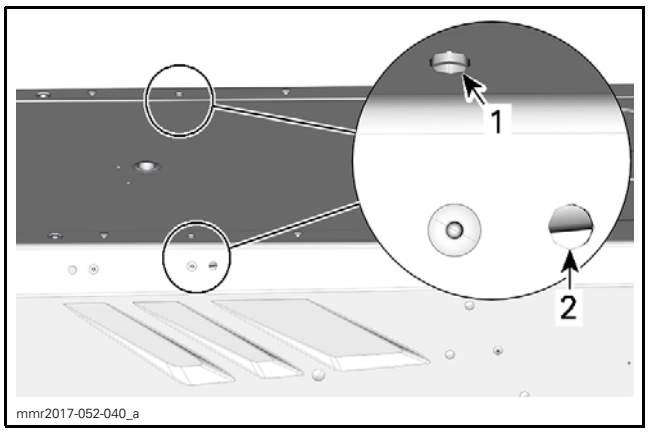
4. Position the new heat exchanger.
5. Install M6 screws and nuts loosely in the Hemlock rivet holes.

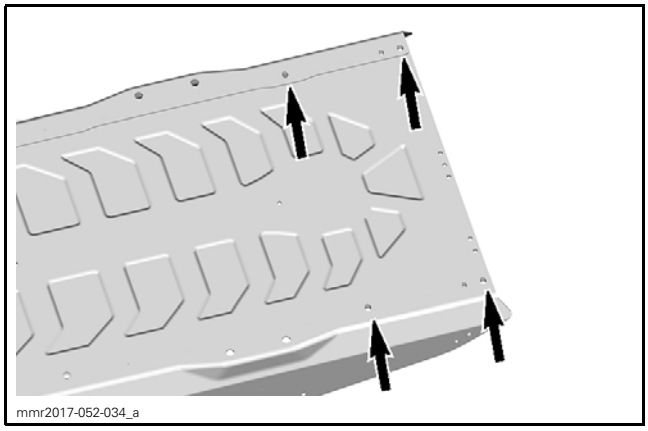
NOTE: M6 screws will not fit in self-piercing rivet holes.



FRONT RIVET HOLES



MID-LENTGH RIVET HOLES
1. *Install M6 screws and nuts here*
2. *Rear mounting hole for rear frame member*



REAR RIVET HOLES

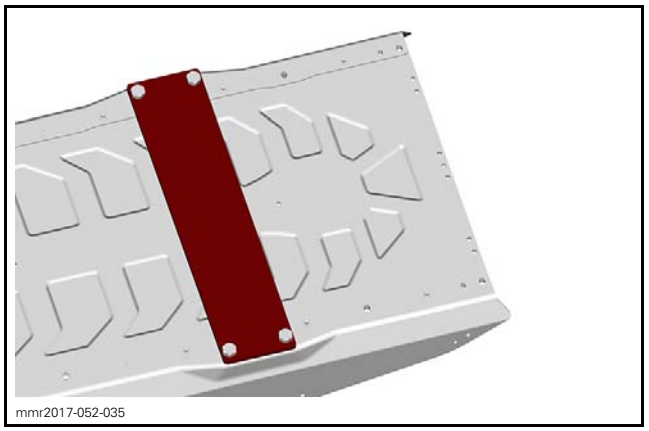
6. Install the gauge kit loosely with the appropriate screws, as per the following illustrations.

NOTICE It is imperative to use the gauge kit and to follow each steps of this procedure to avoid drive axle misalignment.

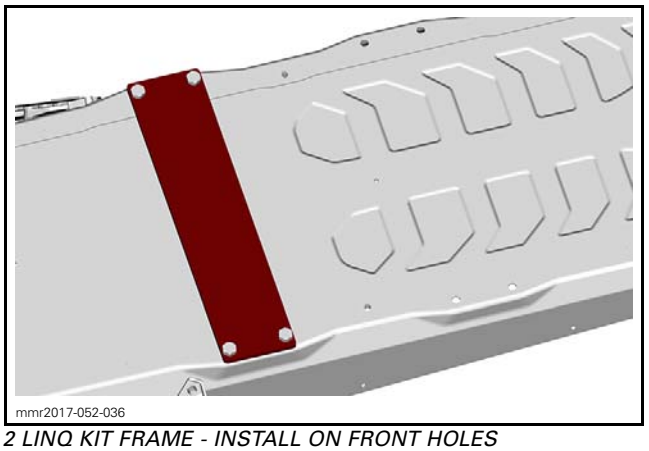
REQUIRED TOOL	
RADIATOR INSTALLATION GAUGES (P/N 529 036 422)	

CYLINDRICAL GAUGES LENGHT	
Rear suspension hole gauges	419.2 mm (16-1/2 in)
Tail gauge	426.4 mm (16-25/32 in)

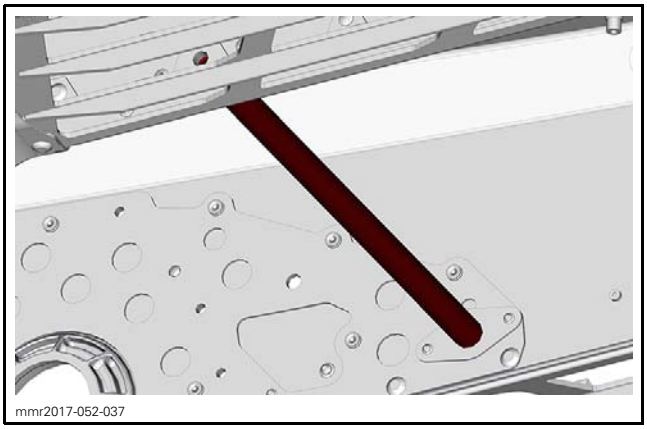
The gauge kit fits all tunnel sizes.



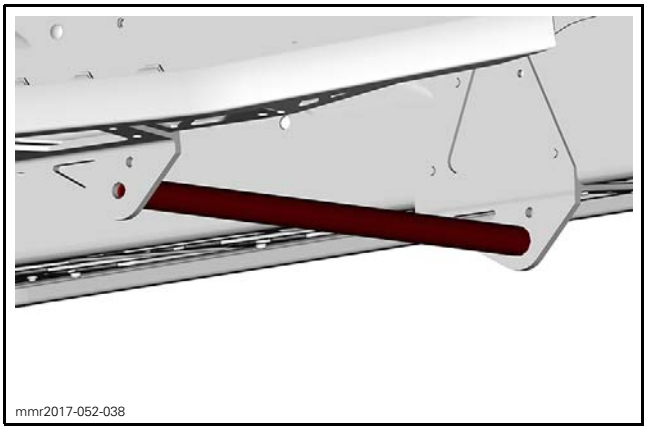
1 LINQ KIT FRAME



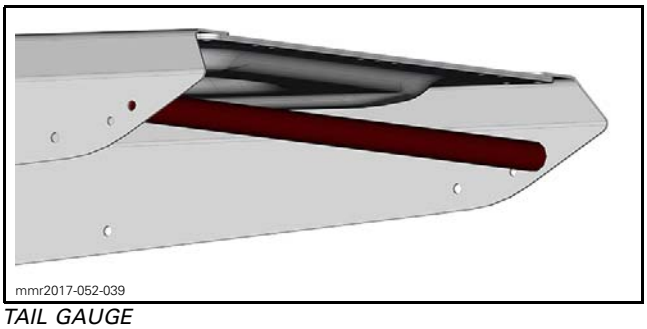
2 LINQ KIT FRAME - INSTALL ON FRONT HOLES


mmr2017-052-037

REAR SUSPENSION FRONT ARM GAUGE


mmr2017-052-038

REAR SUSPENSION REAR ARM GAUGE


mmr2017-052-039

TAIL GAUGE

7. Install the drive axle. Refer to *DRIVE AXLE* subsection.

NOTE: It is not required to install the chain and the brake disc.

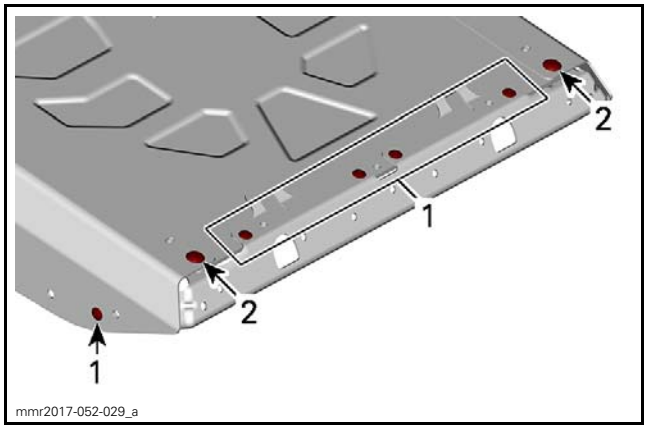
8. Tighten gauges and M6 screws with standard torque.
9. Enlarge self-piercing rivet holes.

REQUIRED TOOL
Drill bit6.35 mm (1/4 in)

10. Install Hemlock rivets in enlarged holes.

REQUIRED PARTS	
Hemlock rivets	293150119

11. Install the tunnel rear cap.



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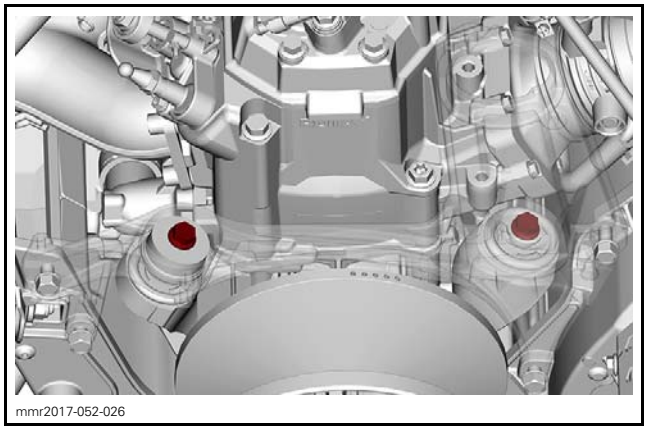
1. Avibulb 4.76 mm (3/16 in) rivets
2. Hemlock 6.4 mm (1/4 in) rivets

12. Remove the M6 screws and nuts, and install Hemlocks rivets.
13. Remove all gauges and the drive axle.
14. Reassemble the vehicle.

COUNTERSHAFT BEARING SUPPORT

Removing the Countershaft Bearing Support

1. Refer to the appropriate subsection and remove:
   – Driven pulley and countershaft
   – LH side bottom pan.
2. Disconnect the Rave valve cable. Refer to *RAVE* subsection in *ENGINE*.
3. Install a shim between the engine bottom end and the engine module.
4. Remove both engine mount screws.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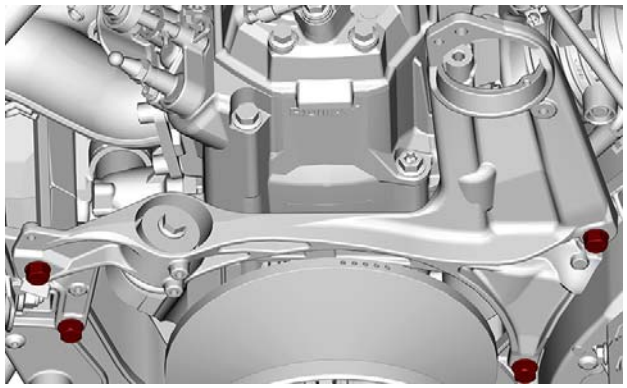
FRAME MEMBER IS TRANSPARENT FOR CLARITY

5. Remove countershaft bearing support screws.


mmr2017-052-027

6. Remove the countershaft bearing support.

Installing the Countershaft Bearing Support

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

IF INSTALLED ON THE SAME FRAME MEMBER	
M8 Hexagonal flange screw (all fasteners)	207683044
IF INSTALLED ON A NEW FRAME MEMBER	
M8 Hexagonal flange self-tapping screw (at rear of bearing support)	210283040

Refer to exploded view for tightening torque and sequence.

ENGINE

ENGINE			
Engine type			Rotax 850 E-TEC
Number of cylinder			2
Bore			82 mm (3.228 in)
Stroke			80.4 mm (3.165 in)
Displacement			849 cm^3 (51.81 in^3)
Compression ratio			12.50 ± 0.3
Combustion chamber volume			37.00 cc ± 0.93
Maximum power engine speed			7900 ± 100 RPM
3D RAVE spring	Valve springs	Color	Yellow
		Wire diameter	0.7 mm (.0276 in)
		Minimum free length	35 mm (1.378 in)
Piston ring type			Semi-trapezoidal
Ring end gap		New	0.4 mm to 0.6 mm (.016 in to .024 in)
		Service limit	1 mm (.039 in)
Engine compression specification		Service limit	7.5 bar (109 PSI)
Piston/cylinder wall clearance		New	0.135 mm to 0.161 mm (.005 in to .006 in)
		Service limit	0.200 mm (.0079 in)
Piston projection			1.75 mm to 1.82 mm (.069 in to .072 in)
Cylinder head warpage		Service limit	0.5 mm (.0197 in)
Cylinder taper		New (max.)	0.03 mm (.0012 in)
		Service limit	0.1 mm (.0039 in)
Cylinder out of round		New (max.)	0.010 mm (.0004 in)
		Service limit	0.080 mm (.0031 in)
Crankshaft deflection		Max.	MAG: 0.05 mm (.002 in) PTO: 0.08 mm (.0031 in)
Connecting rod big end axial play		New	0.152 mm to 0.352 mm (.006 in to .0139 in)

COOLING SYSTEM		
Coolant	Type	Ethyl glycol and distilled water (50%/50%). or coolant specifically formulated for aluminum engines For best performance use BRP LONG LIFE ANTIFREEZE
	Quantity	Refer to *VEHICLE TECHNICAL SPECIFICATIONS* for the quantity required to fill up engine and vehicle
Thermostat opening temperature		37°C (99°F)
Radiator cap opening pressure		90 kPa (13 PSI)

LUBRICATION SYSTEM		
Oil injection pump type		Electronic oil injection pump
Injection oil	Type	XPS synthetic 2-stroke oil
	Quantity	3 L (101.4 U.S. oz)

FUEL SYSTEM	
Fuel delivery	E-TEC direct injection + auxiliary throttle body injection system
Throttle body	52 mm (2x)
Idle speed (not adjustable)	1200 ± 200 RPM

ELECTRICAL SYSTEM		
Lighting system output		1340 W @ 6000 RPM
Ignition type		Inductive
Spark plug	Make and type	NGK ILKR8Q7 (engine and spark plug threads are indexed)
	Gap	Not adjustable 0.6 mm to 0.7 mm (.024 in to .028 in)
Ignition timing BTDC @ 3500 RPM		28°
		5.98 mm (.235 in)

VEHICLES

COOLING SYSTEM			
Coolant	Type		Ethyl glycol and distilled water (50%/50%) Use BRP EXTENDED LIFE PRE-MIXED COOLANT or coolant specifically formulated for aluminum engines.
	Quantity	MXZ	6.2 L (6.6 qt (U.S. liq.))
		Freeride 137" Grand Touring Renegade	6.5 L (6.9 qt (U.S. liq.))
		Backcountry / X / X-RS Expedition LE / SE Freeride 146" Summit 146"	7.0 L (7.4 qt (U.S. liq.))
		Freeride 154" Summit 154"	7.4 L (7.8 qt (U.S. liq.))
		Freeride 165" Summit 165"	7.9 L (8.3 qt (U.S. liq.))
		Summit 175" Expedition Xtreme	8.4 L (8.9 qt (U.S. liq.))
Radiator cap opening pressure			110 kPa (16 PSI)

LUBRICATION SYSTEM		
Oil injection pump type		Electronic oil injection pump
Injection oil	Type	2T E-TEC synthetic oil
	Quantity	3.4 L (3.6 qt (U.S. liq.))

FUEL SYSTEM			
Fuel pump			In-tank electrical
Fuel	Type		Premium unleaded gasoline (fuel which may contain up to 10% MAX ethanol
	Octane rating	Inside North America	91 Pump Posted AKI (R+M)/2)
		Outside North America	95 (RON)
Fuel tank capacity	All models except Expedition		36 L (9.5 U.S. gal.)
	Expedition		42 L (11.1 U.S. gal.)

ELECTRICAL SYSTEM		
Battery	Expedition SE Expedition LE	12 V, 30 A•h
	Other models	12 V, 18 A•h
Headlamp		2 x 60/55 W (H-13)

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ELECTRICAL SYSTEM			
Taillight and stoplight			2.6 W / 139m W LED
Fuses	All models except Expedition	Start/RER/Clock (F1)	5 A
		Loads (F2)	25 A
		Battery (F3)	30 A
		Accessories (F4)	7.5 A
	Expedition	Clock/Start/Relays (F1)	5 A
		Headlamps (F2)	20 A
		Cluster (F3)	15 A
		SD/RFID (F4)	10 A
		Accessory (F5)	15 A
		Fan (F6)	15 A
		ACS (F7)	15 A
		Taillights (F8)	15 A

DRIVE SYSTEM - CHAINCASE		
Chaincase oil (if equipped)	Type	Synthetic chaincase oil
	Quantity	350 ml (12 U.S. oz)

DRIVE SYSTEM - CHAINCASE		
Chain drive ratio	MXZ (600R) (1.5" track profile)	21/43
	Expedition Xtreme	27/49
	All Backcountry / X / X-RS (1.6" track profile) Freeride 137" (2.25" track profile) Renegade X (1.50" track profile)	21/45
	Backcountry (600R) Backcountry X / X-RS (2.0" track profile)	23/51
	Expedition LE / SE MXZ (600R)(1.25" track profile) All Renegade (600R) except Renegade X (1.50" track profile) Renegade X-RS (1.50" track profile) Grand Touring LTD Freeride 137" (1.75" track profile)	23/45
	MXZ X (850) except (1.25" track profile) MXZ X-RS (850) except (1.25" track profile) All Renegade (850) except Renegade X-RS (1.50" track profile)	25/45
	MXZ TNT (850) / X / X-RS (1.25" track profile)	27/45
	Freeride 146" Summit 146" Summit X with Expert Package	21/49
	Summit SP 154" Freeride 154"	21/51
	Freeride 165" Summit SP 165" / 175"	21/53

DRIVE SYSTEM - CHAINCASE			
Chain	Pitch		9.530 mm (.375 in)
	Type		Silent
	Links qty	Expedition LE / SE	96
		Expedition Xtreme	100
		Summit Sport (600R)	104
		MXZ X / X-RS (600R) (1.6" track profile) Renegade X (600R) (1.6" track profile)	106
		MXZ X / X-RS / TNT (600R) (1.25" track profile) MXZ X (850) (1.6" track profile) MXZ X-RS (850) Renegade Adrenaline / X / Enduro (600R) (1.25" track profile) Renegade Adrenaline / X / X-RS / Enduro (850) Grand Touring LTD	108
		MXZ X / TNT (850) (1.25" track profile)	110
		Freeride 137" (2.25" track profile) Backcountry / X / X-RS (850) (1.6" track profile) Summit 146" (1.6" track profile)	112
		Freeride 137" (1.75" track profile) Freeride 146" Summit SP 146"	114
		Backcountry (600R) Backcountry X / X-RS (2" track profile) Backcountry X-RS (2.5" track profile) Summit 154" / 165" / 175" Freeride 154" / 165" Freeride Expert Summit SP (600R) (2.5" track profile) Summit SP (600R) (3.0" track profile)	116

DRIVE SYSTEM - GEARBOX			
Gearbox oil	Type		Synchromesh Transmission Synthetic Oil
	Capacity		900 ml (30.4 U.S. oz)
Gearbox ratio	600R	Low	3.87:1
		High	2.15:1
	850	Low	3.59:1
		High	2.0:1

DRIVE SYSTEM - DRIVE AND DRIVEN PULLEYS			
Drive pulley	Type	All model except Expedition	pDrive
		Expedition	pDrive with clickers
Drive pulley calibration	Clutch engagement (RPM)	All models equipped with a 600R E-TEC	3400 ± 100 RPM
		Freeride 137" Renegade Adrenaline 850 Renegade Enduro 850 Renegade X 850 Renegade X-RS	2900 ± 100 RPM
		Summit 175" (High Altitude Calibration)	3900 ± 100 RPM
		MXZ TNT 850 E-TEC MXZ X 850 MXZ X-RS 850	3200 ± 100 RPM
		Backcountry 850 Backcountry X Backcountry X-RS Summit X with Expert Package (Sea level calibration)	3300 ± 100 RPM
		Summit X with Expert Package (High altitude calibration)	3600 ± 100 RPM
		All others	3800 ± 100 RPM

DRIVE SYSTEM - DRIVE AND DRIVEN PULLEYS			
Drive pulley calibration	Spring color code	MXZ Renegade series (600R)	Blue/Blue
		Renegade series (850) Freeride 137" Grand Touring LTD	Yellow/Blue
		Backcountry (600R) Freeride 146" / 154" / 165" (High Altitude Calibration) Summit 146" / 154" / 165" (High Altitude Calibration) Summit X with Expert Package (High Altitude Calibration)	Blue/Violet
		Backcountry (850) Backcountry X / X-RS Freeride 146" / 154" / 165" Summit 146" / 154" / 165" / 175" (Sea Level Calibration) Summit X with Expert Package (Sea Level Calibration)	Blue/Yellow
		Summit 175" (High Altitude Calibration)	Violet/White
	Spring length	Blue/Blue	99.8 mm (3.929 in)
		Violet/White	98.5 mm (3.878 in)
		Blue/Yellow	115.1 mm (4.531 in)
		Blue/Violet	100.3 mm (3.949 in)
		Yellow/Blue	90.7 mm (3.571 in)

DRIVE SYSTEM - DRIVE AND DRIVEN PULLEYS			
Drive pulley calibration	Screw length		14 mm (.551 in)
	Ramp	Grand Touring LTD	901
		Expedition LE / SE	971
		Expedition Xtreme	982
		Backcountry (600R) Summit (600R) (EUR)	951
		All MXZ All Renegade Freeride 137"	968
		Backcountry (850) Backcountry X / X-RS	990
		Freeride 146" / 154" / 165" (High Altitude Calibration)	965
		Freeride 146" / 154" / 165" (Sea Level Calibration)	990
		Summit (High Altitude Calibration)	965
		Summit (Sea Level Calibration)	990
Drive pulley calibration	Clicker position	Backcountry / X / X-RS Summit Freeride 146" / 154" / 165" (Sea Level Calibration)	4
		All other models	3

DRIVE SYSTEM - DRIVE AND DRIVEN PULLEYS			
Driven pulley type	Type		QRS
	Spring color code	Freeride 137" Grand Touring LTD MXZ Renegade	Green/Green
		Backcountry / X / X-RS Expedition Freeride 146" / 154" / 165" / Expert (Sea level calibration) Summit (Sea level calibration)	Black
		Freeride 146" / 154" / 165"/ Expert (High altitude calibration) Summit (High altitude calibration)	Blue/Blue
	Spring length	Blue/Blue	124.3 mm (4.894 in)
		Green/Green	98.5 mm (3.878 in)
		Black	88.8 mm (3.496 in)
	Spring preload		0
	Cam angle	MXZ (850)	45°/42°
		MXZ (600R) Renegade (600R) Grand Touring LTD	44°
		Freeride 137" Renegade (850)	44°/42°
		Backcountry (850) Backcountry X / X-RS Freeride 146" Summit 146" (850)	42°/38° - XTI
		Expedition Xtreme	42/40
		Backcountry (600R) Summit (600R)	46°/42° - XTI
		Freeride 154" / 165" Summit 154" (850) Summit 165" / 175" Expedition LE / SE	40° - XTIs
Pulley distance	Z		Not adjustable 20.9 mm (.823 in)
	X		Not adjustable 41.1 mm ± 1.8 mm (1.618 in ± .071 in)
Offset	Y - X	New	Not adjustable 3 mm (.118 in)
		After break-in	Not adjustable 2 mm ± .5 mm (.079 in ± .02 in)

DRIVE SYSTEM - DRIVE AND DRIVEN PULLEYS			
Drive belt	Width		38.3 mm (1.508 in)
	Wear limit		35.9 mm (1.413 in)
Drive sprocket number of teeth		Freeride 154" Freeride 165" Summit 154" Summit 165" Summit 175"	6
		All others models	8

DRIVE SYSTEM - TRACK			
Track	Width	All MXZ, Renegade and Backcountry (1.6" track Profile) Grand Touring LTD	381 mm (15 in)
		Backcountry (2.0" track profile) Freeride Summit	406.4 mm (16 in)
		All Expedition	500 mm (20 in)
	Length	All MXZ	326.9 cm (129 in)
		All Expedition	392.3 cm (154 in)
		All Renegade Grand Touring LTD	348.7 cm (137 in)
		All Backcountry excluding X-RS	370.5 cm (146 in)
		Backcountry X-RS	370.8 cm (146 in) OR 391.2 cm (154 in)
		Summit	370.5 cm (146 in)
			392 cm (154 in)
			419 cm (165 in)
			444.5 cm (175 in)
		Freeride	348.7 cm (137 in)
			370.5 cm (146 in)
			392 cm (154 in)
			419 cm (165 in)

DRIVE SYSTEM - TRACK			
Track	Profile height	All MXZ All Renegade	31.8 mm (1.25 in) OR 38 mm (1.5 in)
		Backcountry Backcountry X Backcountry X-RS	40.6 mm (1.6 in) OR 50 mm (2 in) OR 63.5 mm (2.5 in)
		Grand Touring	31.8 mm (1.25 in)
		Expedition LE	38.1 mm (1.5 in)
		Expedition SE	38.1 mm (1.5 in) or 45.7 mm (1.8 in)
		Expedition Xtreme	45.7 mm (1.8 in)
		Freeride	44.5 mm (1.75 in) OR 57.2 mm (2.25 in) OR 63.5 mm (2.5 in) OR 76.2 mm (3 in)
		Summit	63.5 mm (2.5 in) OR 76.2 mm (3 in)
Track adjustment	Deflection	Expedition	4 cm to 5 cm (1.57 in to 1.97 in)
		All other models	3.2 cm (1.26 in)
	Force	Expedition	7.3 kgf (16 lbf)
		All other models	6.0 kgf to 8.5 kgf (13 lbf to 19 lbf)

BRAKE SYSTEM		
Brake lining minimum thickness		1 mm (.039 in)
Brake disk minimum thickness		4.5 mm (.177 in)
Brake fluid	Type	DOT 4
	Quantity	65 ml (2.2 U.S. oz)

FRONT SUSPENSION		
Suspension type		RAS 3
Suspension maximum travel	MXZ X Renegade X	233 mm (9.2 in)
	MXZ TNT Renegade Adrenaline Backcountry Backcountry X Backcountry X-RS Renegade Enduro Grand Touring LTD Freeride 137" Freeride 146"	220 mm (8.7 in)
	Expedition LE Expedition SE Expedition Xtreme	210 mm (8.3 in)
	Freeride 154" Freeride 165" All Summit	215 mm (8.5 in)
	MXZ X-RS Renegade X-RS MXZ 600R	255 mm (10 in)
Shock absorber type	MXZ X-RS Renegade X-RS Backcountry X-RS All Freeride	KYB PRO 36 R EA
	Grand Touring Summit SP	HPG
	MXZ (except X-RS) Renegade (except X-RS) Backcountry (except X-RS) Summit X Expedition Xtreme	HPG Plus
	Summit X with Expert Package	HPG Plus Kashima coated
	Expedition LE Expedition SE	Motion Control
Stabilizer bar type		Link

REAR SUSPENSION		
Suspension type	All Expedition	SC-5U
	All MXZ All Renegade Grand Touring LTD Freeride 137"	rMotion
	All Backcountry	cMotion
	All Summit All Freeride (except 137")	tMotion

REAR SUSPENSION			
Suspension maximum travel Measured at rear arm		MXZ	272 mm (10.7 in)
		Freeride 137" Renegade Grand Touring LTD	270 mm (10.6 in)
		Backcountry All Summit (except 175") All Freeride (except 137") All Expedition	239 mm (9.4 in)
		Summit 175"	242 mm (9.5 in)
Shock absorber type	Center	MXZ TNT MXZ X Renegade X Backcountry X Summit X Expedition Xtreme	HPG Plus
		Renegade Adrenaline Renegade Enduro Backcountry Grand Touring LTD Summit SP	HPG
		MXZ X-RS Renegade X-RS Backcountry X-RS All Freeride	KYB PRO 40 EA
		Expedition LE Expedition SE	Motion control
	Rear	MXZ TNT Summit X	HPG Plus
		MXZ X Renegade X Renegade Backcountry X Expedition Xtreme Summit X with Expert Package	KYB PRO 36 EA
		Renegade Adrenaline Renegade Backcountry Summit SP Expedition LE	HPG
		MXZ X-RS Renegade X-RS Backcountry X-RS All Freeride	KYB PRO 40 EA
		Renegade Enduro Expedition SE Grand Touring LTD	ACS (Air Controlled Suspension)
Stroke limiter standard position		Backcountry / X / X-RS Freeride Summit (except 175")	3
		Summit 175"	2
		MXZ Renegade	1

STEERING SYSTEM		
Handlebar	All Freeride All Summit	Aluminum with J-Hooks and Grab handle
	Renegade Enduro	Aluminum with J-Hooks
	Grand Touring LTD	U-shaped aluminum
	Backcountry / X / X-RS MXZ /X / X-RS Renegade X / X-RS / Adrenaline	Aluminum with J-Hooks and handguards
	Expedition LE	Aluminum with J-Hooks and Low handguards
	Expedition SE Expedition Xtreme	Aluminum with J-Hooks, Low grap handle and Flexible handguards
Riser block height	MXZ TNT Renegade Adrenaline Renegade Enduro Backcountry / X / X-RS	120 mm (4.7 in)
	MXZ X MXZ X-RS Renegade X Renegade X-RS Grand Touring LTD	Adjustable - 120 mm (4.7 in)
	Expedition LE Expedition Xtreme Freeride 137" Freeride 146"	145 mm (5.7 in)
	Freeride 154" Freeride 165" All Summit	165 mm (6.5 in)
	Expedition SE	Adjustable - 120 mm (4.7 in)
Ski type	MXZ TNT Renegade Adrenaline	Pilot 5.7
	Grand Touring LTD	Pilot 5.7 SL
	Renegade Enduro	Pilot TS
	MXZ X MXZ X-RS Renegade X Renegade X-RS	Pilot 5.7 Pilot TS (optional)
	Backcountry / X / X-RS Freeride 137" Freeride 146" Expedition Xtreme	Pilot DS2
	Freeride 154" Freeride 165" All Summit	Pilot DS3
	Expedition LE Expedition SE	Pilot 7.4
Ski alignment		5 mm (.197 in) (toe-out)

WEIGHT AND DIMENSIONS			
Mass (dry)	600R	MXZ TNT	212 kg (467 lb)
		MXZ X (with Quick Adjust Suspension and ski Pilot TS)	223 kg (492 lb)
		MXZ X (without Quick Adjust Suspension and ski Pilot TS)	216 kg (476 lb)
		MXZ X-RS (without Quick Adjust Suspension and ski Pilot TS)	221 kg (487 lb)
		MXZ X-RS (with Quick Adjust Suspension and ski Pilot TS)	228 kg (503 lb)
		MXZ X-RS (with Quick Adjust Suspension and ski Pilot 5.7)	224 kg (494 lb)
		Backcountry	214 kg (471 lb)
		Renegade X (without Quick Adjust Suspension and ski Pilot TS)	216 kg (475 lb)
		Renegade X (with Quick Adjust Suspension and ski Pilot TS)	225 kg (496 lb)
		Renegade Enduro	231 kg (508 lb)
		Summit SP 146"	213 kg (470 lb)
		Summit SP 154" (electric start)	210 kg (463 lb)
		Summit SP 154" (SHOT and manual start)	202 kg (445 lb)
		Renegade Adrenaline	217 kg (478 lb)
		Grand Touring LTD	252 kg (554 lb)
		Expedition LE	280 kg (616 lb)
		Expedition SE	293 kg (645 lb)
Mass (dry)	850	Expedition Xtreme	271 kg (595 lb)
		MXZ TNT	215 kg (474 lb)
		MXZ X (with Quick Adjust Suspension and ski Pilot TS)	226 kg (498 lb)
		MXZ X (without Quick Adjust Suspension and ski Pilot TS)	219 kg (483 lb)
		MXZ X-RS (without Quick Adjust Suspension and ski Pilot TS)	225 kg (496 lb)
		MXZ X-RS (with Quick Adjust Suspension and ski Pilot TS)	232 kg (511 lb)
		MXZ X-RS (with Quick Adjust Suspension and ski Pilot 5.7)	227 kg (500 lb)
		Renegade Adrenaline	221 kg (487 lb)
		Renegade Enduro	234 kg (516 lb)
		Renegade X (without Quick Adjust Suspension and ski Pilot TS)	221 kg (487 lb)
		Renegade X (with Quick Adjust Suspension and ski Pilot TS)	228 kg (503 lb)

WEIGHT AND DIMENSIONS			
Mass (dry)	850	Renegade X-RS (without Quick Adjust Suspension and ski Pilot TS)	227 kg (500 lb)
		Renegade X-RS (with Quick Adjust Suspension and ski Pilot TS)	234 kg (516 lb)
		Renegade X-RS (with Quick Adjust Suspension and ski Pilot 5.7)	237 kg (522 lb)
		Backcountry	217 kg (478 lb)
		Backcountry X (electric starter)	218 kg (481 lb)
		Backcountry X (SHOT starter)	210 kg (463 lb)
		Backcountry X-RS (electric starter) 146"	224 kg (494 lb)
		Backcountry X-RS (SHOT starter) 146"	216 kg (476 lb)
		Backcountry X-RS (electric starter) 154"	230 kg (507 lb)
		Backcountry X-RS (SHOT starter) 154"	221 kg (487 lb)
		Freeride 137" (SHOT and manual start)	216 kg (476 lb)
		Freeride 137" (electric starter)	224 kg (494 lb)
		Freeride 146" (SHOT and manual start)	214 kg (472 lb)
		Freeride 146" (electric starter)	222 kg (489 lb)
		Freeride 154" (SHOT and manual start)	209 kg (460.8 lb)
		Freeride 154" (electric starter)	218 kg (481 lb)
		Freeride 165" (SHOT and manual start)	212 kg (467 lb)
		Freeride 165" (electric starter)	221 kg (487 lb)
		Summit SP 146" (SHOT and manual start)	207 kg (456 lb)
		Summit SP 146" (electric starter)	216 kg (476 lb)

WEIGHT AND DIMENSIONS			
Mass (dry)	850	Summit SP 154" (SHOT and manual start)	205 kg (452 lb)
		Summit SP 154" (electric starter)	213 kg (470 lb)
		Summit SP 165" (SHOT and manual start)	209 kg (461 lb)
		Summit SP 165" (electric starter)	218 kg (481 lb)
		Summit SP 175" (SHOT starter)	210 kg (463 lb)
		Summit SP 175" (electric starter)	223 kg (492 lb)
		Summit X 154" (SHOT and manual start)	205 kg (452 lb)
		Summit X 154" (electric starter)	213 kg (470 lb)
		Summit X 165" (SHOT and manual start)	207 kg (456 lb)
		Summit X 165" (electric starter)	216 kg (476 lb)
		Summit X 175" (SHOT and manual start)	210 kg (463 lb)
		Summit X 175" (electric starter)	218 kg (481 lb)
		Summit X with Expert Package 154"	200 kg (440 lb)
		Summit X with Expert Package 165"	203 kg (448 lb)
Overall length		All MXZ	292.5 cm (115 in)
		All Renegade Grand Touring LTD Freeride 137"	303.8 cm (119.6 in)
		Backcountry Backcountry X Backcountry X-RS (146 in) Freeride 146" Summit SP 146"	311.0 cm (122.4 in)
		Backcountry X-RS (154 in) Freeride 154" Summit SP 154" Summit X 154"	331.2 cm (130.4 in)
		Freeride 165" Summit SP 165" Summit X 165"	344.5 cm (135.6 in)
		Summit SP 175" Summit X 175"	350.3 cm (137.9 in)
		All Expedition	333.6 cm (131.3 in)

WEIGHT AND DIMENSIONS		
Overall width	All MXZ All Renegade Grand Touring LTD	121.7 cm (47.9 in)
	All Backcountry Freeride 137" Freeride 146" All Expedition	114 cm (44.9 in) to 118 cm (46.5 in)
	Freeride 154" Freeride 165" All Summit	108 cm to 111 cm (42.5 in to 43.7 in)
Overall Height	MXZ TNT MXZ X Renegade Adrenaline Renegade X	126.7 cm (49.9 in)
	Renegade Enduro	133.1 cm (52.4 in)
	MXZ X-RS Renegade X-RS	122.2 cm (48.1 in)
	Backcountry X-RS	122.9 cm (48.4 in)
	Grand Touring LTD Expedition LE Expedition SE	140.5 cm (55.3 in)
	Backcountry Backcountry X	127.4 cm (50.2 in)
	All Freeride	136.8 cm (53.9 in)
	Summit SP Summit X	138.6 cm (54.6 in)
	Summit X with Expert Package	129.2 cm (50.9 in)
	Expedition Xtreme	129.9 cm (51.1 in)
Ski stance	All MXZ All Renegade Grand Touring LTD	107.7 cm (42.4 in)
	Backcountry Backcountry X Backcountry X-RS Freeride 137 Freeride 146 All Expedition	97.5 cm (38.4 in) to 102 cm (40.2 in)
	Freeride 154 Freeride 165 All Summit	91 cm to 95.5 cm (35.8 in to 37.6 in)

MATERIAL	
Frame	Aluminum
Side bottom pan, Front bottom pan, gauge support, gauge support cover, side panel, rear console, windshield support, glove box cover and headlamp surrounding	Polypropylene
Rear lateral hood, front hood and top side panel	Surlyn

WIRING DIAGRAM INFORMATION

GENERAL

WIRING DIAGRAM LOCATION

Wiring diagrams are found in the *WIRING DIAGRAM BOOKLET*.

WIRING DIAGRAM WITH COLORED LINES

The wiring diagram on the *KNOWLEDGE CENTER* is in color.

Color Definition

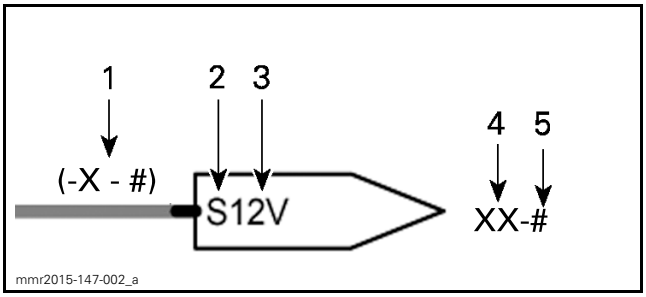
NOTE: To find the color of the wire on the vehicle skip to *WIRE COLORS AND SIZES* in this subsection.

The following colors refer to the color of the line drawn in the wiring diagram.

LINE COLOR	LINE TYPE	FUNCTION	DEFINITION
Red	Thick	Unswitched 12 V	Hot at all times
	Thin	3.3 and 5 V	Sensor reference voltage
Orange	Thick	55 - 60 V	High voltage
Blue	Thin	Analog signal	Variable voltage
Cyan	Thin	Digital signal	Pulsed or constant digital (on/off)
Pink	Thick	12V switched	Condition must be met to activate circuit
Green	Thin dotted	Communication	Data communication between modules using a protocol (CAN, LIN, & other)
Brown	Thick	Power control	Controls a circuit by providing an on/off control to activate the circuit
Yellow	Thick	AC Volts	Alternative current exiting the magneto
Black	Thick	Permanent ground	A ground that is in permanent contact
	Thin	Module (analog/digital) ground	A ground that is controlled by a module

WIRING DIAGRAM CODES

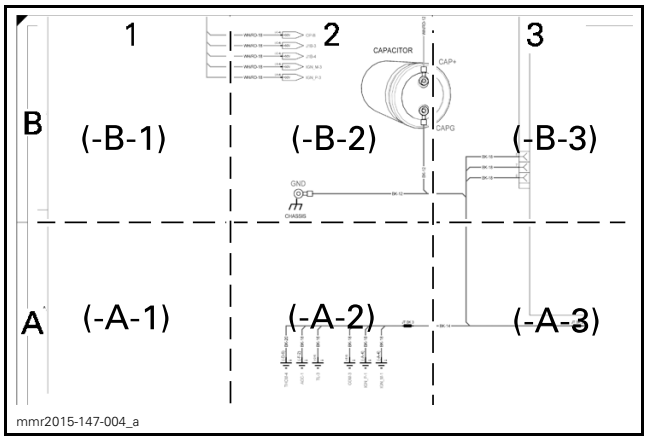
The wiring diagrams use the following codes.



1. *Wiring diagram index*
2. *Power condition*
3. *Voltage of a powered circuit*
4. *Connector code*
5. *Connector pin*

Wiring Diagram Index

The wiring diagram is separated by rows (letters) and columns (numbers).



WIRING DIAGRAM INDEX

Power Condition (12V Circuits Only)

The wiring diagram indicates when a circuit is powered:

– S: Switched. Certain conditions must be met;
– U: Unswitched (hot at all times).

Voltage of Powered Circuit

Voltage references are approximate for a powered circuit in good condition.

INDICATED VOLTAGE	APPROXIMATION
12V	Battery voltage
5V	Regulated 4.95 - 5V
60V	Regulated 55 - 60V

Connector Code

The wire connects to the indicated connector. See image at the beginning of this subsection.

Connector Pin

The wire is the indicated pin in the connector.

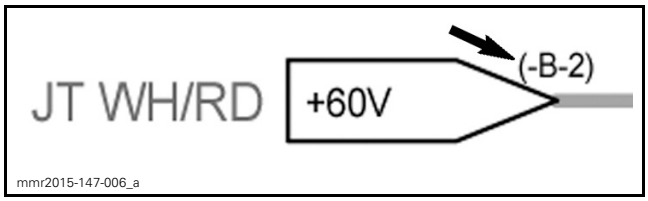
NOTE: Could be identified by either a number or by a letter depending on the type of connector used.

FOLLOWING A CIRCUIT

To follow a circuit, search the in section of the wiring diagram shown in the wiring diagram index.

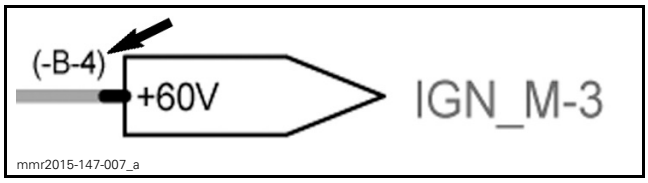
In this example, the 60V comes **from** JT WH/RD in section (-B-2).

NOTE: The arrow indicates the direction of the power in the circuit.



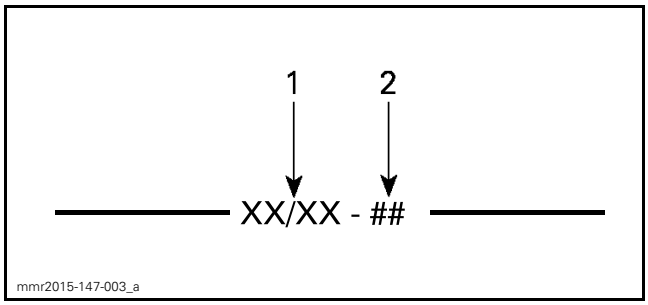
FROM JT WH/RD (-B-2)

In following example, the 60V goes **to** the IGN_M connector pin 3 in section (-B-4).



TO ING_M-3 (-B-4)

WIRE COLORS AND SIZES



1. *Wire color*
2. *Wire gauge (AWG)*

The first color of a wire is the main color, second color is the stripe.

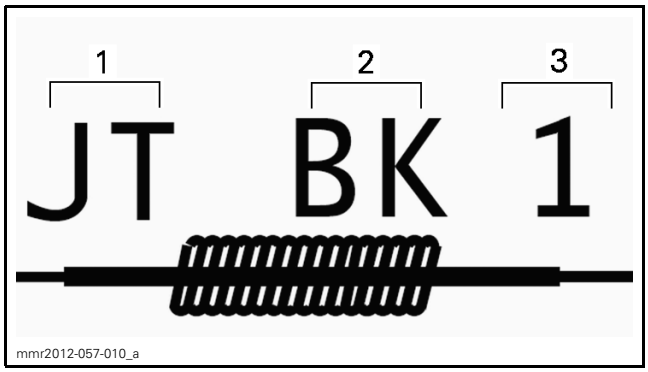
Example: YE/BK is a YELLOW wire with a BLACK stripe.

COLOR CODE					
BG	—	BEIGE	OG	—	ORANGE
BK	—	BLACK	RD	—	RED
BU	—	BLUE	VT	—	VIOLET
BN	—	BROWN	WH	—	WHITE
GN	—	GREEN	YE	—	YELLOW
GY	—	GRAY	PK	—	PINK

LT prefix means a "light" color. E.g: LT GN = Light green.

SPLICES IN WIRING HARNESS

Splices in wiring harness are indicated on the wiring diagram as follows.



1. JT: Splice indication
2. Spliced wire color
3. Splice number on the wire

Refer to *SPLICE INFORMATION* subsection for more details.

2021 *Main Harness*

Freeride and Summit
(Manual and SHOT start)

LINE TYPES

55 / 60 VOLTS	
12 VOLTS SWITCHED	
12 VOLTS UNSWITCHED	
5 OR 3.3 VOLTS	
DIGITAL SIGNAL	
POWER CONTROL	
ANALOG SIGNAL	
COMMUNICATION	
A-D GROUND	
POWER GROUND	
AC VOLTAGE	

ECMB

ONLY WITH SHOT START SYSTEM

UCAP

WAKE-UP SIGNAL — BG-18
CHARGE SIGNAL — BU/WH-18
55 VOLTS — WH/RD-14
12 VOLTS FROM UCAP — RD/WH-18
DISCHARGE SIGNAL — OG/BK-18
GROUND — BK-14

FUSEBOX FB

RER START F1-5A | CLUSTER F4-15A | ACCESSORY LOADS F2-20A

RD/WH-12 | RD/YT-18 | YE-18 | RD/WH-12 | RD/YE-16 | RD/GN-12 | RD/OG-12

BATTERY CHARGING — L1 RD/WH-16, L2 RD/WH-16, L3 RD/WH-16 — JT RD/WH
STARTER SOLENOID — A1 — OG/BK-18
VEHICLE LOADS — M1 RD/GN-16, M2 RD/GN-16, M4 RD/GN-16 — JT RD/GN

START / RER
RER

START/RER CONTROL — A3 BG-20
START BUTTON 12V SUPPLY — H1 YE-18
DIAGNOSTIC POWER — A2 RD/BU-18

BRAKE SIGNAL INPUT — H3 WH-20

DATA — K3
CONTACT — K2
GROUND — J3

RF IDENTIFICATION KEY
RFID
RD/OG-20 — S12V
WH/GY-20 — DATA
BK/WH-20 — CONTACT
BK/GN-20 — GROUND
HALL

CAN LO — C2 WH/BK-20
CAN HI — C1 WH/BG-20
JT WH/BK
JT WH/BG

55 V FOR FUEL PUMP — L4
FUEL PUMP PWM CTRL — M3

FUEL PUMP
FP
WH/RD-18 — 55V
BN/PK-18 — CTRL
BU-18 — (+)
BK/BU-20 — (-)

ENGINE CUT OFF CONTROL INPUT — G3 BK/YE-20 — ECMB-G3 (LF-3) CONTROL — STR 6P-6
ENGINE CUT OFF CONTROL GROUND — G4 BK/BU-20 — ECMB-G4 (LF-3) GND — STR 6P-3

EXHAUST GAS TEMPERATURE SENSOR
EGTS
EGTS SIGNAL — C3 BG/GY-20 — SIGNAL
GROUND — D3 BK/BU-20 — GND

VEHICLE SPEED SENSOR
VSS
5 VOLTS — D2 RD/BK-20 — 5V
GROUND — F2 BK/BU-20 — GND
SPEED SIGNAL INPUT — E2 GN/WH-20 — SS
HALL

MANIFOLD AIR PRESSURE TEMP SENSOR
MAPTS
INTAKE MANIFOLD PRESSURE SIGNAL — F3 WH/BU-20 — PS
5 VOLTS — E4 PK/BU-20 — 5V
INTAKE MANIFOLD TEMP. SIGNAL — B2 WH/OG-20 — TS
GROUND — F4 BK/BU-20 — GND

SD
B A
RD/OG-18
JT RD/OG 2

COMMUNICATION CONNECTOR
COM
RD/OG-16 — 12 VOLTS
RD/WH-16 — 12 VOLTS
RD/BU-18 — ECM POWER IN
BK-16 — GROUND
WH/BK-20 — CAN LO
WH/BG-20 — CAN HI
JT BK 2 (HHD)

RD/OG-12

THCM
WH/BG-20 — CAN HI
WH/BK-20 — CAN LO
RD/OG-20 — 5V
BK-20 — GND
THERMO-COUPLE MODULE
JT BK 1

GAUGE
MG
CAN LO — 14 WH/BK-20
CAN HI — 13 WH/BG-20
S12V WAKE UP — 11 RD/OG-18
U12V POWER — 1 RD/YE-16
FUEL LEVEL GROUND — 8 BK/BU-20
FUEL LEVEL SIGNAL — 3 BU-18

MG GAUGE
HEATED LEVER OUTPUT — 10 BN-20
HEATED GRIPS OUTPUT — 20 OG-20
GRIP/LEVER UP — 7
GRIP/LEVER DOWN — 18
HIGH BEAM — 16 GY/WH-20
GROUND — 2 BK-18

JT OG

TL
RD/OG-16 — RD/YE-16
RD/OG-18 — RD/OG-18
WH-18 — WH-18
BK-16 — BK-16
JT BK 2 (HHD)
JT BK

ACC2
RD/YE-16 — S12V
BK-16 — GND

TAIL LIGHT
RD/OG-18 — S12V
WH-18 — BRAKE
BK-16 — GND

ACC 1
RD/OG-16 — S12V
BK-16 — GND
JT BK 1 (HHD)

STR 4P
RD/OG-18 — GY-20
OG-20 — OG-20
WH-18 — BN-20
BK-20 — OG-20
JT WH
JT BK 2 (HHD)

BRAKE SWITCH
LEFT GRIP WARMER

STR 6P
ECMB-G3 (LF-3) CONTROL — BK/YE-20 — BK-20
BN-20 — BN-20
OG-20 — OG-20
ECMB-G4 (LF-3) GND — BK/BU-20 — BK-20
BK-20 — BN-20
BK-20 — OG-20
JT BK 2 (HHD)

EMERGENCY ENGINE CUT OFF SWITCH
THROTTLE LEVER WARMER
RIGHT GRIP WARMER

GRIP AND LEVER HEATER CONTROL SWITCH
GRIP
OG/WH-20 — UP
BK-20
OG/VT-20 — DOWN

HEADLAMP DIMMER SWITCH
DIMMER
GY/WH-16 — HI
RD/OG-16 — LO
GY/OG-16

JT GY/OG
JT GY/WH

HEADLAMP 1
HL1
GY/WH-18 — HI
GY/OG-18 — LO
BK-18 — GND

HEADLAMP 2
HL2
GY/WH-18 — HI
GY/OG-18 — LO
BK-18 — GND

ENGINE
CHASSIS
GND
CHASSIS
BK-12 — JT BK 2 — BK-12 — JT BK 1

BK-16 (C-3) COM-3
BK-20 (E-6) STR 6P-6
BK-20 (E-3) STR 6P-3
BK-20 (E-6) STR 6P-3
BK-16 (C-3) TL-1
BK-16 (C-3) ACC 1-1
BK-20 (C-3) THCM1-4

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2021 *Main Harness*

Freeride and Summit (Electric start)

LINE TYPES	
55 / 60 VOLTS	
12 VOLTS SWITCHED	
12 VOLTS UNSWITCHED	
5 OR 3.3 VOLTS	
DIGITAL SIGNAL	
POWER CONTROL	
ANALOG SIGNAL	
COMMUNICATION	
A-D GROUND	
POWER GROUND	
AC VOLTAGE	

ECMB
CAPACITOR
ECMB
ECMA
MAGNETO
BATTERY CHARGING
STARTER SOLENOID
VEHICULE LOADS
DIAGNOSTIC POWER
BRAKE SIGNAL INPUT
DATA
CONTACT
GROUND
CAN LO
CAN HI
55 V FOR FUEL PUMP
FUEL PUMP PWM CTRL
ENGINE CUT OFF CONTROL INPUT
ENGINE CUT OFF CONTROL GROUND
EGTS SIGNAL
GROUND
5 VOLTS
GROUND
SPEED SIGNAL INPUT
INTAKE MANIFOLD PRESSURE SIGNAL
5 VOLTS
INTAKE MANIFOLD TEMP. SIGNAL
GROUND
JT RD/WH
JT RD/GN
START / RER
RER
EXHAUST GAS TEMPERATURE SENSOR
EGTS
VEHICLE SPEED SENSOR
VSS
HALL
MANIFOLD AIR PRESSURE TEMP SENSOR
MAPTS
FUSEBOX
BATTERY F3: 30A
RER START F1: 5A
CLUSTER F4: 15A
ACCESSORY LOADS F2: 25A
BAT+
CHASSIS
SD+
STARTER SOLENOID
STARTER MOTOR
ENGINE
ENGINE
CHASSIS
JT RD/OG 2
JT RD/OG 1
COMMUNICATION CONNECTOR
COM
12 VOLTS
12 VOLTS
ECM POWER IN
GROUND
CAN LO
CAN HI
RF IDENTIFICATION KEY
RFID
THCM
THERMO-COUPLE MODULE
GAUGE
MG
CAN LO
CAN HI
S12V WAKE UP
U12V POWER
FUEL LEVEL GROUND
FUEL LEVEL SIGNAL
HEATED LEVER OUTPUT
HEATED GRIPS OUTPUT
GRIP/LEVER UP
GRIP/LEVER DOWN
HIGH BEAM
GROUND
FUEL PUMP
FP
TL
TAIL LIGHT
ACC2
ACC 1
STR 4P
BRAKE SWITCH
LEFT GRIP WARMER
EMERGENCY ENGINE CUT OFF SWITCH
STR 6P
THROTTLE LEVER WARMER
RIGHT GRIP WARMER
GRIP AND LEVER HEATER CONTROL SWITCH
GRIP
DIMMER HEADLAMP DIMMER SWITCH
HEADLAMP 1
HL1
HEADLAMP 2
HL2
JT WH/BK
JT WH/BG
JT OG
JT GY/OG
JT GY/WH
JT BK 1
JT BK 2
GND
CHASSIS

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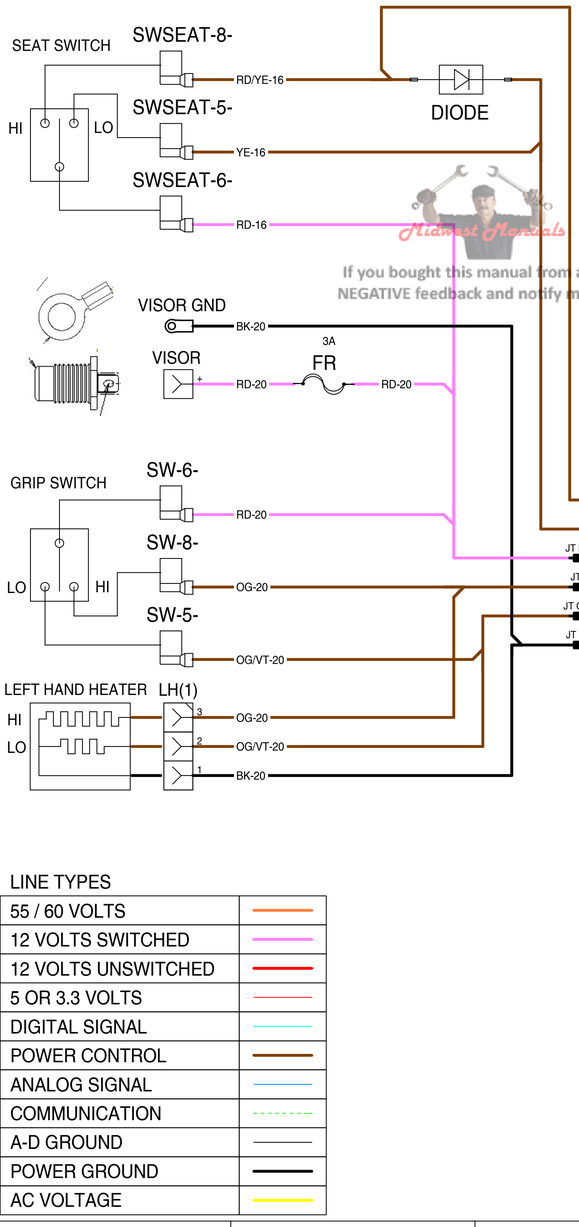
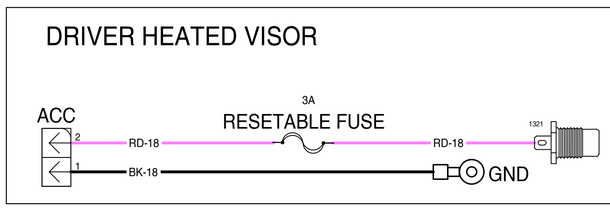
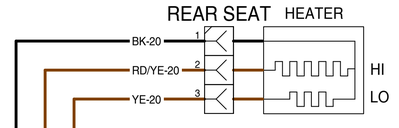
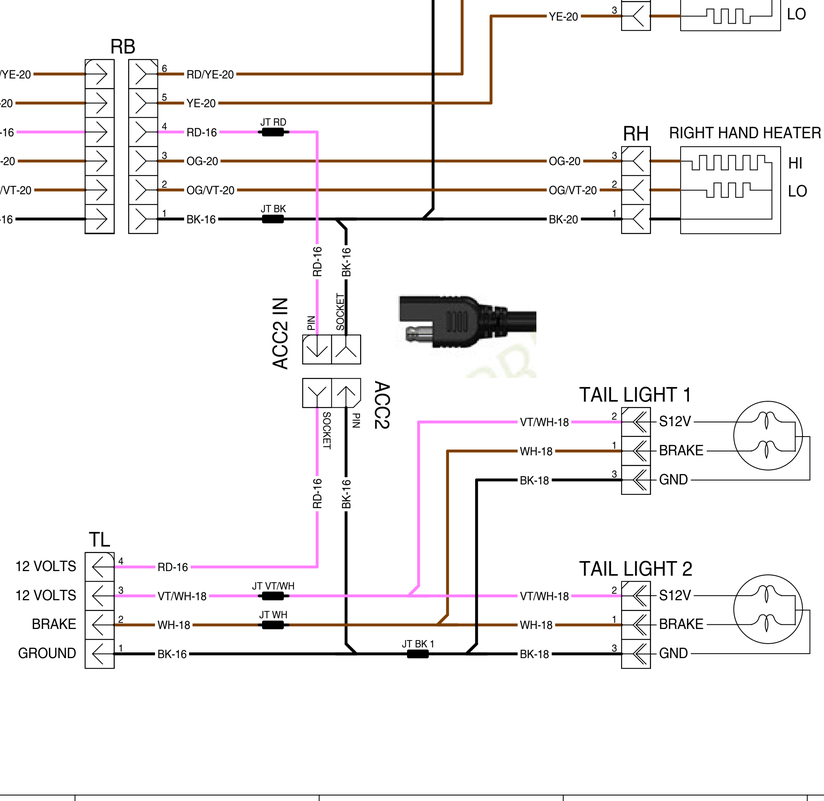
2021 *Accessories Harnesses*

All except
Grand Touring Limited
Renegade Enduro









LINE TYPES

55 / 60 VOLTS	
12 VOLTS SWITCHED	
12 VOLTS UNSWITCHED	
5 OR 3.3 VOLTS	
DIGITAL SIGNAL	
POWER CONTROL	
ANALOG SIGNAL	
COMMUNICATION	
A-D GROUND	
POWER GROUND	
AC VOLTAGE	

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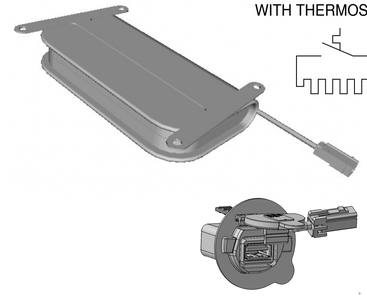
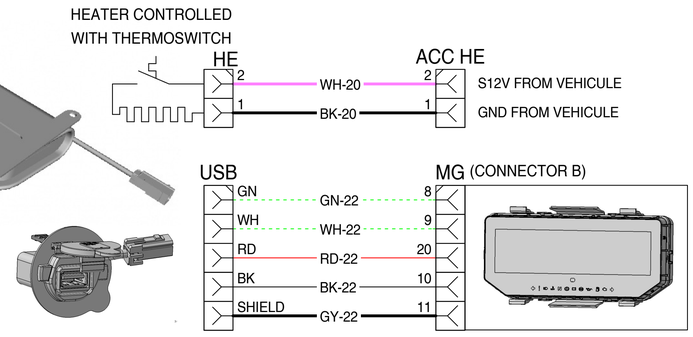
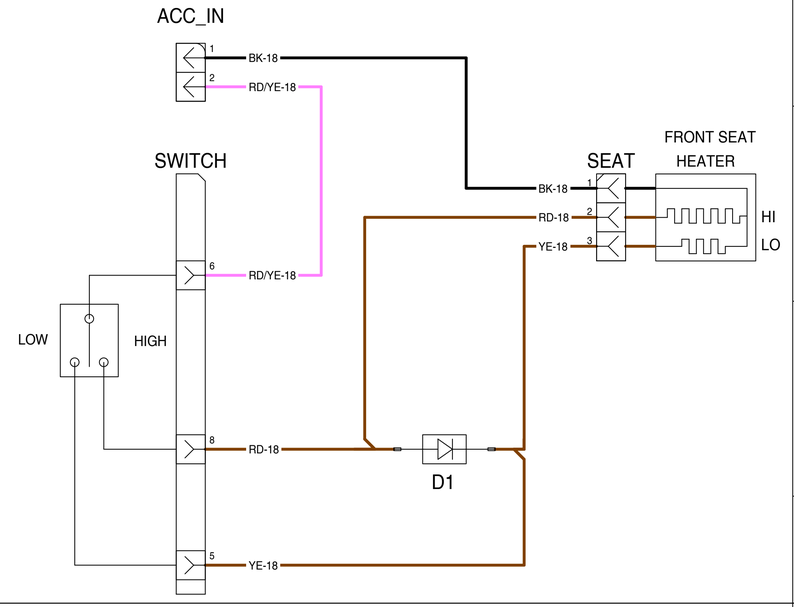
CELLPHONE HARNESS

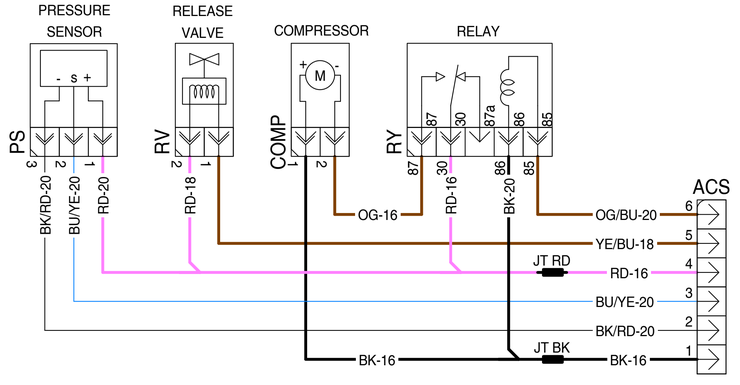




DRIVER HEATED SEAT

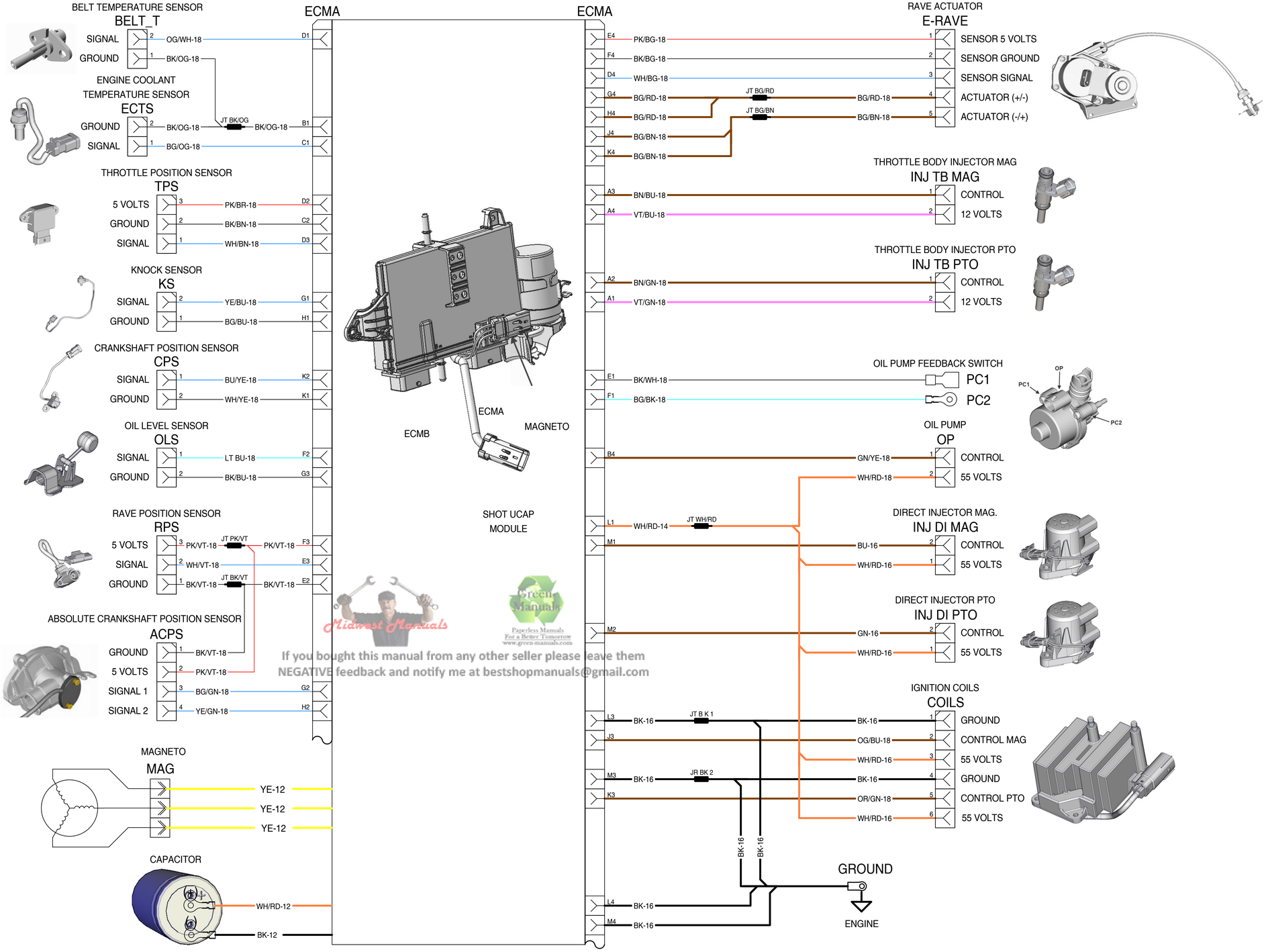


AIR CONTROLLED SUSPENSION



2021 *Engine Harness*

850 E-TEC (SHOT Start except Turbo)



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LINE TYPES
55 / 60 VOLTS
12 VOLTS SWITCHED
12 VOLTS UNSWITCHED
5 OR 3.3 VOLTS
DIGITAL SIGNAL
POWER CONTROL
ANALOG SIGNAL
COMMUNICATION
A-D GROUND
POWER GROUND
AC VOLTAGE

2021 *Engine Harness*

850 E-TEC Turbo (Manual and SHOT Start)

EXHAUST PRESSURE SENSOR
EPS
5 VOLTS 1 PK/BG-18
GROUND 2 BK/BG-18
SIGNAL 3 BG/BU-18 H3

BELT TEMPERATURE SENSOR
BELT_T
SIGNAL 2 OG/WH-18 D1
GROUND 1 BK/OG-18

ENGINE COOLANT TEMPERATURE SENSOR
ECTS
GROUND 2 BK/OG-18 JT BK/OG BK/OG-18 B1
SIGNAL 1 BG/OG-18 C1

THROTTLE POSITION SENSOR
TPS
5 VOLTS 3 PK/BR-18 D2
GROUND 2 BK/BN-18 C2
SIGNAL 1 WH/BN-18 D3

KNOCK SENSOR
KS
SIGNAL 2 YE/BU-18 G1
GROUND 1 BG/BU-18 H1

CRANKSHAFT POSITION SENSOR
CPS
SIGNAL 1 BU/YE-18 K2
GROUND 2 WH/YE-18 K1

OIL LEVEL SENSOR
OLS
SIGNAL 1 LT BU-18 F2
GROUND 2 BK/BU-18 G3

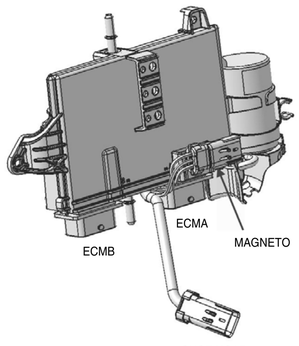
RAVE POSITION SENSOR
RPS
5 VOLTS 3 PK/VT-18 JT PK/VT PK/VT-18 F3
SIGNAL 2 WH/VT-18 E3
GROUND 1 BK/VT-18 JT BK/VT BK/VT-18 E2

ABSOLUTE CRANKSHAFT POSITION SENSOR
ACPS
GROUND 1 BK/VT-18
5 VOLTS 2 PK/VT-18
SIGNAL 1 3 BG/GN-18 G2
SIGNAL 2 4 YE/GN-18 H2

MAGNETO
MAG
YE-12
BN-12
OG-12

CAPACITOR
WH/RD-12
BK-12

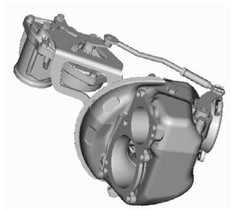
ECMA
ECMA



ECMB
ECMA
MAGNETO
SHOT UCAP MODULE

B2 WH/BG-18
J1 BG/RD-18
J2 BG/RD-18
L2 BG/BN-18

WASTEGATE ACTUATOR
WASTE
PK/BG-18 1 SENSOR 5 VOLTS
BK/BG-18 2 SENSOR GROUND
3 SENSOR SIGNAL
JT BG/RD 2 4 ACTUATOR (+/-)
5 ACTUATOR (-/+)



E4 PK/BG-18
F4 BK/BG-18
D4 WH/BG-18
G4 BG/RD-18
H4 BG/RD-18
J4 BG/BN-18
K4 BG/BN-18

JT PK/BG
JT BK/BG
JT BG/RD 1
JT BG/BN 1

RAVE ACTUATOR
E-RAVE
1 SENSOR 5 VOLTS
2 SENSOR GROUND
3 SENSOR SIGNAL
BG/RD-18 4 ACTUATOR (+/-)
BG/BN-18 5 ACTUATOR (-/+)

A3 BN/BU-18
A4 VT/BU-18

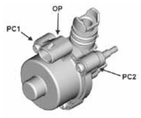
THROTTLE BODY INJECTOR MAG
INJ TB MAG
1 CONTROL
2 12 VOLTS

A2 BN/GN-18
A1 VT/GN-18

THROTTLE BODY INJECTOR PTO
INJ TB PTO
1 CONTROL
2 12 VOLTS

E1 BK/WH-18
F1 BG/BK-18

OIL PUMP FEEDBACK SWITCH
PC1
PC2



B4 GN/YE-18
WH/RD-18

OIL PUMP
OP
1 CONTROL
2 55 VOLTS

L1 WH/RD-14 JT WH/RD
M1 BU-16
WH/RD-16

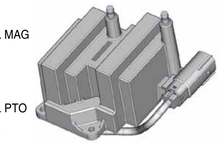
DIRECT INJECTOR MAG.
INJ DI MAG
2 CONTROL
1 55 VOLTS

M2 GN-16
WH/RD-16

DIRECT INJECTOR PTO
INJ DI PTO
2 CONTROL
1 55 VOLTS

L3 BK-16 JT B K 1
J3 OG/BU-18
WH/RD-16
M3 BK-16 JR BK 2
K3 OR/GN-18
WH/RD-16

IGNITION COILS
COILS
BK-16 1 GROUND
2 CONTROL MAG
3 55 VOLTS
BK-16 4 GROUND
5 CONTROL PTO
6 55 VOLTS



BK-16
BK-16
BK-16
GROUND
ENGINE

M4 BK-16
L4 BK-16 JR BK 4
C3 YE/GN-18

TURBO OIL PUMP
TOILP
2 GROUND
1 CONTROL

LINE TYPES

55 / 60 VOLTS	
12 VOLTS SWITCHED	
12 VOLTS UNSWITCHED	
5 OR 3.3 VOLTS	
DIGITAL SIGNAL	
POWER CONTROL	
ANALOG SIGNAL	
COMMUNICATION	
A-D GROUND	
POWER GROUND	
AC VOLTAGE	

REF: 864 446 REV: 1

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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.

We 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 Snowmobiles.

1. HOW DOES IT WORK

We follow the procedures detailed in the BRP *Snowmobiles 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	06
02	CARBURETOR AND FUEL SYSTEM	18
03	IGNITION SYSTEM	22
04	STARTER	24
05	TRANSMISSION SYSTEM	26
06	BRAKE SYSTEM	31
07	STEERING SYSTEM AND FRONT SUSPENSION	33
08	REAR SUSPENSION SYSTEM AND TRACK	37
09	BODY	46
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 motoneiges BRP 2021.

1. UTILISATION DU MANUEL

En procédant de la façon indiquée dans le *Manuel de réparation motoneiges* BRP, chaque temps donné représente le maximum permis pour une réparation portant sur cette pièce. LES TEMPS NE SONT PAS CUMULATIFS. On doit inscrire le temps donné pour l'opération qui prend le plus de temps.

REMARQUE: Le *Barème de temps à taux fixe* a été préparé par des mécaniciens compétents utilisant les outils que l'on retrouve normalement dans les ateliers de réparation, en plus de tous les outils spéciaux mentionnés dans le *Manuel de réparation*.

2. COMPILATION

Le *Barème de temps à taux fixe* a été établi en compilant le temps nécessaire pour faire la réparation plus (+) un facteur de correction de 30% lorsqu'un travail dure 3.0 heures et moins, ou (+) 15% lorsqu'un travail dure plus de 3.0 heures. Cette compilation comprend, entre autres, les étapes suivantes:

- Manutention du véhicule
- Nettoyage
- Aller chercher les pièces, essais physiques
- Compensation spéciale (boulons rouillés)
- Diagnostic.

3. UTILISATION DU BARÈME

Se reporter à la section désirée, repérer la pièce ou l'ensemble de pièces remplacées et inscrire le CODE DE TRAVAIL dans la colonne appropriée sur la formule de réclamation.

SYSTÈME		PAGE
01	MOTEUR	06
02	CARBURATEUR ET SYSTÈME D'ALIMENTATION D'ESSENCE	18
03	SYSTÈME D'ALLUMAGE	22
04	DÉMARREUR	24
05	SYSTÈME DE TRANSMISSION	26
06	SYSTÈME DE FREIN	31
07	SYSTÈME DE DIRECTION ET SUSPENSION AVANT	33
08	SYSTÈME DE SUSPENSION ARRIÈRE ET CHENILLE	37
09	CARROSSERIE	46
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 TWIN CYLINDERS/
2 CYLINDRES REFROIDIS PAR LIQUIDE

TABLE	DESCRIPTION	MODEL/ MODÈLE	ENGINE/ MOTEUR	CHASSIS TYPE/ TYPE DE CHÂSSIS	REAR SUSPENSION/ SUSPENSION ARRIÈRE	STARTER/ DÉMARREUR
15	**EXPEDITION EXTREME 850 E-TEC**	ADMA/ADMB	849 E-TEC	REV-Gen4 154"	SC-5U	STD
16	**MXZ TNT 850 E-TEC**	UDMA/UDMB UDMC/UDMD	849 E-TEC	REV-Gen4 129"	r-Motion	STD
	MXZ XRS 850 E-TEC	MVMA/MVMB/MVMC MVMD/MVME/MVMF MVMG/MVMH/MVMJ MVMK/MVML/MVMM MVMN/MVMP/MVMR MVMS MVMT/MVMU MXMA/MXMB/MXMC MXMD/MXME/MXMF MXMG/MXMH/MXMJ MXMK/MXML/MXMM MXMN/MXMP/MXMR MXMS MXMT/MXMU MXMV/MXMW				
	MXZ X 850 E-TEC	UUM1/UUM2/UUM3 UUM4/UUMA/UUMB UUMC/UUMD/UUME UUMF/UUMG/UUMH UUMJ/UUMK/UUML UUMM/UUMN/UUMP UUMR/UUMS/UUMT UUMU/UUMV/UUMW				
17	**RENEGADE ADRENALINE 850 E-TEC**	UFMA/UFMB	849 E-TEC	REV-Gen4 137"	r-Motion	STD
	RENEGADE ENDURO 850 E-TEC	URMA/URMB				
	RENEGADE X 850 E-TEC	UWMA/UWMB/UWMC UWMD/UWME/UWMF UWMG/UWMH/UWMJ UWMK/UWML/UWMM UWMN/UWMP/UWMR UWMS/UWMT/UWMU UWMV/UWMW				

TABLE	DESCRIPTION	MODEL/ MODÈLE	ENGINE/ MOTEUR	CHASSIS TYPE/ TYPE DE CHÂSSIS	REAR SUSPENSION/ SUSPENSION ARRIÈRE	STARTER/ DÉMARREUR
17	**RENEGADE XRS 850 E-TEC**	ULMA/ULMB/ULMC ULMD/ULME/ULMF ULMG/ULMH/ULMJ ULMLK/ULML/ULMM ULMN/ULMP/ULMR ULMS/ULMT/ULMU ULMV/UMMA/UMMB UMMC/UMMD/UMME UMMF/UMMG/UMMH UMMJ/UMMK/UMML UMMM/UMMN/UMMP UMMR/UMMS/UMMT UMMU/UMMV/UMMW	849 E-TEC	REV-Gen4 137"	r-Motion	STD
18	**BACKCOUNTRY 850 E-TEC**	UGMA/UGMB	849 E-TEC	REV-Gen4 146"	c-Motion	STD
	BACKCOUNTRY X 850 E-TEC	UXMA/UXMB/UXMC UXMD/UXME/UXMF UXMN/UXMP/UXMS UXMT/UXMU/UXMV				
	BACKCOUNTRY XRS 850 E-TEC	UYM5/UYM6/UYMA UYMB/UYMC/UYMD UYME/UYMF/UMN UYMP/UYMR/UYMS UYMT/UYMU				
	BACKCOUNTRY XRS 850 E-TEC	UZMA/UZMB/UZMC UZMD/UZMJ/UZMK UZML/UZMM/UZMT UZMU		REV-Gen4 154"		
19	**BACKCOUNTRY X 850 E-TEC**	UXM2/UXM4/UXMG UXMJ/UXML/UXMW	849 E-TEC	REV-Gen4 146"	c-Motion	SHOT
	BACKCOUNTRY XRS 850 E-TEC	UYM1/UYM3/UYMG UYMJ/UYML/UYMV				
	BACKCOUNTRY XRS 850 E-TEC	UZME/UZMG/UZMN UZMR		REV-Gen4 154"		
20	**FREERIDE 146 850 E-TEC**	VBMA/VBMB/VBME	849 E-TEC	REV-Gen4 146"	t-Motion	STD OPT
	FREERIDE 154 850 E-TEC	VCMA/VCMB/VCMC VCMD/VCMJ		REV-Gen4 154"		
	FREERIDE 165 850 E-TEC	MEMA/MEMB/MEMC MEMG		REV-Gen4 165"		
21	**FREERIDE 146 850 E-TEC**	VBMC/VBMD	849 E-TEC	REV-Gen4 146"	t-Motion	SHOT
	FREERIDE 154 850 E-TEC	VCME/VCMF/VCMG VCMH		REV-Gen4 154"		
	FREERIDE 165 850 E-TEC	MEMD/MEME/MEMF		REV-Gen4 165"		

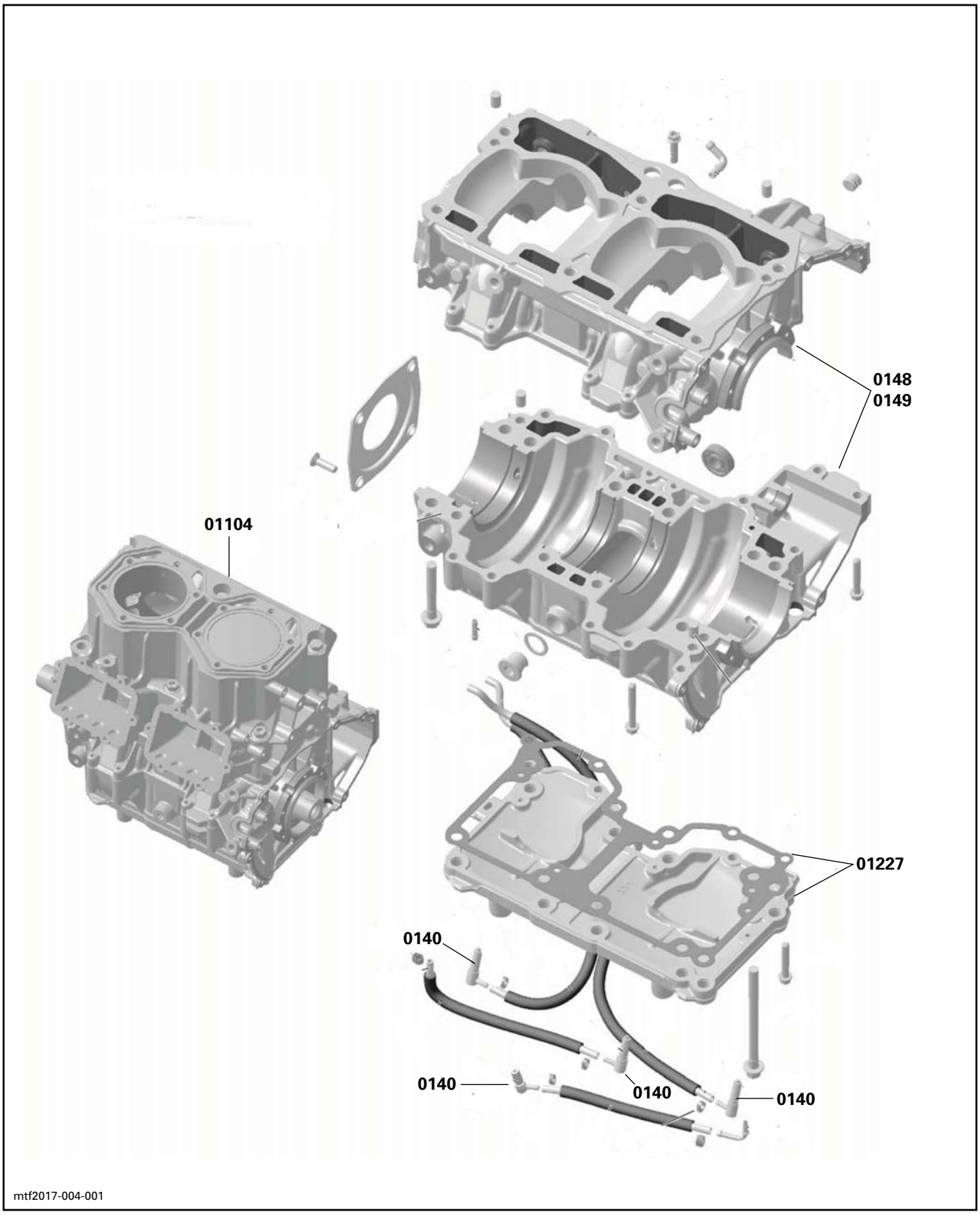
TABLE	DESCRIPTION	MODEL/ MODÈLE	ENGINE/ MOTEUR	CHASSIS TYPE/ TYPE DE CHÂSSIS	REAR SUSPENSION/ SUSPENSION ARRIÈRE	STARTER/ DÉMARREUR
22	**SUMMIT SP 146 850 E-TEC**	CDMA/CDMC/CDME CDMF	849 E-TEC	REV-Gen4 146"	t-Motion	STD OPT
	SUMMIT SP 154 850 E-TEC	CEMA/CEMC/CEMD CEMF/CEMG/CEMJ CEML		REV-Gen 154"		
	SUMMIT SP 165 850 E-TEC	CFMA/CFMC/CFMD CFMF/CFMG/CFMJ		REV-Gen4 165"		
	SUMMIT SP 175 850 E-TEC	CKMA/CKMC/CKME		REV-Gen4 175"		
	SUMMIT X 154 850 E-TEC	TNMA/TNMB/TNMC TNMD/TNMJ/TNMK TNML/TNMM/TNMT TNMU/TNMV/TUMW		REV-Gen 154"		
	SUMMIT X 165 850 E-TEC	TDMA/TDMC/TDMD TDMF/TDMG/TDMJ TDML/TDMN/TDMS		REV-Gen4 165"		
23	**SUMMIT SP 146 850 E-TEC**	CDMB/CDMD	849 E-TEC	REV-Gen4 146"	t-Motion	SHOT
	SUMMIT SP 154 850 E-TEC	CEMB/CEME/CEMH CEMK		REV-Gen 154"		
	SUMMIT SP 165 850 E-TEC	CFMB/CFME/CFMH CFMK		REV-Gen4 165"		
	SUMMIT SP 175 850 E-TEC	CKMB/CKMD		REV-Gen4 175"		
	SUMMIT EXPERT 154 850 E-TEC	TGMA/TGMB/TGMC TGMD/TGME/TGMF TGMG/TMGH/TGMJ TGMK		REV-Gen4 154"		
	SUMMIT EXPERT 165 850 E-TEC	THMA/THMB/THMC THMD/THMF		REV-Gen4 165"		
	SUMMIT X 154 850 E-TEC	TMM1/TMM2/TNME TNMF/TNMG/TNMH TNMN/TNMP/TNMR TNMS		REV-Gen 154"		
	SUMMIT X 165 850 E-TEC	TDMB/TDME/TDMH TDMK/TDMM/TDMP TDMT/TDMU		REV-Gen4 165"		
	SUMMIT EXPERT 175 850 E-TEC	TLMA/TLMB/TLMC TLMD/TLMG		REV-Gen4 175"		

SYSTEM SYSTÈME	CODE	DESCRIPTION	EXPEDITION 850R E-TEC	MXZ / RENEGADE 850 E-TEC	BACKCOUNTRU FREERIDE/SUMMIT 850 E-TEC	BACKCOUNTRU FREERIDE/SUMMIT 50 E-TEC SHOT
			15	16/17	18/20/22	19/21/23
01	**00**	**NO LABOR INVOLVED** **AUCUNE MAIN-D'OEUVRE IMPLIQUÉE**	**0**	**0**	**0**	**0**
01*	**01**	**REMOVE AND REPLACE ENGINE (ASS'Y)** **REMPLACEMENT MOTEUR (COMPLET)**	**3.6**	**3.4**	**3.4**	**3.4**
01	08	FAN VENTILATEUR	0.4			
01	12	CYLINDER HEAD COVER AND/OR GASKET COUVERCLE DE CULASSE ET/OU JOINT D'ÉTANCHÉITÉ	3.4	3.0	3.0	3.0
01	18	COOLANT TEMPERATURE SENDER CAPTEUR DE TEMPÉRATURE LIQUIDE	0.5	0.5	0.5	0.5
01	19	THERMOSTAT THERMOSTAT	1.0	1.0	1.0	1.0
01	20	WATER OUTLET SOCKET TUBULURE DE SORTIE DE LIQUIDE	0.5	0.5	0.5	0.5
01	21	COOLANT HOSE T-FITTING (ONE OR TWO) BOYAU DE LIQUIDE DE REFROIDISSEMENT RACCORD EN T (1 OU 2)	1.0	1.0	1.0	1.0
01	22	RAVE ADJUSTING SCREW AND/OR COVER AND/OR SPRING (1) VIS DE RÉGLAGE RAVE ET/OU COUVERCLE ET/OU RESSORT (1)	0.6	0.6	0.6	0.6
01	23	RAVE VALVE EXHAUST AND/OR HOUSING (1) SOUPAPE D'ÉCHAPPEMENT RAVE ET/OU BOÎTIER (1)	1.0	1.0	1.0	1.0
01	25	PISTON, PIN, CIRCLIP, RING (MAG) PISTON, GOUPILLE, CIRCLIP, SEGMENT (MAG)	5.2	5.0	5.0	5.0
01	26	PISTON, PIN, CIRCLIP, RING (PTO) PISTON, GOUPILLE, CIRCLIP, SEGMENT (PDM)	5.2	5.0	5.0	5.0
01	27	PISTONS, PINS, CIRCLIPS, RINGS (MAG AND PTO) PISTONS, GOUPILLES, CIRCLIPS, SEGMENTS (MAG ET PDM)	5.5	5.3	5.3	5.3
01	37	RADIATOR INLET HOSE BOYAU D'ENTRE DU RADIATEUR	0.5			
01	38	WATER PUMP SHAFT (ALL PARTS) ARBRE DE LA POMPE À EAU (TOUTES LES PIÈCES)	4.0	3.0	3.8	3.8
01	40	OIL LINE TUBE OR CHECK VALVE CONDUIT D'HUILE OU SOUPAPE DE RETENUE	3.9	3.7	3.7	3.7
01	41	WATER PUMP, IMPELLER, COVER AND/OR GASKET POMPE À EAU, CARTER DE POMPE, COUVERCLE ET/OU JOINT D'ÉTANCHÉITÉ	3.5	2.5	3.3	3.3
01	46	RADIATOR AND/OR GROMMET RADIATEUR ET/OU PASSE FILS	1.0			
01	48	CRANKCASE REPLACEMENT REMPLACEMENT DU CARTER	7.4	7.2	7.2	7.2
01	49	CRANKCASE RESEAL AND/OR GASKET RESCELLEMENT DU CARTER ET/OU JOINT D'ÉTANCHÉITÉ	6.6	6.4	6.4	6.4
01	63	CRANKSHAFT BEARINGS (PTO) (2) ROULEMENTS DU VILEBREQUIN (PDM) (2)	7.2	7.0	7.0	7.0
01	64	CRANKSHAFT BEARINGS (MAG) (2) ROULEMENTS DU VILEBREQUIN (MAG) (2)	7.7	7.5	7.5	7.5

SYSTEM SYSTÈME	CODE	DESCRIPTION	EXPEDITION 850R E-TEC	MXZ / RENEGADE 850 E-TEC	BACKCOUNTRU FREERIDE/SUMMIT 850 E-TEC	BACKCOUNTRU FREERIDE/SUMMIT 50 E-TEC SHOT
			15	16/17	18/20/22	19/21/23
01	70	MUFFLER AND/OR EXHAUST GASKET AND/OR HEAT SHEILDS SILENCIEUX ET/OU JOINT D'ÉCHAPPEMENT ET/OU ENVELOPPES	1.7	1.7	1.7	1.7
01	71	EXHAUST MANIFOLD COLLECTEUR D'ÉCHAPPEMENT	0.4	0.4	0.4	0.4
01	72	TUNED PIPE AND/OR HEAT SHEILDS TUYAU D'ÉCHAPPEMENT CALIBRÉ ET/OU ENVELOPPES	1.6	1.6	1.6	1.6
01	76	ENGINE SUPPORT (MAG) SOCLE DU MOTEUR (MAG)	0.5	0.5	0.5	0.5
01	79	COOLANT HOSE (TANK TO ENGINE HEAD) BOYAU DU SYSTÈME DE REFROIDISSEMENT (RÉSERVE AU MOTEUR)	0.4	0.4	0.4	0.4
01	80	REED VALVE (ASS'Y) AND/OR CARBURETOR SOCKET (1) SOUPAPE À CLAPET (COMPLET) ET/OU TUBULURE CARBURATEUR (1)	1.3	1.3	1.3	1.3
01	81	REED VALVE (ASS'Y) AND/OR CARBURETOR SOCKET (2) SOUPAPE À CLAPET (COMPLET) ET/OU TUBULURE CARBURATEUR (2)	1.8	1.8	1.8	1.8
01	84	TUNED PIPE SHIELD (1) COQUILLE DE TUYAU D'ÉCHAPPEMENT (1)	0.3	0.3	0.3	0.3
01	92	CYLINDER BASE GASKET JOINT D'ÉTANCHÉITÉ DE BASE DU CYLINDRE	4.8	4.6	4.6	4.6
01	98	COOLANT RESERVOIR RÉSERVOIR D'ANTIGEL	0.4	0.4	0.4	0.4
01	99	CRANKSHAFT (ASS'Y) VILEBREQUIN (COMPLET)	7.2	7.0	7.0	7.0
01	104	SHORT BLOCK KIT ENSEMBLE DE CARTER CYLINDRE	6.5	6.3	6.3	6.3
01	117	CYLINDER AND/OR GASKET CYLINDRE ET/OU JOINT D'ÉTANCHÉITÉ	5.4	5.2	5.2	5.2
01	169	RAVE ADJUSTING SCREW AND/OR COVER AND/OR SPRING (2) VIS DE RÉGLAGE RAVE ET/OU COUVERCLE ET/OU RESSORT (2)	1.3	1.3	1.3	1.3
01	170	RAVE VALVE AND/OR HOUSING (2) SOUPAPE D'ÉCHAPPEMENT RAVE ET/OU BOÎTIER (2)	1.3	1.3	1.3	1.3
01	207	COOLANT HOSE (ENGINE TO REAR RADIATOR) BOYAU DE REFROIDISSEMENT (MOTEUR AU RADIATEUR ARRIÈRE)	1.1	1.1	1.1	1.1
01	224	KNOCK SENSOR DÉTECTEUR DE DÉTONATION	0.3	0.3	0.3	0.3
01	227	WATERCHANNEL AND GASKET (CRANKCASE) COUVERCLE CIRCULATEUR D'EAU ET JOINT D'ÉTANCHÉITÉ (CARTER)	4.9	4.7	4.7	4.7
01	237	SERVOMOTOR SERVOMOTEUR	0.3	0.3	0.3	0.3
01	238	RAVE CABLE AND/OR ACTUATOR CABLE RAVE ET/OU ACTUATEUR	0.3	0.3	0.3	0.3
01	245	OUTPUT CRANKSHAFT SEAL (PTO SIDE) ANNEAU D'ÉTANCHÉITÉ SORTIE VILBREQUIN (CÔTÉ PDM)	0.5	0.5	0.5	0.5
01	260	COOLAND HOSE (WATER PUMP HOUSING TO ENGINE) BOYAU DE REFROIDISSEMENT (BOÎTIER DE LA POMPE À EAU AU MOTEUR)	1.0	1.0	1.0	1.0

SYSTEM SYSTÈME	CODE	DESCRIPTION	EXPEDITION 850R E-TEC	MXZ / RENEGADE 850 E-TEC	BACKCOUNTRU FREERIDE/SUMMIT 850 E-TEC	BACKCOUNTRU FREERIDE/SUMMIT 50 E-TEC SHOT
			15	16/17	18/20/22	19/21/23
01	289	FRONT ENGINE SUPPORT (PTO) SUPPORT DE MOTEUR AVANT (PDM)	1.3	1.3	1.3	1.3
01	290	REAR ENGINE SUPPORT (PTO) SUPPORT DE MOTEUR ARRIÈRE (PDM)	2.0	2.0	2.0	2.0
01	293	FRONT RUBBER MOUNT (PTO) TAMPON D'ANCRAGE AVANT (PDM)	0.8	0.8	0.8	0.8
01	294	REAR RUBBER MOUNT (PTO) TAMPON D'ANCRAGE ARRIÈRE (PDM)	1.5	1.5	1.5	1.5
01	297	NOISE SHIELD PLAQUE ACOUSTIQUE	0.3	0.3	0.3	0.3
01	300	RAVE POSITION SENSOR CAPTEUR DE POSITION RAVE	0.4	0.4	0.4	0.4
01	318	RADIATOR SUPPORT SUPPORT DE RADIATEUR	0.3			
01	322	WATER PIPE TUYAU D'EAU	1.0			
01	329	INJECTOR (1) INJECTEUR (1)	0.8	0.8	0.8	0.8
01	330	INJECTORS (2) INJECTEURS (2)	0.9	0.9	0.9	0.9
01	335	COOLANT HOSE (WATER PUMP) BOYAU DE REFROIDISSEMENT (POMPE À EAU)	1.2	1.0	1.0	1.0
01	351	THERMO COUPLE MODULE MODULE THERMO COUPLE	0.3	0.3	0.3	0.3
01	356	OUTPUT CRANKSHAFT SEAL (MAG SIDE) ANNEAU ÉTANCHÉITÉ SORTIE DU VILEBREQUIN (CÔTÉ MAG)	6.7	6.5	6.5	6.5
01	365	VALVE SOUPAPE	0.3	0.3	0.3	0.3
01	382	THERMOSTAT HOSE BOYAU DU THERMOSTAT	0.5			
01	383	BLEEDING HOSE BOYAU DE PURGE	0.3	0.3	0.3	0.3
01	396	FUEL RAIL RAMPE D'ALIMENTATION	1.2	1.2	1.2	1.2
01	397	THROTTLE BODY INJECTORS INJECTEUR DU CARTER D'ACCELERATEUR	1.2	1.2	1.2	1.2
01	398	THROTTLE BODY (ASS'Y) CARTER D'ACCELERATEUR (COMPLET)	1.2	1.2	1.2	1.2
01	399	SERVOMOTOR SUPPORT SUPPORT DU SERVOMOTEUR	0.3	0.3	0.3	0.3
01	408	ANGLE SENSOR CAPTEUR D'ANGLE				1.8
01	409	ENGINE SUPPORT (MAG) SUPPORT DE MOTEUR (MAG)	0.5	0.5	0.5	0.5

SYSTEM SYSTÈME	CODE	DESCRIPTION	EXPEDITION 850R E-TEC	MXZ / RENEGADE 850 E-TEC	BACKCOUNTRU FREERIDE/SUMMIT 850 E-TEC	BACKCOUNTRU FREERIDE/SUMMIT 50 E-TEC SHOT
			15	16/17	18/20/22	19/21/23
01	410	ENGINE RUBBER MOUNT (MAG) TAMPON DE MOTEUR (MAG)	0.4	0.4	0.4	0.4



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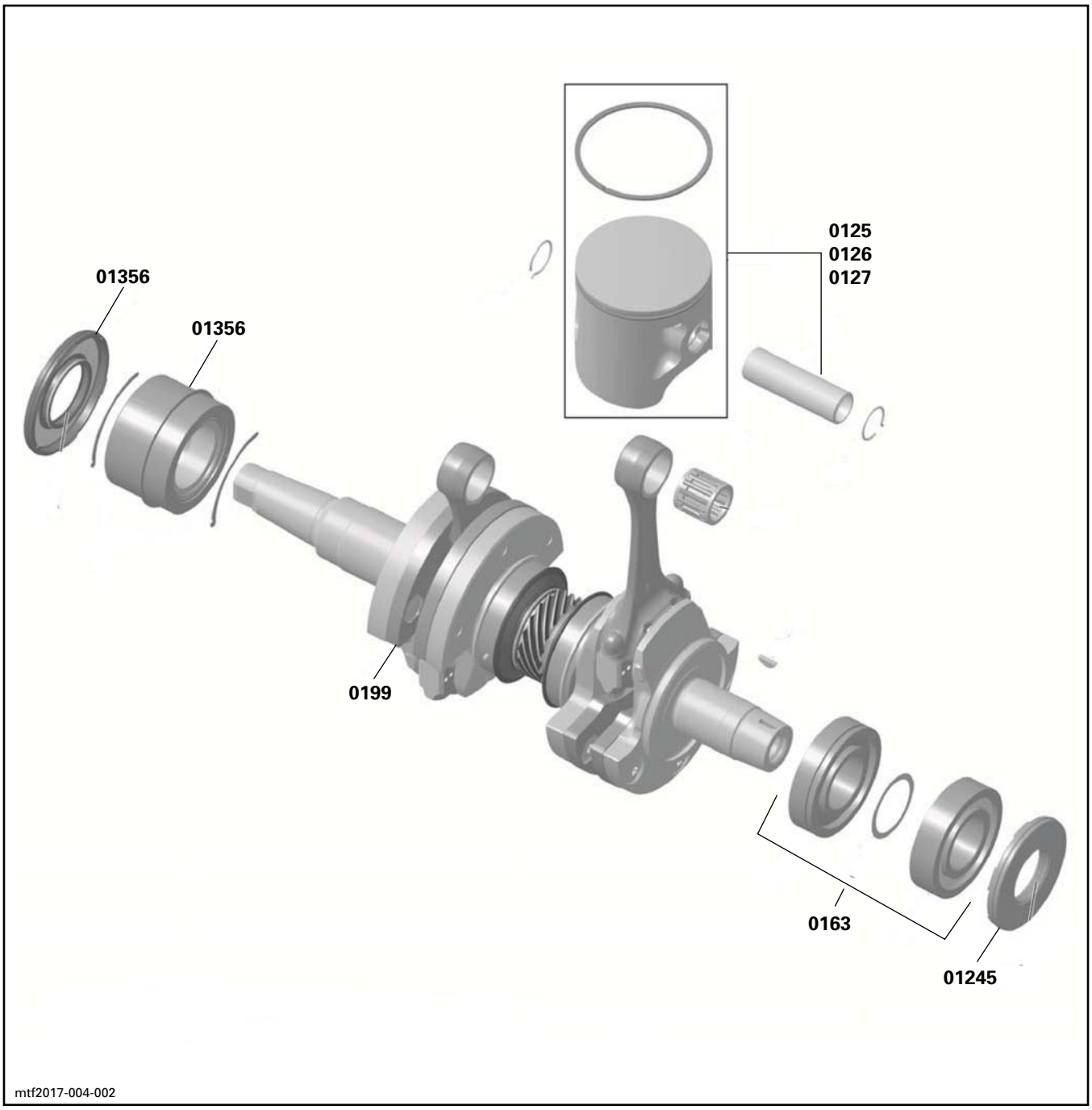
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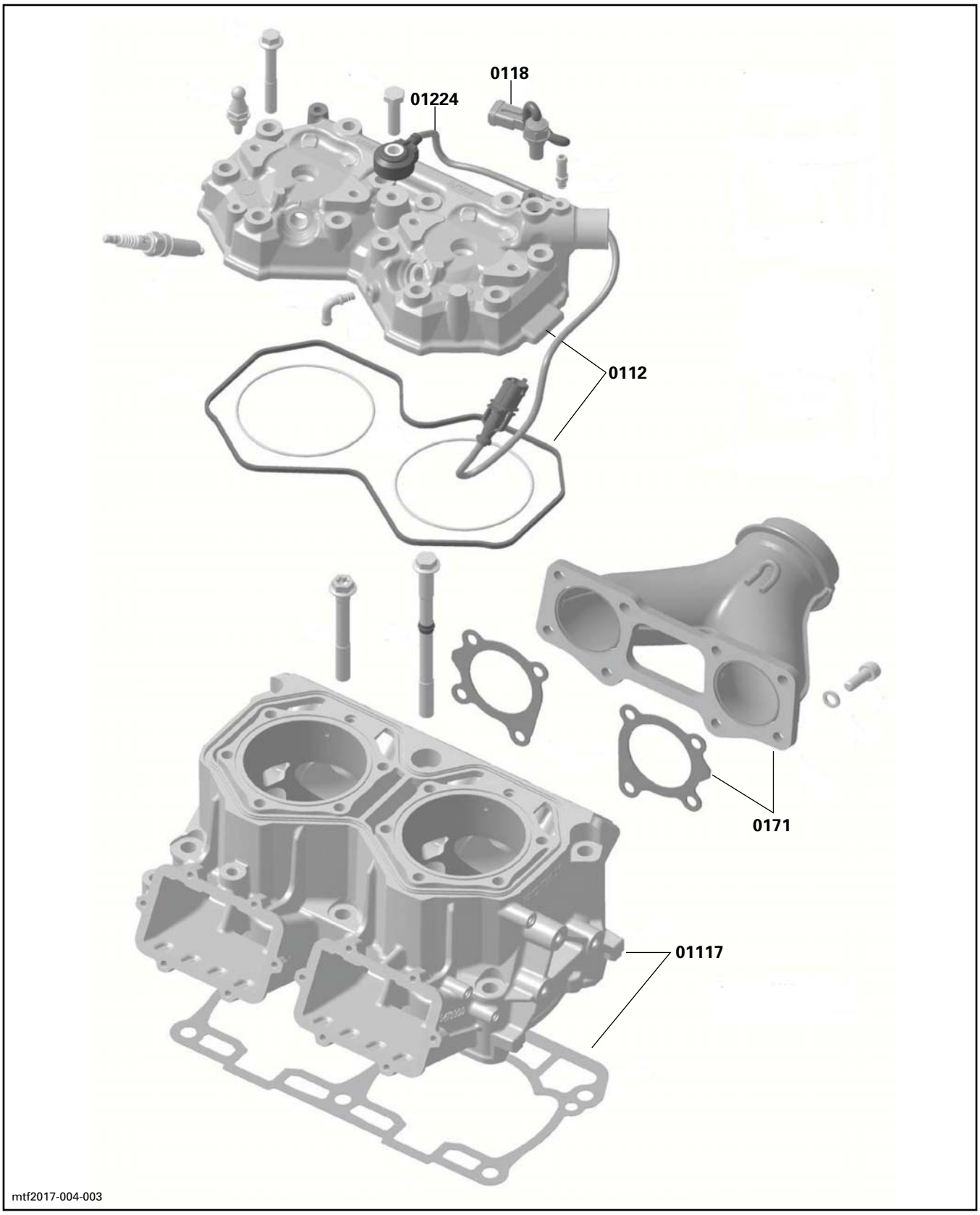
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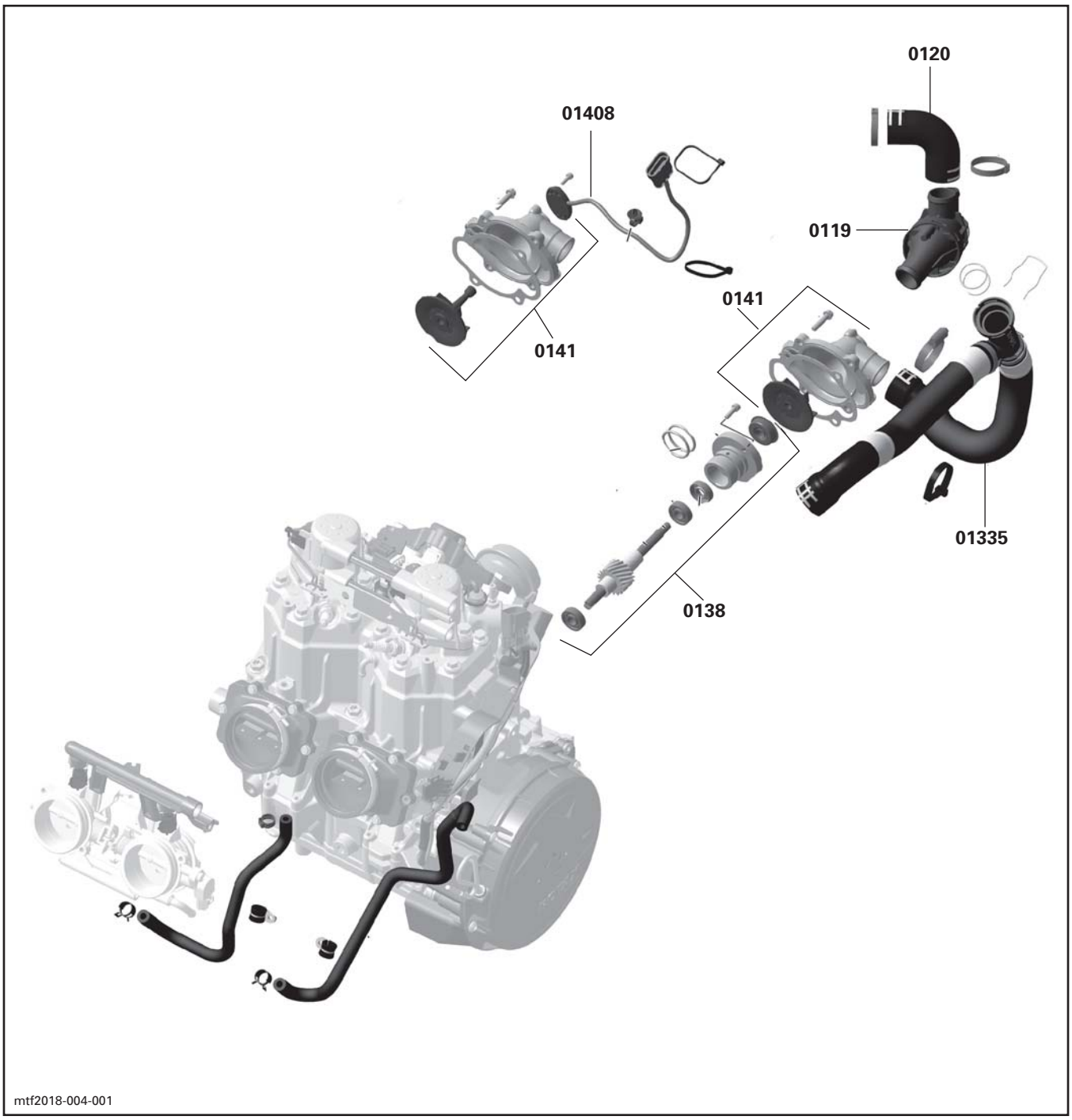
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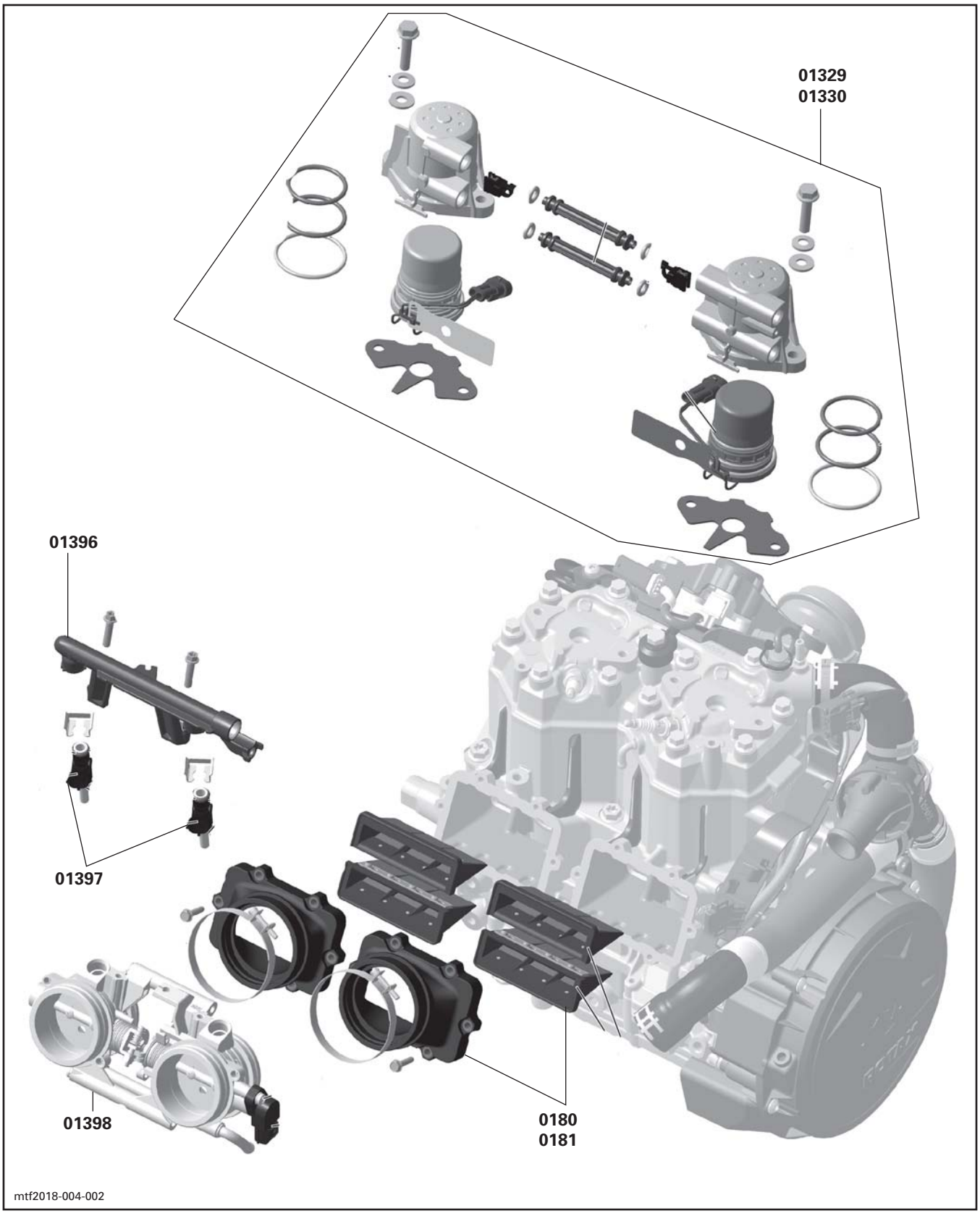
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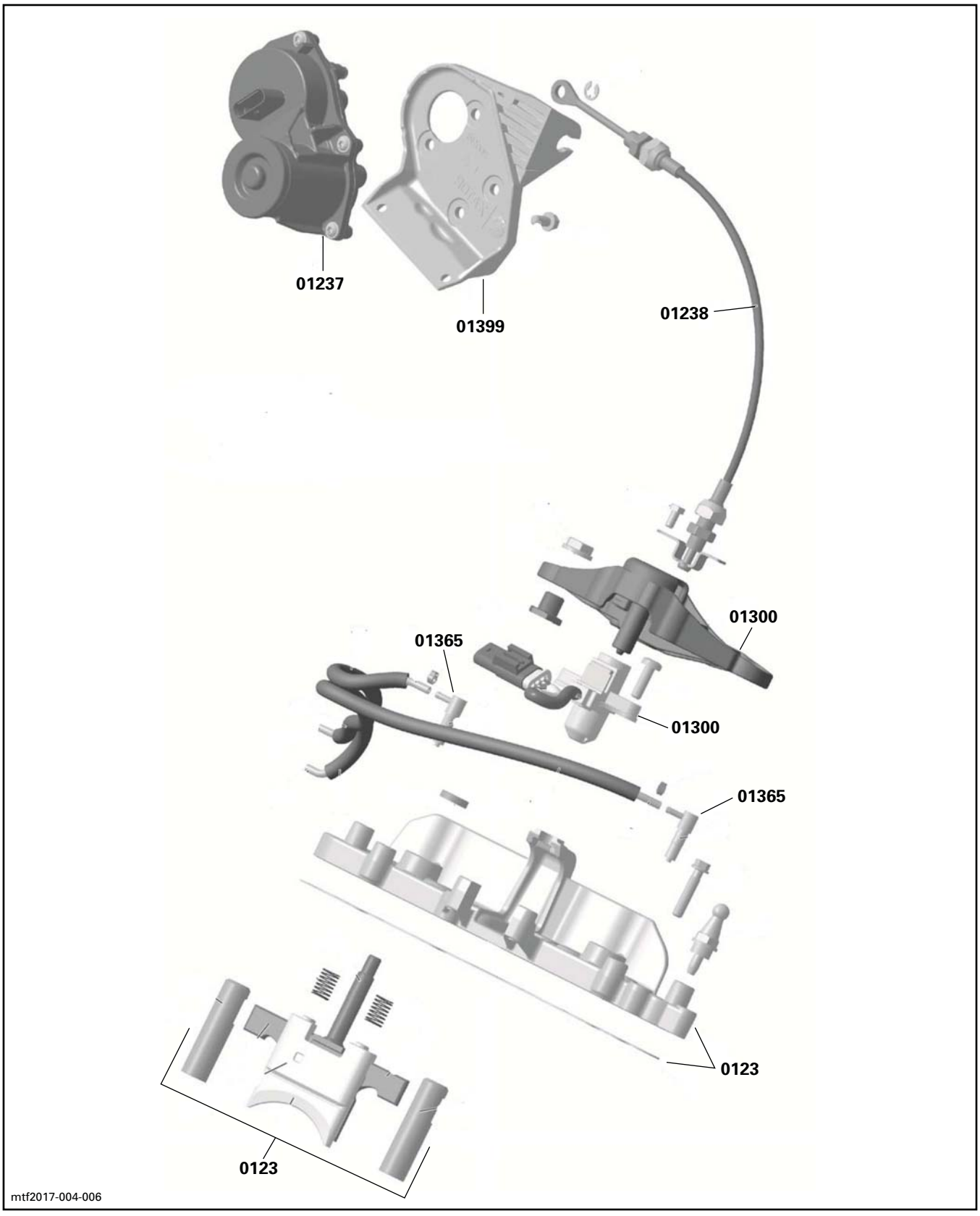
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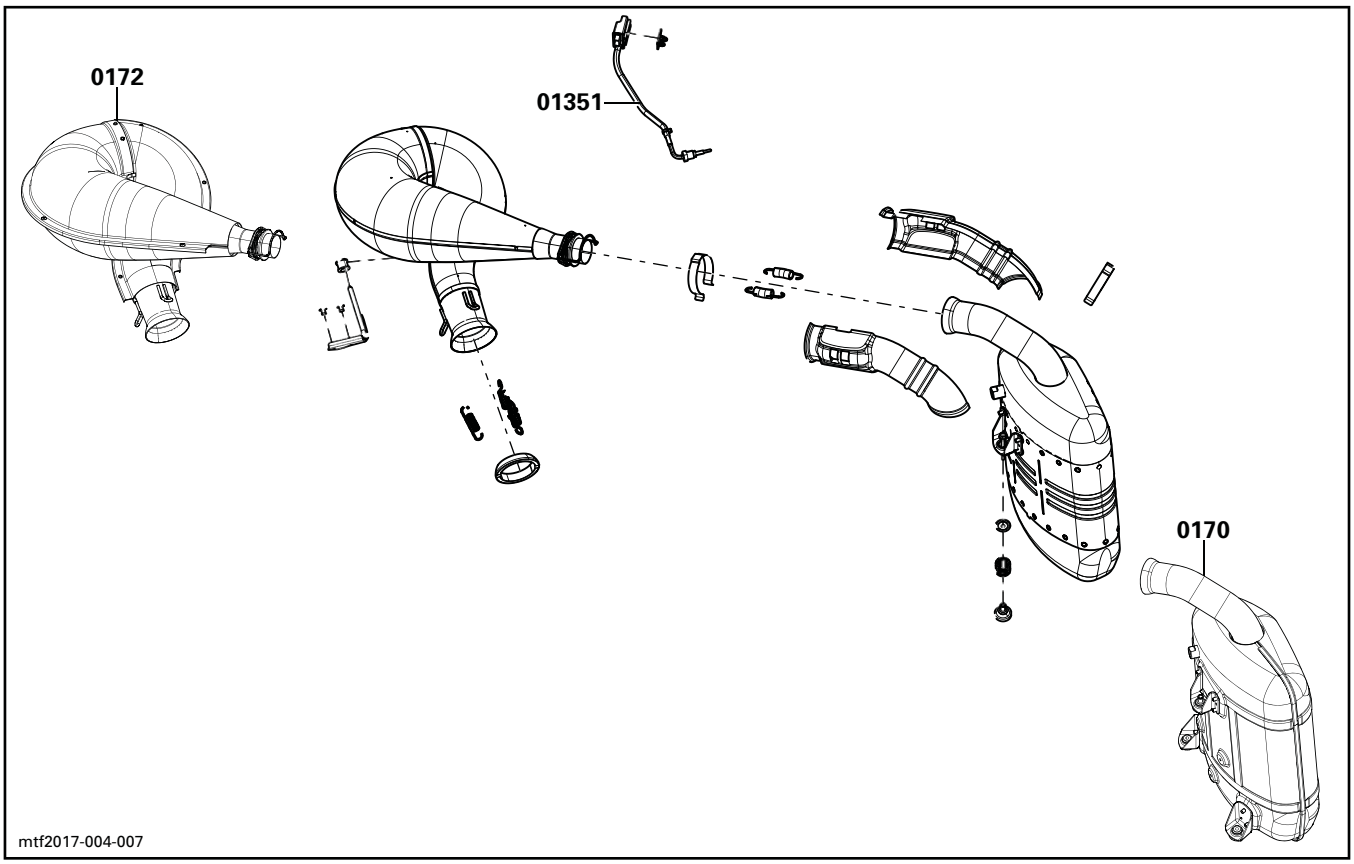
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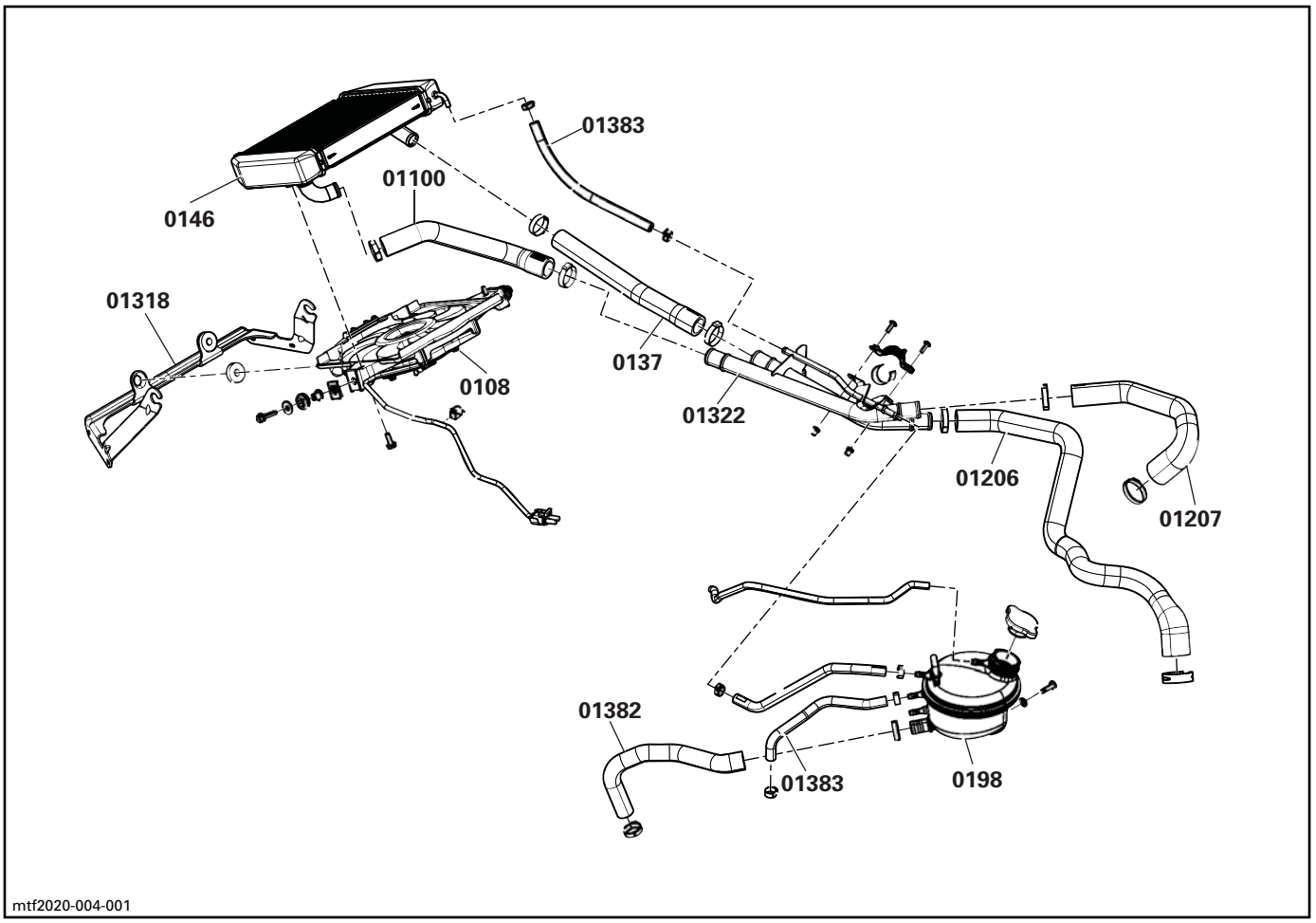
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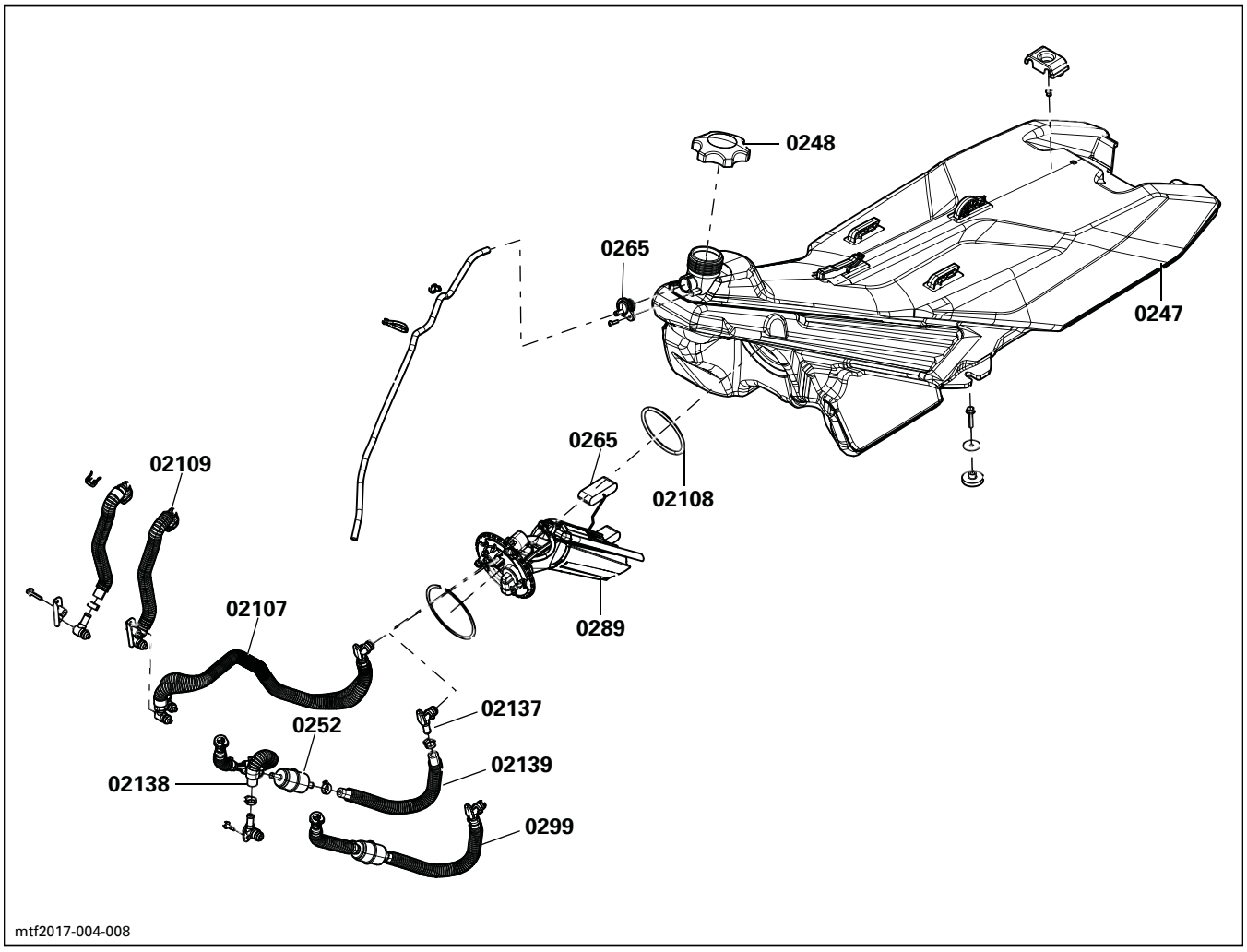
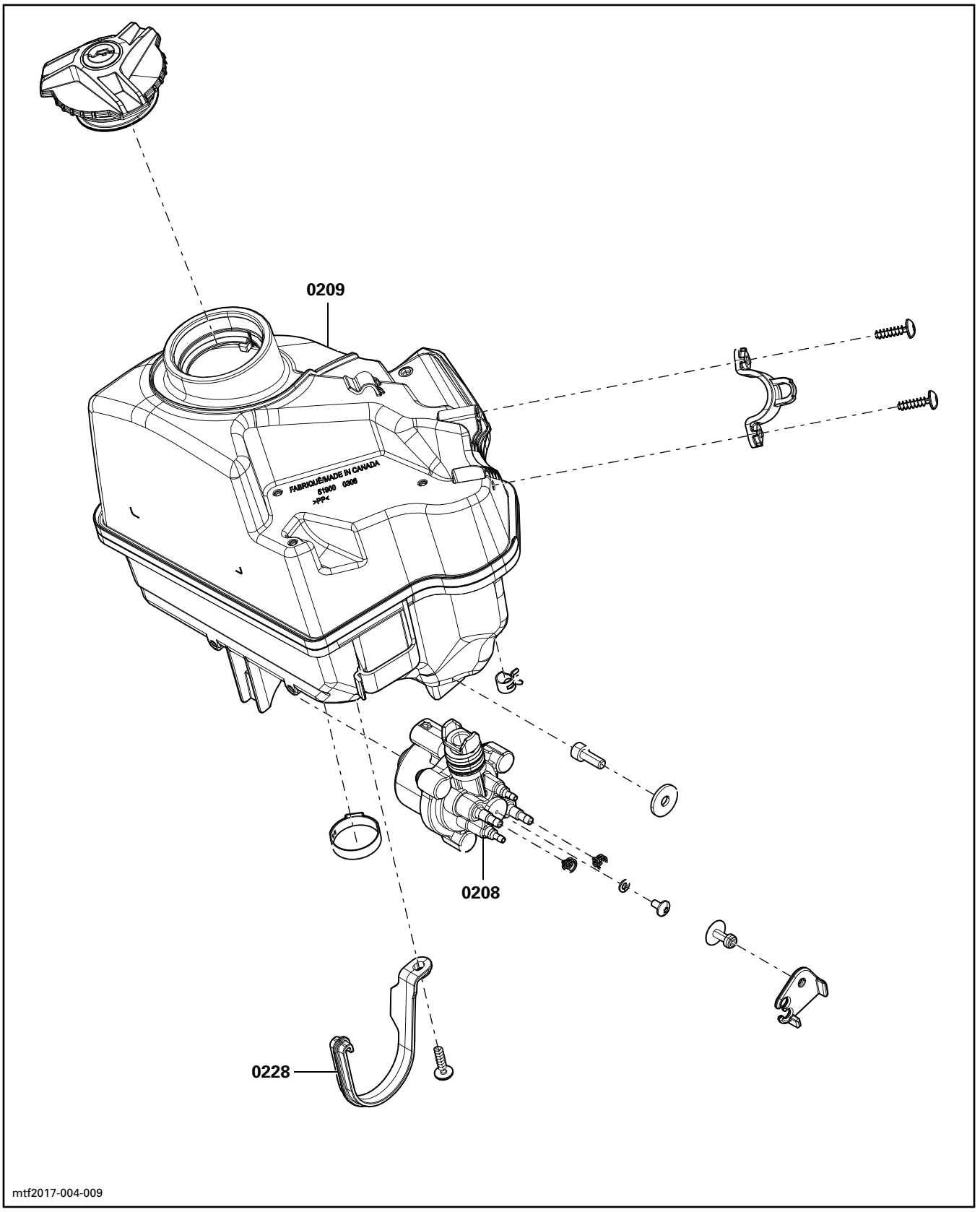
AIR INTAKE AND FUEL SYSTEM
ADMISSION D'AIR ET SYSTÈME D'ALIMENT. D'ESSENCE

SYSTEM SYSTÈME	CODE	DESCRIPTION	EXPEDITION 850R E-TEC	MXZ / RENEGADE 850 E-TEC	BACKCOUNTRU FREERIDE/SUMMIT 850 E-TEC	BACKCOUNTRU FREERIDE/SUMMIT 50 E-TEC SHOT
			15	16/17	18/20/22	19/21/23
02	**00**	**NO LABOR INVOLVED AUCUNE MAIN-D'OEUVRE IMPLIQUÉE**	**0**	**0**	**0**	**0**
02	06	THROTTLE CABLE CÂBLE D'ACCÉLÉRATEUR	1.1	1.1	1.1	1.1
02	08	OIL INJECTION PUMP POMPE À INJECTION D'HUILE	0.6	0.6	0.6	0.6
02	09	OIL INJECTION RESERVOIR RÉSERVOIR D'HUILE À INJECTION	0.7	0.7	0.7	0.7
02	25	OIL INJECTION LINE (1) BOYAU D'HUILE À INJECTION (1)	1.5	1.5	1.5	1.5
02	26	OIL INJECTION LINES (2) BOYAUX D'HUILE À INJECTION (2)	1.5	1.5	1.5	1.5
02	28	OIL PUMP SUPPORT SUPPORT DE POMPE À L'HUILE	1.8	0.5	0.5	0.5
02	37	OIL INJECTION LINES (3) BOYAU D'HUILE À INJECTION (3)	0.4	0.4	0.4	0.4
02	47	FUEL TANK RÉSERVOIR À ESSENCE	1.2	1.2	1.2	1.2
02	48	FUEL TANK CAP BOUCHON DU RÉSERVOIR À ESSENCE	0.3	0.3	0.3	0.3
02	50	THROTTLE HANDLE HOUSING LOGEMENT MANETTE ACCÉLÉRATEUR	0.3	0.3	0.3	0.3
02	52	FUEL FILTER FILTRE À CARBURANT	0.6	0.6	0.6	0.6
02	65	FUEL SENSOR (ASS'Y) CAPTEUR DE NIVEAU D'ESSENCE (COMPLET)	1.2	1.2	1.2	1.2
02	69	AIR FILTER FILTRE À AIR	0.3	0.3	0.3	0.3
02	81	THROTTLE BODY (ASS'Y) CARTER ACCELERATEUR (COMPLET)	1.2	1.2	1.2	1.2
02	82	THROTTLE SENSOR CAPTEUR POSITION ACCÉLÉRATEUR	1.2	1.2	1.2	1.2
02	89	FUEL PUMP MODULE (ASS'Y) MODULE DE POMPE À ESSENCE (COMPLET)	1.2	1.2	1.2	1.2
02	99	FUEL INJECTION HOSE ASS'Y BOYAU D'ESSENCE À INJECTION ASSEMBLEE	1.0	1.0	1.0	1.0
02	104	PRIMARY CHAMBER (ASS'Y) CHAMBRE PRIMAIRE (COMPLET)	0.8	0.8	0.8	0.8
02	105	SECONDARY CHAMBER (ASS'Y) CHAMBRE SECONDAIRE (COMPLET)	0.5	0.5	0.5	0.5
02	107	FUEL RETURN HOSE BOYAU DE RETOUR D'ESSENCE	0.6	0.6	0.6	0.6

SYSTEM SYSTÈME	CODE	DESCRIPTION	EXPEDITION 850R E-TEC	MXZ / RENEGADE 850 E-TEC	BACKCOUNTRU FREERIDE/SUMMIT 850 E-TEC	BACKCOUNTRU FREERIDE/SUMMIT 50 E-TEC SHOT
			15	16/17	18/20/22	19/21/23
02	109	FUEL HOSE (MODULE TO INJECTORS) BOYAU D'ESSENCE (MODULE AU INJECTEURS)	0.5	0.5	0.5	0.5
02	110	FUEL HOSE (REGULATOR TO FUEL PUMP) BOYAU À ESSENCE (RÉGULATEUR À LA POMPE À ESSENCE)	0.4	0.4	0.4	0.4
02	113	FUEL PUMP INLET FILTER FILTRE INTÉRIEUR DE LA POMPE À ESSENCE	1.2	1.2	1.2	1.2
02	119	CHECK VALVE SOUPAPE DE RETENUE	0.3	0.3	0.3	0.3
02	137	FITTING RACCORD	0.6	0.6	0.6	0.6
02	138	FUEL HOSE (FILTER TO MODULE) BOYAU D'ESSENCE (FILTRE AU MODULE)	0.4	0.4	0.4	0.4
02	139	FUEL HOSE (FUEL PUMP TO FILTER) BOYAU D'ESSENCE (POMPE ESSENCE AU FILTRE)	1.0	1.0	1.0	1.0

AIR INTAKE AND FUEL SYSTEM
ADMISSION D'AIR ET SYSTÈME D'ALIMENT. D'ESSENCE

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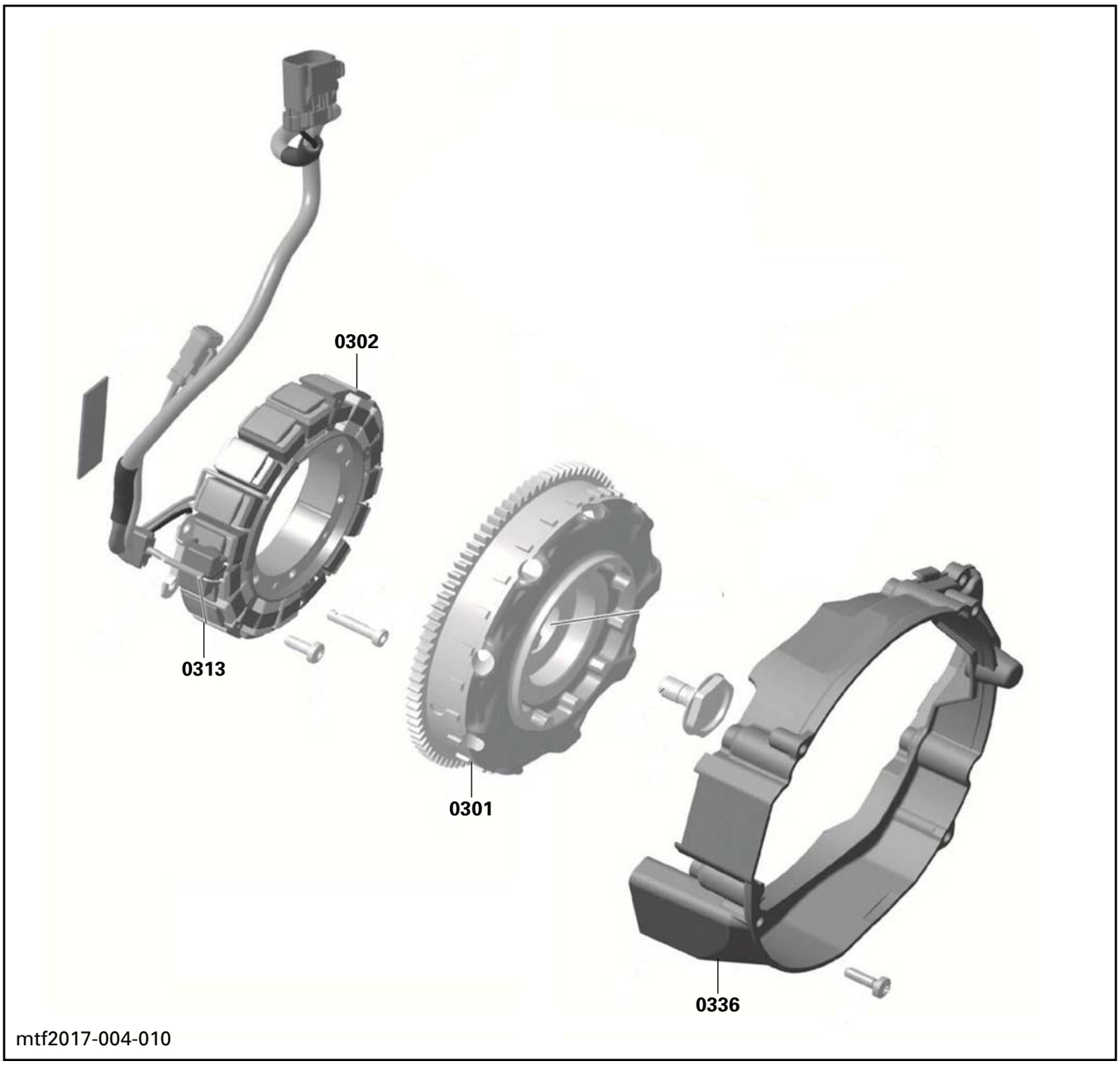
IGNITION SYSTEM
SYSTÈME D'ALLUMAGE

SYSTEM SYSTÈME	CODE	DESCRIPTION	EXPEDITION 850R E-TEC	MXZ / RENEGADE 850 E-TEC	BACKCOUNTRU FREERIDE/SUMMIT 850 E-TEC	BACKCOUNTRU FREERIDE/SUMMIT 50 E-TEC SHOT
			15	16/17	18/20/22	19/21/23
03	**00**	**NO LABOR INVOLVED AUCUNE MAIN-D'OEUVRE IMPLIQUÉE**	**0**	**0**	**0**	**0**
03	01	FLYWHEEL VOLANT MOTEUR	1.0	1.0	1.0	1.0
03	02	MAGNETO (ASS'Y) MAGNÉTO (COMPLET)	3.9	3.9	3.9	3.9
03	08	IGNITION COIL BOBINE D'ALLUMAGE	0.3	0.3	0.3	0.3
03	10	IGNITION CABLE CÂBLE D'ALLUMAGE	0.3	0.3	0.3	0.3
**		**TIMING RÉGLAGE DE L'ALLUMAGE**	**0.3**	**0.3**	**0.3**	**0.3**
03	13	TRIGGER COIL (1) BOBINE DE DÉCLENCHEMENT (1)	3.8	3.8	3.8	3.8
03	15	SPARK PLUG PROTECTOR PROTECTEUR DE BOUGIES	0.3	0.3	0.3	0.3
03	23	SPARK PLUG (1) BOUGIE D'ALLUMAGE (1)	0.3	0.3	0.3	0.3
03	31	SPARK PLUGS (2) BOUGIE D'ALLUMAGE (2)	0.4	0.4	0.4	0.4
03	36	IGNITION HOUSING BOITIER D'ALLUMAGE	3.5	3.5	3.5	3.5



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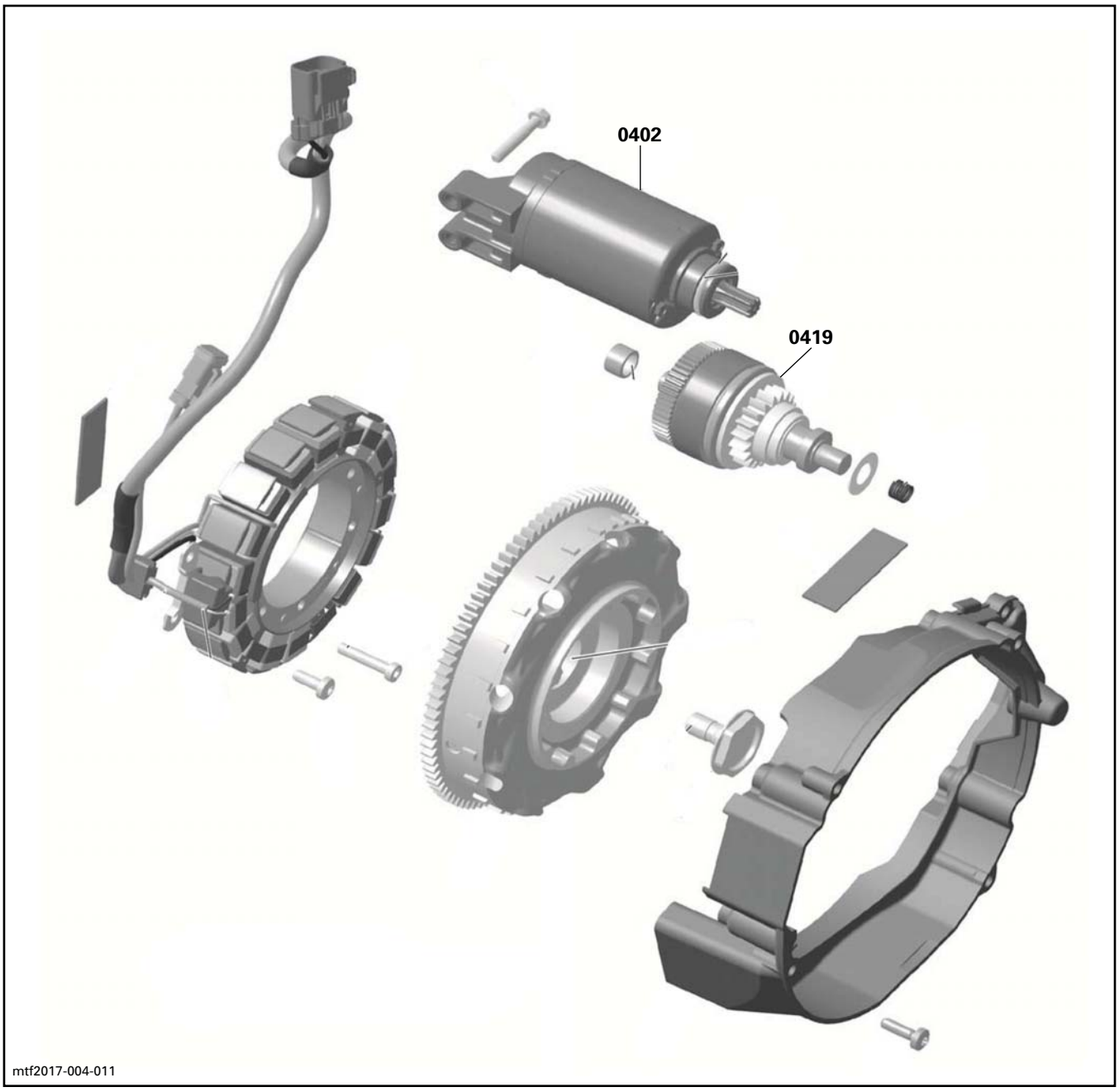
STARTER
DÉMARREUR

SYSTEM SYSTÈME	CODE	DESCRIPTION	EXPEDITION 850R E-TEC	MXZ / RENEGADE 850 E-TEC	BACKCOUNTRU FREERIDE/SUMMIT 850 E-TEC	BACKCOUNTRU FREERIDE/SUMMIT 50 E-TEC SHOT
			15	16/17	18/20/22	19/21/23
04	**00**	**NO LABOR INVOLVED** **AUCUNE MAIN-D'OEUVRE IMPLIQUÉE**	**0**	**0**	**0**	**0**
04	01	REWIND STARTER (ALL PARTS) EXCEPT HANDLE DÉMARREUR À RAPPEL (TOUTES LES PIÈCES) SAUF POIGNÉE		0.4	0.4	0.4
04	02	ELECTRIC STARTER (ASS'Y) DÉMARREUR ÉLECTRIQUE (COMPLET)	1.9	0.6	1.9	1.9
04	03	STARTER SOLENOID SOLÉNOÏDE DE DÉMARRAGE	0.3	0.3	0.3	0.3
04	09	REWIND STARTER HANDLE POIGNÉE DU DÉMARREUR À RAPPEL		0.3	0.3	0.3
04	19	STARTER DRIVE ENTRAINEMENT DU DÉMARREUR	1.0	1.0	1.0	1.0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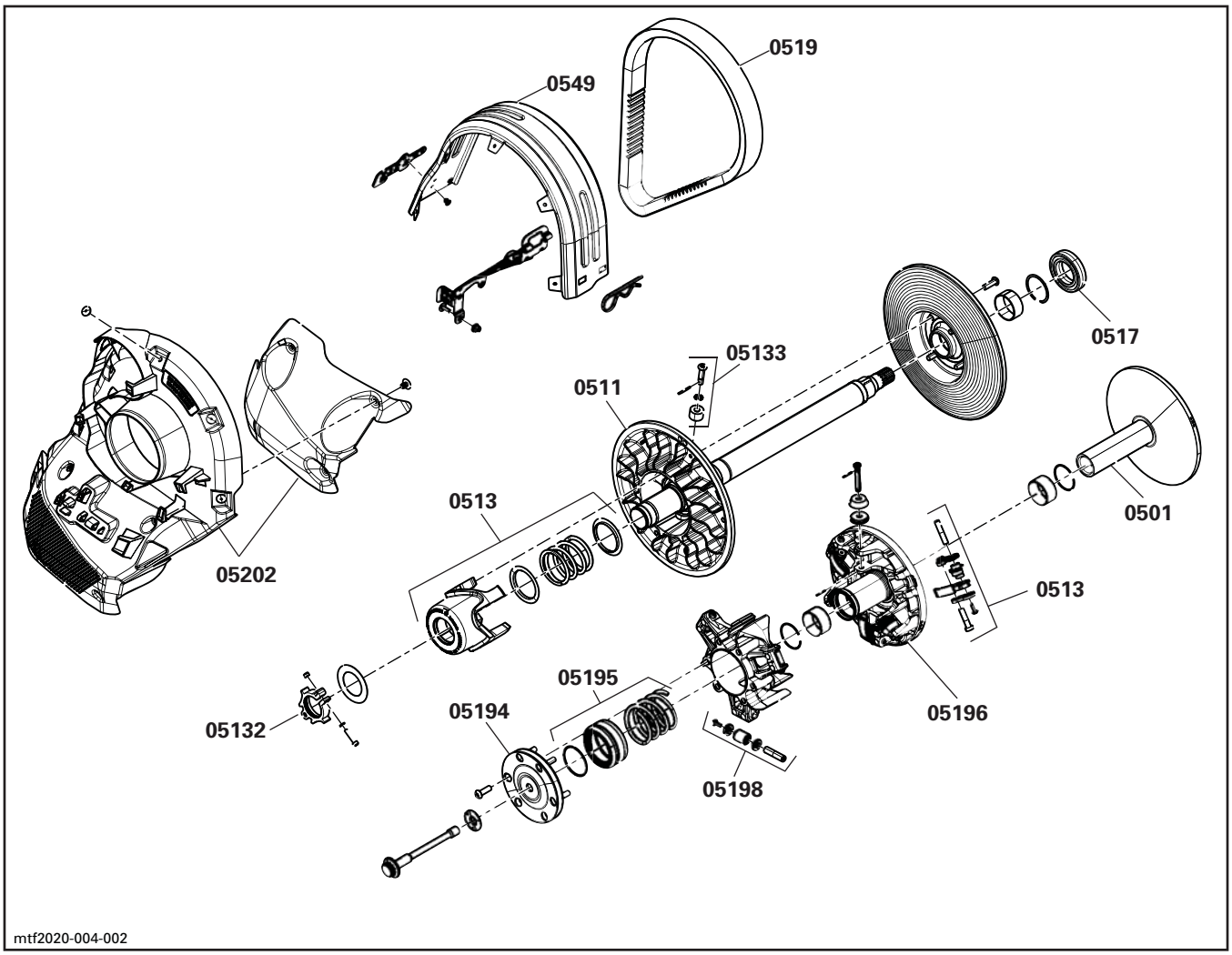
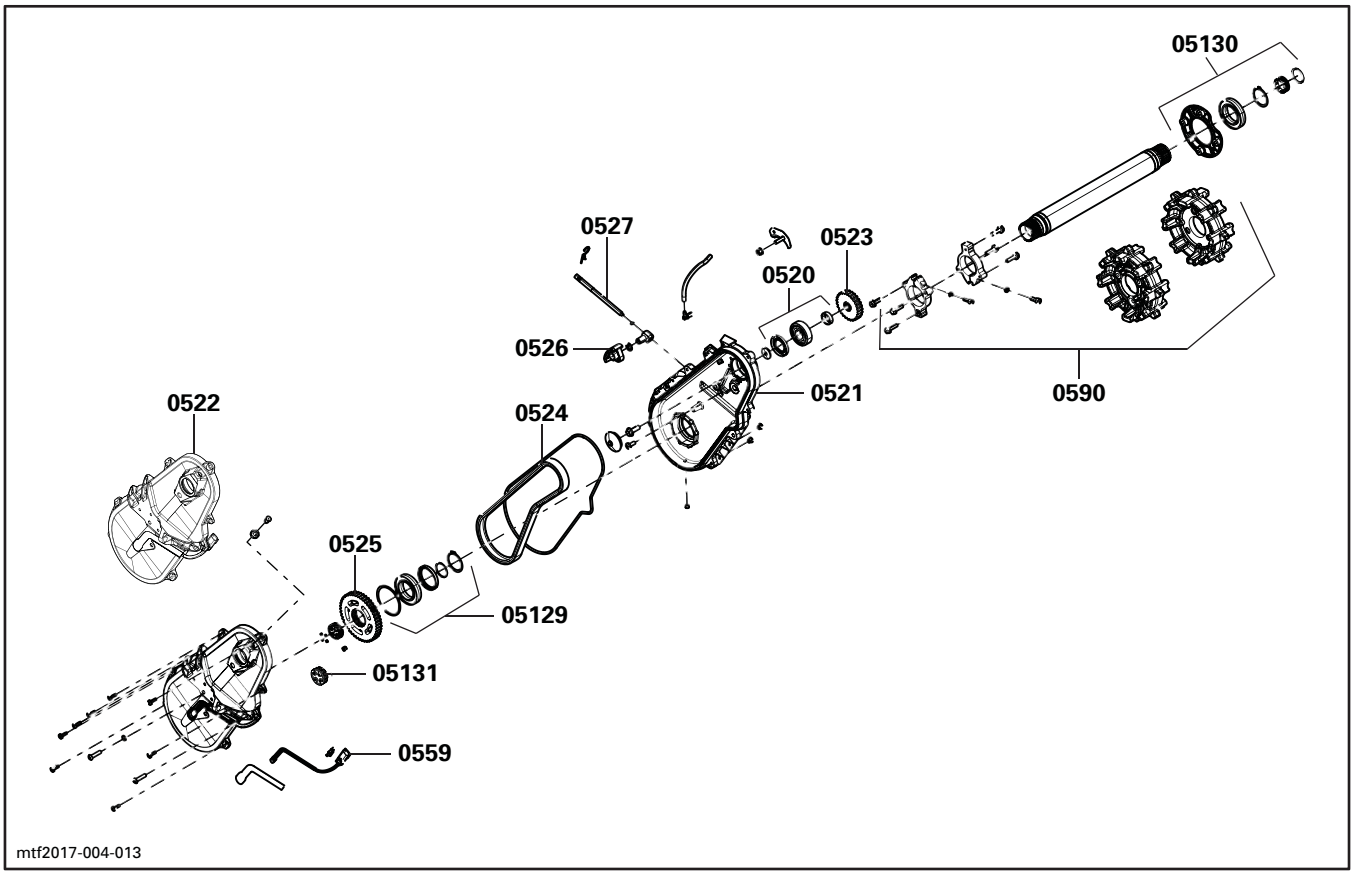
TRANSMISSION SYSTEM
SYSTÈME DE TRANSMISSION

SYSTEM SYSTÈME	CODE	DESCRIPTION	EXPEDITION 850R E-TEC	MXZ / RENEGADE 850 E-TEC	BACKCOUNTRU FREERIDE/SUMMIT 850 E-TEC	BACKCOUNTRU FREERIDE/SUMMIT 50 E-TEC SHOT
			15	16/17	18/20/22	19/21/23
05	**00**	**NO LABOR INVOLVED AUCUNE MAIN-D'OEUVRE IMPLIQUÉE**	**0**	**0**	**0**	**0**
05	01	DRIVE PULLEY (ASS'Y) OR SLIDING FLANGE POULIE MOTRICE (COMPLET) OU FLASQUE COULISSANTE	0.7	0.7	0.7	0.7
05	11	DRIVEN PULLEY FIXED HALF DEMI-POULIE MENÉE FIXE	1.0	1.0	1.0	1.0
05	12	DRIVEN PULLEY SLIDING HALF DEMI-POULIE MENÉE COULISSANTE	0.8	0.8	0.8	0.8
05	13	DRIVEN PULLEY CAM AND/OR SPRING CAME ET/OU RESSORT DE POULIE MENÉE	0.6	0.6	0.6	0.6
05	17	COUNTERSHAFT BALL BEARING AND/OR FLANGE ROULEMENT À BILLE DE L'ARBRE DE RENVOI ET/OU FLASQUE	0.6	0.6	0.6	0.6
05	19	DRIVE BELT AND/OR BELT GUARD COURROIE D'ENTRAÎNEMENT ET/OU GARDE-COURROIE	0.1	0.1	0.1	0.1
05	20	CHAINCASE SEAL AND/OR BEARING ANNEAU D'ÉTANCHÉITÉ DE CARTER ET/OU ROULEMENT	1.4	0.7	0.7	0.7
05	21	CHAINCASE CARTER DE CHAÎNE	3.7	3.0	3.0	3.0
05	22	CHAINCASE COVER COUVERCLE DE CARTER DE CHAÎNE	1.0	0.6	0.6	0.6
05	23	CHAINCASE UPPER SPROCKET AND/OR CENTRAL SPROCKET PIGNON SUPÉRIEUR DE CARTER ET/OU PIGNON CENTRAL	1.0	0.5	0.5	0.5
05	24	CHAINCASE LOWER SPROCKET PIGNON INFÉRIEUR DE CARTER DE CHAÎNE	1.0	0.6	0.6	0.6
05	25	CHAINCASE DRIVE CHAIN CHAÎNE D'ENTRAÎNEMENT DE CARTER DE CHAÎNE	1.0	0.6	0.6	0.6
05	26	CHAINCASE TENSIONERS TENDEURS DE CARTER DE CHAÎNE	1.0	0.6	0.6	0.6
05	27	TENSIONER ADJUSTING SCREW VIS DE RÉGLAGE DE TENDEUR	1.0	0.4	0.4	0.4
05	42	CHAINCASE COVER BEARING ROULEMENT DU COUVERCLE DE CARTER DE CHAINE	1.0			
05	49	DRIVE PULLEY GUARD GARDE DE POULIE MOTRICE	0.3	0.3	0.3	0.3
05	59	SPEED SENSOR CAPTEUR DE VITESSE	0.9	0.9	0.9	0.8
05	90	DRIVE AXLE (ASS'Y) (WITHOUT BATTERY) AXE D'ENTRAÎNEMENT (COMPLET) (SANS BATTERIE)	2.1	1.6	1.6	1.6
05	129	CHAINCASE LOWER BEARING AND SEAL (MAG) ROULEMENT À BILLES INFÉRIEUR DU CARTER DE CHAÎNE ET ANNEAU D'ÉTANCHÉITÉ (MAG)	2.5	2.1	2.1	2.1
05	130	BEARING HOUSING AND/OR BEARING (PTO) LOGEMENT DU ROULEMENT À BILLES ET/OU ROULEMENT À BILLES (PDM)	2.1	1.6	1.6	1.6

SYSTEM SYSTÈME	CODE	DESCRIPTION	EXPEDITION 850R E-TEC	MXZ / RENEGADE 850 E-TEC	BACKCOUNTRU FREERIDE/SUMMIT 850 E-TEC	BACKCOUNTRU FREERIDE/SUMMIT 50 E-TEC SHOT
			15	16/17	18/20/22	19/21/23
05	131	MAGNETIC CAP CAPUCHON MAGNÉTIQUE	1.1	0.7	0.7	0.7
05	132	ADJUSTMENT RING (ASS'Y) ANNEAU DE RÉGLAGE (COMPLET)	0.3	0.3	0.3	0.3
05	133	STUDS AND/OR ROLLERS PIVOTS ET/OU ROULEAUX	0.6	0.6	0.6	0.6
05	193	SLIDING SHEAVE (PDRIVE) POULIE COULISSANTE (PDRIVE)	0.7	0.7	0.7	0.7
05	194	DAMPER (PDRIVE) AMORTISSEUR DE VIBRATIONS (PDRIVE)	0.4	0.4	0.4	0.4
05	195	SPRING SEAT AND SPRING (PDRIVE) SIÈGE RESSORT ET RESSORT (PDRIVE	0.5	0.5	0.5	0.5
05	196	SPIDER (PDRIVE) ARAIGNÉE (PDRIVE)	0.6	0.6	0.6	0.6
05	197	TORQUE ROLLERS (PDRIVE) ROULEAUX DE TRANSFERT	0.6	0.6	0.6	0.6
05	198	ROLLERS AND AXLE ROULEAUX ET AXE	0.5	0.5	0.5	0.5
05	199	CLICKER A/O LEVERS A/O RAMP (PDRIVE) CAME E/O LEVIERS E/O RAMPES (PDRIVE)	0.5	0.5	0.5	0.5
05	202	CVT AIR DUCK AND ACCOUSTIC PANEL CONDUIT D'AIR DE POULIE ET PANNEAU ACCOUSTIQUE	0.5	0.5	0.3	0.3
05	214	BRACE (ASS'Y) BRETELLE (COMPLET)	1.9	1.9	1.9	1.9
05	215	SHAFT GEARBOX IN (ASS'Y) ARBRE BOITE DE VITESSE ENTREE (COMPLET)	1.2			
05	216	SHAFT GEARBOX SELECTION (ASS'Y) ARBRE BOITE DE VITESSE SELECTION (COMPLET)	1.2			
05	217	SHAFT GEARBOX OUT (ASS'Y) ARBRE BOITE DE VITESSE SORTIE (COMPLET)	1.2			
05	218	REVERSE AXLE, FORK AND BALL JOINT AXE RENVERSE, FOURCHETTE ET JOINT À ROTULE	0.4			
05	219	ACTUATING ROD, AXLE AND FORK TIGE DE COMMANDE, AXE ET FOURCHETTE	0.4			

TRANSMISSION SYSTEM
SYSTÈME DE TRANSMISSION

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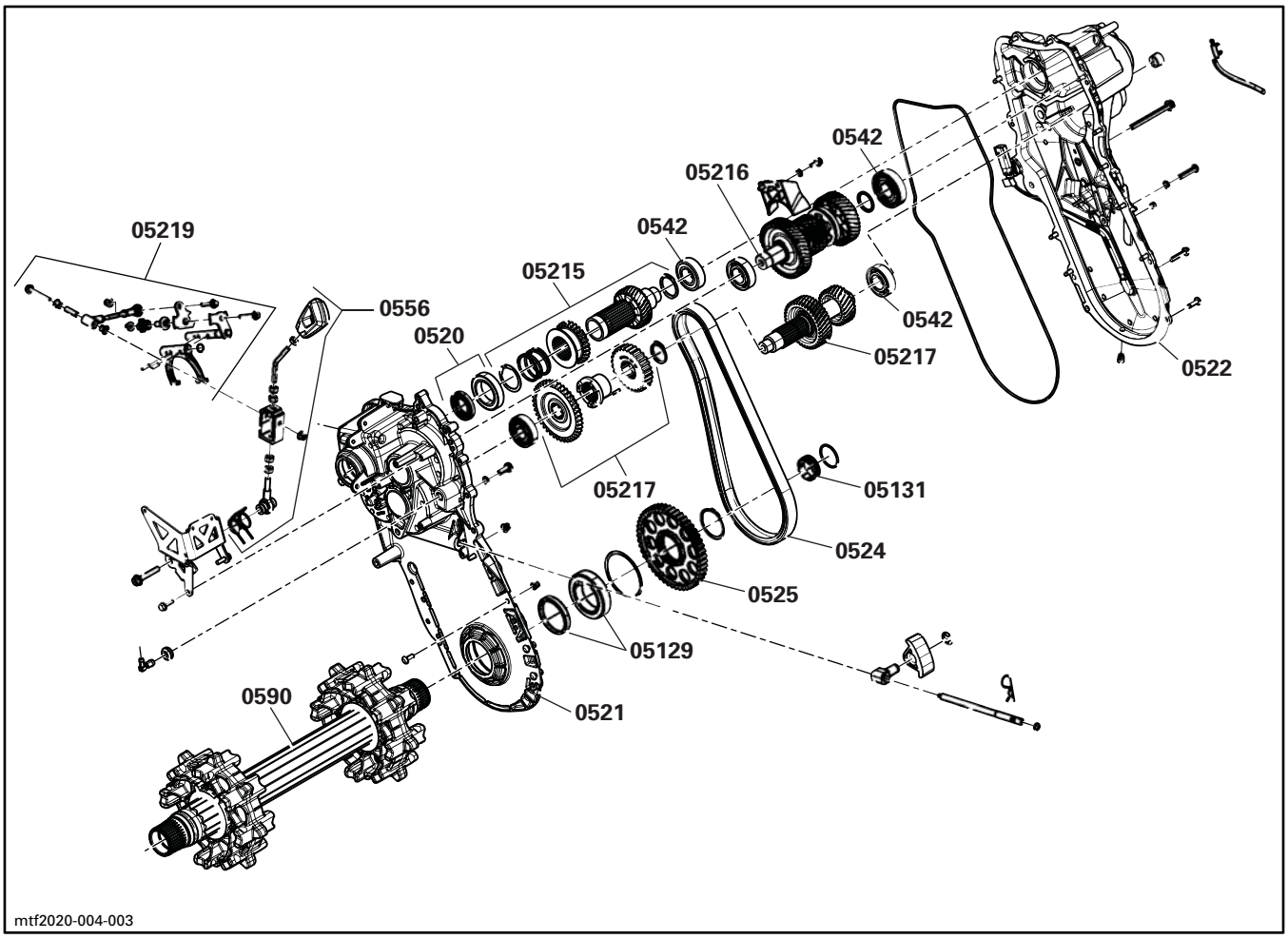
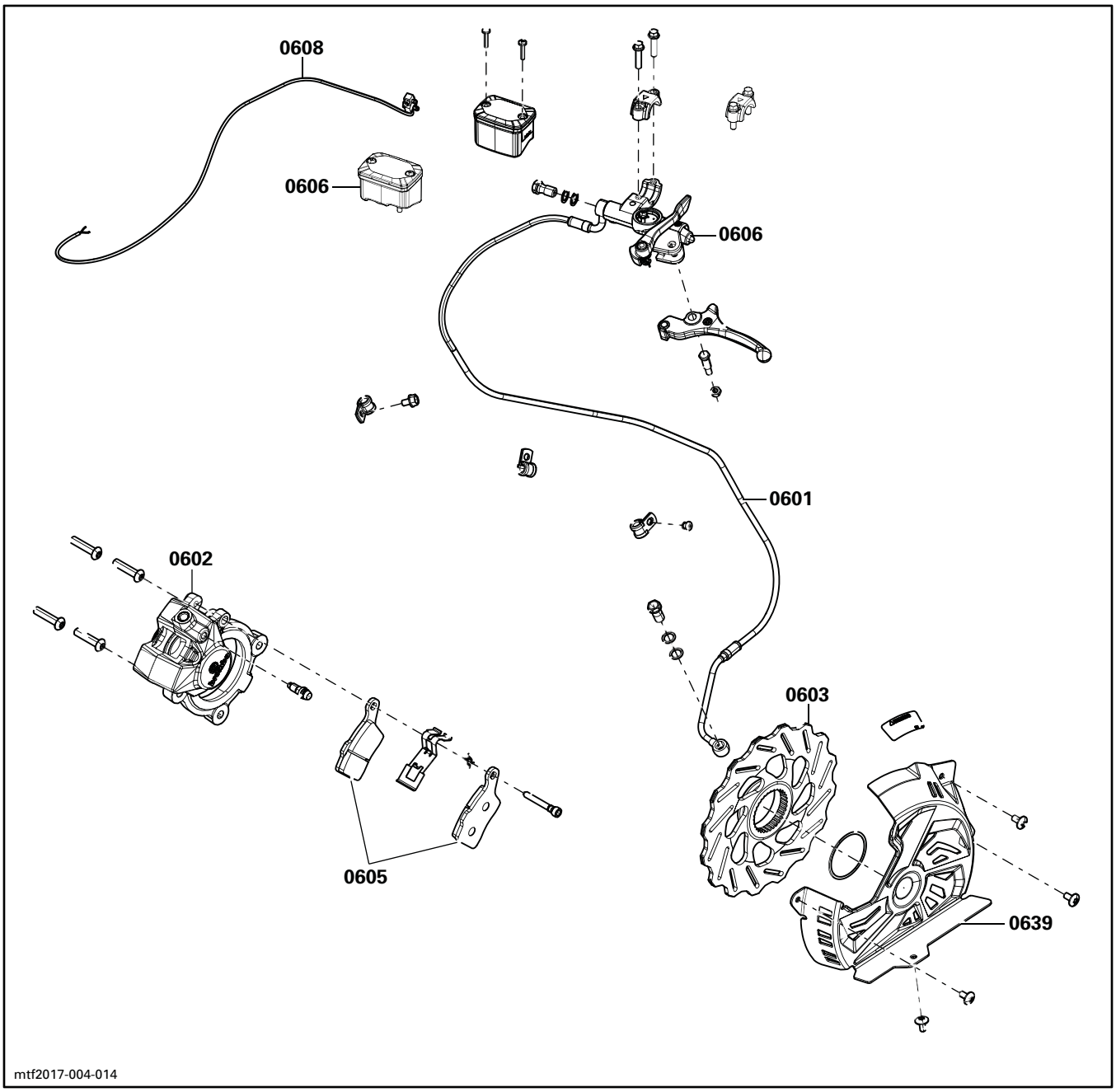
TRANSMISSION SYSTEM
SYSTÈME DE TRANSMISSION



SYSTEM SYSTÈME	CODE	DESCRIPTION	EXPEDITION 850R E-TEC	MXZ / RENEGADE 850 E-TEC	BACKCOUNTRU FREERIDE/SUMMIT 850 E-TEC	BACKCOUNTRU FREERIDE/SUMMIT 50 E-TEC SHOT
			15	16/17	18/20/22	19/21/23
06	**00**	**NO LABOR INVOLVED AUCUNE MAIN-D'OEUVRE IMPLIQUÉE**	**0**	**0**	**0**	**0**
06	01	BRAKE OIL HOSE BOYAU À HUILE POUR FREIN	0.5	0.5	0.5	0.5
06	02	BRACKET, CALIPER, BRAKE PAD SUPPORT, ÉTRIER, PLAQUETTE DE FREIN	0.8	0.8	0.8	0.8
06	03	DISC DISQUE	0.7	0.7	0.7	0.7
06	05	BRAKE PADS PLAQUETTES DE FREIN	0.4	0.4	0.4	0.4
06	06	MASTER CYLINDER MAÎTRE-CYLINDRE	0.4	0.4	0.4	0.4
06	07	BRAKE LEVER (ASS'Y) LEVIER DE FREIN (COMPLET)	0.3	0.3	0.3	0.3
06	08	MICROSWITCH BRAKE (ASS'Y) INTERRUPTEUR MICRO-CONTACT DE FREIN (COMPLET)	0.3	0.3	0.3	0.3
06	39	DISC PROTECTOR PROTECTEUR DE DISQUE	0.3	0.3	0.3	0.3

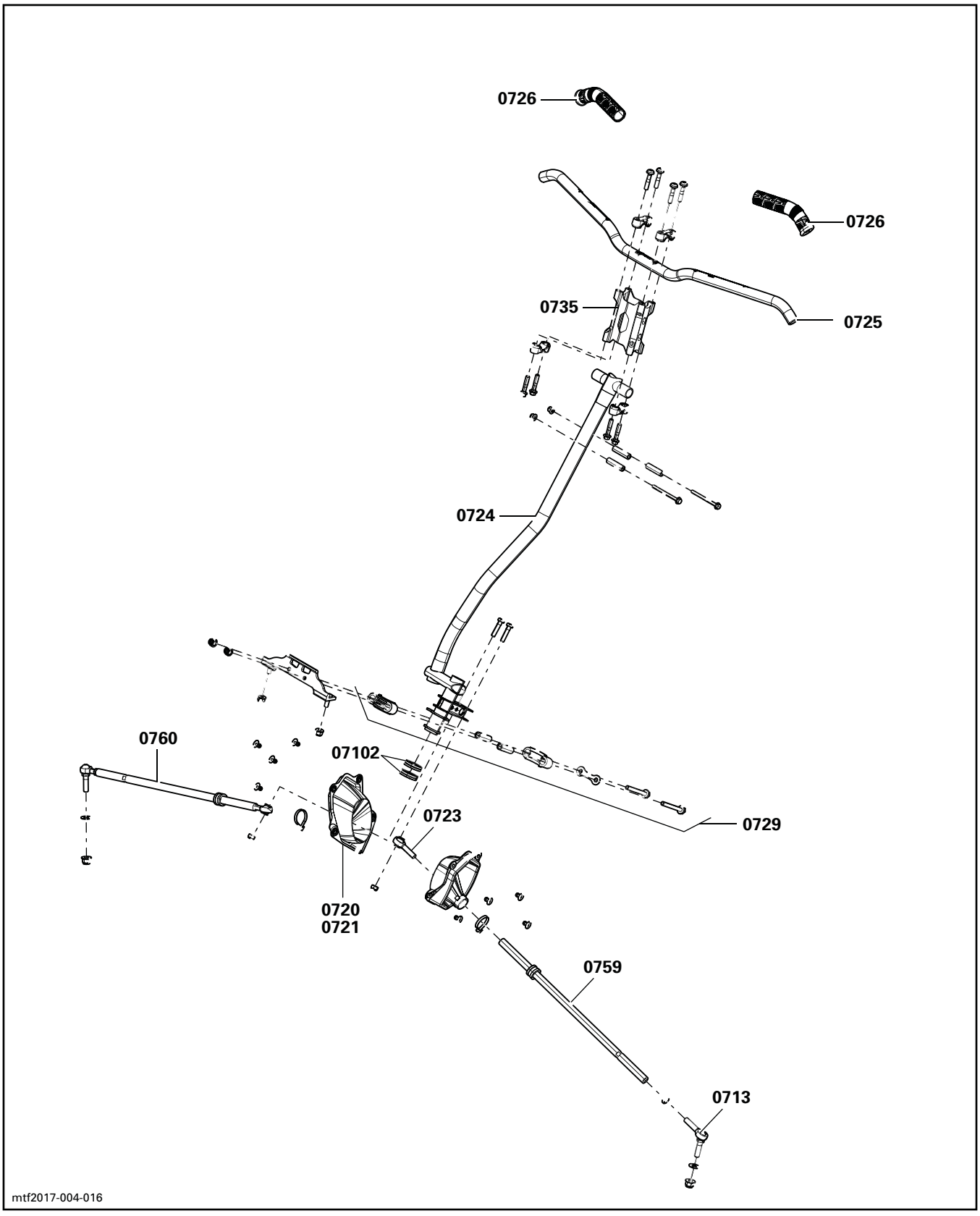
BRAKE SYSTEM
SYSTÈME DE FREIN



SYSTEM SYSTEME	CODE	DESCRIPTION	EXPEDITION 850R E-TEC	MXZ / RENEGADE 850 E-TEC	BACKCOUNTRU FREERIDE/SUMMIT 850 E-TEC	BACKCOUNTRU FREERIDE/SUMMIT 50 E-TEC SHOT
			15	16/17	18/20/22	19/21/23
07	**00**	**NO LABOR INVOLVED AUCUNE MAIN-D'OEUVRE IMPLIQUÉE**	**0**	**0**	**0**	**0**
07	01	SKI (1) SKI (1)	0.3	0.3	0.3	0.3
07	02	SKIS (2) SKIS (2)	0.4	0.4	0.4	0.4
07	03	SKI RUNNER LISSE	0.3	0.3	0.3	0.3
07	08	SKI LEG (RH) AND/OR BUSHING JAMBE DE SKI (DROIT) ET/OU DOUILLE	0.5	0.5	0.5	0.5
07	09	SKI LEG (LH) AND/OR BUSHING JAMBE DE SKI (GAUCHE) ET/OU DOUILLE	0.5	0.5	0.5	0.5
07	13	STEERING ARM BALL JOINT (LH) JOINT À ROTULE DE BRAS DE DIRECTION (GAUCHE)	0.3	0.3	0.3	0.3
07	20	TIE ROD COVER (1) CAPUCHON DE TIMONERIE (1)	0.4	0.4	0.4	0.4
07	21	TIE ROD COVERS (2) CAPUCHON DE TIMONERIE (2)	0.8	0.8	0.8	0.8
07	23	STEERING MAIN TUBE BALL JOINT JOINT À ROTULE DE COLONNE DE DIRECTION	0.6	0.6	0.4	0.4
07	24	STEERING MAIN TUBE COLONNE DE DIRECTION	1.2	0.8	0.8	0.8
07	25	HANDLEBAR GUIDON	1.1	1.1	1.1	1.1
07	26	HANDLEBAR GRIP (RH AND/OR LH) GAINE DE GUIDON (DROITE ET/OU GAUCHE)	0.3	0.3	0.3	0.3
07	27	HANDLEBAR PADDING COUSSINET DE GUIDON	0.3	0.3	0.3	0.3
07	28	UPPER STEERING MAIN TUBE BUSHING DOUILLE SUPÉRIEURE DE COLONNE DE DIRECTION	0.3	0.3	0.3	0.3
07	29	LOWER STEERING MAIN TUBE BUSHING DOUILLE INFÉRIEURE DE COLONNE DE DIRECTION	1.0	0.6	0.6	0.6
07	32	LOWER ARM (LH OR RH) BRAS DE SUSPENSION INFÉRIEUR (GAUCHE OU DROIT)	0.6	0.6	0.6	0.6
07	33	UPPER ARM (LH OR RH) BRAS DE SUSPENSION SUPÉRIEUR (GAUCHE OU DROIT)	0.5	0.5	0.5	0.5
07	35	HANDLE STEERING SUPPORT (ALL) SUPPORT DE GUIDON (TOUS)	0.3	0.3	0.3	0.3
07	37	SHOCK AND/OR SPRING (1) AMORTISSEUR ET/OU RESSORT (1)	0.4	0.4	0.4	0.4
07	38	SHOCKS AND/OR SPRINGS (2) AMORTISSEURS ET/OU RESSORTS (2)	0.6	0.5	0.5	0.5

STEERING SYSTEM AND FRONT SUSPENSION
SYSTÈME DE DIRECTION ET SUSPENSION AVANT

SYSTEM SYSTÈME	CODE	DESCRIPTION	EXPEDITION 850R E-TEC	MXZ / RENEGADE 850 E-TEC	BACKCOUNTRU FREERIDE/SUMMIT 850 E-TEC	BACKCOUNTRU FREERIDE/SUMMIT 50 E-TEC SHOT
			15	16/17	18/20/22	19/21/23
07	39	STABILIZER BAR BARRE STABILISATRICE	0.5	0.5	0.5	0.5
07	59	TIE ROD (STEERING SHAFT LH) BARRE D'ACCOUPLEMENT (ARBRE DE DIRECTION GAUCHE)	0.3	0.3	0.3	0.3
07	60	TIE ROD (STEERING SHAFT RH) BARRE D'ACCOUPLEMENT (ARBRE DE DIRECTION DROIT)	0.3	0.3	0.3	0.3
07	61	LEVER STABILIZER LEVIER STABILISATEUR	0.3	0.3	0.3	0.3
07	64	DOUBLE BALL JOINT JOINT À ROTULE DOUBLE	0.3	0.3	0.3	0.3
07	77	ADJUST STEERING SYSTEM AJUSTEMENT SYSTEM CONDUITE		0.3		
07	101	DEFLECTOR (LH OR RH) DÉFLECTEUR (GAUCHE OU DROIT)	0.3	0.3	0.3	0.3
07	102	LOWER DAMPER AMORTISSEUR DE VIBRATION INFÉRIEUR	1.2	0.8	0.8	0.8
07	124	STRAP SANGLE	0.3	0.3	0.3	0.3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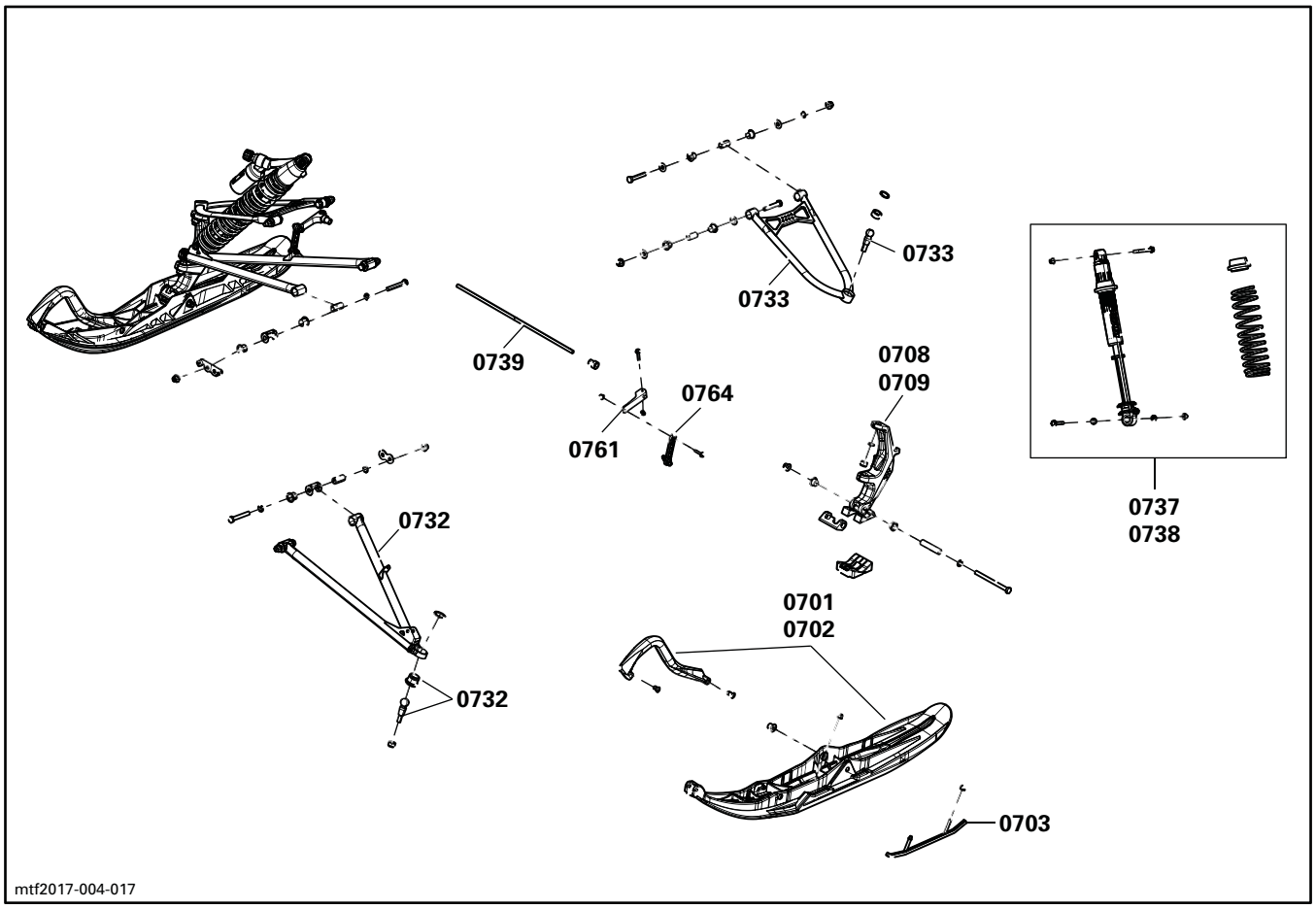
STEERING SYSTEM AND FRONT SUSPENSION
SYSTÈME DE DIRECTION ET SUSPENSION AVANT



SYSTEM SYSTÈME	CODE	DESCRIPTION	EXPEDITION 850R E-TEC	MXZ / RENEGADE 850 E-TEC	BACKCOUNTRU FREERIDE/SUMMIT 850 E-TEC	BACKCOUNTRU FREERIDE/SUMMIT 50 E-TEC SHOT
			15	16/17	18/20/22	19/21/23
08	**00**	**NO LABOR INVOLVED AUCUNE MAIN-D'OEUVRE IMPLIQUÉE**	**0**	**0**	**0**	**0**
08	01	SLIDER SHOE (1) GLISSIÈRE (1)	0.5	0.5	0.5	0.5
08	02	SLIDER SHOES (2) GLISSIÈRES (2)	0.7	0.7	0.7	0.7
08	03	RUNNER (1) PORTE-GLISSIÈRE (1)	1.5	1.2	1.2	1.2
08	04	RUNNERS (2) PORTE-GLISSIÈRES (2)	1.9	1.5	1.5	1.5
08	09	FRONT IDLER WHEEL AND/OR BEARING (1) ROUE DE SUPPORT AVANT ET/OU ROULEMENT (1)	0.3	0.3	0.3	
08	10	FRONT IDLER WHEELS AND/OR BEARINGS AND/OR SHAFTS (2) ROUES DE SUPPORT AVANT ET/OU ROULEMENTS ET/OU ARBRES (2)	0.4	0.4	0.4	
08	11	FRONT IDLER WHEEL SUPPORT (1) SUPPORT DE ROUE AVANT (1)	0.3	0.3	0.3	
08	12	FRONT IDLER WHEELS SUPPORTS (2) SUPPORTS DE ROUE AVANT (2)	0.4	0.4	0.4	
08	13	CENTER IDLER WHEEL AND/OR BEARING (1) ROUE DE SUPPORT CENTRALE ET/OU ROULEMENT (1)	0.3	0.3	0.3	0.3
08	14	CENTER IDLER WHEELS AND/OR BEARINGS (2) ROUES SUPPORT CENTRALE ET/OU ROULEMENTS (2)	0.5	0.5	0.5	0.5
08	15	CENTER IDLER WHEEL SUPPORT (1) SUPPORT DE ROUE CENTRALE (1)	0.3	0.3	0.3	0.3
08	17	REAR IDLER AND/OR BEARING (1) ROUE DE SUPPORT ARRIÈRE ET/OU ROULEMENT (1)	0.4	0.4	0.4	
08	18	REAR IDLERS AND/OR BEARINGS (2) ROUES DE SUPPORT ARRIÈRE ET/OU ROULEMENTS (2)	0.5	0.5	0.5	
08	19	REAR IDLER WHEELS AXLE ESSIEU DE ROUES DE SUPPORT ARRIÈRE	0.5	0.5	0.5	0.5
08	20	INSIDE REAR IDLER WHEEL ROUE ARRIÈRE INTÉRIEUR	0.5	0.5	0.5	0.5
08	21	COMPRESSOR COMPRESSEUR		0.3		
08	24	PNEUMATIC HOSE BOYAU PNEUMATIQUE		0.3		
08	29	AXLE (STOPPER STRAP) AXE (COURROIE D'ARRÊT)	0.3	0.3	0.3	0.3
08	31	TRACK TENSION ADJUSTER (1) PLAQUE DE RÉGLAGE TENSION CHENILLE (1)	0.4	0.3	0.3	0.3
08	32	TRACK TENSION ADJUSTERS (2) PLAQUES DE RÉGLAGE TENSION CHENILLE (2)	0.5	0.4	0.4	0.4

REAR SUSPENSION SYSTEM AND TRACK
SYSTÈME DE SUSPENSION ARRIÈRE ET CHENILLE

SYSTEM SYSTÈME	CODE	DESCRIPTION	EXPEDITION 850R E-TEC	MXZ / RENEGADE 850 E-TEC	BACKCOUNTRU FREERIDE/SUMMIT 850 E-TEC	BACKCOUNTRU FREERIDE/SUMMIT 50 E-TEC SHOT
			15	16/17	18/20/22	19/21/23
08	33	RUNNER RUBBER STOPPER (1) BUTÉE DE CAOUTCHOUC DE PORTE-GLISSIÈRE (1)	0.3	0.3	0.3	0.3
08	34	RUNNER RUBBER STOPPERS (2) BUTÉES DE CAOUTCHOUC DE PORTE-GLISSIÈRE (2)	0.4	0.4	0.4	0.4
08	35	FRONT ARM AND/OR AXLE BRAS AVANT ET/OU AXE	1.0	1.0	1.0	1.0
08	36	FRONT ARM STOPPER STRAP/STOPPER BOLT COURROIE D'ARRÊT DU BRAS AVANT/BOULON D'ARRÊT	0.3	0.3	0.3	0.3
08	40	REAR ARM AND/OR AXLE BRAS ARRIÈRE ET/OU AXE	1.0	1.0	1.0	1.0
08	41	REAR ARM IDLER WHEELS (1-2) AND/OR SHAFT-CROSS ROUES DE SUPPORT DU BRAS ARRIÈRE (1-2) ET/OU AXE TRANSVERSAL	0.4	0.4	0.4	0.4
08	42	REAR ARM SHACKLE JUMELLE DE BRAS ARRIÈRE	0.6	0.6	0.6	0.6
08	44	REAR AND FRONT ARMS BRAS ARRIÈRE ET AVANT	1.9	1.9	1.9	1.9
08	50	REAR TORSION SPRING AND/OR WHEEL (1) RESSORT DE TORSION ARRIÈRE ET/OU ROUE (1)	0.6	0.6	0.6	0.6
08	51	REAR TORSION SPRINGS AND/OR WHEELS (2) RESSORTS DE TORSION ET/OU ROUES (2)	0.7	0.7	0.7	0.7
08	52	TORSION SPRING SUPPORT SUPPORT DE RESSORT DE TORSION	0.3	0.3	0.3	0.3
08	53	SPRING ADJUSTMENT CAM (1) CAME DE RÉGLAGE DE RESSORT (1)	0.3	0.3	0.3	0.3
08	54	SPRING ADJUSTMENT CAMS (2) CAMES DE RÉGLAGE DE RESSORT (2)	0.4	0.4	0.4	0.4
08	55	REAR SHOCK (ASS'Y) AMORTISSEUR ARRIÈRE (COMPLET)	0.5	0.3	0.3	0.3
08	69	TRACK (1) CHENILLE (1)	2.2	2.2	2.2	1.9
08	71	CLEATS AND/OR GUIDES (0-9) SEGMENTS-GUIDE ET/OU GUIDES (0-9)	0.3	0.3	0.3	0.3
08	72	CLEATS AND/OR GUIDES (10-14) SEGMENTS-GUIDE ET/OU GUIDES (10-14)	0.4	0.4	0.4	0.4
08	73	CLEATS AND/OR GUIDES (15-19) SEGMENTS-GUIDE ET/OU GUIDES (15-19)	0.5	0.5	0.5	0.5
08	74	CLEATS AND/OR GUIDES (20-24) SEGMENTS-GUIDE ET/OU GUIDES (20-24)	0.6	0.6	0.6	0.6
08	75	CLEATS AND/OR GUIDES (25-29) SEGMENTS-GUIDE ET/OU GUIDES (25-29)	0.7	0.7	0.7	0.7
08	76	CLEATS AND/OR GUIDES (30-34) SEGMENTS-GUIDE ET/OU GUIDES (30-34)	0.8	0.8	0.8	0.8
08	77	CLEATS AND/OR GUIDES (35-39) SEGMENTS-GUIDE ET/OU GUIDES (35-39)	0.9	0.9	0.9	0.9

SYSTEM SYSTÈME	CODE	DESCRIPTION	EXPEDITION 850R E-TEC	MXZ / RENEGADE 850 E-TEC	BACKCOUNTRU FREERIDE/SUMMIT 850 E-TEC	BACKCOUNTRU FREERIDE/SUMMIT 50 E-TEC SHOT
			15	16/17	18/20/22	19/21/23
08	78	CLEATS AND/OR GUIDES (40-44) SEGMENTS-GUIDE ET/OU GUIDES (40-44)	1.0	1.0	1.0	1.0
08	79	CLEATS AND/OR GUIDES (45-49) SEGMENTS-GUIDE ET/OU GUIDES (45-49)	1.1	1.1	1.1	1.1
08	80	CLEATS AND/OR GUIDES (50-54) SEGMENTS-GUIDE ET/OU GUIDES (50-54)	1.2	1.2	1.2	1.2
08	85	ADJUSTMENT SCREW (1) VIS D'AJUSTEMENT (1)	0.3	0.3	0.3	0.3
08	86	ADJUSTMENT SCREWS (2) VIS D'AJUSTEMENT (2)	0.4	0.4	0.4	0.4
08	87	SHOCK SUPPORT AND/OR AXLE SUPPORT D'AMORTISSEUR ET/OU AXE	0.6	0.6	0.6	0.6
08	88	FRONT SHOCK AND/OR SPRING AMORTISSEUR AVANT ET/OU RESSORT	0.5	0.5	0.5	0.5
08	89	FRONT IDLER WHEELS AND/OR BEARINGS (3 OR 4) ROUES DE SUPPORT AVANT ET/OU ROULEMENTS (3 OU 4)	0.5			
08	91	REAR PIVOT ARM BRAS DE PIVOT ARRIÈRE	0.7			
08	141	AIR DAMPER AMORTISSEUR PNEUMATIQUE		0.6		
08	144	CAM AXLE, SPRING, SHAFT AND CUSHIONS AXE DE CAM, RESSORT, ARBRE ET COUSSINETS	0.6			
08	145	BLOCK, GUIDE, CAM AND PIVOT BLOC, GUIDE, CAME ET PIVOT	0.7			
08	153	HYDRAULIC ADJUSTER (ASS'Y) AJUSTEUR HYDRAULIQUE (COMPLET)		0.6		
08	154	SUPPORT, HALF-HOUSING AND HOSE PROTECTOR (LH) SUPPORT, DEMI-LOGEMENT ET PROTECTEUR DE BOYAU (GAUCHE)		0.3		
08	155	SUPPORT, HALF-HOUSING AND HOSE PROTECTOR (RH) SUPPORT, DEMI-LOGEMENT ET PROTECTEUR DE BOYAU (DROIT)		0.3		
08	156	EXTENSION ARM (ASS'Y) BRAS DE RALLONGE (COMPLET)		0.4		
08	157	CAM BLOCK (LH AND/OR RH) BLOC DE CAME (GAUCHE ET/OU DROIT)		0.3	0.3	0.3
08	159	ACTUATOR ACTUATEUR		0.3		
08	160	CONNECTOR HOSE BOYAU RACCORD		0.8		
08	161	MASTER CYLINDER AND/OR O-RING MAÎTRE CYLINDRE ET/OU JOINT TORIQUE		0.9		
08	162	KNOB AJUSTER BOUTON D'AJUSTEMENT		0.3		
08	163	PISTON RING, O-RINGS AND AIR VALVE BAGUE, JOINTS TORIQUE ET SOUPAPE À AIR		0.7		

REAR SUSPENSION SYSTEM AND TRACK
SYSTÈME DE SUSPENSION ARRIÈRE ET CHENILLE

SYSTEM SYSTÈME	CODE	DESCRIPTION	EXPEDITION 850R E-TEC	MXZ / RENEGADE 850 E-TEC	BACKCOUNTRU FREERIDE/SUMMIT 850 E-TEC	BACKCOUNTRU FREERIDE/SUMMIT 50 E-TEC SHOT
			15	16/17	18/20/22	19/21/23
08	164	SPHERICAL BEARING ROTULE RADIALE			0.8	0.8
08	183	ICE SCRATCHER AND/OR HOOK AND/OR SUPPORT GRATTOIR À NEIGE ET/OU CROCHET ET/OU SUPPORT			0.3	0.3

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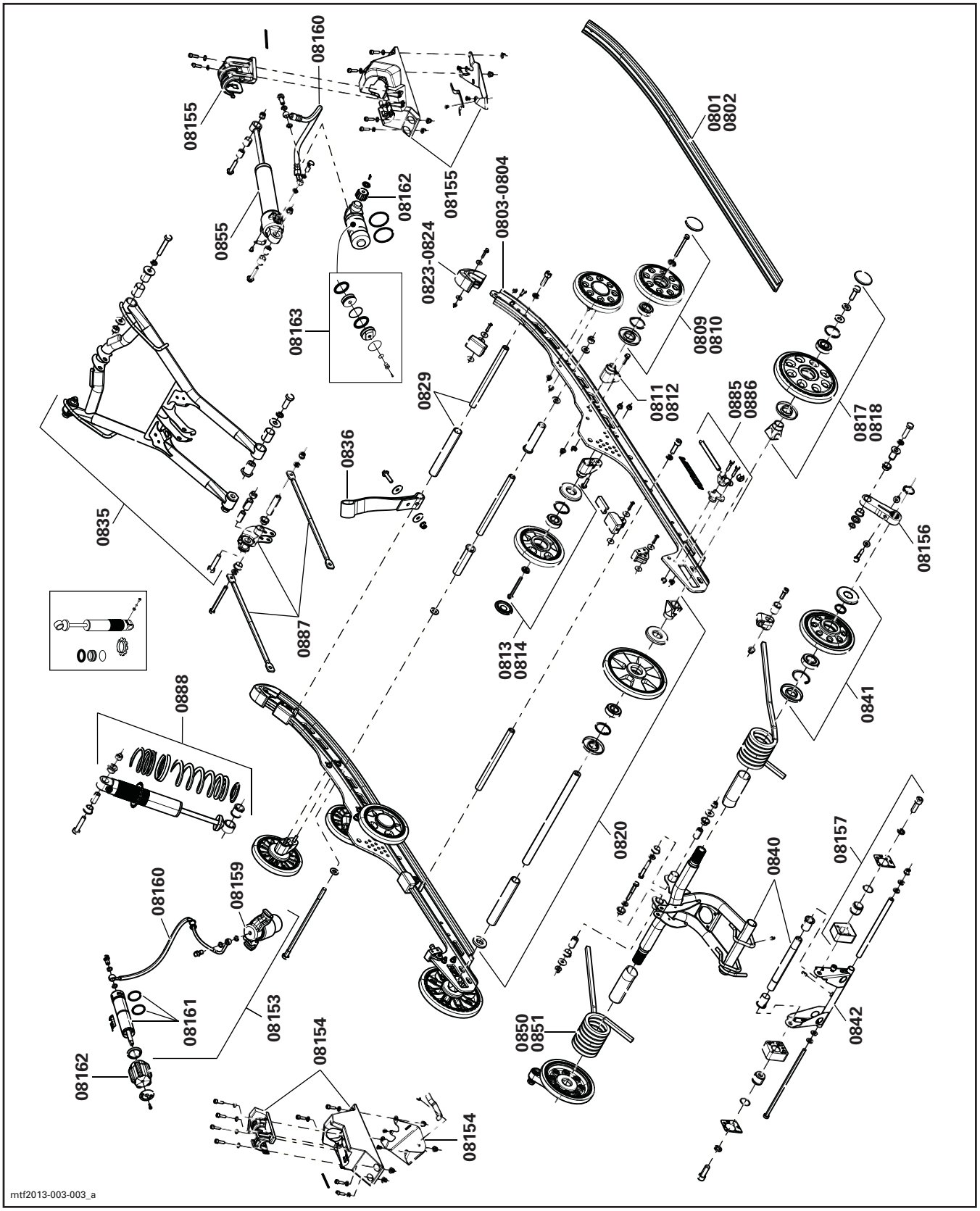
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REAR SUSPENSION SYSTEM AND TRACK
SYSTÈME DE SUSPENSION ARRIÈRE ET CHENILLE

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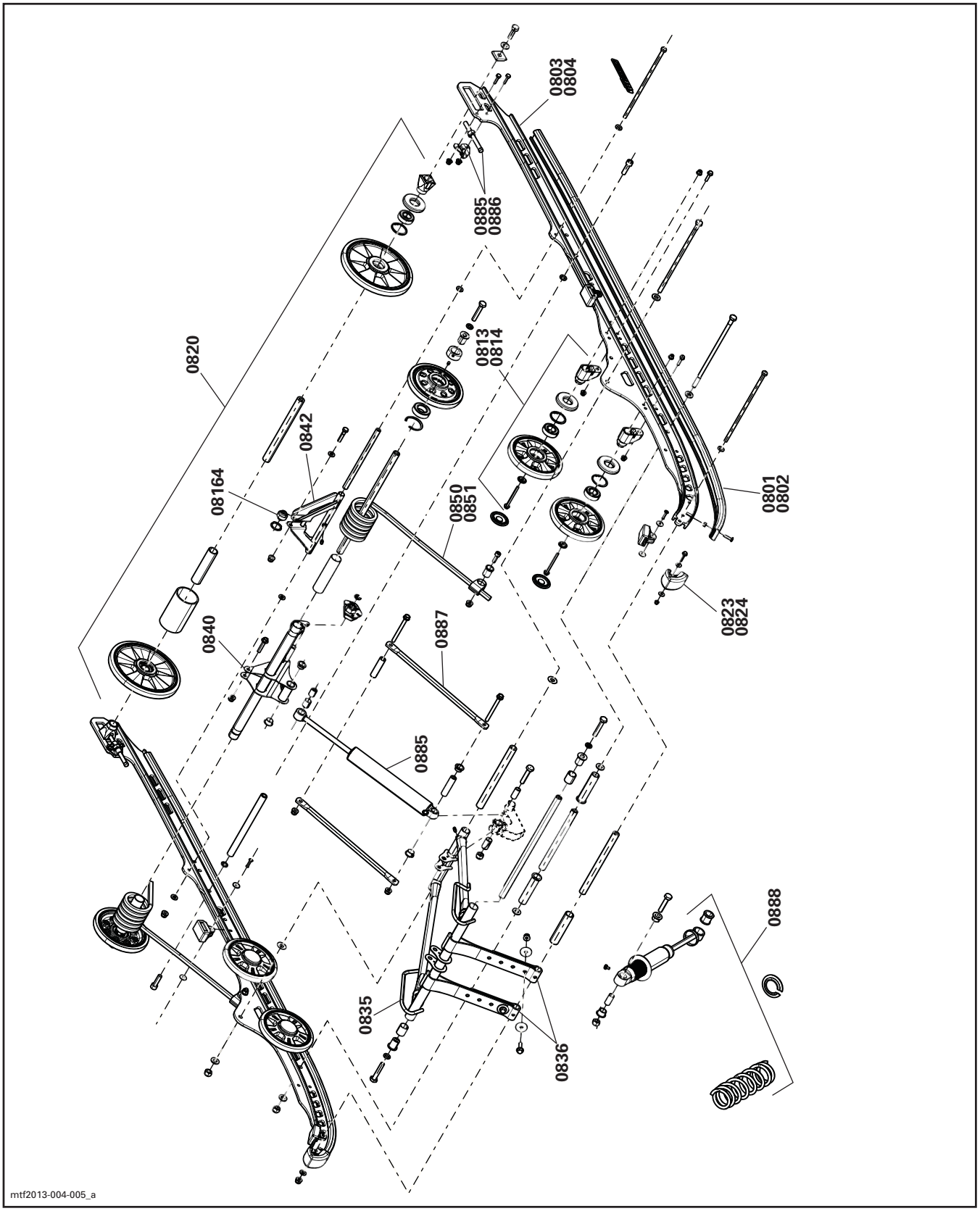

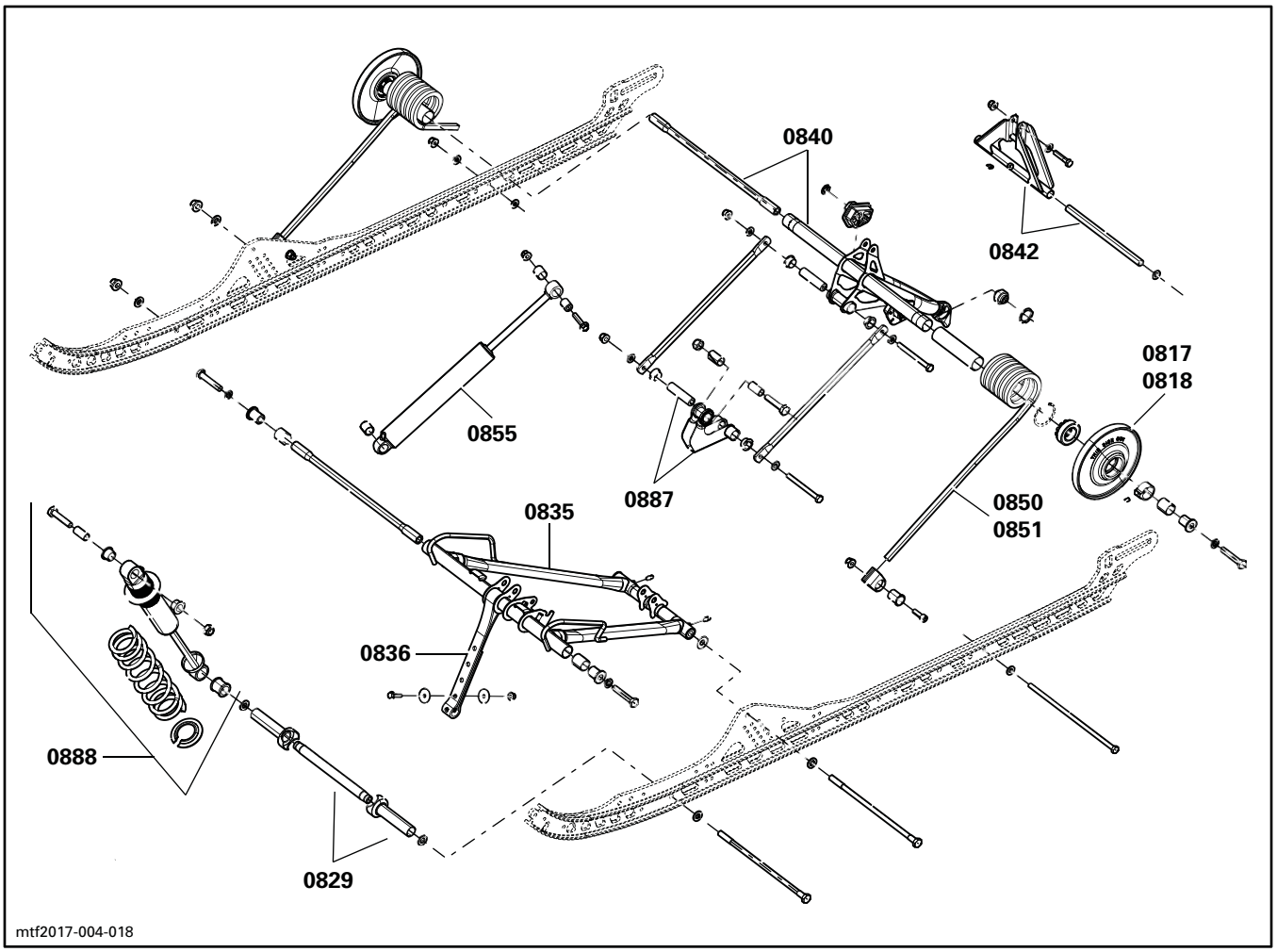
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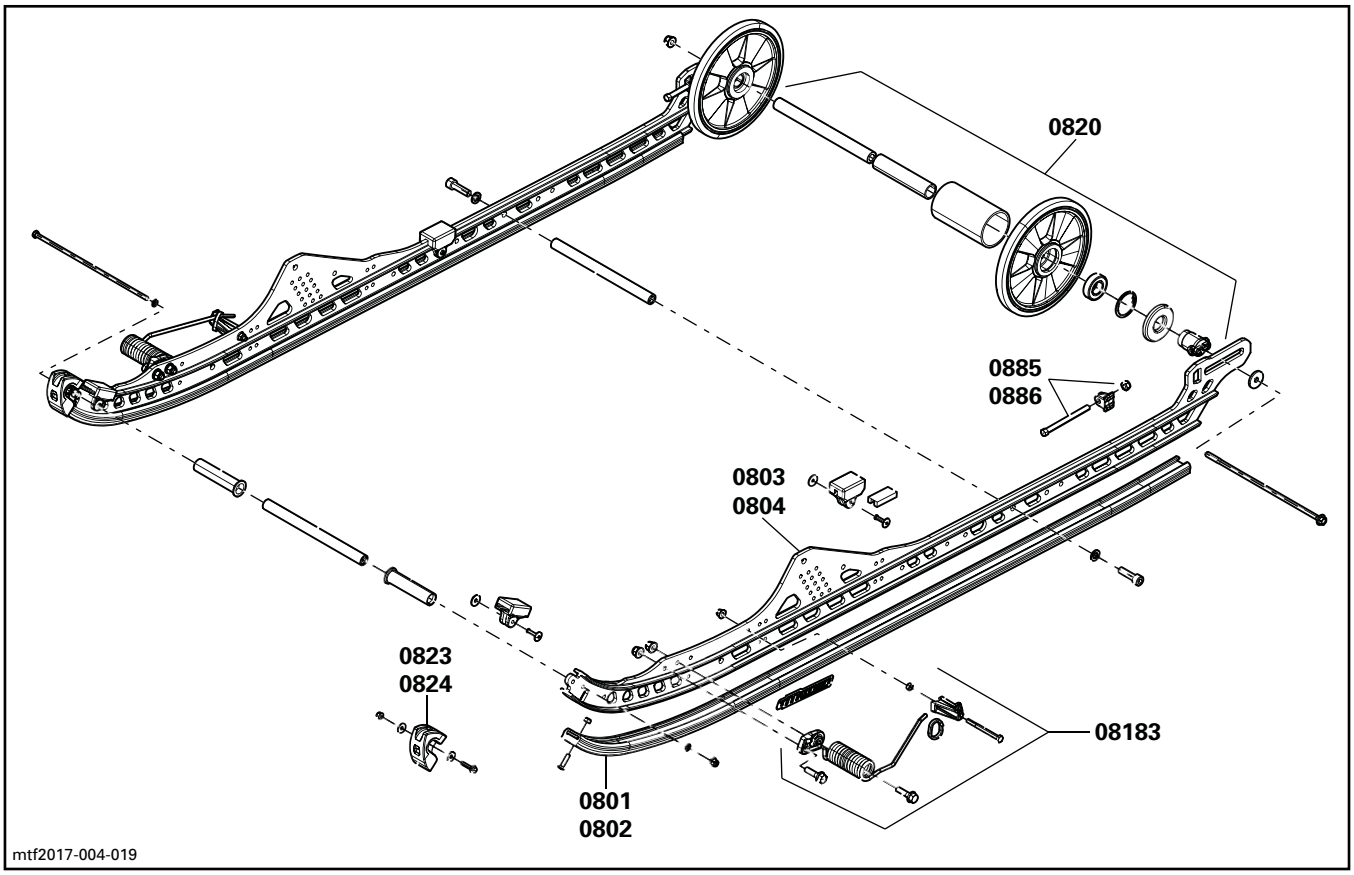
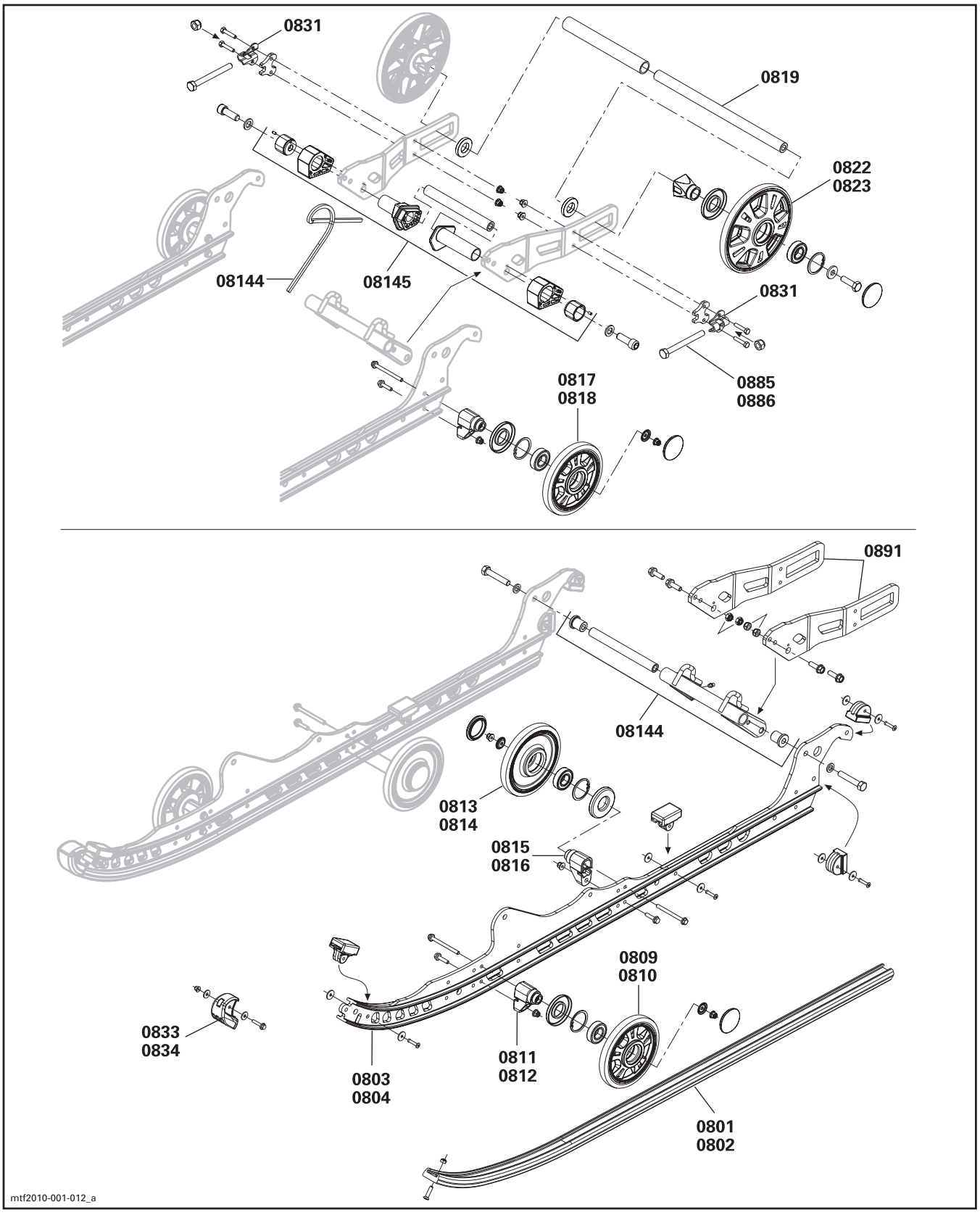
REAR SUSPENSION SYSTEM AND TRACK
SYSTÈME DE SUSPENSION ARRIÈRE ET CHENILLE

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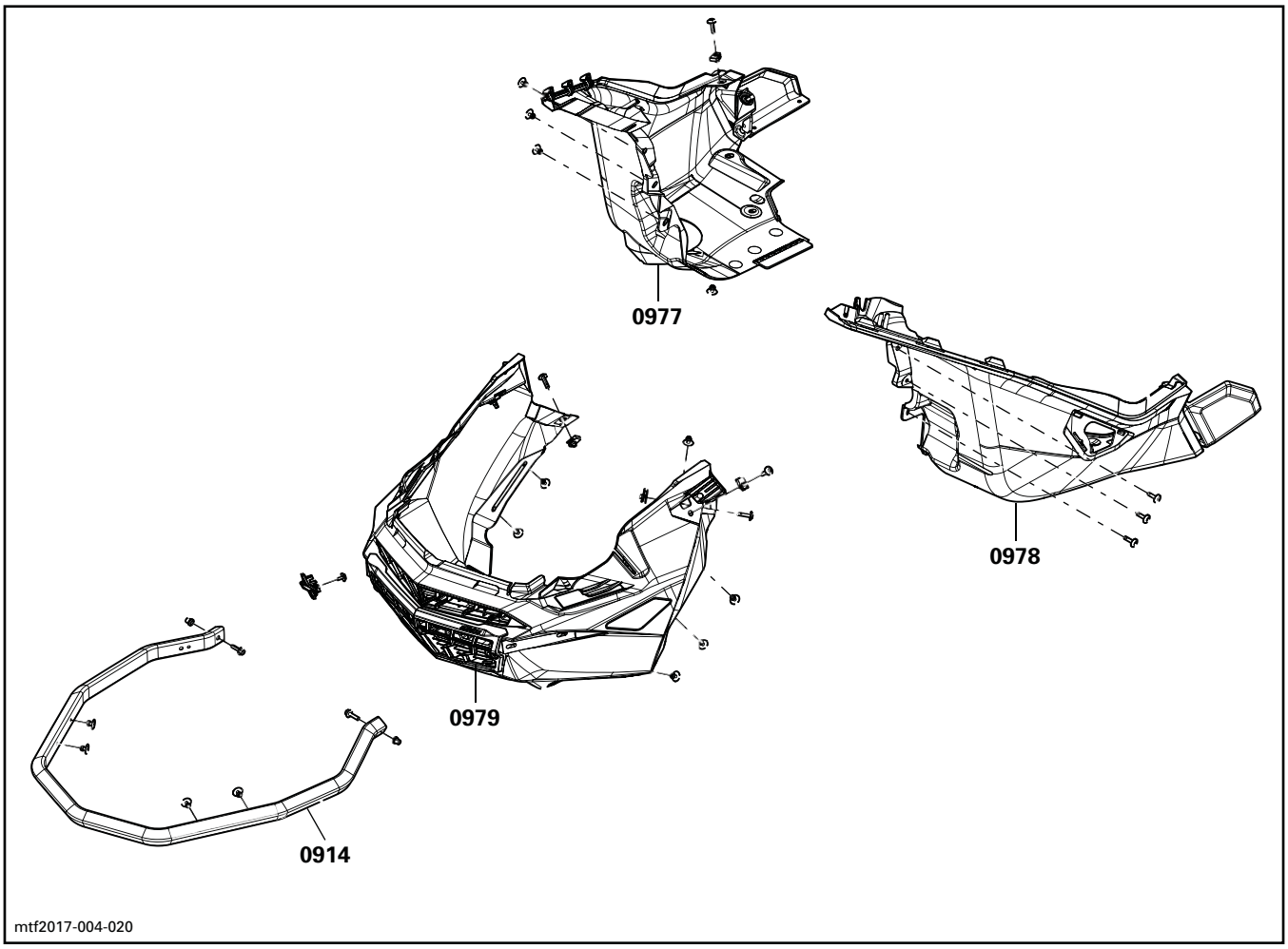
SYSTEM SYSTÈME	CODE	DESCRIPTION	EXPEDITION 850R E-TEC	MXZ / RENEGADE 850 E-TEC	BACKCOUNTRU FREERIDE/SUMMIT 850 E-TEC	BACKCOUNTRU FREERIDE/SUMMIT 50 E-TEC SHOT
			15	16/17	18/20/22	19/21/23
09	**00**	**NO LABOR INVOLVED AUCUNE MAIN-D'OEUVRE IMPLIQUÉE**	**0**	**0**	**0**	**0**
09	05	HOOD DECALS (LH OR RH) AUTOCOLLANTS DU CAPOT (GAUCHE OU DROIT)	0.3	0.3	0.3	0.3
09	06	HOOD DECALS (ALL) AUTOCOLLANTS DU CAPOT (TOUS)	0.5	0.5	0.5	0.5
09	09	WINDSHIELD PARE-BRISE	0.3	0.3	0.3	0.3
09	14	FRONT BUMPER PARE-CHOCS AVANT	0.5	0.5	0.6	0.5
09	17	CONSOLE CONSOLE	0.3	0.3	0.3	0.3
09	21	SEAT (ASS'Y) OR BACKREST SIÈGE (COMPLET) OU DOSSIER	0.3	0.3	0.3	0.3
09	22	SEAT COVER AND/OR FOAM HOUSSE DE SIÈGE ET/OU MOUSSE	1.0	1.0	1.0	1.0
09	23	SEAT FOAM MOUSSE DE SIÈGE	1.0	1.0	1.0	1.0
09	33	HEAT EXCHANGER RADIATEUR	9.7	9.5	9.7	9.7
09	34	REAR BUMPER PARE-CHOCS ARRIÈRE	0.3	0.3	0.3	0.3
09*	**49**	**FRAME (ASS'Y) CHÂSSIS (COMPLET)**	**15.0**	**14.0**	**13.5**	**13.5**
09	51	REAR CAP FRAME CAPUCHON ARRIÈRE DU CHÂSSIS	0.7	0.7	0.7	0.7
09	52	SIDE BRACKET (RIGHT OR LEFT) SUPPORT LATERAL (GAUCHE OU DROITE)	0.4	0.4	0.4	0.4
09	55	SNOW GUARD (1) GARDE-NEIGE (1)	0.3	0.3	0.3	0.3
09	76	HOLDING TOE ACCROCHE PIED	0.3	0.3	0.3	0.3
09	77	RH BOTTOM PAN COQUE CÔTÉ DROIT	0.4	0.4	0.4	0.4
09	78	LH BOTTOM PAN COQUE CÔTÉ GAUCHE	0.3	0.3	0.3	0.3
09	79	CENTER BOTTOM PAN COQUE PARTIE CENTRALE	0.9	0.7	0.7	0.7
09	80	FRONT GRILL (RH AND/OR LH) GRILLE AVANT (DROIT ET/OU GAUCHE)	0.3			
09	81	SIDE GRIL (RH) GRILLE LATÉRALE (DROIT)	0.3			

SYSTEM SYSTÈME	CODE	DESCRIPTION	EXPEDITION 850R E-TEC	MXZ / RENEGADE 850 E-TEC	BACKCOUNTRU FREERIDE/SUMMIT 850 E-TEC	BACKCOUNTRU FREERIDE/SUMMIT 50 E-TEC SHOT
			15	16/17	18/20/22	19/21/23
09	86	ROLLER ROULEAU	1.5	1.2	1.2	1.2
09	96	FOOT PROTECTOR (LH OR RH) PROTÈGE PIED (GAUCHE OU DROIT)	1.4	1.4	1.4	1.4
09	149	ENGINE SIDE PANELS (2) PANNEAUX MOTEUR (2)	0.9			0.9
09	156	FRONT FRAME CHÂSSIS AVANT	3.0	3.0	3.0	3.0
09	163	MEMBER (LH OR RH) MEMBRURE (GAUCHE OU DROIT)	0.4	0.4	0.4	0.4
09	191	SIDE PANEL DECAL (LH OR RH) (1) DÉCALQUE DE PANNEAU (GAUCHE OU DROIT) (1)	0.3	0.3	0.3	0.3
09	192	SIDE PANEL DECALS (LH OR RH) (ALL) DÉCALQUES DE PANNEAU (GAUCHE OU DROIT) (TOUS)	0.8	0.8	0.8	0.8
09	194	ENGINE SIDE PANEL (LH OR RH) PANNEAU LATÉRAL DU MOTEUR (GAUCHE OU DROIT)	0.5	0.5	0.5	0.5
09	233	UPPER SIDE PANEL (RH OR LH) PANNEAU LATERAL SUPERIEUR (DROITE OU GAUCHE)	0.6	0.6	0.6	0.6
09	238	LOWER SIDE PANEL (LH OR RH) PANNEAU LATÉRAL INFÉRIEUR (GAUCHE OU DROIT)	0.6	0.6	0.6	0.6
09	245	HEADLAMP SUPPORT SUPPORT DE PHARE	0.8	0.8	0.8	0.8
09	249	WINDSHIELD SUPPORT SUPPORT DE PARE-BRISE	0.3	0.3	0.3	0.3
09	250	AIR DEFLECTOR (LH OR RH) DÉFLECTEUR D'AIR (GAUCHE OU DROIT)	0.3	0.3	0.3	
09	251	PANEL LATCH (ALL) LOQUET DE PANNEAU (TOUS)	0.3	0.3	0.3	0.3
09	252	FOOTREST REINFORCEMENT (LH OR RH) RENFORT DE MARCHE-PIED (GAUCHE OU DROIT)	1.1	1.1	1.1	1.1
09	284	BOX DOOR PORTE DE COFFRE	0.3	0.3	0.3	0.3
09	289	GLOVES BOX BOÎTE A GANTS	0.3	0.3	0.3	0.3
09	311	E-MODULE MODULE «E»	6.3	6.0	6.0	6.0
09	312	S-MODULE MODULE «S»	4.5	4.3	4.3	4.3
09	329	FRONT PROTECTOR PROTECTEUR AVANT	1.5	1.5	1.5	1.5
09	400	CENTER HOOD CAPOT CENTRAL	0.8	0.8	0.8	0.8

SYSTEM SYSTÈME	CODE	DESCRIPTION	EXPEDITION 850R E-TEC	MXZ / RENEGADE 850 E-TEC	BACKCOUNTRU FREERIDE/SUMMIT 850 E-TEC	BACKCOUNTRU FREERIDE/SUMMIT 50 E-TEC SHOT
			15	16/17	18/20/22	19/21/23
09	401	HOOD (RH OR LH) CAPOT (DROIT OU GAUCHE)	0.7	0.7	0.7	0.7
09	469	REAR SUSPENSION BRACKET (RIGHT OR LEFT) ATTACHE DE SUSPENSION ARRIÈRE (DROIT OU GAUCHE)	0.8	0.8	0.8	0.8
09	520	REAR PROTECTOR PROTECTEUR ARRIÈRE	2.0	2.0	2.0	2.0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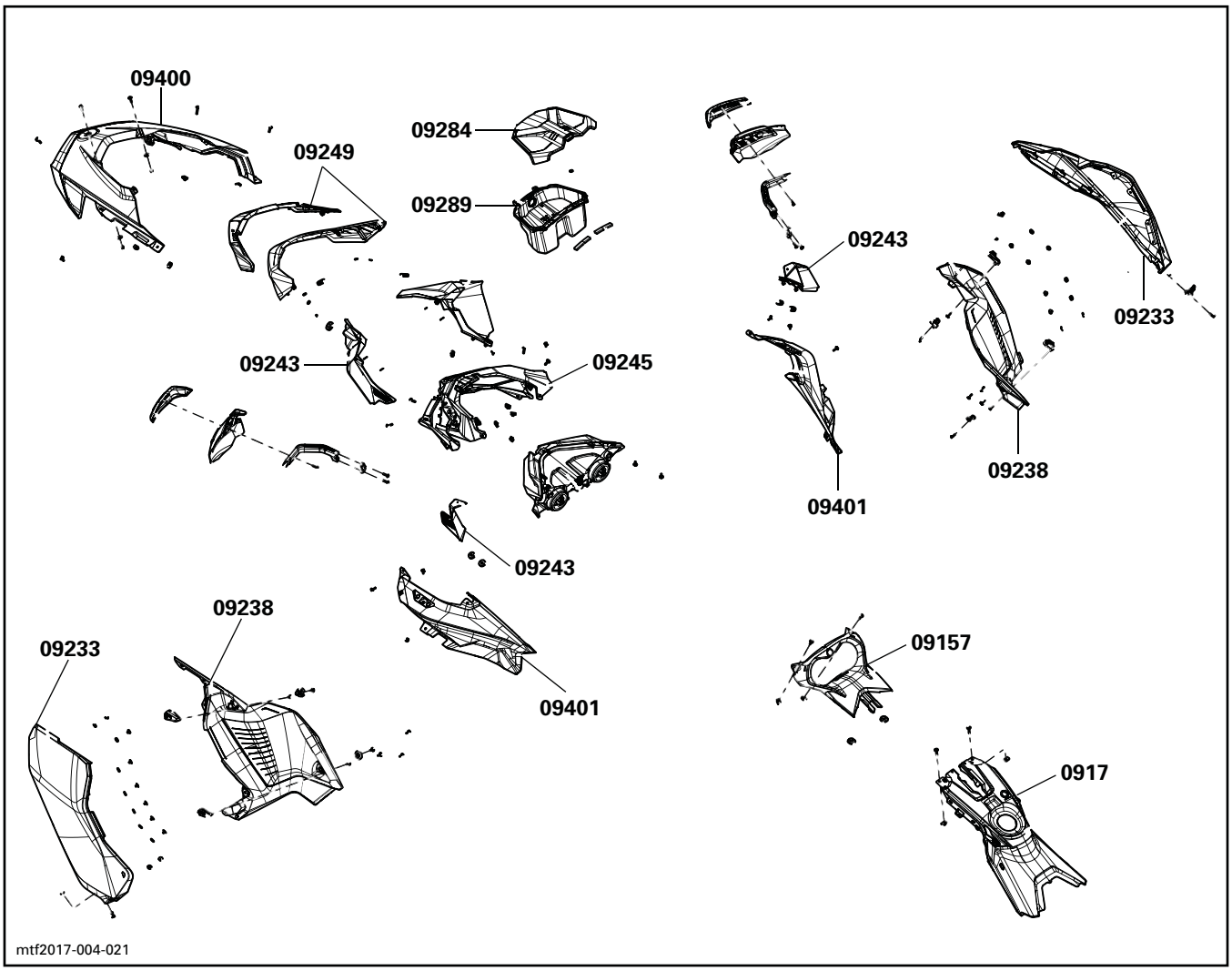
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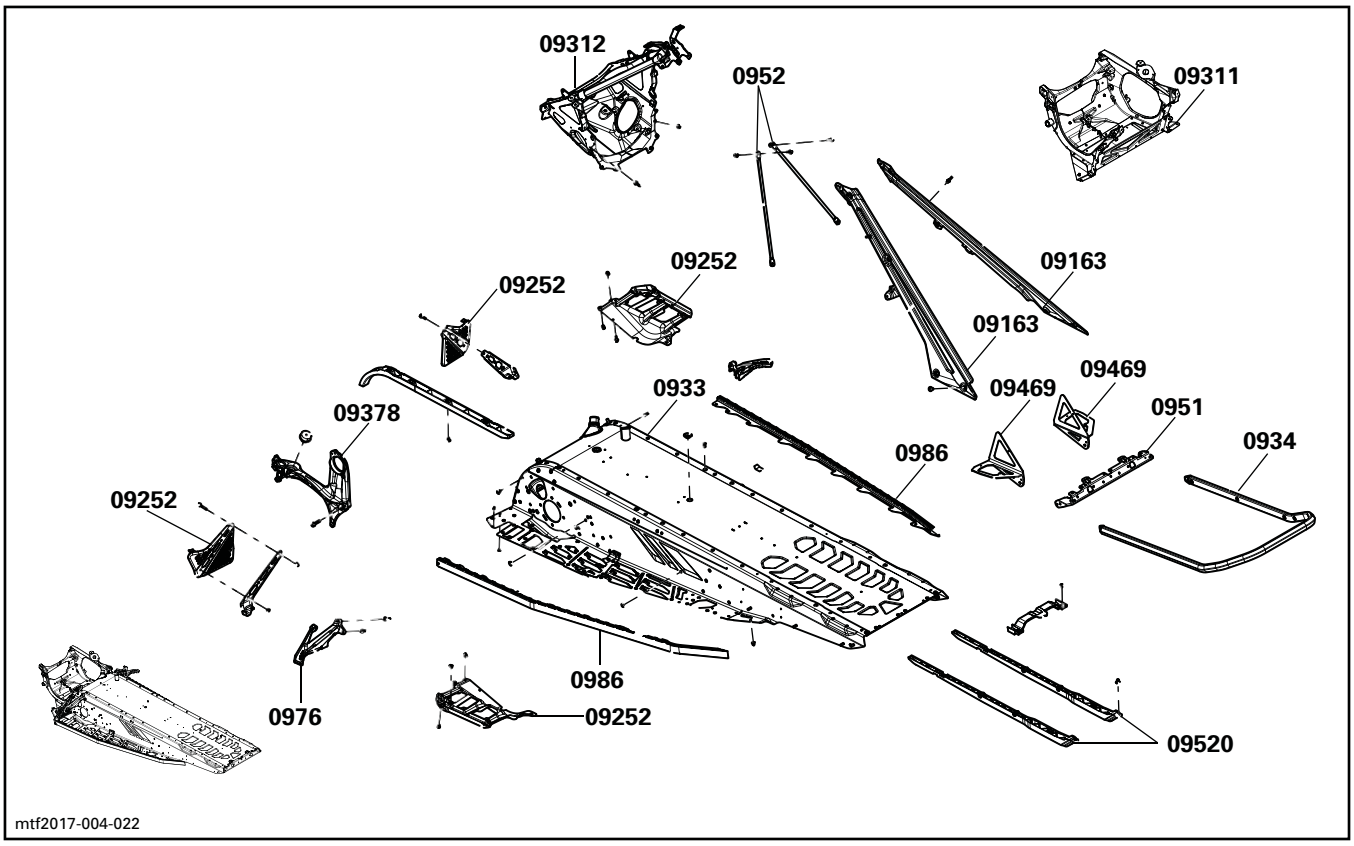
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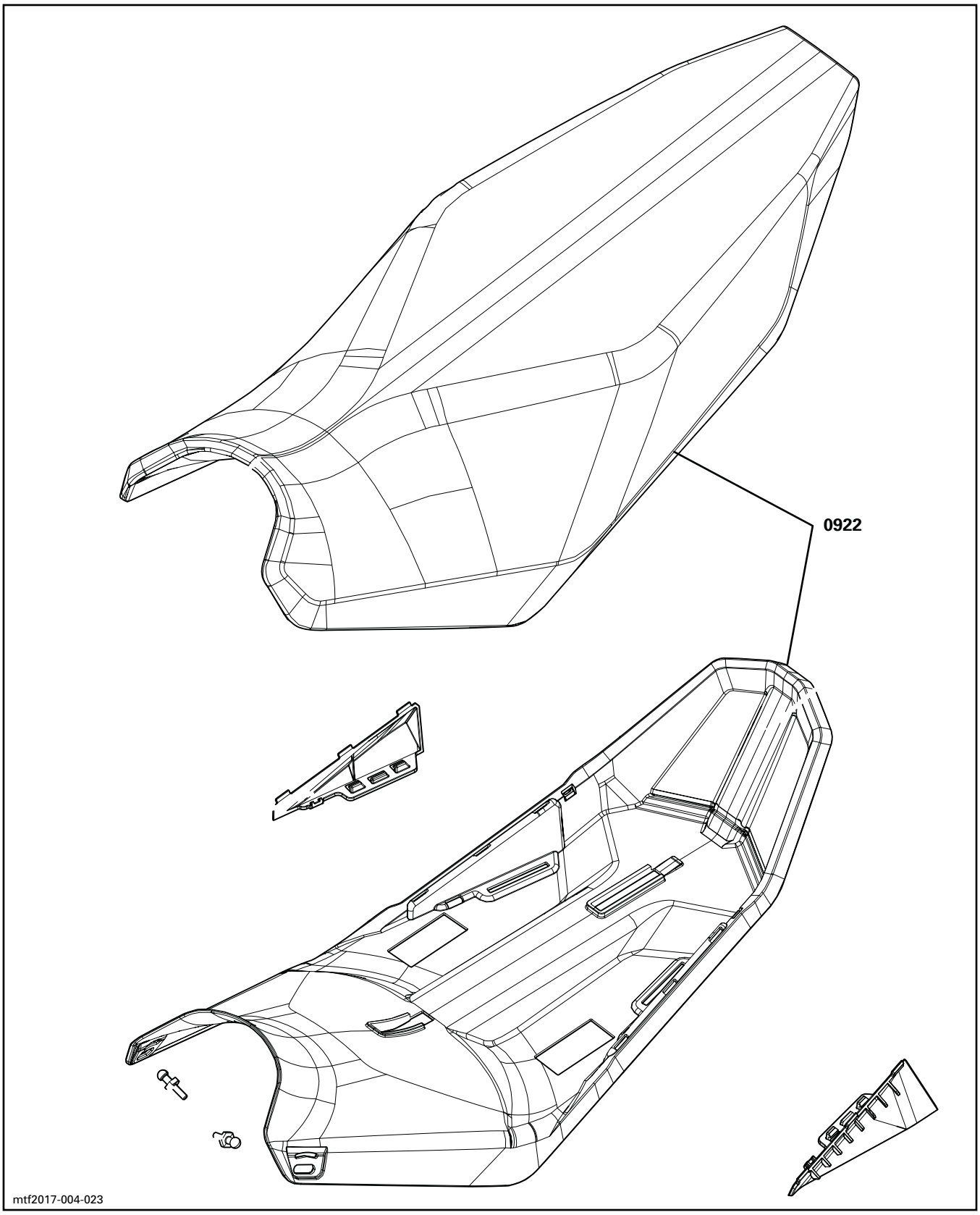
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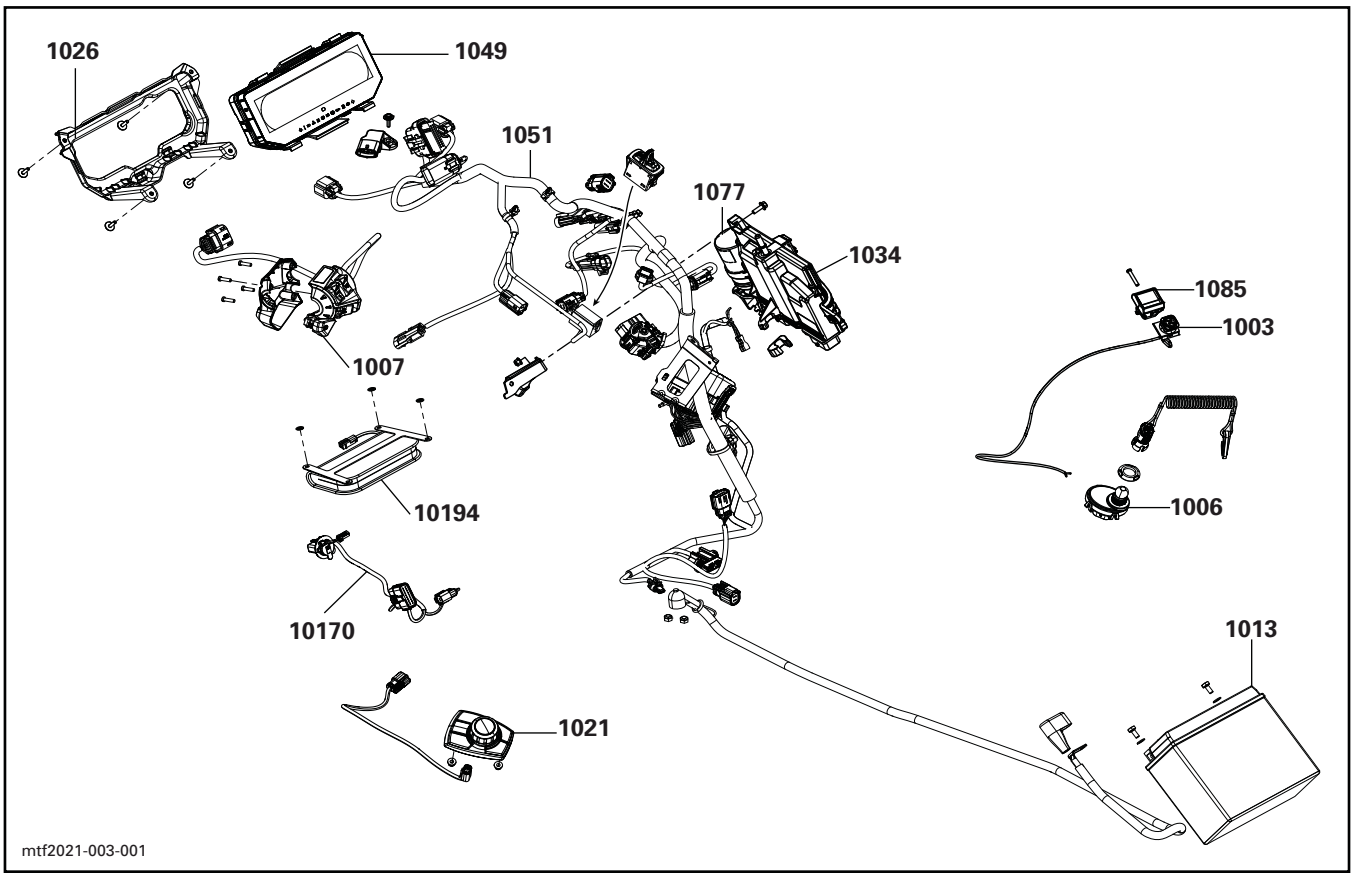
SYSTEM SYSTÈME	CODE	DESCRIPTION	EXPEDITION 850R E-TEC	MXZ / RENEGADE 850 E-TEC	BACKCOUNTRU FREERIDE/SUMMIT 850 E-TEC	BACKCOUNTRU FREERIDE/SUMMIT 50 E-TEC SHOT
			15	16/17	18/20/22	19/21/23
10	**00**	**NO LABOR INVOLVED AUCUNE MAIN-D'OEUVRE IMPLIQUÉE**	**0**	**0**	**0**	**0**
10	01	IGNITION SWITCH INTERRUPTEUR D'ALLUMAGE	0.3	0.3	0.3	0.3
10	03	KILL SWITCH INTERRUPTEUR D'URGENCE	0.3	0.3	0.3	0.3
10	04	HEADLIGHT SWITCH INTERRUPTEUR DE PHARE			0.3	0.3
10	05	BRAKE LIGHT SWITCH INTERRUPTEUR DE FEU D'ARRÊT	0.3	0.3	0.3	0.3
10	06	TETHER CORD SWITCH OR DESS CAPUCHON COUPE-CIRCUIT OU DESS	0.3	0.3	0.3	0.3
10	07	IGNITION SWITCH BLOCK LOGEMENT D'INTERRUPTEUR D'ALLUMAGE	0.3	0.3	0.3	0.3
10	08	CURRENT OR GROUND WIRE FIL DE BATTERIE OU DE MASSE	0.3	0.3	0.3	0.3
10	09	HEADLAMP (ASS'Y) (ALL PARTS) PHARE (COMPLET) (TOUTES LES PIÈCES)	0.6	0.6	0.6	0.6
10	12	TAILLIGHT (ASS'Y) (ALL PARTS) FEU ARRIÈRE (COMPLET) (TOUTES LES PIÈCES)	0.3	0.3	0.3	0.3
10	13	BATTERY BATTERIE	0.3	0.3	0.3	0.3
10	15	HEATED GRIP (1) POIGNÉES CHAUFFANTE (1)	0.5	0.5	0.5	0.5
10	16	BULBS (ONE OR ALL) AMPOULES (UNE OU TOUTES)	0.5	0.5	0.5	0.5
10	17	HEATED THROTTLE LEVER MANETTE D'ACCÉLÉRATEUR CHAUFFANTE	0.3	0.3	0.3	0.3
10	21	MULTIFONCTION SWITCH INTERRUPTEUR MULTIFONCTION		0.3		
10	26	GAUGE SUPPORT SUPPORT DE CADRAN		0.3		
10	31	DC OUTLET PLUG PRISE D'ACCESSOIRE DC	0.3			
10	32	PRESSURE AND TEMPERATURE SENSOR CAPTEUR DE PRESSION ET DE TEMPÉRATURE	0.3	0.3	0.3	0.3
10	34	ELECTRONIC MODULE MODULE ÉLECTRONIQUE	1.0	1.0	1.0	1.0
10	41	ENGINE HARNESS HARNAIS MOTEUR	3.0	3.0	3.0	3.0
10	42	TEMPERATURE SENSOR CAPTEUR DE TEMPÉRATURE	0.3	0.3	0.3	0.3

SYSTEM SYSTÈME	CODE	DESCRIPTION	EXPEDITION 850R E-TEC	MXZ / RENEGADE 850 E-TEC	BACKCOUNTRU FREERIDE/SUMMIT 850 E-TEC	BACKCOUNTRU FREERIDE/SUMMIT 50 E-TEC SHOT
			15	16/17	18/20/22	19/21/23
10	49	MULTIFUNCTION GAUGE CADRAN MULTIFONCTION	0.3	0.3	0.3	0.3
10	50	HEATED GRIPS (2) POIGNÉES CHAUFFANTES (2)	0.9	0.9	0.9	0.9
10	51	MAIN WIRE HARNESS CÂBLAGE PRINCIPAL	2.0	2.0	2.0	2.0
10	52	STARTER RELAY RELAIS DE DÉMARREUR	0.3	0.3	0.3	0.3
10	77	CAPACITOR CONDENSATEUR	0.3	0.3	0.3	0.3
10	79	COMPRESSOR MODULE MODULE COMPRESSEUR		0.3		
10	81	CONNECTOR PLATE PLAQUE DE CONNECTEUR	0.7	0.7	0.7	0.7
10	85	KILL SWITCH SUPPORT SUPPORT DE L'INTERRUPTEUR D'URGENCE	0.3	0.3	0.3	0.3
10	91	HEATED GRIPS SWITCH INTERRUPTEUR POIGNEES CHAUFFANTE			0.3	0.3
10	111	START BUTTON BOUTON DE DEMARRAGE			0.3	0.3
10	116	THERMO COUPLE MODULE MODULE THERMO COUPLE	0.5	0.5	0.5	0.5
10	118	STEERING HARNESS CÂBLAGE DU GUIDON	1.0	1.0	1.0	1.0
10	124	DOUBLE SWITCH MODULE MODULE INTERRUPTEUR DOUBLE			0.3	0.3
10	158	BATTERY COVER COUVERCLE DE BATTERIE	0.3	0.3	0.3	0.3
10	162	ULTRA CONDENSATOR MODULE MODULE ULTRA CONDESATEUR				0.3
10	170	USB OUTLET PRISE USB		0.3		
10	194	PROTECTIVE BAG SAC DE PROTECTION		0.3		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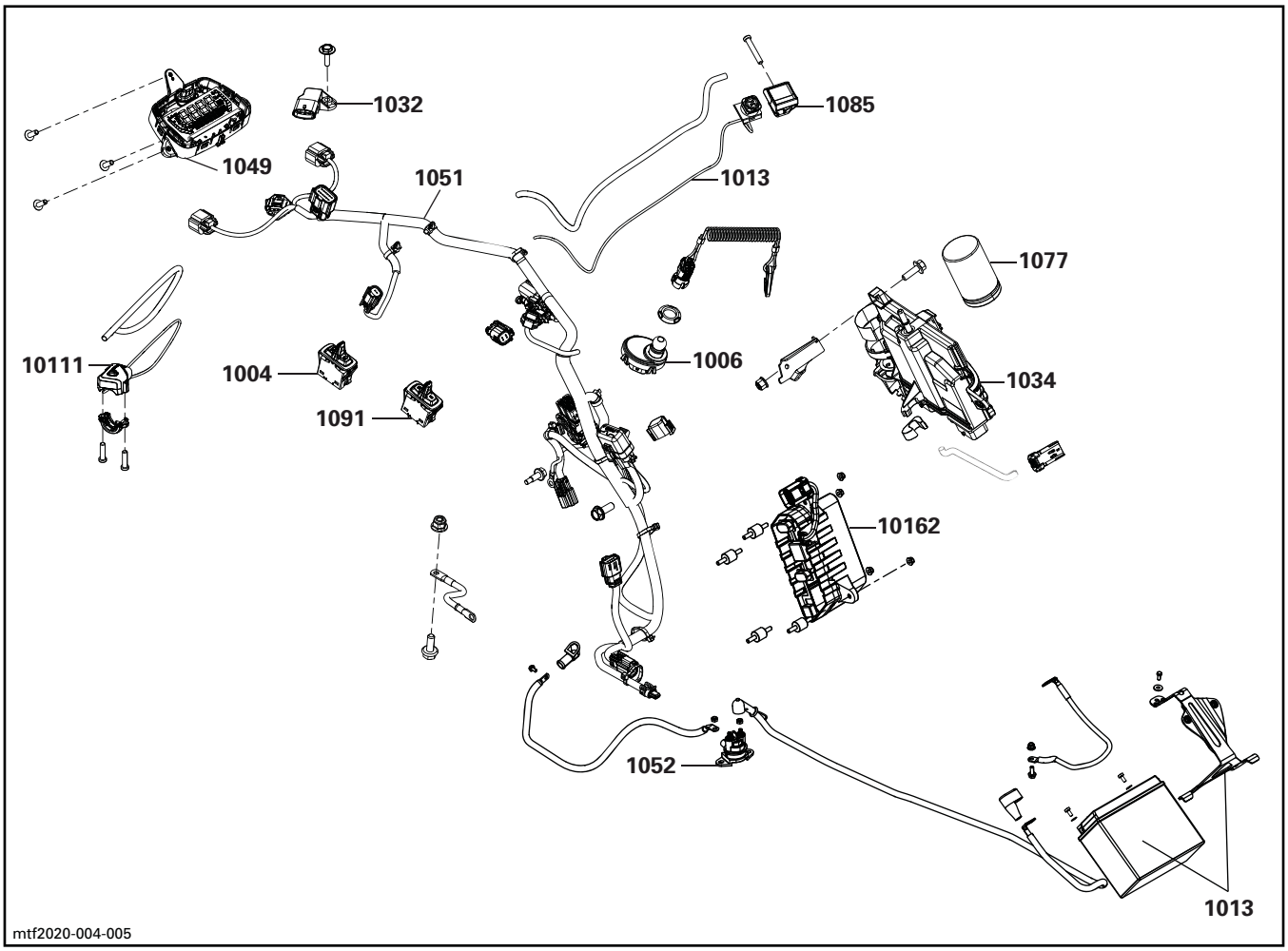

ski-doo

REV® GEN4
DEEP SNOW SERIES

2021

OPERATOR'S GUIDE

Includes
Safety, Vehicle and
Maintenance Information

⚠ WARNING

Read this guide thoroughly.
It contains important safety information.
Minimum recommended age: Operator: 16 years old.
Keep this Operator's Guide in the vehicle.

520 002 345

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!

⚠ WARNING

This vehicle may exceed the performance of other vehicles you may have ridden. Take time to familiarize yourself with your new vehicle.

CALIFORNIA PROPOSITION 65 WARNING

⚠ **WARNING:** Operating, servicing and maintaining an off-road vehicle 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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Svenska	Denna bok kan finnas tillgänglig på ditt språk. Kontakta din återförsäljare eller gå till: www.operatorsguides.brp.com

Model	Package	Engine
Freeride	-	850 E-TEC
		850 E-TEC Turbo
Summit	SP	600R E-TEC
		850 E-TEC
	X	850 E-TEC
		850 E-TEC Turbo
	X with Expert package	850 E-TEC
		850 E-TEC Turbo

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GENERAL INFORMATION

FOREWORD

Congratulations on your purchase of a new Ski-Doo® snowmobile. Whatever model you have chosen, it is backed by the Bombardier Recreational Products Inc. (BRP) warranty and a network of authorized Ski-Doo snowmobile 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 set-up and inspection of your snowmobile as well as completed the final adjustment required to suit your specific weight and riding environment before you took possession.

At delivery, you were informed of the warranty coverage and signed the *PREDELIVERY CHECK LIST* to ensure your new vehicle was prepared to your entire satisfaction.

Know Before you Go

To learn how to reduce the risk for you, your passenger or bystanders being injured or killed, read the following sections before you operate the vehicle:

- *SAFETY INFORMATION*
- *VEHICLE INFORMATION*.

Also read all safety labels on your snowmobile and watch attentively the safety video located at www.ski-doo.com/safety.

BRP highly recommend that you take a safety riding course. Please check with your dealer or local authorities for availability in your area.

Failure to follow the warnings contained in this Operator's Guide can result in SERIOUS INJURY or DEATH.

The proper functioning of a snowmobile depends in part on the surface on which it is driven. See *RIDING CONDITIONS AND YOUR SNOWMOBILE* for details.

Safety Messages

The types of safety messages, what they look like and how they are used in this guide are explained as follows:

The safety alert symbol ⚠ indicates a potential injury hazard.

⚠ WARNING

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

⚠ CAUTION

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

NOTICE Indicates an instruction which, if not followed, could severely damage vehicle components or other property.

About this Operator's Guide

This Operator's Guide has been prepared to acquaint the owner, operator and passenger with this snowmobile and its various controls, safe riding and maintenance instructions.

The following terminology in regards to operator, passenger and vehicle configuration is used as follows throughout this guide:

- **Operator** : refers to the person being behind the controls and driving the snowmobile.
- **Passenger** : refers to a person sitting behind the operator.
- **1-UP** : refers to a model designed for an operator only.
- **2-UP** : refers to a model designed to accommodate **one** passenger.

Keep this Operator's Guide in the vehicle as you can refer to it for things such as maintenance, troubleshooting and instructing others.

Note that this guide is available in several languages. In the event of any discrepancy, the English version shall prevail.

If you want to view and/or print an extra copy of your Operator's Guide, simply visit the following website **www.operatorsguides.brp.com** .

The informations contained in this document are correct at the time of publication. 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, some differences between the manufactured product and the descriptions and/or specifications in this guide may occur. BRP reserves the right at any time to discontinue or change specifications, designs, features, models or equipment without incurring any obligation upon itself.

This Operator's Guide should remain with the vehicle when it's sold.

SAFETY INFORMATION

GENERAL PRECAUTIONS

Avoid Carbon Monoxide Poisoning

All engine exhaust contains carbon monoxide, a deadly gas. Breathing carbon monoxide can cause headaches, dizziness, drowsiness, nausea, confusion and eventually death.

Carbon monoxide is a colorless, odorless, tasteless gas that may be present even if you do not see or smell any engine exhaust. Deadly levels of carbon monoxide can collect rapidly, and you can quickly be overcome and unable to save yourself. Also, deadly levels of carbon monoxide can linger for hours or days in enclosed or poorly ventilated areas. If you experience any symptoms of carbon monoxide poisoning, leave the area immediately, get fresh air and seek medical treatment.

To prevent serious injury or death from carbon monoxide:

- Never run the vehicle in poorly ventilated or partially enclosed areas such as garages, carports or barns. Even if you try to ventilate engine exhaust with fans or open windows and doors, carbon monoxide can rapidly reach dangerous levels.
- Never run the vehicle outdoors where engine exhaust can be drawn into a building through openings such as windows and doors.

Avoid Gasoline Fires and Other Hazards

Gasoline is extremely flammable and highly explosive. Fuel vapors can spread and be ignited by a spark or flame many feet away from the engine. To reduce the risk of fire or explosion, follow these instructions:

- Use only an approved gasoline container to store fuel.
- Strictly adhere to instructions in *VEHICLE FUELING PROCEDURE*.
- Never start or operate the engine if the fuel cap is not properly installed.

Gasoline is poisonous and can cause injury or death.

- Never siphon gasoline by mouth.
- If you swallow gasoline, get any in your eye or inhale gasoline vapor, see your doctor immediately.

If gasoline spills on you, wash with soap and water and change your clothes.

Avoid Burns from Hot Parts

The exhaust system and engine become hot during operation. Avoid contact during and shortly after operation to avoid burns.

Accessories and Modifications

Do not make unauthorized modifications, or use attachments or accessories that are not approved by BRP. Since these changes have not been tested by BRP, they may increase the risk of crashes or injuries, and they can make the vehicle illegal.

Tunnel accessories must be loaded onto vehicle as per instructions provided for each accessories.

Accessory passenger seats approved by BRP and conforming to SSCC standards may be available for certain models. If such a seat is used, you must follow the guidelines and recommendations in regards to a passenger in this guide.

⚠ WARNING

Never carry a passenger on a seat not approved by BRP.

WARNING

Passenger seat must have a strap or handholds and must meet SSCC standards.

See your authorized Ski-Doo dealer for available accessories for your vehicle.

SPECIAL SAFETY MESSAGES

SEVERE INJURY OR DEATH can result if you do not follow these instructions:

- Always make a pre-ride inspection BEFORE you start the engine.
- Throttle mechanism should be checked for free movement and return to idle position before starting engine.
- Always attach tether cord eyelet to clothing before starting the engine.
- Never operate the engine without belt guard and brake disk guard securely installed or, with hood or side panels opened or removed. Never run the engine without drive belt installed. Running an unloaded engine such as without drive belt or with track raised, can be dangerous.
- Always engage parking brake before starting the engine.
- Everyone is a beginner the first time he sits behind the controls of a snowmobile regardless of previous experience in driving any other type of vehicle. The safe use of your snowmobile depends on many conditions such as visibility, speed, weather, environment, traffic, vehicle condition and the condition of the operator.
- Basic training is required for the safe operation of any snowmobile. Study your operator's guide paying particular attention to cautions and warnings. Join your local snowmobile club: its social activities and trail systems are planned for both fun and safety. Obtain basic instructions from your snowmobile dealer, friend, fellow club member or enroll in your state or provincial safety training program.
- Any new operator must read and understand all safety labels on the snowmobile, the Operator's Guide and watch the safety video at www.ski-doo.com/safety before operating the snowmobile. Only allow a new operator to operate the snowmobile in a restricted flat area, at least until he is completely familiar with its operation. If snowmobile operator's training course is offered in your area, have him enroll.
- The performance of some snowmobiles may significantly exceed that of other snowmobiles you have operated. Therefore, use by novice or inexperienced operators is not recommended.
- Snowmobiles are used in many areas and in many snow conditions. Not all models perform the same in similar

conditions. Always consult your snowmobile dealer when selecting the snowmobile model for your particular needs and uses.

- Injury or death may result to the snowmobile operator, passenger or bystander if the snowmobile is used in risky conditions which are beyond the operator's, passenger's or snowmobile's capabilities or intended use.
- BRP recommends the operator has at least 16 years old of age. Verify also your local laws for age and training requirements.
- It is very important to inform any operator, regardless of his experience, of the handling characteristics of this snowmobile. The snowmobile configuration, such as ski stance, ski type, suspension type, track length, width and type vary from a model to another. The snowmobile handling is greatly influenced by these characteristics.
- The novice operator should become familiar with the snowmobile through practice on a level area at slow speeds before venturing far afield.
- Know your local laws. Federal, state, provincial and local government agencies have enacted laws and regulations pertaining to the safe use and operation of snowmobiles. It is your responsibility as a snowmobiler to learn and obey these laws and regulations. Respect and observance will result in safer snowmobiling for all. Be aware of the liability property damages and insurance laws regarding your equipment.
- Speeding can be fatal. In many cases, you cannot react or respond quickly enough to the unexpected. Always ride at a speed which is suitable to the trail, weather conditions and your own ability. Know your local rules. Speed limit may be in effect and meant to be observed.
- Always keep right hand side of the trail.
- Always keep a safe distance from other snowmobiles and bystanders.
- Remember, promotional material may show risky maneuvers performed by professional riders under ideal and/or controlled conditions. You should never attempt any such risky maneuvers if they are beyond your level of riding ability.

- Never use this vehicle with drugs or alcohol. They slow reaction time and impair judgement.
- Your snowmobile is not designed to be operated on public streets, roads or highways.
- Avoid road traveling. If you must do so, and it is permitted, reduce speed. The snowmobile is not designed to operate or turn on paving. When crossing a road, make a full stop, then look carefully in both directions before crossing at a 90° angle. Be wary of parked vehicles.
- Snowmobiling at night can be a delightful experience but because of reduced visibility, be extra cautious. Avoid unfamiliar terrain and be sure your lights are working. Always carry a flashlight and spare light bulbs.
- Never remove any original equipment from your snowmobile. Each vehicle has many built in safety features. Such features include various guards and consoles, plus reflective materials and safety labels.
- Nature is wonderful but don't let it distract your attention from driving. If you want to truly appreciate winter's scenery, stop your snowmobile on the side of the trail so that you don't become a hazard to others.
- Fences represent a very serious threat for both you and your snowmobile. Give a wide berth to telephone poles or posts.
- Hidden wires unseen from a distance can cause serious accidents.
- Always wear an approved safety helmet, eye protection and a face shield. This also applies to your passenger.
- Be aware of inherent risks associated with riding off trails, such as avalanche and other natural or man made hazards or obstacles.
- Tailgating another snowmobile should be avoided. If the snowmobile in front of you slows for any reason, its operator and passenger could be harmed through your neglect. Maintain a safe stopping distance between you and the snowmobile in front of you. Depending on the terrain condition, stopping may require a little more space than you think. Play it safe. Be prepared to use evasive driving.
- Venturing out alone with your snowmobile could also be hazardous. You could run out of fuel, have an accident, or damage your snowmobile. Remember, your snowmobile

is capable of traveling further in half an hour than you may be able to walk in a day. Use the “buddy system”. Always ride with a friend or member of your snowmobile club. Even then, tell someone where you are going and the approximate time you plan to return.

- Meadows sometimes have low areas where water accumulate and freezes over in winter. This ice is usually glare ice. Attempting to turn or brake on this surface could cause your vehicle to spin out of control. Never brake or attempt speeding or turning on glare ice. If you do happen to travel over such a condition, reduce speed by carefully releasing the throttle.
- Never “jump” with your snowmobile.
- While on safari, do not “gun” the throttle. Snow and ice can be thrown back into the path of a following snowmobile. In addition, when “gunning” the throttle, the vehicle digs into and leaves an irregular snow surface for others.
- Safaris are both fun and enjoyable but don't show off or overtake others in the group. A less experienced operator might try to do the same as you and fail. When riding with others, limit your abilities to the experience of others.
- In an emergency, the snowmobile engine can be stopped by pressing down on the emergency engine stop switch or by pulling the tether cord cap from the engine cut-off switch, while applying brake.
- Always engage parking brake when vehicle is not in use.
- Never run the engine in a non-ventilated area or if the vehicle is left unattended.
- Electric start models only: Never charge or boost a battery while installed on snowmobile.
- Never attempt any fuel system or electrical system maintenance or repair. Any maintenance or repair of these systems must be performed by an authorized Ski-Doo dealer.
- Ensure the path behind is clear of obstacles or bystanders before proceeding in reverse.
- Always remove the tether cord cap from engine cut-off switch when vehicle is not in operation in order to prevent accidental engine starting, to avoid unauthorized use by children or others or theft.

- NEVER stand behind or near a rotating track. Debris could be projected causing severe injuries. To remove packed snow or ice, stop engine, tilt and hold vehicle on its side and use wrench tool on the belt guard.
- BRP do not recommend to install studded track on deep snow vehicles.
- Always wear an approved helmet and follow the same dressing guidelines as those recommended for the operator and described in this guide.
- Make sure that you are able to achieve a stable stance, both feet resting positively on the footboards of footrests with good grip, and that you are able to hold on firmly to the handholds.
- Do not forget, with 2-UP models, the operator is responsible for the safety of the passenger. Always remember that the snowmobile handling, stability and braking distance may be affected when riding with a passenger.
- Before riding the vehicle, ask your passenger to inform you to slowdown or stop immediately if he feels uncomfortable or insecure during the ride. Keep a watchful eye on your passenger while riding.

RIDING THE VEHICLE

Each operator has a responsibility to ensure the safety of other recreationists or bystanders.

You are responsible for proper operation of your vehicle as well as training those whom you allow to ride or drive. There may be noticeable handling and performance differences from one snowmobile to the other.

A snowmobile is relatively simple to operate but like any other vehicle or mechanical equipment, it can be hazardous if you or a passenger are reckless, thoughtless or inattentive. We encourage you to have an Annual Safety Inspection of your snowmobile. Please contact an authorized Ski-Doo dealer for further details. Though not required, it is recommended that an authorized Ski-Doo dealer performs the preseason preparation of your snowmobile. Each visit to your authorized Ski-Doo dealer is a great opportunity for your dealer to verify if your snowmobile is included in any safety campaign. We also urge you to visit your authorized Ski-Doo dealer in a timely manner if you become aware of any safety related campaigns.

See an authorized Ski-Doo dealer for available accessories you may require.

Before venturing on the trails, operate the snowmobile in a restricted flat area until you are completely familiar with its operation and feel comfortable that you can safely tackle a more demanding task. Have an enjoyable and safe ride.

How to Ride

Riding Gear

Proper snowmobile clothing should be worn. It should be comfortable and not too tight. Always check the weather forecast before going on a ride. Dress for the coldest weather expected. Thermal underwear next to the skin also provides a good insulation.

Wear an approved helmet at all times for safety and comfort. They provide both warmth and reduce injury. A stocking type cap, balaclava and face mask should always be carried or worn. Goggles or a face shield that attach to the helmet are indispensable.

Hands should be protected by a pair of snowmobile gloves or mitts which have sufficient insulation and allow use of thumbs and fingers for operation of controls.

Rubber bottom boots with either a nylon or a leather top, with removable felt liners are best suited for snowmobiling.

You should keep yourself as dry as possible when snowmobiling. When you come indoors, take your snowmobile suit and boots off and make certain they dry properly.

Do not wear a long scarf or loose apparels that could get caught in moving parts.

Carry colored lens goggles.

What to Bring

First aid kit	Provided tool kit
Mobile phone	Knife
Spare spark plugs	Flashlight
Adhesive tape (duct tape)	Trail map
Spare drive belt	Snack
Probe*	Shovel*
Avalanche beacon*	
*When riding in an area with avalanche risk	

Rider Position (Forward Operation)

Your riding position and balance are the two basic principles of making your snowmobile go where you want it to. When turning on the side of a hill, you and your passenger must be ready to shift body weight to help it turn in the desired direction. Operator and passenger must never attempt this maneuvering by placing feet outside of the vehicle. Experience will teach you how much lean to put into turns at different speeds and how much you will have to lean into a slope to maintain proper balance.

Generally, the riding position for best balance and control is sitting. However, the posting, kneeling or standing positions are also used under certain conditions.

⚠ WARNING

Do not attempt any maneuvers if they are beyond your abilities.

Sitting

Feet on the running boards, body midway back on seat is an ideal position when operating the snowmobile over familiar, smooth terrain. Knees and hips should remain flexible to absorb shocks.

mmo2008-003-001

Posting

A semi-sitting position with the body off the seat and the feet under the body in a sort of squatting posture, thus allowing the legs to absorb the shocks when traveling over uneven terrain. Avoid abrupt stops.

mmo2008-003-002

Kneeling

This position is achieved by placing one foot firmly on the running board and the opposite knee on the seat. Avoid abrupt stops.

mmo2008-003-003

Standing

Place both feet on the running boards. Knees should be flexed to absorb the shock from surface bumps. This is an effective position to see better and to shift weight as conditions dictate. Avoid abrupt stop.

mmo2008-003-004

Rider Position (Reverse Operation)

We recommend sitting on your snowmobile when operating in reverse.

Avoid standing up. Your weight could shift forward against throttle lever while operating in reverse, causing an unexpected acceleration.

⚠ WARNING

Unexpected acceleration when snowmobile operates in reverse can cause a loss of control.

Carrying a Passenger

Certain snowmobiles are designed for an operator only (1-UP), and others can allow one passenger (2-UP). Make sure to identify and respect the warnings according to your specific models.

Even when a passenger is allowed, this person must be physically fit for snowmobiling.

⚠ WARNING

Any passenger must be able to firmly lay his feet on the footrests and keep his hands on the handholds or seat strap at all times when seated. Respecting those physical criteria is important to ensure that the passenger is stable and to reduce the risks of ejection.

The operator has a responsibility to ensure the safety of his passenger and should inform the passenger about snowmobiling basics.

WARNING

- Passenger must only sit on designated passenger seat. Never allow anyone to sit between the handlebar and the operator.
- Passenger and operator must always wear an approved helmet and warm clothing appropriate for snowmobiling. Make sure that no skin is exposed.
- If the passenger feels uncomfortable or insecure for any reason, he must right away inform the operator to slowdown or stop.

Riding with a passenger on board is different than riding alone. The operator has the benefit of knowing what will be the next maneuver and is able to prepare himself accordingly. The operator also benefits from the support of his grip on the handlebar. In contrast, the passenger has to rely on

the operator's careful and safe operation of the vehicle. In addition, "body english" is limited with a passenger, and the operator can sometimes see more of the trail ahead than the passenger. Therefore, smooth starting and stopping are required with a passenger, and the operator must slow down. The operator must also warn the passenger about side hills, bumps, branches, etc. An unforeseen bump can leave you passenger-less. Remind your passenger to lean into the turn with you, without causing the vehicle to topple. Be extremely careful, go more slowly and check the passenger frequently.

⚠ WARNING

When riding with a passenger:

- Braking ability and steering control are reduced. Decrease speed and allow extra space to maneuver.
- Adjust suspension according to weight.

For complete information on how to adjust the suspension, please refer to *TUNE YOUR RIDE*.

Riding with a Child

On snowmobiles allowing two passengers (with optional seat), if you have an adult and a child for passenger, BRP recommends that the child sits in the center location. This allows an adult sitting in the rear seat to keep a visual contact with the child and hold him if necessary. In addition, the child is best protected against the wind and cold temperature if seated in the center location.

Use extra caution and go even more slowly with a young passenger. Check frequently to make certain the child has a firm grip and is properly positioned with his feet on the running boards.

Terrain/Riding Variations

Groomed Trail

On a maintained trail, sitting is the most preferred riding position. Do not race and, above all, keep to the right hand side of the trail. Be prepared for the unexpected. Observe all trail signs. Do not zigzag from one side of the trail to the other.

Ungroomed Trail

Unless there has been a fresh snowfall you can expect “washboard” and snowdrift conditions. Taken at excessive speeds, such conditions can be physically harmful. Slow down. Hold on the handlebar and assume a posting position. Feet should be under the body assuming a crouched position to absorb any jarring effect. On longer stretches of “washboard” trails, the kneeling position of one knee on the seat can be adopted. This provides a certain amount of comfort, while at the same time keeps the body loose and capable of vehicle control. Beware of hidden rocks or tree stumps partially hidden by a recent snowfall.

Deep Snow

In deep “powder” snow, your vehicle could begin to “bog” down. If this occurs, turn in as wide an arc as possible and look for a firmer base. If you do get “bogged”, and it happens to everyone, do not spin your track as this makes the vehicle sink deeper. Instead, turn the engine off, get off and move the back of the vehicle onto new snow. Then tramp a clear path ahead of the vehicle. A few feet will generally suffice. Restart the engine. Assume the standing position and rock the vehicle gently as you steadily and slowly apply the throttle. Depending on whether the front or rear end of the vehicle is sinking, your feet should be placed on the opposing end of the running boards. Never place foreign material beneath the track for support. Do not allow anyone to stand in front of, or to the rear of, the snowmobile with the engine running. Stay away from the track. Personal injury will result if contact is made with the revolving track.

Frozen Water

Traveling frozen lakes and rivers can be fatal. Avoid waterways. If you are in an unfamiliar area, ask the local authorities or residents about the ice condition, inlets, outlets, springs, fast moving currents or other hazards. Never attempt to operate your snowmobile on ice that may be too weak to support you and the vehicle. Operating a snowmobile on ice or icy surfaces can be very dangerous if you do not observe certain precautions. The very nature of ice is foreign to good control of a snowmobile or any vehicle. Traction for starting, turning or stopping is much less than that on snow. Thus, these distances can be multiplied manyfold. Steering is minimal, and uncontrolled spins are an ever present danger. When operating on ice, drive slowly with caution. Allow yourself plenty of room for stopping and turning. This is especially true at night.

Hard Packed Snow

Do not underestimate hard packed snow. It can be difficult to negotiate as both skis and track do not have as much traction. Best advice is to slow down and avoid rapid acceleration, turning or braking.

Uphill

There are two types of hills you can encounter — the open hill on which there are few trees, cliffs or other obstacles, and a hill that can only be climbed directly. On an open hill, the approach is to climb it by side hilling or slaloming. Approach at an angle. Adopt a standing position with both feet on the same running board. Keep your weight on the uphill side at all times. Maintain a steady, safe speed. Continue as far as you can in this direction, then switch to an opposite hill angle and riding position.

A direct climb could present problems. Choose the standing position, accelerate before you start the climb and then reduce throttle pressure to prevent track slippage.

In either case, vehicle speed should be as fast as the incline demands. Always slow down as you reach the crest. If you cannot proceed further, don't spin your track. Apply the parking brake, turn the engine off, free the skis by pulling them out

and downhill, place the rear of the snowmobile uphill restart the engine and ease it out with slow even throttle pressure. Position yourself to avoid tipping over, then descend.

Downhill

Downhill driving requires that you have full control of your vehicle at all times. On steeper hills, keep your center of gravity low and both hands on the handlebar. Maintain slight throttle pressure and allow the machine to run downhill with the engine operating. If a higher than safe speed is reached, slow down by braking but apply the brake with frequent light pressure. Never jam the brake and lock the track.

Side Hill

When crossing a side hill or traversing up or downhill, certain procedures must be followed. All riders should lean towards the slope as required for stability. The preferred operating position is the standing position, with both feet on the running board that is facing uphill. Be prepared to shift your weight quickly as needed. Side hills and steep slopes are not recommended for a beginner or a novice snowmobiler.

Avalanche Hazard

When riding on mountainous terrain, you should be aware of the risk of avalanches. Avalanches vary in size and shapes and generally occur in steep terrain and on unstable snow.

New snow, animals, people, wind and snowmobiles can all trigger an avalanche. Avoid high marking or traversing steep terrain when avalanche conditions are possible. When in unstable snow conditions, travel should be restricted to lower angle slopes. Wind formed cornices should be avoided. Staying off unstable conditions is the key to safe mountain riding. Probably most important is to be aware of the conditions and dangers on a daily basis when in the mountains. Check local avalanche forecasts and threats each day before heading out to ride and heed forecasters advice.

You should always carry on you a snow shovel, probe and avalanche beacon while riding on mountains. We recommend that all mountain riders take a local avalanche safety training

course to become more familiar with snow conditions and learn how to properly use their equipment.

Here are some web sites that can help you finding important information:

- US: www.avalanche.org
- Europe: www.avalanches.org
- Canada: www.avalanche.ca

Slush

Slush should be avoided at all times. Always check for slush before starting across any lake or river. If dark spots appear in your tracks, get off the ice immediately. Ice and water can be thrown rearward into the path of a following snowmobile. Getting a vehicle out of a slush area is strenuous and in some cases, impossible.

Fog or Whiteout Conditions

On land or water, fog or visibility-limiting snow can form. If you have to proceed into the fog or heavy snow, do so slowly with your lights on and watch intently for hazards. If you are not sure of your way, do not proceed. Keep a safe distance behind other snowmobilers to improve visibility and reaction time.

Unfamiliar Territory

Whenever you enter an area that is new to you, drive with extreme caution. Go slow enough to recognize potential hazards such as fences or fence posts, brooks crossing your path, rocks, sudden dips, guy wires and countless other obstacles which could result in a termination of your snowmobile ride. Even when following existing tracks, be cautious. Travel at a speed so you can see what is around the next bend or over the top of the hill.

Bright Sunshine

Bright sunny days can considerably reduce your vision. The glare from sun and snow may blind you to the extent that you cannot easily distinguish ravines, ditches or other obstacles. Goggles with colored lenses should always be worn under these conditions.

Unseen Obstruction

There may be obstructions hidden beneath the snow. Driving off established trails and in the woods requires reduced speed and increased vigilance. Driving too fast in an area can make even minor obstacles very hazardous. Even hitting a small rock or stump could throw your snowmobile out of control and cause injury to its riders. Stay on established trails to reduce your exposure to hazards. Be safe, slow down and enjoy the scenery.

Hidden Wires

Always be on the lookout for hidden wires, especially in areas that may have been farmed at one time or another. Too many accidents have been caused by running into wires in the fields, guy wires next to poles and roads, and into chains and wires used as road closures. Slow speeds are a must.

Obstacles and Jumping

Unplanned jumps of snowdrifts, snowplow ridges, culverts or indistinguishable objects can be dangerous. You can avoid them by wearing the proper color lenses or face shields and by operating at a lower speed.

Jumping can be a hazardous situation. Be prepared before landing to absorb the shock and brace yourself for the impact. Knees must be flexed to act as shock absorbers. If the trail does suddenly drop away from you, crouch (stand) towards the rear of the vehicle and keep the skis up and straight ahead. Apply partial throttle and brace yourself for the impact. Knees must be flexed to act as shock absorbers.

Turning

Depending on terrain conditions, there are two preferred ways to turn or corner a snowmobile. For most snow surfaces, “body english” is the key to turning. Leaning towards the inside of the turn and positioning body weight on the inside foot will create a “banking” condition beneath the track. By adopting this position and positioning yourself as far forward as possible, weight will be transferred to the inside ski.

On occasion, you will find that the only way to turn the vehicle about in deep snow is to pull the snowmobile around. Do not over-exert yourself. Get assistance. Remember to always lift using your legs as opposed to your back.

mmo2008-003-005

Road Crossing

In some cases, you will be approaching the road from a ditch or snowbank. Choose a place where you know you can climb without difficulty. Use the standing position and proceed with only as much speed needed to crest the bank. Stop completely at the top of the bank and wait for all traffic to clear. Judge the drop to the roadway. Cross the road at a 90° angle. If you encounter another snowbank on the opposite side, position your feet near the rear of the vehicle. Remember, your

snowmobile is not designed to operate on bare pavement and steering on this type of surface is more difficult.

Railroad Crossing

Never ride on railroad tracks. It is illegal. Railroad tracks and railroad rights-of-way are private property. A snowmobile is no match for a train. Before crossing a railroad track, stop, look and listen.

Night Rides

The amount of natural and artificial light at a given time can effect your ability to see or to be seen. Nighttime snowmobiling is delightful. It can be a unique experience if you acknowledge your reduced visibility. Before you start, make certain your lights are clean and work properly. Drive at speeds that will allow you to stop in time when you see an unknown or dangerous object ahead. Stay on established trails and never operate in unfamiliar territory. Avoid rivers and lakes. Guy wires, barbed wire fences, cabled road entrances and other objects such as tree limbs are difficult to see at night. Never drive alone. Always carry a flashlight. Keep away from residential areas and respect the right of others to sleep.

Riding in a Group

Before starting out, designate a “trail boss” to lead the party and another person to follow-up at the end of the party. Ensure that all members of the party are aware of the proposed route and destination. Make certain that you are carrying all necessary tools and equipment and that you have sufficient fuel to complete the trip. Never overtake the trail boss or, for that matter, any other snowmobile. Use down-the-line hand signals to indicate hazards or intent of direction change. Assist others whenever necessary.

It is always IMPORTANT to keep a safe distance between each snowmobile. Always maintain a safe interval and allow sufficient stopping distance. Don't be a tailgater. Know the position of the machine ahead.

Signals

If you intend to stop, raise either hand straight above your head. A left turn is indicated by extending your left hand straight out in the proper direction. For right turns, extend the left arm and raise the hand to a vertical position so it forms a right angle at the elbow. Every snowmobiler should relay any signal to the ones behind.

Trail Stops

Whenever possible, pull off the trail when you stop. This will reduce the hazard to other snowmobilers using the trail.

Trails and Signs

Trail signs are used to control, direct or regulate the use of snowmobiles on trails. Become familiar with all signs used in the area where you are snowmobiling.

Environment

Wildlife compliments your snowmobiling day. Snowmobile tracks provide firm ground over which animals can travel from area to area. Do not violate this privilege by chasing or harassing wildlife. Fatigue and exhaustion can lead to animal's death. Avoid areas posted for the protection or feeding of wildlife.

If you happen to be fortunate enough to see an animal, stop your snowmobile and observe quietly.

The guidelines that we support are not designed to limit your snowmobiling fun, but to preserve the beautiful freedom that you can experience only on a snowmobile! These guidelines will keep snowmobilers healthy, happy and able to introduce others to what they know and enjoy about their favorite winter pastime. So, the next time you hit the trails on a cool, crisp and clear winter day, we ask you to remember that you are paving the way for the future of our sport. Help us lead it down the right path! From all of us at BRP, thank you for doing your share.

There is nothing more exhilarating than snowmobiling. Venturing onto snowmobile trails that cross wild areas is an exciting and healthy winter sport. However, as the number of people

using these recreational parks increases, so does the potential for damage to the environment. Abuse of land, facilities and resources inevitably leads to restrictions and closures of both private and public land.

In essence, the greatest threat to our sport, is all around us. Which leaves us with one logical choice. When we snowmobile, we must always ride responsibly.

The vast majority respect the law and the environment. Each of us must set an example for those who are new to the sport, young and old alike.

It is in every one's best interest to tread lightly into our recreational areas. Because, in the long run, to protect the sport we must preserve the environment.

Recognizing the importance of this issue and the need for snowmobilers to do their share in preserving areas that make it possible to enjoy our sport, BRP has developed the “Light Treading Is Smart Sledding” campaign for snowmobilers.

Light Treading refers to more than the thread of our tracks. It's a statement of concern, respect and willingness to take the lead and take action. It applies to the environment in general, its proper care and maintenance, its natural inhabitants and all enthusiasts and the public at large who enjoy the great outdoors. With this theme, we invite all snowmobilers to remember that respecting the environment is not only critical to the future of our industry but to future generations.

Light Treading in no way suggests you should curb your appetite for snowmobiling fun! It simply means tread with respect!

The fundamental objective of Light Treading is one of respect for where and how you ride a snowmobile. You're a light treader when you follow the principles below.

Become informed. Obtain maps, regulations and other information from the Forest Service or from other public land agencies. Learn the rules and follow them and that goes for speed limits, too!

Avoid running over young trees, shrubs, and grasses and don't cut wood. On flatlands or areas where trail riding is popular, it's important to ride only where authorized. Remember, there

is a link between protecting your environment and your own safety.

Respect wildlife and be particularly sensitive of animals that are rearing young or suffering from food shortage. Stress can sap scarce energy reserves. Refrain from riding in areas where only animals are intended to tread!

Obey gate closures and regulatory signs and remember, light treaders don't litter!

Stay out of wilderness areas. They're closed to all vehicles. Know where the boundaries are.

Obtain permission to travel across private land. Respect the rights of landowners and other people's privacy. Remember, snowmobile technology has lowered the noise factor considerably, but you still shouldn't rev your engines where quiet “is the order of the day”.

Snowmobilers know all too well the efforts that have been made throughout the sport's history to enjoy access to areas where people can snowmobile safely and responsibly. This effort continues today, as strong as ever.

Respecting the areas where we ride... wherever they may be... is the only way to ensure their future enjoyment. That's one major reason why we know you'll agree that Light Treading is smart sledding! And there are more.

Enjoying the opportunity to see winter and all its natural majestic wonders, is an experience cherished by snowmobilers. Light Treading will preserve this opportunity and will make it possible for us to expose others to the beauty of winter and the unique thrill of our sport! Light Treading will help our sport to grow!

Finally, Light Treading is the sign of a smart snowmobiler. You don't have to leave big tracks or careen through a virgin forest to show you can ride. So whether you're driving a high performance Ski-Doo snowmobile or any other make or model, show you know what you're doing. Show you know how to send snow flying and make tracks with a light touch!

TRACTION ENHANCING PRODUCTS

Important

- *DEEP SNOW SERIES* snowmobiles are not meant to be used with any type of traction enhancing products such as, adjustable or more aggressive ski carbide runners and/or track studs.
- BRP does not recommend the installation and use of such products on your *DEEP SNOW SERIES* snowmobile.

⚠ WARNING

Never stud a track that has not been approved for studs. Installing studs on an unapproved track could increase the risk of the track tearing or severing.

Altough not recommended, the installation of more agressive carbide ski runners still possible.

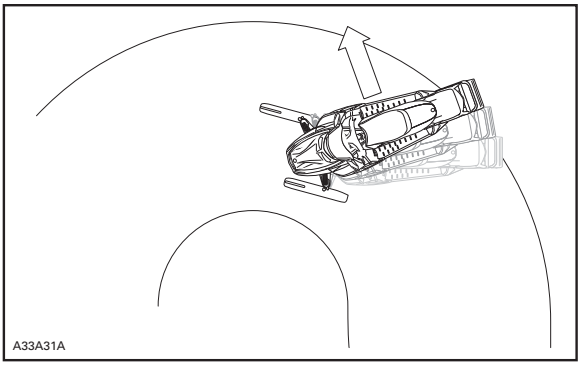
Using more agressive than original carbide ski runners gives a better grip on packed snow and ice, but has no noticeable effect on soft snow. For this reason, driving a snowmobile equipped with agressive carbide runners requires a certain adaptation period. If your snowmobile is equipped with aggressive carbide runners , be sure to take plenty of time to get used to the way it handles when turning. Refer to *MANOEUVRABILITY*.

Manoeuvrability

Using more aggressive ski carbide runners makes the snowmobile grip the ground better at the front. This could unbalance the front and rear of the snowmobile.

WARNING

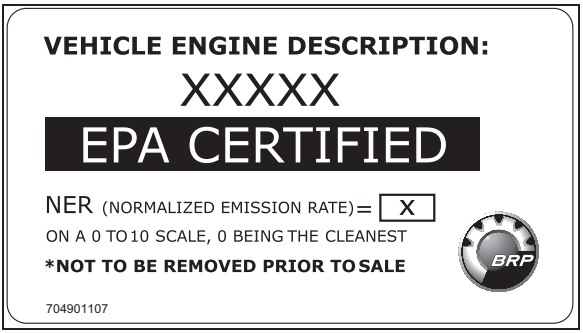
If the front and rear of the snowmobile are out of balance due to the use of aggressive carbide runners the snowmobile may tend to oversteer which could lead to a loss of control.



OVERSTEERING

SAFETY INFORMATION ON THE VEHICLE

Hang Tag(s)



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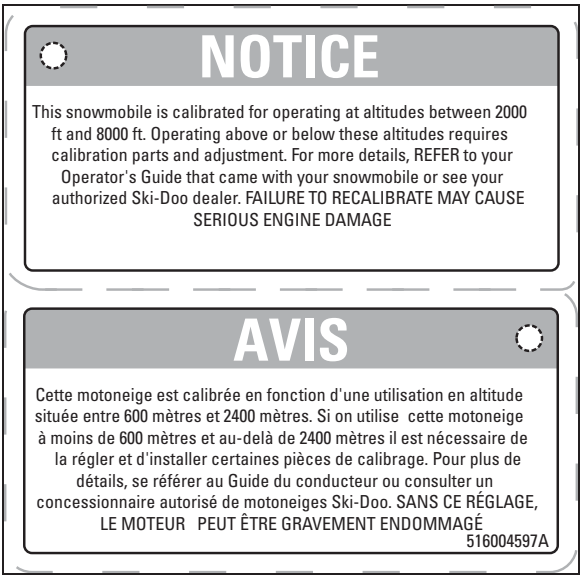
TYPICAL

516004598
TYPICAL



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TYPICAL

⚠**WARNING**. Operating, servicing and maintaining an off-road vehicle 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

704906872

EN-704906872-DEC

Have you asked your dealer to adjust your suspension to **YOUR** riding style?

·Limiter strap length
·Spring preload

for more details.
See the operator's guide -Tune your ride section

***This hangtag may ONLY be removed by the customer.**

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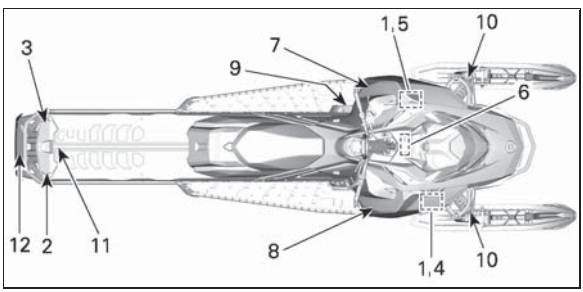
Vehicle Safety Labels

These labels are affixed to the vehicle for the safety of the operator, passenger or bystanders.

The following labels are on your vehicle and they should be considered permanent parts of the vehicle. If missing or damaged, the decals can be replaced free of charge. See an authorized Ski-Doo dealer.

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.



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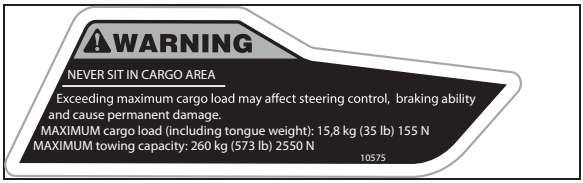
LABEL 1



EN-516010575-DEC
LABEL 2

EN-516008594-DEC
LABEL 3

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LABEL 4 - COOLANT TANK CAP

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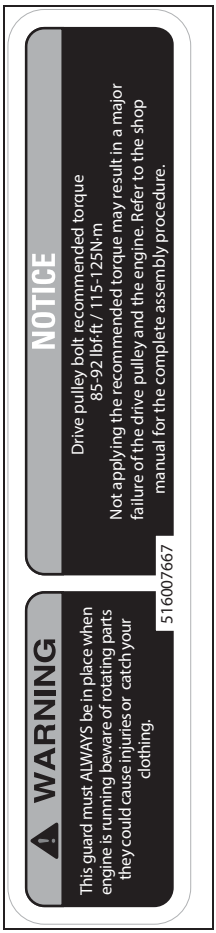
LABEL 4 - ON COOLANT TANK



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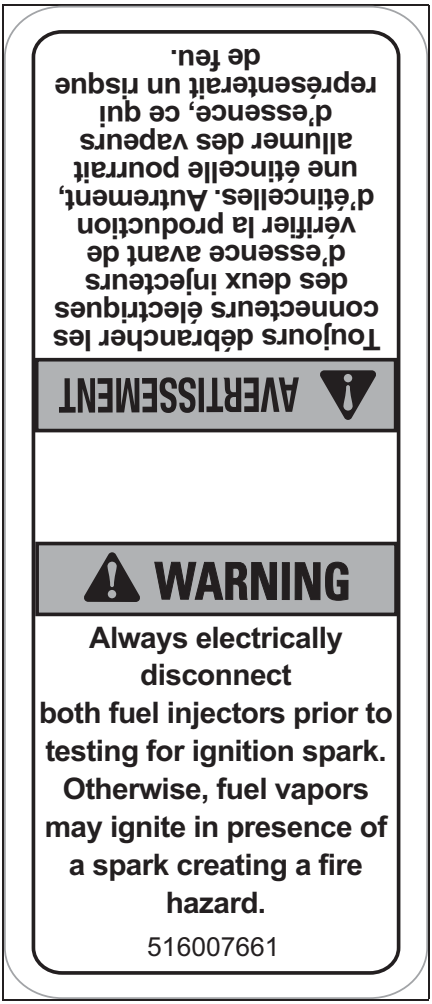
LABEL 5



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LABEL 6

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LABEL 7

EN-516010558-DEC
LABEL 8

EN-516007652-DEC
LABEL 9

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LABEL 10 - ON GAS CHARGED SHOCK ABSORBERS

On 175 tunnel

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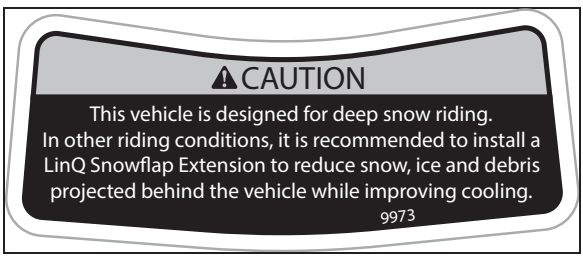
LABEL 11 - ON TOP OF REAR TUNNEL

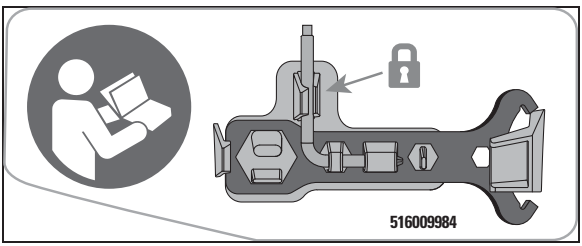
On Summit Expert models



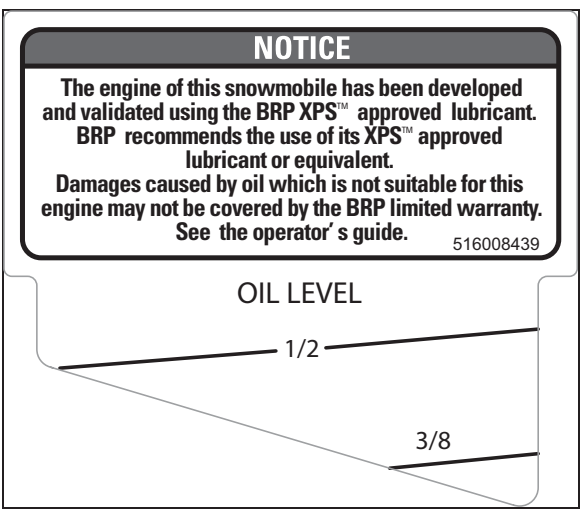
EN-516009973-DEC
LABEL 12 - ON TOP OF SNOW GUARD

Technical Information Labels

- Install Suspension adjustment tool 1st (illustrated Red on label).
- Install Pulley Expander and Headlight adjustment tool 2nd illustrated Blue on label).
- Refer to your operator's guide.



EN-516009984-DEC
LOCATED ON BELT GUARD



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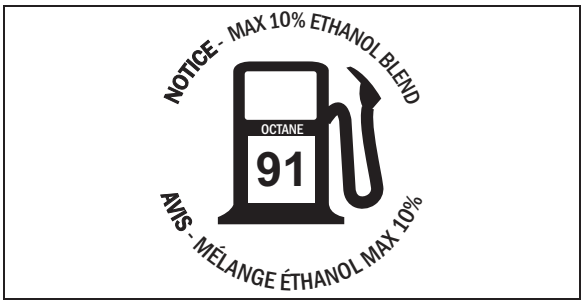
ON OIL RESERVOIR



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ON FUEL CAP - IN COUNTRIES USING PUMP POSTED AKI (RON+MON)/2 OCTANE RATINGS

DEC 513033943 EN-FR

ON FUEL CAP - IN COUNTRIES USING RON OCTANE RATINGS

EN-516009897-DEC

ON SIDE OF TUNNEL, FOR ADJUSTABLE STOPPER STRAP

REPORTING SAFETY DEFECT

In Canada, if you believe that your vehicle has a defect which could cause a crash or cause injury or death, you should immediately inform Transport Canada in addition to notifying Bombardier Recreational Products Inc.

If Transport Canada receives similar complaints, it may open an investigation, and if it finds that a safety defect exists in a group of vehicles, it may order a recall and remedy campaign. Transport Canada cannot become involved in any individual problems between you, your dealer or Bombardier Recreational Products Inc.

TO CONTACT TRANSPORT CANADA:	
	819-994-3328 (Gatineau-Ottawa area or internationally) Toll free: 1-800-333-0510 (in Canada)
	Transport Canada - ASFAD 330 Sparks Street Ottawa, ON K1A 0N5
	https://www.tc.gc.ca/recalls

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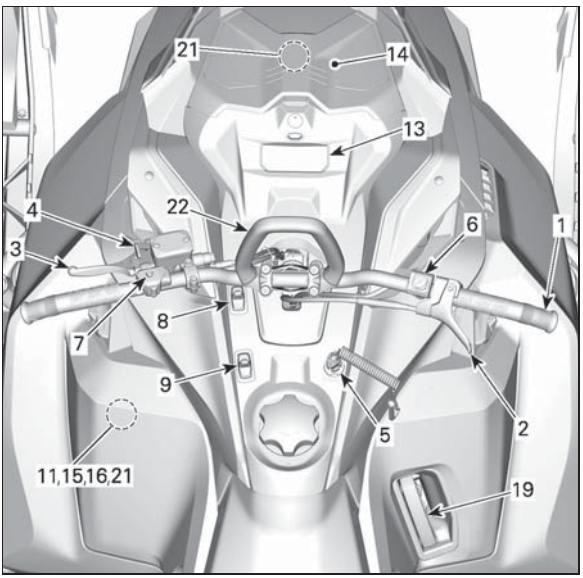
VEHICLE INFORMATION

CONTROLS, INSTRUMENTS AND EQUIPMENT

Some features may not apply to your model or could be optional.

Some vehicle safety labels are not shown on illustrations. For information on vehicle safety labels, refer to *SAFETY INFORMATION ON THE VEHICLE*.



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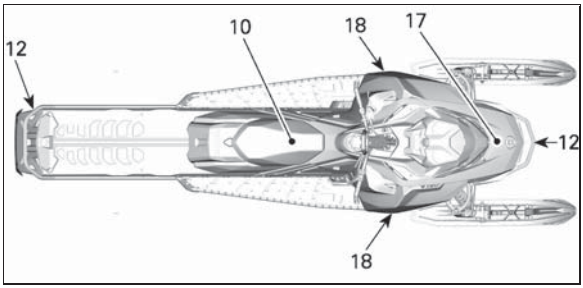

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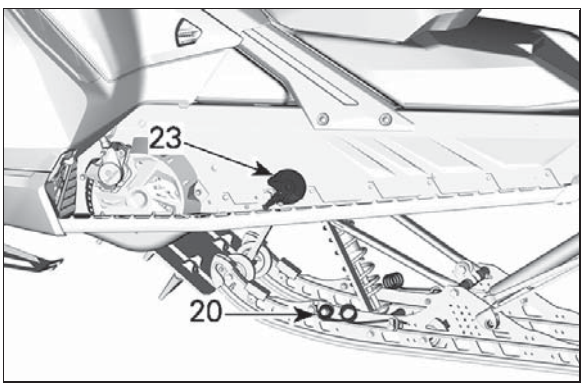


520002139-001

1) Handlebar

The handlebar controls the steering of the snowmobile. As the handlebar is rotated to right or left, the skis are turned right or left to steer the snowmobile.

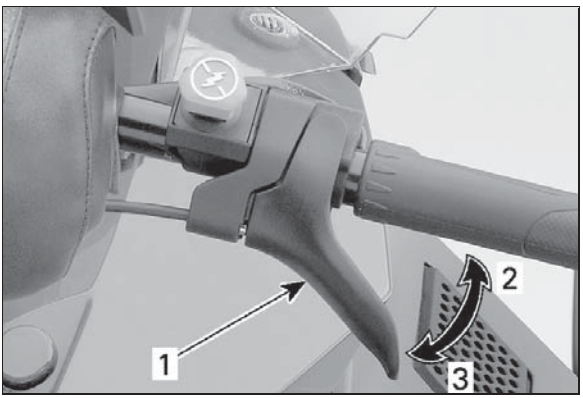
⚠ WARNING

Fast reverse while turning, could result in loss of stability and control.

2) Throttle Lever

Throttle lever is located on the RH side of handlebar.

Designed to be thumb activated. When squeezed, it increases the engine speed. When released, engine speed returns automatically to idle.



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TYPICAL

1. *Throttle lever*
2. *To accelerate*
3. *To decelerate*

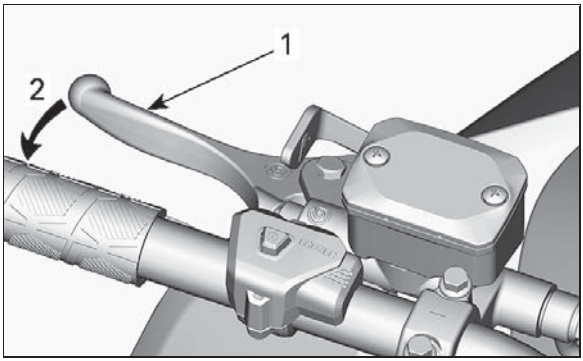
⚠ WARNING

Test the throttle lever operation each time before starting the engine. The lever must return to the rest position once released. Otherwise, do not start engine.

3) Brake Lever

Brake lever is located on the LH side of handlebar.

When squeezed, brake is applied. When released, it automatically returns to the rest. Braking effect is proportional to the pressure applied on the lever and to the type of terrain and its snow coverage.



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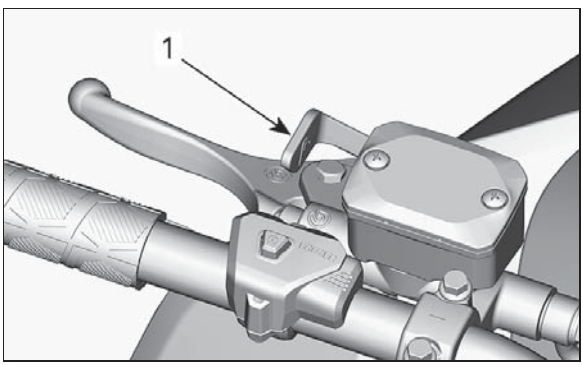
1. *Brake lever*
2. *Apply brake*

4) Parking Brake Lever

Parking brake lever is located on the LH side of handlebar.

Parking brake should be used whenever snowmobile is parked.



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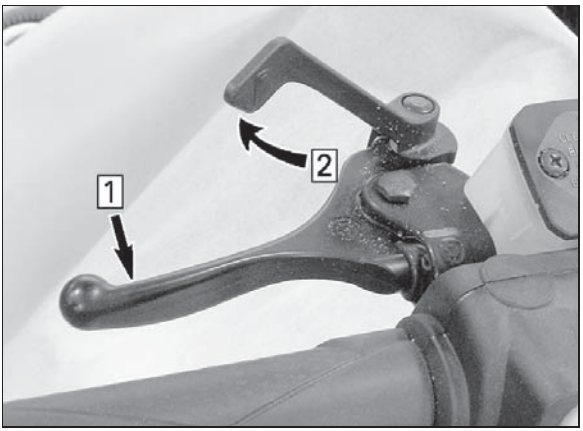
1. *Parking brake lever*

⚠ WARNING

Make sure parking brake is fully disengaged before operating the snowmobile. When you ride the vehicle, brake pads that are caused to drag by a continuous pressure on the lever may cause damage to the brake system and cause loss of braking capacity and/or fire.

To Engage Parking Brake

Apply and hold brake, then lock brake lever using the parking brake lever as shown.



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TYPICAL — ENGAGE MECHANISM

Step 1: Apply and hold brake

Step 2: Lock brake lever using parking brake lever

To Release Parking Brake

Squeeze brake lever. Parking brake lever will automatically return to its original position. Always release parking brake before riding.

5) Engine Cut-off Switch (D.E.S.S. Post)

The engine cut-off switch, also known as D.E.S.S.post, is located on the console.

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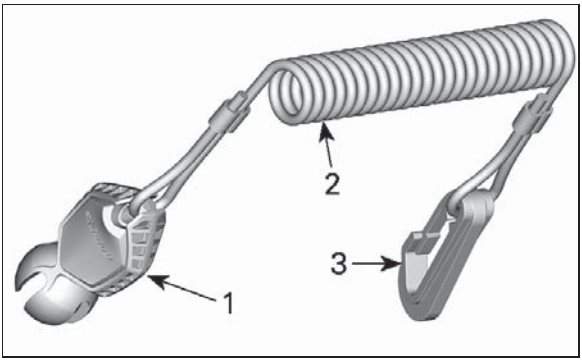
The D.E.S.S.key must be securely snapped on the engine cut-off switch to allow vehicle operation.



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1. *D.E.S.S. key*
2. *Tether cord*
3. *Tether cord eyelet*

After engine starting, 2 short beeps should be heard if a programmed D.E.S.S. key (tether cord cap) is correctly snapped on engine cut-off switch. If another beep code is heard, refer to *MONITORING SYSTEM* for D.E.S.S. for malfunction codes information.

Pulling the D.E.S.S. from the post shuts the engine off.

⚠ WARNING

Always attach the tether cord eyelet to clothing before starting the engine.

D.E.S.S. (Digitally Encoded Security System)

The D.E.S.S. key provides your snowmobile with the equivalent security of a conventional lock key.

The D.E.S.S. key contains an electronic chip which features a unique permanently memorized digital code.

Your authorized Ski-Doo dealer has programed the D.E.S.S. of your snowmobile to recognize the D.E.S.S. key to allow vehicle operation.

If another D.E.S.S.key is used without programming the D.E.S.S., the engine will start but will not reach drive pulley engagement speed to move vehicle.

Make sure the D.E.S.S. key is free of dirt or snow.

D.E.S.S. Flexibility

The D.E.S.S. of your snowmobile can be programmed by your authorized Ski-Doo dealer to accept up to 8 different keys.

We recommend the purchase of an additional D.E.S.S. key from your authorized Ski-Doo dealer.

If you have more than one D.E.S.S. equipped Ski-Doo snowmobile, each can be programmed by your authorized Ski-Doo dealer to accept other vehicles D.E.S.S. keys.

6) Emergency Engine Stop Switch

The emergency engine stop switch is located on the RH side of handlebar.

To stop the engine in an emergency, push the switch down in OFF position and simultaneously apply the brake.

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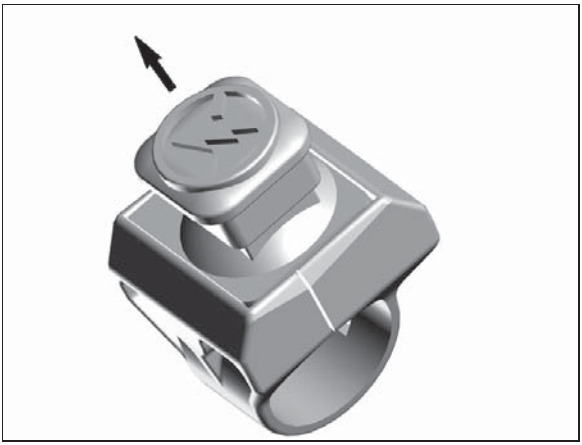
OFF POSITION

To allow engine starting, pull the switch up in the ON position.



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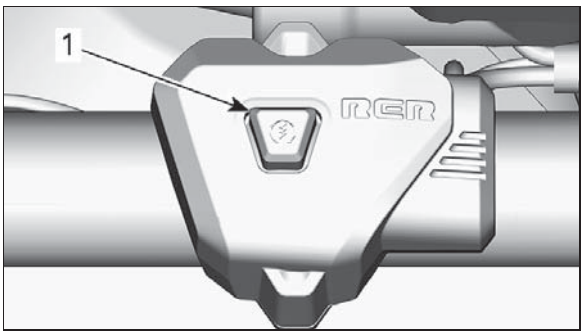
ON POSITION

All operators of the snowmobile should familiarize themselves with the function of the emergency engine stop switch by using it several times on first outing and whenever stopping the engine thereafter. This engine stopping procedure will become a reflex and will prepare operators for emergency situations requiring its use.

⚠ WARNING

If the switch has been used in an emergency caused by a suspected malfunction, the source of the malfunction should be determined and corrected before restarting engine. See an authorized Ski-Doo dealer for servicing.

7) SHOT/ Electric Start/ Electronic Reverse (RER) Button



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1. Start / RER button

On SHOT and electric start models, press to start engine.

Once the engine is started, press to engage the electronic reverse.

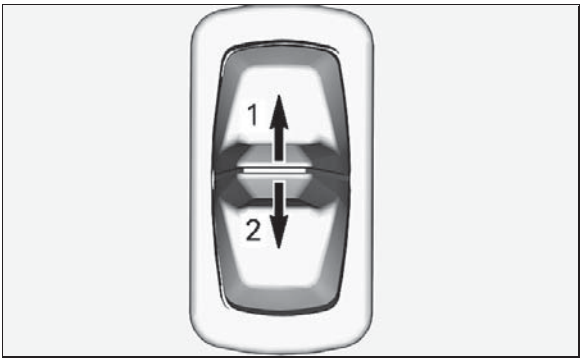
Refer to *BASIC PROCEDURES* for instructions on how to use:

- SHOT system (if equipped)
- Electric starter (if equipped)
- Electronic Reverse (RER)

8) Headlights Dimmer Switch

Push the switch forward to select high beam.

Push the switch backwards to select low beam.



520001496-004_a

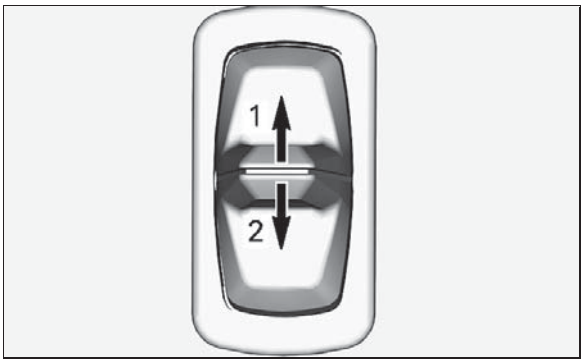
1. *High beam*
2. *Low beam*

9) Heated Grips and Throttle Lever Switch

NOTE: Under 2000 RPM, heated grips are limited to 50%.

The heated throttle lever **and** heated grips are adjusted simultaneously using the switch.

There are 4 intensity settings. To set, press and release the switch repeatedly until the desired setting is obtained.



520001496-004_a

1. *Increase heat*
2. *Decrease heat*

The setting is displayed on the bar gauges of the multifunction digital gauge. See *MULTIFUNCTION DIGITAL GAUGE* in this section.

To shut off, press the button down until the bar gauge is empty.

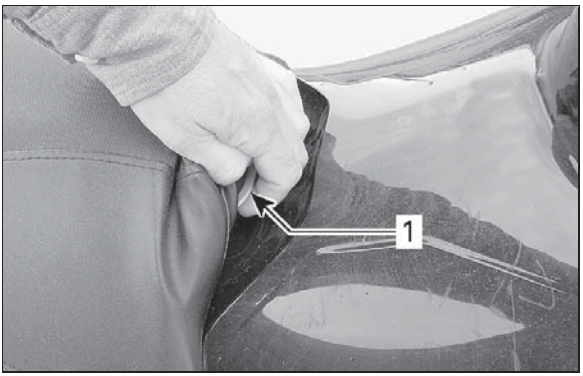
NOTE: If the balance between the temperature of the throttle lever and the grips does not suit your needs, it is possible to adjust it. Contact an authorized Ski-Doo dealer.

10) Seat

Seat Removal

Roll up the front of the foam.

While pushing seat forward, pull up the latch.



520001496-003_b

1. Seat latch

Slide seat rearwards to remove it.

Seat Installation

NOTICE Riding the vehicle with any objects between the seat and the fuel tank could damage the fuel tank. NEVER place any objects between seat and fuel tank.

Place seat over the hooks, then slide it forward.

Securely engage latch.

⚠ WARNING

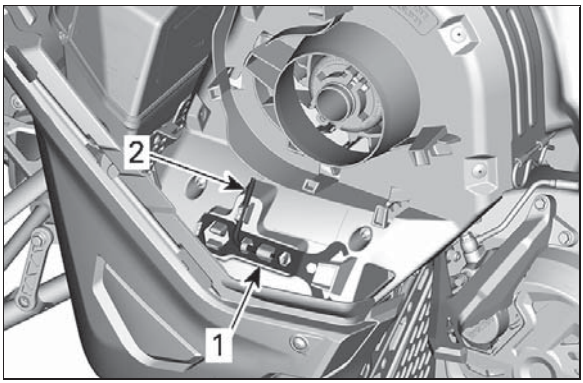
Make sure seat is securely latched before riding.

11) Tools

A part of the drive belt guard is designed to hold the tools allowing for basic maintenance.

The tools are supplied with the vehicle. They should always be installed in their proper location and orientation.

NOTICE Make sure tools are secured properly.



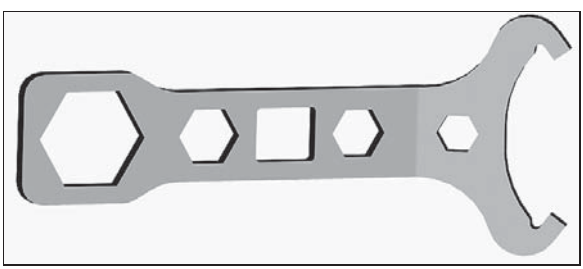
520001897-001_a

DRIVE BELT GUARD TOOLS LOCATION

1. *Suspension adjustment tool*
2. *Pulley expander*

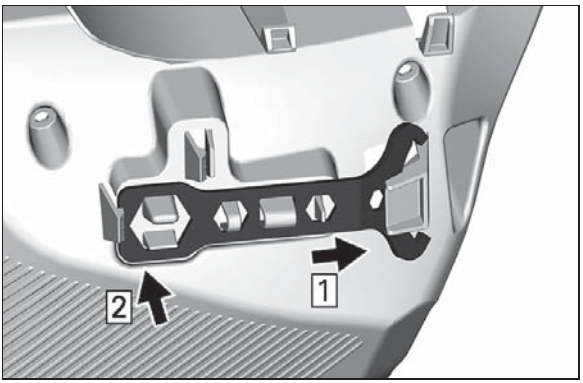
Install in the following sequence:

1. Slide the Suspension adjustment tool open end under retaining tab.
2. Press the closed end on the retaining tabs.



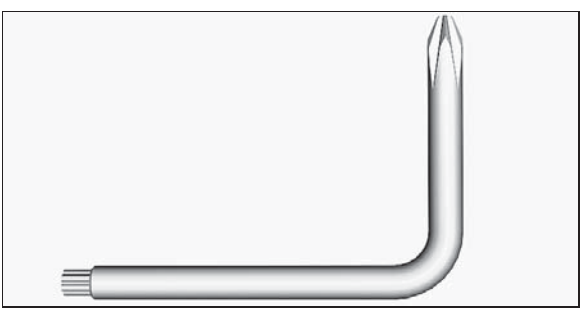
520001663-022

SUSPENSION ADJUSTMENT TOOL

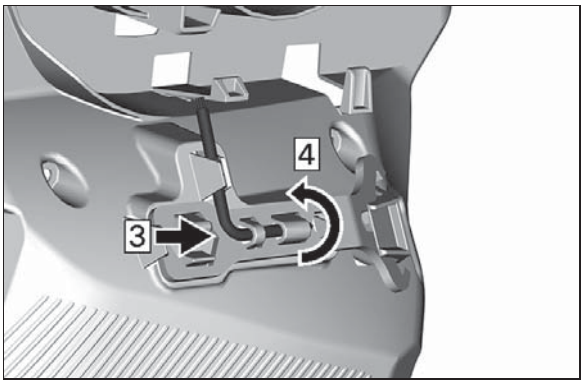


520002104-500

3. Slide the Pulley expander and headlight adjustment tool short end into hole.
4. Rotate and clip long end in place.



520001798-008
PULLEY EXPANDER



520002104-501

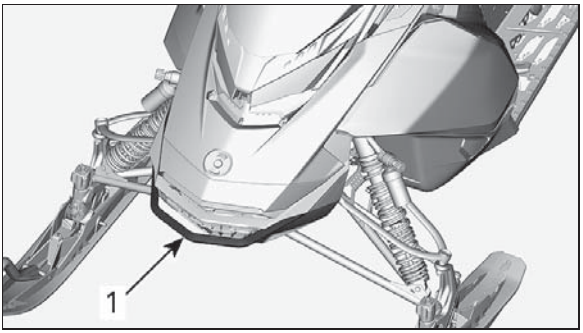
NOTICE Make sure tools are secured properly. Tools may detach and cause damage to rotating parts.

12) Front and Rear Bumpers

To be used whenever snowmobile requires manual lifting.

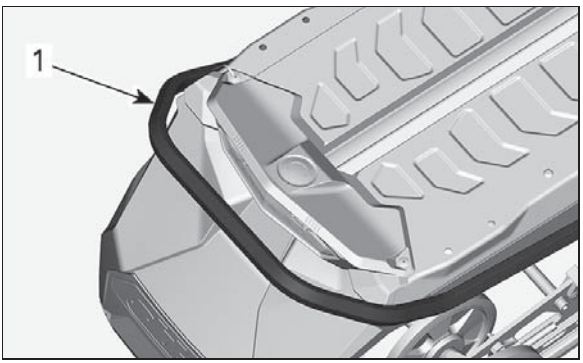
⚠ CAUTION

Beware of injuries by using proper lifting techniques, notably by using your legs to lift instead of your back. Do not attempt to lift the rear of vehicle if it is above your limits. Use appropriate lifting device or have assistance to share lifting stress if possible.



520001663-004_a

1. Front bumper



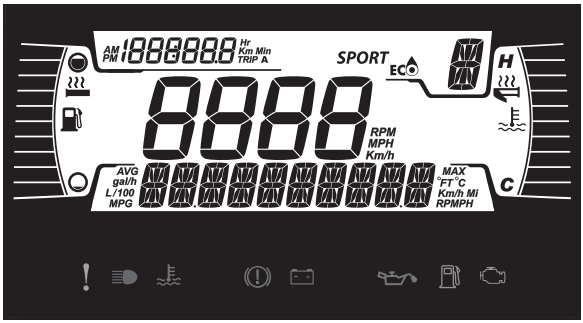
520001663-005_a

1. Rear bumper

NOTICE Do not use skis to pull or lift snowmobile.

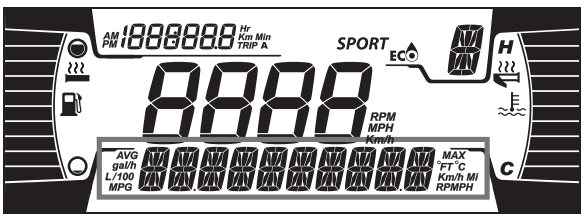
13) Gauge

4.5" Digital Display



619900974-706

Lower Display



619900974-700

May display the following:

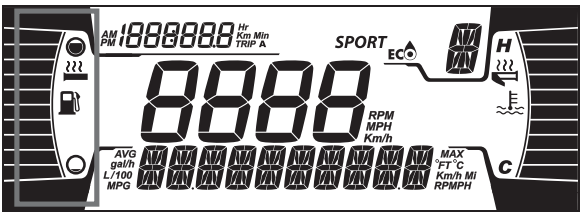
- RPM
- Speed
- Engine Temperature
- Fuel Statistics
- Settings
- Messages
- Outside temperature (if equipped)

Use LOWER button to change the displayed information.

The SPEED STAT display shows the maximum and the averaged speed. Hold LOWER button for 3 seconds to reset.

When the SPEED display is chosen, the RPM is shown in the TRIP display.

Left Lateral Display

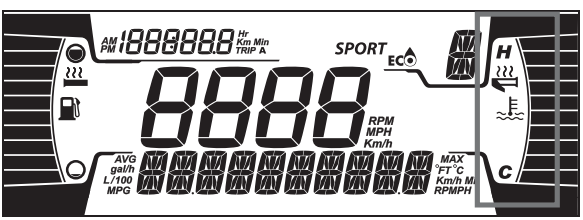


619900974-701

The left lateral display includes:

- Fuel level indicator
- Heated Grip level

Right Lateral Display

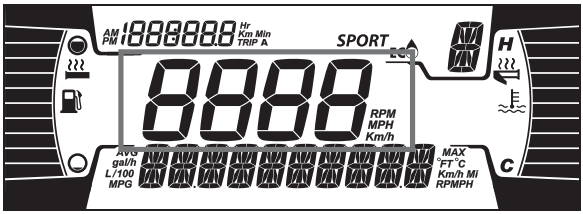


619900974-702

The right lateral display includes:

- Engine Temperature
- Heated throttle indicator

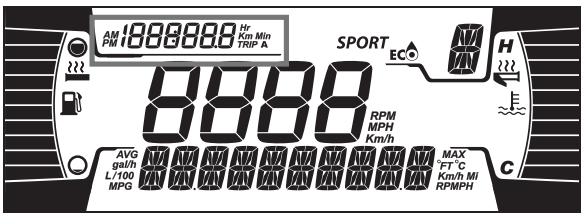
Central Display



619900974-703

Display the RPM of engine or vehicle speed in Km/h or MPH.

Trip Display



619900974-705

This display shows trip informations:

- Odometer
- Trip A distance (Km or mph)
- Trip B distance (Km or mph)
- Vehicle hour meter
- Clock (If battery equipped)

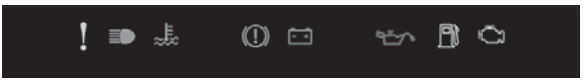
Use UPPER button to change the displayed information.

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



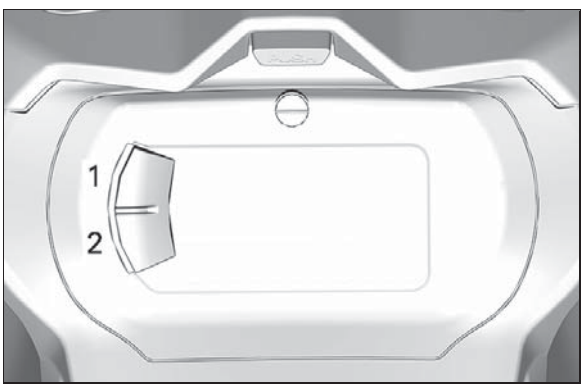
619900974-809

Lights	Description
	ORANGE - Vehicle malfunction
	BLUE - The high beam are selected
	RED - The engine temperature is too high.
	RED - Parking brake is engaged or malfunction of the brake system
	RED - The battery voltage too low or problem with the electrical system
	RED - Low oil

Lights	Description
	ORANGE - Low fuel level
	ORANGE **Turn on** : Malfunction of the vehicle emissions control system **Blink** : Engine problems, the limp home mode is activated. Have the vehicle serviced immediately.

Settings

Setup



520002114-102

1. *Upper button (S)*
2. *Lower button (M)*

Using LOWER button, Select **SETTINGS** and hold to enter setting menu.

Reset Stats

Using LOWER button, select **RESET STAT** and hold to reset.

Unit Selection

This multifunction gauge is factory preset in Metric units but it is possible to change it to Imperial units.

Using LOWER button, Select **UNITS** to change the clock.

Setting Clock

Using LOWER button, Select **CLOCK** to change the clock.

1. Press LOWER button to select clock display.
2. Push and hold LOWER button for 1 second.
3. Press LOWER button to select 12:00 AM PM or 24:00 time base.
4. Push and hold LOWER button to acknowledge selection.
5. Press LOWER button to change hours (hours flash).
6. Push and hold LOWER button to acknowledge hour selection.
7. Press LOWER button to switch to minutes (minutes flash).
8. Push and hold LOWER button to acknowledge minutes selection.

Setting Language

The gauge display language can be changed. Refer to an authorized Ski-Doo dealer for language availability and to setup the gauge to your preference.

Setting Brightness

Using the MENU button, select Brightness and hold the MENU button to change the brightness.

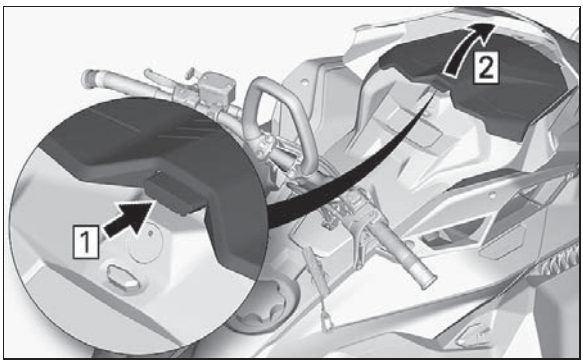
When the brightness is adjusted press and hold the MENU button to acknowledge the selection.

14) Storage Compartment (if equipped)

A storage compartment is located at the front of the vehicle, above the gauge.

The Operator's Guide and the emergency starter rope are in the front storage compartment.

To open, push the button and lift the cover.



520001496-005_a

NOTE: When closing, make sure cover is secured properly. You will hear a "clic".

15) Drive Belt Guard

Drive Belt Guard Removal

⚠ WARNING

NEVER operate engine:

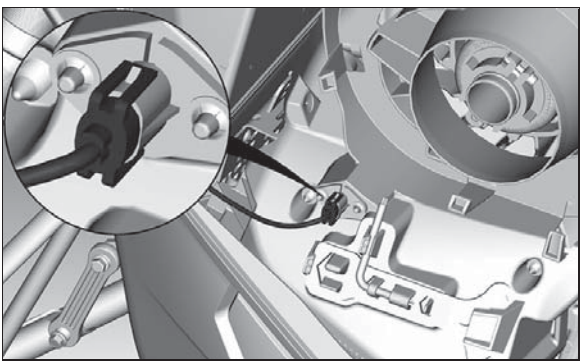
- Without shields and belt guard securely installed.
- With hood or side panels opened or removed.

NEVER attempt to make adjustments to moving parts while engine is running.

Belt guard is purposely made slightly oversize to maintain tension on its pins and retainers preventing undue noise and

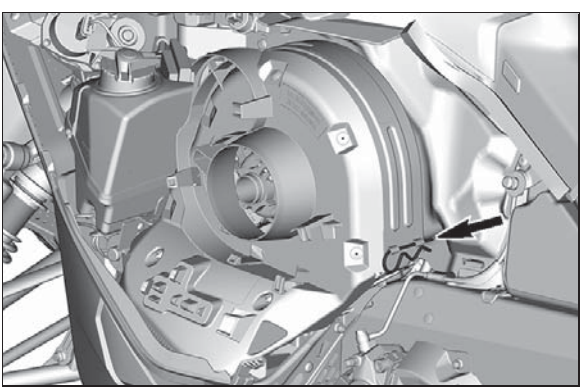
vibration. It is important that this tension be maintained when reinstalling.

1. Remove tether cord cap from engine cut-off switch.
2. Open the LH side panel. See procedure in this section.
3. Disconnect the drive belt temperature sensor, if equipped.



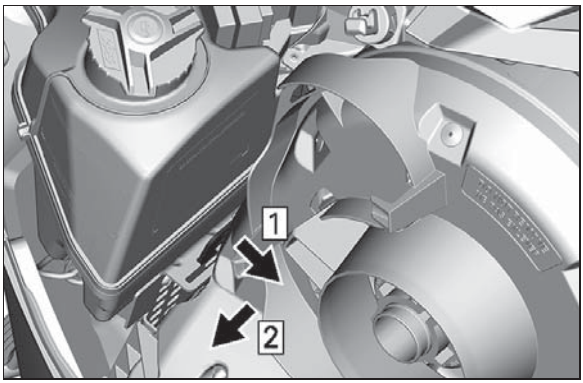
520002095-001

4. Remove retaining pin.



520002104-200

5. Slide belt guard rear and outward.



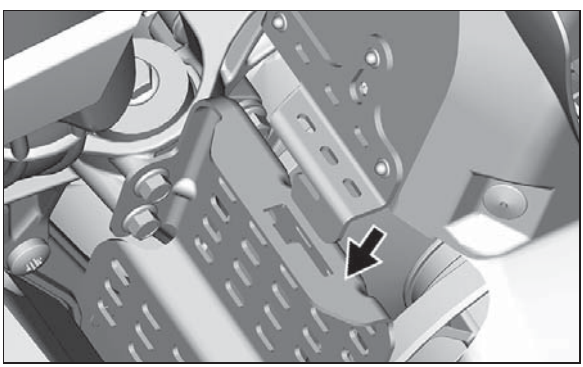
520002104-201

Step 1: Slide rearward
Step 2: Slide outward

6. Lift belt guard out.

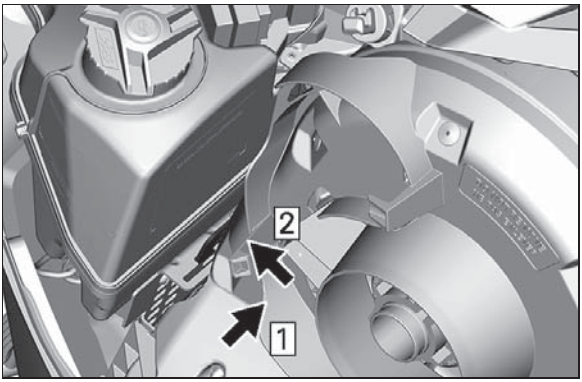
Drive Belt Guard Installation

1. Insert belt guard tab in front support slot.



219100985-017-001_a
PARTS REMOVED FOR CLARITY

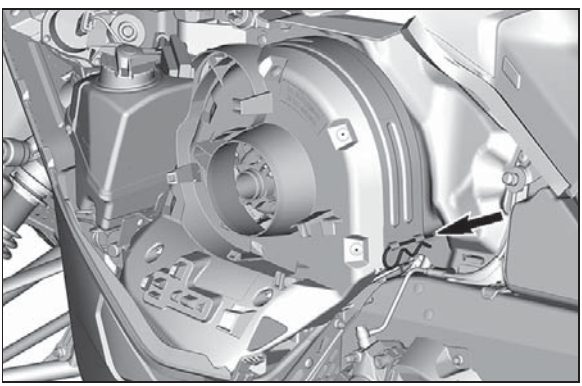
2. Push drive belt guard toward engine then toward front of vehicle.



520002104-202

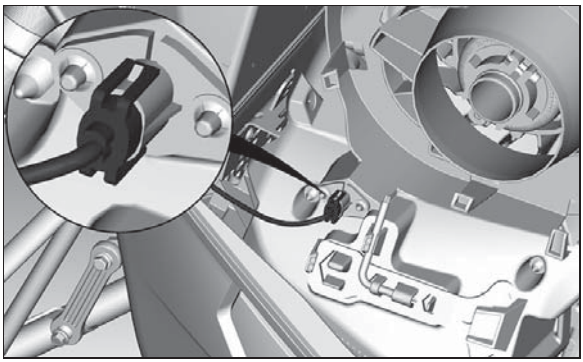
Step 1: Slide toward engine
Step 2: Slide toward front of vehicle

3. Position the rear portion of the belt guard over the retainer and secure it using the retaining pin.



520002104-200

4. Reconnect the drive belt temperature sensor, if equipped.

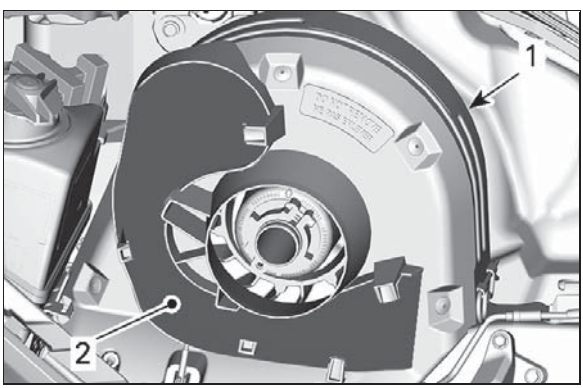


520002095-001

16) Spare Drive Belt Holder

A spare drive belt can be stored in a holder located on the drive belt guard. The spare drive belt is sold separately.

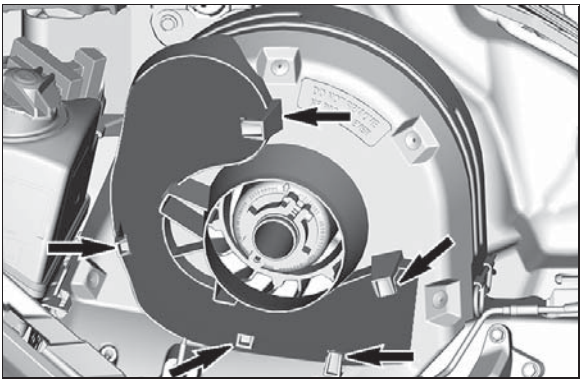
Position spare drive belt into drive belt guard slot.



520001897-002_a

1. *Drive belt guard*
2. *Slot*

Secure in place by sliding it behind the tabs.



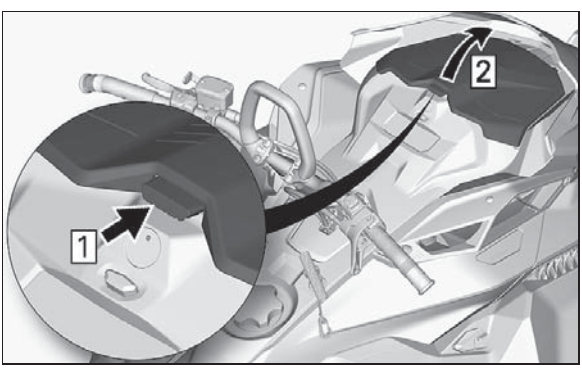
520001897-002_b

17) Upper Body Module (Hood)

Upper Body Module Removal

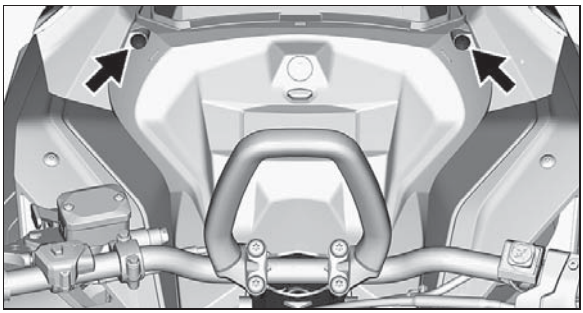
Models with Storage Compartment

1. Remove the windshield.
2. Open the storage compartment.



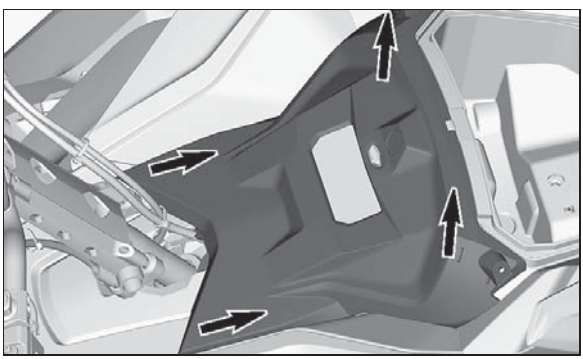
520001496-005_a

3. Remove the gauge support retaining screws.



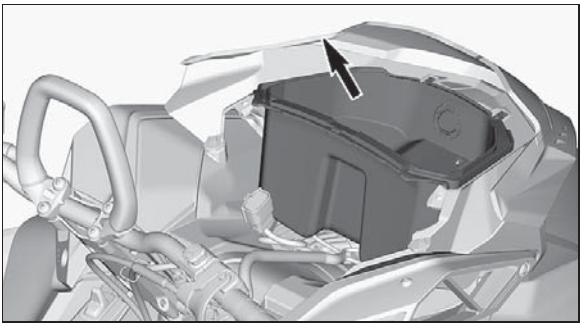
520001496-006_a

4. Lift the front of the gauge support, then slide it forward to remove it.



520001496-007_b

5. Disconnect the gauge and remove the gauge support from vehicle.
6. Remove the storage compartment.



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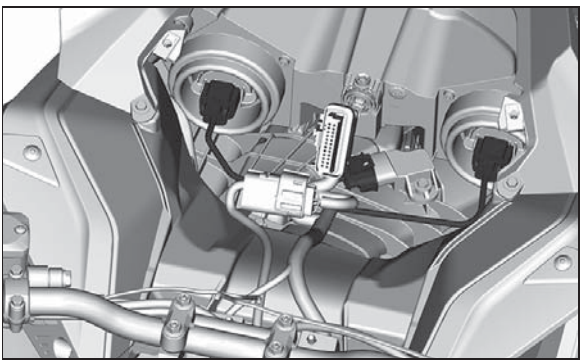
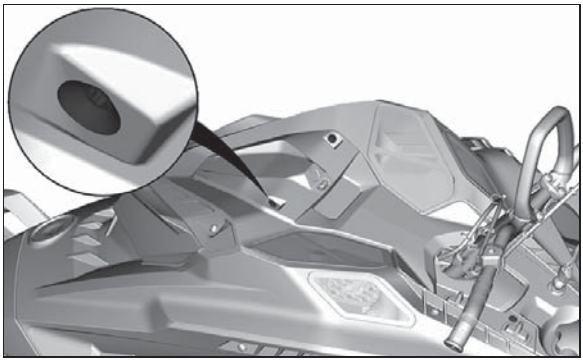
7. Disconnect the MAPTS and headlight connectors.



mmr2017-051-012

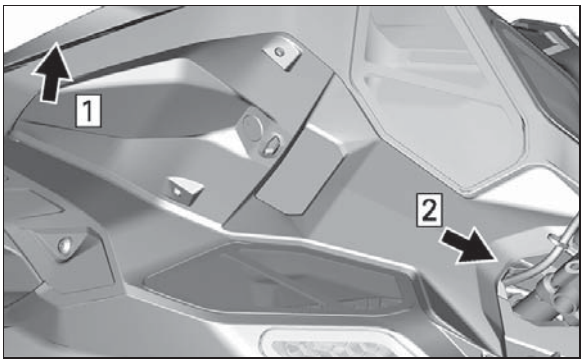
Models without Storage Compartment

8. Remove the gauge support retaining screws.



520002095-002

9. Remove the gauge support as per the illustration.

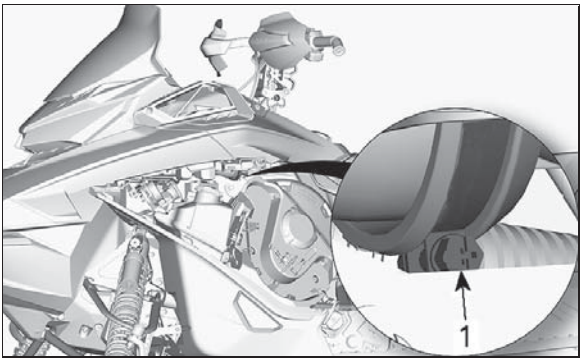


520002095-003_a

10. Disconnect the gauge and remove the support from the vehicle.
11. Disconnect the headlight connectors.

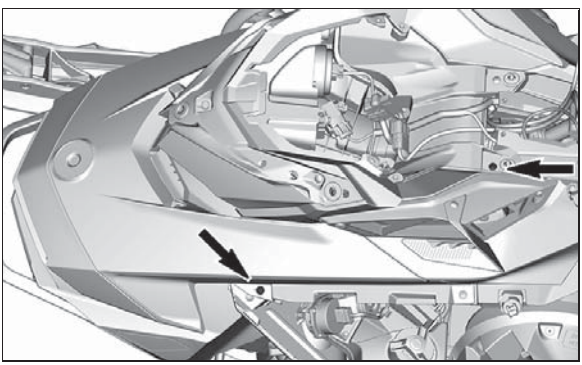
All Models

12. Loosen the air intake duct clamp.



520001663-026_a
TYPICAL
1. Clamp

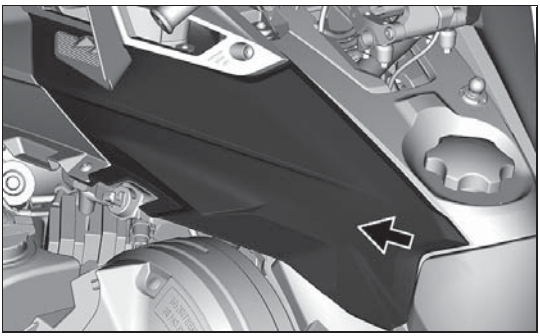
13. Remove the upper body module retaining screws on both sides.



mmr2017-051-014_a
TYPICAL

14. Remove the upper body module.
    14.1 Grab the upper body module in the gauge support section.
    14.2 Pull the module forward.

14.3 Make sur to release the rear tabs from console slots.



mmr2017-051-015_a
TYPICAL

14.4 Remove the module from the vehicle.

Upper Body Module Installation

1. At front, insert the upper body module tabs into the upper bottom pan openings.

mmr2017-051-016

2. Lower the rear end of the upper body module.

3. Insert the rear end hooks of the upper body module into the slots in the console.

Make sure the air intake silencer is correctly inserted in the duct.

4. Tighten air intake duct clamp.
5. On both sides, install the upper body module retaining screws.

Tightening Torque	
Upper body screws	1.8 ± 0.2 Nm (16 ± 2 lbf-in)

6. Connect the headlight connectors.

Models with Multi-Pieces Hood

7. Connect the manifold air pressure and temperature sensor (MAPTS) connector.
8. Install the storage compartment but leave the cover open.

All Models

9. Install the gauge support.

Tightening Torque	
Gauge support screws	2.3 ± 0.2 Nm (20 ± 2 lbf-in)

10. Install the windshield and the side panels

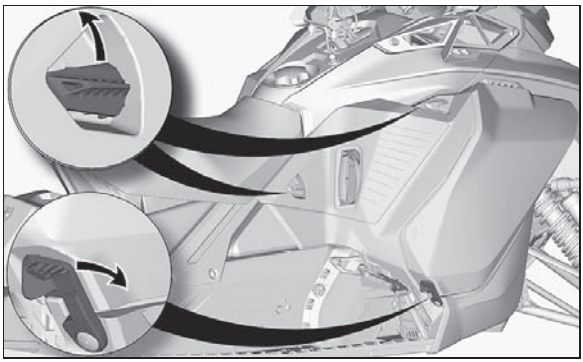
18) Side Panels

⚠ WARNING

Never operate engine with side panels opened or removed from vehicle.

Side Panels Opening and Closing

Unlock all latches, then open panel.



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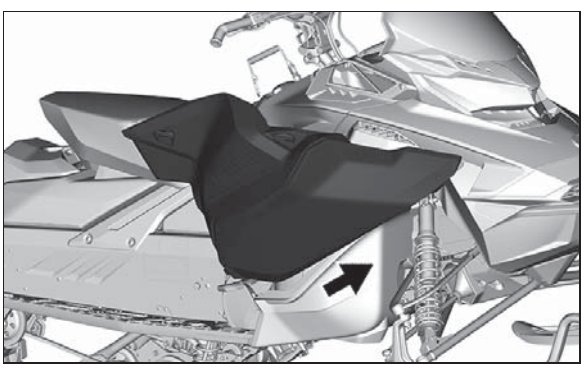
When closing panel, make sure latches are locked securely.

Side Panels Removal

Open side panel.

Pull the hinges off the bottom pan.



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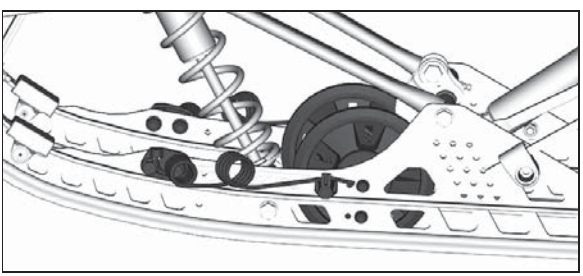
19) Rewind Starter Handle (if equipped)

Auto-rewind type located on right hand side of snowmobile. To engage mechanism, pull handle slowly until a resistance is felt then pull vigorously. Slowly release handle.

NOTE: The maximum torque that can be transmitted to the engine by the rewind starter is 80 Nm (59 lbf-ft). The maximum force that can be exerted on the rope is 2 200 N (494.6 lbf).

20) Ice Scratchers

Summit models are factory equipped with 2 idler wheels, and 2 ice scratchers which provide lubrication and cooling to slides and track guides for **short rides** on ice and hard packed trails.



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Ice scratchers must be used whenever the vehicle is operated on a trail, hard snow or ice.

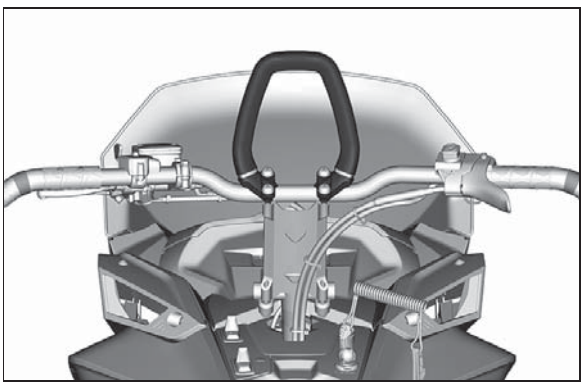
BRP ice scratchers are designed to be used in forward or reverse.

21) Operator's Guide

The Operator's Guide is stored in the *STORAGE COMPARTMENT* if equipped. Otherwise it is attached to the injection oil reservoir.

22) Mountain Strap

The handlebar strap shall be used only to provide additional pulling force when snowmobile is stuck in a slanted position. On an exceptional basis it can be used at very slow speed only, when standing on the right running board to bring the vehicle back on its desired path. When riding, both hands should remain on the handlebar grips to provide braking capability, as well proper steering and directional control. Do not use handlebar strap for towing, lifting or side hilling.



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⚠ WARNING

Do not use the handlebar strap while riding at speed. Steering control is highly reduced and brake control is not possible.

23) Adjustable Stopper Strap (if equipped)

Can be used to adjust the stopper strap length. refer to *TUNE YOUR RIDE*.

Horn Button

For Vehicles Sold in Finland Only

The horn button is mounted on the handlebar. Press it to activate the electric horn.

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FUEL

Fuel Requirements

NOTICE Always use fresh gasoline. Gasoline will oxidize; the result is loss of octane, volatile compounds, and the production of gum and varnish deposits which can damage the fuel system.

Alcohol fuel blending varies by country and region. Your vehicle has been designed to operate using the recommended fuels, however, be aware of the following:

- Use of fuel containing alcohol above the percentage specified by government regulations is not recommended and can result in the following problems in the fuel system components:
  - Starting and operating difficulties.
  - Deterioration of rubber or plastic parts.
  - Corrosion of metal parts.
  - Damage to internal engine parts.
- Inspect frequently for the presence of fuel leaks or other fuel system abnormalities if you suspect the presence of alcohol in gasoline exceeds the current government regulations.
- Alcohol blended fuels attract and hold moisture which may lead to fuel phase separation and can result in engine performance problems or engine damage.

Recommended Fuel

Use unleaded gasoline containing MAXIMUM 10% ethanol. The gasoline must have the following minimum octane requirements.

Fuel Type	Engine	Min. octane rating
Fuel with NO ethanol	850 E-TEC 850 E-TECTurbo 600R E-TEC	91 AKI (RON+MON)/2 95 RON
Fuel which may contain up to 10% MAX ethanol	850 E-TEC 850 E-TECTurbo 600R E-TEC	91 AKI (RON+MON)/2 95 RON

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.

Vehicle Fueling Procedure

⚠ WARNING

Always stop engine before refueling.

WARNING

- Fuel is flammable and explosive under certain conditions.
- Never use an open flame to check fuel level.
- Never smoke or allow flame or spark in vicinity.
- Always work in a well-ventilated area.

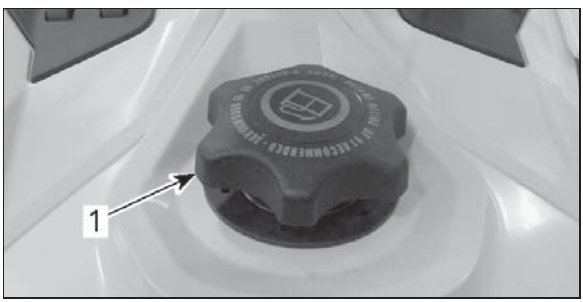
1. Stop engine.
2. Have operator and passenger get off vehicle.

⚠ WARNING

Do not allow anyone seated on the vehicle while fueling.

3. Unscrew slowly the fuel reservoir cap counterclockwise to stabilize pressure before removing it.

NOTE: A short whistling sound is normal.



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TYPICAL

1. Fuel tank cap

4. Insert the spout into the filler neck.
5. Pour fuel slowly so that air can escape from the tank and prevent fuel flow back. Be careful not to spill fuel.
6. Stop filling when the fuel reaches the bottom of filler neck. **Do not overfill.**

WARNING

Never top up the fuel tank before placing the vehicle in a warm area. As temperature increases, fuel expands and may overflow.

7. Fully tighten fuel reservoir cap clockwise.

⚠ WARNING

Always wipe off any small fuel spillage from the vehicle. If a major spillage occurs, remove side panels to remove fuel vapors from engine compartment before starting.

INJECTION OIL

Recommended Injection Oil

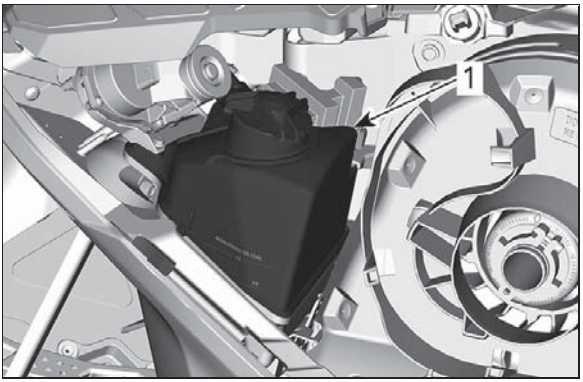
Rotax® engines were developed and validated using the XPS™ oil. BRP recommends the use of its XPS injection oil or an equivalent at all time. Damages caused by the use of an injection oil not suitable for this 2-stroke direct fuel injection engine may not be covered by the BRP Limited Warranty.

Recommended Injection Oil
XPS 2T E-TEC Synthetic Oil
IF THE RECOMMENDED XPS ENGINE OIL IS NOT AVAILABLE
Use a 2-stroke lubricant designed for snowmobiles meeting or exceeding the following lubricant industry specifications: - **JASO FD (M345-2004)** - **SAE Grade 4 (F / M 4)**

Injection Oil Level Verification

The injection oil reservoir is located behind the LH side panel. See *CONTROLS, INSTRUMENTS AND EQUIPMENT* for opening procedure.

Always maintain a sufficient amount of recommended injection oil in the injection oil reservoir.



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1. Oil reservoir

Marks on the tank indicates "3/8" and "1/2" of the total amount of oil.

NOTICE Check level and refill every time you refuel.

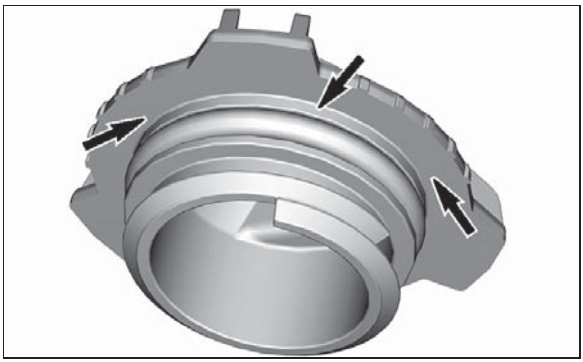
To Add Injection Oil

Remove injection oil reservoir cap.

Add injection oil.

Do not overfill.

Wipe the reservoir cap seal and flange area.



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Reinstall cap.

NOTICE Do not overtighten.

⚠ WARNING

Wipe off any oil spills. Oil is highly flammable when heated.

BREAK-IN PERIOD

Operation During Break-In

Engine

During the break-in period:

- Avoid prolonged full throttle operation.
- Avoid sustained accelerations.
- Avoid prolonged cruising speeds.
- Avoid engine overheating.

However, brief accelerations and speed variations contribute to a good break-in.

During a predetermined period, the engine management system controls some engine parameters.

The duration is based on fuel volume. It will take approximately two fuel tanks to complete the break-in.

During this period:

- The engine performance and behavior will not be optimal.
- The fuel and oil consumption will be higher.

Drive Belt

A new drive belt requires a break in period of 50 km (30 mi).

During the break-in period:

- Avoid strong acceleration and deceleration.
- Avoid pulling a load.
- Avoid high speed cruising.

If the vehicle creeps, lower the drive belt height from the preliminary setting. Refer to *DRIVE BELT* in *MAINTENANCE PROCEDURE*.

Engine Starting Procedure

Procedure

1. Apply parking brake.
2. Check throttle control lever operation.
3. Put your helmet on.
4. Ensure that the tether cord cap (D.E.S.S. key) is installed on the engine cut-off switch (D.E.S.S. post) and that the cord is attached to your clothing eyelet.
5. Ensure that the emergency engine stop switch is in the ON position (up).

⚠ WARNING

Never depress throttle while starting engine.

6. Release parking brake.

NOTE: For an initial cold start, do not release parking brake. Perform the *VEHICLE WARM-UP* procedure as explained below.

Manual Start Models

Grab rewind starter handle, pull handle slowly until a resistance is felt, then hold handle firmly and pull vigorously to start engine.

NOTE: The maximum torque that can be transmitted to the engine by the rewind starter is 80 Nm (59 lbf-ft). The maximum force that can be exerted on the on the rope is 2 200 N (494.6 lbf).

SHOT Models

The SHOT system uses an ultracapacitor instead of a battery as an energy source.

To enable the SHOT system:

- Start engine manually as explained above
- Let the engine run for at least 2 minutes.

NOTE: If engine temperature is below 0 °C (32 °F), it may have to run longer than 2 minutes.

Once the engine is turned off, the system will be able to start the engine for the next 30 minutes.

Depress the START/RER button to start the engine. Release button immediately when engine has started.

After 30 minutes, with the engine off, the system loses power and may not be able to start the engine. In such case, start engine manually and the system will be enabled again.

Electric Start Models

Depress the START/RER button to engage the electric starter and start the engine. Release button immediately when engine has started.

NOTICE Do not engage electric starter for more than 10 seconds at a time. A rest period should be observed between the cranking cycles to allow electric starter to cool down.

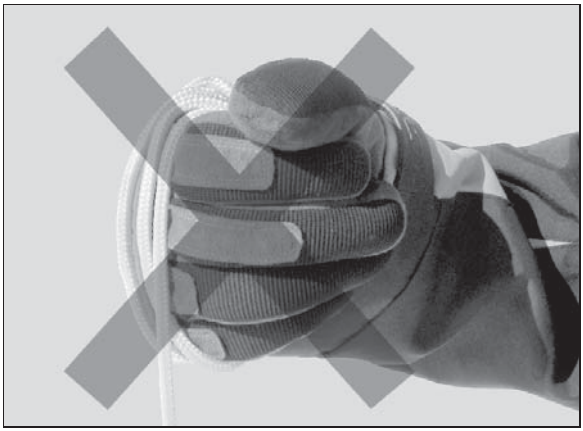
Emergency Starting

The engine can be started with the emergency starter rope supplied in the storage compartment, see *CONTROLS, INSTRUMENTS AND EQUIPMENT*.

Remove the drive belt guard, see *CONTROLS, INSTRUMENTS AND EQUIPMENT*.

⚠ WARNING

Do not wind starting rope around your hand. Hold rope by the handle only. Do not start the engine by the drive pulley unless it is a true emergency situation. Have the snowmobile repaired as soon as possible.



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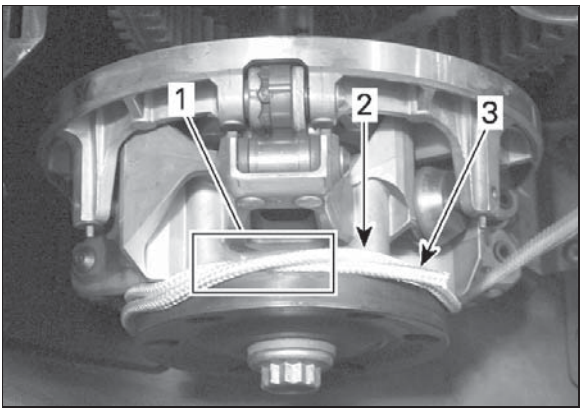
Attach one end of emergency rope to the rewind handle.

NOTE: The suspension adjustment tool can be used as an emergency handle.

Cross the rope on the first turn as shown.



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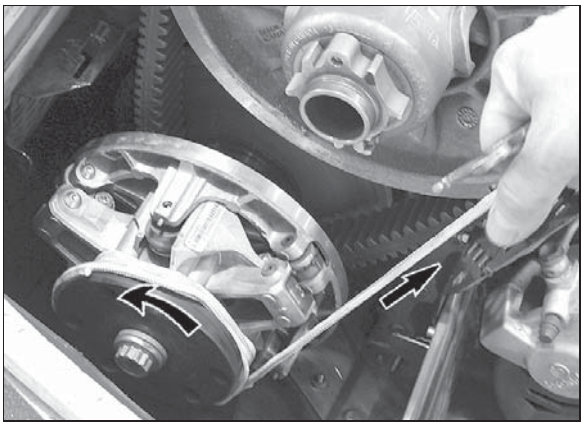
1. *Rope crossed*
2. *Rope to be winded*
3. *Rope end*

Wind rope two turns counterclockwise tightly around the drive pulley where shown.

Pull the rope using a sharp, crisp pull so the rope comes free of the drive pulley.



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Start engine as per usual manual starting.

⚠ WARNING

When starting the snowmobile in an emergency situation, using drive pulley, do not reinstall the belt guard and return slowly to have snowmobile repaired.

Vehicle Warm-Up

Before every ride, vehicle has to be warmed up as follows.

1. Start engine as explained in *ENGINE STARTING PROCEDURE* above.
2. Allow engine to warm up one or two minutes at idle speed.

NOTE: Engine will shut down after approximately 5 minutes of idling.

3. Disengage parking brake.
4. Apply throttle until drive pulley engages. Drive at low speed the first two or three minutes.

NOTICE If vehicle does not move when throttle is applied, stop engine, remove tether cord cap from the engine cut-off switch, then do the following.

- Check if skis are stuck on the ground. Lift one ski at a time by the handle, then put it down.
- Check if track is stuck on the ground. Lift rear of snowmobile enough to clear track from the ground, then drop.
- Check rear suspension for hard snow or ice accumulation that could interfere with track rotation. Clean the area.

⚠ CAUTION

Beware of injuries by using proper lifting techniques, notably by using your legs to lift instead of your back. Do not attempt to lift the rear of vehicle if it is above your limits.

⚠ WARNING

Make sure tether cord cap is removed before standing in front the vehicle, getting close to the track or rear suspension components.

NOTE: Warm-up is electronically controlled. During this period (up to 10 minutes depending on ambient temperature), engine RPM is limited.

Reverse (RER)

When the engine is running, depressing the RER button will slow down engine RPM to almost a stop and advance the ignition timing to invert crankshaft rotation.

- Engine will automatically shift into forward when restarting after stopping or stalling.
- Shifting procedure will take place only when the engine is running.
- If engine is running at a speed above 4300 RPM, the function of the RER button is disabled.
- It is recommended to warm up the engine to its normal operating temperature before shifting.

Shifting in Reverse

1. Bring vehicle to a complete stop.
2. Apply and hold brake. Remain seated, refer to *RIDER POSITION (REVERSE OPERATION)* in *RIDING THE VEHICLE* for posture information.
3. With engine at idle speed, press and release the RER button.
4. Wait until reverse beeper sounds, then gently depress throttle lever.

⚠ WARNING

Engaging the reverse mode is done by depressing the RER button when the engine is running. Wait until the reverse alarm sounds and the RER pilot lamp comes on in the digital gauge before operating throttle to proceed in reverse. The reverse speed is not limited. Always proceed with caution as fast reverse could result in loss of vehicle stability. Come to complete stop before depressing RER button. Always remain seated and apply the brake before shifting. Ensure the path behind is clear of obstacles or bystanders before proceeding.

Shifting in Forward

1. Bring vehicle to a complete stop.
2. Apply and hold brake.
3. Press and release the RER button.
4. RER pilot lamp will stop.
5. Apply throttle slowly and evenly. Allow drive pulley to engage then accelerate carefully.

Shutting Off the Engine

Release throttle lever and wait until engine has returned to idle speed.

Shut off the engine using either the emergency engine stop switch or by pulling off the tether cord cap from the engine cut-off switch.

⚠ WARNING

Always remove the tether cord cap from engine cut-off switch when vehicle is not in operation in order to prevent accidental engine starting or to avoid unauthorized use by children or others or theft.

RIDING CONDITIONS AND YOUR SNOWMOBILE

Altitude

At factory, your snowmobile was calibrated to be used within an altitude range (relative to sea level).

A new snowmobile has a tag attached to the handlebar indicating its calibration. See *IMPORTANT ON-PRODUCT LABELS*.

If for any reason you don't know your snowmobile calibration, contact an authorized Ski-Doo dealer.

If your snowmobile is to be used at an altitude outside the specified range, have it calibrated accordingly by an authorized Ski-Doo dealer.

NOTICE An inappropriate altitude calibration would decrease performance and may cause serious damage to the snowmobile.

Temperature

The engine management of these engines provides the optimum air/fuel ratio for all temperatures.

Hard Packed Snow

The models covered in this guide are built for deep snow conditions and should never be used during prolonged time in marginal or hard packed snow conditions.

NOTICE Using mountain models in marginal or hard packed snow conditions could reduce drastically the lifetime of specific wear items.

BRP does **not recommend** to ride a snowmobile equipped with high lug profile track at **high speed** in a trail, on hard packed surfaces or ice for an extended period of time.

In the event that you have to; **reduce your speed** and minimize the distance you ride on those surfaces.

NOTICE Running those tracks at high speed in a trail, on hard packed surfaces or ice put more stress on the lugs, which tend to heat up as a result. To avoid potential degradation or

damage to the track, reduce your speed, then minimize the distance you ride on those surfaces.

Vehicles Equipped with Ice Scratchers

Ice scratchers are equipped on the vehicle to increase engine cooling efficiency, to lubricate and to cool track clips and sliders. They must be used whenever on ice, hard packed snow, or any conditions that do not lift enough snow particles into the rear suspension/tunnel.

NOTICE Although it is not recommended to ride Summit and Freeride in trail or hard snow conditions, it is highly suggested to combine idler wheels with ice scratchers if the vehicle is used in those conditions.

SPECIAL OPERATION

Towing an Accessory

Always use a rigid tow bar to tow an accessory. Any towed accessory should have reflectors on both sides and at the rear. Check local laws for brake light(s) requirements.

⚠ WARNING

Never tow an accessory with a rope. Always use a rigid tow bar. Using a rope would result in a collision between the object and the snowmobile and possibly in a tip over in case of a rapid deceleration or on a downward slope.

Towing Another Snowmobile

If a snowmobile is disabled and must be towed use a rigid tow bar. Remove the drive belt from disabled snowmobile, refer to *DRIVE BELT* in *MAINTENANCE PROCEDURES* and tow at moderate speed.

NOTICE Always remove the drive belt of the snowmobile that is to be towed to prevent damage to its belt and drive system.

In an emergency situation only, if a rigid tow bar is not available, a rope can be used. Proceed with extra caution. In some areas, it may be illegal to do so. Check with state or local authorities.

Remove the drive belt, attach the rope to the ski legs (spindles), have someone sit on the towed snowmobile to activate the brake, and tow at low speed.

NOTICE In order to prevent damage to the steering system, never attach the tow rope to the ski loops (handles).

WARNING

Never ride at high speed when towing a disabled snowmobile. Proceed slowly with extra caution.

TUNE YOUR RIDE

Snowmobile handling and comfort depend upon multiple adjustments.

⚠ WARNING

Suspension adjustment could affect vehicle handling. Always take time to familiarize yourself with the vehicle's behavior after any suspension adjustment have been made. Always adjust LH and RH suspension components to the same setting.

Choice of suspension adjustments vary with carrying load, operator's weight, personal preference, riding speed and field condition.

NOTE: Some adjustments may not apply to your snowmobile.

WARNING

Before proceeding with any suspension adjustment, remember:

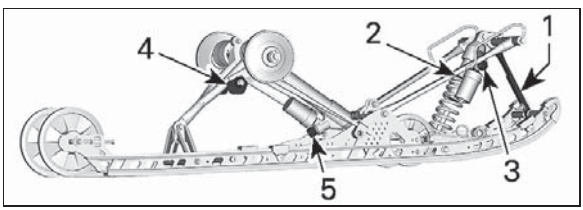
- Park in a safe place.
- Remove the tether cord cap from the engine cut-off switch.
- Use appropriate lifting device or have assistance to share lifting stress. If a lifting device is not used, use proper lifting techniques, notably by using your legs to lift instead of your back.
- Do not attempt to lift the front or rear of vehicle if it is above your limits.
- Support front of vehicle off the ground with a suitable device before adjusting suspension.
- Support rear of vehicle off the ground with a wide-base snowmobile stand with a rear deflector panel.
- Make sure support device is stable and secure.

The best way to set up the suspension is to customize each adjustment one at a time. Various adjustments are interrelated. It may be necessary to readjust center spring after adjusting front springs for instance. Test run the snowmobile under the

same conditions; trail, speed, snow, operator riding position, etc. Proceed methodically until you are satisfied.

Following are guidelines to fine-tune suspension. Use suspension adjustment tool provided in the tool kit.

Rear Suspension Adjustments



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TMOTION ADJUSTABLE COMPONENTS

1. *Stopper strap*
2. *Center spring*
3. *Center shock absorber*
4. *Rear spring*
5. *Rear shock absorber*

Stopper Strap

Stopper strap length has an effect on the amount of weight the center spring has to carry especially during acceleration, therefore on the front end uplift.

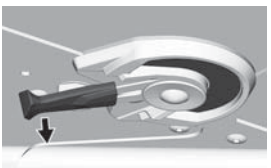
Stopper strap length also has an effect on center spring travel.

When operating the snowmobile in deep snow or hill climbing, it may be necessary to vary stopper strap length and/or riding position, to change the angle at which the track rides on the snow. Operator's familiarity with the various adjustments as well as snow conditions will dictate the most efficient combination.

Generally, a longer stopper strap setting gives better performance in deep snow on a flat landscape and a shorter setting will improve handling in steep hill climbing conditions.

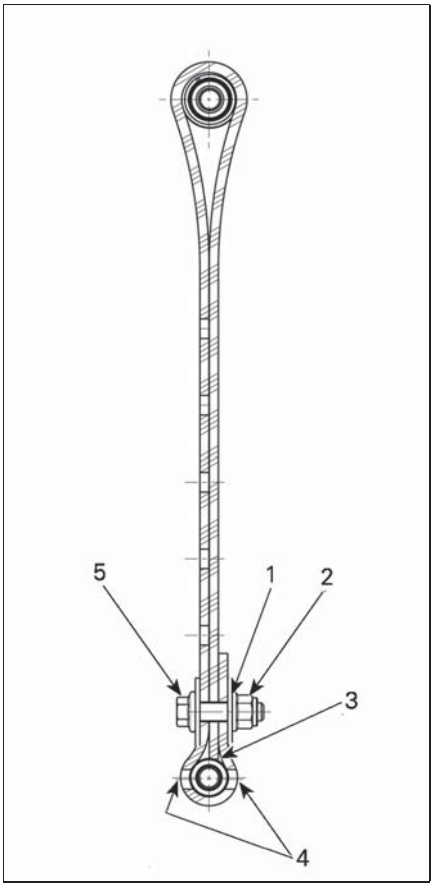
On models equipped with a quick adjust stopper strap system, the lever position can be changed at any time. The crank mechanism will switch position when tension on strap is

released, i.e. when front portion of suspension is slightly compressed.

From short to long	
	

Stopper Strap Setting	
Position	**use**
1	Longest strap position for optimal bump absorption
2	Boon docking: - Better boon docking manoeuvrability - Better bump absorption - Better deep snow starts (forward and reverse)
3	Factory setting: Best overall setting (general use)
4	Hill climb: - Better track attack angle for hill climbing
5	Steep hill climb: - Better track attack angle for hill climbing - Less transfer - Lower ride height

Illustrations below are for position 1 and 3.



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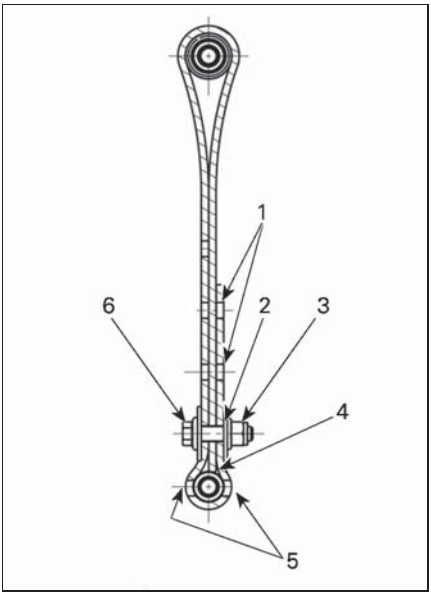
STOPPER STRAP POSITION 1 (LONGEST, 1ST HOLE)

1. *1st hole from end*
2. *Towards rear*
3. *Tip of strap touching strap axis*
4. *Two holes left open between screw head and nut*
5. *Towards front*



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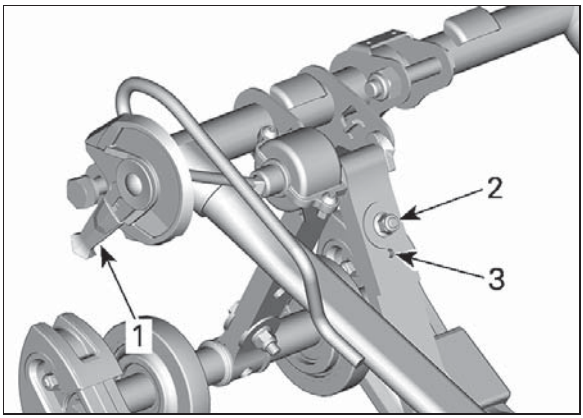
STOPPER STRAP IN POSITION 3 (3RD HOLE)

1. *Free holes*
2. *3rd hole from end*
3. *Towards rear*
4. *Tip of strap touching strap axis*
5. *Two holes left open between screw head and nut*
6. *Towards front*

From factory, the quick adjust stopper strap system is set in the way where the "long" position = setting #3 on regular stopper strap. The "short" position = setting #5 on the regular position. You also have the possibility to adjust the stopper strap bolt to long position (see picture) and the regular strap to setting #2. Then the "long" position will = setting #2 and the short position = setting #4



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QUICK ADJUST STOPPER STRAP SYSTEM

1. *Handle*
2. *Short position (Position 3 to 5) (factory setting)*
3. *Long position (Position 2 to 4)*

NOTE: Smaller numbers correspond to a longer strap setting.

Decreasing the stopper strap length may reduce comfort. Always install stopper strap bolt as close as possible to the lower shaft (two holes left open between screw head and nut).

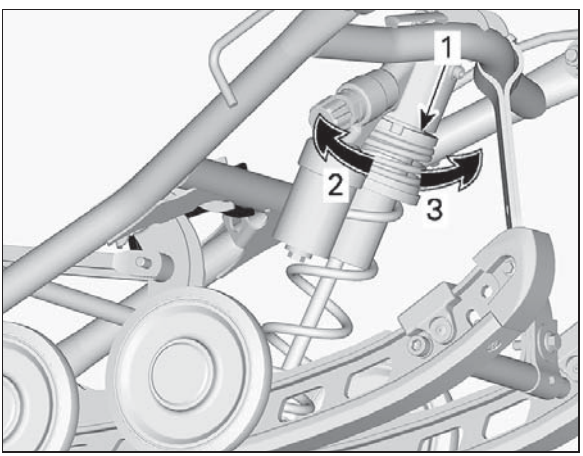
NOTICE Whenever stopper strap length is changed - except when using the quick adjust lever - track tension must be checked.

Center Spring

Center spring preload has an effect on steering effort, handling and bump absorption.

Also, since center spring preload adjustment puts more or less pressure on the front of the track, it has an effect on the performance in deep snow.

Action	Result
Increasing preload	Lighter steering
	More bump absorption capability
	Better deep snow starts
	Better deep snow performance and handling
Decreasing preload	Heavier steering
	Less bump absorption capability
	Better trail handling



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TYPICAL - RING TYPE

1. *Spring preload adjustment ring*
2. *Increase preload*
3. *Decrease preload*

For cam type or ring type preload adjuster, use the suspension adjustment tool provided in the tool kit.

Rear Springs

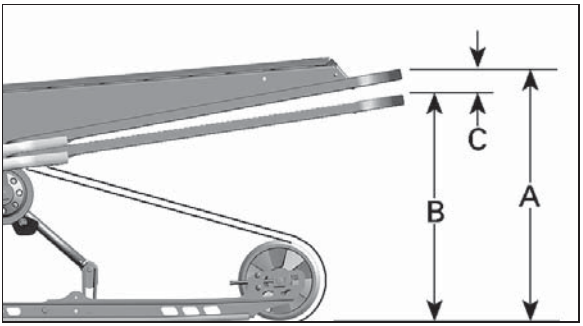
Rear spring preload has an effect on comfort, ride height and load compensation.

Also, adjusting rear spring preload shifts more or less weight to the snowmobile front end. As a result, more or less weight is applied to the skis. This has an effect on performance in deep snow, steering effort and handling.

Slight suspension bottoming occurring under the worst riding conditions indicates a good choice of spring preload.

Action	Result
Increasing preload	Firmer rear suspension
	Higher rear end
	More bump absorption capability
	Heavier steering
Decreasing preload	Softer rear suspension
	Lower rear end
	Less bump absorption capability
	Lighter steering
	Better deep snow performance and handling

Refer to the following to determine if preload is correct.



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TYPICAL - PROPER ADJUSTMENT

A. Suspension fully extended

B. Suspension has collapsed with operator, passenger and load added

C. Distance between dimension “A” and “B”, see table below

”C”	What to do
65 mm to 100 mm (2.5 in to 4 in)	No adjustment required
More than 100 mm (4 in)	Adjusted too soft. Increase preload
Less than 65 mm (2.5 in)	Adjusted too firm. Decrease preload

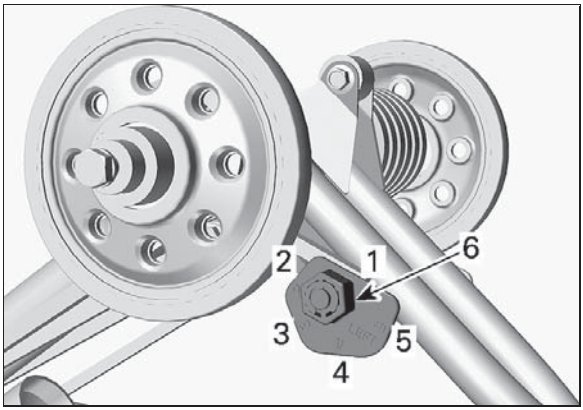
If the specification is unattainable with the original springs, see an authorized Ski-Doo dealer for other available springs.

To increase spring preload, using tool, always turn the left side adjustment cam in a clockwise direction, and the right side cam in a counterclockwise direction.

CAUTION

Never set preload cams directly from position 5 to 1 or directly from position 1 to 5.

The adjustment cams have 5 different settings, 1 being the softest.



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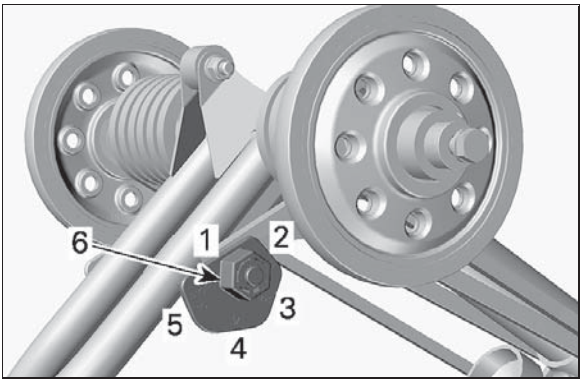
LH SIDE

1. *Position 1*
2. *Position 2*
3. *Position 3*
4. *Position 4*
5. *Position 5*
6. *Adjustment nut*



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RH SIDE

1. *Position 1*
2. *Position 2*
3. *Position 3*
4. *Position 4*
5. *Position 5*
6. *Adjustment nut*

Center and Rear Shock Absorber

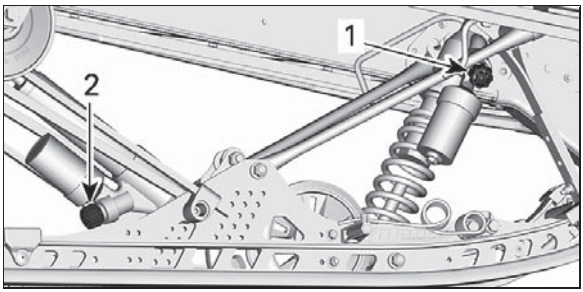
Compression Damping (KYB PRO Series Only)

Both low and high speed compression damping are adjusted simultaneously.

Low speed compression damping controls how the shock absorber reacts to a low suspension velocity (slow compression strokes, in most cases when riding at lower speeds).

High speed compression damping controls how the shock absorber reacts to a high suspension velocity (quick compression strokes, in most cases when riding at higher speeds).

To adjust, turn the adjuster button located on the reservoir.



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TMOTION

1. *Center shock button*
2. *Rear shock button*

Turning	Action	Result on big and small bumps
Clockwise	Increasing compression damping force	Firmer compression damping
Counter Clockwise	Decreasing compression damping force	Softer compression damping

Front Suspension Adjustments

Ski Stance

Ski stance can be set to different width.

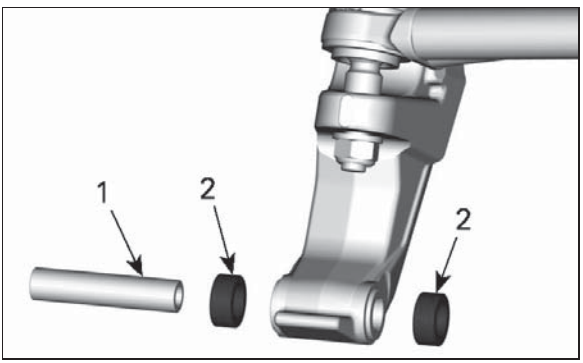
Proceed as follows to change the stance setting:

1. Lift the front of vehicle.
2. Remove the ski bolt.
3. Place the spacer according to the desired stance. Refer to table and illustration.

⚠ WARNING

Proceed to the same setting for both skis.

Ski Stance Settings		
Narrow	Place both spacers on the inside of the ski leg	Allows snowmobile to fit in narrow spaces
Middle	Place one spacer on each side of the ski leg	Best overall position
Wide	Place both spacers on the outside of the ski leg	Best for trail riding



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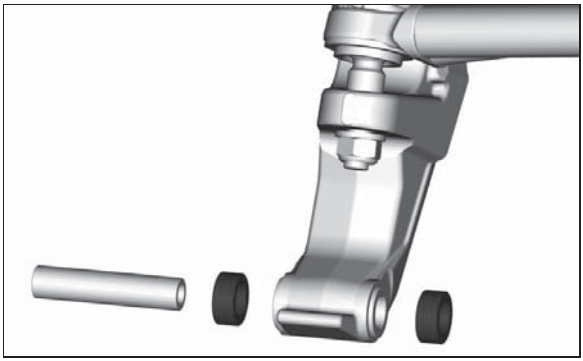
RH SIDE SHOWN

1. *Ski axle*
2. *Spacers*



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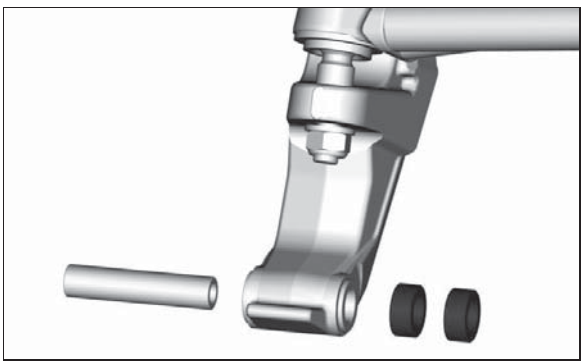
MIDDLE - SPACERS EACH SIDE



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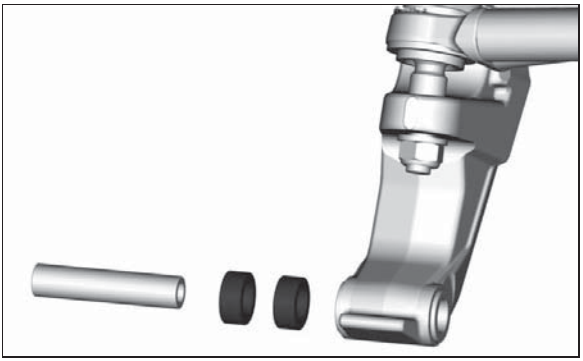
NARROW - SPACERS INSIDE



520002347-003
WIDE - SPACERS OUTSIDE

4. Tighten nut to the specified torque.

Tightening Torque	
Ski nut	48 ± 6 Nm (35 ± 4 lbf-ft)

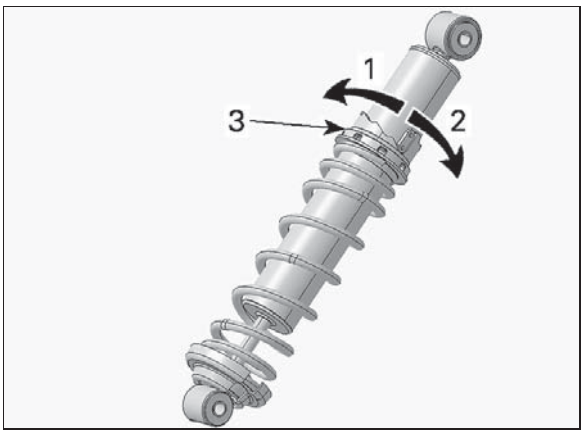
Front Springs

Front spring preload has an effect on front suspension firmness.

Front spring preload also has an effect on the steering behavior.

Action	Result
Increasing preload	Firmer front suspension
	Higher front end
	More precise steering
	More bump absorption capability
Decreasing preload	Softer front suspension
	Lower front end

Action	Result
Decreasing preload	Lighter steering
	Less bump absorption capability



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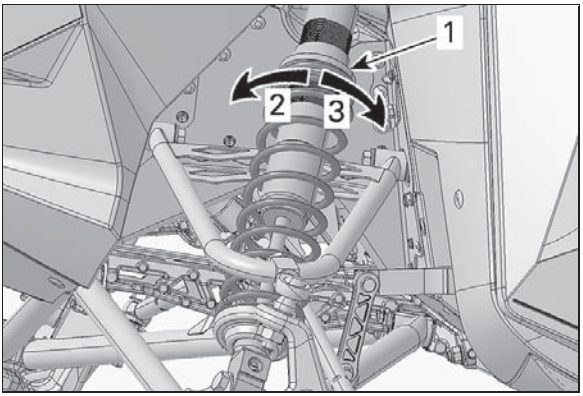
CAM TYPE - HPG SHOCK ABSORBER

1. *Decrease preload*
2. *Increase preload*
3. *Spring preload adjustment cam*



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TYPICAL - RING TYPE

1. *Spring preload adjustment ring*
2. *Increase preload*
3. *Decrease preload*

Front Shock Absorber

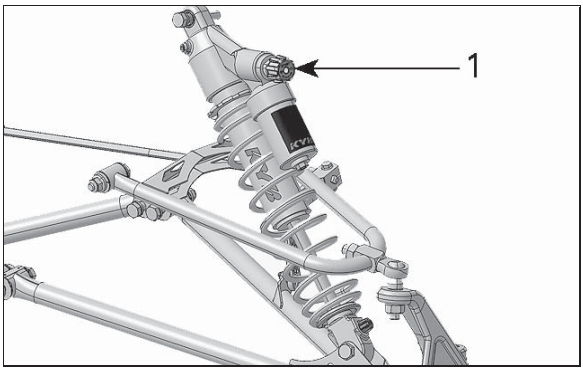
Front Shock Compression Damping (KYB PRO Series Only)

Both low and high speed compression damping are adjusted simultaneously.

Low speed compression damping controls how the shock absorber reacts to a low suspension velocity (slow compression strokes, in most cases when riding at lower speeds).

High speed compression damping controls how the shock absorber reacts to a high suspension velocity (quick compression strokes, in most cases when riding at higher speeds).

To adjust, turn the adjuster button located on the reservoir.



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1. Compression damping adjuster button

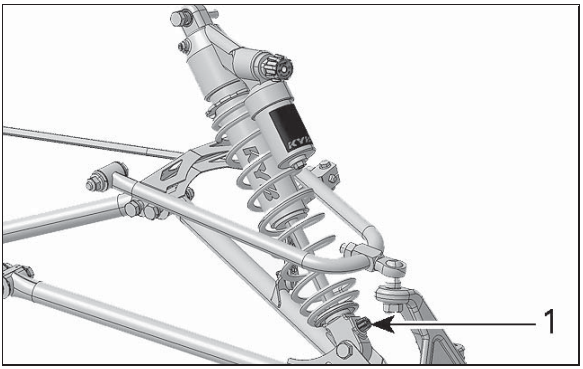
Turning	Action	Result on big and small bumps
Clockwise	Increasing compression damping force	Firmer compression damping
Counter Clockwise	Decreasing compression damping force	Softer compression damping

Shock Rebound Damping (KYB PRO R Series Only)

Rebound damping controls how the shock absorber restrains the extension stroke.

In repetitive short small bumps (ripple), it is recommended to use a lower rebound damping setting.

To adjust, turn the adjuster button or slot located at the bottom of the shock absorber.



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1. Rebound adjuster button

Turning	Action	Result on big and small bumps
Clockwise	Increasing rebound damping force	Firmer rebound damping (slower extension speed)
Counter Clockwise	Decreasing rebound damping force	Softer rebound damping (faster extension speed)

Adjustment Tips According to Vehicle Behavior

Problem	Corrective measures
Front suspension darting	Check ski alignment. - Reduce front suspension spring preload. - Increase center spring preload. - Reduce rear spring preload.
Steering feels too heavy at steady speeds	- Reduce front suspension spring preload. - Increase center spring preload.
Steering feels too heavy during acceleration	- Reduce rear spring preload. - Lengthen limiter strap.
Too much ski lift during cornering or acceleration	- Shorten limiter strap. - Increase rear spring preload.
Rear of snowmobile seems too stiff	- Reduce rear spring preload. - Reduce compression damping adjustment if equipped
Rear of snowmobile seems too soft	- Increase rear spring preload.

Problem	Corrective measures
Rear suspension is frequently bottoming	- Increase compression damping adjustment if equipped. - Increase rear spring preload. - Increase center spring preload. - Lengthen limiter strap. - Increase compression damping adjustment if equipped.
Snowmobile seems to pivot around its center	- Reduce center spring preload. - Increase rear spring preload. - Increase front suspension spring preload. - Shorten limiter strap.
Track spins too much at start	- Lengthen limiter strap.
Ski diving in deep snow	- Install ski tip enlarger.

VEHICLE TRANSPORTATION

Make sure that oil reservoir and fuel tank caps are properly installed.

Tilt bed trailers can easily be equipped with a winch mechanism to afford maximum safety in loading. Simple as it may seem, never drive your snowmobile onto a tilt bed trailer or any other kind of trailer or vehicle. Many serious accidents have resulted from driving up and over a trailer. Anchor your vehicle securely, front and rear, even on short hauls. Be certain all equipment is securely fastened. Cover your snowmobile when trailering to prevent road grime from causing damage.

Be certain your trailer meets state or provincial requirements. Ensure the hitch and safety chains are secure and the brake, turn indicators and clearance lights all function.

⚠ WARNING

Do not tow the vehicle facing backwards. If the vehicle is towed facing backwards, the wind may cause damage to the windshield or even loss of the windshield.

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PRE-RIDE INSPECTION

PRE-RIDE INSPECTION

⚠ WARNING

The pre-operation check is very important prior to operating the vehicle. Always check the proper operation of critical controls, safety features and mechanical components before starting.

Before Starting the Engine

1. Remove snow and ice from body including lights, seat, footrests, controls and instruments.
2. Verify that air silencer prefilter is free of snow.
3. Verify that skis and steering operate freely. Check corresponding action of skis versus handlebar.
4. Check fuel and injection oil (if applicable) for levels and leaks. Replenish if necessary and in case of any leaks; you should seek service from an authorized Ski-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. All storage compartments must be properly latched and they must not contain any heavy or breakable objects. Hood and side panels must be also properly latched.
6. Activate the throttle control lever several times to check that it operates easily and smoothly. It must return to idle position when released.
7. Activate the brake lever and make sure the brake fully applies before the brake control lever touches the handlebar grip. It must fully return when released.
8. Apply parking brake and check if it operates properly. Leave parking brake applied.
9. Inspect drive belt condition and height, refer to *DRIVE BELT* in *MAINTENANCE PROCEDURES*.

After Engine is Started

For proper engine starting procedure, refer to the appropriate *ENGINE STARTING PROCEDURE*.

1. Check headlights high beam and low beam, taillight, stop light and pilot lamps operation.

NOTE: You may need to detach tether cord from your clothes to check lights. In such a case, attach cord as soon as you get back at the controls of the snowmobile.

2. Check the engine cut-off switch (by pulling tether cord cap) and emergency engine stop switch operation.
3. Release parking brake.
4. Refer to *VEHICLE WARM UP* and follow instructions.

Pre-Ride Check List

ITEM	OPERATION	✔
Body including seat, footrests, lights, air filter, controls and instruments	Check condition and remove snow or ice.	
Skis and steering action	Check for free movement and proper operation.	
Fuel and injection oil	Check for proper level and no leaks.	
Coolant	Check for proper level and no leaks.	
Brake fluid	Check for proper level and no leaks.	
Storage compartment	Check for proper latching and no heavy or breakable objects.	
Track	Check condition and remove snow or ice.	
Throttle lever	Check for proper operation.	
Brake lever	Check for proper operation.	
Parking brake, Brake	Check for proper operation.	
Emergency engine stop switch and engine cut-off switch (D.E.S.S. key)	Check for proper action. Tether cord must be attached to operator clothing eyelet.	
Lights	Check for proper operation.	

Ski runners	Check for proper operation.	
Slider shoes	Check for proper operation.	
Drive belt	Check for cracks, fraying or abnormal wear and proper height.	
Horn (if equipped)	Check for proper operation.	

MAINTENANCE

MAINTENANCE SCHEDULE

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

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

⚠ 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 Ski-Doo dealers.

Although an authorized Ski-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 Ski-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 Ski-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.

During the first 1 500 km (1,000 mi)
Adjust drive chain **after the first 75 km (50 mi)**
Adjust drive chain **every 500 km (300 mi)**
Adjust and align track **after the first 75 km (50 mi)**
Verify track tension and alignment **every 500 km (300 mi)** adjust if required

Every 1 500 km (1,000 mi)
Adjust drive chain
Verify track tension and alignment. Adjust if required

Every 100 Hours or 3 000 km (2,000 mi) (Whichever Comes First)
Replace spark plugs (850 E-TEC Turbo)

Every Year at Preseason or 3 000 km (2,000 mi) (Whichever Comes First)
Perform pre-ride inspection
Check fault codes
Charge battery (if equipped)
Adjust drive chain
Verify track tension. Adjust and align if required
Inspect brake hose, pads and disk
Check coolant density
Verify coolant level in upper tank (850 E-TEC Turbo)
Inspect drive belt
Visually inspect and clean drive pulley
Inspect and clean driven pulley
Lubricate rear suspension. Lubricate whenever the vehicle is used in wet conditions (rain, puddles)

Every Year at Preseason or 3 000 km (2,000 mi) (Whichever Comes First)
Inspect exhaust system and check for leaks
Tighten exhaust manifold screws to specified torque
Inspect fuel lines, oil lines and connections
Inspect front suspension
Inspect rear suspension (including stopper straps and slider shoes)
Inspect tie-rod ends and ski alignment
Adjust headlight beam aiming

Every 2 Years or 6 000 km (4,000 mi) (Whichever Comes First)
Replace brake fluid
Inspect throttle cable
Clean and lubricate rewind starter (manual start models)
Replace chaincase oil
Inspect engine rubber mounts

Every 3 Years Or 10 000 km (6,000 mi) (Whichever Comes First)
Replace spark plugs (except 850 E-TEC Turbo)
Inspect oil injection pump strainer and clean if needed
Clean and inspect 3D RAVE valves. If oil is present in the valve base, replace the seal

Every 5 Years
Replace engine coolant
Replace in-line fuel filter

MAINTENANCE PROCEDURES

This section includes instructions for basic maintenance procedures.

⚠ WARNING

Turn off the engine, remove tether cord cap 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 be required (e.g. lock tabs, self-locking fasteners, etc.) when undergoing disassembly/assembly , always replace with a new one.

Engine Coolant

WARNING

Never open coolant tank cap when engine is hot.

Engine Coolant level Verification

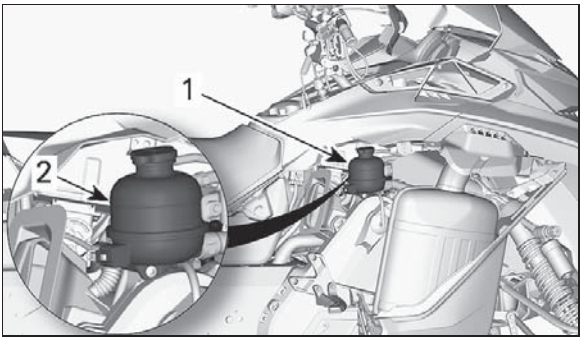
All Models Except 850 E-TEC Turbo

Open the RH side panel, refer to *CONTROLS, INSTRUMENTS AND EQUIPMENT*.

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

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

If additional coolant is necessary or if entire system has to be refilled, refer to an authorized Ski-Doo dealer, repair shop or person of your own choosing.



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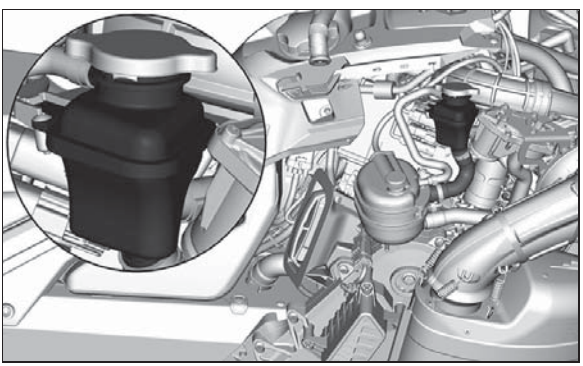
EXCEPT 850 E-TEC TURBO

1. *Coolant tank*
2. *COLD line*

Models with 850 E-TEC Turbo

Remove the upper body module. Refer to *CONTROLS, INSTRUMENTS AND EQUIPMENT*.

Check coolant level of the coolant tank filler neck at room temperature with the cap removed. Liquid should be at top of filler neck nozzle.



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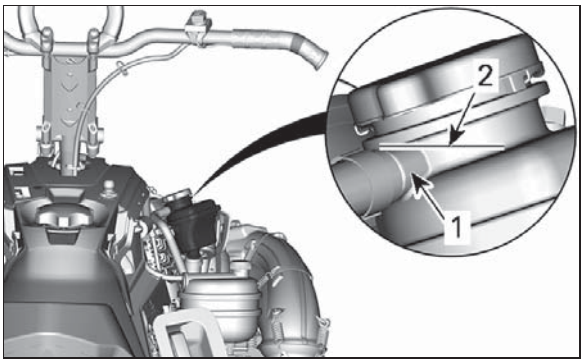
COOLANT TANK FILLER NECK



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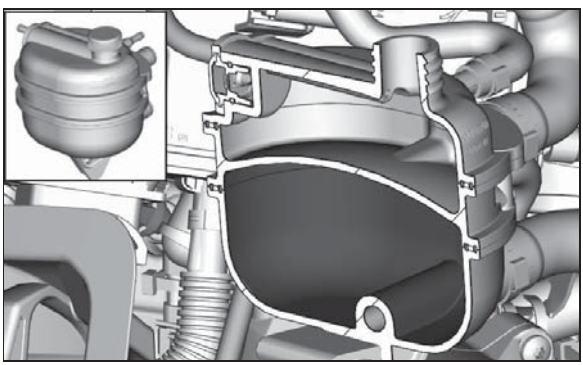
COOLANT TANK FILLER NECK

1. *Filler neck nozzle*
2. *Coolant level MAX*



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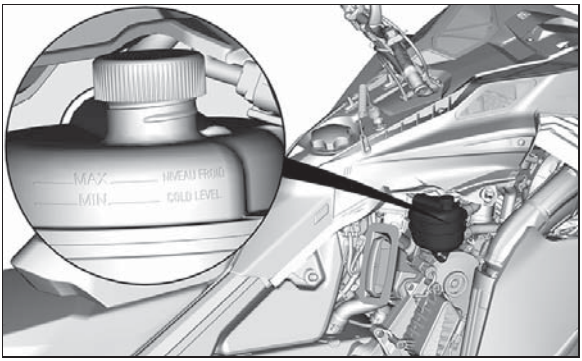
COOLANT TANK - CROSS SECTION

Check coolant level of the coolant reserve tank at room temperature with the cap removed. Liquid should be between MIN and MAX level lines.



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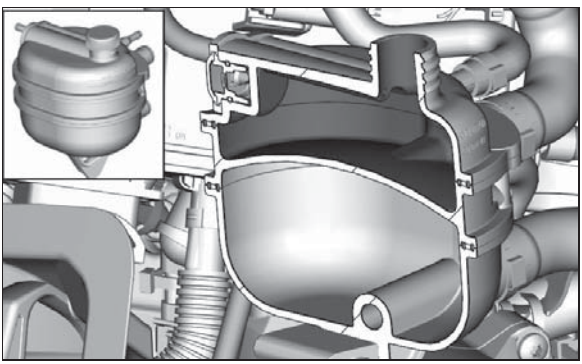
RESERVE TANK - MIN AND MAX COLD LEVEL LINES



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RESERVE TANK - CROSS SECTION

Recommended Engine Coolant

Recommended Coolant
Extended life pre-mixed coolant
Alternative, or if not available
Distilled water and antifreeze solution (50% distilled water, 50% antifreeze)

NOTICE Always use ethylene-glycol antifreeze containing corrosion inhibitors specifically for internal combustion aluminum engines.

Exhaust System

Exhaust System Verification

The muffler tail pipe should be centered with the exit hole in the bottom pan. Exhaust system must be free of rust or leaks. Make sure that all parts are securely in place.

Check retaining springs condition and replace if necessary.

The exhaust system is designed to reduce noise and to improve the total performance of the engine. Modification may be in violation of local laws.

NOTICE If any exhaust system component is removed, modified or damaged, severe engine damage may result.

Spark Plugs

Spark plugs inspection or replacement may be performed by an authorized Ski-Doo dealer, repair shop, or person of your own choosing. Spark plugs inspection or replacement requires an in-depth technical knowledge. Though not required, it is recommended that an authorized Ski-Doo dealer performs spark plugs inspection or replacement.

Brake Fluid

Recommended Brake Fluid

Use only DOT 4 brake fluid from a sealed container. An opened container may be contaminated or may have absorbed moisture from the air.

⚠ WARNING

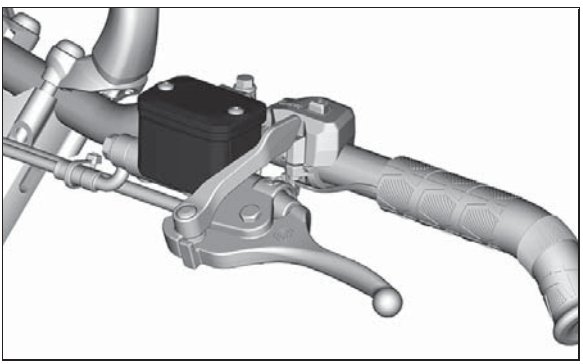
Use only DOT 4 brake fluid from a sealed container. To avoid serious damage to the braking system, do not use fluids other than the recommended one, nor mix different fluids for topping up.

NOTICE Brake fluid can damage painted and plastic parts. Handle with care. Rinse thoroughly in case of spillage.

Brake Fluid Level Verification

NOTICE Vehicle must be on a level surface before checking any fluid levels.

Check brake fluid (DOT 4) in reservoir for proper level. Add fluid (DOT 4) as required.



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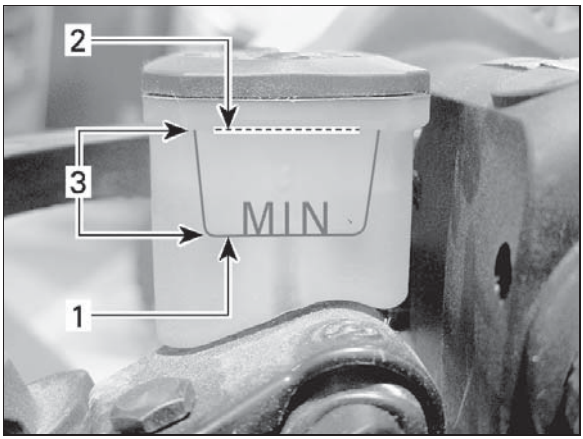
BRAKE FLUID RESERVOIR



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1. *Minimum*
2. *Maximum*
3. *Operating range*

CAUTION

Avoid getting brake fluid on skin or eyes - it may cause severe burns. In case of contact skin, wash thoroughly. In case of contact with the eyes, immediately rinse with plenty of water for at least 10 minutes and then consult a doctor immediately.

NOTICE Avoid spilling brake fluid on plastic, rubber or painted parts. Brake fluid is highly corrosive for these types of parts. Wipe up any brake fluid spillage.

Chaincase Oil

Recommended Chaincase Oil

Recommended Chaincase Oil
XPS Synthetic chaincase oil
Alternative, or if not available
Use a 75W140 gear oil that meets the API GL-5 specification

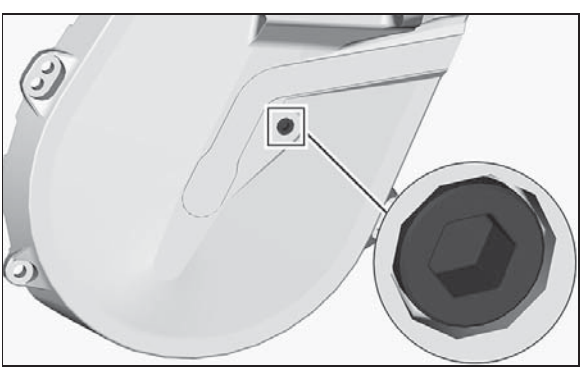
NOTICE The chaincase of this snowmobile has been developed and validated using the XPS™ synthetic chaincase oil. BRP strongly recommends the use of its XPS synthetic chaincase oil at all times. Damages caused by oil which is not suitable for the chaincase will not be covered by the BRP limited warranty.

Access to Chaincase

Open RH side panel, refer to *CONTROLS, INSTRUMENTS AND EQUIPMENT*.

Chaincase Oil Level Verification

With the vehicle on a level surface, check the oil level by removing the check plug.



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CHECK PLUG

Oil level must reach the threaded hole.

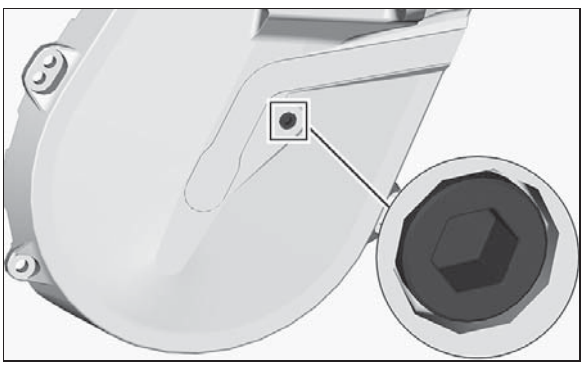
If level is correct, reinstall check plug and tighten to the specified torque.

Tightening Torque	
Check plug	6 ± 1 Nm (53 ± 9 lbf-in)

If level is insufficient, See *CHAINCASE FILLING PROCEDURE*.

Chaincase Filling Procedure

Remove the check plug.



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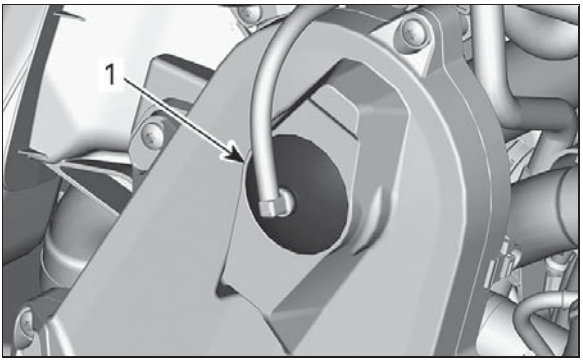
CHECK PLUG

Remove the filler cap.



520001663-010_a

TOP OF CHAINCASE

1. Filler cap

Pour recommended oil in the filler hole until oil comes out by the check plug hole.

Reinstall check plug and tighten to specification.

Tightening Torque	
Check plug	6 ± 1 Nm (53 ± 9 lbf-in)

Reinstall the filler cap.

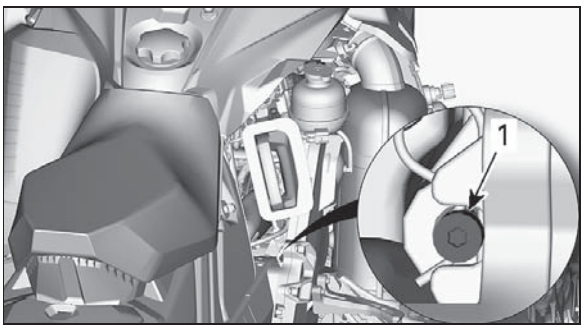
Drive Chain

Access to Chaincase

Open RH side panel, refer to *CONTROLS, INSTRUMENTS AND EQUIPMENT*.

Drive Chain Adjustment

Using the Torx end of the driven pulley expander, GENTLY turn tensioner clockwise to eliminate the play.



520001798-006_a
TYPICAL
1. Tensioner

Do not force the tensioner in.

NOTE: Do not remove the hair cotter pin.

NOTICE Overtightening the drive chain could result in severe damage to the chaincase components.

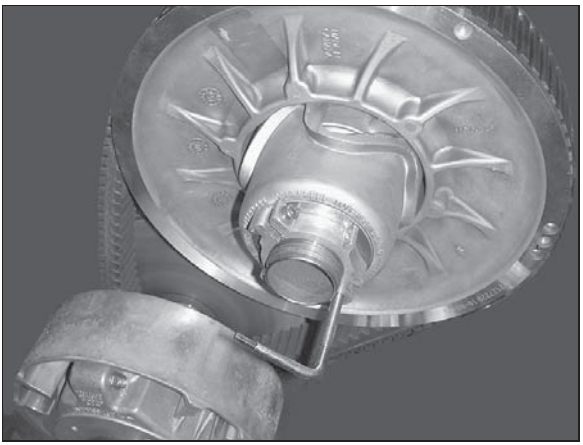
Drive Belt

Drive Belt Inspection

Inspect belt for cracks, fraying or abnormal wear (uneven wear, wear on one side, missing cogs, cracked fabric). If abnormal wear is noted, probable cause could be pulley misalignment, excessive RPM with frozen track, fast starts without warm-up period, burred or rusty sheave, oil on belt or distorted spare belt. Contact an authorized Ski-Doo dealer.

Drive Belt Replacement

1. Remove tether cord cap from engine cut-off switch.
2. Remove drive belt guard, refer to *CONTROLS, INSTRUMENTS AND EQUIPMENT*.
3. Insert the driven pulley expander provided in the threaded hole on the adjuster hub as shown.

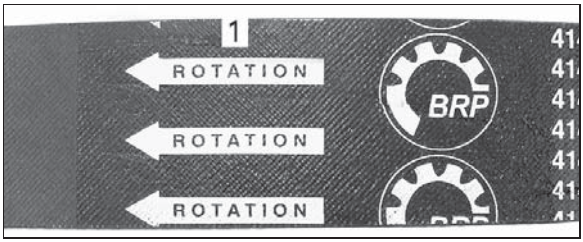


mmo2012-005-980
PULLEY EXPANDER INSTALLED ON ADJUSTER HUB

4. Open the driven pulley by screwing the tool in.
5. Remove the drive belt by slipping it over the top of the driven pulley, then over the drive pulley.
6. Slip the new drive belt over the drive pulley, then over the driven pulley.

NOTICE Do not force or use tools to pry the belt into place, as this could cut or break the cords in the belt.

NOTE: The maximum drive belt life span is obtained when belt is installed with arrows in the direction of rotation.



mmo2011-002-006_a

1. To be pointed in the direction of rotation

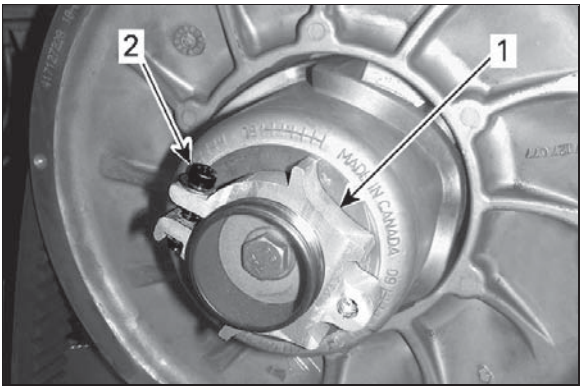
7. Unscrew and remove the driven pulley expander from the pulley.
8. Rotate the driven pulley several times to properly set the belt between the sheaves.
9. If a new belt was installed, an adjustment will be required for the proper belt height. Refer to *Drive Belt Height Adjustment* below.
10. Install the belt guard. Refer to *Controls, Instruments and Equipment*.
11. Close side panel. Refer to *Controls, Instruments and Equipment*.

Drive Belt Height Adjustment

The drive belt height must be checked every time a new drive belt is installed and as part of the pre-ride inspection.

To adjust the drive belt height, proceed as follows:

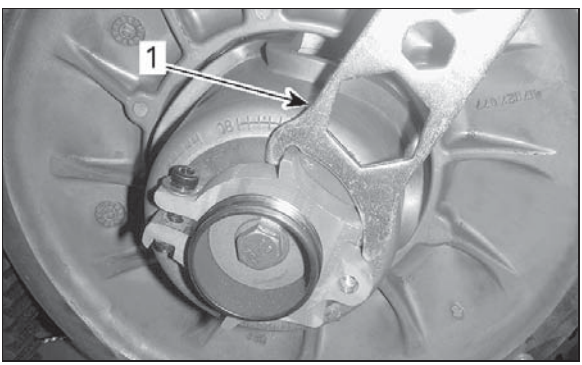
1. Remove tether cord cap from engine cut-off switch.
2. Remove drive belt guard.
3. Loosen the clamping bolt.



mmo2011-003-010_a

1. *Adjuster hub*
2. *Clamping bolt*

4. Using the suspension adjustment tool provided, turn the ring 1/4 turn at a time then rotate the driven pulley to properly set the drive belt between the pulley sheaves.



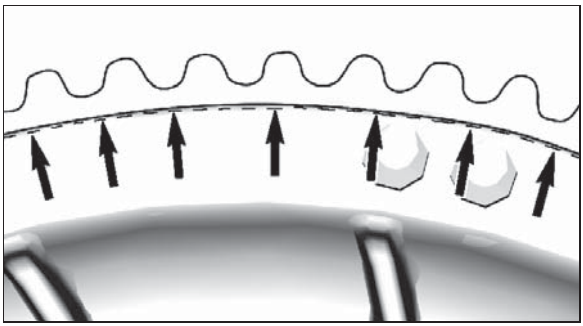
mmo2011-003-011_a

1. *Suspension adjustment tool*

NOTE: The adjustment ring has left hand treads.

850 E-TEC

Repeat step 4 until the cord of drive belt is just hidden by the driven pulley edge.



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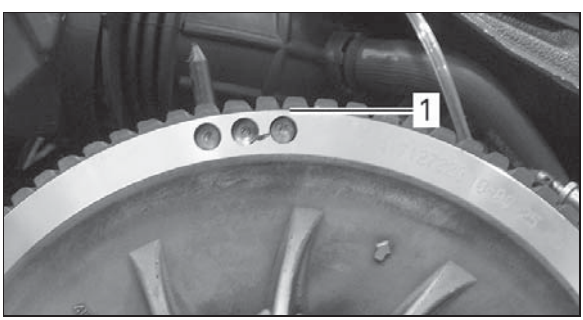
All Other Engines

Repeat step 4 until the lowest portion of the cogs on the external surface of drive belt is even with the driven pulley edge.



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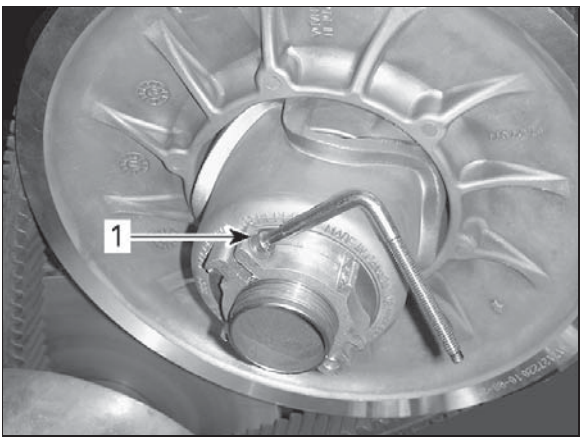
PRELIMINARY SETTING

1. Lowest portion of cogs even with external surface of drive belt

NOTE: Turning the ring counterclockwise lowers the drive belt in the pulley. Turning the ring clockwise raises the drive belt in the pulley.

5. Firmly tighten the clamping bolt. If possible, tighten to specification using a torque wrench.

Tightening Torque	
Clamping bolt	5.5 ± 0.5 Nm (49 ± 4 lbf-in)



mmo2012-004-903_a

1. Clamping bolt

6. Install drive belt guard.
7. Install side panel.

NOTE: These settings are correct as a preliminary adjustment for most models. In some cases, when starting the engine, the vehicle could creep, indicating that the drive belt is too tight.

If the vehicle creeps, lower the drive belt height from the preliminary setting. Repeat procedure until creeping stops.

Reverse Activation

NOTE: The reverse may not activate if the belt is positioned too high in the driven pulley. If reverse activation does not work properly, ensure the drive belt is properly adjusted. Adjust the drive belt lower in the driven pulley if needed.

Drive Pulley

Drive Pulley Adjustment

⚠ WARNING

Remove tether cord cap from engine cut-off switch before performing any adjustment. Vehicle must be parked in a safe place, away from the trail.

WARNING

NEVER disassemble or modify the drive pulley.

Improper assembly or modifications could cause the pulley to explode violently under the stress generated by the high rotational speed.

See your Ski-Doo dealer to maintain or service the drive pulley. Improper servicing or maintenance may affect performance and reduce belt life. Always respect maintenance schedules.

The drive pulley is factory calibrated to transmit maximum engine power at a predefined RPM. Factors such as ambient temperature, altitude or surface condition may vary this critical engine RPM thus affecting snowmobile efficiency.

This adjustable drive pulley allows setting maximum engine RPM to maintain maximum power.

Ramp cams should be adjusted so that actual maximum engine RPM matches the maximum horsepower RPM. Refer to *SPECIFICATIONS - ENGINE*.

NOTE: Use a precision digital tachometer for engine RPM adjustment.

There are 5 positions in which the ramp cam can be set.

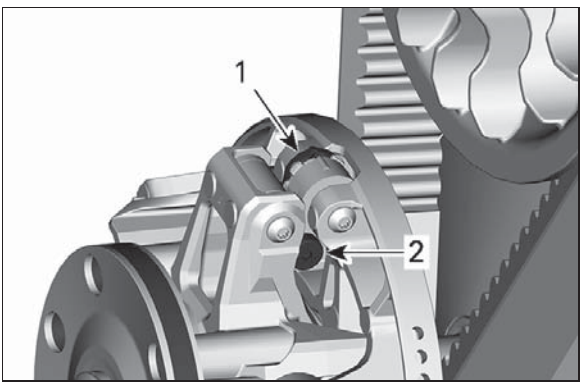
Each position modifies the maximum engine RPM by about 200 RPM.

Lower position numbers decrease the engine RPM and higher position numbers increase it.

Procedure

1. Refer to *CONTROLS, INSTRUMENTS AND EQUIPMENT* and remove:
   - LH side panel
   - Drive pulley guard

2. Locate the cam and the pivot screw on the drive pulley.



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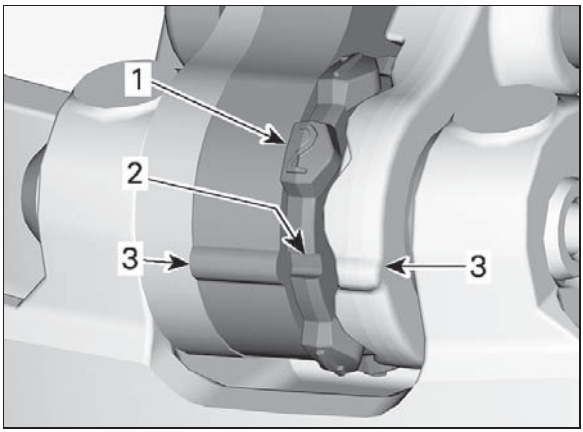
1. Cam
2. Pivot screw

The cam position is identified as follows:

- Positions 1, 2, 4 and 5 are numbered.
- Position 3 (middle) is identified by a notch.
- There are notches on each side of the cam used as pointers.

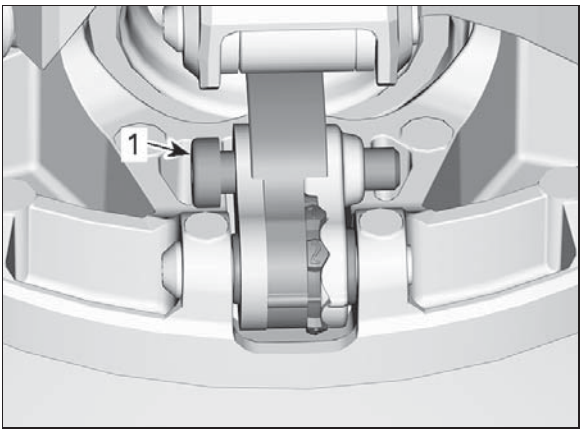


mmc2016-001-118_b

1. *Numbered position*
2. *Position 3 - Notch*
3. *Pointers*

To adjust, proceed as follows for all 3 cams:

3. Using the Torx end of the driven pulley expander, loosen the pivot screw.



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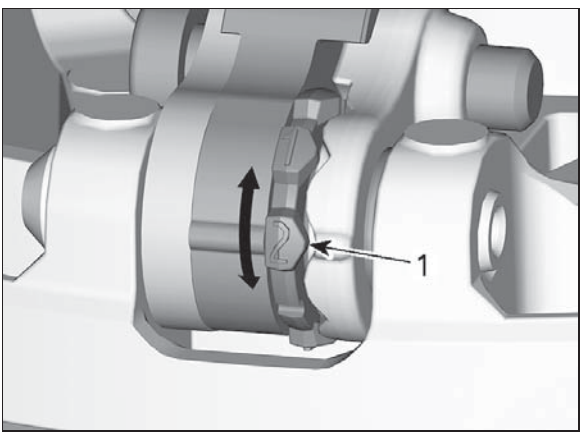
1. Pivot screw

4. Move the right lever aside to be able to turn the cam.
5. Turn cam to the desired position.



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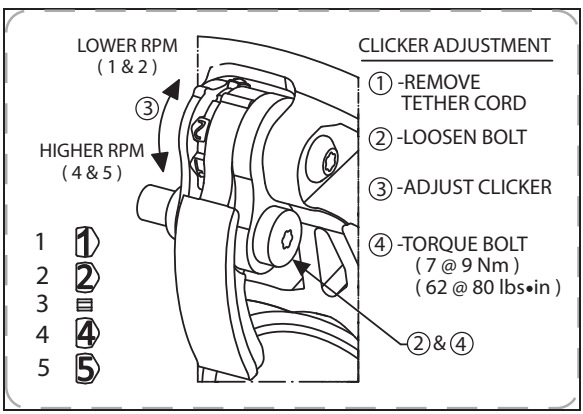
1. Desired cam position (here #2)

6. Tighten the pivot screw.

Tightening Torque	
Pivot	8 ± 1 Nm (71 ± 9 lbf-in)

NOTICE Always adjust all 3 cams to the same setting.



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Track

Track Condition

⚠ WARNING

Remove tether cord cap from engine cut-off switch before performing any maintenance or adjustment, unless otherwise specified. Vehicle must be parked in a safe place, away from the trail.

Remove tether cord cap from engine cut-off switch.

Lift the rear of the snowmobile and support it with a wide-base snowmobile mechanical stand with a rear deflector panel. With the engine off, rotate the track by hand, and inspect condition. If worn or cut, or if track fibers are exposed, or if missing or

defective inserts or guides are noted; contact an authorized Ski-Doo dealer.

Snowmobiles Equipped with Traction Enhancing Products

Look for any defects, such as:

- Perforations in the track
- Tears in the track
- Lugs that are broken or torn off, exposing portions of rods
- Delamination of the rubber
- Broken rods
- Missing track guide(s).

Deep snow snowmobiles are not meant to receive pre-studded or studdable track.

For complete information on traction enhancing products, refer to *TRACTION ENHANCING PRODUCTS* in *SAFETY INFORMATION* at the beginning of this Operator's Guide.

Track Tension and Alignment

NOTICE Track tension and alignment are interrelated. Do not adjust one without the other.

⚠ WARNING

To prevent serious injury to individuals near the snowmobile:

- NEVER stand behind or near a moving track.
- Always use a wide-base snowmobile stand with a rear deflector panel if it is necessary to rotate track.
- When the track is raised off the ground, only run it at the lowest possible speed.

Centrifugal force could cause debris, damaged or loose studs, pieces of torn track, or an entire severed track to be violently thrown backwards out of the tunnel with tremendous force, possibly resulting in the loss of a leg or other serious injury.

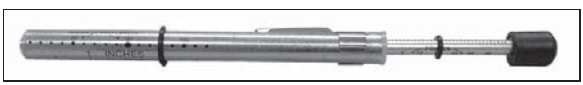
Track Tension Verification

1. Ride the snowmobile in snow about 15 to 20 minutes prior to adjusting track tension.
2. Remove tether cord cap from engine cut-off switch.
3. Lift rear of vehicle and support it off the ground.

CAUTION

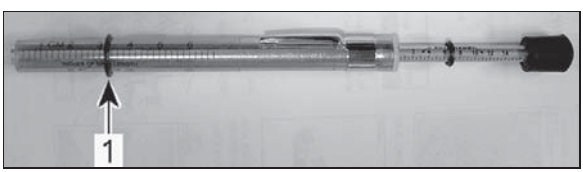
Use proper lifting techniques, notably by using your legs to lift instead of your back. Do not attempt to lift the rear of vehicle if it is above your limits.

4. Allow rear suspension to fully extend.
5. Use the Tensiometer (P/N 414 348 200).



414348200

6. Set deflection between 30 mm and 35 mm (1-3/16 in and 1-3/8 in) using bottom O-ring.



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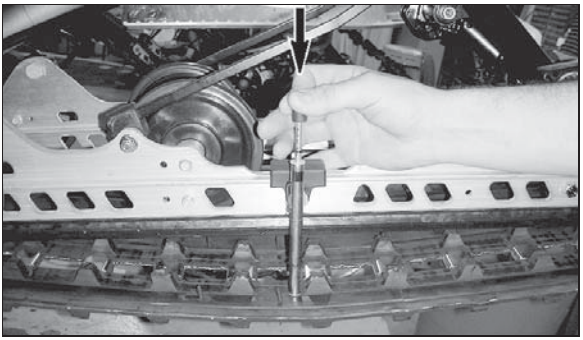
DEFLECTION SETTING

1. Bottom O-ring set to specification

7. Place upper O-ring to 0 kgf (0 lbf).
8. Position the tensiometer on track, halfway between front and rear idler wheels.
9. Push the tensiometer downwards until bottom O-ring (deflection set earlier) be aligned with the bottom of slider shoe.



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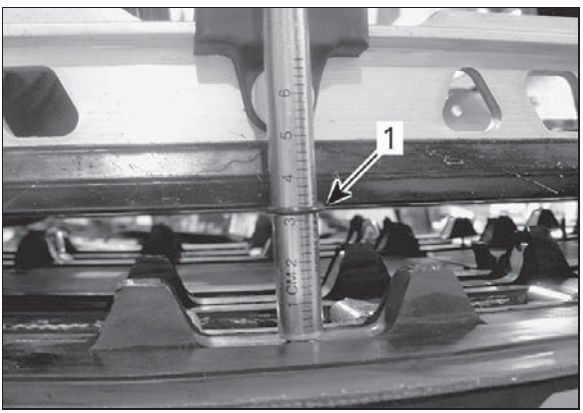

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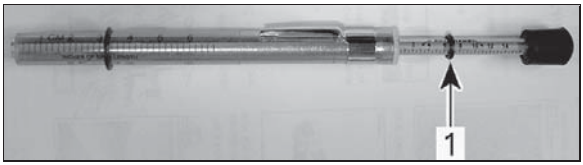
1. Deflection O-ring aligned with slider shoe

10. Read load recorded by the upper O-ring on the tensiometer.



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LOAD READING
1. Upper O-ring

11. Load reading must be as per the following table.

Track Adjustment Specification	
Track deflection setting	3.2 cm (1.26 in)
Track load reading	6 kgf to 8.5 kgf (13 lbf to 19 lbf)

12. If load reading is not in accordance with the specification, adjust track tension. Refer to *TRACK TENSION ADJUSTMENT*.

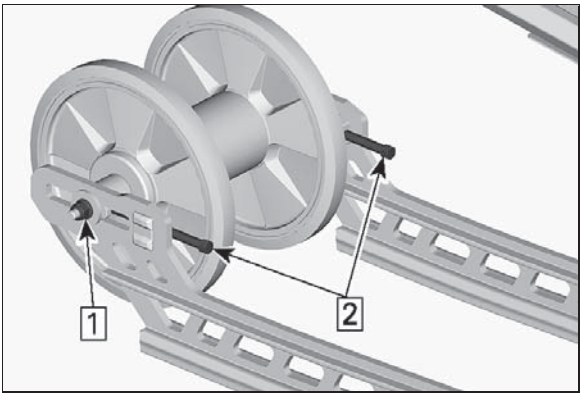
Track Tension Adjustment

1. Remove tether cord cap from engine cut-off switch.
2. Lift rear of vehicle and support it off the ground.

CAUTION

Use proper lifting techniques, notably by using your legs to lift instead of your back. Do not attempt to lift the rear of vehicle if it is above your limits.

3. Loosen the rear axle nut.
4. Tighten or loosen both adjustment screws (equally) to increase or decrease track tension.



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Step 1: Loosen the axle nut
Step 2: Tighten or loosen the adjustment screws

5. If correct tension is unattainable, contact an authorized Ski-Doo dealer.
6. Retighten the rear axle nut to specification.

Tightening Torque	
Rear idler wheel retaining nut and screw	48 ± 6 Nm (35 ± 4 lbf-ft)

7. Check track alignment as described below.

Track Alignment

⚠ WARNING

Before checking track alignment, ensure that the track is free of all particles which could be thrown out while track is rotating. Keep hands, tools, feet and clothing clear of track. Always lift the snowmobile on a wide-base stand with a rear deflector panel. Ensure no one is standing in close proximity to the snowmobile, especially at the rear of the track. Never rotate track at high speed.

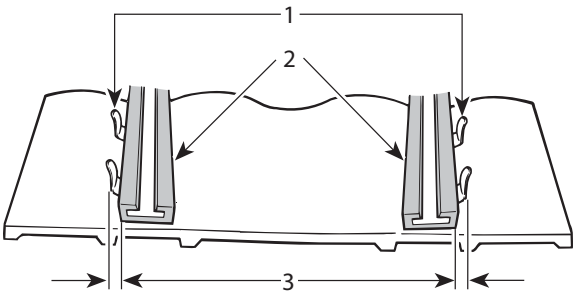
Centrifugal force could cause debris, damaged or loose studs, pieces of torn track, or an entire severed track to be violently thrown backwards out of the tunnel with tremendous force.

1. Lift rear of vehicle and support it off the ground.

⚠ CAUTION

Use proper lifting techniques, notably by using your legs to lift instead of your back. Do not attempt to lift the rear of vehicle if it is above your limits.

2. Start engine and accelerate slightly so that track slowly turns. This must be done in a short period of time (15 to 20 seconds).
3. Check that the track is well centered; equal distance on both sides between edges of track guides and slider shoes.



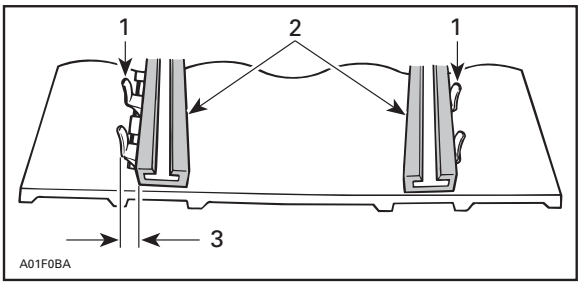
1. *Guides*
2. *Slider shoes*
3. *Equal distance*

4. To correct track alignment:
   4.1 Stop engine.
   4.2 Remove tether cord cap from engine cut-off switch.

⚠ WARNING

Remove tether cord cap from engine cut-off switch before performing any maintenance or adjustment, unless otherwise specified. Vehicle must be parked in a safe place, away from the trail.

   4.3 Loosen the rear axle nut.
   4.4 Tighten adjustment screw on side where the slider shoe is the farthest from the track insert guides.



1. Guides
2. Slider shoes
3. Tighten on this side

5. Tighten the rear axle nut.

⚠ WARNING

Properly tighten wheel retaining bolt, otherwise wheel may come off and cause track to “lock”.

6. Restart engine and rotate track slowly to recheck alignment.
7. Tighten the rear axle nut to specified torque.

Tightening Torque	
Rear idler wheel retaining nut and screw	48 ± 6 Nm (35 ± 4 lbf-ft)

8. Reposition snowmobile on the ground.

Suspension

Rear Suspension Condition

Visually inspect all suspension components including slider shoes, springs, wheels, etc.

During normal driving, snow will act as a lubricant and coolant for the slider shoes. Extensive riding on ice or sanded snow, will create excessive heat build-up and cause premature slider shoe wear.

Suspension Stopper Strap Condition

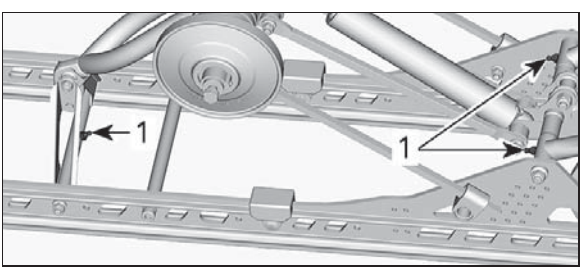
Inspect stopper strap for wear and cracks, bolt and nut for tightness. If loose inspect holes for deformation. Replace as required. Tighten nut to specification.

Tightening Torque	
Stopper strap nut	10 ± 1 Nm (89 ± 9 lbf-in)

Suspension Lubrication

Lubricate the following suspension pivots at grease fittings. Refer to *MAINTENANCE SCHEDULE* for maintenance frequency.

Service Product
XPS synthetic suspension grease



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TMOTION

1. Grease fitting

Steering and Front Suspension Condition

Visually inspect steering and front suspension for tightness of components (steering arms, control arms and links, tie rods, ball joints, ski bolts, ski legs, etc.). If necessary, contact an authorized Ski-Doo dealer.

Skis

Wear and Condition of Skis and Runners

Check the condition of the skis and ski runner carbides. If worn, contact an authorized Ski-Doo dealer.

⚠ WARNING

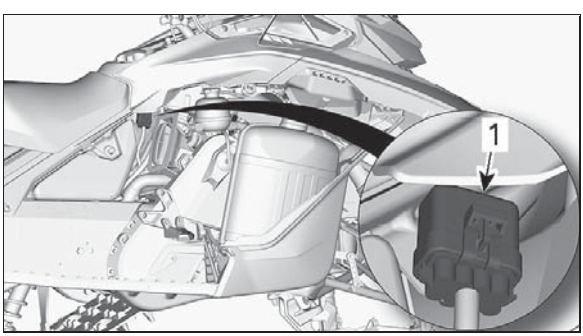
Excessively worn skis and/or ski runners will adversely affect snowmobile control.

Fuses

Access to Fuse Block

Open RH side panel, refer to *CONTROLS, INSTRUMENTS AND EQUIPMENT*.

Fuses Location



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1. Fuse block

Unlock fuse block from its cover.

Fuse Identification	Amperage Rating
Start/RER	5 A
Battery	30 A
Accessories	15 A
Loads	25 A

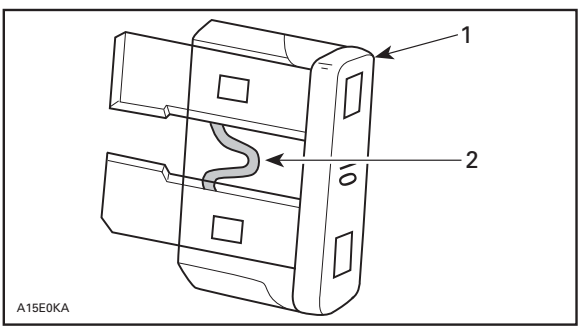
Fuse Inspection

Check fuse condition and replace it if necessary.

⚠ WARNING

Never use a higher rated fuse than specified.

To remove fuse from holder, pull fuse out. Check if filament is melted.



1. Fuse
2. Filament

WARNING

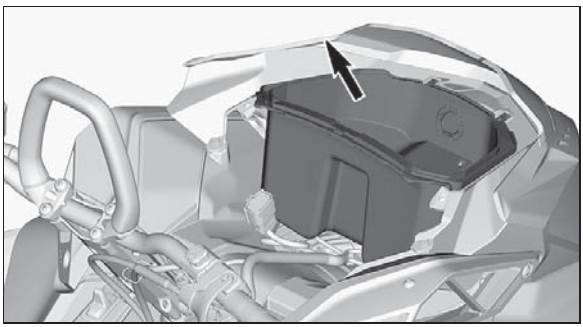
If fuse burn repeatedly, source of malfunction should be determined and corrected before restarting. See an authorized Ski-Doo dealer for servicing.

Headlights

Headlights Bulb Replacement

All Models Except with 850 E-TEC Turbo

1. Remove the storage compartment. Refer to *Upper Body Module Removal* in *Controls, Instruments and Equipments*.



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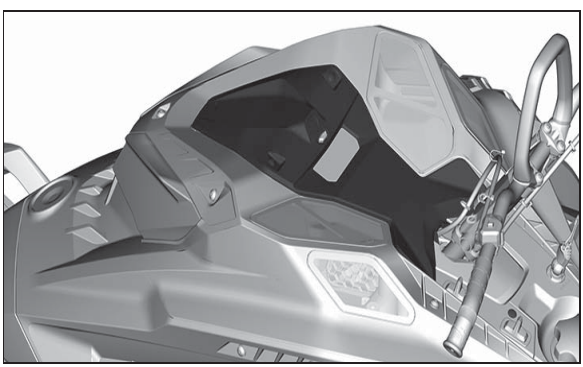
Models with 850 E-TEC Turbo

2. Remove the gauge support. Refer to *Upper Body Module Removal* in *Controls, Instruments and Equipments*.



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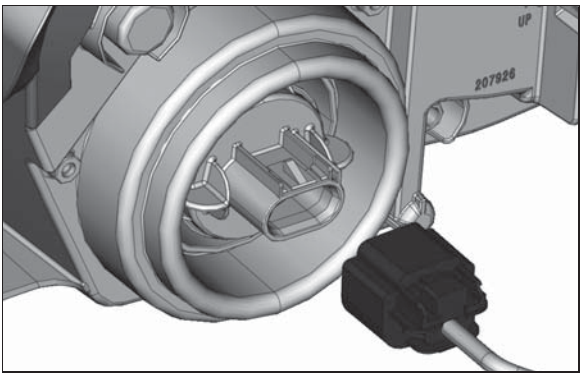
All Models

3. Disconnect bulb connector.



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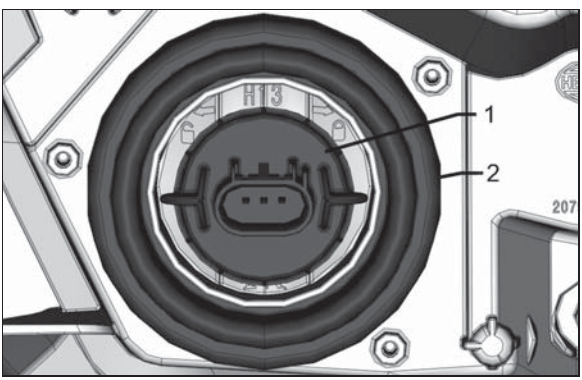
4. Unlock bulb by turning it counterclockwise.
5. Pull bulb out.

NOTE: Ensure bulb seal stays in place.



mmr2017-036-008

1. Bulb
2. Bulb seal

Install a new bulb using the reverse of the removal procedure.

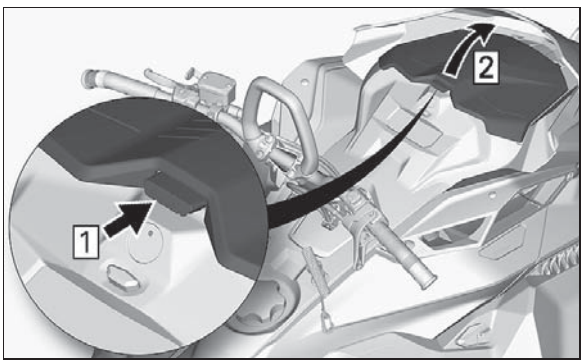
NOTICE Never touch glass portion of an halogen bulb with bare fingers, it shortens its operating life. If glass is touched, clean it with isopropyl alcohol which will not leave a film on the bulb.

Check headlights operation.

Headlights Beam Aiming

All Models Except with 850 E-TEC Turbo

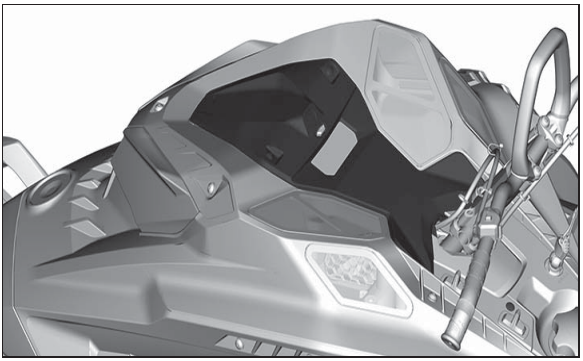
Open the storage compartment.



520001496-005_a

Models with 850 E-TEC Turbo

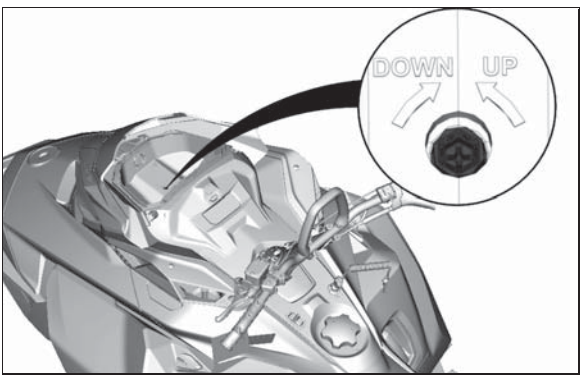
Remove the gauge support. Refer to *UPPER BODY MODULE REMOVAL* in *CONTROLS, INSTRUMENTS AND EQUIPMENTS*.



520002095-008

All Models

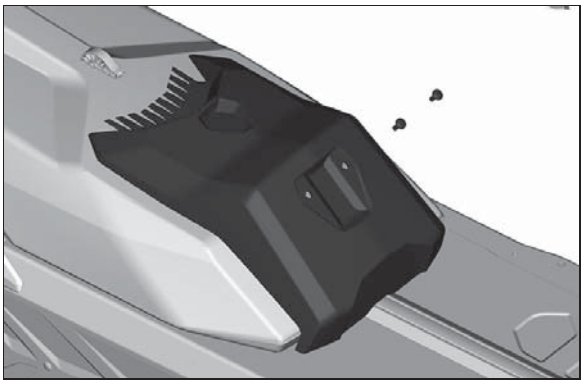
Turn the adjustment screw to reach desired beam height.



mmr2017-036-005
TYPICAL

Battery Removal

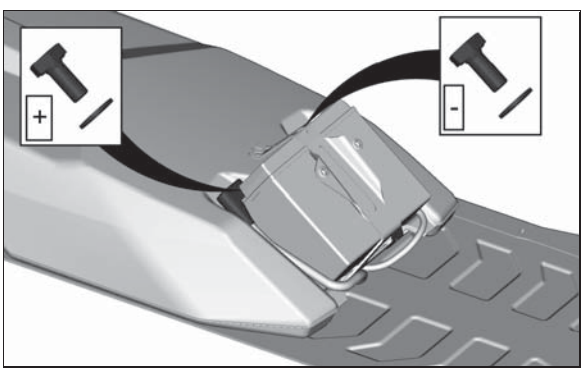
1. Remove seat.
2. Remove battery cover.



520002104-301
TYPICAL

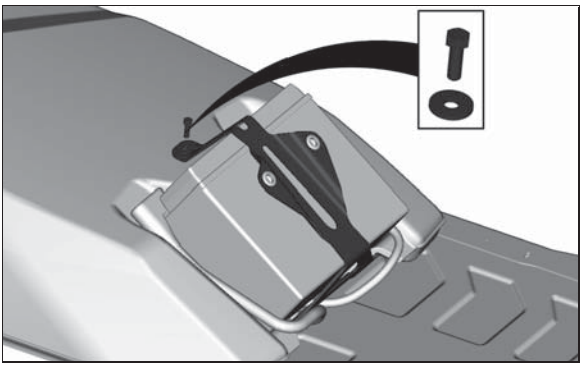
3. Disconnect negative cable first, then the positive.

NOTICE Battery BLACK (–) cable must always be disconnected first and connected last.



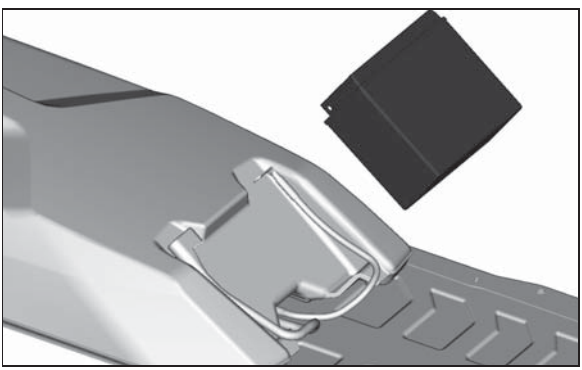
mmr2017-032-002

4. Remove battery hold down bracket.



mmr2017-032-003

5. Remove battery.



mmr2017-032-004

The installation is the reverse of the removal procedure.

Tightening Torque	
Battery bracket screw	5 ± 0.5 Nm (44 ± 4 lbf-in)
Battery post screw	10 ± 1 Nm (89 ± 9 lbf-in)
Battery cover screw	7 ± 1 Nm (63 ± 9 lbf-in)

Post-Operation Care

Remove snow and ice from rear suspension, track, front suspension, steering mechanism and skis.

⚠ WARNING

Make sure D.E.S.S. key is removed from D.E.S.S. post before standing in front the vehicle, getting close to the track or rear suspension components.

Always cover your snowmobile when leaving it outside overnight or during extended periods of inactivity. This will protect it from frost and snow as well as help retain its appearance.

Vehicle Cleaning and Protection

Wash snowmobile with water mixed with a mild detergent. Use only microfiber cloths or an equivalent.

NOTICE Never use a high pressure washer to clean the vehicle. **USE LOW PRESSURE ONLY (like a garden hose).**

NOTICE Never use XPS Brake and Parts Cleaner or any petroleum based cleaners on plastic parts.

Non Compatible Cleaning Products

Material Type	Non-Compatible Cleaning Products
All plastics, vinyls, painted steel and aluminium.	BRAKE AND PARTS CLEANER OR ANY PETROLEUM BASE CLEANING PRODUCTS

Compatible Cleaning Products

Material Type	Cleaning Product
All plastics, vinyls, painted steel and aluminium.	Soapy water XPS Spray Cleaner and Polish XPS All Purpose Cleaner

For more information and products, Visit the XPS Products website at www.xpslubricants.com

STORAGE

During summer, or when the snowmobile is not in use for more than three months, proper storage is necessary.

- Clean the vehicle
- Add fuel stabilizer to fuel following the product manufacturer recommendations. Run the engine after adding the product to the fuel
- Lubricate engine
- Lubricate brake lever pivot
- Lubricate rear suspension
- Charge the battery monthly to keep it fully charged during storage (if equipped)
- Block muffler outlet with rags
- Lift rear of vehicle until track is clear of the ground. Do not release track tension.

⚠ CAUTION

Use appropriate lifting device or have assistance to share lifting stress. If a lifting device is not used, use proper lifting techniques, notably by using your legs to lift instead of your back. Do not attempt to lift the rear of vehicle if it is above your limits.

NOTICE The snowmobile has to be stored in a cool and dry place and covered with an opaque but ventilated tarpaulin. This will prevent sun rays and grime from affecting plastic components and vehicle finish.

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

Engine Storage Mode

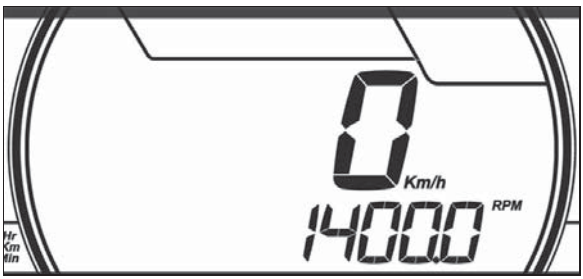
Like other engines, the E-TEC has to be properly lubricated at storage for internal parts protection. The E-TEC system offers a built-in engine storage lubrication function (summerization) that can be initiated by the operator.

To engage procedure, do the following:

1. Place the vehicle in a well ventilated area.
2. Start the engine and let it run at idle speed until it reaches its operating temperature (watch the coolant

temperature on the display or verify the rear heat exchanger becomes warm).

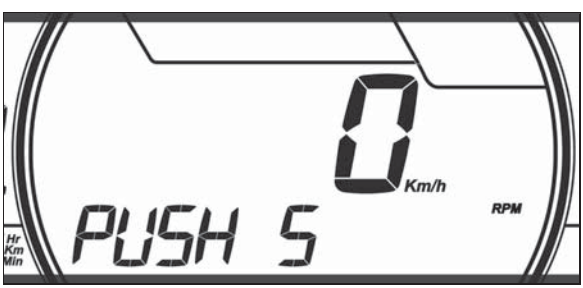
3. Push the SET (S) button to select odometer mode.



619900974-808
TYPICAL

NOTE: The storage mode does not function in other modes (trip A, trip B and hr trip).

4. Repeatedly depress the HI/LOW beam switch rapidly, then, **while doing this** , press and hold the **SET button** until PUSH "S" appears on the display.

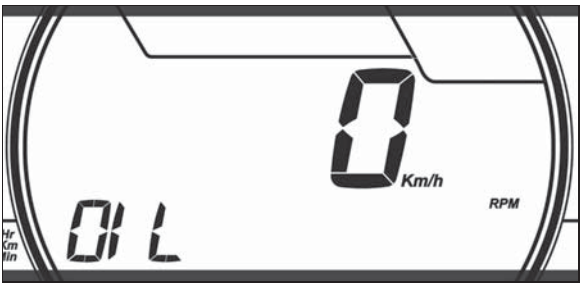


619900974-806
TYPICAL

5. Release all buttons when gauge displays **PUSH (S)**.
6. Again, press and hold the SET (S) button for 2 - 3 seconds.

NOTE: The gauge will display OIL when the storage procedure is initiated.

7. When gauge displays **OIL** , release button and wait for the lubrication function to end.



619900974-807
TYPICAL

Do not touch anything during engine lubrication cycle.

The engine lubrication function takes approximately 1 minute. During this time the engine RPM will increase slightly to approximately 1600 RPM and the oil pump will "oil flood" the engine.

At the end of engine lubrication procedure, the ECM will turn the engine off.

Remove tether cord cap from engine cut-off switch.

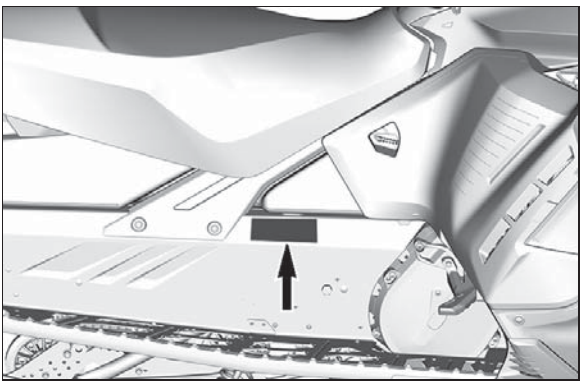
NOTICE Do not start the engine during storage period.

TECHNICAL INFORMATION

VEHICLE IDENTIFICATION

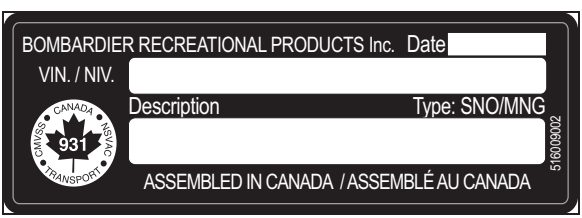
Vehicle Description Decal

Vehicle description decal is located on right hand side of tunnel.



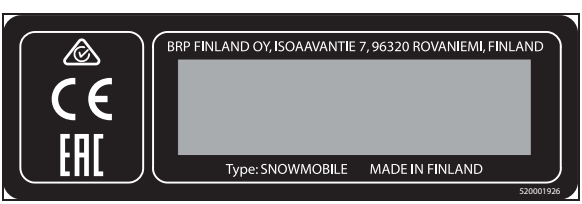
520002114-103

TYPICAL VEHICLE DESCRIPTION DECAL



516009002

VEHICLE BUILT IN CANADA



EN_520001926_DEC

VEHICLE BUILT IN FINLAND

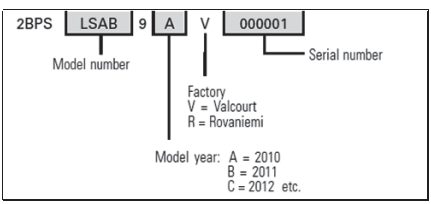
Identification Numbers

The main components of your snowmobile (engine and frame) are identified by different identification numbers. It may sometimes become necessary to locate these numbers for warranty purposes or to trace your snowmobile in the event of loss. These numbers are required by the authorized Ski-Doo dealer to complete warranty claims properly. We strongly recommend that you take note of all the identification numbers on your snowmobile and supply them to your insurance company.

Vehicle Identification Number (VIN)

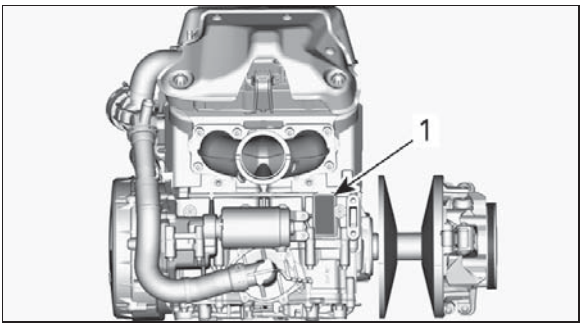
VIN is scribed on vehicle description decal. See above. It is also engraved on tunnel near vehicle description decal.

Model number and model year are part of the information found in the VIN. See illustration.



520002345-001

Engine Identification Number Location

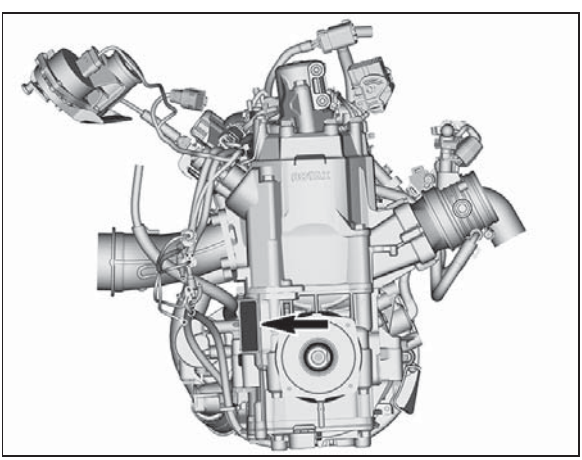


520001663-025_a

1. Engine identification number

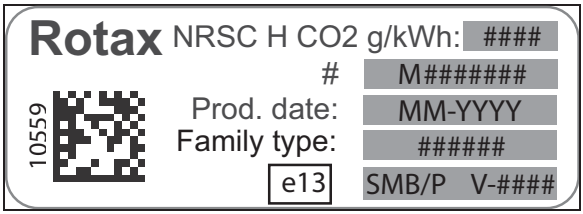
Regulation (EU) 2016/1628 applicable for Non-Road Mobile Machineries

Vehicles who comply to Regulation (EU) 2016/1628 (NRMM) are identified on the engine.



NRMM_E-TEC_MY20

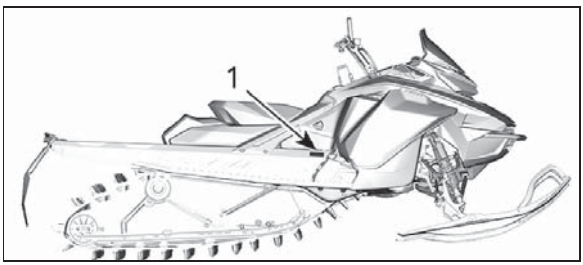
TYPICAL



EN-516010559-DEC

NRMM IDENTIFICATION LABEL

Depending on your particular vehicle configuration, an additional NRMM identification decal may be installed on the tunnel, near the chaincase.



520002104-001

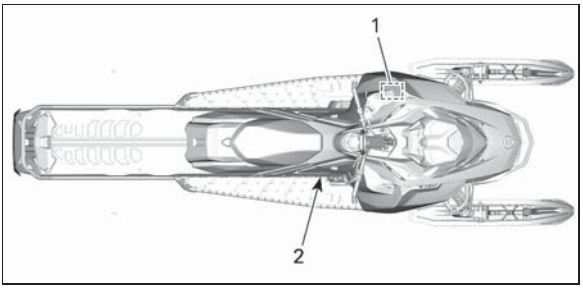
RH SIDE OF TUNNEL

1. NRMM label

EN-516010557-DEC

NRMM IDENTIFICATION ON VEHICLE

VEHICLE COMPLIANCE LABELS



520001496-101_b

EPA Compliance Label

EMISSION CONTROL INFORMATION

THIS VEHICLE IS CERTIFIED TO OPERATE ON UNLEADED GASOLINE AND MEETS XXXX U.S. EPA REGULATIONS FOR SNOWMOBILE SI ENGINES.

EC 121

ENGINE FAMILY	XXXXXXXXXXXX	FAMILLE DE MOTEUR
PERMEATION FAMILY	XXXXXXXXXXXX	FAMILLE DE PERMÉATION
FEL	XX g/kW-hr HC XXX g/kW-hr CO X.X g/ m2 / day	LIMITE DES ÉMISSIONS DES FAMILLES
ENGINE DISPLACEMENT	XXX cm^3	CYLINDRÉE
EXHAUST EMISSION CONTROL SYSTEM	XXXX	SYSTÈME DE CONTRÔLE DES ÉMISSIONS

RENSEIGNEMENTS SUR LE DISPOSITIF ANTIPOLLUTION

CE VÉHICULE EST CERTIFIÉ POUR FONCTIONNER À L'ESSENCE SANS PLOMB ET IL RÉPOND AUX NORMES XXXX DE L'EPA DES É.-U. POUR LES MOTONEIGES À MOTEUR SI.

SEE OPERATOR'S GUIDE FOR MAINTENANCE SPECIFICATIONS
VOIR GUIDE DU CONDUCTEUR POUR LES SPÉCIFICATIONS D'ENTRETIENS

BOMBARDIER RECREATIONAL PRODUCTS INC. 6865

516006865

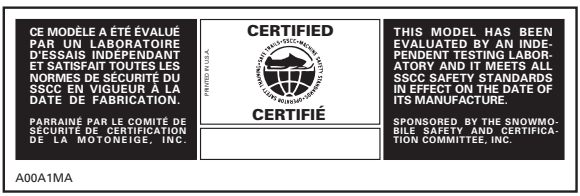
LABEL 1 - IN ENGINE COMPARTMENT

SSCC Label

Safety standards for snowmobiles have been adopted by the Snowmobile Safety and Certification Committee (SSCC) of which BRP is a proud participating member. Assurance that your snowmobile meets these standards is easily checked by

locating the Certification Label on a right vertical portion of the vehicle.

The following label shows that an independent testing laboratory has verified compliance with the SSCC safety standards.



LABEL 2

NOISE EMISSION AND VIBRATION VALUES (ALL COUNTRIES EXCEPT CANADA/UNITED STATES)

MODEL		850 E-TEC	600R E-TEC
NOISE EMISSION AND VIBRATION VALUES[1]			
Noise	Sound power level (L_{WA})	100 dB (Uncertainty (K_{wa}) 3 dB)	98.3 dB (Uncertainty (K_{wa}) 3 dB)
	Sound pressure (L_{pA})	86 dB (Uncertainty (K_{pA}) 3 dB)	86.2 dB (Uncertainty (K_{pA}) 3 dB)
Vibration	Hand-arm system	<2.5 m/s^2	3.11 m/s^2
	Whole body at seat	<0.5 m/s^2	<0.5 m/s^2

[1] : Noise emission and Vibration values are measured in accordance with Standard ISMA 1, annexes A and B, v.1 (2014) to v.4 (2018) on a grass surface, at neutral or without belt.

EC DECLARATION OF CONFORMITY

565 de la Montagne Street
Valcourt (Québec) J0E 2L0
Canada

www.brp.com

ADVENTURE BY DESIGN

EU Declaration of Conformity

Authorized Representative: BRP Europe N.V., Skaldenstraat 125, Gent, Belgium, 9042

This declaration of conformity is issued under the sole responsibility of the manufacturer.

The undersigned, representing the manufacturer, hereby declares that model year **2021 Snowmobiles** marked with the CE mark and a 17-character vehicle identification number (VIN) structured as **2BPSxxxxxMVxxxxxx** or **YH2SxxxxxMRxxxxxx** under commercial names **Ski-Doo** comply with all the relevant provisions of the following Directives and Regulations:

Machinery Directive 2006/42/EC as amended up to and including Reg. 2019/1243/EU	ISO 12100:2010
Non-Road Mobile Machinery (NRMM) Regulation (EU) 2016/1628 on gaseous pollutants	Category SMB, Stage V emissions limits
Electromagnetic Compatibility (EMC) Directive 2014/30/EU as amended up to and including Reg. (EU) 2018/1139	CISPR 12:2007/A1:2009 & IEC 61000-6-1:2005 or UN R10.04 or later version
Battery Directive 2005/66/EC as amended up to and including Dir. (EU) 2018/849	
Radio Equipment (RED) Directive 2014/53/EU as amended up to and including Reg. 2018/1139 (If fitted with radio frequency (RF) D.E.S.S. key)	EN 300 330-2 & EN 60950-1

Dominic Tessier, Eng.
Director, Vehicle Engineering, Ski-Doo
Bombardier Recreational Products Inc.

Valcourt, QC, Canada

February 18th, 2020

ski-doo LYNX SEA-DOO EVINRUDE ROTAX can-am

DoC_Ski-Doo_MY21

EAC DECLARATION OF CONFORMITY

Left blank for Eurasian Conformity mark where applicable

EPA CERTIFIED ENGINES

Engine Emissions Information

Manufacturer's Responsibility

Beginning with **2007 model year engines** , snowmobile manufacturers of snowmobile engines need to 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's Responsibility

When performing service on a certified Ski-Doo snowmobiles 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 Ski-Doo snowmobiles manufactured by BRP are certified to the EPA as conforming to the requirements of the regulations for the control of air pollution from new snowmobile 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 snowmobile products. For more detailed information on this subject, you may contact the following locations:

MAIL:

U.S. Environmental Protection Agency

Certification Division

Gasoline Engine Compliance Center

2000 Traverwood Drive

Ann Arbor MI 48105

USA

INTERNET WEB SITE:

www.epa.gov/otaq/

RADIO FREQUENCY DIGITALLY ENCODED SECURITY SYSTEM (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

SPECIFICATIONS ENGINE

Engine	600R E-TEC
Engine type	Rotax 600R E-TEC liquid cooled with reed valves and electronic RAVE
Number of cylinder	2
Bore	72.3 mm (2.85 in)
Stroke	73 mm (2.87 in)
Displacement	599.4 cm³ (36.6 in³)
Maximum power engine speed	8100 ± 100 RPM

Engine	850 E-TEC 850 E-TEC Turbo
Engine type	Rotax 850 E-TEC liquid cooled with reed valves and electronic RAVE
Number of cylinder	2
Bore	82 mm (3.228 in)
Stroke	80.4 mm (3.165 in)
Displacement	849 cm³ (51.81 in³)
Maximum power engine speed	7900 ± 100 RPM

Engine	600R E-TEC
Engine type	Rotax 600R E-TEC liquid cooled with reed valves and electronic RAVE
Number of cylinder	2
Bore	72.3 mm (2.85 in)
Stroke	73 mm (2.87 in)
Displacement	599.4 cm³ (36.6 in³)
Maximum power engine speed	8100 ± 100 RPM

Fuel System		
Fuel delivery	850 E-TEC 850 E-TEC Turbo	E-TEC direct injection with integrated auxiliary injection system
	600R E-TEC	E-TEC direct injection
Idle speed (not adjustable)		1200 ± 200 RPM

Electrical System		
Lighting system output		30 A @ 14.5 V 1340 W @ 6000 RPM
Spark plug	Type	NGK ILKR8Q7 (engine and spark plug threads are indexed)
	Gap[1]	Not adjustable 0.6 mm to 0.7 mm (.024 in to .028 in)

Lubrication System		
Oil injection pump type		Electronic
Injection oil	Type	2T E-TEC synthetic oil
	Quantity	3.4 l (3.6 qt(liq.,US))

Cooling System		
Coolant type		Extended life pre-mixed coolant
		If not available: Coolant specifically formulated for aluminum engines Ethyl glycol and distilled water (50%/50%).
Coolant capacity	146" models	7.3 l (7.7 qt(liq.,US))
	154" models	7.5 l (7.9 qt(liq.,US))
	165" except 850 E-TEC Turbo models	7.7 l (8.1 qt(liq.,US))
	165" 850 E-TEC Turbo models	7.8 l (8.2 qt(liq.,US))
	175" except 850 E-TEC Turbo models	7.9 l (8.3 qt(liq.,US))
	175" 850 E-TEC Turbo models	8.3 l (8.7 qt(liq.,US))

Fuel System			
Fuel pump			In-tank electrical fuel pump
Fuel	Type		Premium unleaded gasoline (fuel which may contain up to 10% MAX ethanol
	Octane rating	Inside North America	91 Pump Posted AKI (R+M)/2)
		Outside North America	95 (RON)
Fuel tank capacity			36 l (9.5 U.S. gal.)

Electrical System	
Battery (if equipped)	12 V, 18 A•h
Headlamp	2 x 60/55 W (H-13)
Taillight and stoplight	2.6 W / 139m W LED
Fuses	Refer to *FUSES* in *MAINTENANCE PROCEDURES*

Drive System		
Chaincase oil	Type	Synthetic chaincase oil
	Quantity	350 ml (12 fl oz (US))
Chain drive ratio	146" 850 E-TEC	21/49

Drive System			
Chain drive ratio	146" 600R E-TEC 154" 850 E-TEC		21/51
	154" 600R E-TEC 165" and 175" models		21/53
Drive pulley type			pDrive with clickers
Drive pulley engagement RPM	Summit SP 600R E-TEC		3400 ± 100 RPM
	All 850 E-TEC Sea level calibration		3300 ± 100 RPM
	146"/154"/165" 850 E-TEC High altitude calibration		3600 ± 100 RPM
	165" 850 E-TEC Turbo		3800 ± 100 RPM
	175" High altitude calibration		3900 ± 100 RPM
Driven pulley type			QRS
Pulley distance	Z		Not adjustable 20.9 mm (.823 in)
	X		Not adjustable 41.1 mm ± 1.8 mm (1.618 in ± .071 in)
Offset	Y - X	New	Not adjustable 3 mm (.118 in)

Drive System			
Offset	Y - X	After break-in	Not adjustable 2 mm ± .5 mm (.079 in ± .02 in)
Drive belt	Width		38.3 mm (1.508 in)
	Wear limit		35.9 mm (1.413 in)
Drive sprocket number of teeth	146" models		8
	All others		6
Track dimensions (Width x Length x Profile Height)	146" models		40.6 cm (16 in) X 370.5 cm (146 in) X 63.5 cm (2.5 in)
	154" models		40.6 cm (16 in) X 392 cm (154 in) X 63.5 cm (2.5 in) 40.6 cm (16 in) X 392 cm (154 in) X 76.2 cm (3.0 in)
	165" models		40.6 cm (16 in) X 419 cm (165 in) X 63.5 cm (2.5 in) 40.6 cm (16 in) X 419 cm (165 in) X 76.2 cm (3.0 in)
	175" models		40.6 cm (16 in) X 444.5 cm (175 in) X 76.2 cm (3.0 in)

Drive System		
Track adjustment (3)	Deflection	3.2 cm (1.26 in)
	Force	6.0 kgf to 8.5 kgf (13 lbf to 19 lbf)

Brake System		
Brake	Type	Single 200 mm cross drilled carbon steel disc
Brake fluid	Type	DOT 4
	Quantity	65 ml (2.2 fl oz (US))
Caliper		Fixed twin pistons (2 x 40mm)
Brake pad material		Organic
Minimum brake pad thickness (includes backing plate)		5 mm (.197 in)
Minimum brake disc thickness		4.5 mm (.177 in)
Maximum brake disc warpage		0.25 mm (.01 in)

Front Suspension		
Suspension type		RAS 3
Suspension maximum travel	Freeride 146"	220 mm (8.7 in)
	Freeride 154" Freeride 165"	215 mm (8.5 in)
	All Summit	215 mm (8.5 in)
Shock absorber type	All Freeride	KYB PRO 36 R EA
	Summit SP	HPG
	Summit X	HPG Plus

Front Suspension		
Shock absorber type	Summit X Expert	HPG Plus Kashima coated
Stabilizer bar type		Link

Rear Suspension			
Suspension type		All	tMotion
Suspension maximum travel		All Freeride	239 mm (9.4 in)
		All Summit	239 mm (9.4 in)
Shock absorber type	Center	All Freeride	KYB PRO 40 EA
		Summit SP	HPG
		Summit X	HPG Plus
	Rear	All Freeride	KYB PRO 40 EA
		Summit SP	HPG
		Summit X	HPG Plus
		Summit X Expert	KYB PRO 36 EA

Weight and Dimensions		
Mass (dry)	Freeride 146"	213 kg (469 lb)
	Freeride 154"	205 kg (451 lb)
	Freeride 165" Summit SP 165" Summit X 175"	208 kg (458 lb)
	Summit SP 146" 850 E-TEC Summit SP 154"" 850 E-TEC Summit X 165"	204 kg (449 lb)

Weight and Dimensions		
Mass (dry)	Summit SP 146" 600R E-TEC Summit SP 154" 600R E-TEC Summit X 154"	201 kg (442 lb)
	Summit SP 175"	211 kg (465 lb)
	Summit X Expert 154"	200 kg (440 lb)
	Summit X Expert 165"	203 kg (448 lb)
Overall length	146" models	311.0 cm (122.4 in)
	154" models	331.2 cm (130.4 in)
	165" models	344.5 cm (135.6 in)
	175" models	350.3 cm (137.9 in)
Overall width	Freeride 146	114 cm to 118.4 cm (44.9 in to 46.6 in)
	Freeride 154 Freeride 165 All Summit	108 cm to 111 cm (42.5 in to 43.7 in)
Overall height	Freeride 146	134.8 cm (53.1 in)
	Freeride 154" Freeride 165"	136.8 cm (53.9 in)
	Summit SP Summit X	138.6 cm (54.6 in)
	Summit X Expert	129.2 cm (50.9 in)

Weight and Dimensions		
Ski stance	Freeride 146	97.5 cm to 102 cm (38.4 in to 40.2 in)
	Freeride 154 Freeride 165 All Summit	91 cm to 95 cm (35.8 in to 37.4 in)

(1) ***NOTICE*** Do not attempt to adjust gap on this spark plug.

(2) Refer to *INJECTION OIL* for detailed information.

(3) Measure gap between slider shoe and bottom inside track when exerting a downward pull to the track.

TROUBLE-SHOOTING

TROUBLESHOOTING GUIDELINES

Electric starter does not work

1. Emergency engine stop switch in OFF position or tether cord cap not installed on engine cut-off switch.
   – *Place the emergency engine stop switch in the ON position and install tether cord cap (on engine cut-off switch.*

2. Throttle applied while attempting an engine start.
   – *Release throttle while cranking.*

Engine is cranked but fails to start

1. No fuel to the engine.
   – *Check fuel tank level, add fuel if necessary.*

2. System voltage too low.
   – *Contact an authorized Ski-Doo dealer.*

Engine RPM does not reach clutch engagement point

1. D.E.S.S. did not read D.E.S.S. key code in the tether cord cap. D.E.S.S. pilot lamp blinks (slow short beeps/repetitive).
   – *Properly install tether cord cap.*

2. D.E.S.S. has read a different code than the one programmed. D.E.S.S. pilot lamp blinks rapidly (fast short beeps/repetitive).
   – *Install a tether cord cap for which this snowmobile was programmed.*

3. ECM does not recognize the D.E.S.S. key.
   – *Refer to an authorized Ski-Doo dealer.*

Engine lacks acceleration or power

1. Engine warm-up in progress.

– *DRIVE VEHICLE AT LOW SPEEDS FOR A FEW MINUTES.*

2. Engine break-in period not completed.
   – *COMPLETE BREAK-IN PERIOD.*

3. Drive and driven pulleys require servicing.
   – *CONTACT AN AUTHORIZED SKI-DOO DEALER.*

4. Engine overheats.
   – *CHECK COOLANT LEVEL, SEE MAINTENANCE PROCEDURES.*

   – *CHECK HEAT EXCHANGERS CLEANLINESS. CLEAN IF NECESSARY.*

5. Drive belt worn too thin.
   – *IF THE DRIVE BELT HAS LOST MORE THAN 3 MM (1/8 IN) OF ITS ORIGINAL WIDTH, IT WILL AFFECT VEHICLE PERFORMANCE.*

   – *REPLACE DRIVE BELT.*

6. Incorrect track adjustment.
   – *SEE MAINTENANCE PROCEDURES AND/OR AN AUTHORIZED SKI-DOO DEALER FOR PROPER ALIGNMENT AND TENSION ADJUSTMENTS.*

7. R.A.V.E. valves problem.
   – *SEEK SERVICE FROM AN AUTHORIZED SKI-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. Fuel pressure too low.
   – *SEEK SERVICE FROM AN AUTHORIZED SKI-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 backfires

1. Engine is running too hot.
   – SEE ITEM 4 OF ENGINE LACKS POWER.

2. Ignition timing is incorrect or there is an ignition system failure.
   – SEEK SERVICE FROM AN AUTHORIZED SKI-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. Exhaust system leak.
   – SEEK SERVICE FROM AN AUTHORIZED SKI-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. Fuel pressure too low.
   – SEEK SERVICE FROM AN AUTHORIZED SKI-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

1. Water in fuel.
   – DRAIN FUEL SYSTEM AND REFILL WITH FRESH FUEL.

2. RAVE valves malfunction.

– *HAVE RAVE VALVES SYSTEM INSPECTED. SEEK SERVICE FROM AN AUTHORIZED SKI-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.*

Heated grips/thumb warmers are not working

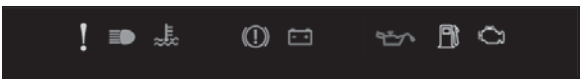
1. Engine RPM is too low.
   – *MAKE SURE ENGINE RPM IS ABOVE 2000.*

Engine has shut down

1. The engine shuts down after long periods of idling.
   – *DO NOT LET ENGINE IDLE TOO LONG. REFER TO VEHICLE WARM-UP IN OPERATING INSTRUCTION.*

Pilot Lamps, Messages and Beeper Codes

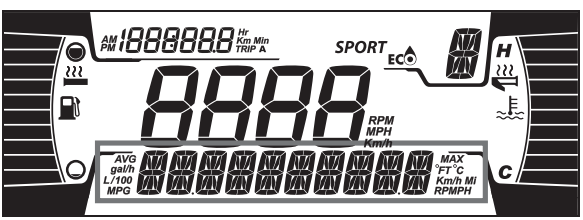
Gauge pilot lamp(s) will inform you if an anomaly occurs or to inform you of a particular condition.



619900974-809
TYPICAL — PILOT LAMPS

Pilot lamp can flash alone or in combination with another lamp.

On the multifunction gauge, the center display is used as a complement of the pilot lamps to give you a brief description if an anomaly occurs or to inform you of a particular condition.



619900974-700

Messages will be displayed with a beep code and pilot lamp(s).

Beeper codes will be heard and messages will be displayed to catch your attention.

See table below for details.

NOTE: Some of the listed pilot lamps and messages do not apply to all models.

Pilot Lamp ON	Beeper	Message Display	Description
	4 short beeps every 30 seconds	HIGH ENGINE TEMPERATURE	Engine is overheating, reduce snowmobile speed and run in loose snow or stop engine immediately and let engine cool down. Check coolant level, refer to *MAINTENANCE*. If coolant level is correct and overheating persists, contact an authorized Ski-Doo dealer. Do not run the engine if condition persists.
		MUFFLER OVERHEAT	Reduce speed or stop engine. Let engine cool down and restart. If overheating persists, contact an authorized Ski-Doo dealer. Do not run the engine if condition persists.
	Short beeps repeating rapidly	HIGH ENGINE TEMPERATURE	Critical overheat. Stop engine immediately and let engine cool down. Check coolant level, refer to *MAINTENANCE*. If coolant level is correct and overheating persists, contact an authorized Ski-Doo dealer. Do not run the engine if condition persists.
		MUFFLER OVERHEAT	Critical overheat. Stop engine immediately and let engine cool down. If overheating persists, contact an authorized Ski-Doo dealer. Do not run the engine if condition persists.
		ECM OVERHEAT	
	4 short beeps every 5 minutes	BATT VOLT	Indicate a low or high battery voltage condition. See an authorized Ski-Doo dealer as soon as possible.
	4 short beeps	CHECK ENGINE	Engine fault, see an authorized Ski-Doo dealer, repair shop or person of your own choosing as soon as possible.

Pilot Lamp ON	Beeper	Message Display	Description
	—	—	Displayed when brake is applied for more than 15 seconds while throttle lever is squeezed and vehicle is moving at more than 5 km/h (3 mi/h).
—	4 short beeps every 5 minutes	KNOCK	Engine detonation (RPM is limited when this condition occurs). - Ensure recommended fuel is used. - Check fuel quality, replace if necessary. - If fault still occurs, contact an authorized Ski-Doo dealer, repair shop, or person of your own choosing.
—	4 short beeps every 5 minutes	REV LIMIT	Engine RPM limited for protection when certain faults occur.
—	—	OVER REV	Indicates that maximum engine RPM is reached. Check clutch calibration.
—	Short beeps repeating rapidly	SHUTDOWN	Shutdown procedure in force due to engine overheating or fuel pump problem.
DESS	2 short beeps	—	Good key, vehicle ready to operate.
	Short beeps, repeating slowly	WRONG KEY	Unable to read key (bad connection). Make sure the key is clean and correctly snapped on post.
	Short beeps repeating rapidly	BAD KEY	Invalid key or key not programmed. Use the proper key for the vehicle or have the programmed.

Pilot Lamp ON	Beeper	Message Display	Description
(blinking)	—	—	Fuel level sensor problem.

Fault Codes

On the multifunction gauge, fault codes can be displayed on the center display.

To read any active fault code, press and hold MENU (M) Button and simultaneously depress the HI/LOW beam switch repeatedly several times.

If two or more codes are registered, use SET (S) or MENU (M) to scroll.

To exit the fault codes mode, press and hold MENU (M) button.

Contact an authorized Ski-Doo dealer for code signification.

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WARRANTY

BRP LIMITED WARRANTY USA AND CANADA: 2021 SKI-DOO® SNOWMOBILES

SCOPE OF THE LIMITED WARRANTY

Bombardier Recreational Products Inc. (**"BRP"**)* warrants its 2021 Ski-Doo snowmobiles 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 snowmobile was used for racing or any other competitive activity, at any point, even by a previous owner; or (2) the snowmobile 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.

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.

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 or accessories 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, use of the product on surfaces other than snow, 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);
- Snow or water ingestion;
- 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; and
- Damage resulting from studs installed on tracks if the installation does not conform to BRP's instructions.

WARRANTY COVERAGE PERIOD

This limited warranty will be in effect from the date of delivery to the first retail consumer or the date the product is first put into use, whichever occurs first and for the following period:

TWELVE (12) CONSECUTIVE MONTHS, for private or commercial use owners. However, the warranty coverage period

on a snowmobile delivered between June 1st and December 1st of a given year will expire November 30th of the following year.

For emission-related components; please also refer to the *US EPA EMISSION-RELATED WARRANTY* contained herein.

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.

CONDITIONS REQUIRED FOR WARRANTY COVERAGE

This warranty coverage is available **only** if each of the following conditions has been fulfilled:

- The 2021 Ski-Doo snowmobile must be purchased as new and unused by its first owner from a BRP dealer authorized to distribute Ski-Doo snowmobiles in the country in which the sale occurred (**"BRP dealer"**);
- The BRP specified pre-delivery inspection process must be completed and documented and signed by the purchaser;
- The 2021 Ski-Doo snowmobile must have undergone proper registration by an authorized BRP dealer;
- The 2021 Ski-Doo snowmobile 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 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.

WHAT TO DO TO OBTAIN WARRANTY COVERAGE

The customer must cease using the snowmobile upon the appearance of an anomaly. The customer must notify a 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 starting the repair in order to validate the warranty repair. All parts replaced under this limited warranty become the property of BRP.

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 Ski-Doo parts without charge for parts and labor , at any authorized BRP dealer during the warranty coverage period under the conditions described herein. No claim of breach of warranty shall be cause for cancellation or rescission of the sale of the snowmobile 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.

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 Ski-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.

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 dealership level. We recommend discussing the issue with the authorized 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 1051 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 1051 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 Ski-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	Kilo meters
Exhaust emission-related components	200	30	4000
Evaporative emission-related components	N/A	24	N/A

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

*As related to the evaporative emission control system

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.

Limited Applicability

As a certifying manufacturer, BRP may deny emission-related warranty claims for failures that have been caused by the owner's or operator's improper maintenance or use, by accidents for which the manufacturer has no responsibility, or by acts of God. For example, an emission-related warranty claim need not be honored for failures that have been directly caused by the operator's abuse of the engine/equipment or the operator's

use of the engine/equipment in a manner for which it was not designed and are not attributable to the manufacturer in any way.

If you have any question regarding your warranty rights and responsibility, you should contact 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.

BRP INTERNATIONAL LIMITED WARRANTY: 2021 SKI-DOO® SNOWMOBILES

SCOPE OF THE LIMITED WARRANTY

Bombardier Recreational Products Inc. (“BRP”)* warrants its 2021 Ski-Doo snowmobiles sold by distributors or dealers authorized by BRP to distribute SKI-Doo snowmobiles (**"Ski-Doo Distributor/Dealer"**) outside of the fifty United States, Canada, members 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”**), members 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 snowmobile was used for racing or any other competitive activity, at any point, even by a previous owner; or (2) the snowmobile 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.

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 Ski-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.

EXCLUSIONS – ARE NOT WARRANTED

The following are not warranted under this limited warranty under any circumstances:

- Normal wear and tear;
- Routine maintenance items, tune ups, adjustments;
- 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, modifications 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 Ski-Doo Distributor/Dealer;
- Damage caused by abuse, abnormal use, neglect, racing or operation of the product on surfaces other than snow, 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, snow 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;

- 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.
- And damage resulting from studs installed on tracks if the installation does not conform to BRP's instructions.

WARRANTY COVERAGE PERIOD

This 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:

TWELVE (12) CONSECUTIVE MONTHS, for private or commercial use owners. However, the warranty coverage period on a snowmobile delivered between June 1st and December 1st of a given year will expire November 30th of the following year.

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.

CONDITIONS TO HAVE WARRANTY COVERAGE

This warranty coverage is available **only** if each of the following conditions has been fulfilled:

- The 2021 Ski-Doo snowmobile must be purchased as new and unused by its first owner from a Ski-Doo Distributor/Dealer authorized to distribute Ski-Doo snowmobiles in the country in which the sale occurred;
- The BRP specified pre-delivery inspection process must be completed and documented;
- The product must have undergone proper registration by an authorized Ski-Doo Distributor/Dealer;
- The 2021 Ski-Doo snowmobile must be 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 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.

WHAT TO DO TO OBTAIN WARRANTY COVERAGE

The customer must cease using the snowmobile upon the appearance of an anomaly. The customer must notify a servicing Ski-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 Ski-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.

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 Ski-Doo parts without charge for parts and labour, at any authorized Ski-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 snowmobile 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.

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 Ski-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.

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 Ski-Doo Distributor/Dealer level. We recommend discussing the issue with the authorized Ski-Doo Distributor/Dealer's service manager or owner.

If the matter still remains unresolved, contact BRP by filling out the customer contact form at www.brp.com or contact BRP by mail at one of the addresses listed under the *CONTACT US* section of this guide.

* For the territory covered by this limited warranty, products are distributed and serviced by Bombardier Recreational Products Inc. or its affiliates.

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BRP LIMITED WARRANTY FOR THE EUROPEAN AND THE COMMONWEALTH OF THE INDEPENDENT STATES (CIS) AREAS AND TURKEY: 2021 SKI-DOO® SNOWMOBILES

SCOPE OF THE LIMITED WARRANTY

Bombardier Recreational Products Inc. (**"BRP"**)* warrants its 2021 Ski-Doo snowmobiles sold by distributors or dealers authorized by BRP to distribute Ski-Doo snowmobiles (**"Ski-Doo Distributor/Dealer"**) in member states of the European Economic Area (which is comprised of the member states of the European Union plus the United Kingdom, Norway, Iceland and Liechtenstein) (**"EEA"**), in member states of the Commonwealth of the Independent States (including Ukraine and Turkmenistan) (**"CIS"**) and Turkey from defects in material or workmanship for the period and under the conditions described below.

Non-factory installed parts and accessories are not covered under this limited warranty. Please refer to the applicable parts and accessories limited warranty text.

This limited warranty will become null and void if: (1) the snowmobile was used for racing or any other competitive activity, at any point, even by a previous owner; or (2) the snowmobile 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.

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 WARRANTIES. 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 Ski-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.

EXCLUSIONS – ARE NOT WARRANTED

The following are not warranted under this limited warranty under any circumstances:

- Normal wear and tear;
- Routine maintenance items, tune ups, adjustments;
- 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, modifications 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 Ski-Doo Distributor/Dealer;
- Damage caused by abuse, abnormal use, neglect, racing or operation of the product on surfaces other than snow, 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, snow 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;
- Incidental or consequential damages, or damages of any kind including without limitation towing, transportation expenses, storage, telephone, rental, taxi, inconvenience, insurance coverage, loan payments, loss of time, loss of income or time missed for downtime experience due to service work;
- and damage resulting from studs installed on tracks if the installation does not conform to BRP's instructions.

WARRANTY COVERAGE PERIOD

This 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:

TWENTY-FOUR (24) CONSECUTIVE MONTHS, for private use owners and TWELVE (12) CONSECUTIVE MONTHS for commercial use owners. However, the warranty coverage period on a snowmobile delivered between June 1st and December 1st of a given year will expire November 30th of the applicable year. A snowmobile 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 snowmobile 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.

CONDITIONS TO HAVE WARRANTY COVERAGE

This warranty coverage is available **only** if each of the following conditions has been fulfilled:

- The 2021 Ski-Doo snowmobile must be purchased as new and unused by its first owner from a Ski-Doo Distributor/Dealer authorized to distribute Ski-Doo products in the country in which the sale occurred;
- The BRP specified pre-delivery inspection process must be completed and documented;
- The product must have undergone proper registration by an authorized Ski-Doo Distributor/Dealer;
- The 2021 Ski-Doo snowmobile 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 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.

WHAT TO DO TO OBTAIN WARRANTY COVERAGE

The customer must cease using the snowmobile upon the appearance of an anomaly. The customer must notify a servicing Ski-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 Ski-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.

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 Ski-Doo parts without charge for parts and labour, at any authorized Ski-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 snowmobile 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 EEA, CIS or Turkey, 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.

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 Ski-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.

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 Ski-Doo Distributor/Dealer level. We recommend discussing the issue with the authorized Ski-Doo Distributor/Dealer's service manager or owner.

If the matter still remains unresolved, contact BRP by filling out the customer contact form at www.brp.com or contact BRP by mail at one of the addresses listed under the *CONTACT US* section of this guide.

* In the EEA, products are distributed and serviced by BRP European Distribution S.A. and other affiliates or 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 though 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.

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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 ❑ 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

EN-CHANGEADD-SKI

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EN-CHANGEADD-SKI

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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EN-CHANGEADD-SKI

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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Notes

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⚠ WARNING

BEFORE YOU OPERATE THIS VEHICLE, READ THIS OPERATOR'S GUIDE, ALL ON-PRODUCT SAFETY LABELS AND WATCH THE SAFETY VIDEO.