

2016 Can-Am Outlander L 570 / Max Series

**Here is combined the base manual along with all the needed updates and
the 2016 supplement manual into one manual**

SAFETY NOTICE

This shop manual supplement has been prepared as a guide to correctly service and repair the 2016 Can-Am™ Outlander™ L ATV as described in the model list in the *INTRODUCTION*.

This edition was primarily published to be used by mechanics and technicians who are already familiar with all service procedures relating to BRP products. 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 procedures applicable to the particular product at the time of writing. Service and warranty bulletins may be published to update the content of this manual. Dealer modifications that were carried out after manufacturing of the product, whether or not authorized by BRP, are not included.

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

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

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

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

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

WARNING

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

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

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

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

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

Always observe common shop safety practice.

Unless otherwise noted, the engine must be stopped and the key must be removed prior to performing 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.

INTRODUCTION

GENERAL INFORMATION

This shop manual supplement covers the following BRP made 2016 Outlander L and Outlander L MAX Series vehicles.

MODEL	OPTION PACKAGE
Outlander L 450	STD
	DPS
	PRO
Outlander L 570	STD
	DPS
Outlander L MAX 450	STD
	DPS
Outlander L MAX 450	STD
	DPS

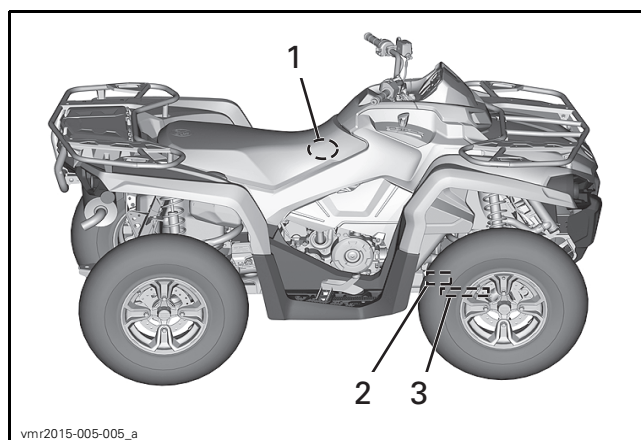
The information and component/system descriptions contained in this manual are correct at time of publication. BRP however, maintains a policy of continuous improvement of its products without imposing upon itself any obligation to install them on products previously manufactured.

Due to late changes, it may have 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

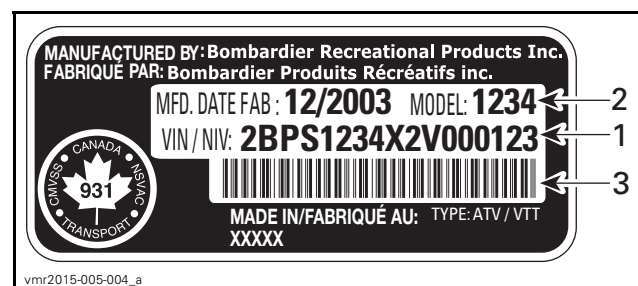
VEHICLE IDENTIFICATION NUMBER (VIN) LOCATIONS



VIN LOCATIONS

1. VIN decal under seat
2. VIN decal on lower frame member, RH side
3. VIN stamped on lower frame member, RH side

VIN Decal Description



TYPICAL — VEHICLE SERIAL NUMBER DECAL UNDER SEAT

1. VIN (Vehicle Identification Number)
2. Vehicle manufacturing date and model number
3. VIN bar code

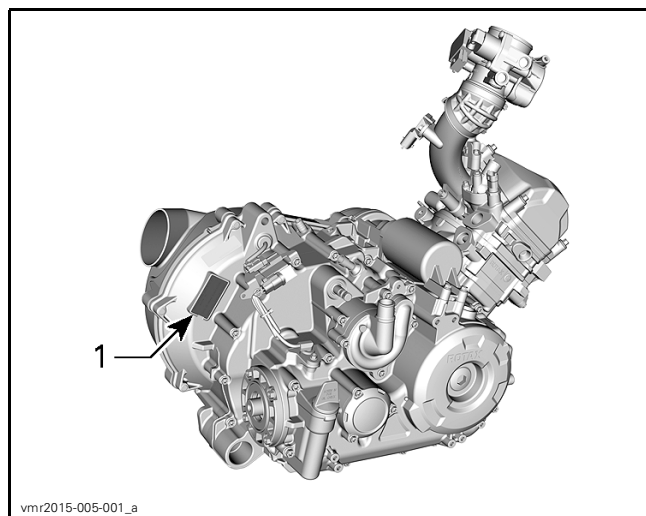
INTRODUCTION



TYPICAL — VEHICLE SERIAL NUMBER DECAL ON RH SIDE OF FRAME

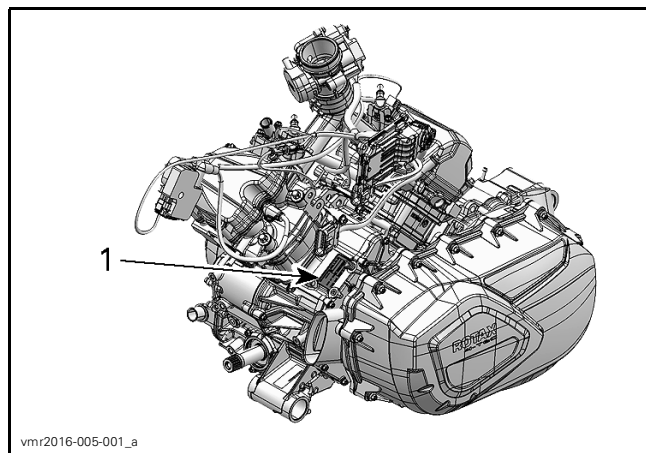
1. VIN (Vehicle Identification Number)
2. Vehicle manufacturing date and model number

ENGINE IDENTIFICATION NUMBER (EIN)



BACK OF 450 ENGINE

1. EIN (Engine Identification Number)



LH SIDE OF 570 ENGINE

1. EIN (Engine Identification Number)

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

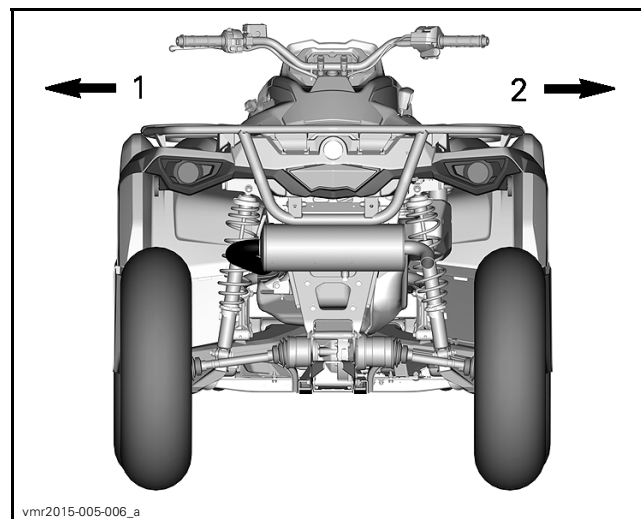
Many of the procedures in this manual are inter-related. Before undertaking any task, you should read and thoroughly understand the entire section or subsection in which the procedure is contained.

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).



TYPICAL

- 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.

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TYPICAL PAGE

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

Reference to a specific section or subsection.

Indicates component procedures apply to.

Indicates specific procedure to be carried out.

Section 03 ENGINE
Subsection 09 (MAGNETO SYSTEM)

GENERAL

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

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

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

WARNING

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

PROCEDURES

MAGNETO FLYWHEEL

Magneto Flywheel Cleaning

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

CAUTION: Clean magneto flywheel using only a clean cloth.

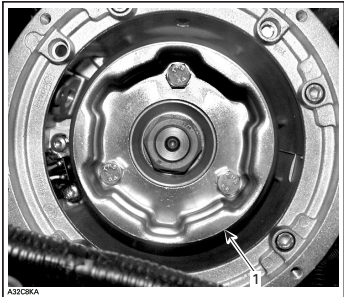
Magneto Flywheel Removal

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

Remove acoustic panel.

Remove rewind starter.

Remove starting pulley **no. 2**.



TYPICAL
1. Starting pulley

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



TYPICAL

Models

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

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

Call-outs pertaining to above illustration.

Illustration always follows text to which it applies.

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

mmr2008-001
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no. 2
 Bold face number following part name refers to exploded view at beginning of subsection.

typical_txt_2008_en

INTRODUCTION

TIGHTENING TORQUE

Tighten fasteners to the torque specified in the exploded view(s) and/or in the written procedure. When a torque is not specified, refer to the following table.

WARNING

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

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

1. Manually screw in 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.

Whenever possible, always apply torque on the nut.

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.

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

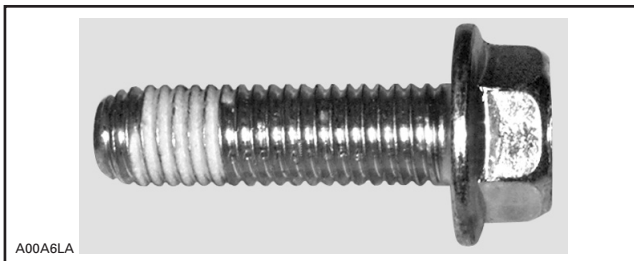
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FASTENER SIZE	FASTENER GRADE/TORQUE			
	5.8 Grade	8.8 Grade	10.9 Grade	12.9 Grade
M4	1.5 – 2 N•m (13 – 18 lbf•in)	2.5 – 3 N•m (22 – 27 lbf•in)	3.5 N•m - 4 N•m (31 lbf•in - 35 lbf•in)	4 N•m - 5 N•m (35 lbf•in - 44 lbf•in)
M5	3 N•m - 3.5 N•m (27 lbf•in - 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 FASTENER PROCEDURE



TYPICAL — SELF-LOCKING FASTENER

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

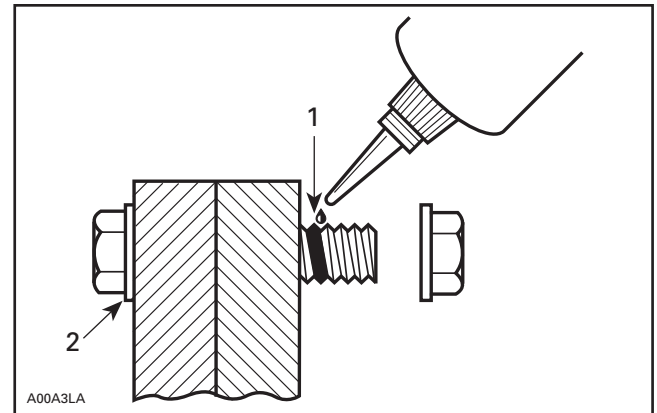
Use a metal brush or a tap to properly clean a threaded hole, then use a solvent. Allow the solvent time to act, approximately 30 minutes, then wipe off. Solvent utilization is to ensure proper adhesion of the product used for locking the fastener.

LOCTITE® THREADLOCKER 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.

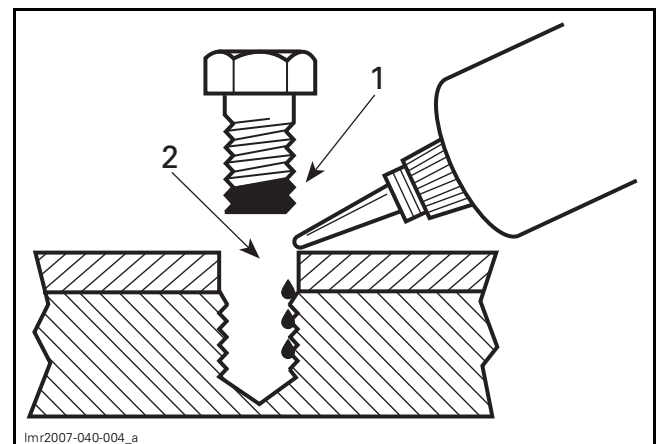
Threadlocker Application for Uncovered Holes (Bolts and Nuts)



1. Apply here
2. Do not apply

1. Clean threads (bolt and nut) with solvent.
2. Apply LOCTITE 7649 (PRIMER) (P/N 293 800 041) 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



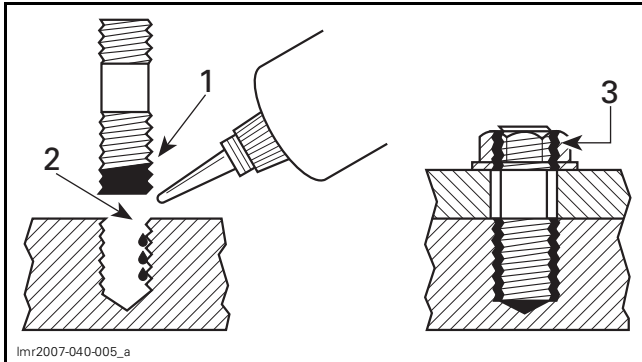
1. On fastener threads
2. On threads and at the bottom of hole

1. Clean threads (bolt and hole) with solvent.
2. Apply LOCTITE 7649 (PRIMER) (P/N 293 800 041) on threads (bolt and nut) and allow to dry for 30 seconds.
3. Choose proper strength Loctite threadlocker.

INTRODUCTION

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.

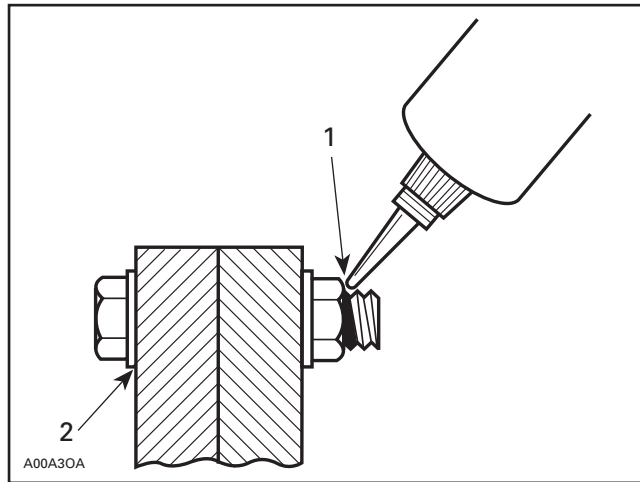
Threadlocker Application for Stud Installation in Blind Holes



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) (P/N 293 800 041) on threads and allow to dry.
 3. Apply 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

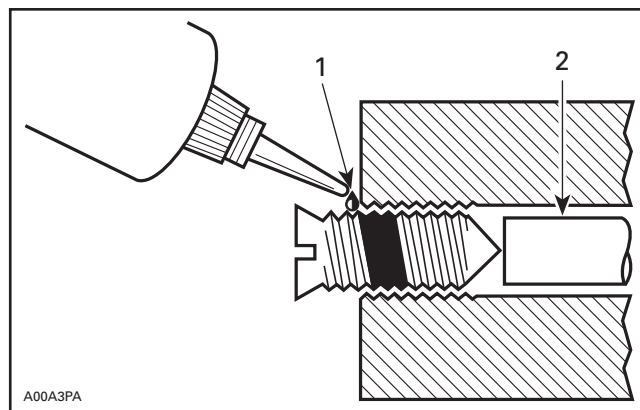


1. Apply here
2. Do not apply

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

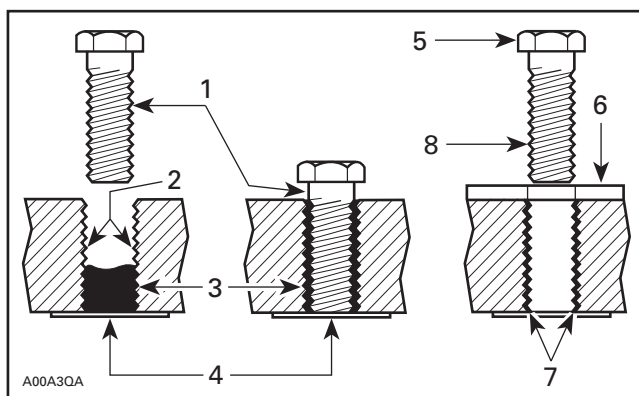


1. Apply here
2. Plunger

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. Tape
5. Cleaned bolt
6. Plate
7. New threads
8. Threadlocker

Standard Thread Repair

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

If a plate is used to align bolt:

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

NOTE: NOT intended for engine stud repairs.

Repair of Small Holes/Fine Threads

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

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

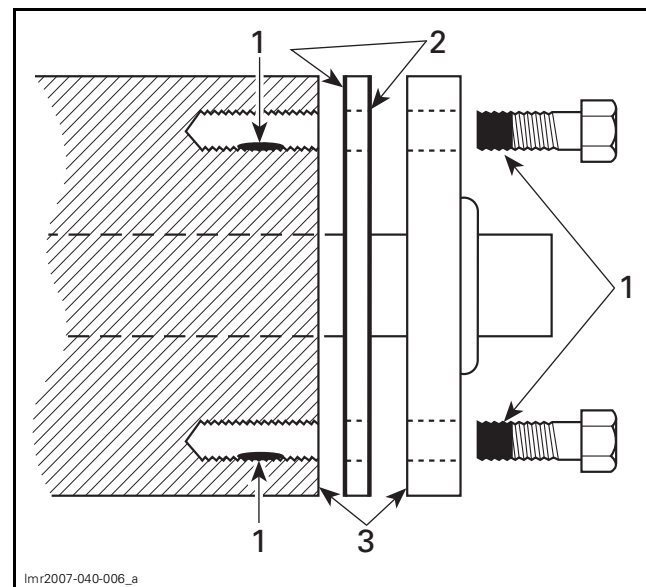
Permanent Stud Installation (Light Duty)

1. Use a stud of the desired thread length.

NOTE: DO NOT apply release agent on stud.

2. Follow Standard Thread Repair procedure.
3. Allow 30 minutes for Loctite FORM-A-THREAD to cure.
4. 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) (P/N 413 708 500). 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 (P/N 293 800 038) 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.

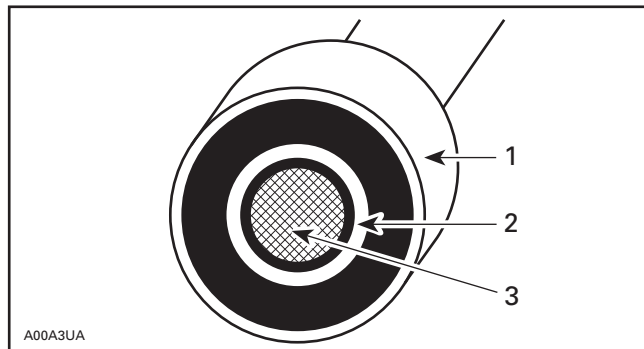
NOTE: If holes are sunken, apply proper strength Loctite on bolt threads.

6. Tighten as usual.

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Threadlocker Application for Mounting on a Shaft

Mounting with a Press



1. Bearing
2. Proper strength Loctite
3. Shaft

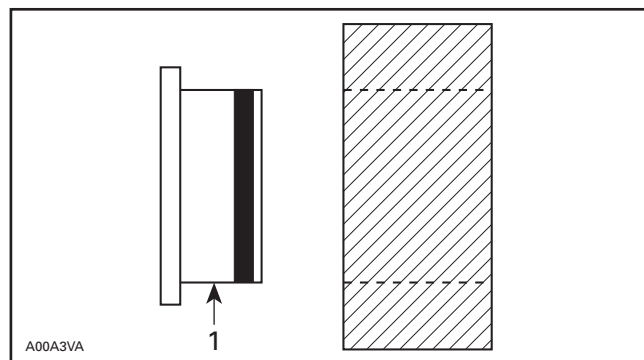
1. Clean shaft external contact surface.
2. Clean internal contact surface of part to be installed on shaft.
3. Apply a strip of proper strength Loctite on circumference of shaft contact surface at insertion or engagement point.

NOTE: Retaining compound is always forced out when applied on shaft. DO NOT use Loctite anti-seize or any similar product. 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 in the prescribed order.

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) (P/N 293 800 041).

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

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

4. Install according to standard procedure.

5. Wipe off excess product.

6. Allow 30 minutes for product to cure.

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

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

PERIODIC MAINTENANCE SCHEDULE

GENERAL

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

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

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 Can-Am dealers. Although an authorized Can-Am dealer has an in-depth technical knowledge and tools to service the Can-Am ATV, the emission-related warranty is not conditioned on the use of an authorized Can-Am dealer or any other establishment with which BRP has a commercial relationship. For emission-related warranty claims, BRP is limiting the diagnosis and repair of emission-related parts to the authorized Can-Am dealers. For more information, please refer to the *US EPA EMISSION-RELATED WARRANTY* contained herein. Proper maintenance is the owner's responsibility. A warranty claim may be denied if, among other things, the owner or operator caused the problem through improper maintenance or use.

You must follow the instructions for fuel requirements in the fueling section of 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.

WARNING

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

SEVERE DUSTY CONDITIONS

Engine Air Filter Maintenance Guideline

Air filter maintenance should be adjusted according to riding conditions.

Air filter maintenance must be increased in frequency in the following dusty conditions:

- Riding on dry sand
- Riding on dry dirt covered surfaces
- Riding on dry gravel roads or similar conditions.

NOTE: Riding in a group in these conditions would increase even more the air filter maintenance.

MAINTENANCE SCHEDULE LEGEND

Operation in trail riding conditions

Operation in severe riding conditions (dusty or muddy) or carrying heavy loads condition

MAINTENANCE SCHEDULE

Make sure to perform proper maintenance at recommended intervals as indicated in the tables. Some items of the maintenance schedule must be performed in function of the calendar, regardless of the distance or time of operation.

Section 01 MAINTENANCE

Subsection 02 (PERIODIC MAINTENANCE SCHEDULE)

EVERY 1 500 KM (1,000 MI) OR 50 HOURS (whichever comes first)
EVERY 750 KM (500 MI) OR 25 HOURS (whichever comes first)
Verify and clean engine air filter. Replace as needed
Verify battery connections
Inspect front differential and rear final drive oil level and look for contamination (X mr only)
Lubricate front propeller shaft joints (450 only)
Lubricate rear propeller shaft joints
Inspect tie rod ends and ball joints for play and boots condition
Lubricate front suspension arm bushings
Lubricate rear stabilizer bar bushings
Inspect the drive shaft boots and protectors
Inspect brake pads. Replace as needed
Inspect wheel bearings for abnormal play
Verify gearbox oil level and look for contamination (X mr only)

EVERY 3 000 KM (2,000 MI) OR 100 HOURS (whichever comes first)
EVERY 1 500 KM (1,000 MI) OR 50 HOURS (whichever comes first)
Adjust valve clearance
Clean muffler spark arrester
Verify and clean throttle body
Replace fuel vent breather filter
Verify CVT drive belt and clean CVT pulleys
Lubricate the one way bearing of the drive pulley
The following must be performed at least once a year:
Change engine oil and filter
Lubricate throttle cable
Inspect and clean brake system
Inspect battery condition
Verify steering system for abnormal play
Verify front differential and rear final drive oil level and look for contamination (570)
Verify gearbox oil level and look for contamination (570)

PERFORM AT THE FIRST 3 000 KM (2,000 MI) AND AT 6 000 KM (4,000 MI) THEN FOLLOW THE REGULAR SCHEDULE
PERFORM AT THE FIRST 1 500 KM (1,000 MI) AND AT 3 000 KM (2,000 MI) THEN FOLLOW THE REGULAR SCHEDULE
Replace gearbox oil
Clean the vehicle speed sensor (VSS)

Section 01 MAINTENANCE
Subsection 02 (PERIODIC MAINTENANCE SCHEDULE)

EVERY 6 000 KM (4,000 MI) OR 200 HOURS (whichever comes first)
EVERY 3 000 KM (2,000 MI) OR 100 HOURS (whichever comes first)
Verify the cooling system
Test engine coolant strength
Verify fuel system for leaks
Verify fuel pump pressure
Replace spark plugs
Replace front differential oil
Replace rear final drive oil
Replace gearbox oil (570 only)
Inspect input and output shaft seals (gearbox, differential and final drive)
Clean vehicle speed sensor
Clean and lubricate lower and upper steering column half bushings
The following must be performed every 2 years:
Replace the brake fluid
EVERY 12 000 KM (8,000 MI) OR 5 YEARS (whichever comes first)
EVERY 6 000 KM (4,000 MI) OR 5 YEARS (whichever comes first)
Replace engine coolant

PERIODIC MAINTENANCE PROCEDURES (570)

SERVICE TOOLS

Description	Part Number	Page
TEST CAP	529 035 991	16
VACUUM/PRESSURE PUMP	529 021 800	16, 29

SERVICE PRODUCTS

Description	Part Number	Page
AIR FILTER CLEANER	219 700 341	11
AIR FILTER OIL	219 700 340	11
BRAKE FLUID GTLMA DOT4.....	293 600 131	27, 29
LOCTITE 767 (ANTISEIZE LUBRICANT)	293 800 070	23
LONG LIFE ANTIFREEZE(F)	619 590 204	14
LONG LIFE ANTIFREEZE	219 702 685	14
SUSPENSION GREASE	293 550 033	25–26
XPS 4-STROKE SYNTH. BLEND OIL (SUMMER)	293 600 121	12
XPS 4-STROKE SYNTHETIC OIL (ALL CLIMATE)	293 600 112	12
XPS BRAKES AND PARTS CLEANER (USA)	219 701 705	27
XPS BRAKES AND PARTS CLEANER	219 701 776	27
XPS SYNTHETIC GEAR OIL (75W 140)	293 600 140	19, 24
XPS SYNTHETIC GEAR OIL (75W 90)	293 600 043	23
XPS SYNTHETIC GREASE.....	293 550 010	28

GENERAL

This subsection provides:

- Fluid level verifications
- Maintenance procedures.

The following systems should be serviced according to the *PERIODIC MAINTENANCE SCHEDULE*.

PROCEDURES

AIR INTAKE SYSTEM

Engine Air Filter Maintenance Guideline

As with any ATV, air filter maintenance is critical to ensure proper engine performance and life span.

Air filter maintenance should be adjusted according to riding conditions.

Air filter maintenance must be increased in frequency and oil must be added to the foam filter for the following dusty conditions:

- Riding on dry sand

- Riding on dry dirt covered surfaces
- Riding on dry gravel trails or similar conditions.

NOTE: Riding in a group in these conditions would increase even more the air filter maintenance.

Engine Air Filter Removal

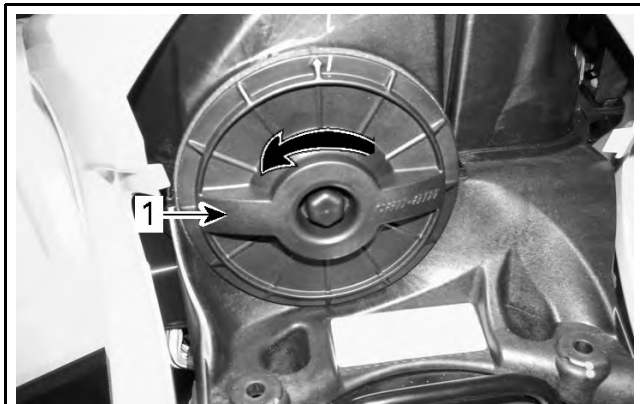
NOTICE Never remove or modify any component in the air filter housing. Otherwise, engine performance degradation or damage can occur. The engine is calibrated to operate specifically with these components.

1. Remove seat.
2. Remove console. Refer to *BODY* subsection.
3. Rotate air filter cover counterclockwise to remove it.

NOTE: A socket wrench may be used to ease removal of the air filter cover.

Section 01 MAINTENANCE

Subsection 03 (PERIODIC MAINTENANCE PROCEDURES (570))



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1. Air filter cover

4. Remove air filter.

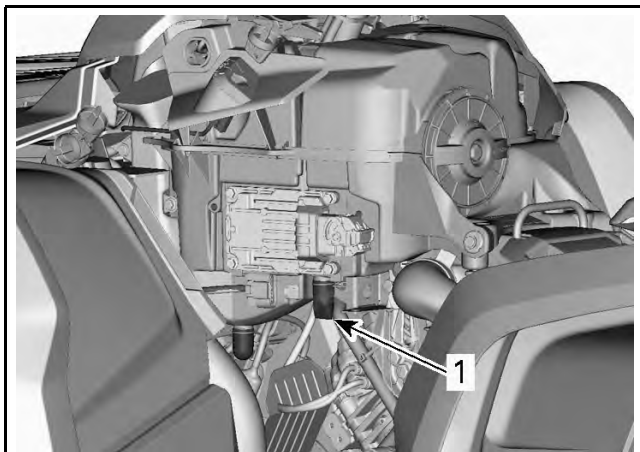


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AIR FILTER REMOVAL

Engine Air Filter Housing Inspection and Draining

1. Remove LH side panel and extension. Refer to *BODY* subsection.
2. Drain air filter housing drain tube.



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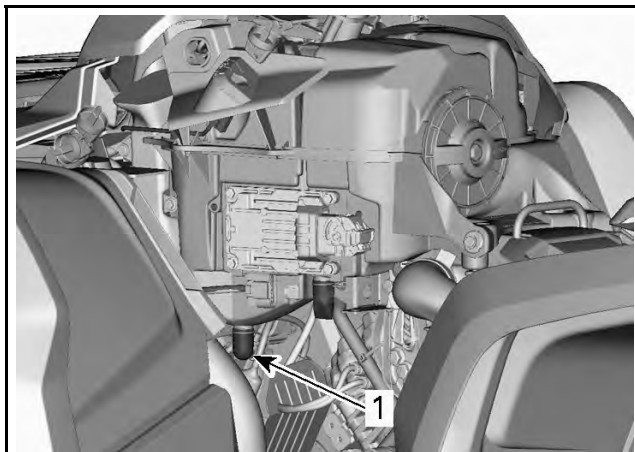
TYPICAL - SOME PARTS REMOVED FOR CLARITY

1. Air filter housing drain tube

3. Check air filter dirty chamber for cleanliness.
 - If any debris or water are found, clean air filter chamber using a vacuum cleaner.

NOTICE Do not blow compressed air into air filter chamber.

4. Check air filter housing drain tube (clean chamber).
 - If any debris or water are found, refer to *SPECIAL PROCEDURES* subsection.
 - Investigate for contamination source.



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TYPICAL - SOME PARTS REMOVED FOR CLARITY

1. Air filter drain tube

Paper Filter Cleaning

1. Ensure that the foam filter is removed from paper filter.
 2. Tap out heavy dust from the paper filter.
- This will allow dirt and dust to get out of the paper filter.

NOTE: Paper filter have a limited life span; replace filter if too dirty or clogged.

NOTICE It is not recommended to blow compressed air on the paper filter; this could damage the paper fibers and reduce its filtration ability when used in dusty environments.

NOTICE Do not wash the paper filter with any cleaning solution.

Foam Filter Cleaning

1. Spray the foam filter inside and out with air filter cleaner and follow manufacturer's instructions.

RECOMMENDED PRODUCT	
AIR FILTER CLEANER (P/N 219 700 341)	



TYPICAL - SPRAY THE FOAM FILTER

2. Dry the foam filter completely.



TYPICAL - DRY

NOTE: A second application may be necessary for heavily soiled elements.

Foam Filter Oiling

1. Spray the recommended air filter oil on the foam filter previously cleaned and dried. Follow manufacturer's informations.

RECOMMENDED PRODUCT	
AIR FILTER OIL (P/N 219 700 340)	



TYPICAL - OIL THE FOAM FILTER

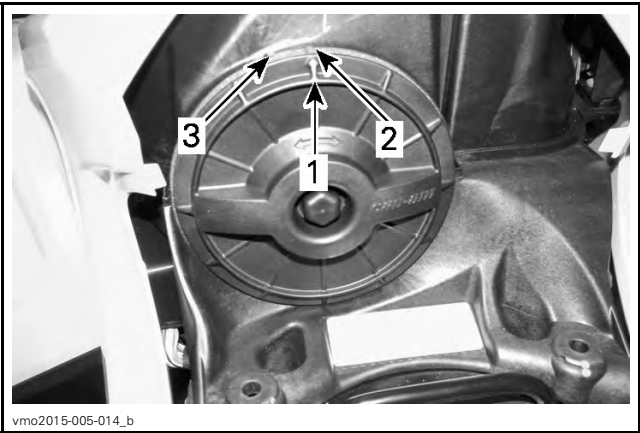
Reinstall oiled foam filter over the paper filter.

Engine Air Filter Installation

Slightly grease O-ring seal and plastic body of air filter. Refer to *AIR INTAKE SYSTEM* exploded view.

Install filter assembly in air filter housing.

Ensure air filter cover is properly locked onto the air filter housing. See indications on filter cover and housing.



1. Cover position arrow
2. Locked
3. Unlocked

Reinstall the console.

EXHAUST SYSTEM

Muffler Spark Arrester Cleaning

The muffler must be periodically purged of accumulated carbon.

Section 01 MAINTENANCE

Subsection 03 (PERIODIC MAINTENANCE PROCEDURES (570))

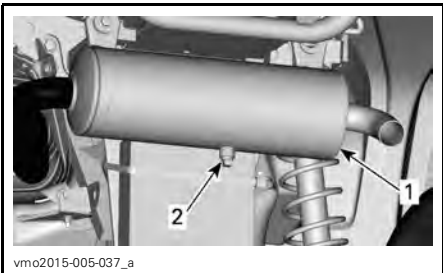
⚠ WARNING

Never run engine in an enclosed area. Never perform this operation immediately after the engine has been run because exhaust system is very hot. Make sure that there are no combustible materials in the area. Wear eye protection and gloves. Never stand behind the vehicle while purging exhaust system. Respect all applicable laws and regulations.

Select a well-ventilated area and make sure the muffler is cool.

Place transmission on PARK position.

Remove the clean out plug of the muffler.



TYPICAL

1. Muffler

2. Clean out plug

Block the end of the muffler with a shop rag and start engine.

Momentarily increase engine RPM several times to purge accumulated carbon out of the muffler.

Stop engine and allow muffler to cool.

Reinstall the clean out plug.

LUBRICATION SYSTEM

Recommended Engine Oil

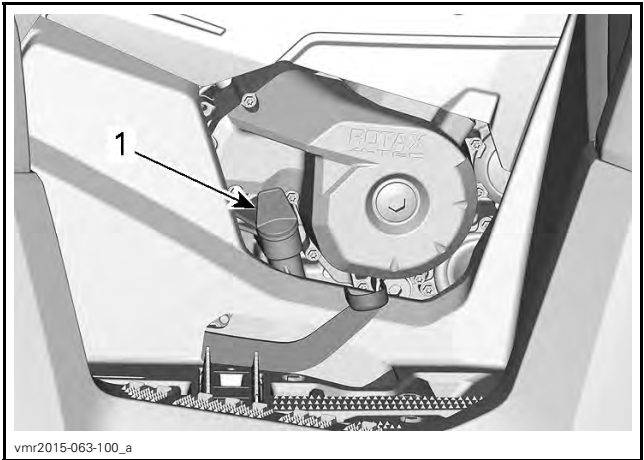
RECOMMENDED ENGINE OIL	
SEASON	TYPE
Summer	XPS 4-STROKE SYNTH. BLEND OIL (SUMMER) (P/N 293 600 121)
All seasons	XPS 4-STROKE SYNTHETIC OIL (ALL CLIMATE) (P/N 293 600 112)

If recommended XPS oil is not available, use a 4-stroke SAE 5W 40 engine oil that meets or exceeds the requirements for API service classification SG, SH or SJ. Always check the API service label certification on the oil container, it must contain at least one of the above standards.

Engine Oil Level Verification

NOTICE Operating the engine with an improper level may severely damage engine.

NOTE: While checking the oil level, visually inspect engine area for leaks.



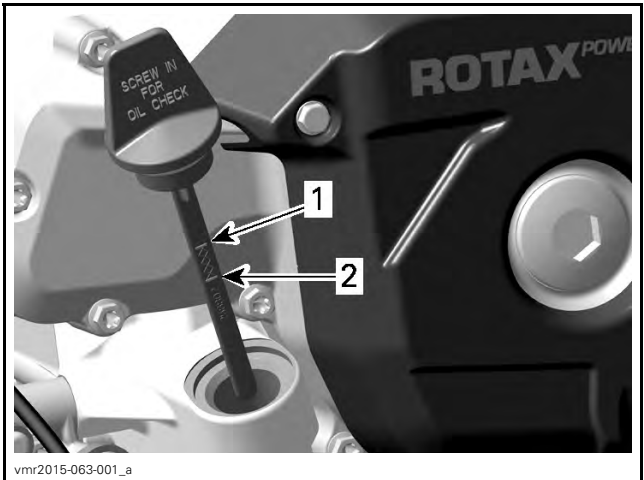
TYPICAL - RH SIDE OF ENGINE

1. Dipstick

NOTE: Do not lose the O-ring placed on the dipstick.

With vehicle on a level surface and engine cold, not running, check the oil level as follows:

1. Unscrew dipstick then remove it and wipe clean.
2. Reinstall dipstick, screw in it completely.
3. Remove and check oil level. It should be near or equal to the upper mark.



1. Full

2. Add

To add oil, remove the dipstick. Place a funnel into the dipstick orifice.

Add a small amount of recommended oil and recheck oil level.

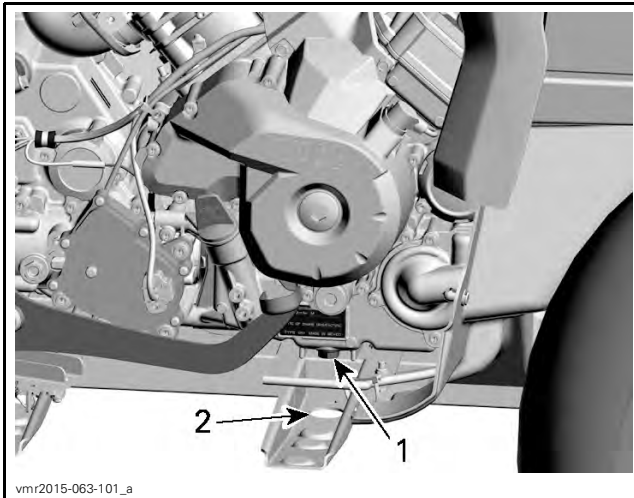
Repeat the above procedures until oil level reaches the dipstick's upper mark. **Do not over-fill. Wipe off any spillage.**

Properly tighten dipstick.

Engine Oil Change

1. Start and warm-up engine.
2. Stop engine.
3. Ensure vehicle is on a level surface.
4. Remove dipstick.
5. Place a drain pan under the engine drain plug area.
6. Clean the magnetic drain plug area.
7. Unscrew magnetic drain plug and discard the gasket ring.

CAUTION The engine oil can be very hot.



TYPICAL - SOME PARTS REMOVED FOR CLARITY

1. Magnetic drain plug
2. Access through frame

Allow oil to drain completely from the crankcase.

8. Clean the magnetic drain plug from metal shavings and residue. Presence of debris gives an indication of internal engine damage.
9. Install a **NEW** gasket ring on the magnetic drain plug.

NOTICE Never use the gasket ring a second time. Always replace by a new one.

10. Install and tighten magnetic drain plug to the recommended torque.

TIGHTENING TORQUE	
Magnetic drain plug	20 N•m ± 1 N•m (15 lbf•ft ± 1 lbf•ft)

11. Replace oil filter. Refer to *ENGINE OIL FILTER REPLACEMENT* in this subsection.

12. Refill engine with recommended engine oil.

ENGINE OIL CAPACITY
2 L (2.1 qt (U.S. liq.))

13. After filling, check the oil level, refer to *ENGINE OIL LEVEL VERIFICATION* in this subsection.

14. Start engine and let it idle for a few minutes.

15. Ensure oil filter and drain plug areas are not leaking.

16. Stop engine.

17. Wait a while to allow oil to flow down to crankcase, then check oil level again.

18. Refill as necessary.

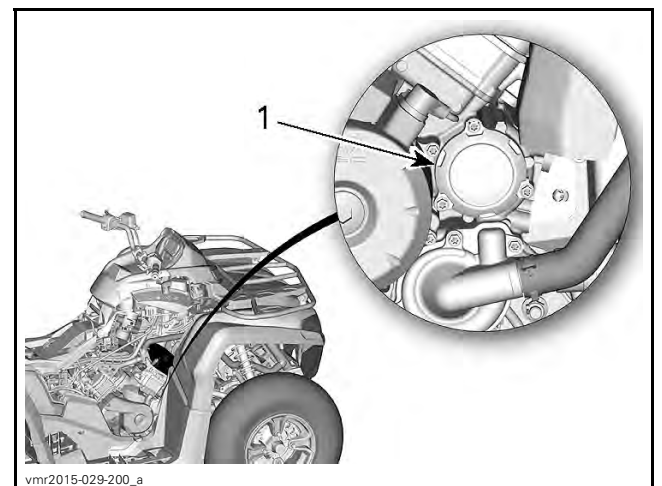
19. Dispose oil and filter as per your local environmental regulations.

Engine Oil Filter Replacement

Engine Oil Filter Access

To reach oil filter, refer to *BODY* subsection and remove the following parts:

- Seat
- Console
- RH side panel and extension
- RH inner fender panel.



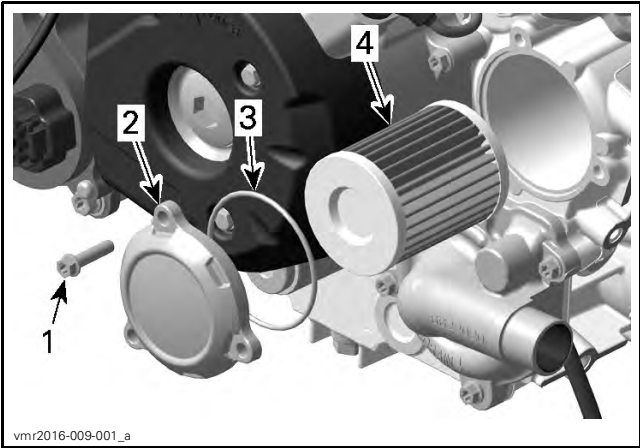
1. Oil filter cover

Engine Oil Filter Removal

1. Clean oil filter area.
2. Remove oil filter cover.
3. Remove oil filter.

Section 01 MAINTENANCE

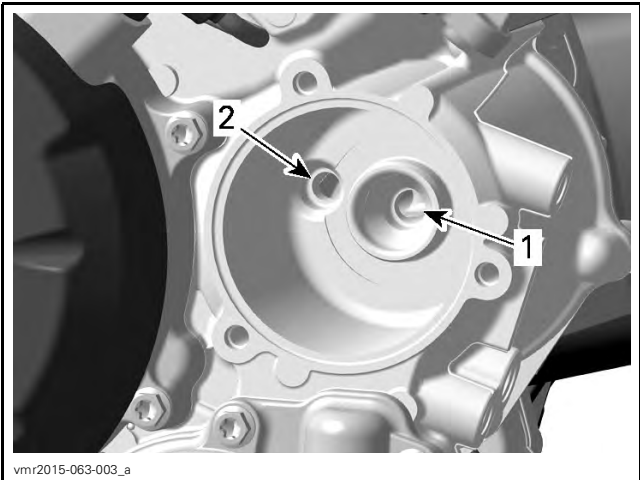
Subsection 03 (PERIODIC MAINTENANCE PROCEDURES (570))



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

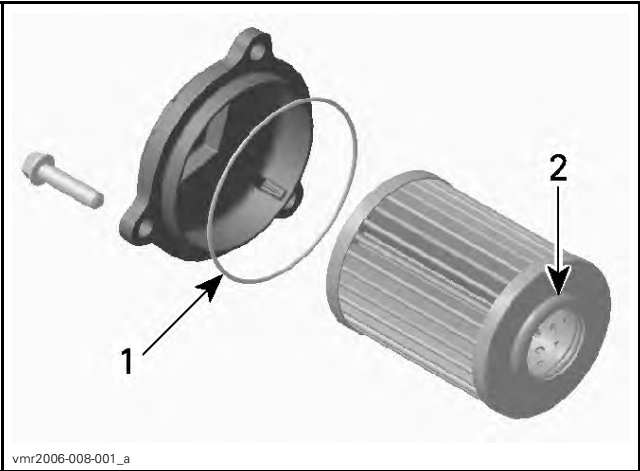
Engine Oil Filter Installation

- 1. Check and clean the oil filter inlet and outlet area of dirt and other contaminations.



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

- 2. Install a **NEW** O-ring on oil filter cover.
- 3. Install the filter into the cover.
- 4. Apply engine oil on O-ring and on end of filter.



- 1. O-ring - slightly oil
- 2. End of filter - slightly oil

- 5. Install the cover on the engine.
- 6. Tighten oil filter cover screws to recommended torque.

TIGHTENING TORQUE	
Oil filter cover screws	10 N•m ± 1 N•m (89 lbf•in ± 9 lbf•in)

- 7. Reinstall remaining parts if applicable.

COOLING SYSTEM

Recommended Engine Coolant

COOLANT		
BRP recommended product	Finland, Norway and Sweden	LONG LIFE ANTIFREEZE(F) (P/N 619 590 204)
	All Other Countries	LONG LIFE ANTIFREEZE (P/N 219 702 685)
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 formulated for internal combustion aluminum engines.

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

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 and does not have the same efficiency.

Engine Coolant Level Verification

⚠ WARNING

In order to avoid potential burns, check coolant level with engine cold. Do not remove the radiator cap if the engine is hot.

1. Place vehicle on a level surface.
2. Remove gauge support. Refer to *BODY* subsection.

With the vehicle on a level surface, coolant level should be between the MIN. and MAX. marks of the reservoir.



TYPICAL

1. Engine coolant reservoir

NOTE: When checking level at temperature lower than 20°C (68°F), it may be slightly lower than MIN. mark.

3. Add coolant up to MAX. mark if required.
4. Use a funnel to avoid spillage. **Do not overfill.**
5. Properly reinstall and tighten reservoir cap.
6. Reinstall gauge support.

NOTICE Do not store any objects under the gauge support.

Engine Coolant Specific Gravity Check

1. Remove gauge support. Refer to *BODY* subsection.
2. Remove pressure cap.

⚠ WARNING

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

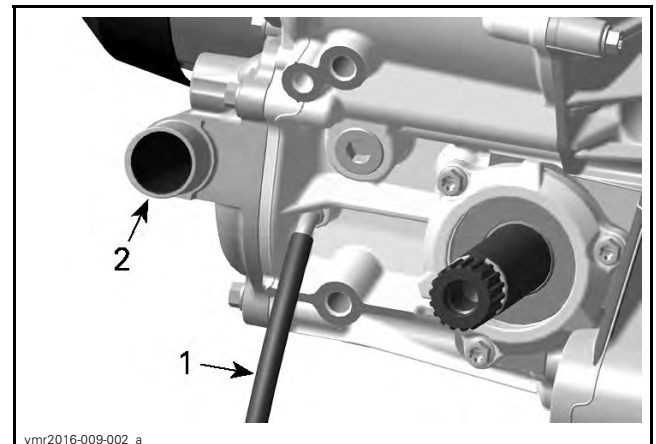
3. Using an antifreeze tester, test coolant strength.

MINIMUM RECOMMENDED COOLANT STRENGTH

-30°C (-22°F)

Engine Cooling System Inspection

1. Check general condition of hoses and clamps for tightness.
2. Check the leak indicator hose for oil or coolant. Leaking coolant indicates a defective rotary seal. Leaking oil indicates a defective oil seal. If either seal is leaking, both seals must be replaced at the same time. Refer to *WATER PUMP SHAFT AND SEALS* in the *COOLING SYSTEM* subsection.

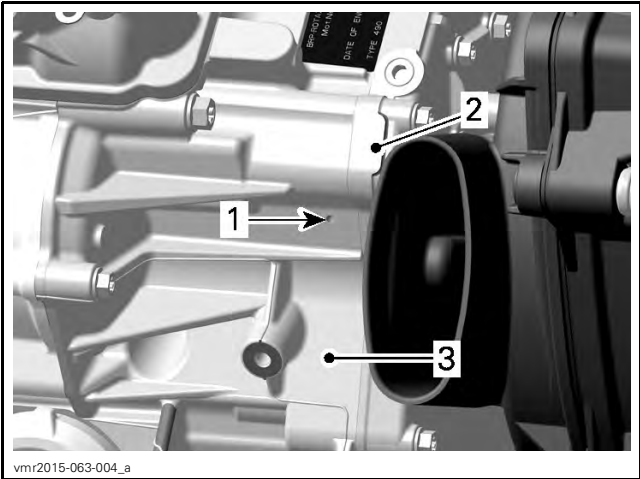


1. Leak indicator hose
2. Water pump

Another leak indicator hole is visible on the PTO side. It provides an indication of the PTO gasket condition. If a liquid leaks from this hole, PTO gasket replacement is necessary.

Section 01 MAINTENANCE

Subsection 03 (PERIODIC MAINTENANCE PROCEDURES (570))



TYPICAL

1. Leak indicator hole

2. PTO cover

3. Crankcase PTO, front side

3. Ensure vent hose on coolant expansion tank is not obstructed.

Engine Cooling System Pressure Cap Test

1. Remove gauge support. Refer to *BODY* sub-section.
2. Remove pressure cap.

WARNING

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

3. Test the pressure cap using a cooling system tester.
4. Replace the cap if it does not hold the pressure, or if it opens at a relief pressure that is too low or too high.

PRESSURE CAP RELIEF PRESSURE
Approximately 110 kPa (16 PSI)

Engine Cooling System Leak Test

1. Remove gauge support. Refer to *BODY* sub-section.
2. Remove pressure cap.

WARNING

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

3. Pressurize cooling system as follows.

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

If there is no pressure drop after 10 minutes, there is no leak in the cooling system.

If the pressure drops, check all hoses, radiator, cylinders and engine base for coolant leaks or air bubbles.

Engine Coolant Replacement

Engine Cooling System Draining

CAUTION Engine coolant can be very hot. Coolant draining should be carried out on a cold engine.

1. Remove gauge support. Refer to *BODY* sub-section.
2. Remove cooling system pressure cap.

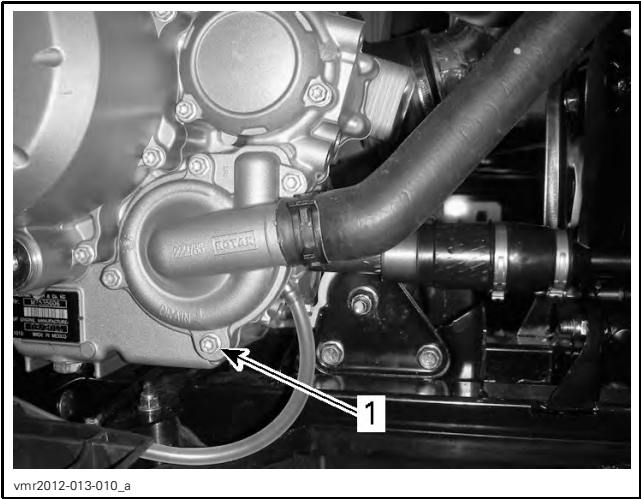


TYPICAL

1. Cooling system pressure cap

3. Unscrew coolant drain plug.

NOTE: Coolant drain plug is accessible from underneath RH footrest panel.



TYPICAL - SOME PARTS REMOVED FOR CLARITY

1. Coolant drain plug

4. Drain cooling system into a suitable container.
5. Disconnect the lower radiator hose and drain the remaining coolant.

NOTE: Take note of the hose clamp position before it is loosened for hose removal.

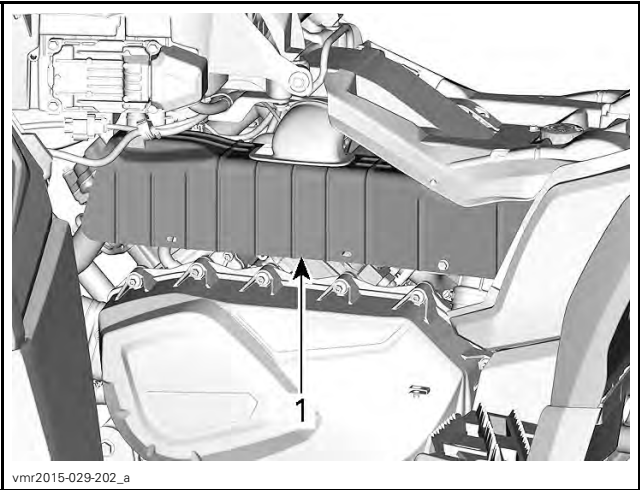
6. Reinstall coolant drain plug with a **NEW** sealing washer.
7. Tighten coolant drain plug to specification.

TIGHTENING TORQUE	
Coolant drain plug	10 N•m ± 1 N•m (89 lbf•in ± 9 lbf•in)

8. Fill cooling system with recommended coolant, refer to *COOLING SYSTEM FILLING AND BLEEDING* procedure.

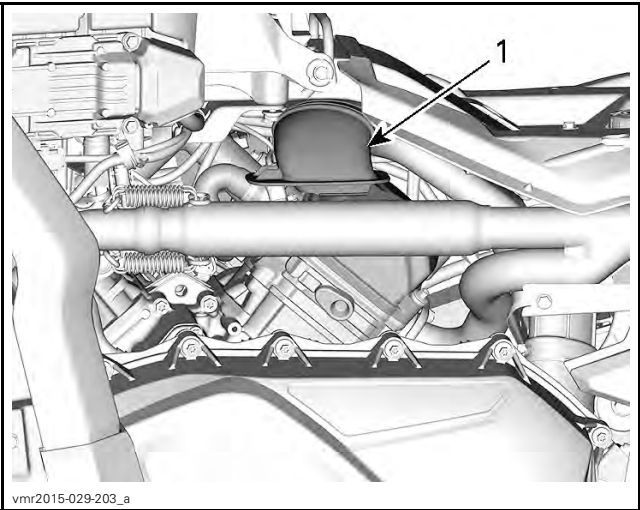
Engine Cooling System Filling and Bleeding

1. Remove cooling system pressure cap.
2. Remove RH and LH side panels. Refer to *BODY* subsection.
3. On LH side of engine, remove outer exhaust heat shield. Refer to *EXHAUST SYSTEM* subsection.



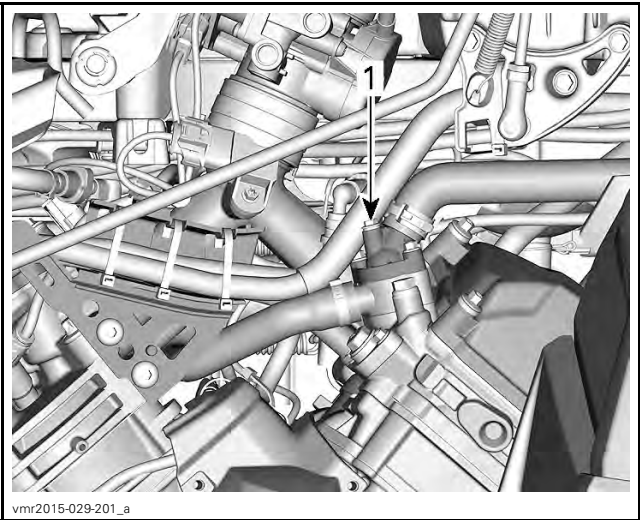
1. Outer exhaust heat shield

4. Remove CVT duct outlet.



1. CVT duct outlet

5. Unscrew bleed screws on thermostat housing covers of both front and rear cylinders.

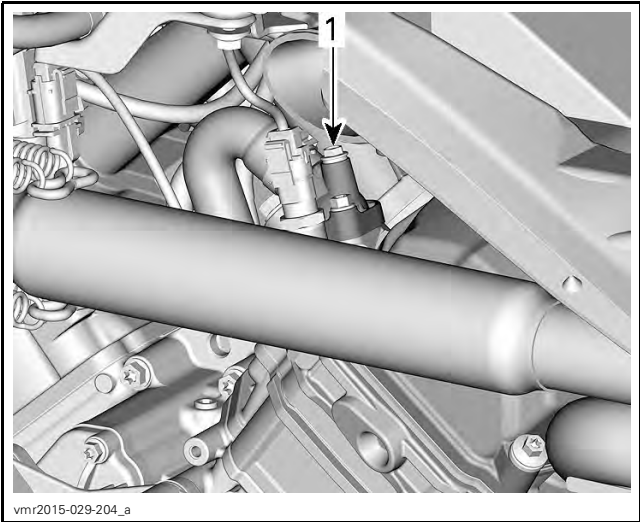


RH SIDE

1. Front cylinder bleed screw

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LH SIDE
1. Rear cylinder bleed screw

- 6. Fill cooling system until coolant comes out of bleed screws.
- 7. Squeeze the top of the coolant hose between the radiator and coolant pump several times to bleed all air from the highest point of the hose.
- 8. Install bleed screws using **NEW** gasket rings.
- 9. Tighten bleed screws.

TIGHTENING TORQUE	
Bleed screws	5.0 N•m ± 0.6 N•m (44 lbf•in ± 5 lbf•in)

- 10. Refill coolant tank up to MAX level mark.
- 11. Install cooling system pressure cap.
- 12. Run engine at idle until the cooling fan cycles on for a second time.
- 13. Stop the engine and let it cool down.

 **WARNING**

Do not remove the pressure cap if the engine is hot.

- 14. Check coolant level in the coolant tank. Refer to *ENGINE COOLANT LEVEL VERIFICATION* in this subsection.
- 15. Add coolant if required.

CYLINDER HEAD

Engine Valve Clearance Inspection and Adjustment

NOTE: Check and adjust valve clearance only when engine is cold.

- 1. Remove valve covers, refer to *TOP END* subsection.

- 2. Before checking or adjusting the valve clearance, turn crankshaft clockwise to TDC ignition of the respective cylinder, refer to *CAMSHAFT TIMING GEAR* in the *TIMING CHAIN* subsection.

NOTICE Crankshaft must be turned clockwise only to avoid loosening the magneto retaining bolt.

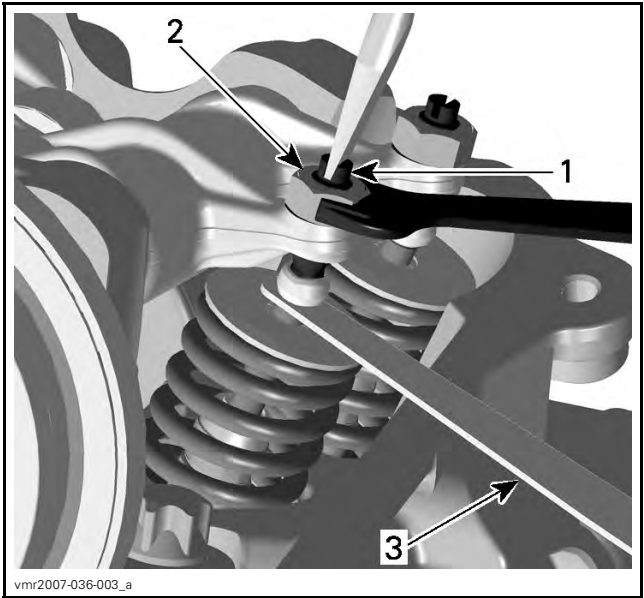
- 3. Using a feeler gauge, check the valve clearance.

VALVE CLEARANCE	
EXHAUST	0.11 mm to 0.19 mm (.0043 in to .0075 in)
INTAKE	0.06 mm to 0.14 mm (.0024 in to .0055 in)

If the valve clearance is out of specification, adjust valves as follows.

NOTE: Use the center value of exhaust/intake specification to ensure a proper valve adjustment.

- 4. Hold the adjustment screw at the proper position and torque the locking nut.



1. Adjustment screw
2. Locking nut
3. Feeler gauge

- 5. Repeat the procedure for each valve.
- 6. Before installing valve covers, recheck valve clearance.

GEARBOX

Recommended Gearbox Oil

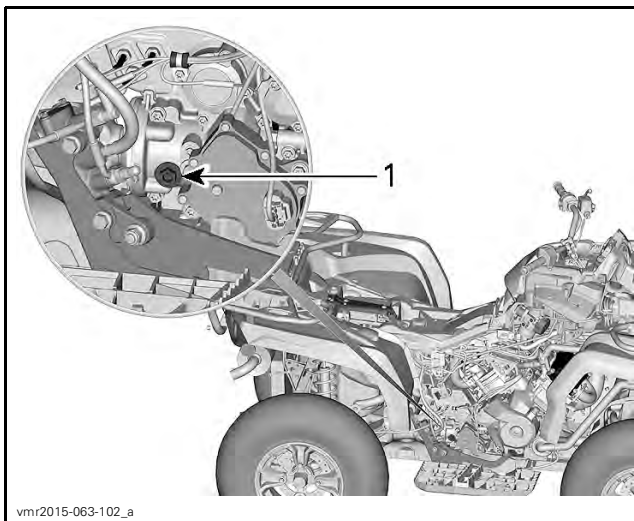
RECOMMENDED PRODUCT	QUANTITY
XPS SYNTHETIC GEAR OIL (75W 140) (P/N 293 600 140)	Approximately 450 ml (15.2 U.S. oz)

If the recommended oil is not available, use a 75W140 gearbox oil that meets the API GL-5 specification.

Gearbox Oil Level Verification

NOTE: Prior checking the gearbox oil level, ensure vehicle is on a level surface.

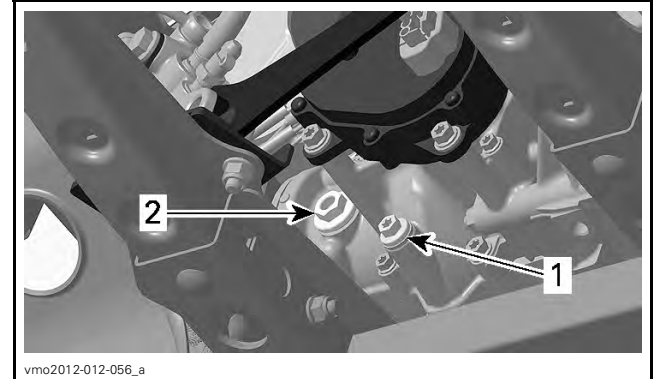
- To access gearbox oil level plug, refer to *BODY* subsection and remove the following parts:
 - Seat
 - Console
 - RH side panel and extension(s)
 - RH footrest panel.



TYPICAL

1. Oil level plug

- Remove the gearbox oil level plug.



1. Drain plug
2. Oil level plug

- Check oil level.

The oil should be level with the bottom of the oil level hole.

NOTICE Operating the gearbox with an improper oil level may severely damage gearbox.

- Install the oil level plug with its O-ring. Tighten plug as per table.

TIGHTENING TORQUE	
Oil level plug	5 N•m ± 0.6 N•m (44 lbf•in ± 5 lbf•in)

Gearbox Oil Replacement

Gearbox Oil Draining Procedure

- Start engine and operate vehicle to warm-up the gearbox oil.

NOTE: Running engine at idle is not sufficient, vehicle transmission must be operated.

- Position vehicle on a level surface.
- Place a drain pan under the gearbox drain plug area.
- Clean drain plug area.
- Remove magnetic drain plug and sealing washer. Discard sealing washer.

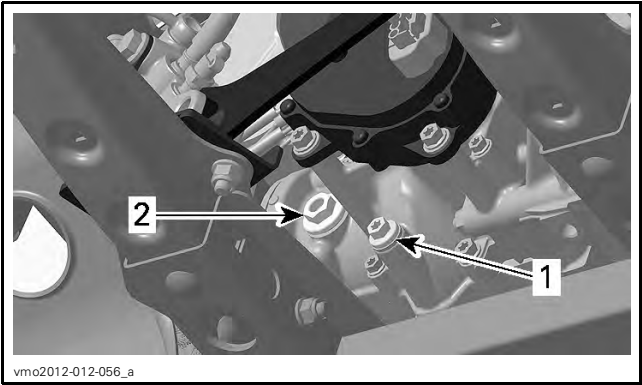
WARNING

The gearbox oil can be very hot.

- Remove oil level plug and its O-ring.

NOTE: Allow oil to completely flow out of gearbox.

Section 01 MAINTENANCE
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1. Magnetic drain plug
2. Oil level plug

7. Clean magnetic drain plug and pay attention to any debris present on drain plug.

NOTE: Presence of excessive debris provides an indication of a gearbox problem.

8. Reinstall magnetic drain plug with a **NEW** sealing washer.

TIGHTENING TORQUE	
Magnetic drain plug	20 N•m ± 2 N•m (15 lbf•ft ± 1 lbf•ft)

9. Dispose gearbox oil as per your local environmental regulations.

Gearbox Oil Filling Procedure

1. Fill the gearbox through the oil level hole until the oil reaches the bottom of the oil level hole.
2. Install the oil level plug with its O-ring. Tighten plug as per table.

TIGHTENING TORQUE	
Oil level plug	5 N•m ± 0.6 N•m (44 lbf•in ± 5 lbf•in)

Vehicle Speed Sensor (VSS) Cleaning

Remove the VSS. Refer to *GEARBOX AND 4X4 COUPLING UNIT* subsection.

Remove all metal particles and oil from the VSS magnet.

NOTE: A dirty VSS will cause erratic speedometer readings.

CONTINUOUSLY VARIABLE TRANSMISSION (CVT)

CVT Air Inlet/Outlet Cleaning

1. Remove CVT cover, refer to *CONTINUOUSLY VARIABLE TRANSMISSION (CVT)* subsection.

2. Inspect and clean the air inlet and outlet openings from inside the CVT cover.
3. Inspect and clean the air outlet duct connected to the exhaust system heat shield under the seat.

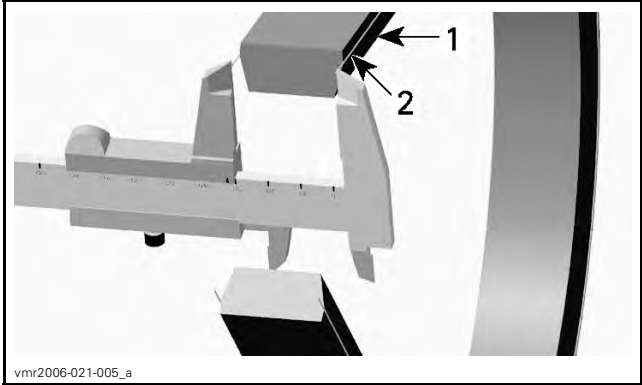
NOTE: If a lot of debris or grime are found in the CVT system, it may be necessary to remove the ducts and thoroughly clean them.

4. Reinstall CVT cover.

Drive Belt Inspection

1. Inspect belt for cracks, fraying or abnormal wear. Replace if necessary.
2. Check drive belt width at cord level. Replace if it is out of specification.

DRIVE BELT WIDTH	
SERVICE LIMIT	30 mm (1.181 in)



1. Drive belt
2. Cord in drive belt

Drive Pulley, Driven Pulley and One-Way Bearing Maintenance

Refer to *CONTINUOUSLY VARIABLE TRANSMISSION (CVT)* subsection.

FUEL SYSTEM

Throttle Body Inspection and Cleaning

1. Remove the air intake housing, refer to *AIR INTAKE SYSTEM* subsection.
2. Visually inspect throttle plate and throttle body venturi for cleanliness.
3. Clean inside throttle body if necessary. Refer to *ELECTRONIC FUEL INJECTION (EFI)* subsection.

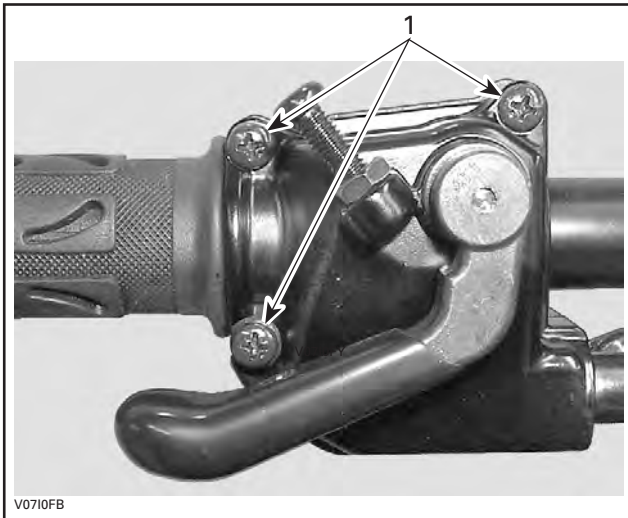
Throttle Cable Lubrication

The throttle cable must be lubricated with a silicone based lubricant.

⚠ WARNING

Always use a silicone-based lubricant. Using another lubricant (like a water-based lubricant) could cause the throttle lever/cable to become sticky and stiff.

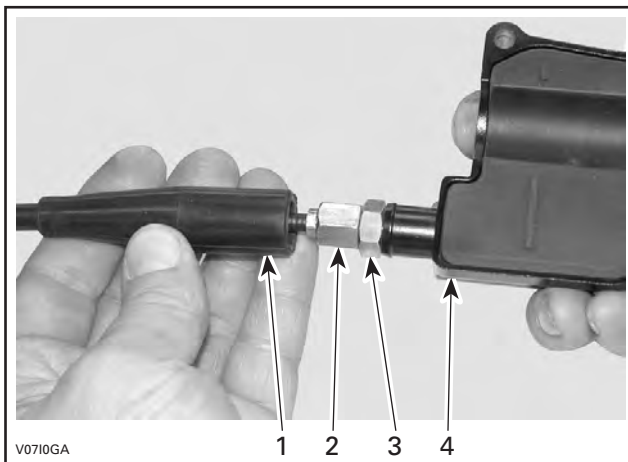
Open the throttle lever housing.



1. Remove these screws

Separate the housing.

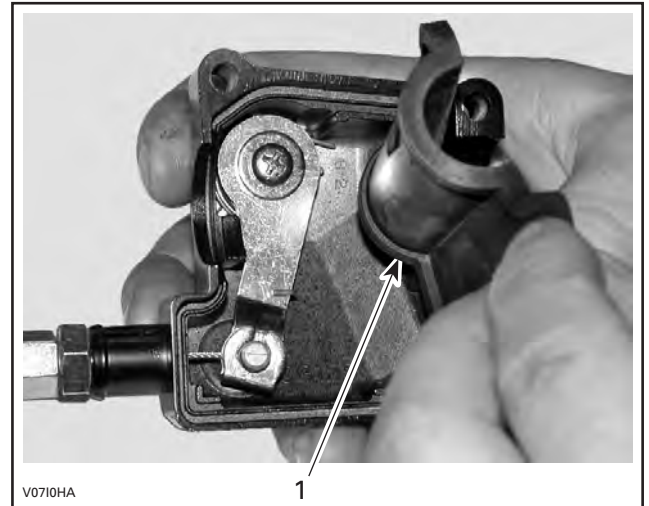
Slide rubber protector back to expose throttle cable adjuster.



1. Cable protector
2. Throttle cable adjuster
3. Lock nut
4. Throttle lever housing

Screw in the throttle cable adjuster.

Remove inner housing protector.



1. Inner housing protector

Remove the cable from the throttle lever housing.

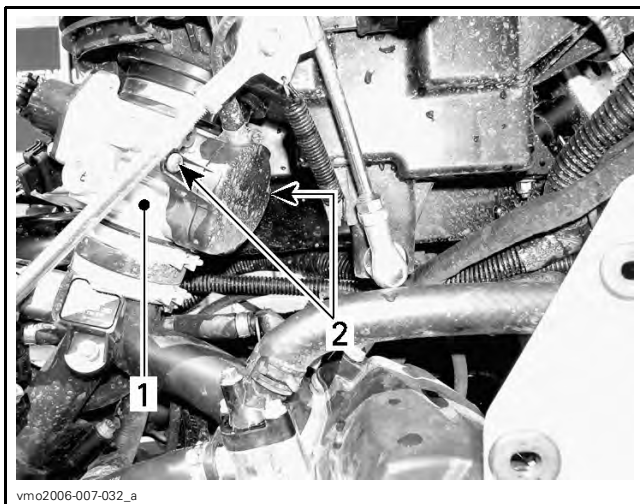
NOTE: Slide cable in clip slot and remove the end of cable from clip.



Remove the throttle body side cover.

Section 01 MAINTENANCE

Subsection 03 (PERIODIC MAINTENANCE PROCEDURES (570))



1. Throttle body
2. Side cover screws

Insert the needle of the lubricant can in the end of throttle cable adjuster.



TYPICAL

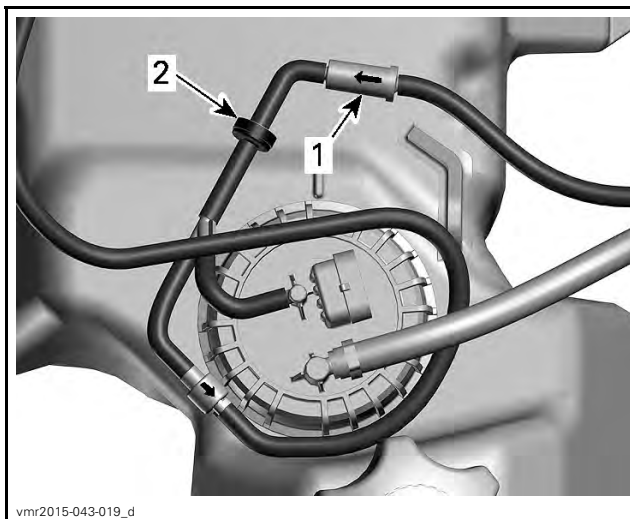
NOTE: Place a rag around the throttle cable adjuster to prevent the lubricant from splashing.

Add lubricant until it runs out at throttle body end of the throttle cable.

Reinstall and adjust the cable. Refer to *ELECTRONIC FUEL INJECTION* subsection.

Fuel Tank Vent Breather Filter Replacement

Ensure breather filter is installed with the flow arrow pointing towards the vent inlet check valve.



1. Vent breather filter
2. Vent inlet check valve

Fuel System Inspection

1. Visually inspect fuel tank for cracks, wear marks, signs of leakage or any other damages.
2. Visually inspect fuel system hoses for proper routing, cracking, wear marks, signs of leakage or any other damages.
3. Carry out a *FUEL TANK LEAK TEST*, refer to *FUEL TANK AND FUEL PUMP* subsection.

⚠ WARNING

All fuel system leaks must be repaired. Damaged, worn or leaking fuel system components should be replaced to ensure fuel system tightness.

Fuel Pump Pressure Test

Refer to *FUEL TANK AND FUEL PUMP* subsection for procedure.

ELECTRICAL SYSTEM

Battery Inspection

Visually inspect battery casing for cracks or other damage. If casing is damaged, replace battery and thoroughly clean battery rack with water and sodium bicarbonate (baking soda).

Inspect battery posts condition and battery retainer plate.

For battery testing, refer to *CHARGING SYSTEM* subsection.

Spark Plug Replacement

Spark Plug Access

For access to the LH spark plug, remove the LH inner fender panel.

For access to the RH spark plug, remove the RH side panel and extension(s).

Spark Plug Removal

1. Remove spark plug cable from spark plug.
2. Clean the spark plug area using pressurized air.
3. Remove spark plug.

Spark Plug Installation

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

1. Using a wire feeler gauge, set electrode gap as specified in *TECHNICAL SPECIFICATIONS*.
2. Apply LOCTITE 767 (ANTISEIZE LUBRICANT) (P/N 293 800 070) over the spark plug threads to prevent possible seizure.

NOTICE Do not apply antiseize lubricant on the first 2 spark plug threads.

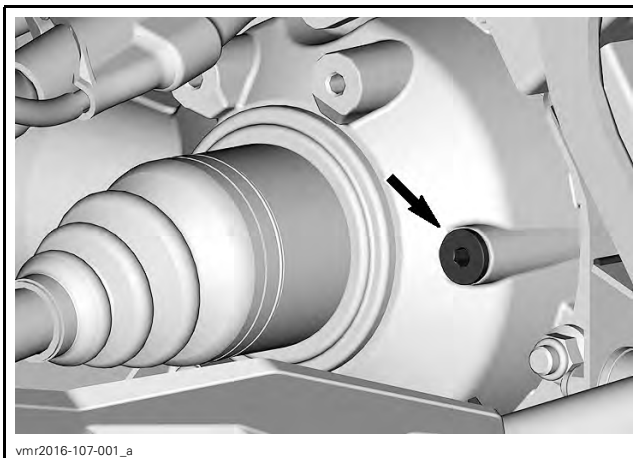
3. Hand screw spark plug into cylinder head, then tighten to specification using a torque wrench and an appropriate socket.

TIGHTENING TORQUE	
Spark plug	20 N•m ± 2 N•m (15 lbf•ft ± 1 lbf•ft)

DRIVE SYSTEM

Front Differential Oil Level Verification

1. Clean filler plug prior to checking oil level.



RH SIDE OF VEHICLE

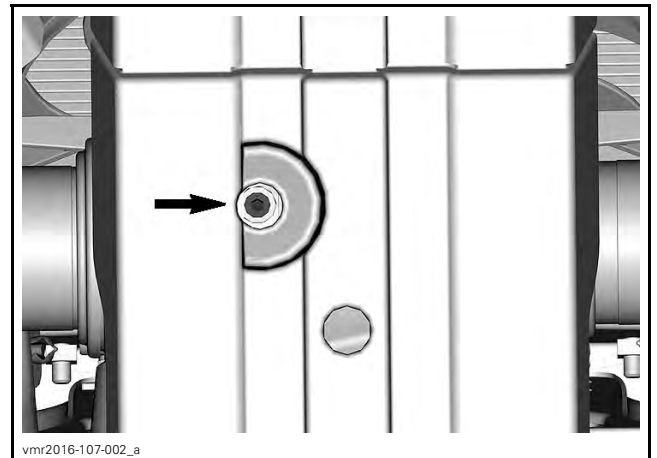
2. With vehicle on a level surface, check oil level by removing filler plug. Oil level must reach the lower edge.

3. Reinstall filler plug with a **NEW** sealing washer.

TIGHTENING TORQUE	
Filler plug	22.5 N•m ± 2.5 N•m (17 lbf•ft ± 2 lbf•ft)

Front Differential Oil Replacement

1. Place vehicle on a level surface. Set transmission in park position.
2. Clean filler and drain plug areas.
3. Place a drain pan under the front differential.
4. Remove filler plug.
5. Remove drain plug.



BOTTOM VIEW OF VEHICLE

NOTE: Allow enough time for oil to flow out.

6. Install and tighten drain plug to specification.

TIGHTENING TORQUE	
Drain plug	7.5 N•m ± 0.5 N•m (66 lbf•in ± 4 lbf•in)

7. Refill front differential with recommended oil.

CAPACITY	RECOMMENDED OIL
500 ml (17 U.S. oz)	XPS SYNTHETIC GEAR OIL (75W 90) (P/N 293 600 043) or a 75W 90 (API GL-5) gear oil

8. Reinstall filler plug with a **NEW** sealing washer.
9. Tighten filler plug to specification.

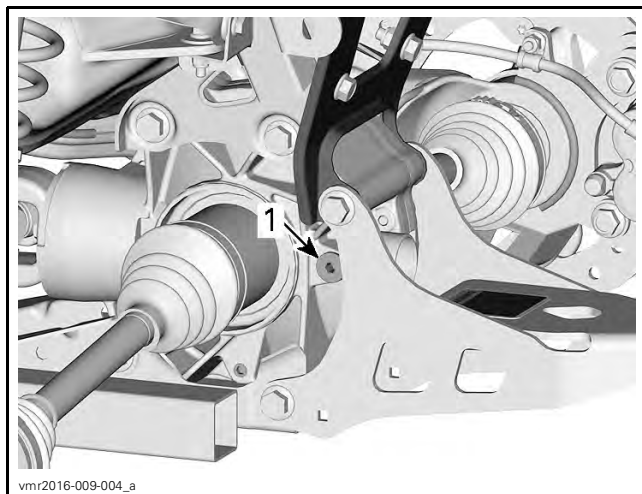
Section 01 MAINTENANCE

Subsection 03 (PERIODIC MAINTENANCE PROCEDURES (570))

TIGHTENING TORQUE	
Filler plug	22.5 N•m ± 2.5 N•m (17 lbf•ft ± 2 lbf•ft)

Rear Final Drive Oil Level Verification

1. Ensure vehicle is on a level surface.
2. Clean filler plug area.
3. Remove filler plug.



LH REAR SIDE OF VEHICLE

1. Filler plug

4. Verify the oil level by inserting a wire with a 90° bend through the oil filler hole.
5. Oil level must be within the following specification from the bottom of oil filler hole.

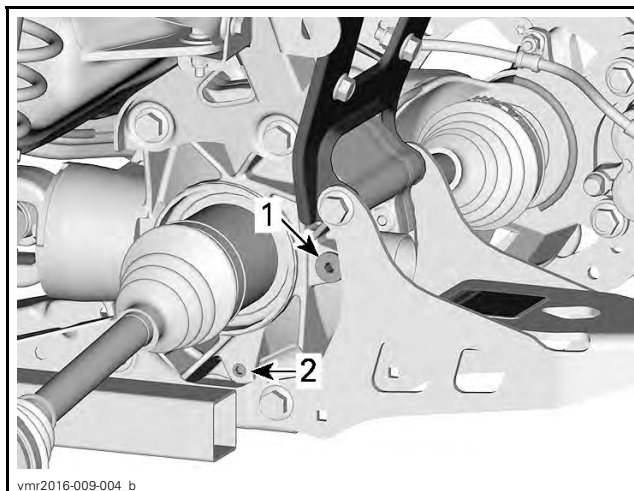
OIL LEVEL
20 mm ± 5 mm (9/16 in ± 3/16 in)

6. Reinstall filler plug with a **NEW** sealing washer.

TIGHTENING TORQUE	
Filler plug	22.5 N•m ± 2.5 N•m (17 lbf•ft ± 2 lbf•ft)

Rear Final Drive Oil Replacement

1. Ensure vehicle is on a level surface.
2. Clean filler and drain plug areas.
3. Place a drain pan under rear final drive.
4. Unscrew filler plug.
5. Remove drain plug.



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LH REAR SIDE OF VEHICLE

1. Filler plug
2. Drain plug

NOTE: Allow enough time for oil to flow out.

6. Install drain plug.

TIGHTENING TORQUE	
Drain plug	7.5 N•m ± 0.5 N•m (66 lbf•in ± 4 lbf•in)

7. Refill the rear final drive.

QUANTITY	RECOMMENDED OIL
250 ml (8 U.S. oz)	XPS SYNTHETIC GEAR OIL (75W 140) (P/N 293 600 140) or a 75W 140 (API GL-5) gear oil

8. Reinstall filler plug with a **NEW** sealing washer.

TIGHTENING TORQUE	
Filler plug	22.5 N•m ± 2.5 N•m (17 lbf•ft ± 2 lbf•ft)

Drive Shaft Boot and Protector Inspection

1. Visually inspect each drive shaft boot for grease leak, cracks or opening.
2. Check if the drive shaft boot protectors are fixed firmly, not torn or otherwise damaged.
3. Replace if necessary.

Drive Shaft Joint Inspection

Turn and move drive shaft back and forth to detect excessive play.

Rear Propeller Shaft U-Joint Condition

Check yoke U-joints for wear, backlash or axial play. Replace if necessary.

Rear Propeller Shaft U-Joint Lubrication

PROPELLER SHAFT U-JOINT LUBRICATION

Use Hi-temp bearing grease NLGI-2 or an equivalent

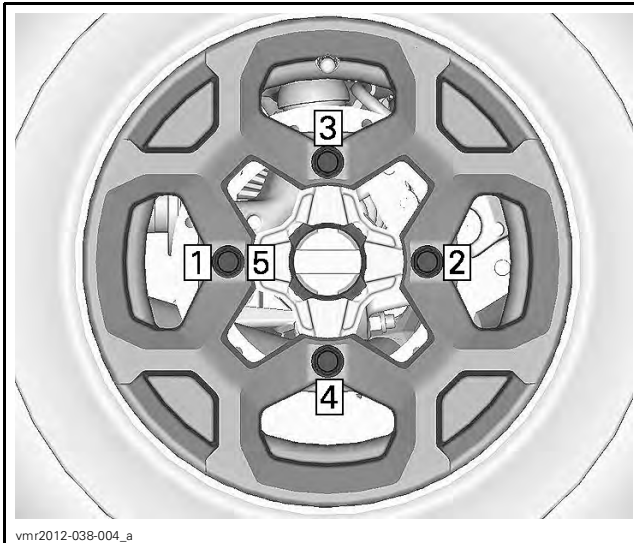
WHEELS AND TIRES

Wheel Lug Nut Torque Inspection

Tighten wheel lug nuts to the specified torque using the illustrated sequence.

TIGHTENING TORQUE

Wheel lug nuts	100 N•m ± 10 N•m (74 lbf•ft ± 7 lbf•ft)
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TIGHTENING SEQUENCE

Wheel Bearing Inspection

1. Safely lift and support the vehicle.
2. Hold wheel by the top and the bottom and try to move it by pulling and push alternately with both hands. Check for any play.
3. If there is any looseness detected, replace the wheel bearing. refer to *STEERING SYSTEM* subsection.

NOTE: To properly locate play during this inspection, be sure to check other components for wear or looseness (ball joints, suspension pivots, etc). If necessary repair or replace all defective parts before checking the wheel bearing condition. Be careful not to misinterpret a loose ball joint as a loose wheel bearing.

STEERING SYSTEM

Steering System Inspection

Steering Column

Turn and move steering column back and forth to detect any abnormal play.

If abnormal play is detected, inspect upper and lower steering column half bushings. Replace half bushings and O-rings as necessary, refer to *STEERING SYSTEM* subsection.

If steering column feels stiff, refer to *STEERING COLUMN HALF BUSHING CLEANING AND LUBRICATION* in this subsection.

Tie-Rod End

Check tie-rod end ball joint for:

- Damage
- Pitting
- Abnormal play.

Replace if necessary.

Steering Column Half Bushing Cleaning and Lubrication

Clean, inspect and lubricate upper and lower steering column half bushings and O-rings. Refer to *STEERING SYSTEM* subsection.

SUSPENSION

Shock Absorber Inspection

Check shock absorber for any leaks, replace if necessary.

HPG Shock Absorber (without Remote Reservoir)

Check shock absorber for abnormal play:

- Front to back
- Up and down.

If any play is detected, replace shock absorber bushings. Refer to *REAR SUSPENSION* subsection.

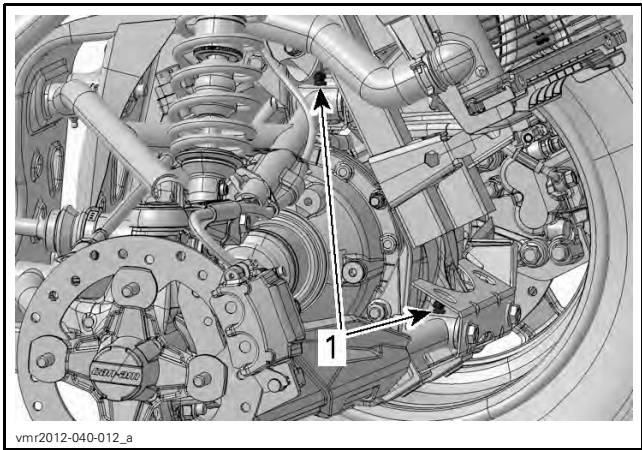
Front Suspension Arm Lubrication

Lubricate suspension arm at grease fittings.

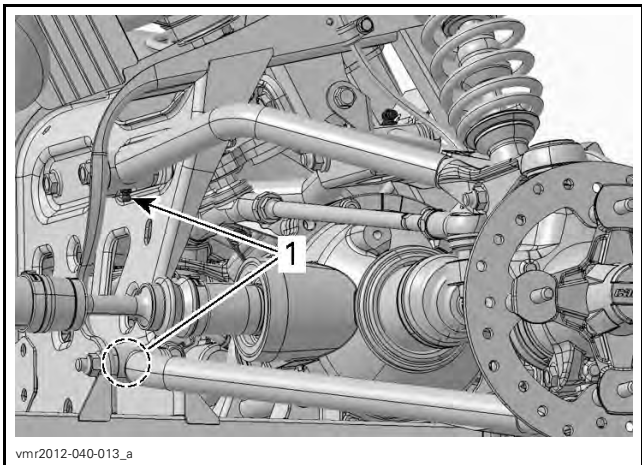
SUSPENSION ARM LUBRICATION

SUSPENSION GREASE (P/N 293 550 033)

Section 01 MAINTENANCE
Subsection 03 (PERIODIC MAINTENANCE PROCEDURES (570))



TYPICAL
1. Grease fittings



TYPICAL
1. Grease fittings

Front Suspension Arm Inspection

1. Check suspension arm for:
 - Cracks
 - Pitting
 - Bending
 - Distortion.
2. Check suspension arm for abnormal play:
 - Side to side
 - Up and down.
3. If any play is detected, inspect:
 - Wear plates
 - Bushings
 - Sleeves.
4. Check ball joint for:
 - Damage
 - Pitting
 - Play.

5. Check ball joint bellows for:
 - Damage
 - Cracks.

Rear Suspension Trailing Arm Inspection

1. Check trailing arms for:
 - Cracks
 - Pitting
 - Bending
 - Distortion.
2. Check trailing arm for abnormal play:
 - Side to side
 - Up and down.
3. If any play is detected, inspect:
 - Spacers
 - Bearings
 - Inner spacers.

Rear Stabilizer Bar Bushing Inspection and Lubrication

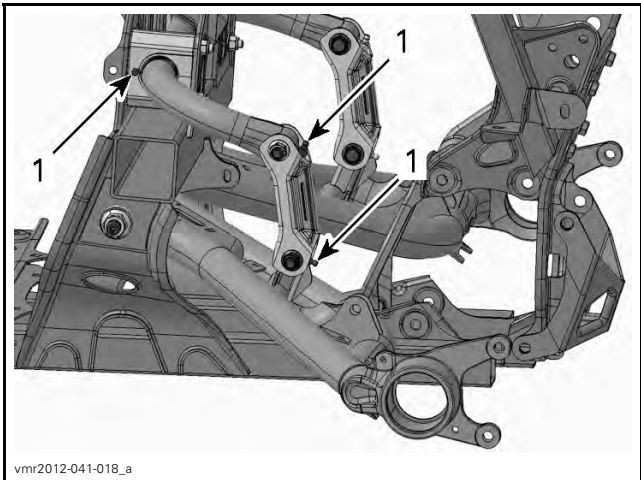
Rear Stabilizer Bar Bushing Inspection

- Inspect bushings for:
- Cracks
 - Damage
 - Abnormal wear.

Rear Stabilizer Bar Bushing Lubrication

Lubricate bushings at grease fittings.

LUBRICATION	
Stabilizer bar bushing	SUSPENSION GREASE (P/N 293 550 033)



TYPICAL
1. Grease fittings

BRAKES

Recommended Brake Fluid

Always use brake fluid meeting the specification DOT 4 only such as the BRAKE FLUID GTLMA DOT4 (P/N 293 600 131) or an equivalent.

⚠ WARNING

To avoid damage to the braking system, do not use other brake fluid types.

Brake Fluid Reservoir Level Verification

With vehicle on a level surface, check brake fluid in reservoirs for proper level.

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

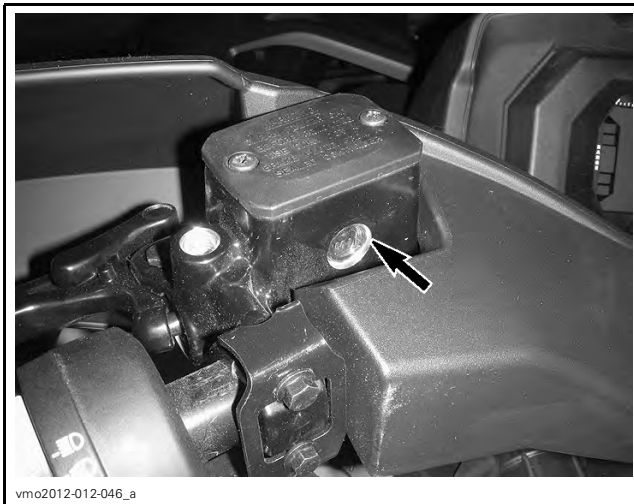
Front Brake Reservoir

Turn steering in the straight-ahead position to ensure reservoir is level.

Check the brake fluid level, the reservoir is full when the fluid reaches of the top of window.

Visually inspect lever boot condition.

Check for cracks, tears, etc. Replace if damaged.

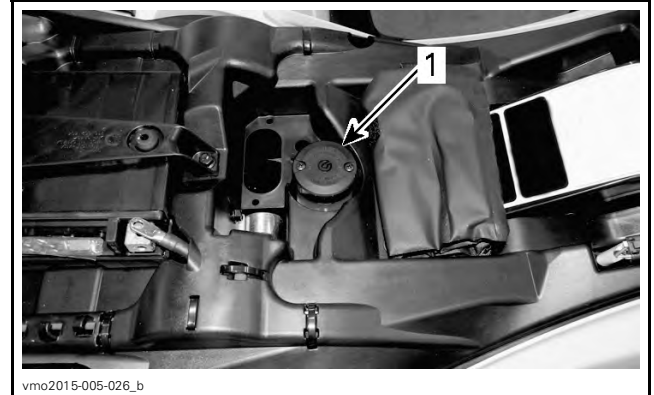


TYPICAL

Rear Brake Reservoir

Remove the seat.

With vehicle on a level surface, liquid should be between MIN. and MAX. level marks of brake pedal fluid reservoir.



1. Rear brake fluid reservoir

Adding Brake Fluid

Clean filler cap.

⚠ WARNING

Clean filler cap before removing.

Remove screws retaining the reservoir cap.

Remove reservoir cap.

Add fluid as required using a clean funnel. **Do not overfill.**

NOTICE Brake fluid can damage plastic and painted surface. Wipe off and clean any spillage.

Reinstall reservoir cap and tighten screws.

NOTE: Ensure filler cap diaphragm is pushed inside the cap before closing the brake fluid reservoir.

Brake System Inspection and Cleaning

NOTICE Do not clean brake components in petroleum based solvent. Use brake system cleaner only. Soiled brake pads must be replaced with new ones.

To clean parts from the brake system, use the following recommended products or an equivalent.

RECOMMENDED PRODUCT	
For United States of America	XPS BRAKES AND PARTS CLEANER (USA) (P/N 219 701 705)
For all other countries	XPS BRAKES AND PARTS CLEANER (P/N 219 701 776)

Brake Pads

1. Measure brake pad lining thickness.

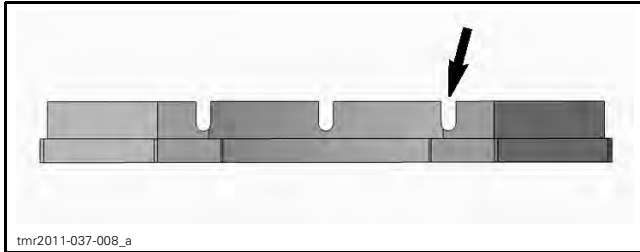
Section 01 MAINTENANCE

Subsection 03 (PERIODIC MAINTENANCE PROCEDURES (570))

BRAKE PAD MINIMUM THICKNESS

1 mm (1/32 in)

NOTE: The brake pad grooves are wear indicators.



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BRAKE PAD GROOVE

NOTICE Brake pads must always be replaced in pairs.

Brake Caliper

1. Remove caliper then check the following components:
 - Check brake pad pin
 - Check caliper boots for cracks
 - Check caliper movement on its support
 - Check pistons movement
 - Check pistons for scratches, rust or other damages.
2. Clean the following components using the recommended product or an equivalent:
 - Brake pads
 - Caliper support and slider
 - Caliper pistons and pin.

NOTE: Do not remove pistons from caliper for cleaning them.

3. Lubricate caliper slider using an appropriate *BRAKE CALIPER SYNTHETIC GREASE*.

Brake Disc

1. Check brake disc as follows:
 - Check disc thickness
 - Check disc surfaces
 - Check disc warpage.

NOTE: Refer to *BRAKE DISC INSPECTION* in *BRAKES* subsection for details.

2. Clean brake disc using the recommended product or an equivalent.

Master Cylinder

1. Check master cylinder as follows:
 - Leaks or damages.
 - Brake fluid level.

- Check cleanliness of master cylinder rod and boot.
- Check master cylinder boot for cracks or damage. Replace as necessary.

Hand Lever

Check hand lever as follows:

- Lever pivot bolt cleanliness
- Lever pivot bolt movement.

Brake Pedal

1. Check brake pedal as follows:

- Brake pedal pivot movement
- Brake pedal pivot cleanliness.

2. If required, clean then lubricate brake pedal pivot using XPS SYNTHETIC GREASE (P/N 293 550 010).

Brake Hoses

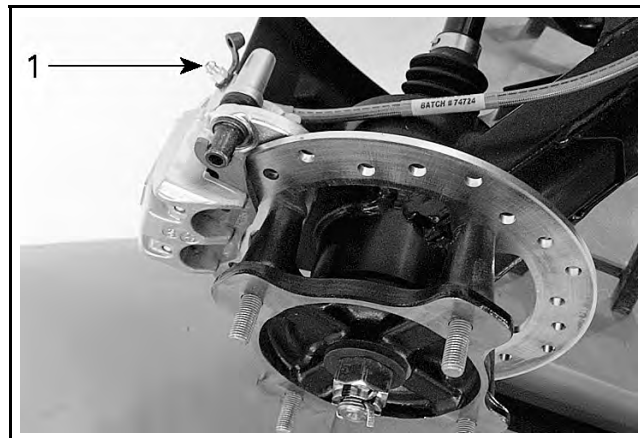
1. Check hoses for leaks, crushed, deformations, cracking or scrapes.

NOTE: Any deformation can restrict the proper flow of fluid and cause braking problems.

Brake Fluid Replacement

Brake Fluid Draining

1. Clean and remove reservoir cover with its diaphragm.
2. Connect a clear hose onto bleeder.



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TYPICAL

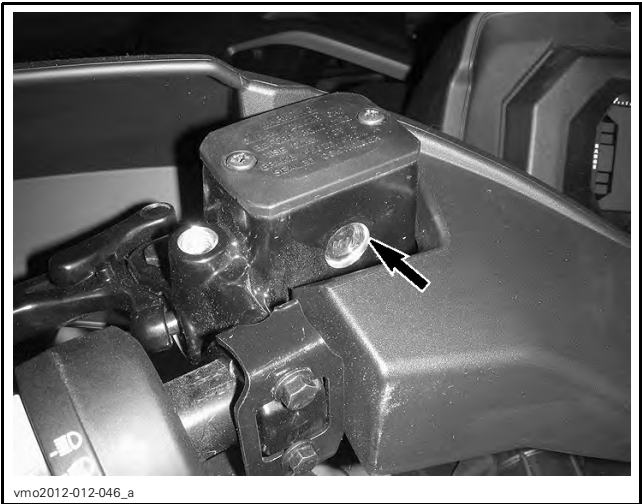
1. Caliper bleeder

3. Loosen bleeder.
4. Pump brake lever(s) and/or brake pedal until no more fluid flows out.
5. Repeat draining procedure for the other bleeders.

NOTE: To locate all bleeders according to vehicle configuration, refer to *EXPLODED VIEW* and *BRAKE CIRCUIT CONFIGURATIONS*. See *BRAKES* subsection.

Brake Fluid Filling

1. Add recommended brake fluid to MAX. mark. Do not overfill.



TYPICAL - BRAKE FLUID RESERVOIR



TYPICAL - UNDER THE SEAT
1. Brake fluid reservoir

NOTE: If applicable, ensure filler cap diaphragm is fully retracted before closing the cap.

RECOMMENDED BRAKE FLUID
BRAKE FLUID GTLMA DOT4 (P/N 293 600 131)

 **WARNING**

Use only DOT 4 brake fluid from a sealed container.
Do not use brake fluid from an old or already opened container.

Brake System Bleeding (Using a Vacuum Pump)

NOTE: Brake fluid reservoir must be kept full to prevent air from being pumped into the system.

1. Unscrew all bleeders until brake fluid comes out then close it.

NOTE: To locate all bleeders according to vehicle configuration, refer to *EXPLODED VIEW* and *BRAKE CIRCUIT CONFIGURATIONS*. See *BRAKES* subsection.

2. Install the Vacuum/pressure pump onto bleeder.

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

3. Place pump to vacuum position.
4. Pump vacuum pump a few times.
5. Loosen bleeder.
6. Continue to pump until no more air bubbles appear in clear hose.
7. Close then tighten bleeder.

TIGHTENING TORQUE	
Bleeder	5.5 N•m ± 1.5 N•m (49 lbf•in ± 13 lbf•in)

8. Add recommended brake fluid to MAX. mark. Do not overfill.
9. Perform bleeding procedure for the other bleeders.
10. Check brakes operation:
 - If brakes feel spongy, bleed system again then carry out the *BRAKE SYSTEM PRESSURE VALIDATION* as detailed in *BRAKES* subsection.

Brake System Bleeding (Manual Procedure)

NOTE: Brake fluid reservoir must be kept full to prevent air from being pumped into the system.

1. Connect a clear hose onto bleeder.
2. Pump up system pressure slowly using brake pedal and/or lever(s) until resistance is felt.
3. Depress and hold brake pedal and/or lever(s).
4. Open bleeder and then close it.
5. Release brake pedal and/or lever(s) slowly.

Section 01

MAINTENANCE

Subsection 03 (PERIODIC MAINTENANCE PROCEDURES (570))

NOTE: Do not release brake pedal and/or lever(s) until bleeder has been closed.

6. Repeat procedure until fluid flows out without any air bubbles.
7. Tighten bleeder.

TIGHTENING TORQUE	
Bleeder	5.5 N•m ± 1.5 N•m (49 lbf•in ± 13 lbf•in)

8. Perform bleeding procedure for the other bleeders.

NOTE: To locate all bleeders according to vehicle configuration, refer to *EXPLODED VIEW* and *BRAKE CIRCUIT CONFIGURATIONS*. See *BRAKES* subsection.

9. Check brakes operation:
 - If brakes feel spongy, bleed system again then carry out the *BRAKE SYSTEM PRESSURE VALIDATION* as detailed in *BRAKES* subsection.

BODY

Seat Latch Inspection and Operation

Ensure seat latch functions properly and that seat is properly secured when latched.

FRAME

Frame Inspection

Inspect frame for damages such as:

- Cracks
- Dents
- Twisting
- Deformation
- Corrosion
- Loose fasteners.

Pay particular attention to:

- Front and rear frame extensions (body modules)
- Underside of frame
- Suspension attachment points
- Engine attachment points.

Tow Hitch Inspection

1. Ensure tow hitch receptacle module is solidly mounted.
2. Inspect hitch for cracks and other damages.
3. Repair or replace if necessary.

STORAGE PROCEDURE

SERVICE PRODUCTS

Description	Part Number	Page
BRP HEAVY DUTY CLEANER	293 110 001	55
XPS ALL PURPOSE CLEANER	219 701 709	55
XPS ATV CLEANING KIT	219 701 713	55
XPS ATV FINISHING SPRAY	219 701 704	55
XPS ATV WASH	219 701 702	54
XPS FUEL STABILIZER	413 408 601	53
XPS LUBE	293 600 016	54–55
XPS STORAGE OIL (EXCEPT U.S. COUNTRY)	413 711 600	53
XPS STORAGE OIL (U.S. COUNTRY ONLY)	413 711 900	53

GENERAL

If the ATV is not used or is to be stored for more than 4 months, be sure to perform the storage procedures described below.

Where applicable, refer to the appropriate subsections in this manual for details of the required tasks as outlined in these procedures.

PROCEDURES

NOTE: To facilitate the inspection and ensure adequate lubrication of components, it is recommended to clean the entire vehicle. Refer to *VEHICLE CLEANING* in this subsection.

FUEL SYSTEM

Fuel System Protection

Pour fuel stabilizer in fuel tank and fill up fuel tank. Start vehicle to allow for fuel stabilizer to spread through the fuel system.

Follow the manufacturer's instructions for proper use.

RECOMMENDED FUEL SYSTEM PROTECTION
XPS FUEL STABILIZER (P/N 413 408 601)

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

ENGINE

Engine Internal Lubrication

Engine internal parts must be lubricated to protect them from rust formation during the storage period.

Proceed as follows:

1. Remove side body panels.
2. Remove spark plugs.
3. Spray storage oil into each cylinder (see following table).

NOTE: Use the storage oil as per country availability.

RECOMMENDED PRODUCTS
XPS STORAGE OIL (EXCEPT U.S. COUNTRY) (P/N 413 711 600)
XPS STORAGE OIL (U.S. COUNTRY ONLY) (P/N 413 711 900)

4. In drowned mode, press start button, 1 or 2 seconds maximum, to lubricate cylinders.
5. Reinstall spark plugs.

NOTE: Do not run engine during storage period.

Engine Air Intake System

Remove parts required for access to engine air inlet hose, refer to *AIR INTAKE SYSTEM* subsection.

Block engine air inlet hose using a rag to prevent intrusion of small animals.

CVT Protection

1. Remove drive belt. Refer to *CONTINUOUSLY VARIABLE TRANSMISSION (CVT)*.
2. Inspect and clean pulleys.

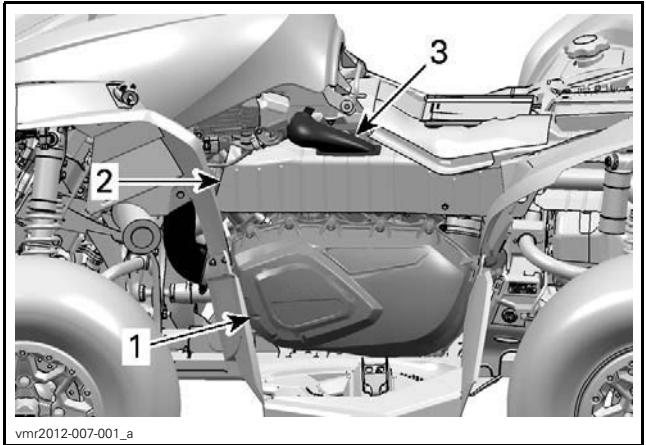
Section 01 MAINTENANCE
Subsection 05 (STORAGE PROCEDURE)

3. Protect pulleys by spraying XPS LUBE (P/N 293 600 016) on pulley faces.

NOTE: Do not reinstall drive belt.

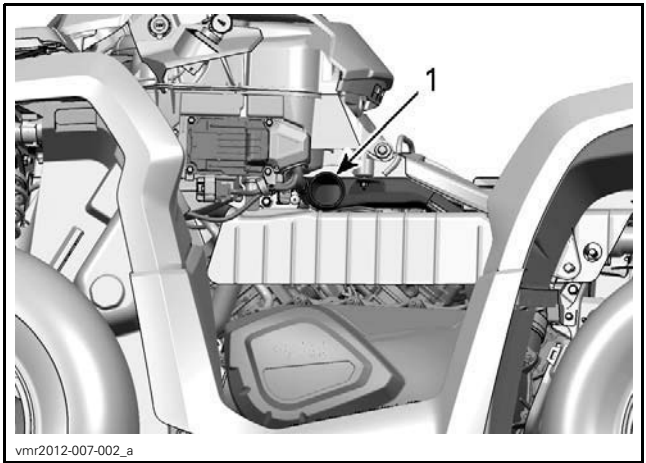
4. Close CVT cover.

5. Remove CVT outlet from exhaust system heat shield and from CVT outlet hose.



TYPICAL
1. CVT cover
2. Exhaust system heat shield
3. CVT outlet

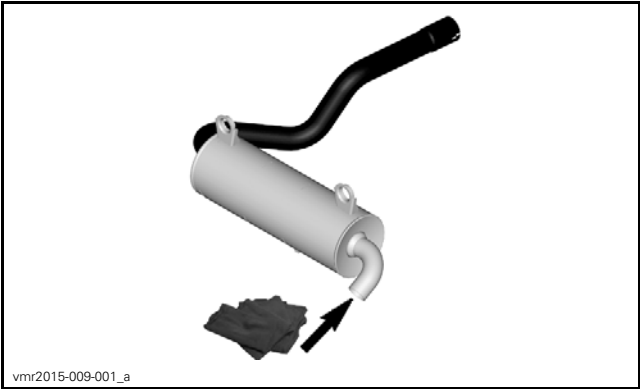
6. Block CVT outlet hose using a rag.



TYPICAL
1. CVT outlet hose

Exhaust System

Block muffler outlet using a rag to avoid intrusion of small animals.



ELECTRICAL SYSTEM

Battery

Remove battery from ATV.
Store and charge battery as per battery manufacturer's recommendations.

DRIVE SYSTEM

Lubricate rear propeller shaft U-joints.

CHASSIS

Lubrication

Lubricate front and rear suspension as applicable.

Tire Pressure

Inflate tires to recommended pressure.

Vehicle Cleaning

Wash and dry the vehicle.

NOTICE Never use a high pressure washer to clean the vehicle. **USE LOW PRESSURE ONLY** (such as a garden hose). The high pressure can cause electrical or mechanical damages.

Remove any dirt or rust.

To clean plastic parts, use only flannel cloths and XPS ATV WASH (P/N 219 701 702) or soapy water.

To clean vinyl parts, use only flannel cloths and a mild non abrasive multipurpose cleaner.

RECOMMENDED PRODUCT FOR PLASTIC PARTS
XPS ATV Wash (P/N 219 701 702)
Soapy water

NOTICE It is necessary to use flannel cloths on plastic parts to avoid damaging surfaces. Never clean plastic parts with strong detergent, degreasing agent, paint thinner, acetone, products containing chlorine, etc. To avoid damaging the glossy finish on Polypropylene body parts, never use:

- Petroleum based cleaning products
- XPS ATV FINISHING SPRAY (P/N 219 701 704)
- XPS ATV CLEANING KIT (P/N 219 701 713).

RECOMMENDED PRODUCT FOR VINYL PARTS
XPS ALL PURPOSE CLEANER (P/N 219 701 709)

To clean heavily soiled parts of the vehicle, including metallic parts use the following.

RECOMMENDED PRODUCT FOR HEAVILY SOILED PARTS
BRP HEAVY DUTY CLEANER (P/N 293 110 001)

Inspect the vehicle and repair any damage. Touch up all metal spots where paint has been scratched off.

Spray all metal parts with an appropriate lubricant for rust protection.

RECOMMENDED RUST PROTECTION
XPS LUBE (P/N 293 600 016)

Vehicle Protection

Protect the vehicle with a cover to prevent dust accumulation during storage.

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

PRESEASON PREPARATION

Proper vehicle preparation is required after a storage period.

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

Remove rags that were installed for storage: engine air inlet hose, CVT outlet hose and muffler.

Clean drive and driven pulleys to remove storage protective lubricant, then reinstall drive belt. Refer to *CONTINUOUSLY VARIABLE TRANSMISSION (CVT)*.

Remove parts required to allow inspection of entire engine air inlet system. Check for animal nests and other foreign material. Reinstall removed parts.

Drain fuel tank and fill with fresh fuel if a fuel stabilizer was not used for storage.

Reinstall battery. Refer to *CHARGING SYSTEM* subsection.

Inflate tires to the recommended pressure.

Using the *MAINTENANCE SCHEDULE*, perform the items titled EVERY 3 000 km (2,000 mi) OR 100 HOURS OF OPERATION OR 1 YEAR.

MAINTENANCE SCHEDULE	
1	→ EVERY 3 000 KM (2,000 MI) OR 100 HOURS OF OPERATION OR 1 YEAR (WHICHEVER COMES FIRST)
	Inspect seat belts (check for any damages and proper operation)
	Inspect side nets (check for any damages and they must buckle properly)
	Replace the engine oil and filter

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TYPICAL

1. Use this schedule

NOTE: If the EVERY 6 000 km (4,000 mi) OR 200 HOURS OF OPERATION OR 2 YEARS maintenance service is due, also perform the related items as per the *MAINTENANCE SCHEDULE*.

Test drive vehicle.

SPECIAL PROCEDURES

SERVICE PRODUCTS

Description	Part Number	Page
XPS LUBE.....	293 600 016	2

GENERAL

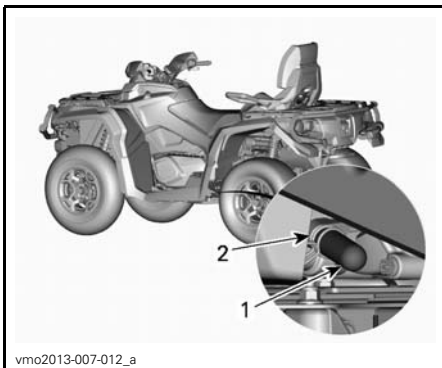
NOTE: Component failures resulting from these events are not warrantable.

Refer to the appropriate subsections in this manual for details of the required tasks as outlined in these procedures.

WHAT TO DO IF WATER IS IN THE CVT

The CVT drain plug is located on the rear portion of the CVT cover. It is accessible from the rear LH fender.

Inspect the CVT drain plug to validate if water is present.



1. Drain plug
2. Spring clamp

NOTICE If water is present in the CVT, it could result in belt slippage. The engine will accelerate but the vehicle will remain still.

If water is present, remove CVT drain plug to expel water.

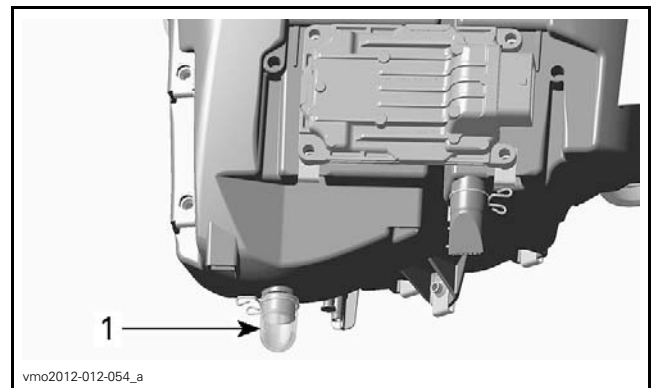
Reinstall the drain plug and secure it using the spring clamp.

NOTE: Make sure hose is properly inserted on CVT cover nipple.

If an appreciable amount of water is drained from the CVT cover, remove the cover and properly service the CVT.

WHAT TO DO IF WATER IS IN THE AIR FILTER HOUSING

Inspect the drain reservoir underneath the air filter housing to validate if water is present.



TYPICAL
1. Air filter housing drain reservoir

If water is present, press clamp and remove reservoir to drain water from air filter housing.

If one of the following conditions is met, refer to *WHAT TO DO IF VEHICLE IS IMMERSSED IN WATER*:

- If more than 50 ml (2 U.S. oz) of water (approximately 5 drain reservoirs) is found in the air filter housing.
- If any deposits are present in the drain reservoir.

NOTICE Failure to service vehicle properly may lead to component permanent damage.

WHAT TO DO IF VEHICLE IS TURNED OVER

In the event the vehicle was rolled over tilted on it's side; put the vehicle back on its wheel, wait 3 to 5 minutes, then check the following:

- Inspect air filter housing for oil accumulation, if any oil is found, clean air filter and air filter housing.
- Check engine oil level and refill if necessary.
- Check engine coolant level and refill if necessary.
- Check gearbox oil level and refill if necessary.

Subsection XX (SPECIAL PROCEDURES)

- Check rear final drive oil level and refill if necessary.
- Inspect suspension components and steering system components.
- Inspect body and chassis for any damages.
- Start engine. If the oil pressure light stays on, stop engine immediately and investigate the problem.
- After restarting engine, check for indicator lights or messages displayed in the multifunction gauge. Correct as required.

Limited model: Inspect ACS intake hose for any trace of oil. Clean thoroughly if oil is found in hose. If oil reached compressor, disassemble compressor and clean thoroughly.

WARNING

Do not use vehicle if any of the controls, steering, suspension or brakes are damaged or inoperative.

WHAT TO DO IF VEHICLE IS IMMERSED IN WATER

In the event the vehicle was immersed, proceed with the following.

NOTICE A vehicle that was immersed may be damaged or prone to malfunctions (short and long term) if not serviced promptly and appropriately. Do not crank or start engine.

Drain the entire air intake system. Inspect the throttle body. Remove parts as required.

Inspect and clean air box as needed. Remove parts as required.

Replace the air filter.

Drain, inspect and clean the CVT.

Limited model: Inspect ACS hose. If water is present, disassemble and dry compressor.

Inspect front differential and rear final drive vents. Clean or replace as necessary

Drain muffler and exhaust pipes (removal required).

Clean muffler spark arrester..

Remove fuse box covers. Check for presence of water. Dry as necessary.

Disconnect, clean and dry the following electrical connectors:

- ECM
- Multifunction gauge
- DPS.

Replace the engine oil (without starting the engine).

Replace gearbox oil.

Inspect fuel tank for water intrusion. If in doubt, flush fuel tank and refill with new fuel.

Inspect fuel tank vent system for water intrusion. Clean as required. Replace breather filter. Carry out a fuel pump pressure test.

Inspect brake system for water intrusion. Replace brake fluid as required.

Inspect all lights for water intrusion. Dry as required.

Inspect multifunction switch for water intrusion. Dry as required.

Remove spark plugs. Crank engine in drowned mode to expel any water.

CAUTION Keep away from spark plug holes to avoid being splashed when cranking engine.

Add a small quantity of engine oil in cylinders (approximately 2 teaspoonfuls).

Install spark plugs (replace if required).

WARNING

Before starting engine, use B.U.D.S. and check vehicle for fault codes.

Start the engine and allow it to run at idle speed until the engine reaches its operating temperature.

Stop the engine.

Change engine oil and filter.

NOTE: Change oil as many times as necessary, until there is no whitish appearance in engine oil.

Replace front differential oil.

Replace rear final drive oil.

Lubricate front and rear suspensions and propeller shaft joints.

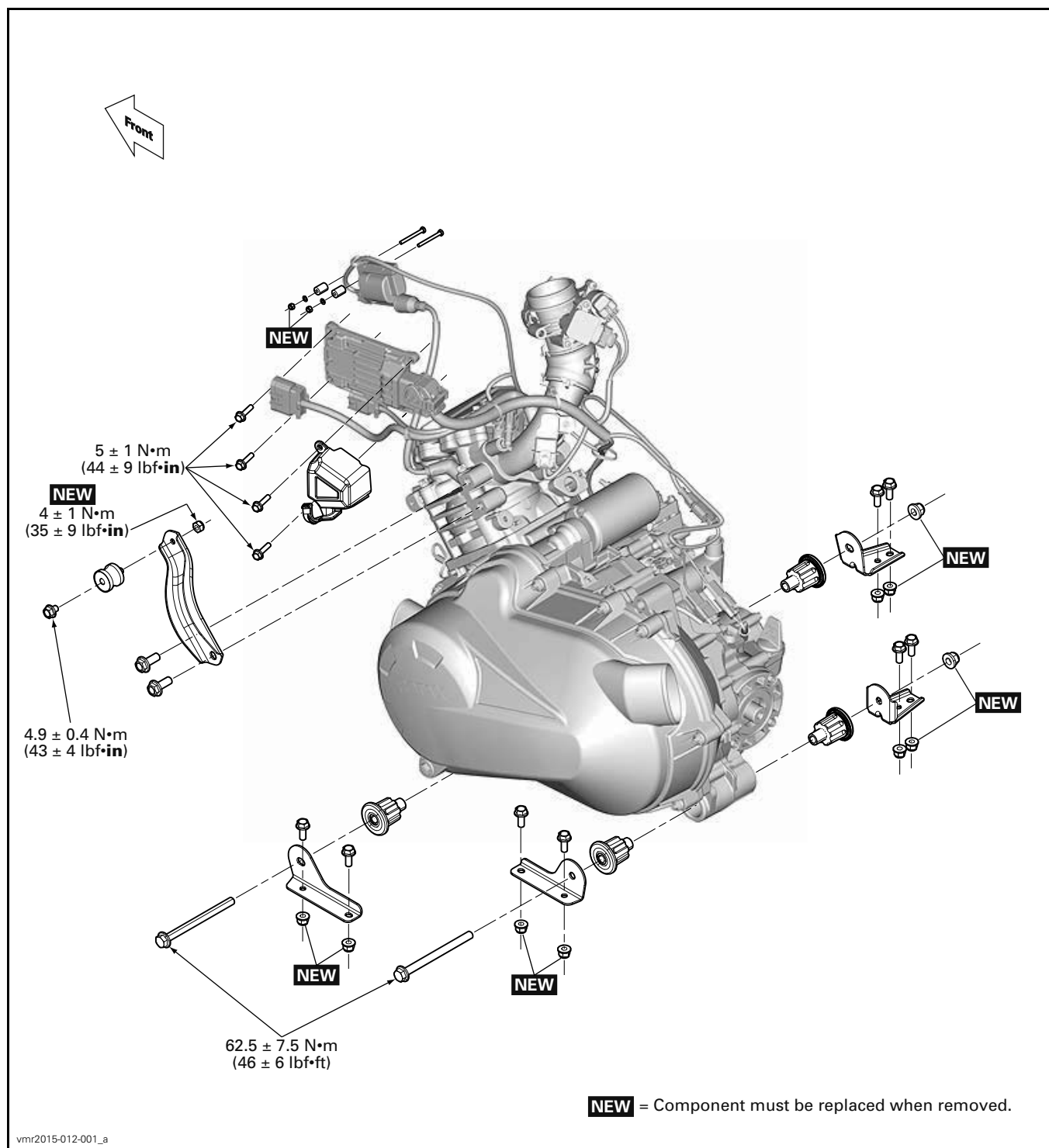
Spray all metal parts with XPS LUBE (P/N 293 600 016).

Test drive to confirm proper operation.

ENGINE REMOVAL AND INSTALLATION

SERVICE TOOLS

Description	Part Number	Page
ENGINE LIFTING TOOL	529 035 898	68



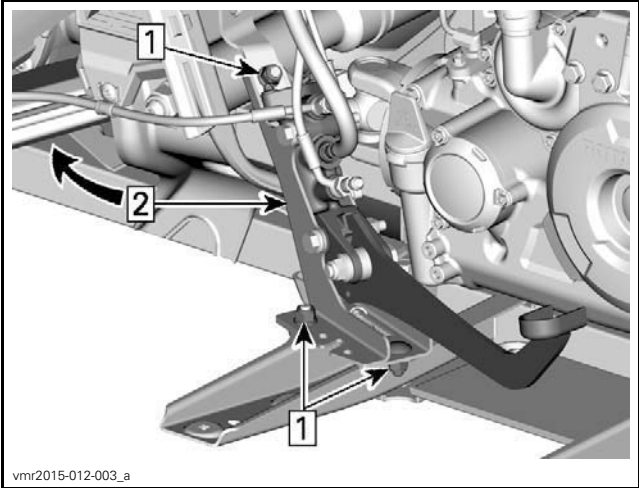
PROCEDURES

ENGINE REMOVAL

- 1. Place vehicle on a workstation equipped with an engine-lifting hoist.
- 2. Set transmission to park "P" and engage parking brake.
- 3. Carry out procedures in following table.

OPERATIONS	REFERENCES (SUBSECTION)
Disconnect and remove battery from vehicle	CHARGING SYSTEM
Release fuel pressure	FUEL TANK AND FUEL PUMP
Drain engine coolant	PERIODIC MAINTENANCE PROCEDURES
Remove LH and RH inner fender panels	BODY
Remove front body module	
Remove LH and RH footrest panels	
Remove LH footrest support	
Remove muffler	EXHAUST SYSTEM
Remove exhaust pipe	

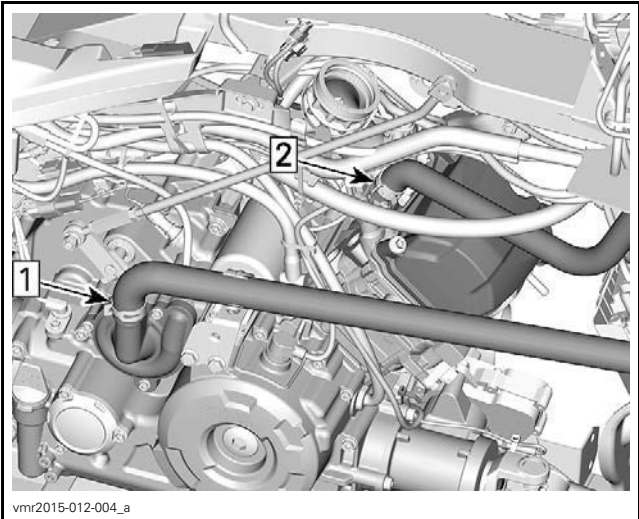
- 4. Secure throttle body towards front of vehicle to make room for engine removal.



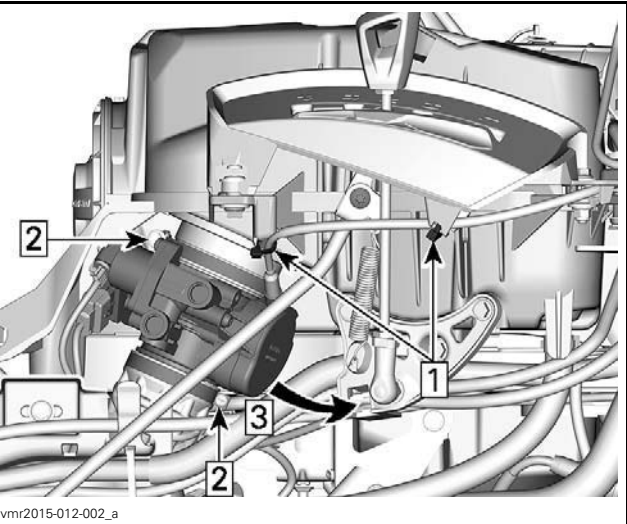
MASTER BRAKE CYLINDER
Step 1: Remove these fasteners
Step 2: Move master cylinder assembly back



1. Master cylinder assembly moved back



COOLING SYSTEM HOSE DISCONNECT
Step 1: Disconnect radiator hose at water pump
Step 2: Disconnect return hose at thermostat

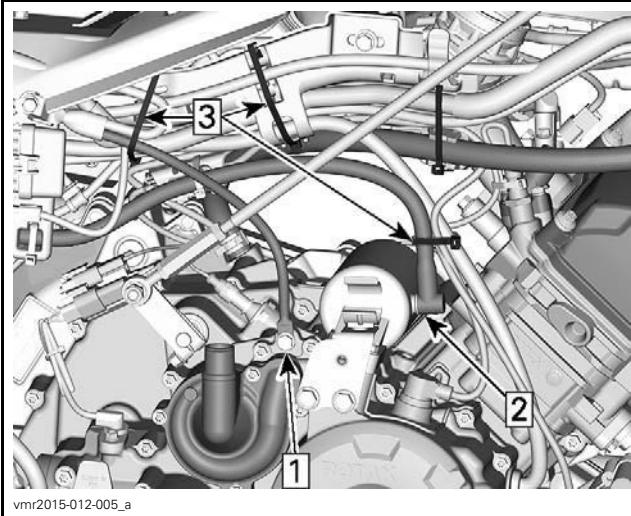


Step 1: Cut locking ties
Step 2: Loosen clamps
Step 3: Move throttle body

- 5. Carry out procedures in following illustrations.

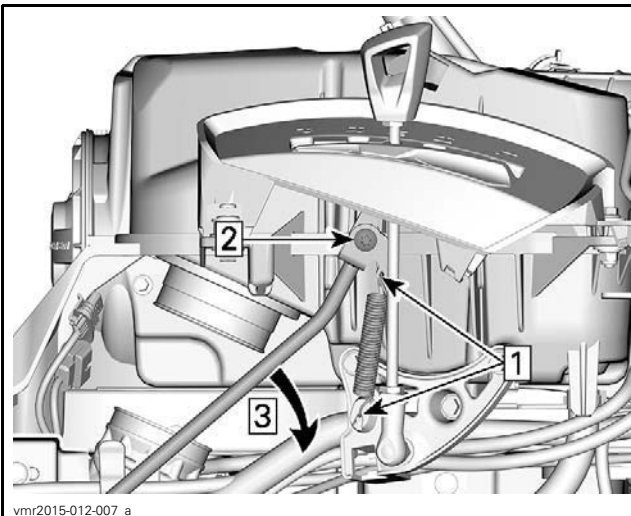
Section 02 ENGINE, CVT AND GEARBOX (450)

Subsection 01 (ENGINE REMOVAL AND INSTALLATION)



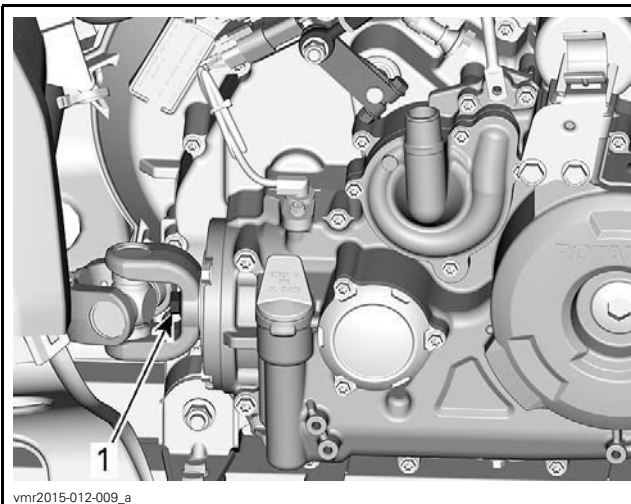
ENGINE GROUND AND STARTER CABLE DISCONNECT

- Step 1: Disconnect engine ground wire
Step 2: Disconnect starter power wire
Step 3: Cut locking ties (3)

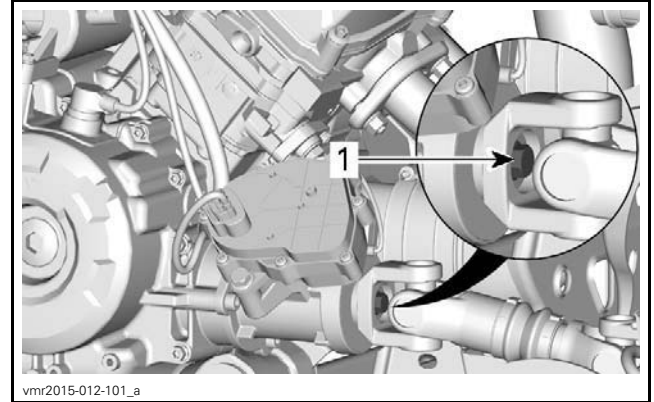


SHIFT ROD DISCONNECT

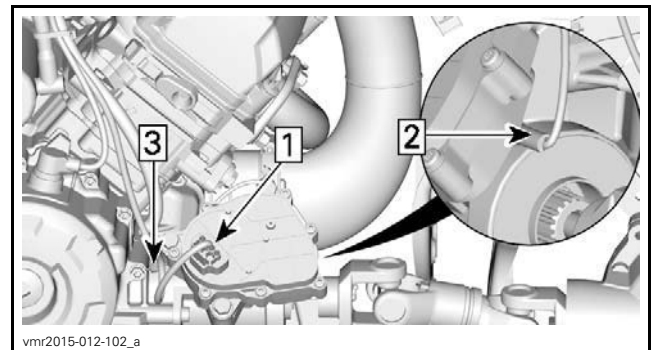
- Step 1: Remove spring
Step 2: Remove fasteners and bushing
Step 3: Move shift rod



1. Remove rear propeller shaft bolt

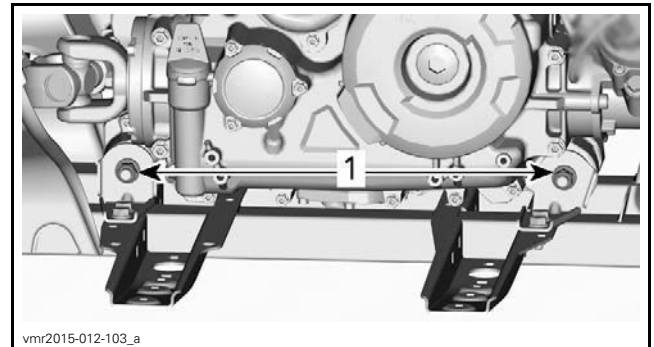


1. Remove front propeller shaft bolt and washer



4 X 4 COUPLING UNIT DISCONNECT

1. Disconnect motor connector
2. Disconnect light switch connector
3. Remove locking tie



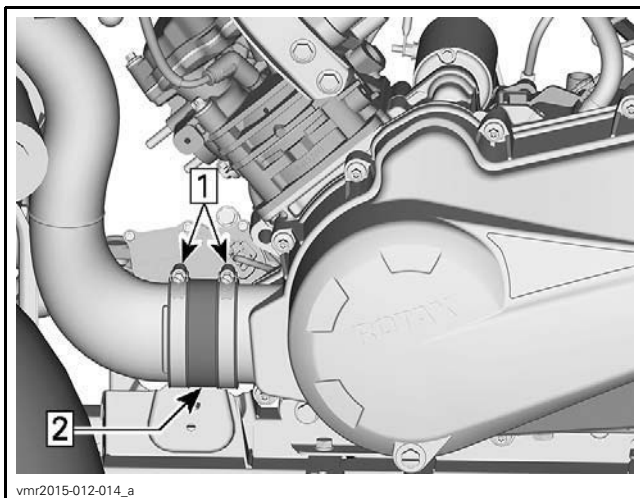
ENGINE MOUNT NUT REMOVAL, RH SIDE

1. Remove nuts

NOTE: Do not remove engine mount bolts at this time.

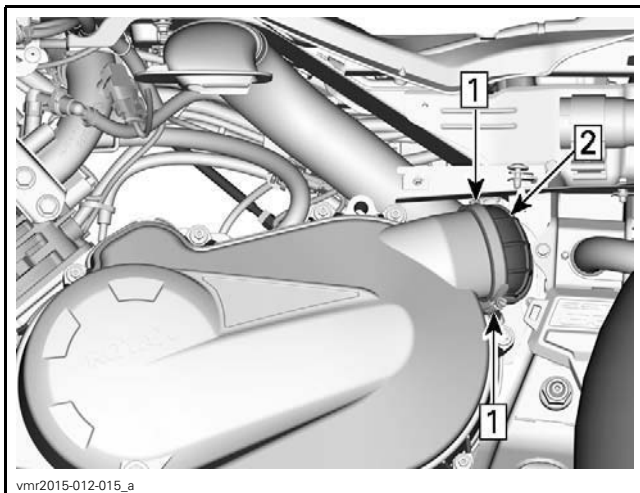
Section 02 ENGINE, CVT AND GEARBOX (450)

Subsection 01 (ENGINE REMOVAL AND INSTALLATION)



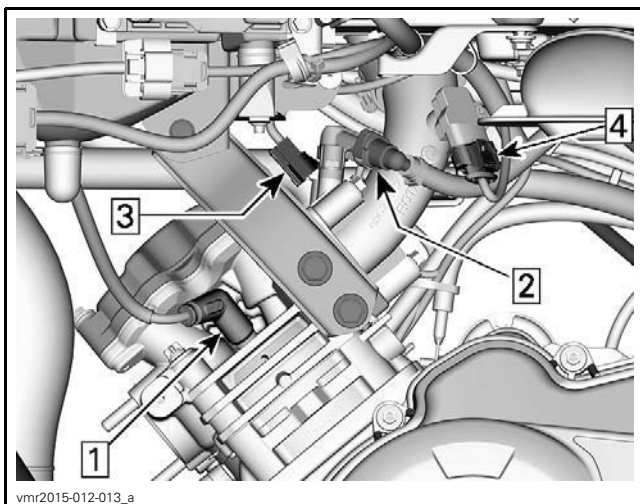
CVT AIR INLET DUCT DISCONNECT

1. Loosen clamps
2. Remove CVT air inlet adapter



CVT AIR OUTLET DUCT DISCONNECT

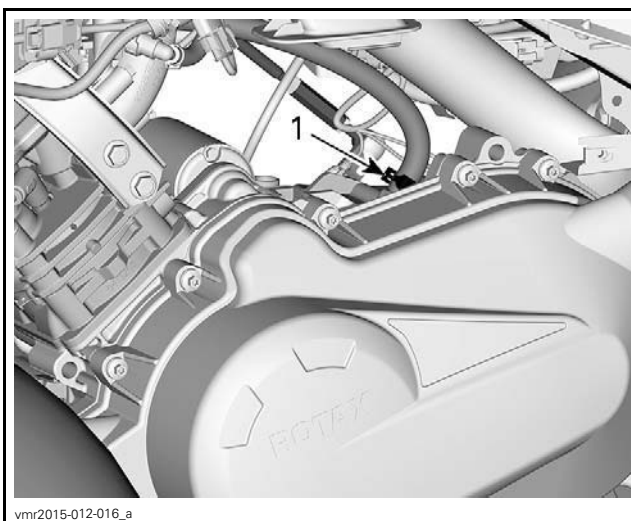
- Step 1: Loosen clamps
Step 2: Remove CVT air outlet adapter



FUEL AND IGNITION DISCONNECT

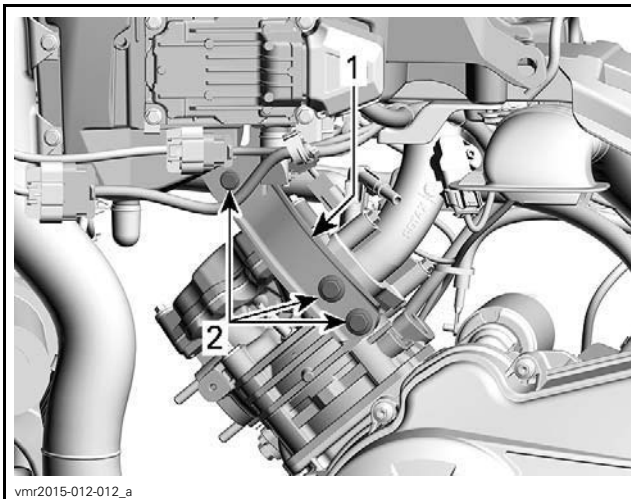
- Step 1: Disconnect spark plug wire
Step 2: Disconnect fuel injector hose
Step 3: Disconnect fuel injector connector
Step 4: Disconnect MAPTS sensor

NOTE: Refer to *ELECTRONIC FUEL INJECTION (EFI)* subsection for fuel injector disconnect.



CRANKCASE VENT DISCONNECT

1. Disconnect crankcase vent hose from engine

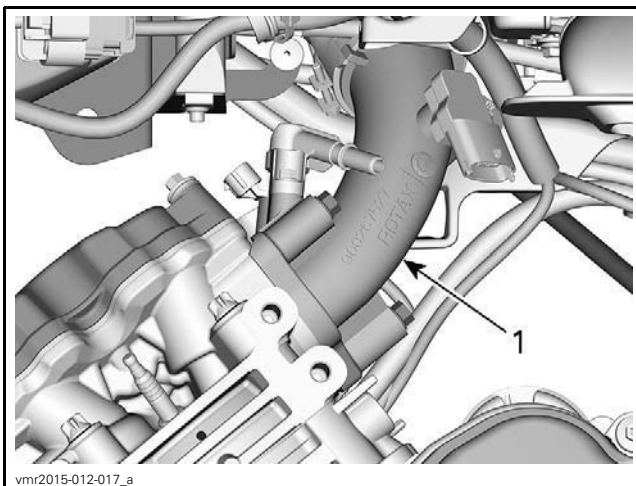


FRONT ENGINE MOUNT REMOVAL

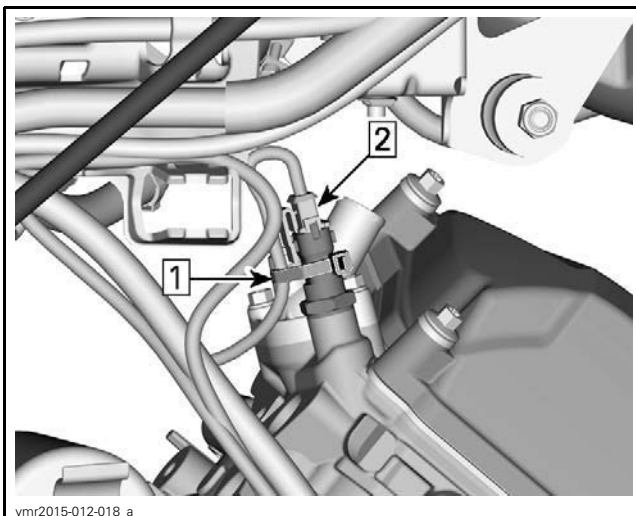
1. Upper engine mount
2. Remove these screws

Section 02 ENGINE, CVT AND GEARBOX (450)

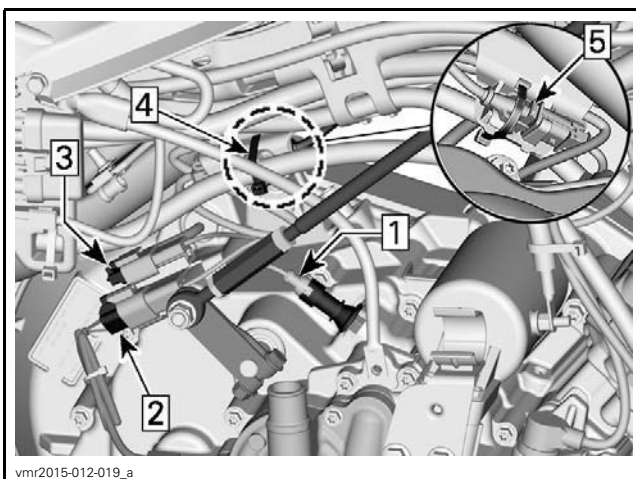
Subsection 01 (ENGINE REMOVAL AND INSTALLATION)



vmr2015-012-017_a
AIR INTAKE MANIFOLD REMOVAL
1. Remove air intake manifold

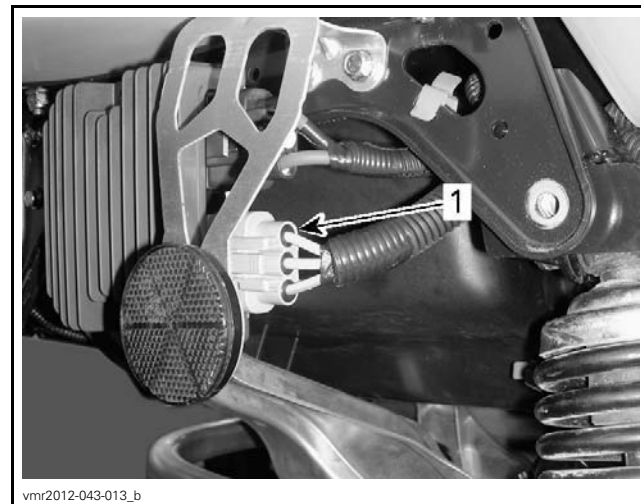


vmr2015-012-018_a
COOLANT TEMPERATURE SENSOR REMOVAL
Step 1: Cut this locking tie
Step 2: Disconnect coolant temp sensor



vmr2015-012-019_a
ELECTRICAL DISCONNECTS
Step 1: Disconnect OPS connector
Step 2: Disconnect VSS connector
Step 3: Disconnect Gear Switch connector
Step 4: Cut this locking tie
Step 5: Disconnect CPS connector (rear view)

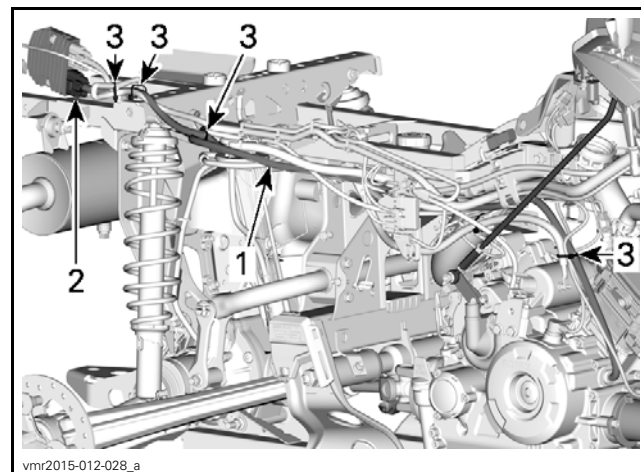
6. Remove the gear switch connector and VSS connectors from their support.
7. Disconnect magneto connector from voltage regulator rectifier.



vmr2012-043-013_b
TYPICAL
1. Magneto connector

8. Remove magneto harness from its location along vehicle and gather it in a bundle near engine.

NOTE: It may be necessary to slightly lift the rear body module to ease magneto harness removal. Refer to *BODY* subsection.

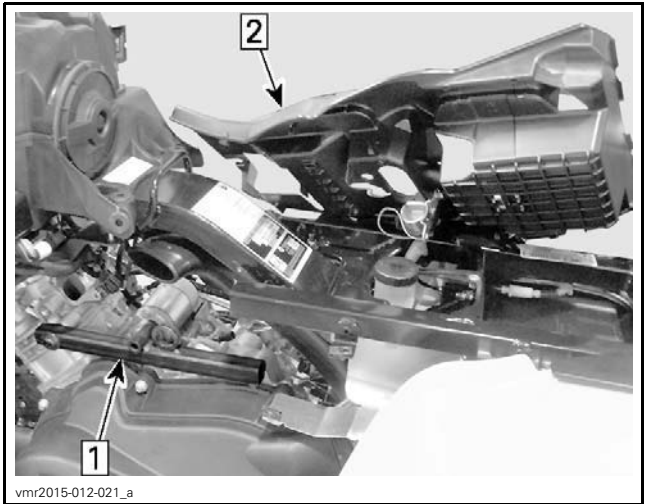


vmr2015-012-028_a
MAGNETO HARNESS ROUTING (SOME PARTS REMOVED FOR CLARITY)
1. Magneto harness
2. Voltage regulator connector to disconnect (gray)
3. Locking ties to remove

Section 02 ENGINE, CVT AND GEARBOX (450)
Subsection 01 (ENGINE REMOVAL AND INSTALLATION)

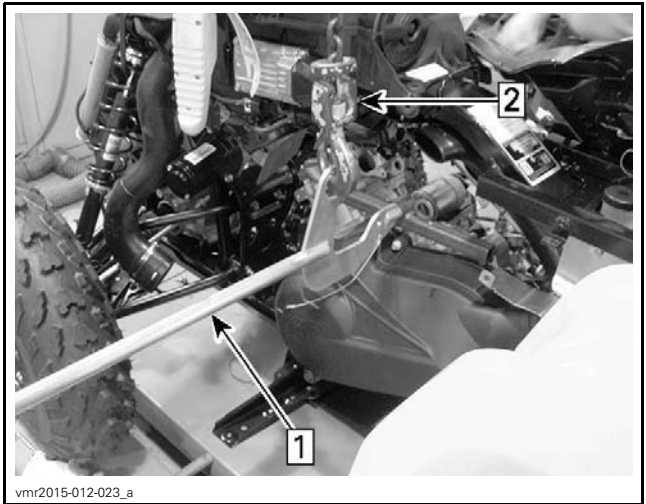
Engine Lifting

REQUIRED TOOL
ENGINE LIFTING TOOL (P/N 529 035 898)

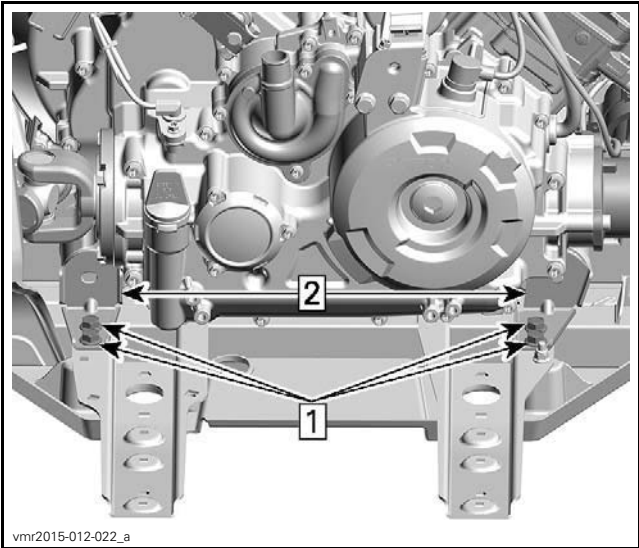


- 1. Install engine lifting tool
- 2. Move battery tray to make room

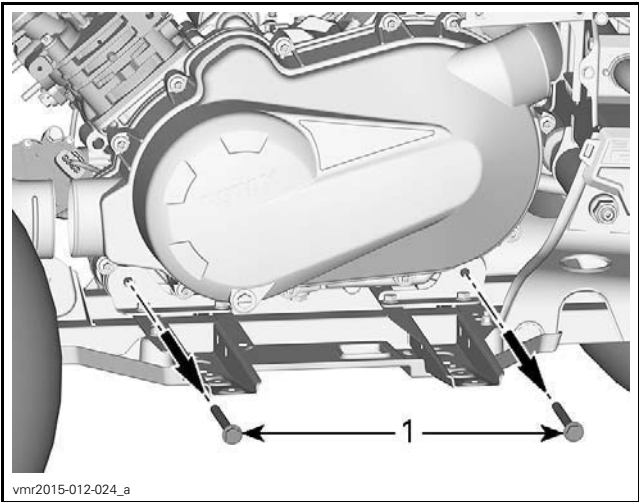
- 1. Install extension tool (P/N 529 035 619) onto engine lifting tool to ease engine manoeuvring.
- 2. Attach hoist to extension tool and slightly pick up some engine weight with the hoist.



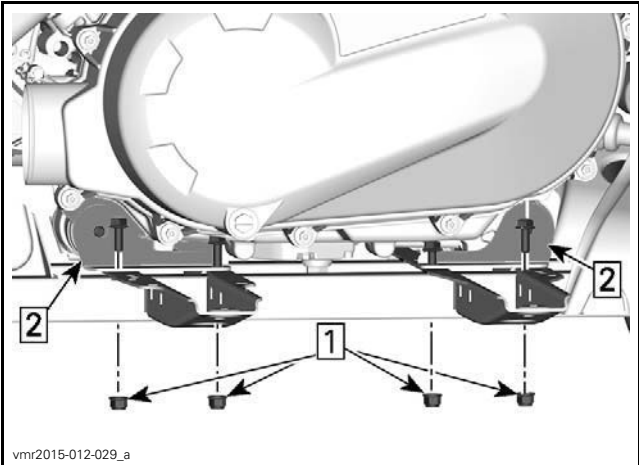
- 1. Install extension tool
- 2. Hoist attached to extension tool



RH SIDE, ENGINE MOUNTING PLATE REMOVAL
1. Remove these fasteners
2. Remove right side engine mounting plates

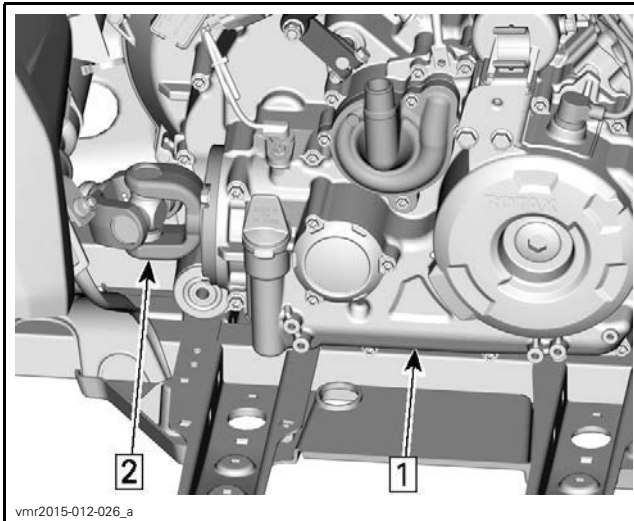


LH SIDE, ENGINE MOUNTING BOLT REMOVAL
1. Engine mounting bolts



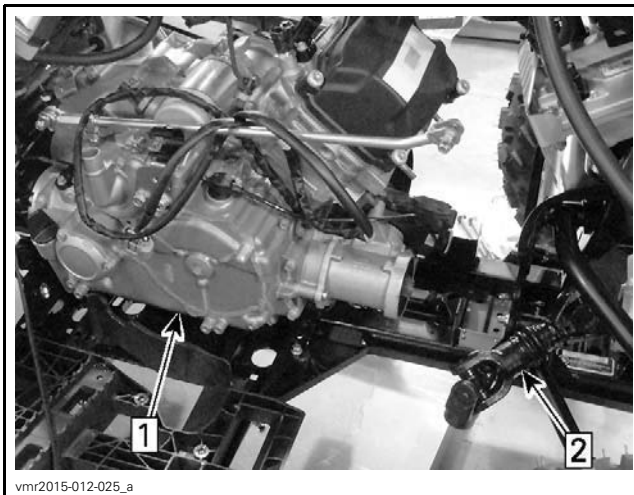
LH SIDE, ENGINE MOUNT BRACKET REMOVAL
Step 1: Remove engine mount bracket bolts
Step 2: Remove engine mounts

Remove the engine mount brackets on the right hand side.



REAR PROPELLER SHAFT DISCONNECT

1. Slightly lift engine and move forward
2. Disconnect rear propeller shaft



TYPICAL FRONT PROPELLER SHAFT DISCONNECT

1. Move engine rearward
2. Disconnect front propeller shaft



ENGINE INSTALLATION

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

When installing a part, refer to its applicable subsection for tightening torques and products required.

Inspect condition of engine mounts.

Install engine on vehicle.

Install all engine retaining bolts loosely.

Install front and rear propeller shafts. Tighten retaining screws to specification.

Tighten engine mounting bolts to specification.

TIGHTENING TORQUE	
Engine retaining bolts	62.5 N•m ± 7.5 N•m (46 lbf•ft ± 6 lbf•ft)

Reconnect all hoses, adapters and electrical connections.

If applicable, fill engine as per specification with engine oil. Refer to *LUBRICATION SYSTEM* subsection.

Fill and bleed cooling system. Refer to *PERIODIC MAINTENANCE PROCEDURE* subsection.

Check for any leaks.

Install all remaining removed parts.

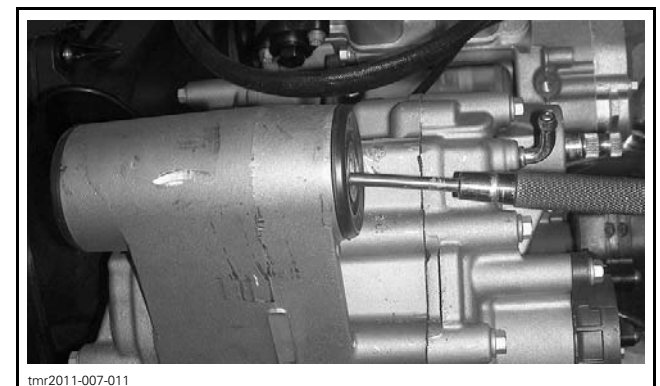
Test drive vehicle to confirm proper operation.

ENGINE MOUNTS REPLACEMENT

NOTE: Use the same procedure for the front and rear engine mounts.

Engine Mount Removal

Insert a punch into one engine mount bushing and push the opposite bushing out.



TYPICAL

Section 02 ENGINE, CVT AND GEARBOX (450)

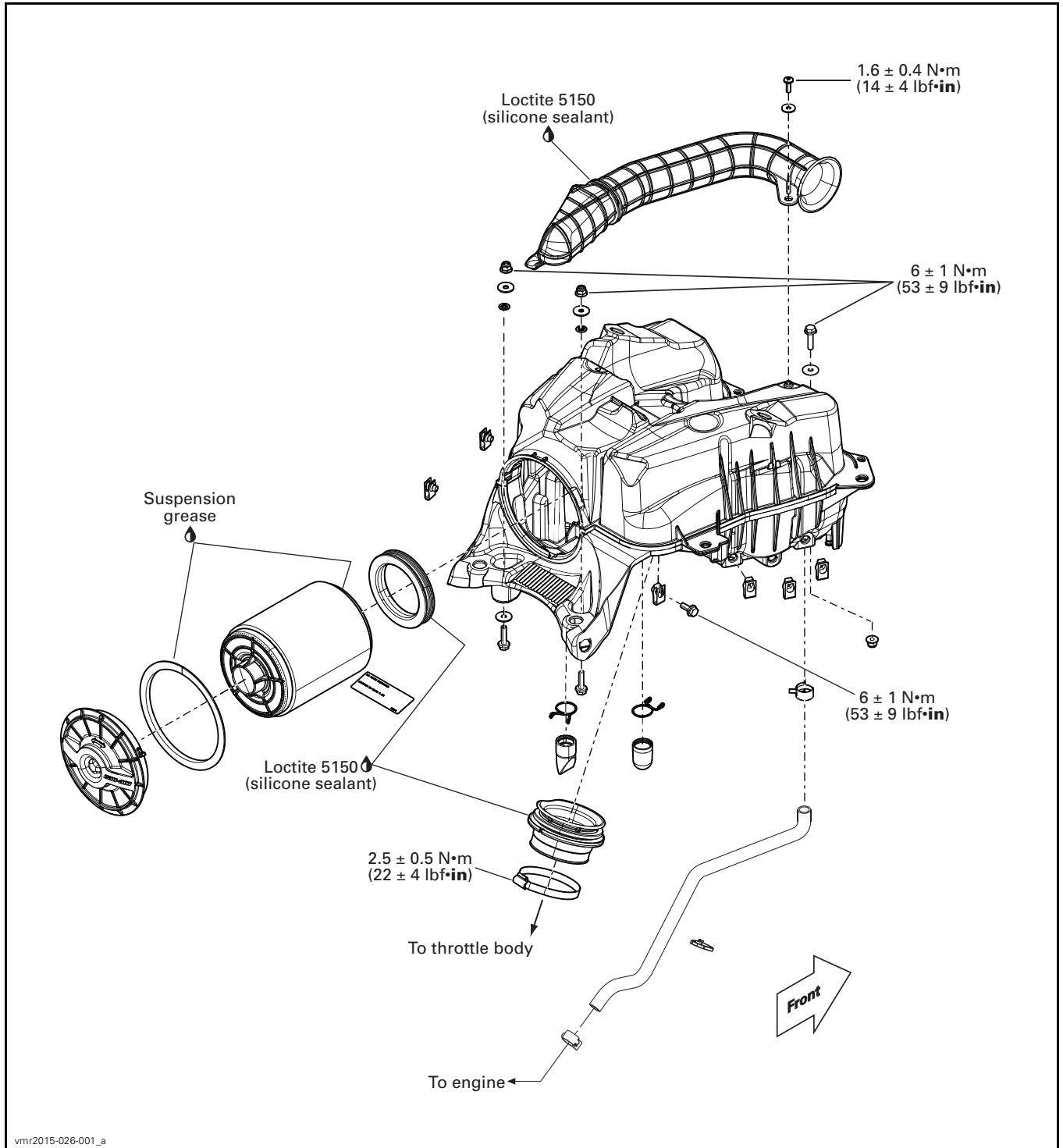
Subsection 01 (ENGINE REMOVAL AND INSTALLATION)

Engine Mount Installation

Push in each mount bushing until it bottoms out.

AIR INTAKE SYSTEM

AIR FILTER HOUSING



Section 03 ENGINE, CVT AND GEARBOX (570)

Subsection 02 (AIR INTAKE SYSTEM)

GENERAL

NOTICE Never modify the air intake system. Otherwise, engine performance degradation or damage can occur. The engine is calibrated to operate specifically with these components.

PROCEDURES

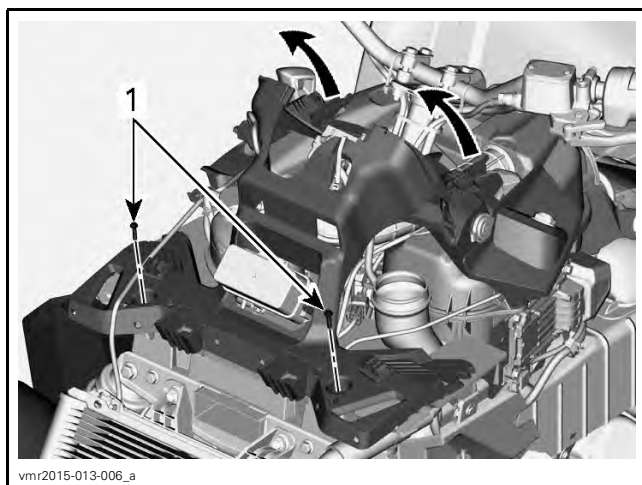
AIR FILTER

For air filter servicing, refer to *PERIODIC MAINTENANCE PROCEDURES* subsection.

AIR FILTER HOUSING

Air Filter Housing Removal

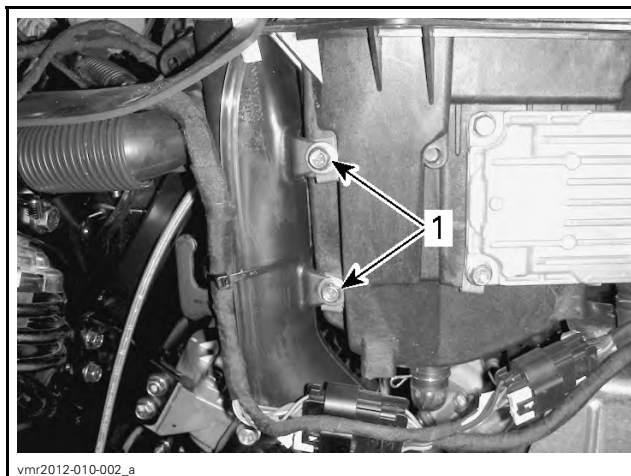
1. Remove front body module. Refer to *BODY* subsection.
2. Remove dashboard support retaining screws. Pull aft retaining pins from grommets and move support toward front.



DASHBOARD SUPPORT REMOVAL

1. Screws to remove

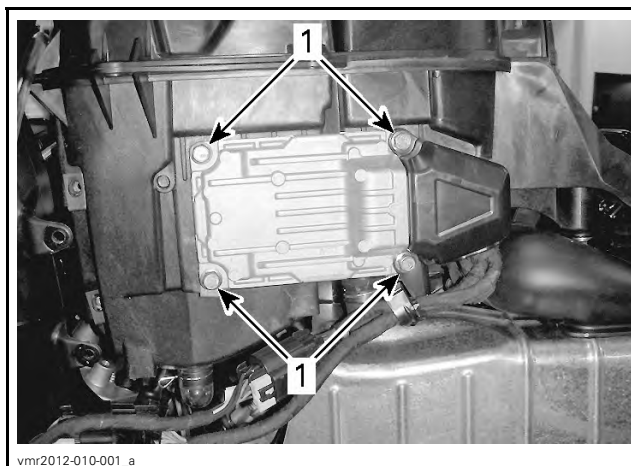
3. On LH side, remove screws securing CVT air inlet to air filter housing.



TYPICAL

1. CVT air inlet screws

4. Remove ECM retaining screws.



1. ECM retaining screws

5. Remove engine harness connectors (HIC) from air filter housing.

6. Move ECM aside.



TYPICAL

1. Engine harness connectors (HIC)

Section 03 ENGINE, CVT AND GEARBOX (570)

Subsection 02 (AIR INTAKE SYSTEM)

7. Remove air intake tube retaining screw.



1. Air intake tube retaining screw

8. Move air intake tube forward for access to coolant tank screw.

9. Remove coolant tank retaining screws.



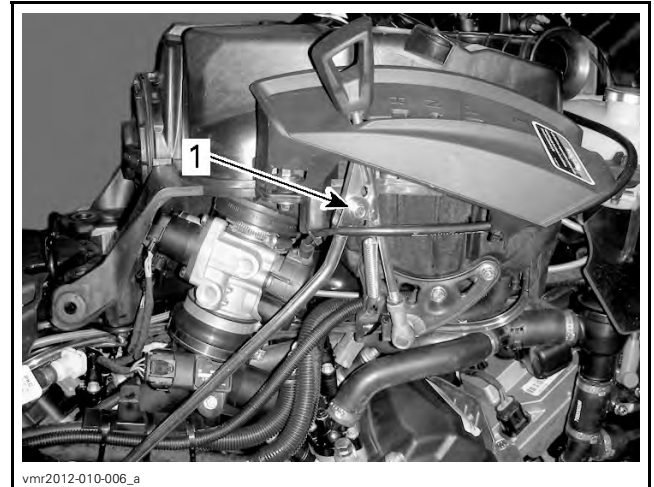
AIR INTAKE TUBE MOVED FOR ACCESS

1. Left side coolant tank retaining screw



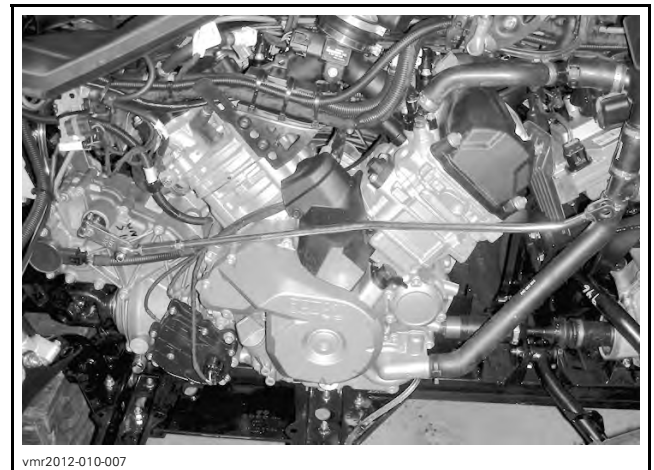
1. Right side coolant tank retaining screw

10. Remove link rod from shift lever.



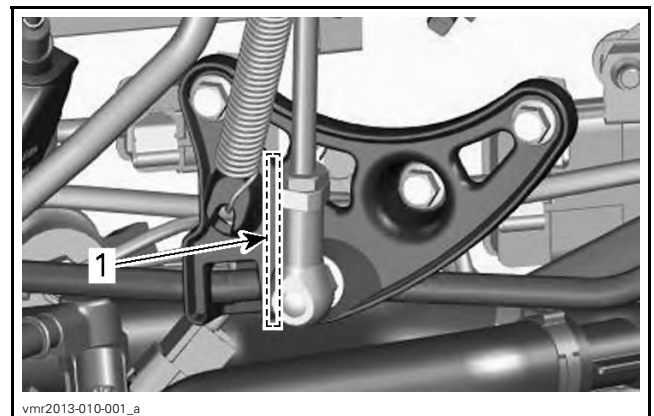
1. Disconnect link rod r here

11. Carefully move link rod downward.



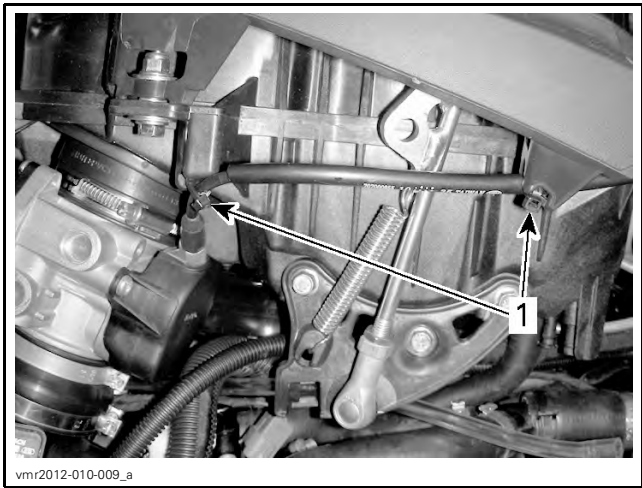
TYPICAL

12. Remove the following locking ties.



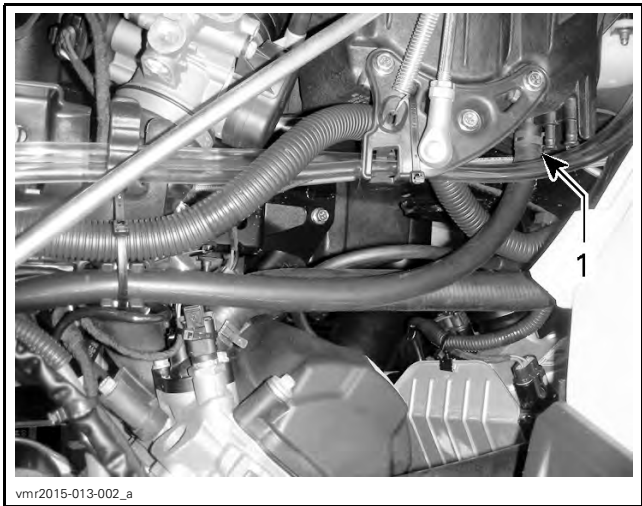
1. Locking tie to remove - location shown

Section 03 ENGINE, CVT AND GEARBOX (570)
Subsection 02 (AIR INTAKE SYSTEM)



1. Locking ties to remove

13. Remove crankcase vent hose from air filter housing.



TYPICAL
1. Crankcase vent hose

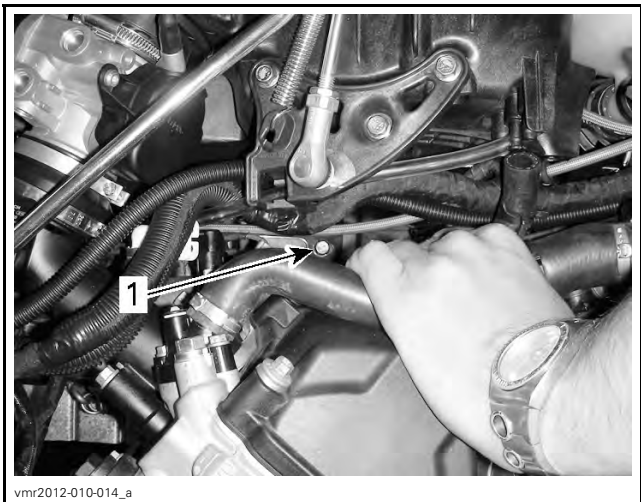
14. Remove fasteners retaining aft end of air filter housing.



FASTENERS LOCATED NEAR FORWARD SEAT ANCHOR
1. Nuts and washers (2x)



SCREW LOCATED UNDER COOLANT TANK
1. Air filter housing retaining screw



SCREW ACCESSED FROM UNDER SHIFT LEVER
1. Air filter housing retaining screw

15. Detach throttle body from intake adapter and air filter housing.

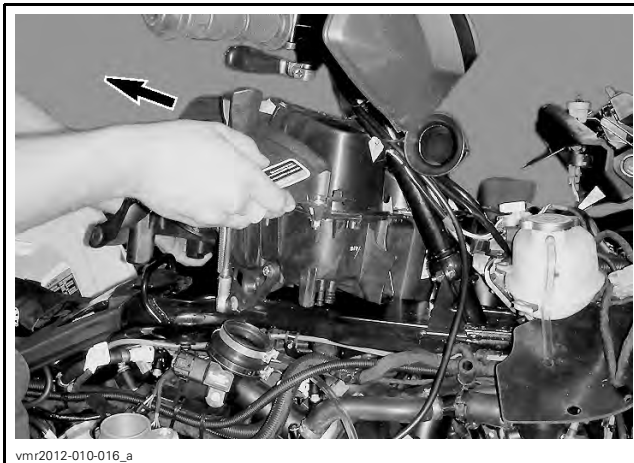
16. Slightly lift air filter housing upward.

17. Move throttle body aside to make room.



1. Throttle body

18. Remove air filter housing by pulling it towards rear.



AIR FILTER HOUSING REMOVAL

19. Remove remaining components from air filter housing.

Air Filter Housing Inspection

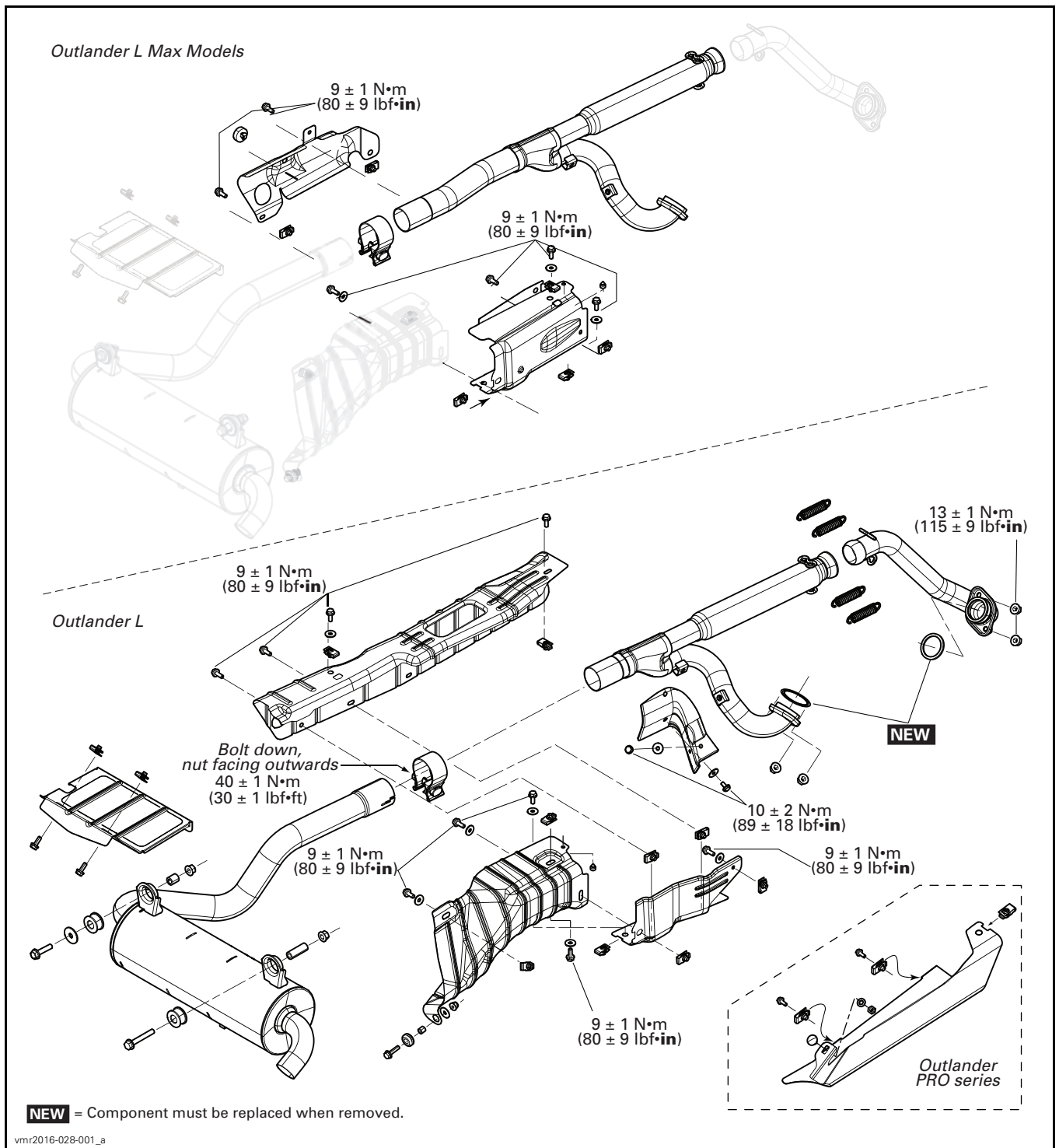
Check air filter housing for cracks or other damage. Replace if necessary.

Air Filter Housing Installation

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

Refer to exploded view for tightening torque.

EXHAUST SYSTEM



Section 03 ENGINE, CVT AND GEARBOX (570)

Subsection 03 (EXHAUST SYSTEM)

GENERAL

WARNING

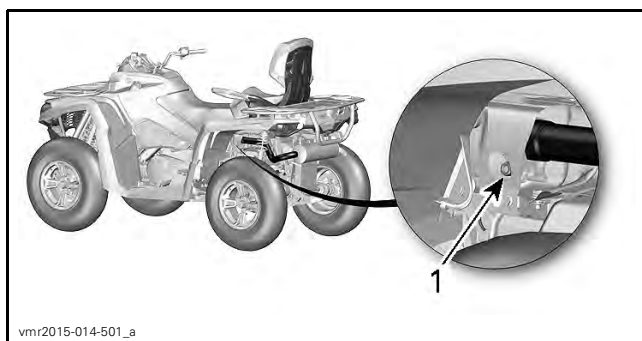
Never touch exhaust system components immediately after the engine has run.

PROCEDURES

MUFFLER

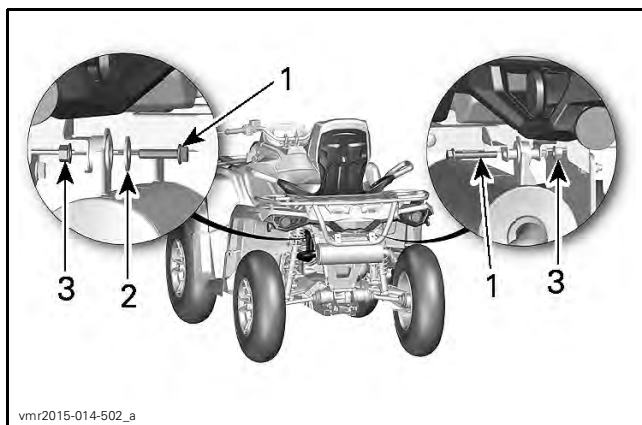
Muffler Removal

1. Loosen exhaust pipe clamp.



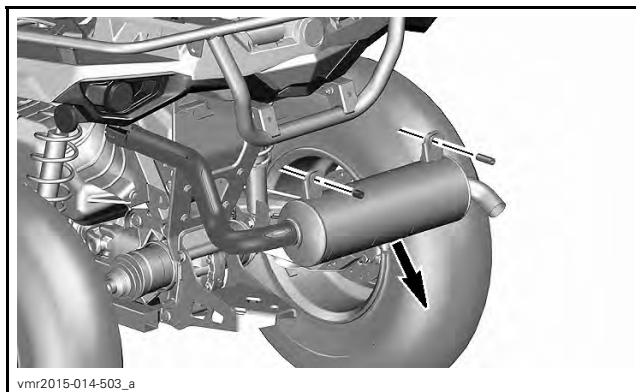
1. Clamp nut

2. Remove muffler retaining bolts.



1. Bolt
2. Washer
3. Nut

3. Remove the muffler.



Muffler Inspection

Check muffler and cover for cracks or other damages. Replace if necessary.

Check if the rubbers support are brittle, hard or otherwise damaged. Replace if needed.

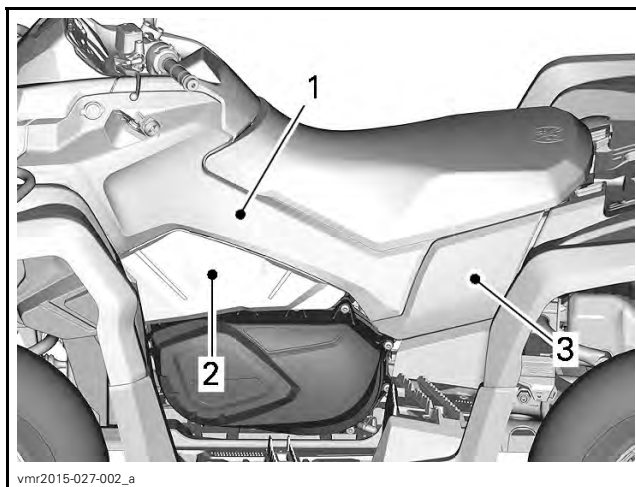
Muffler Installation

Reverse the removal procedure.

HEAT SHIELD

Heat Shield Removal

1. Refer to *BODY* and remove following LH body panels.

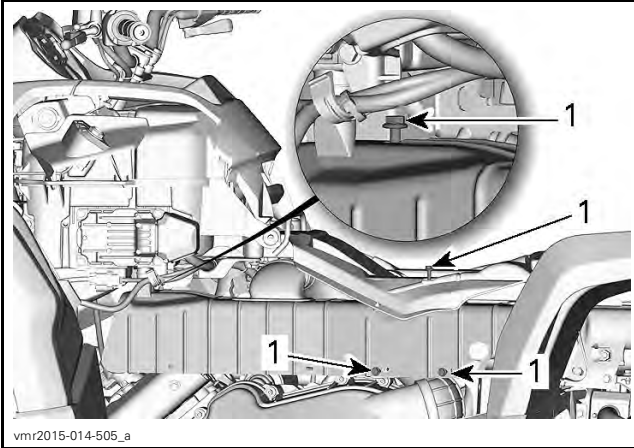


LH SIDE

1. Side panel
2. Side panel extension
3. Rear panel extension (Max models)

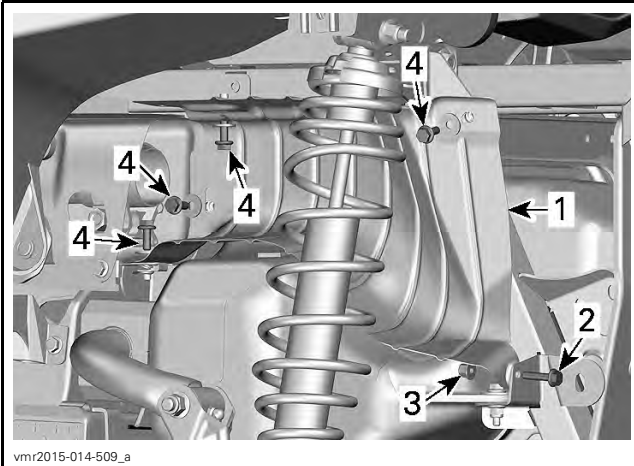
2. Remove outer heat shield retaining bolts.

NOTICE Do not use impact tool to remove or install heat shield bolts.

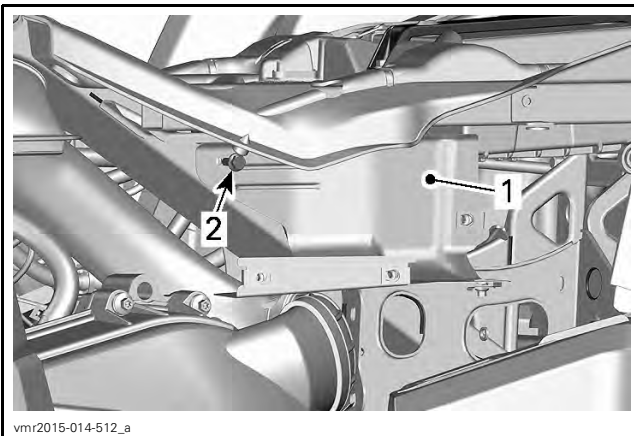


TYPICAL - OUTER HEAT SHIELD - SHORT MODEL SHOWN
1. Heat shield bolts

3. Remove muffler for rear and inner heat shield removal.



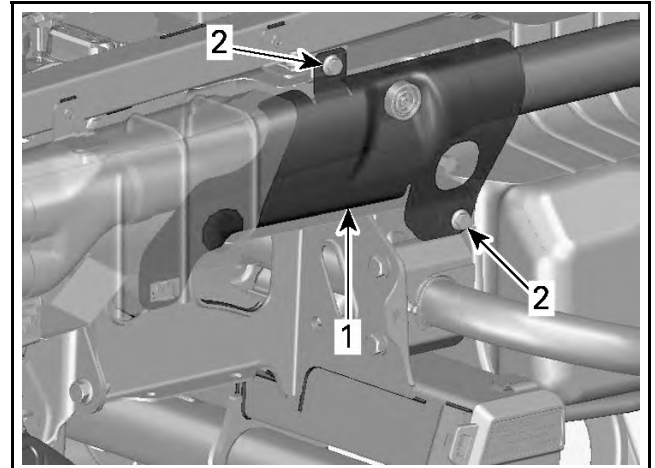
TYPICAL - REAR HEAT SHIELD REMOVAL
1. Rear heat shield
2. M6 x 25 bolt
3. M6 elastic nut
4. M6 x 16 bolts with washers



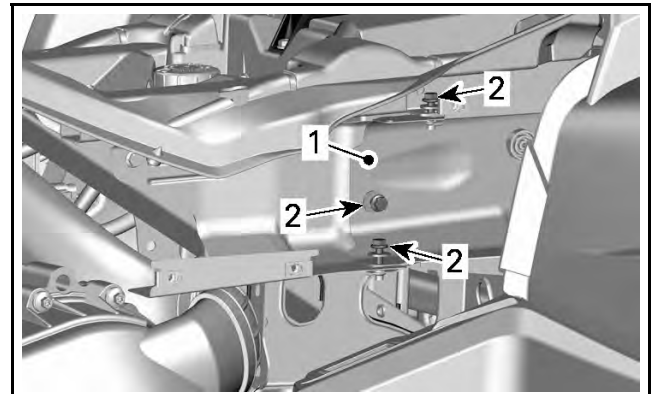
TYPICAL - INNER HEAT SHIELD REMOVAL
1. Inner heat shield
2. M6 x 16 bolts

MAX Models

4. Remove heat shield extension retaining bolts.



1. Outer heat shield extension
2. M6 x 16 bolts



TYPICAL
1. Inner heat shield extension
2. M6 x 16 bolts

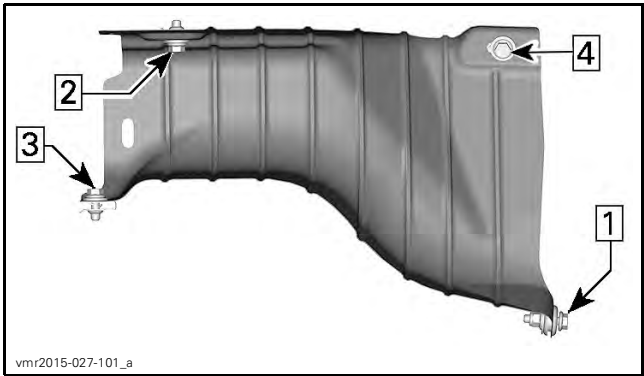
Heat Shield Installation

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

Refer to exploded view for torque specifications, and following illustration for rear heat shield tightening sequence.

Section 03 ENGINE, CVT AND GEARBOX (570)

Subsection 03 (EXHAUST SYSTEM)

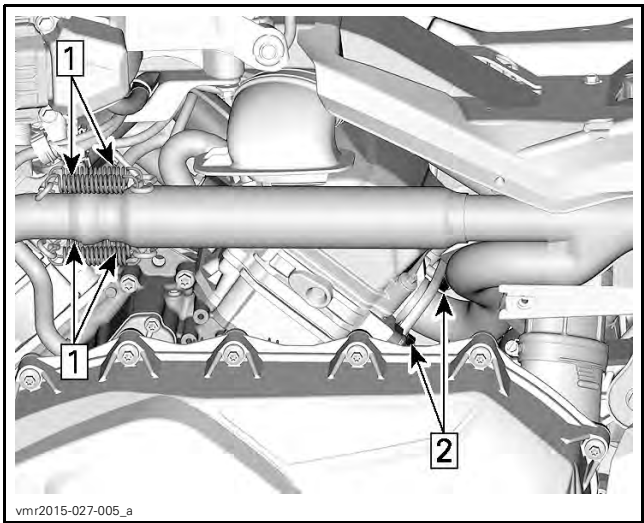


REAR HEAT SHIELD TIGHTENING SEQUENCE

Y-EXHAUST PIPE

Y-Exhaust Pipe Removal

- 1. Remove *MUFFLER*. See procedure in this subsection.
- 2. Remove *OUTER HEAT SHIELD*. See procedure in this subsection.
- 3. Remove the following parts:
 - Springs from head pipe
 - Y-exhaust pipe retaining nuts on rear cylinder
 - Y-exhaust pipe from vehicle.



- 1. Springs (4)
- 2. Y-exhaust pipe retaining nuts on rear cylinder (2)

Y-Exhaust Pipe Inspection

Check Y-exhaust pipe for cracks, bending or other damages. Replace if needed.

Y-Exhaust Pipe Installation

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

Install NEW exhaust gasket and exhaust pipe retaining nuts.

Properly position exhaust pipe before tightening.

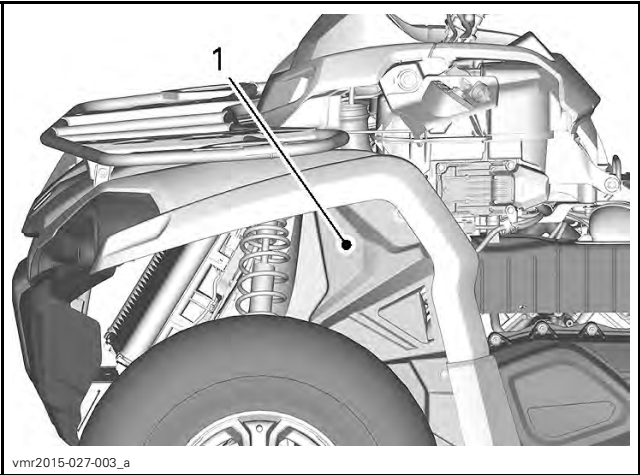
Refer to *EXHAUST SYSTEM TIGHTENING SEQUENCE*.

TIGHTENING TORQUE	
Head pipe nuts (rear cylinder)	13 N•m ± 1 N•m (115 lbf•in ± 9 lbf•in)

HEAD PIPE (FRONT CYLINDER)

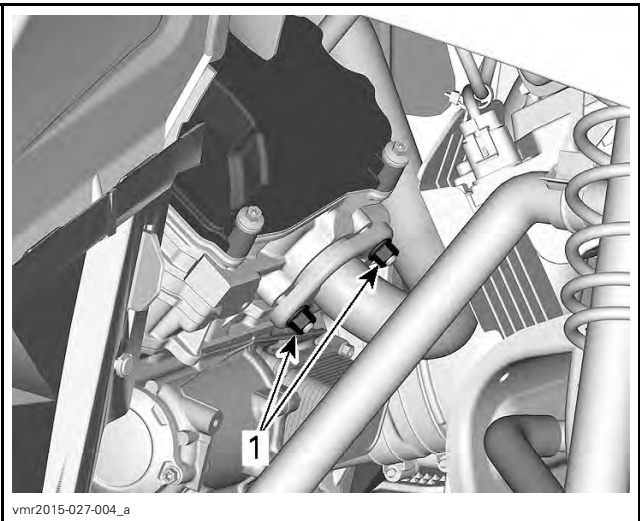
Front Head Pipe Removal

- 1. Remove *Y-EXHAUST PIPE* See procedure in this subsection.
- 2. Refer to *BODY* and remove LH and RH inner fenders.



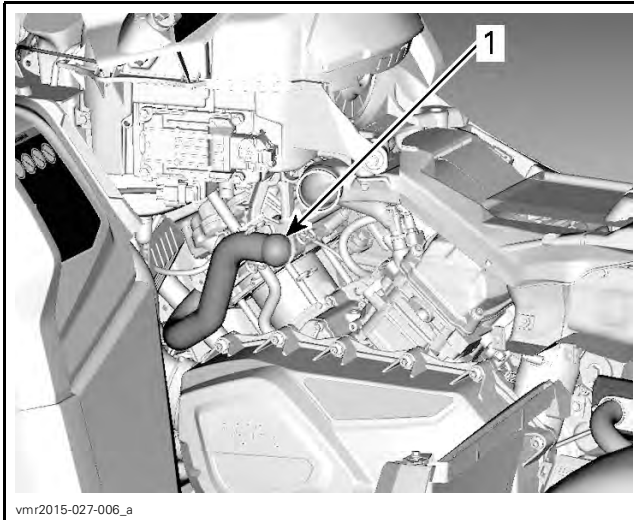
- 1. Remove inner fender panel (both sides)

- 3. From RH side of vehicle, remove head pipe retaining nuts.



- 1. Head pipe retaining nuts

- 4. Remove front head pipe from vehicle.



1. Head pipe

NOTE: The space to remove the front head pipe is limited. Remove it without force.

Front Head Pipe Inspection

Check head pipe for cracks, bending or other damages. Replace if needed.

Front Head Pipe Installation

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

Install NEW exhaust gaskets and nuts.

Refer to *EXHAUST SYSTEM TIGHTENING SEQUENCE*.

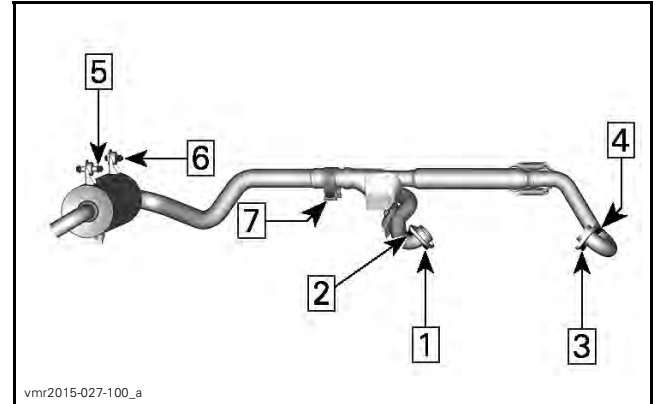
TIGHTENING TORQUE	
Head pipe nuts	13 N•m ± 1 N•m (115 lbf•in ± 9 lbf•in)

Exhaust System Tightening System Sequence

Install all nuts and bolts loosely.

Install springs.

Tighten all fasteners as per following tightening sequence. Refer to exploded view for torque specifications.



EXHAUST SYSTEM TIGHTENING SYSTEM SEQUENCE

LUBRICATION SYSTEM

SERVICE TOOLS

Description	Part Number	Page
ADAPTER HOSE	529 035 652	46
DISCONNECT TOOL	529 035 714	46
PRESSURE GAUGE.....	529 035 709	46

SERVICE PRODUCTS

Description	Part Number	Page
LOCTITE 243 (BLUE).....	293 800 060	48, 52

Subsection 04 (LUBRICATION SYSTEM)

20 ± 2 N•m
(15 ± 1,5 lbf•ft)

NEW

12 ± 1 N•m
(106 ± 9 lbf•in)

Loctite 243

NEW

10 ± 1 N•m
(89 ± 9 lbf•in)

Engine oil

Engine oil

6 ± 0,7 N•m
(53 ± 6 lbf•in)

Loctite 243

NEW

20 ± 2 N•m
(15 ± 1,5 lbf•ft)

Engine oil

10 ± 1 N•m
(89 ± 9 lbf•in)

Loctite 243

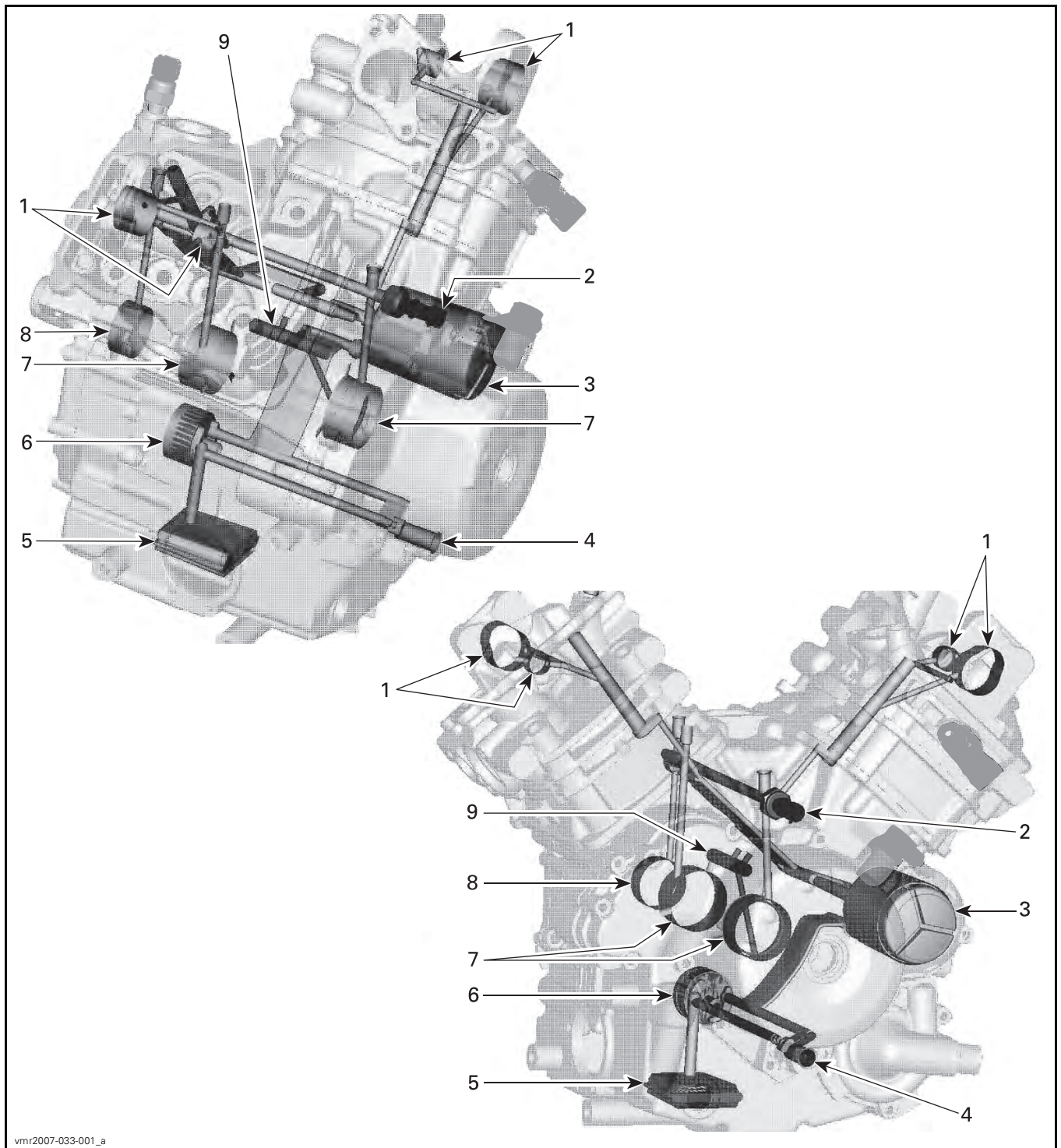
7 ± 0,5 N•m
(62 ± 4 lbf•in)

Engine oil

NEW = Component must be replaced when removed.

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ENGINE LUBRICATION CIRCUIT



vmr2007-033-001_a

1. Camshaft bearings
2. Oil pressure switch
3. Oil filter
4. Oil pressure regulator valve
5. Oil strainer
6. Oil pump
7. Crankshaft main bearings
8. Crankshaft support bearing
9. Connecting rod bearings

Section 03 ENGINE, CVT AND GEARBOX (570)

Subsection 04 (LUBRICATION SYSTEM)

INSPECTION

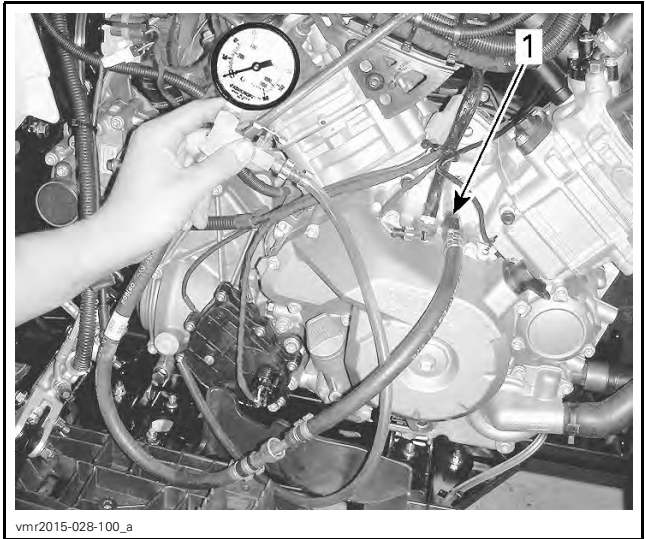
ENGINE OIL PRESSURE

NOTE: The engine oil pressure test should be done with a warm engine 100°C (212°F) and the recommended oil.

Remove the oil pressure switch. Refer to *OIL PRESSURE SWITCH* in this subsection.

Install the pressure test gauge with the proper adapter hose in the OPS engine bore.

REQUIRED TOOL	
PRESSURE GAUGE (P/N 529 035 709)	
ADAPTER HOSE (P/N 529 035 652)	



TYPICAL
1. Gauge connected in OPS engine bore

The engine oil pressure should be within the following values.

OIL PRESSURE	1250 RPM	6000 RPM
MINIMAL	70 kPa (10 PSI)	300 kPa (44 PSI)
NOMINAL	150 kPa (22 PSI)	350 kPa (51 PSI)
MAXIMAL	250 kPa (36 PSI)	450 kPa (65 PSI)

If the engine oil pressure is out of specifications, check the points described in *TROUBLESHOOTING* in this subsection.

Remove oil pressure gauge and adapter hose.

NOTE: To remove adapter hose from oil pressure gauge, use the disconnect tool.

REQUIRED TOOL	
DISCONNECT TOOL (P/N 529 035 714)	

Reinstall the oil pressure switch and remaining components.

TROUBLESHOOTING

LOW OR NO OIL PRESSURE

- Oil level is too low.
 - Refill engine with recommended engine oil. Refer to *OIL LEVEL VERIFICATION* in the *PERIODIC MAINTENANCE PROCEDURES* subsection.
 - Check for high oil consumption, refer to *HIGH OIL CONSUMPTION* in this *TROUBLESHOOTING*.
 - Check for engine oil leaks. For leak indicator hose and leak indicator hole, refer to *COOLING SYSTEM INSPECTION* in the *PERIODIC MAINTENANCE PROCEDURES* subsection. Repair if necessary.
- Use of unsuitable engine oil type.
 - Replace engine oil by the recommended engine oil.
- Clogged oil filter.
 - Replace oil and oil filter at the same time.
- Defective oil pressure switch.
 - Test oil pressure switch, see procedure in this subsection.
- Defective or worn oil pump.
 - Check oil pump, see procedure in this subsection.
- Defective engine oil pressure regulator.
 - Check engine oil pressure regulator, see procedure in this subsection.
- Worn plain bearings in crankcase.
 - Check plain bearing clearance, refer to *BOTTOM END* subsection.
- Clogged engine oil strainer.
 - Clean engine oil strainer, see procedure in this subsection.

OIL CONTAMINATION

- Defective water pump seal ring or rotary seal.
 - Check for oil or coolant leak from indicator near water pump, refer to *COOLING SYSTEM INSPECTION* in the *PERIODIC MAINTENANCE PROCEDURES* subsection. Replace seal if necessary.

2. Cylinder head or cylinder base gasket leak.
 - Retighten cylinder head to specified torque, refer to *TOP END* subsection. Replace gasket if tightening does not solve the problem.
3. Engine internal damage.
 - Repair engine.
4. Oil cooler gasket leak.
 - Replace oil cooler gasket and change engine oil.

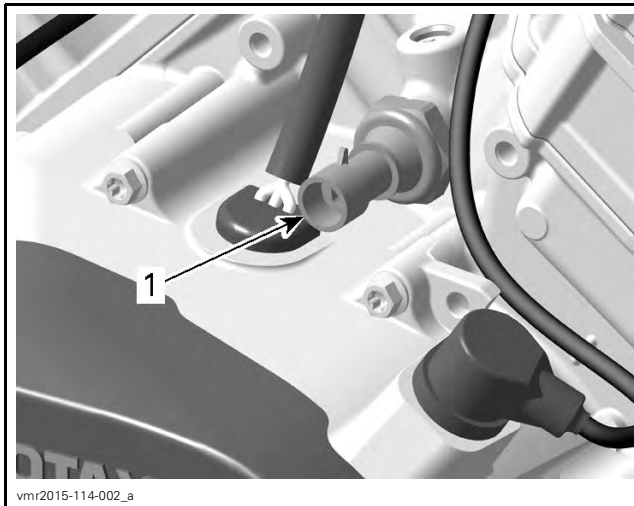
HIGH OIL CONSUMPTION

1. Leaking breather oil seal.
 - Check if the oil seal of the breather is brittle, hard or damaged. Refer to *BOTTOM END* subsection.
2. Valve stem seals worn or damaged.
 - Replace valve stem seals.
3. Worn piston rings (blue exhaust smoke).
 - Replace piston rings.

PROCEDURES

OIL PRESSURE SWITCH (OPS)

Oil Pressure Switch Location



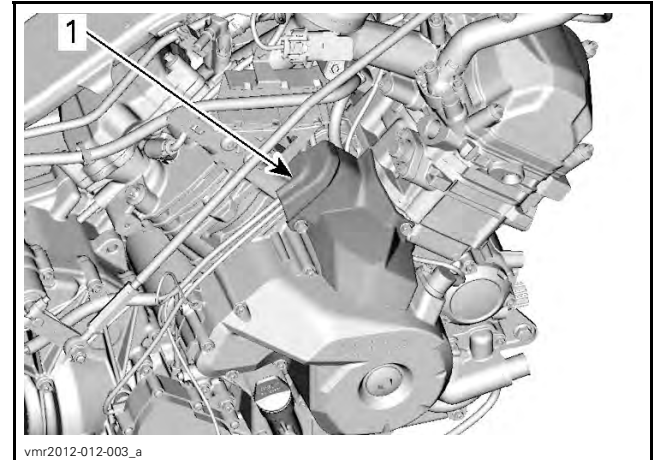
1. Oil pressure switch

Oil Pressure Switch Access

Refer to *BODY* subsection and remove the following

- Seat
- Console
- RH side panel and extension.

Remove OPS cover.



TYPICAL

1. Remove

Oil Pressure Switch Activation

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

OIL PRESSURE SWITCH ACTIVATION RANGE

30 kPa $\pm$ 10 kPa (4.35 PSI $\pm$ 1.45 PSI)

To check the function of the oil pressure switch, an oil pressure test has to be performed. Refer to *ENGINE OIL PRESSURE* in this subsection.

If the engine oil pressure is good, perform the oil pressure switch resistance test.

Testing the Oil Pressure Switch Resistance

Disconnect the connector from the oil pressure switch.

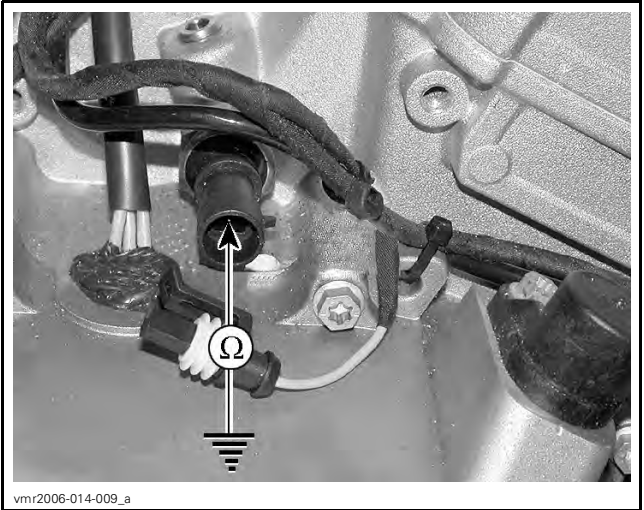
Check resistance as per following tables.

OPS CONNECTOR	ENGINE	ENGINE NOT RUNNING
PIN		RESISTANCE (Ω)
1	Engine ground	Close to 0 Ω (normally closed switch)

Section 03 ENGINE, CVT AND GEARBOX (570)

Subsection 04 (LUBRICATION SYSTEM)

OPS CONNECTOR	ENGINE	ENGINE RUNNING
PIN		RESISTANCE (Ω)
1	Engine ground	Infinite (open) when pressure reaches 30 kPa $\pm$ 10 kPa (4.35 PSI $\pm$ 1.45 PSI)



If resistance values are incorrect, replace the oil pressure switch.

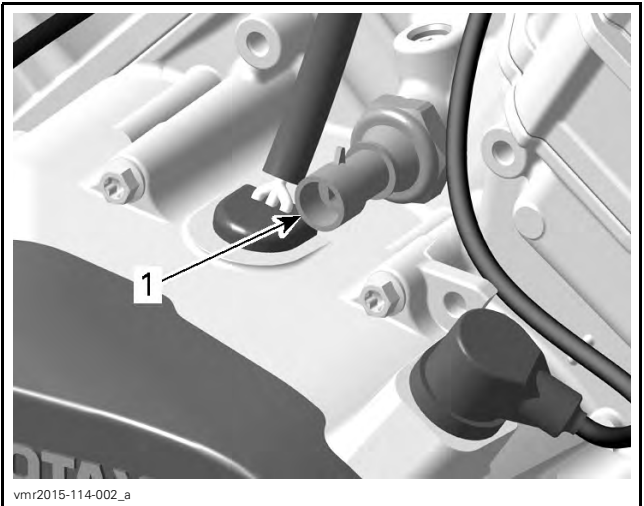
If the values are correct, check wiring.

Removing the Oil Pressure Switch

Unplug the oil pressure switch connector.

Unscrew and remove oil pressure switch.

Installing the Oil Pressure Switch



1. Oil pressure switch

Apply required service product on threads of oil pressure switch.

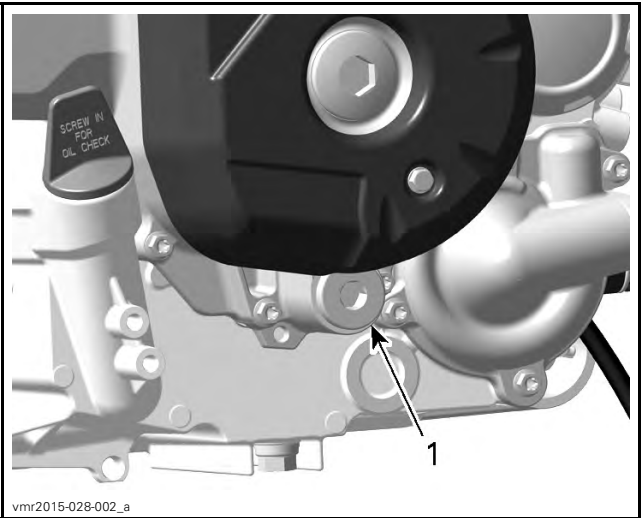
Tighten oil pressure switch to specification.

SERVICE PRODUCT	
Oil pressure switch	LOCTITE 243 (BLUE) (P/N 293 800 060)
TIGHTENING TORQUE	
Oil pressure switch	12 N•m $\pm$ 1 N•m (106 lbf•in $\pm$ 9 lbf•in)

ENGINE OIL PRESSURE REGULATOR

Oil Pressure Regulator Location

The oil pressure regulator is located on the engine magneto side, integrated in the magneto cover.



1. Engine oil pressure regulator

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

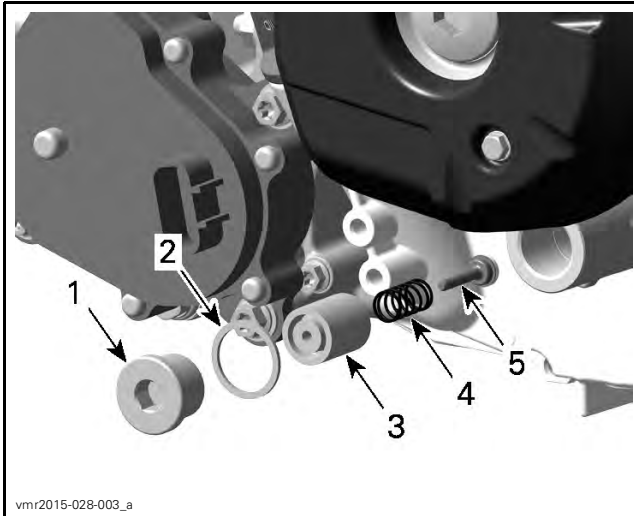
Oil Pressure Regulator Access

Refer to *BODY* subsection and remove the following:

- Seat
- Console
- RH side panel and extension
- RH footboard panel.

Removing the Oil Pressure Regulator

Remove plug screw and pull oil pressure regulator out.



1. Plug screw
2. Gasket ring
3. Pressure regulator housing
4. Spring
5. Pressure regulator valve

Inspecting the Oil Pressure Regulator

Inspect pressure regulator housing and valve for scoring or other damages.

Check spring for free length.

SPRING FREE LENGTH	
NEW NOMINAL	39 mm (1.535 in)
SERVICE LIMIT	37 mm (1.457 in)

NOTE: Replace worn or damaged components.
Clean bore and thread in the magneto housing from metal shavings and other contaminations.

Installing the Oil Pressure Regulator

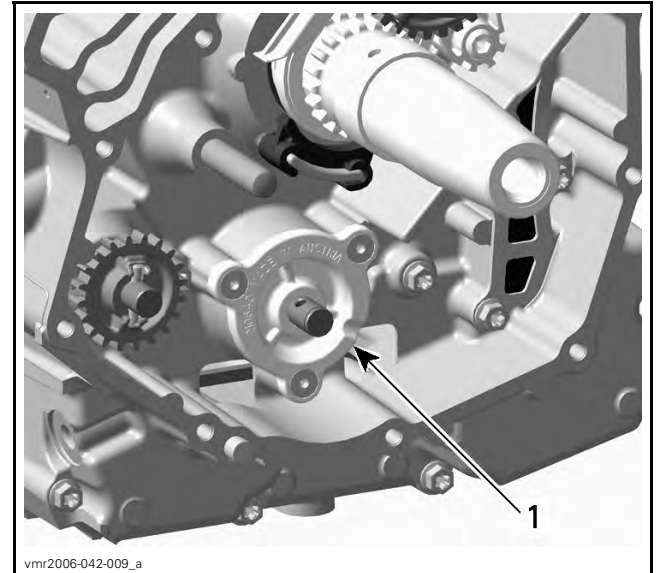
For installation, reverse the removal procedure. Pay attention to the following details.

NOTE: At installation always replace the gasket ring of the plug screw by a NEW one.

OIL PUMP

Oil Pump Location

The oil pump is located on the engine PTO side (behind PTO cover).

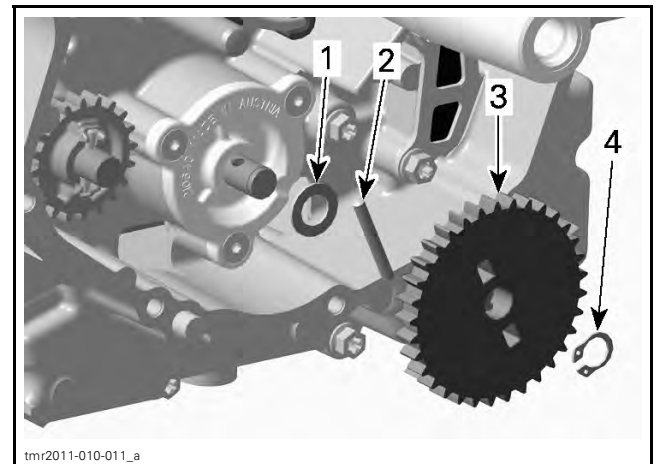


1. Oil pump

Removing the Oil Pump

Remove the PTO cover. Refer to *PTO COVER* in the *BOTTOM END* subsection.

1. Remove:
 - Retaining ring
 - Oil pump gear
 - Needle pin
 - Thrust washer.

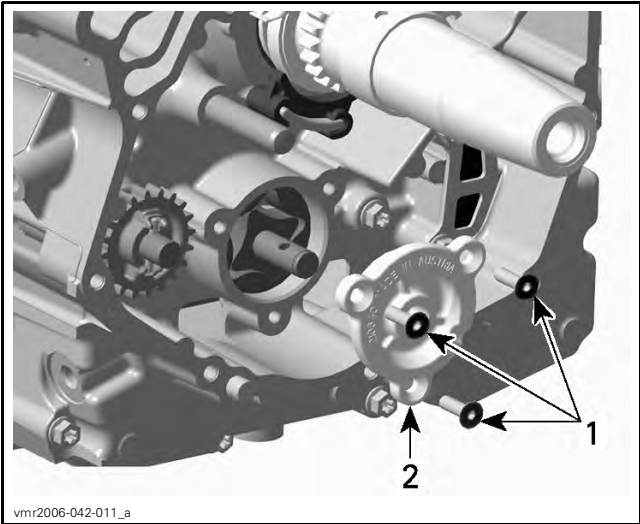


1. Thrust washer
2. Needle pin
3. Oil pump gear
4. Retaining ring

2. Remove oil pump cover screws and pull oil pump cover out.

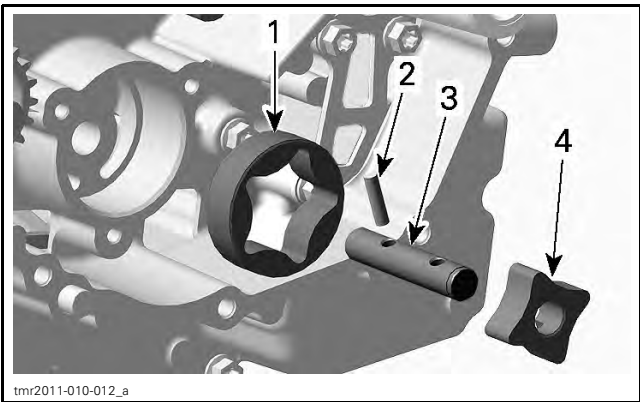
Section 03 ENGINE, CVT AND GEARBOX (570)

Subsection 04 (LUBRICATION SYSTEM)



1. Retaining screws
2. Oil pump cover

3. Remove oil pump shaft with needle pin and inner rotor.
4. Remove outer rotor.

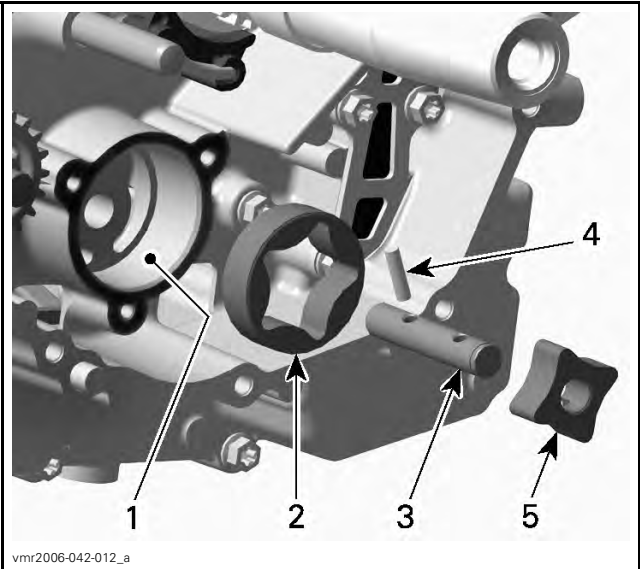


1. Outer rotor
2. Needle pin
3. Oil pump shaft
4. Inner rotor

Inspecting the Oil Pump

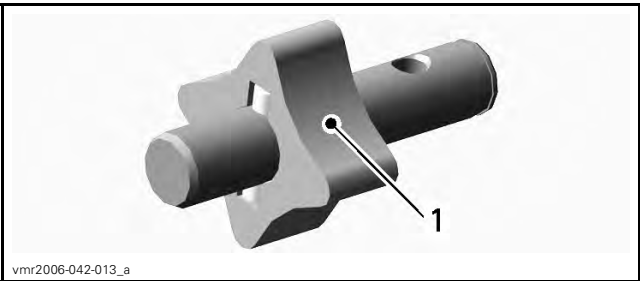
Inspect oil pump and oil pump cover bore for marks, scratches or other damages. Check for scratches in crankcase between outer rotor and oil pump bore. If so, replace damaged parts.

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



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

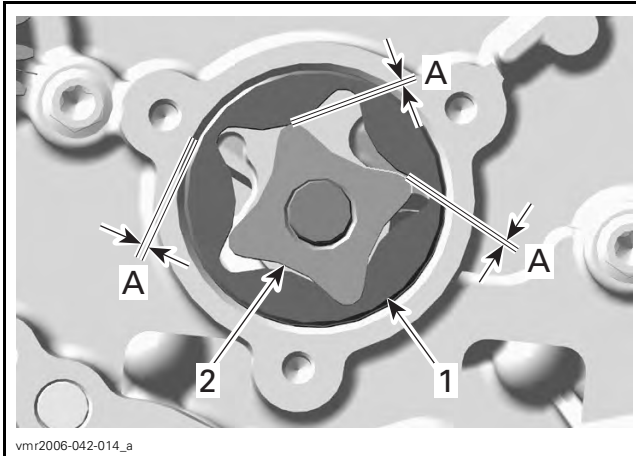
Check inner rotor for corrosion pin holes or other damages. If so, replace oil pump shaft assembly.



1. Pittings on the teeth

Using a feeler gauge, measure the clearance of inner and outer rotors as shown.

CLEARANCE OF INNER AND OUTER ROTOR	
SERVICE LIMIT	0.25 mm (.0098 in)

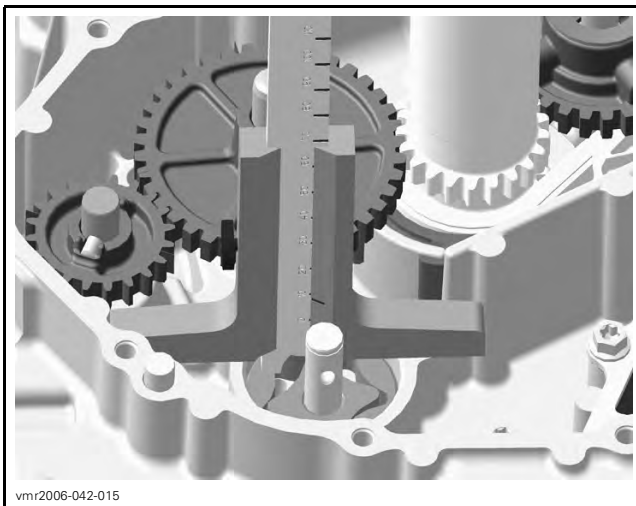


- 1. Outer rotor
- 2. Inner rotor
- A. 0.25 mm (.0098 in)

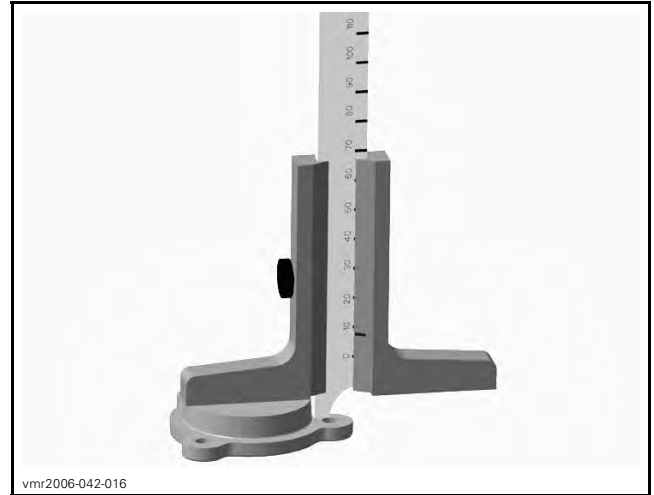
If clearance of inner and outer rotors exceeds the tolerance, replace oil pump rotors. Ensure to also check oil pump cover. If damaged, replace the complete oil pump assembly.

If clearance between outer rotor and its bore in crankcase exceeds the tolerance, replace the complete oil pump rotors and/or the crankcase.

Using a depth gauge, measure the axial clearance of the oil pump as shown.



OIL PUMP — MEASUREMENT "A"



OIL PUMP COVER — MEASUREMENT "B"

Subtract measurement B from measurement A to obtain axial clearance.

OIL PUMP AXIAL CLEARANCE	
SERVICE LIMIT	0.20 mm (.008 in)

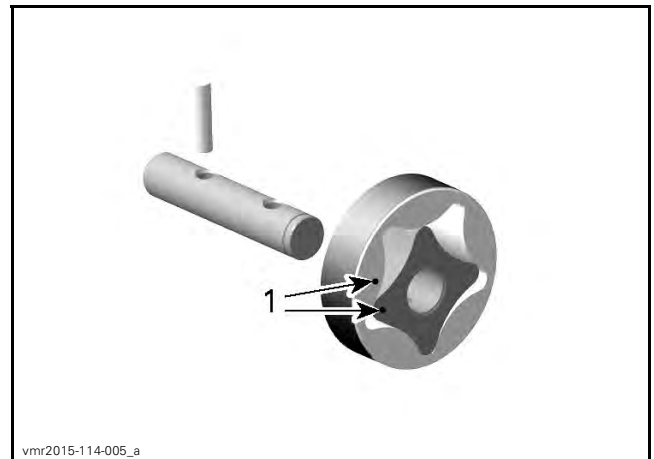
NOTE: When the axial clearance of the oil pump assembly increases, the oil pressure decreases.

Installing the Oil Pump

For installation, reverse the removal procedure.

Pay attention to the following details.

NOTE: When installing the oil pump rotors, make sure both markings are on the outer side.



- 1. Markings

After reinstallation of the remaining parts, check for smooth operation of the oil pump assembly.

Testing the Oil Pump Function

After engine is completely reassembled, start engine and make sure oil pressure is within specifications (refer to *ENGINE OIL PRESSURE* in this subsection).

Section 03 ENGINE, CVT AND GEARBOX (570)

Subsection 04 (LUBRICATION SYSTEM)

ENGINE OIL STRAINER

Oil Strainer Location

The engine oil strainer is located between both crankcase halves.

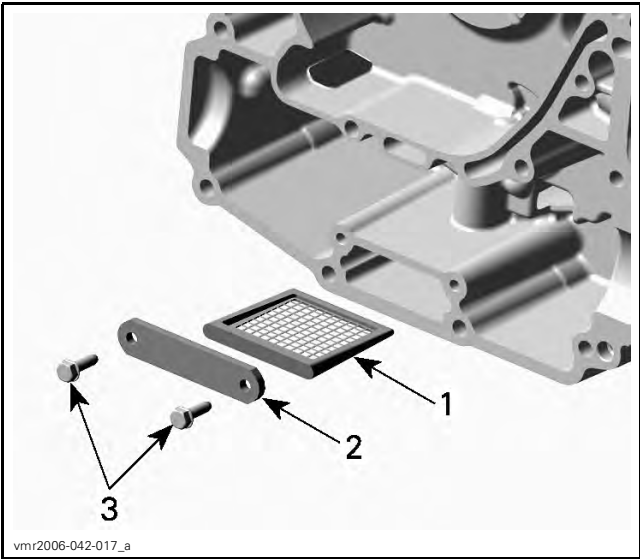
Removing the Oil Strainer

Remove engine from vehicle.

Separate crankcase halves. Refer to *BOTTOM END* subsection.

Remove screws and retaining plate.

Pull out engine oil strainer.



- 1. Engine oil strainer
- 2. Retaining plate
- 3. Screws

Cleaning and Inspecting the Oil Strainer

Clean engine oil strainer with a part cleaner then use an air gun to dry it.

WARNING

Always wear eye protector. Chemicals can cause a rash break out and injure your eyes.

Check engine oil strainer for cracks or other damage. Replace if damaged.

Installing the Oil Strainer

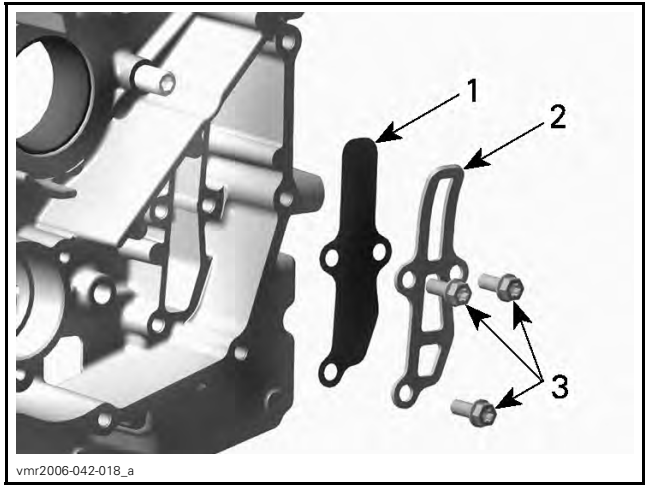
The installation is the reverse of the removal procedure.

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

TIGHTENING TORQUE	
Oil strainer screws	6 N•m ± 0.7 N•m (53 lbf•in ± 6 lbf•in)

REED VALVE

The engine is equipped with a reed valve which prevents accumulation of larger oil quantities in the crankcase. The reed valve is fitted into the crankcase.



- 1. Reed valve
- 2. Stopper
- 3. Screws

Removing the Reed Valve

Remove:

- Engine from vehicle
- PTO cover (refer to *PTO COVER* in the *BOTTOM END* subsection)
- Reed valve retaining screws
- Stopper plate
- Reed valve.

Inspecting the Reed Valve

Check reed valve for cracks or other damage. Replace reed valve if damaged.

Installing the Reed Valve

The installation is the reverse of the removal procedure.

COOLING SYSTEM

SERVICE TOOLS

Description	Part Number	Page
HANDLE	420 877 650	66
OIL SEAL PUSHER.....	529 035 757	66
ROTARY SEAL PUSHER PLATE	529 036 130	64
SEAL PUSHER	529 035 766	64, 67

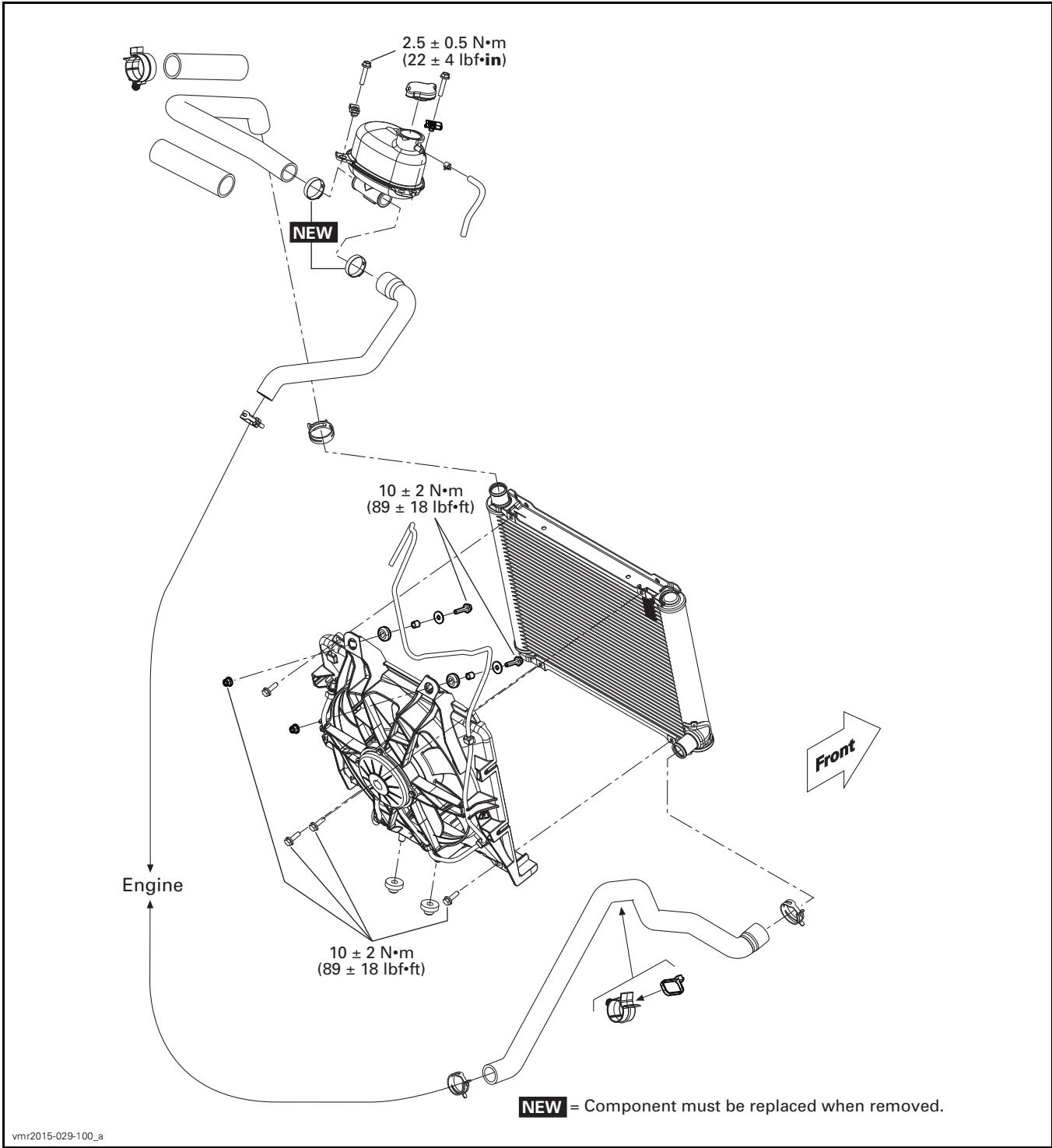
SERVICE PRODUCTS

Description	Part Number	Page
DOW CORNING 111	413 707 000	67
LOCTITE 243 (BLUE).....	293 800 060	56

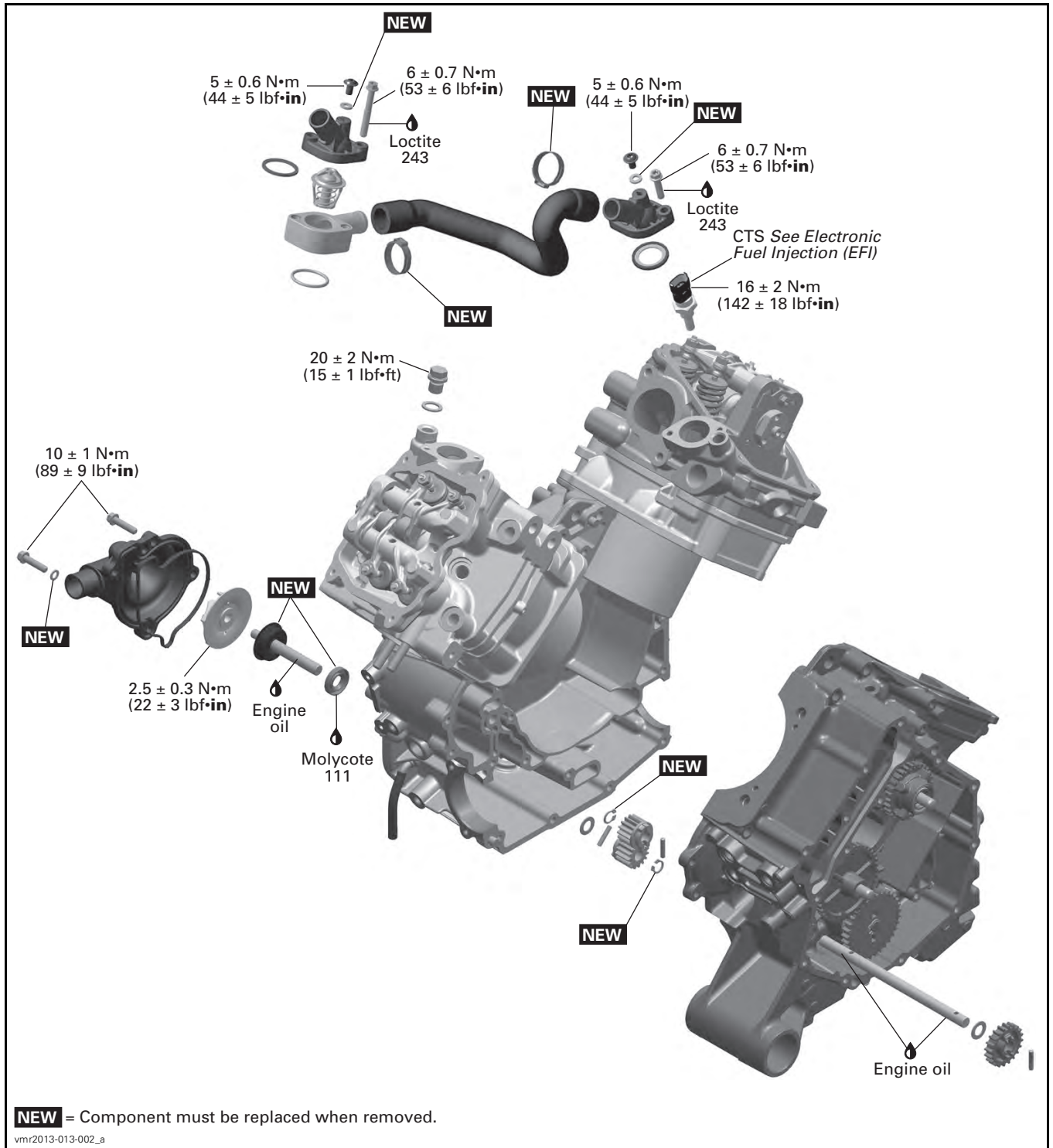
Section 03 ENGINE, CVT AND GEARBOX (570)

Subsection 05 (COOLING SYSTEM)

RADIATOR



WATER PUMP AND THERMOSTAT



GENERAL

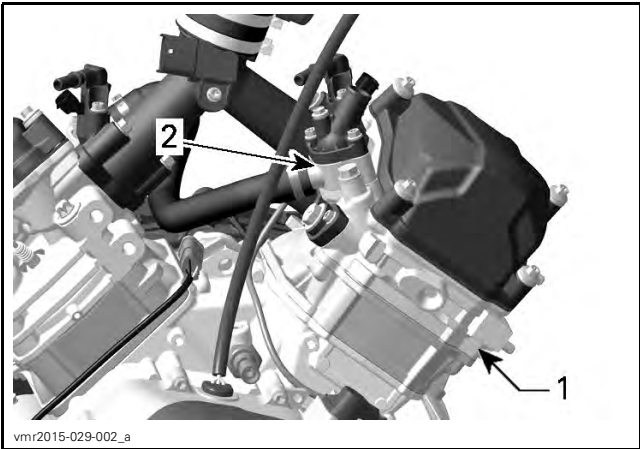
NOTICE Never start engine without coolant. Some engine parts such as the rotary seal on the water pump shaft can be damaged.

PROCEDURES

THERMOSTAT

Thermostat Location

The thermostat is located in the thermostat housing at the top of the front cylinder (RH side).

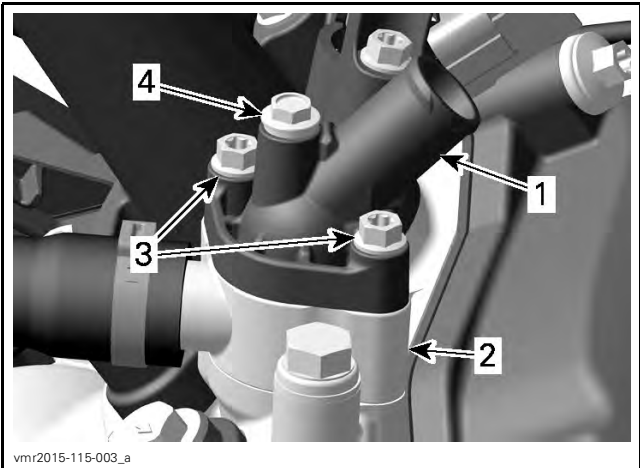


THERMOSTAT LOCATION

- 1. Front cylinder
- 2. Thermostat housing

Removing the Thermostat

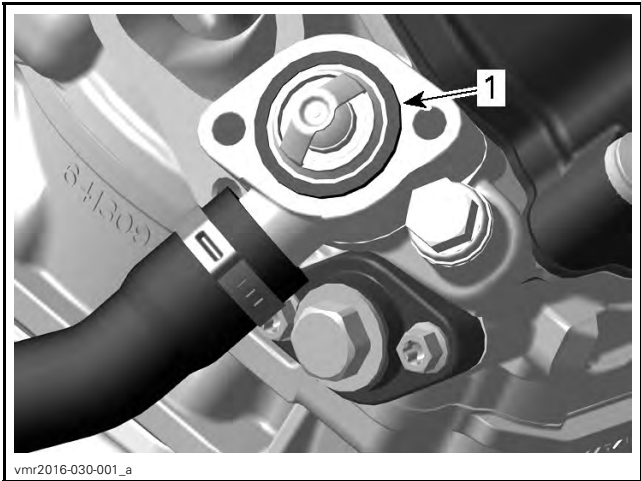
- 1. Drain engine coolant, refer to *PERIODIC MAINTENANCE PROCEDURES* subsection.
- 2. Remove thermostat housing screws and remove thermostat cover.



THERMOSTAT

- 1. Thermostat cover
- 2. Thermostat housing
- 3. Cover screws
- 4. Bleed screw

- 3. Pull thermostat and gasket.



1. Thermostat with gasket

Testing the Thermostat

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

THERMOSTAT OPENING TEMPERATURE	
STARTS TO OPEN	FULLY OPEN
65°C (149°F)	75°C (167°F)

Replace thermostat if it does not begin to open at specified temperature.

Check if gasket is brittle, hard or damaged. If so, replace gasket.

Installing the Thermostat

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

SERVICE PRODUCT	
Thermostat cover retaining screws	LOCTITE 243 (BLUE) (P/N 293 800 060)

TIGHTENING TORQUE	
Thermostat cover retaining screws	6 N•m ± 0.7 N•m (53 lbf•in ± 6 lbf•in)

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

Check cooling system for leaks.

RADIATOR

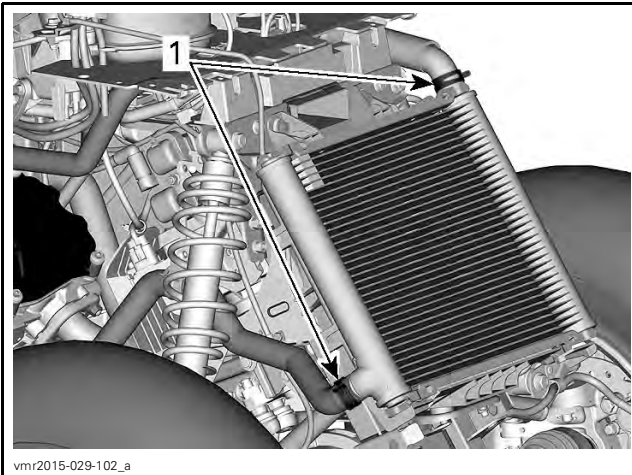
Inspecting the Radiator

Check radiator fins for clogging or damage.

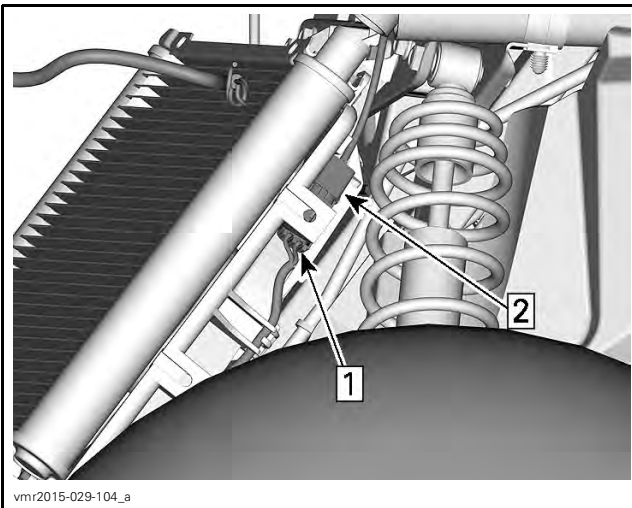
Remove insects, mud or other obstructions with compressed air or low pressure water.

Removing the Radiator

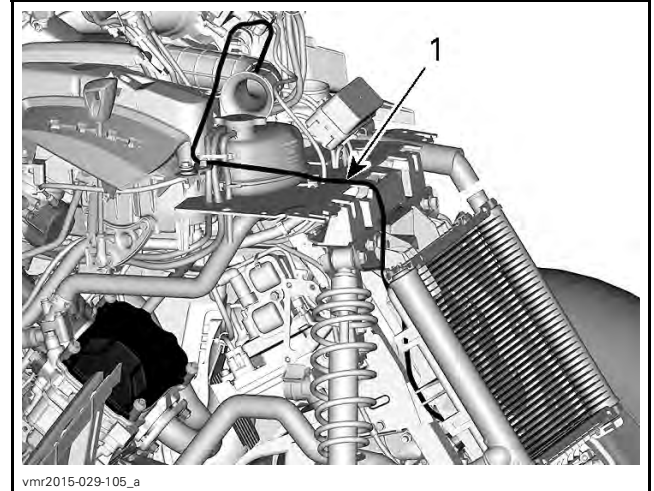
1. Drain engine coolant. Refer to *PERIODIC MAINTENANCE PROCEDURES* subsection.
2. Remove front body module. Refer to *BODY* subsection.
3. Disconnect radiator and fan assembly.



1. Radiator hoses

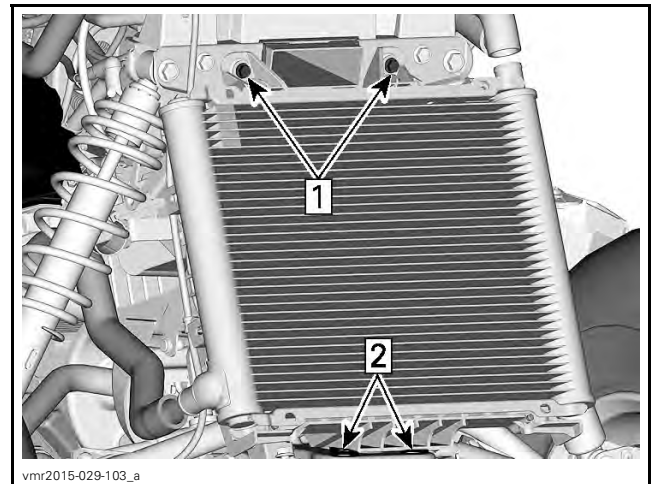


Step 1: Disconnect cooling fan connector
Step 2: Remove the harness connector from the fan shroud



1. Remove fan motor vent hose

NOTE: Take note of the rooting of vent hose on vehicle to ease reinstallation.



Step 1: Remove upper retaining bolts
Step 2: Remove radiator from bushings

Installing the Radiator

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

Ensure that rubber bushings are properly installed between frame and fan shroud.

Ensure that vent hose of the cooling fan motor is properly rooted as prior to removal.

NOTICE If the vent hose of the cooling fan motor is not properly rooted, the fan motor may be damaged due to improper venting.

Tighten radiator upper retaining bolts to specification.

TIGHTENING TORQUE	
Radiator upper retaining bolts	10 N•m ± 2 N•m (89 lbf•in ± 18 lbf•in)

Section 03 ENGINE, CVT AND GEARBOX (570)

Subsection 05 (COOLING SYSTEM)

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

Check cooling system for leaks.

COOLANT TEMPERATURE SENSOR (CTS)

Refer to *ELECTRONIC FUEL INJECTION (EFI)* subsection.

RADIATOR COOLING FAN

Radiator Cooling Fan Operation

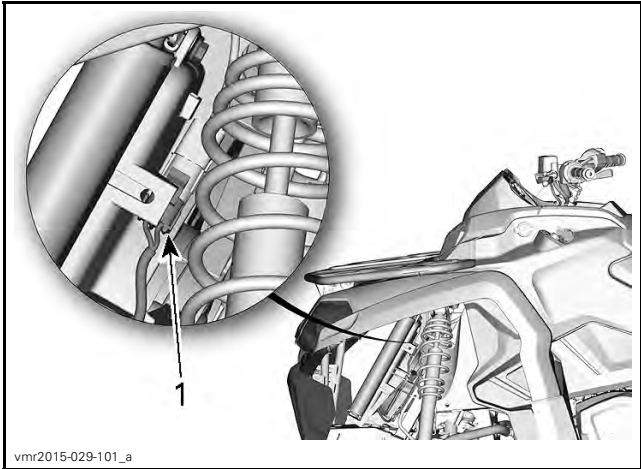
The ECM controls the radiator cooling fan via the input of the coolant temperature sensor (CTS). Refer to the following table.

ENGINE TEMP.	COOLING FAN	CHECK ENGINE LIGHT	GAUGE MESSAGE
95°C (203°F)	Turns ON	—	—
93°C (199°F)	Turn OFF	—	—
115°C (239°F)	ON	Turns ON	Check engine Hi Temp
118°C (244°F)	ON	Flashes	Limp Home

Radiator Cooling Fan Fuse Location

The radiator cooling fan fuse (F9) is located in the front fuse box, under the gauge support.

R1	F9	F8		F12	R3	
				R8		
R2	F5	F4			R4	



1. Cooling fan connector

2. Connect cooling fan connector pin B to a suitable 20 A fuse jumper and then directly to the positive battery post.
3. Connect cooling fan connector pin A (BK wire) directly to the negative battery post.
4. Check if cooling fan works properly.
 - If cooling fan does not work, replace it.
 - If cooling fan works properly, refer to *RADIATOR COOLING FAN TROUBLESHOOTING CHART*.
5. Reconnect radiator cooling fan connector.

Troubleshooting the Radiator Cooling Fan

NOTE: The following troubleshooting chart assumes that the engine is operating in the fan activation temperature range. Refer to *RADIATOR COOLING FAN OPERATION*.

Testing the Radiator Cooling Fan

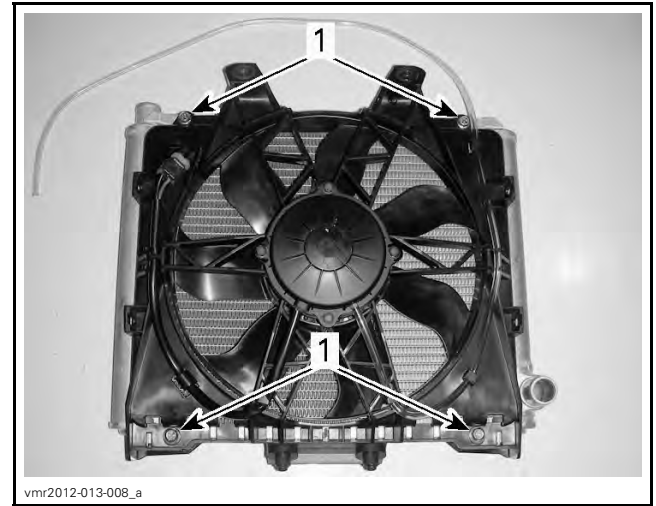
1. Disconnect radiator cooling fan connector.

COOLING FAN TROUBLESHOOTING CHART		
Is fan working?	YES →	Everything is OK
NO ↓		
Check FAN fuse (F9) Is fuse burnt?	YES →	Replace fuse Is fan working?
NO ↓		
Bypass fan relay R1 (refer to <i>RELAY OPERATION TEST</i>)		
↓		
Fan turns?	YES →	Replace relay Is fan working?
NO ↓		
Apply 12 Vdc and a ground to fan connector (refer to <i>RADIATOR COOLING FAN TEST</i>)		
↓		
Fan turns?	NO →	Replace fan Is fan working?
YES ↓		
Check CTS (refer to <i>ELECTRONIC FUEL INJECTION (EFI)</i> subsection)		
↓		
CTS works?	NO →	Replace CTS Is fan working?
YES ↓		
Check wiring harness and connectors (refer to <i>WIRING DIAGRAM</i>)		
↓		
Harness and connectors good?	NO →	Repair or replace defective part(s)
YES ↓		
Try a new ECM	→	Is fan working?

Removing the Radiator Cooling Fan

1. Proceed with *RADIATOR REMOVAL*. See procedure in this subsection.

2. Remove radiator cooling fan retaining screws.



1. Cooling fan retaining screws

3. Remove radiator cooling fan.

Installing the Radiator Cooling Fan

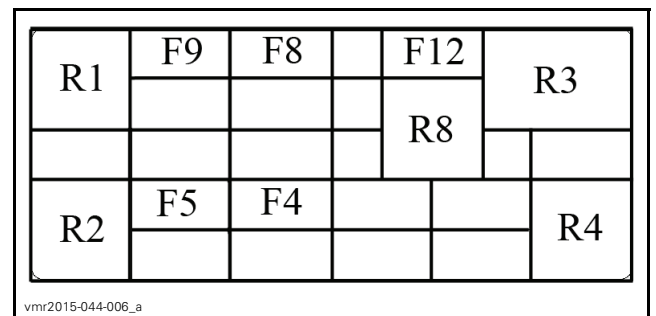
The installation is the reverse of the removal procedure. However, pay attention to the following. Tighten cooling fan retaining screws to specification.

TIGHTENING TORQUE	
Radiator cooling fan screws	10 N•m ± 2 N•m (89 lbf•in ± 18 lbf•in)

RADIATOR COOLING FAN RELAY (R1)

Relay Location (Radiator Cooling Fan)

The radiator cooling fan relay (R1) is located in the front fuse box, under the gauge support.



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Testing the Radiator Cooling Fan Relay

Relay Operation Test

1. Remove relay (R1).
2. Bypass relay using a jumper. Refer to *WIRING DIAGRAM* to locate proper terminals.

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3. If the radiator cooling fan is activated, replace the relay.

Relay Continuity Test

Refer to *POWER DISTRIBUTION AND GROUNDS* subsection.

WATER PUMP HOUSING

Water Pump Housing Location

The water pump housing is located on the engine MAG side.

Water Pump Housing Access

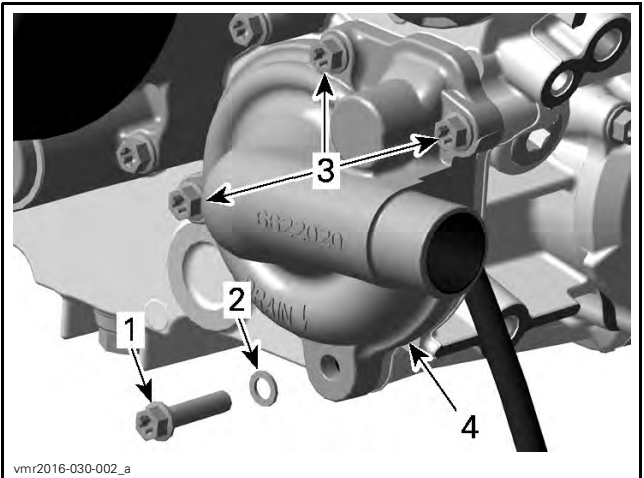
Remove RH footrest panel, refer to *BODY* subsection.

Removing the Water Pump Housing

 **WARNING**

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

1. Drain engine coolant. Refer to *PERIODIC MAINTENANCE PROCEDURES* subsection.
2. Remove radiator outlet hose from water pump housing.
3. Remove screws retaining water pump housing.

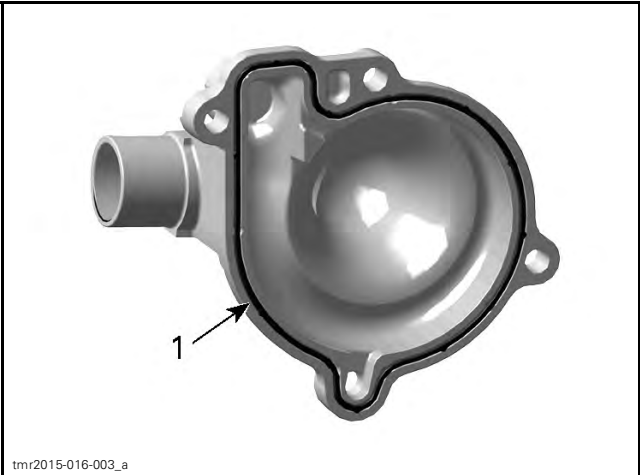


1. Coolant drain plug
2. Sealing ring
3. Screws
4. Water pump housing

4. Pull water pump housing to remove it.

Inspecting the Water Pump Housing

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



1. Gasket

Installing the Water Pump Housing

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

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

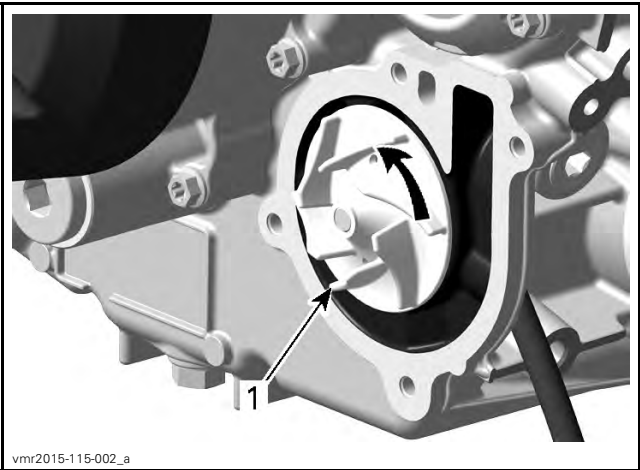
Tighten screws of water pump housing in a criss-cross sequence to specification.

TIGHTENING TORQUE	
Water pump housing screws	10 N•m ± 1 N•m (89 lbf•in ± 9 lbf•in)

WATER PUMP IMPELLER

Removing the Water Pump Impeller

1. Proceed with *WATER PUMP HOUSING REMOVAL*. See procedure in this subsection.
2. Remove impeller by unscrewing it counterclockwise.



1. Turn counterclockwise to unscrew

NOTICE Water pump shaft and impeller have right-hand threads.

Inspecting the Water Pump Impeller

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

Installing the Water Pump Impeller

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

NOTICE Be careful not to damage impeller fins during installation.

WATER PUMP SHAFT AND SEALS

Use these guidelines to service these parts.

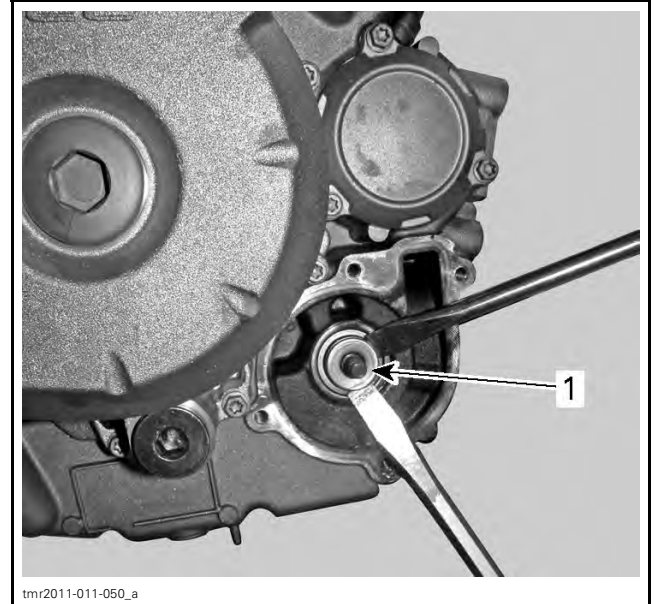
DEFECTIVE PART	ACTION
Rotary seal	Replace: - Rotary seal - Oil seal (assembled engine)
Oil seal	Replace: - Rotary seal - Oil seal (assembled engine)
Water pump shaft	Replace: - Water pump shaft assembly (including rotary seal) - Oil seal (engine disassembled)

Water Pump Seals Replacement (Assembled Engine)

NOTE: Read and thoroughly understand the entire procedure before starting it.

Seals Removal

1. Remove the following parts, see procedure in this subsection.
 - *WATER PUMP HOUSING*
 - *WATER PUMP IMPELLER.*
2. Carefully pry out inner part of the rotary seal using 2 screwdrivers.



1. Inner part of rotary seal

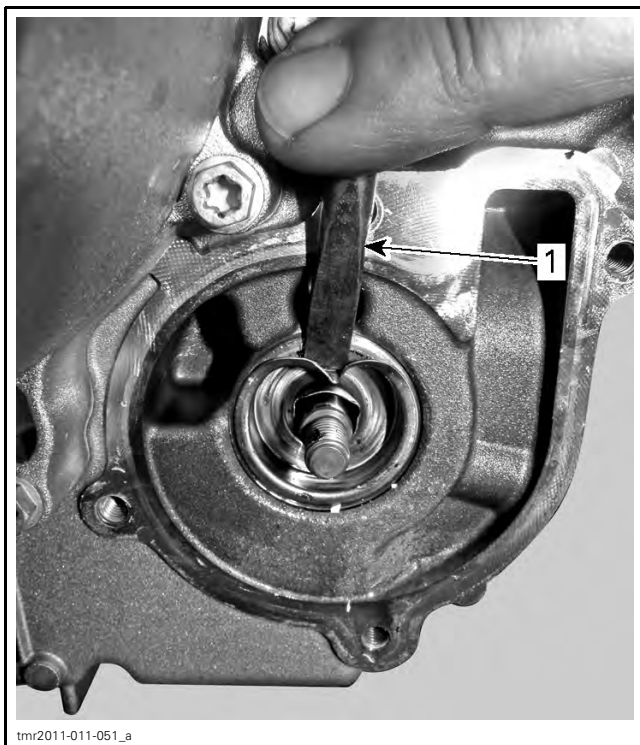


TYPICAL - INNER PART OF ROTARY SEAL REMOVED

3. Carefully bend down the outer part of rotary seal lip using a small chisel.

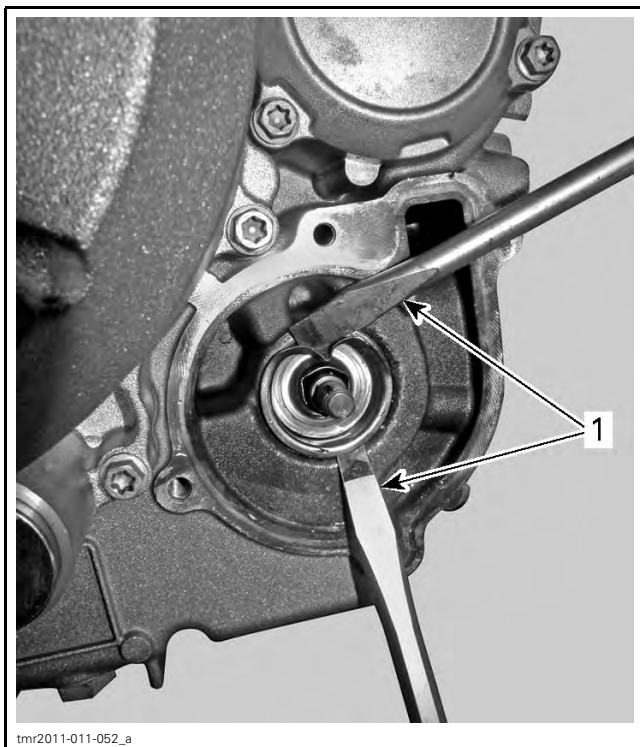
Section 03 ENGINE, CVT AND GEARBOX (570)

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1. Small chisel

4. Use 2 screwdrivers and carefully remove the outer part of the rotary seal.

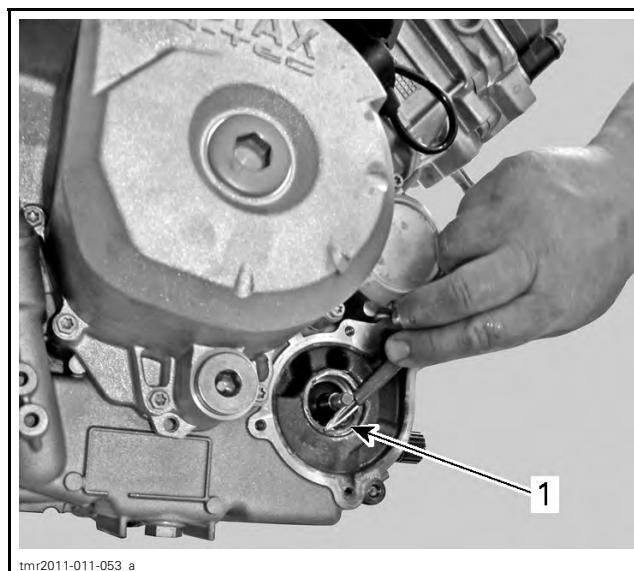


1. Screwdrivers

NOTICE Be careful not to damage the crankcase while removing outer part of the rotary seal.

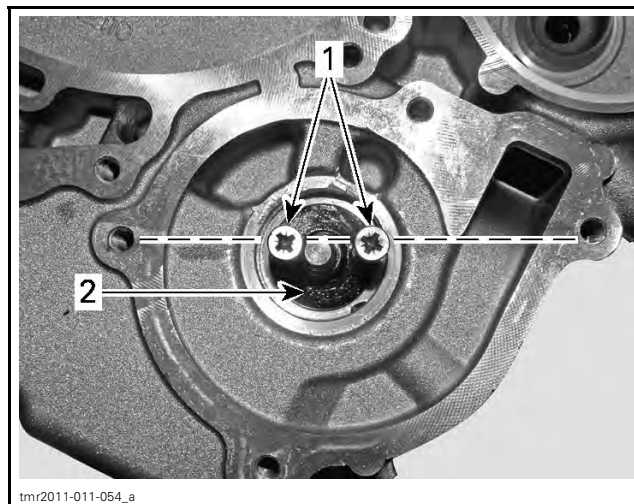
5. Thoroughly remove sealing residue and burr of rotary seal using a scraper.

NOTICE Be careful not to damage water pump shaft.



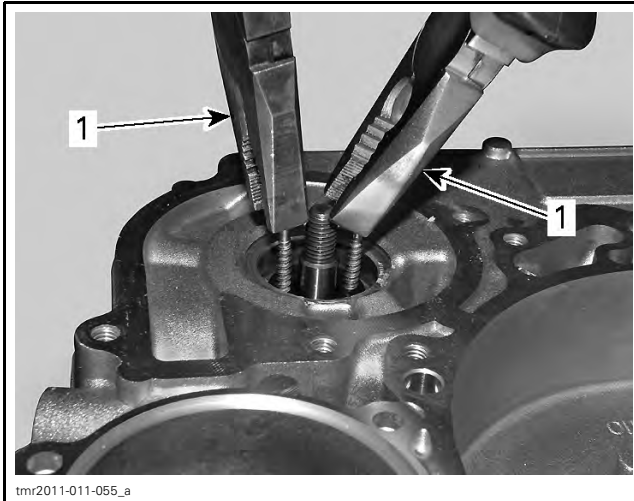
1. Scraper

6. Install 2 wooden screws in the seal.



1. Wooden screws
2. Oil seal

7. Remove oil seal from crankcase by pulling screws with pliers.



1. Pull on screws to remove seal

8. Check water pump shaft axial play.

NOTE: If axial play is not adequate, engine must be disassembled to replace water pump shaft.

9. Clean oil seal seat.



Seals Installation

1. Apply engine oil on water pump shaft.
2. Apply grease on the lips of the oil seal.
3. Carefully install oil seal over the water pump shaft.
4. Push oil seal into the water pump cavity.

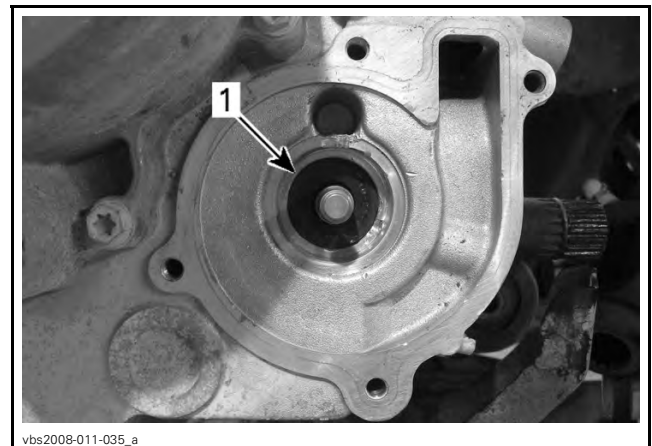
REQUIRED TOOL

17 mm (11/16 in) deep socket



OIL SEAL INSTALLATION

5. Ensure that the oil seal is properly seated in water pump cavity.



TYPICAL

1. Oil seal properly seated

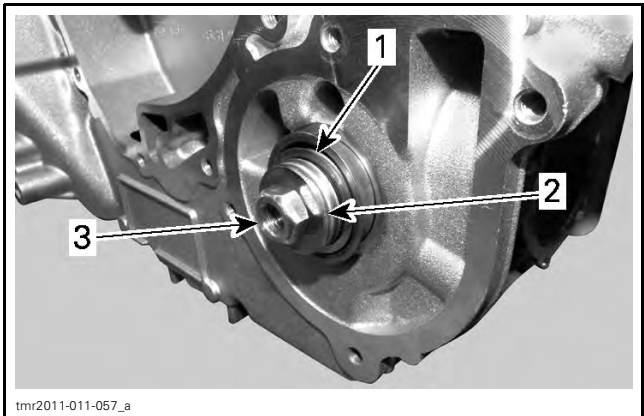
6. Apply engine oil on water pump shaft.
7. Place rotary seal onto water pump shaft and pull out water pump shaft by hand.

NOTICE Do not install the rotary seal completely into the crankcase to prevent the water pump shaft plastic gear from breaking. Push it partially in, then pull the shaft.

8. Place a robust M8 flat washer (P/N 420 227 935) onto water pump shaft.
9. Install a M8 x 1.25 nut (P/N 233 281 414) onto water pump shaft by hand.
10. Thread nut 1-1/2 turns to pull the shaft into rotary seal.

Section 03 ENGINE, CVT AND GEARBOX (570)

Subsection 05 (COOLING SYSTEM)



- 1. Rotary seal
- 2. M8 robust flat washer (P/N 420 227 935)
- 3. M8 x 1.25 nut (P/N 233 281 414)

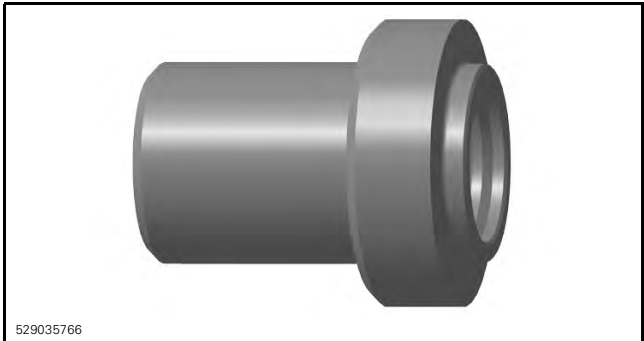
11. Remove M8 nut.

NOTE: The robust M8 flat washer must remain on water pump shaft.

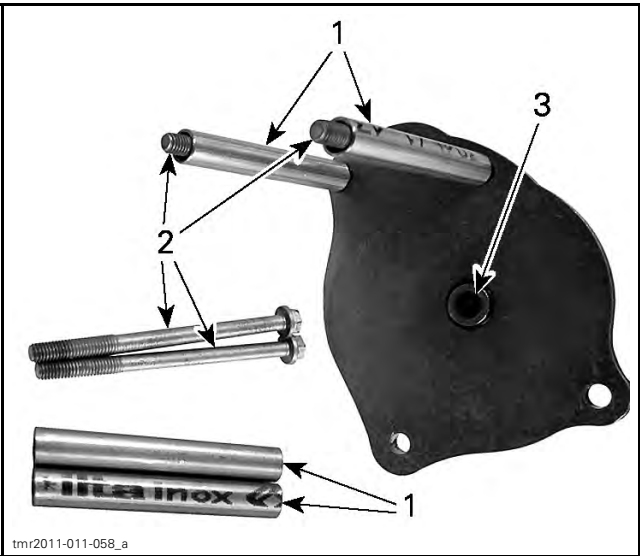
REQUIRED TOOLS
ROTARY SEAL PUSHER PLATE (P/N 529 036 130)
4x M6 x 85 screws (P/N 420 440 347)
4x tubes 70 mm (2.75 in)
SEAL PUSHER (P/N 529 035 766)



ROTARY SEAL PUSHER PLATE (P/N 529 036 130)



SEAL PUSHER (P/N 529 035 766)



ROTARY SEAL PUSHER PLATE ASSEMBLY

- 1. 4 x tubes (70 mm (2.75 in) length)
- 2. 4 x screws M6 x 85
- 3. Plane surface on pusher bolt

12. Install rotary seal installation tools on crankcase as follows.

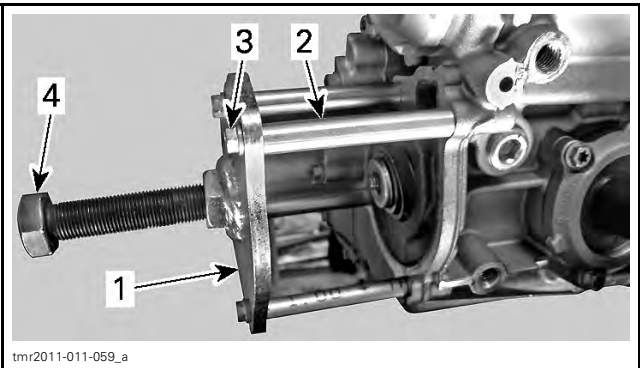
NOTE: Make sure pusher bolt has a plane surface.

12.1 Apply a little grease at the end of tool pusher bolt.

12.2 Ensure that pusher bolt is completely unscrewed.

12.3 Install rotary seal pusher plate on crankcase by tightening M6 screws.

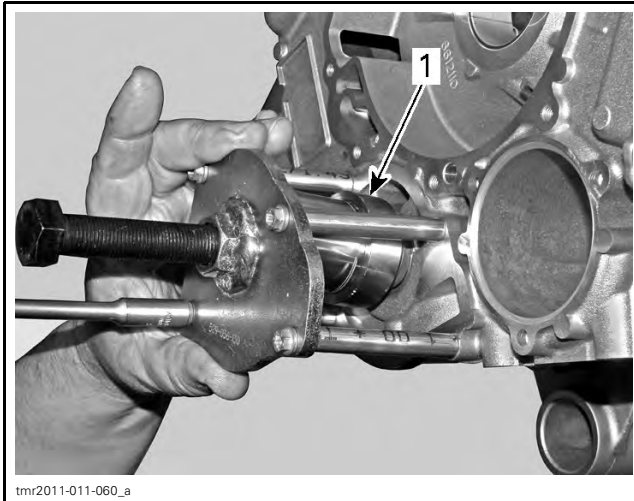
NOTICE Do not use pneumatic or electric tools for tightening screws.



ROTARY SEAL PUSHER PLATE INSTALLATION

- 1. Rotary seal pusher plate
- 2. Tube (70 mm (2.75 in) length)
- 3. M6 x 85 screw
- 4. Pusher bolt

12.4 Install seal pusher between rotary seal pusher plate and water pump shaft.



SEAL PUSHER INSTALLATION

1. Seal pusher aligned with pusher bolt

- 12.5 Tighten the pusher bolt by hand until it stops against the seal pusher.
13. Carefully thread the pusher bolt 1-1/2 turns.
14. Ensure that the rotary seal is going straight into crankcase.
15. Remove rotary seal installation tools from crankcase.
16. Repeat steps 9 TO 15 until rotary seal is completely seated in the crankcase.



ROTARY SEAL PROPERLY SEATED ON CRANKCASE

17. Carry out the final adjustment of the water pump shaft as follows.
 - 17.1 Install M8 x 1.25 nut (P/N 233 281 414) onto water pump shaft.
 - 17.2 Carefully thread M8 nut until the rotary seal is flush with the end of water pump shaft threads.



WATER PUMP SHAFT PROPERLY ADJUSTED WITH ROTARY SEAL

NOTICE The water pump shaft must be properly adjusted with rotary seal. The water pump shaft must move freely while pushing it toward the crankcase.

18. Install the following parts, see procedure in this subsection.
 - WATER PUMP IMPELLER
 - WATER PUMP HOUSING.
19. Refill and bleed cooling system. Refer to *PERIODIC MAINTENANCE PROCEDURES* subsection.
20. Check cooling system for leaks.

Water Pump Shaft and Seals Replacement (Disassembled Engine)

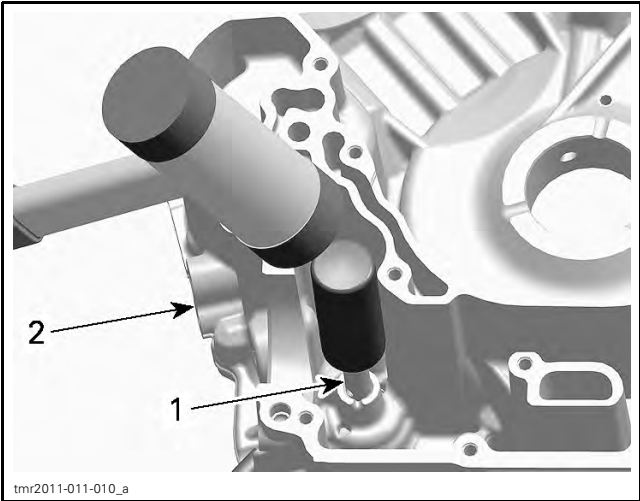
Water Pump Shaft and Seals Removal

1. Remove the following parts, see procedure in this subsection:
 - WATER PUMP HOUSING
 - WATER PUMP IMPELLER
 - WATER PUMP GEARS.
2. Push out water pump shaft with inner portion of rotary seal from inside of crankcase MAG side.

REQUIRED TOOL
Soft hammer

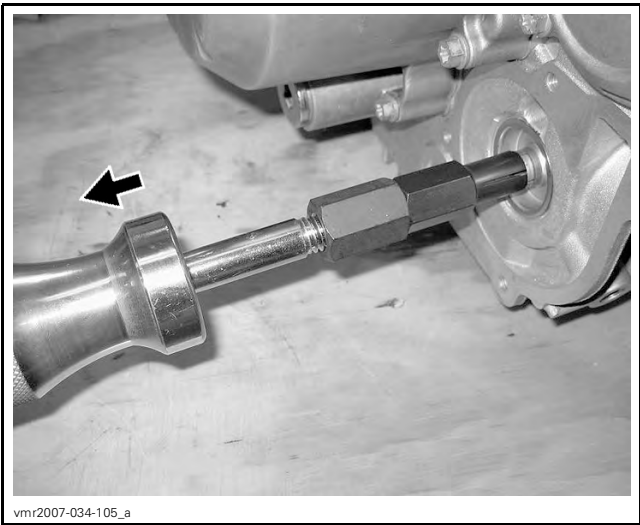
Section 03 ENGINE, CVT AND GEARBOX (570)

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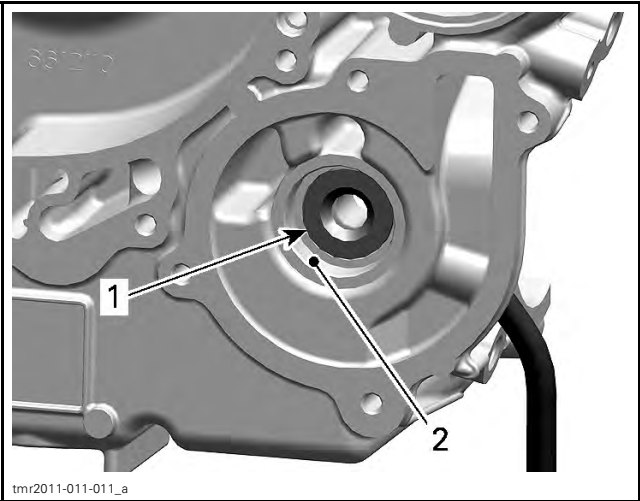
1. Water pump shaft
2. Crankcase MAG side

3. Install a blind hole puller expander snugly against outer part of rotary seal and pull seal out.

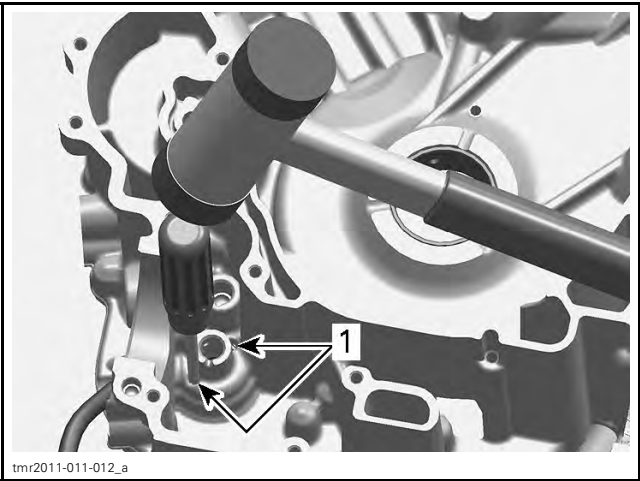


4. Remove oil seal from inside of crankcase MAG side using a pusher tool.

NOTICE Be careful not to damage the rotary seal surface in crankcase.



1. Oil seal
2. Machined surface for rotary seal



OIL SEAL REMOVAL - VIEW FROM INSIDE CRANKCASE MAG SIDE

1. Orifices for oil seal removal

Water Pump Shaft and Seals Installation

The installation is the reverse of the removal procedure. However, pay attention to the following. Use tightening torque values specified in the exploded view.

NOTE: Never apply oil on the press fit area of the oil seal and rotary seal.

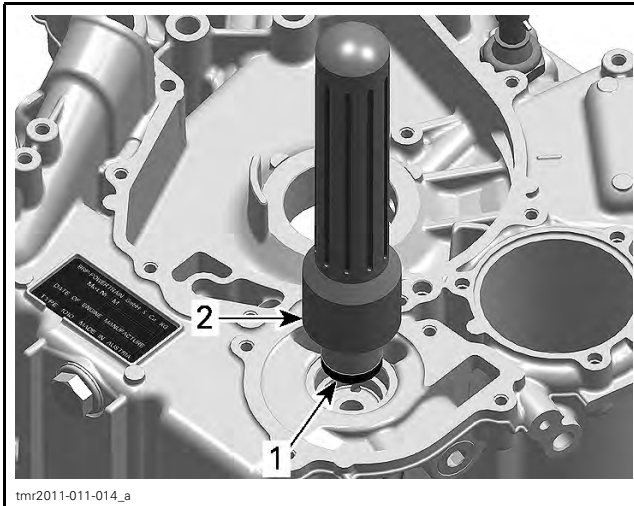
Clean rotary seal surface of any old sealant.

Install oil seal.

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

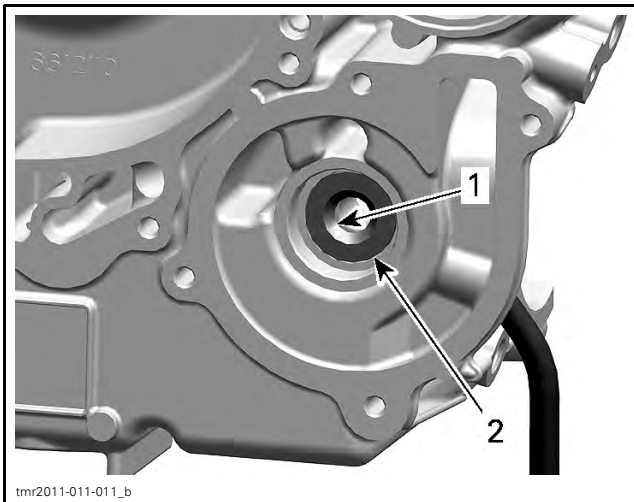
When installing the oil seal on the pusher, make sure the sealing lip points outwards.

Push **NEW** oil seal in place.



1. Oil seal
2. Installer handle with oil seal pusher

Apply DOW CORNING 111 (P/N 413 707 000) on sealing lip of the oil seal.

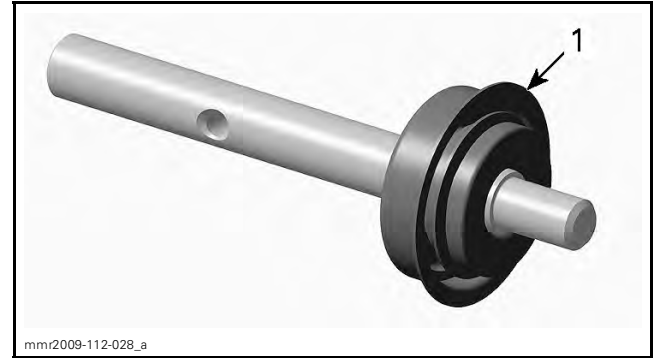


1. Sealing lip
2. Oil seal properly installed

Apply engine oil on the water pump shaft and intermediate shaft.

Slide **NEW** water pump shaft assembly into crankcase.

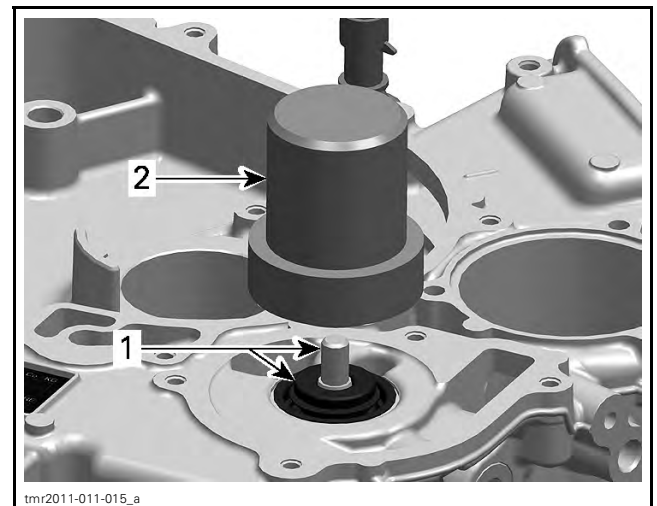
REQUIRED TOOL	
SEAL PUSHER (P/N 529 035 766)	



WATER PUMP SHAFT ASSEMBLY

1. Surface where rotary seal is pushed by tool

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



1. Water pump shaft with rotary seal
2. Water pump seal installer

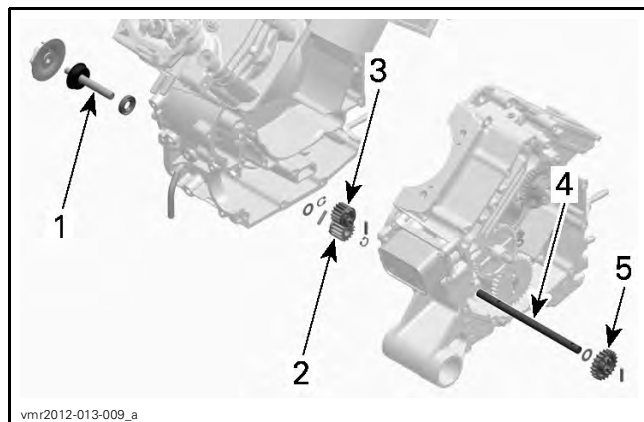
NOTICE After installation, water pump shaft with rotary seal must rotate freely.

Section 03 ENGINE, CVT AND GEARBOX (570)

Subsection 05 (COOLING SYSTEM)

WATER PUMP GEARS

Water Pump Gears Identification

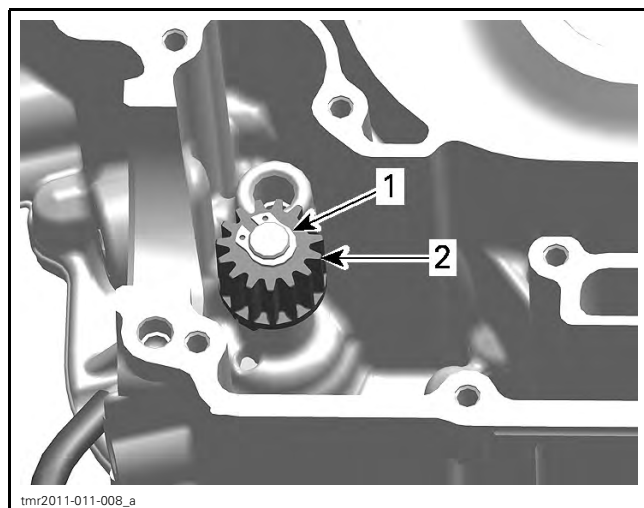


1. Water pump shaft
2. Water pump gear
3. Water pump intermediate drive gear
4. Water pump intermediate shaft
5. Water pump drive gear (See *BOTTOM END* subsection)

Inspecting the Water Pump Gears

Water Pump Gear

Inspect water pump gear for wear and damage on the snap mechanism to the needle pin. Replace if damaged.

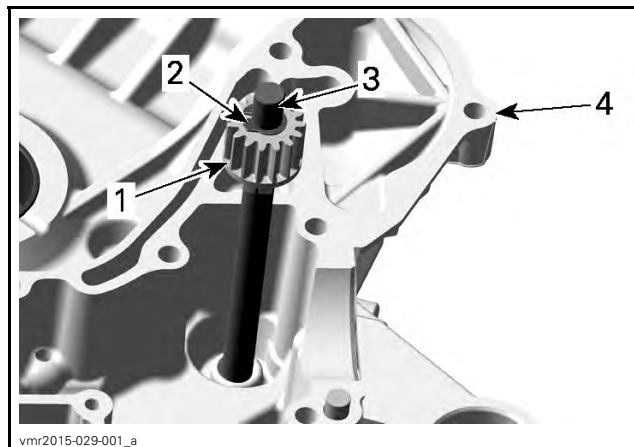


CRANKCASE MAG SIDE

1. Circlip
2. Water pump gear

Water Pump Intermediate Drive Gear

Check water pump intermediate drive gear for wear or broken teeth. Replace if damaged.



CRANKCASE PTO SIDE

1. Water pump intermediate drive gear
2. Circlip
3. Water pump intermediate shaft
4. Crankcase PTO side

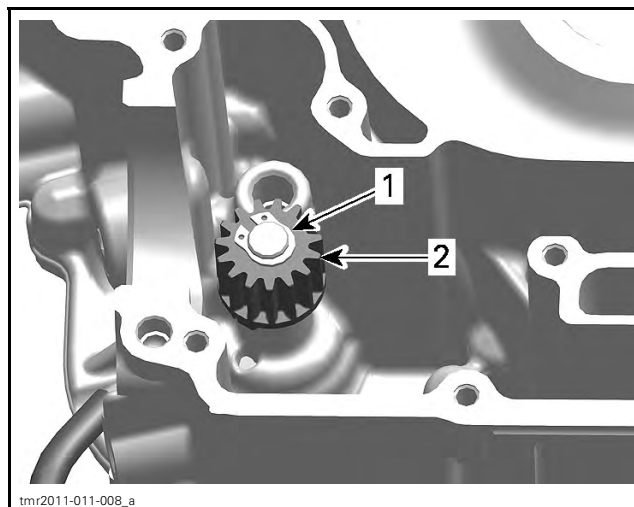
Water Pump Drive Gear

See *BOTTOM END* subsection.

Water Pump Gears Removal

Water Pump Gear

1. Remove circlip retaining water pump gear and discard it.

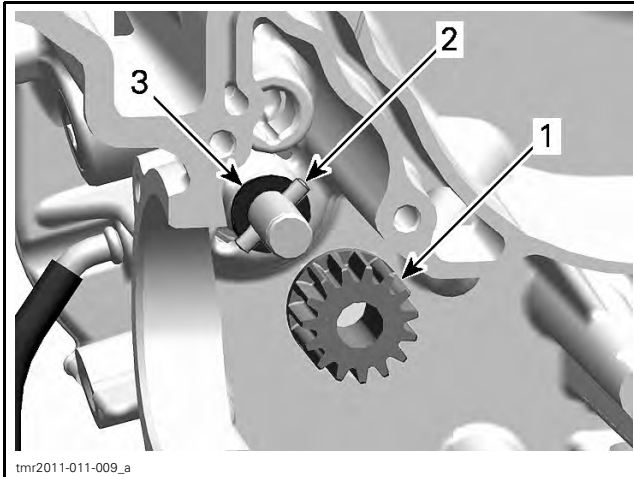


CRANKCASE MAG SIDE

1. Circlip
2. Water pump gear

2. Remove the following parts:

- Water pump gear
- Needle pin
- Thrust washer.



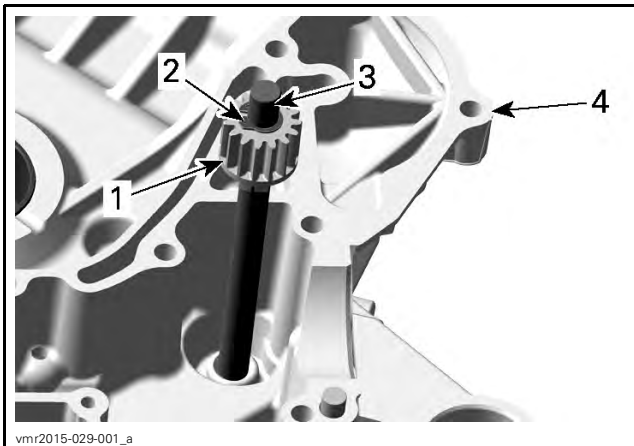
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CRANKCASE MAG SIDE

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

Water Pump Intermediate Drive Gear

1. Remove circlip retaining water pump intermediate drive gear and discard it.



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CRANKCASE PTO SIDE

1. Water pump intermediate drive gear
2. Circlip
3. Water pump intermediate shaft
4. Crankcase PTO side

2. Remove the following parts:
 - Water pump intermediate drive gear
 - Needle pin.

Water Pump Drive Gear

See *BOTTOM END* subsection.

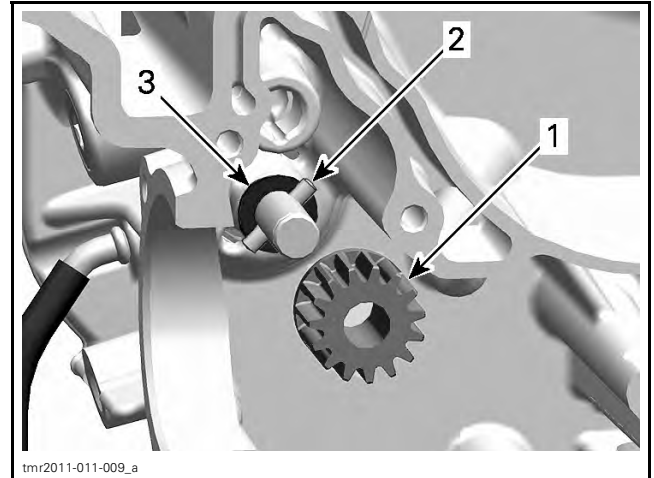
Installing the Water Pump Gears

Water Pump Gear

Install the following parts on water pump shaft.

- Thrust washer
- Needle pin
- Water pump gear.

NOTICE A missing thrust washer will cause a leaking rotary seal.

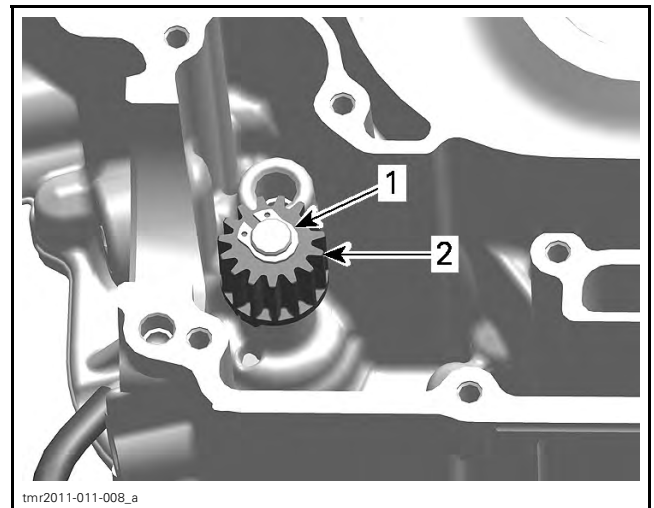


1. Water pump gear
2. Needle pin
3. Thrust washer

NOTE: Ensure water pump gear snaps properly onto needle pin.

Install **NEW** circlip to retain water pump gear.

NOTICE Never use the circlip a second time. Always install a **NEW** one.



1. Circlip
2. Water pump gear

Water Pump Intermediate Drive Gear

Install the following parts on water pump intermediate shaft.

- Needle pin
- Water pump intermediate drive gear.

Install **NEW** circlip to retain water pump intermediate drive gear.

NOTICE Never use the circlip a second time. Always install a **NEW** one.

Section 03 ENGINE, CVT AND GEARBOX (570)

Subsection 05 (COOLING SYSTEM)

Water Pump Drive Gear

See *BOTTOM END* subsection.

MAGNETO AND STARTER

SERVICE TOOLS

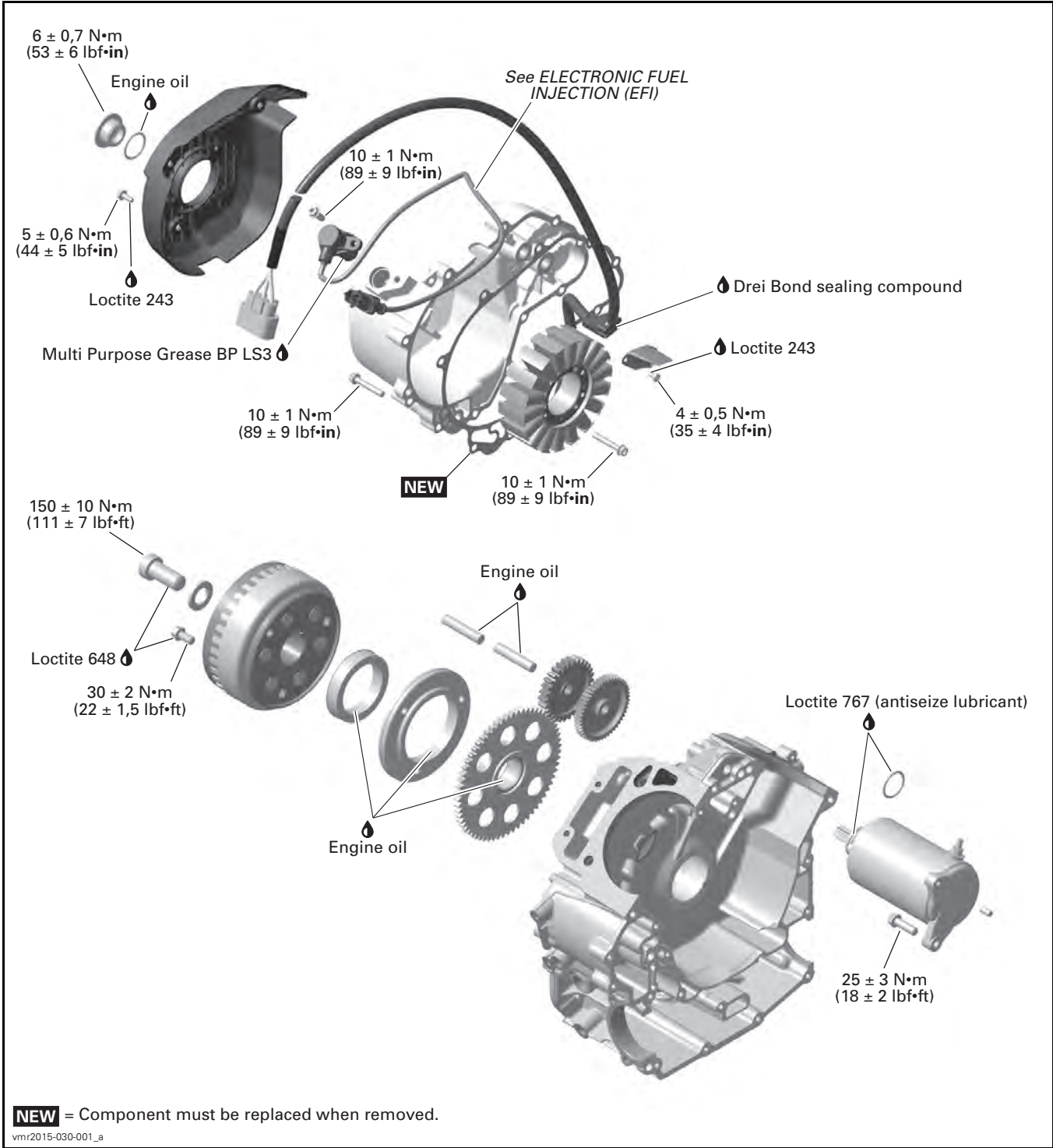
Description	Part Number	Page
CRANKSHAFT LOCKING BOLT.....	529 035 617	76
CRANKSHAFT PROTECTOR	529 036 034	76
FLUKE 115 MULTIMETER	529 035 868	74–75
MAGNETO PULLER	529 035 748	76

SERVICE PRODUCTS

Description	Part Number	Page
DIELECTRIC GREASE	293 550 004	81
DREI BOND SEALING COMPOUND	420 297 906	73
LOCTITE 243 (BLUE).....	293 800 060	76
LOCTITE 648 (GREEN).....	413 711 400	78–79
LOCTITE 767 (ANTISEIZE LUBRICANT)	293 800 070	80–81
LOCTITE CHISEL (GASKET REMOVER)	413 708 500	73
PULLEY FLANGE CLEANER	413 711 809	77–78

Section 03 ENGINE, CVT AND GEARBOX (570)

Subsection 06 (MAGNETO AND STARTER)



PROCEDURES

MAGNETO COVER

Magneto Cover Access

Refer to *BODY* subsection and remove the following:

- Seat
- Console
- RH side panel and extension panel
- RH footboard panel.

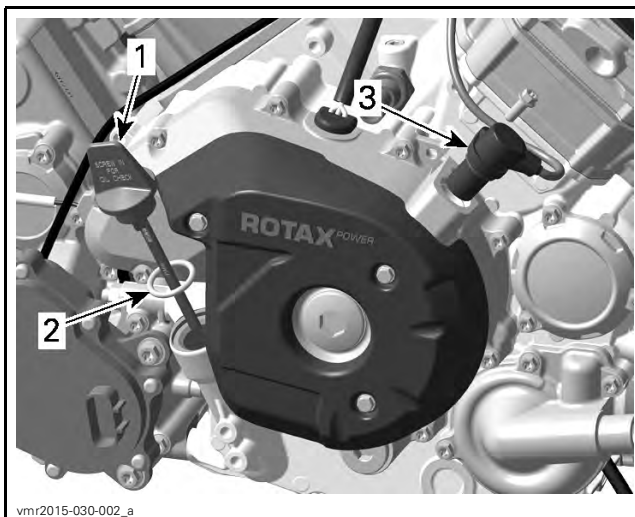
Removing the Magneto Cover

Drain engine oil (refer to *ENGINE OIL CHANGE* in the *PERIODIC MAINTENANCE PROCEDURES* subsection).

Remove crankshaft position sensor (CPS) and cut tie raps.

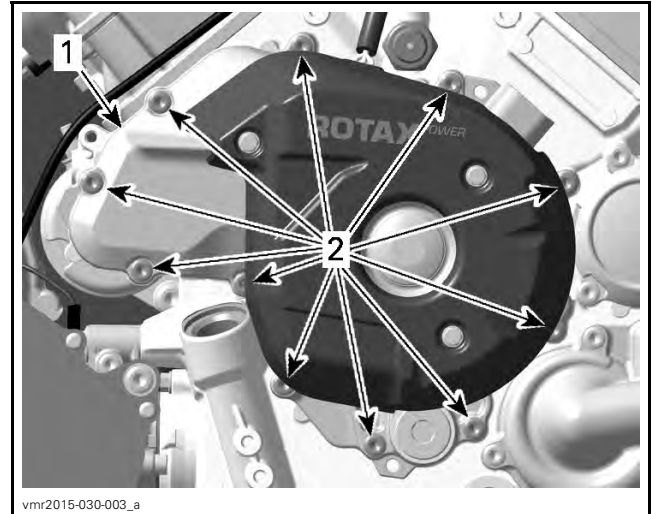
Disconnect the stator connector on the voltage regulator/rectifier, refer to *STATOR CONNECTOR ACCESS* in this subsection.

Remove dipstick with O-ring.



1. Dipstick
2. O-ring
3. Crank position sensor (CPS)

Remove magneto cover retaining screws.



1. Magneto cover
2. Retaining screws

Pull out magneto cover.

Inspecting and Cleaning the Magneto Cover

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

NOTE: Clean all metal components in a non-ferrous metal cleaner. Use LOCTITE CHISEL (GASKET REMOVER) (P/N 413 708 500), or suitable equivalent.

WARNING

Wear safety glasses and work in a well ventilated area when working with strong chemical products. Also wear suitable non-absorbent gloves to protect your hands.

Installing the Magneto Cover

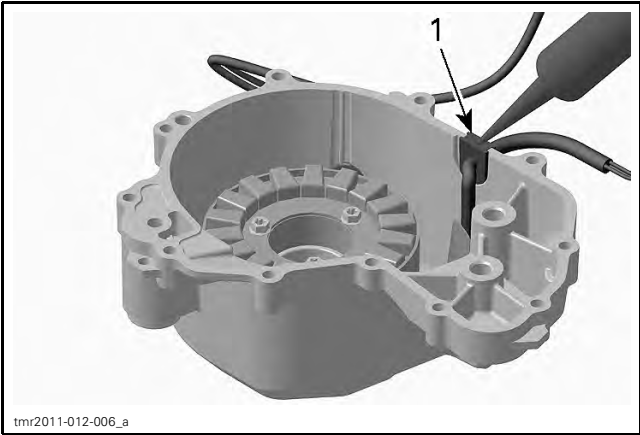
For installation, reverse the removal procedure. However, pay attention to the following.

Install a **NEW** magneto cover gasket.

Apply DREI BOND SEALING COMPOUND (P/N 420 297 906) on stator cable grommet as shown in next illustration.

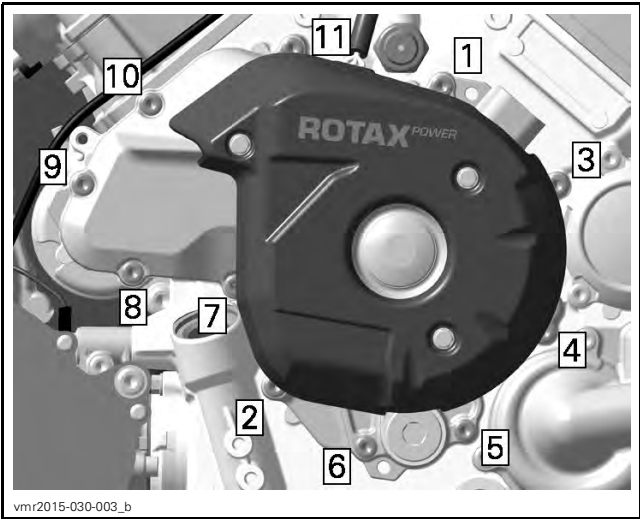
Section 03 ENGINE, CVT AND GEARBOX (570)

Subsection 06 (MAGNETO AND STARTER)



1. Stator cable grommet (apply Drei Bond sealing compound)

Tighten screws using the following sequence.



TIGHTENING SEQUENCE

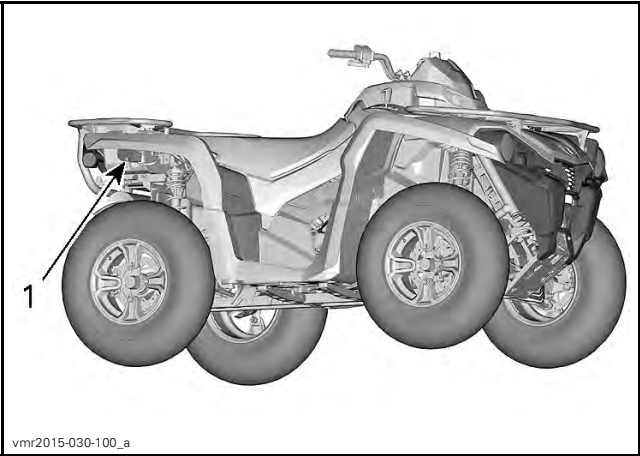
TIGHTENING TORQUE	
Magneto cover screws	10 N•m ± 1 N•m (89 lbf•in ± 9 lbf•in)

Refill engine with recommended oil.

STATOR

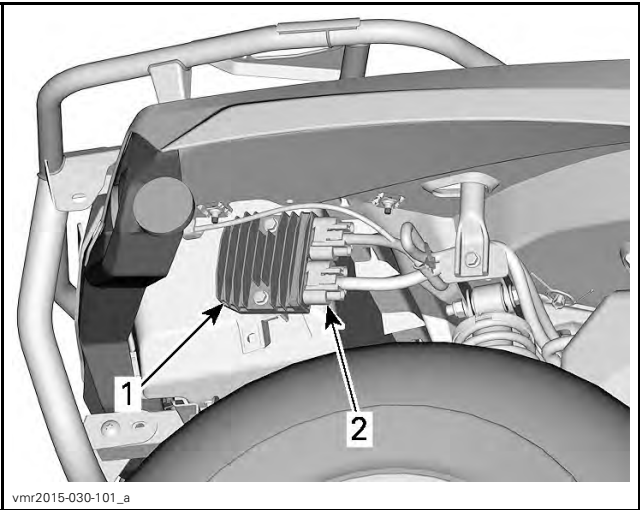
Stator Connector Access

NOTE: The stator is directly connected to the voltage regulator/rectifier.



TYPICAL

1. Voltage regulator/rectifier location



1. Voltage regulator/rectifier
2. Three YELLOW wires

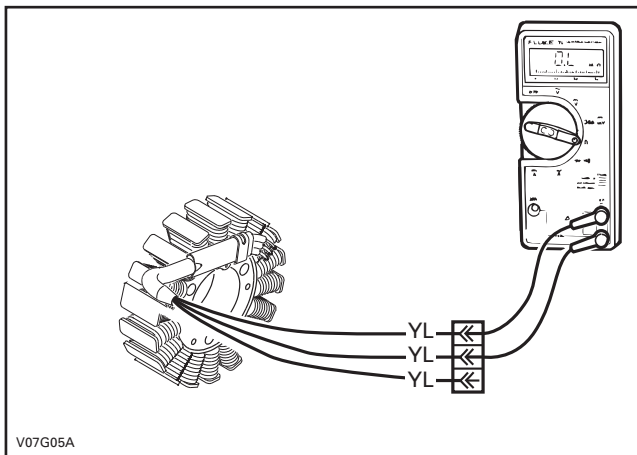
Testing the Stator Static Continuity

1. Disconnect the stator connector on the voltage regulator/rectifier.

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

2. Set multimeter to Ω .
3. Connect multimeter between YELLOW wires.
4. Read resistance.

TERMINAL	RESISTANCE @ 20°C (68°F)
1 and 2	0.15 - 0.30 Ω
1 and 3	
2 and 3	



TYPICAL

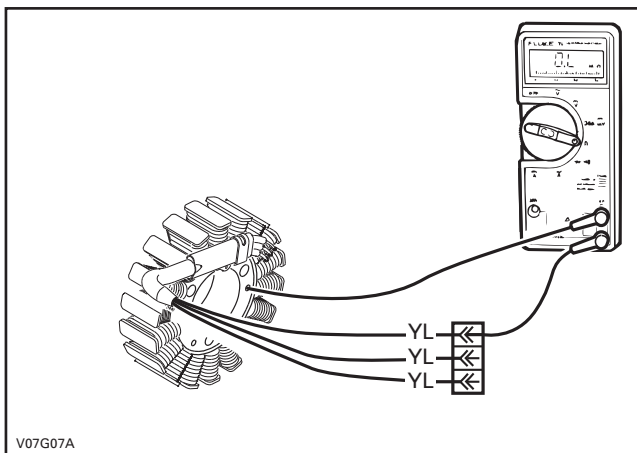
5. If any reading is out of specification, replace stator.
6. Re-plug connectors properly.

Testing the Stator Insulation

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

1. Set multimeter to Ω .
2. Connect multimeter between any YELLOW wire (on stator connector) and engine ground.
3. Read resistance.

TEST PROBES	RESISTANCE @ 20°C (68°F)
Any YELLOW wire and engine ground	Infinite (open circuit)



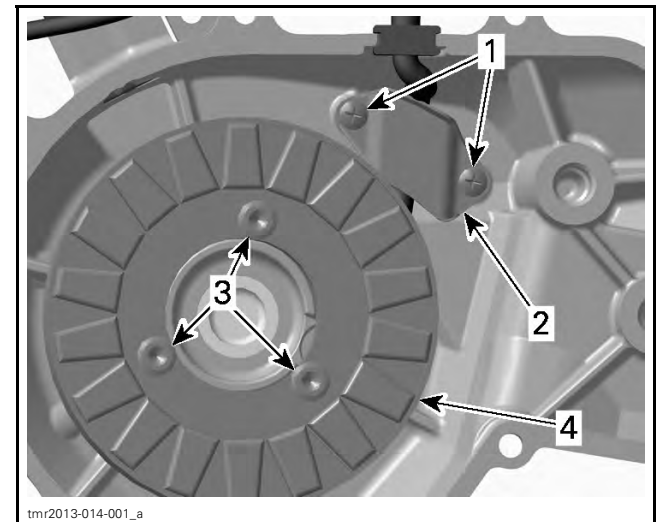
TYPICAL

4. If there is a resistance or continuity, the stator coils and/or the wiring is shorted to ground and needs to be repaired or replaced.
5. Re-plug connectors properly.

Removing the Stator

Remove *MAGNETO COVER*. See procedure in this subsection.

Remove screws securing the wire holding strip.
Remove stator retaining screws then the stator.



1. Holding strip screws
2. Wire holding strip
3. Stator retaining screws
4. Stator

Inspecting the Stator

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

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

Installing the Stator

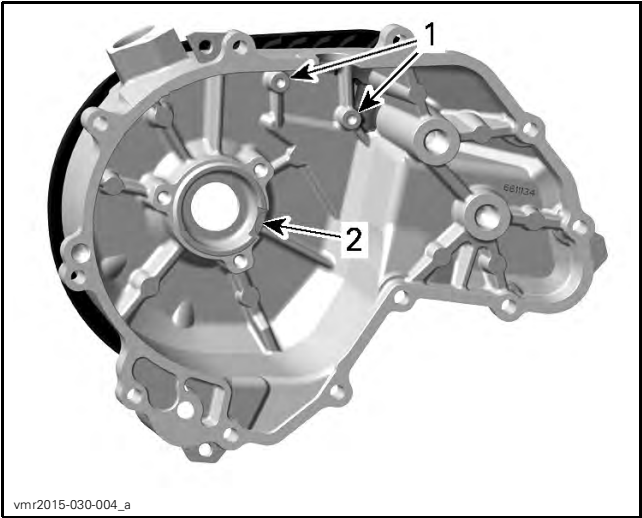
For installation, reverse the removal procedure. However, pay attention to the following.

NOTICE When installing the stator take care to route wires properly and install retaining strip.

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

Section 03 ENGINE, CVT AND GEARBOX (570)

Subsection 06 (MAGNETO AND STARTER)



- 1. Threads for cable holding strip
- 2. Notch for stator

SERVICE PRODUCT	
Holding strip screws	LOCTITE 243 (BLUE) (P/N 293 800 060)
TIGHTENING TORQUE	
Holding strip screws	4 N•m ± 0.5 N•m (35 lbf•in ± 4 lbf•in)
TIGHTENING TORQUE	
Stator retaining screws	10 N•m ± 1 N•m (89 lbf•in ± 9 lbf•in)

ROTOR

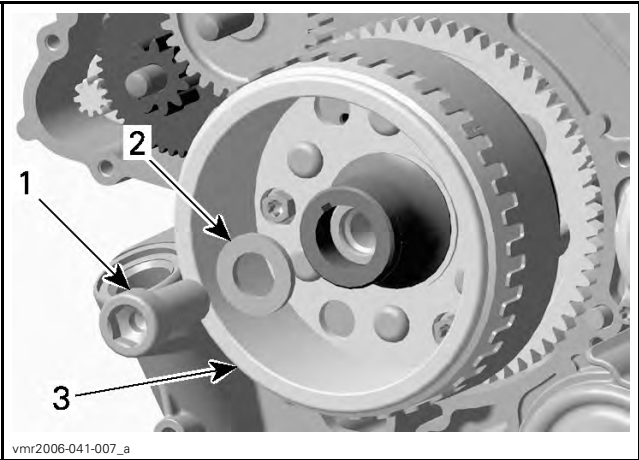
Removing the Rotor

Remove *MAGNETO COVER*. See procedure in this subsection.

Lock crankshaft (refer to *CRANKSHAFT LOCKING PROCEDURE* in the *BOTTOM END* subsection).

REQUIRED TOOL	
CRANKSHAFT LOCKING BOLT (P/N 529 035 617)	

Heat screw in order to break the Loctite.
Remove screw and washer securing rotor to crankshaft.

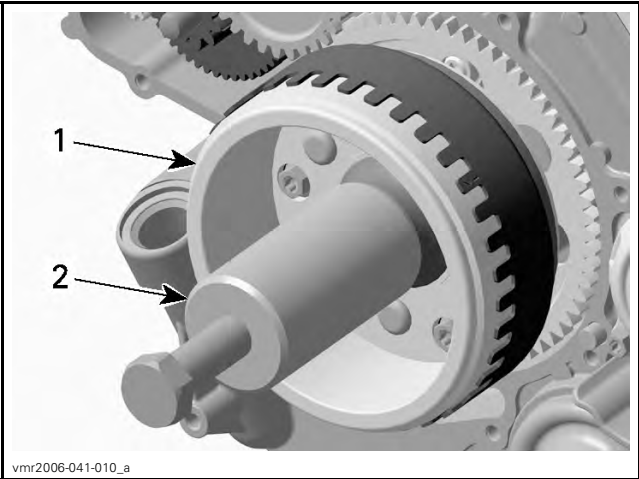


- 1. Screw M16
- 2. Washer
- 3. Rotor

Remove rotor.

REQUIRED TOOLS	
CRANKSHAFT PROTECTOR (P/N 529 036 034)	
MAGNETO PULLER (P/N 529 035 748)	

NOTE: Use grease to place protector on crankshaft end prior to screw on the magneto puller.



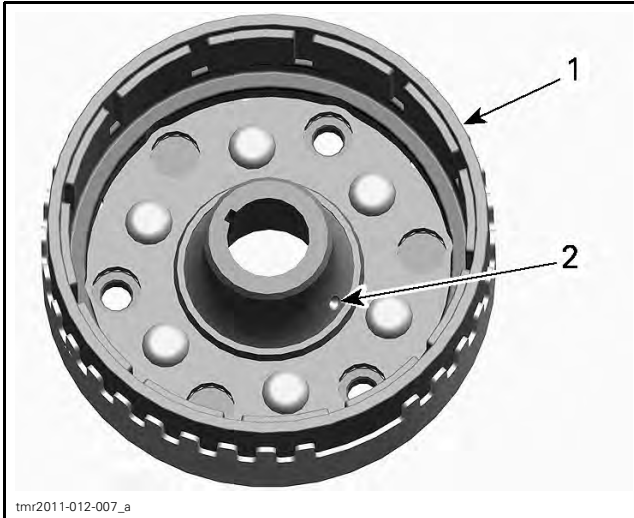
- 1. Rotor
- 2. Magneto puller

Screw magneto puller bolt to remove rotor.

Inspecting the Rotor

Check inner side of rotor for scratches or other damage.

Blow pressurized air in the rotor oil bore and make sure it is not clogged.



1. Rotor
2. Oil bore

Check keyway of the rotor for wear or damages.
Check if trigger wheel teeth are bent or otherwise damaged.

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

Replace parts as necessary.

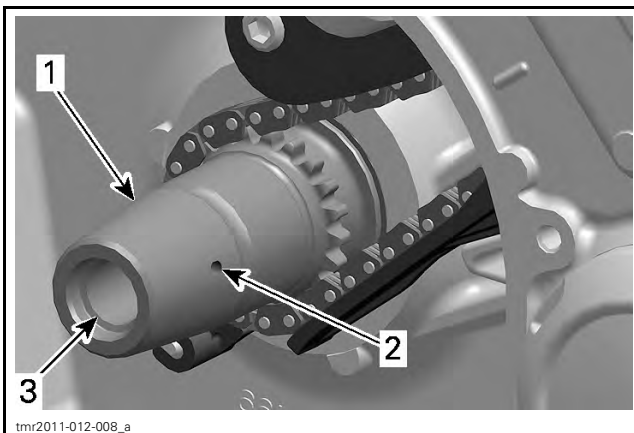
Installing the Rotor

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

Use PULLEY FLANGE CLEANER (P/N 413 711 809) to clean following parts:

- Crankshaft taper
- Oil passage in crankshaft taper
- Thread in crankshaft
- Rotor taper
- Oil bore in rotor.

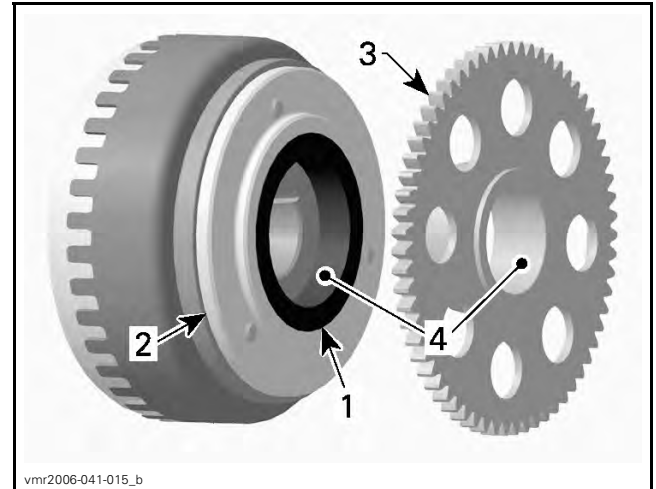
NOTICE Taper on crankshaft and rotor must be free of grease.



1. Crankshaft (MAG side)
2. Oil passage
3. Threads

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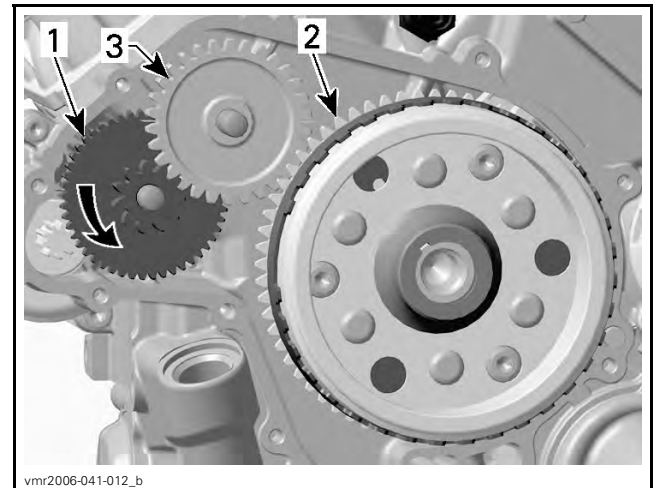
Oil sprag clutch and install sprag clutch gear.



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

Slide rotor onto crankshaft. The woodruff key and the keyway must be aligned.

Rotate starter double gear counterclockwise to align intermediate gear teeth with sprag clutch gear.



1. Starter double gear
2. Sprag clutch gear
3. Intermediate gear

SERVICE PRODUCT	
Rotor retaining screw	LOCTITE 648 (GREEN) (P/N 413 711 400)
TIGHTENING TORQUE	
Rotor retaining screw	150 N•m ± 10 N•m (111 lbf•ft ± 7 lbf•ft)

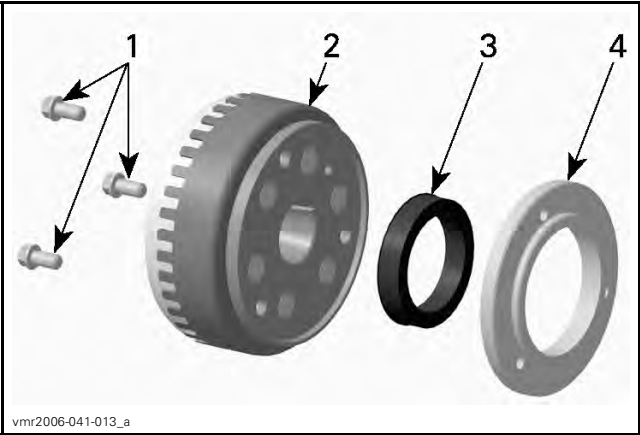
SPRAG CLUTCH

Removing the Sprag Clutch

Remove *MAGNETO COVER*. See procedure in this subsection.

Heat screws in order to break the Loctite.

Loosen sprag clutch housing screws located inside rotor.



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

Inspecting the Sprag Clutch

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

Also check the collar of the sprag clutch gear.

Rotate sprag clutch gear in sprag clutch.

NOTE: Sprag clutch must lock in counterclockwise direction.



SPRAG CLUTCH FUNCTIONAL TEST
1. Lock

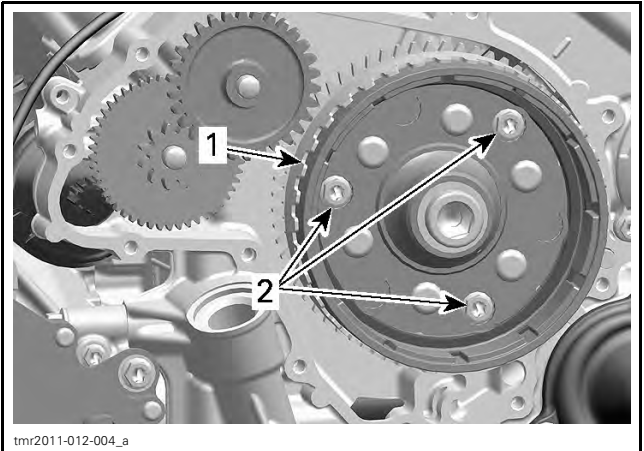
NOTE: Sprag clutch, housing and gear must be replaced at the same time, if damaged.

Installing the Sprag Clutch

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

Use PULLEY FLANGE CLEANER (P/N 413 711 809) to clean following:

- Threads in sprag clutch housing
- Threads of sprag clutch housing screws.



1. Rotor
2. Sprag clutch housing screws

Remove rotor (refer to *ROTOR* in this subsection).

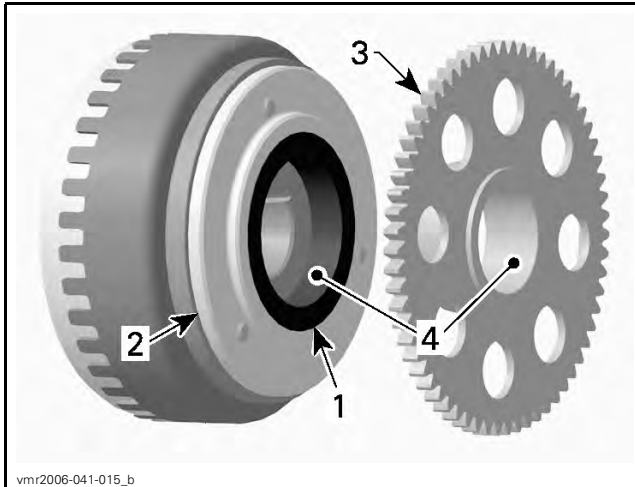
Remove sprag clutch gear.

Remove sprag clutch housing screws and sprag clutch housing.

Apply LOCTITE 648 (GREEN) (P/N 413 711 400) on threads of sprag clutch housing screws.

Install screws but do not torque yet.

Apply engine oil on sprag clutch and sprag clutch gear needle bearing.



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

Install rotor, refer to *ROTOR* in this subsection.

Tighten sprag clutch housing screws to specification.

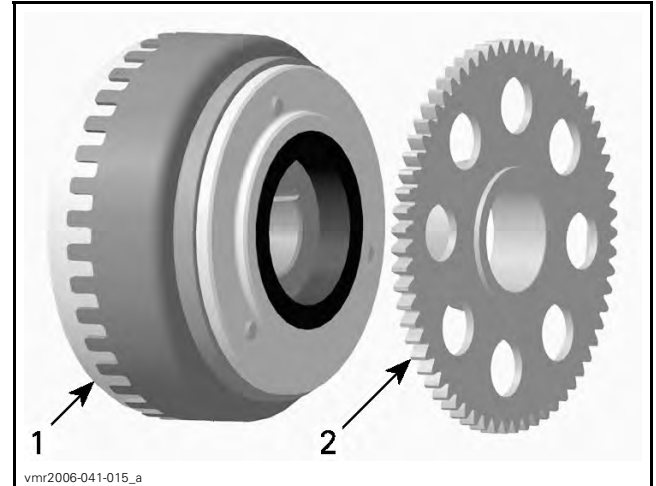
TIGHTENING TORQUE	
Sprag clutch housing screws	30 N•m ± 2 N•m (22 lbf•ft ± 1 lbf•ft)

SPRAG CLUTCH GEAR

Removing the Sprag Clutch Gear

Remove *ROTOR*. See procedure in this subsection.

Pull sprag clutch gear out of the rotor.

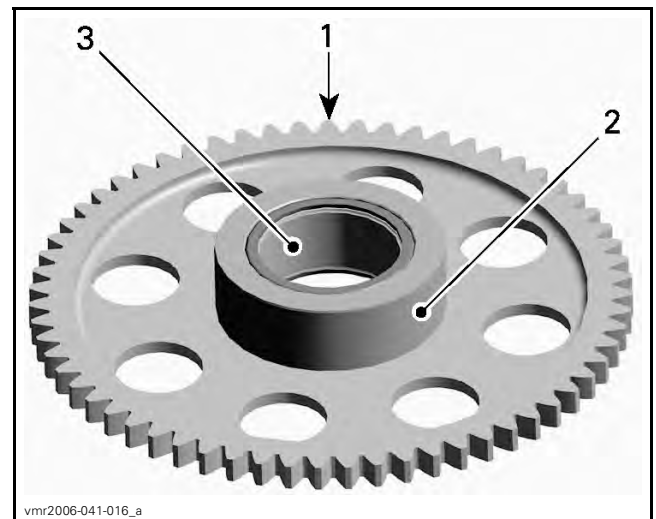


1. Rotor
2. Sprag clutch gear

Inspecting the Sprag Clutch Gear

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

Check needle bearing condition. Replace sprag clutch gear if necessary.



- INSPECT**
1. Teeth
 2. Collar
 3. Needle bearing

Installing the Sprag Clutch Gear

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

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

STARTER DRIVE GEARS

Starter Drive Gear Location

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

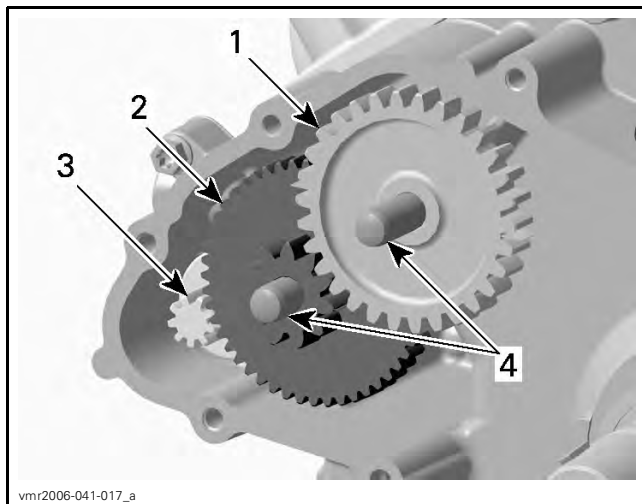
Section 03 ENGINE, CVT AND GEARBOX (570)

Subsection 06 (MAGNETO AND STARTER)

Removing the Starter Drive Gear

Remove *MAGNETO COVER*. See procedure in this subsection.

Remove location pins, starter double gear and intermediate gear.



1. Intermediate gear
2. Starter double gear
3. Starter gear
4. Location pins

Inspecting the Starter Drive Gear

Inspect gears and location pins for wear and damage.

Replace parts as necessary.

Installing the Starter Drive Gear

The installation is the reverse of the removal procedure. Pay attention to the following details.

Apply LOCTITE 767 (ANTISEIZE LUBRICANT) (P/N 293 800 070) on starter gear before installing the starter double gear.

Apply engine oil on location pins.

ELECTRIC STARTER

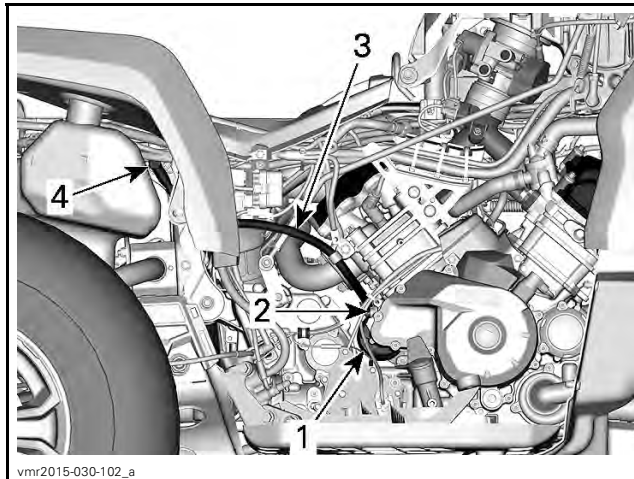
Starter Access

To access starter electrical terminal, refer to *BODY* subsection and remove the following:

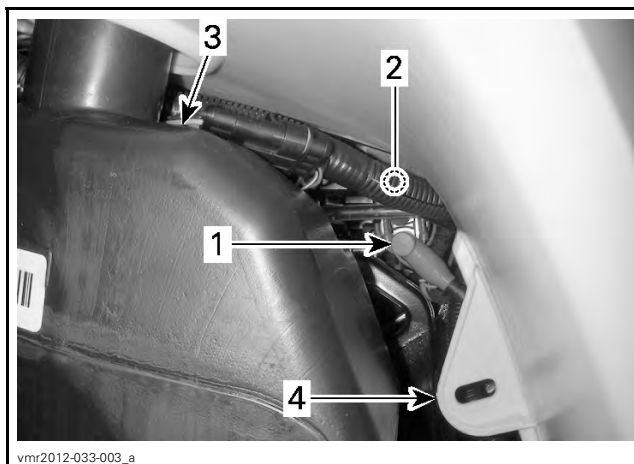
- Seat
- Console
- RH side panel and extension panel
- RH footboard panel.

Testing the Starter Operation

1. Disconnect starter power cable from starter solenoid and pull cable out to RH side of the vehicle.



1. Starter
2. Starter power cable connection at starter
3. Starter power cable
4. Starter power cable connection at solenoid



1. Power cable from starter solenoid to starter
2. Power cable from battery to starter solenoid (not visible)
3. Fuel tank
4. RH rear fender

2. Using booster cables, carefully supply current from a 12 volt battery directly to the starter power cable.

NOTICE First connect the red jumper cable from the booster battery to the starter cable. Momentarily connect the BLACK (-) cable from the booster battery to engine ground last.

If the starter turns, test other starting system components.

Removing the Starter

1. Ensure ignition switch is set to OFF.
2. Disconnect BLACK (-) cable from battery.

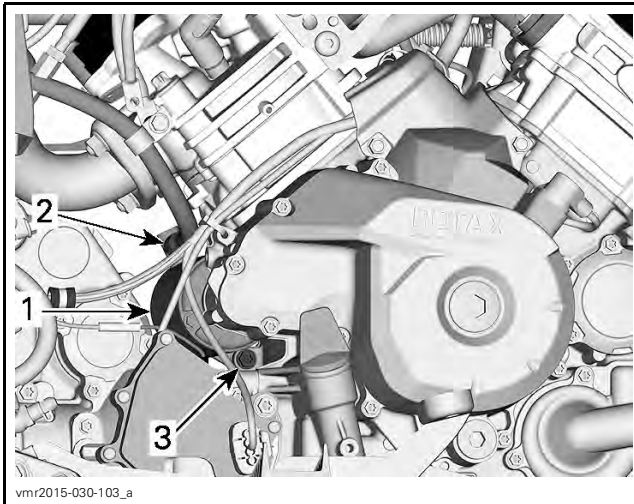
⚠ WARNING

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

Section 03 ENGINE, CVT AND GEARBOX (570)

Subsection 06 (MAGNETO AND STARTER)

3. Remove body parts as listed in *STARTER ACCESS*.
4. Disconnect RED (+) cable from starter.
5. Clean starter area.
6. Remove starter retaining screw (from RH side of engine).



1. Starter
2. Starter power cable to disconnect
3. Starter retaining screw to remove

7. Carefully pry starter out of the engine crankcase.

Installing the Starter

Reverse 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.

Lubricate starter O-ring.

SERVICE PRODUCT	
Starter O-ring and mating surface	LOCTITE 767 (ANTISEIZE LUBRICANT) (P/N 293 800 070)

Bring starter close to its location. Rotate it so that its mounting ear allows installation in engine crankcase and on its alignment pin.

Push starter in place and align mounting ear to install screw.

TIGHTENING TORQUE	
Starter mounting screw	25 N•m ± 3 N•m (18 lbf•ft ± 2 lbf•ft)

NOTICE When connecting the RED (+) cable to the starter motor, make sure the battery cables are disconnected.

SERVICE PRODUCT	
Starter terminal and retaining nut	DIELECTRIC GREASE (P/N 293 550 004)

TIGHTENING TORQUE	
Service product	DIELECTRIC GREASE (P/N 293 550 004)
Starter terminal and retaining nut	6 N•m ± 0.5 N•m (53 lbf•in ± 4 lbf•in)

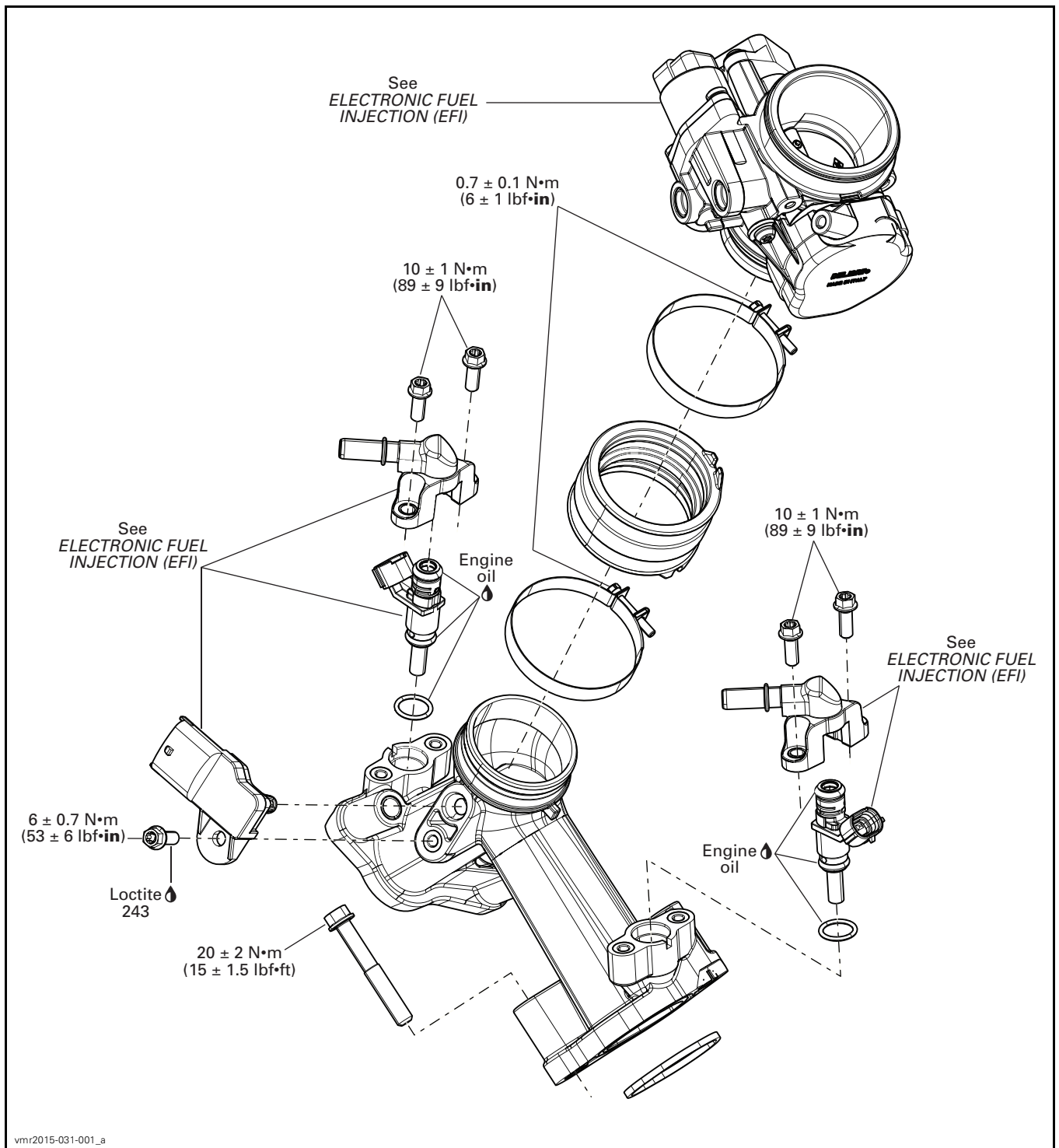
When installing remaining removed parts, refer to applicable subsections.

Connect battery cables.

⚠ WARNING
Always connect RED (+) cable first then BLACK (-) cable last.

Test starter operation.

INTAKE MANIFOLD



Section 03 ENGINE, CVT AND GEARBOX (570)

Subsection 07 (INTAKE MANIFOLD)

PROCEDURES

INTAKE MANIFOLD

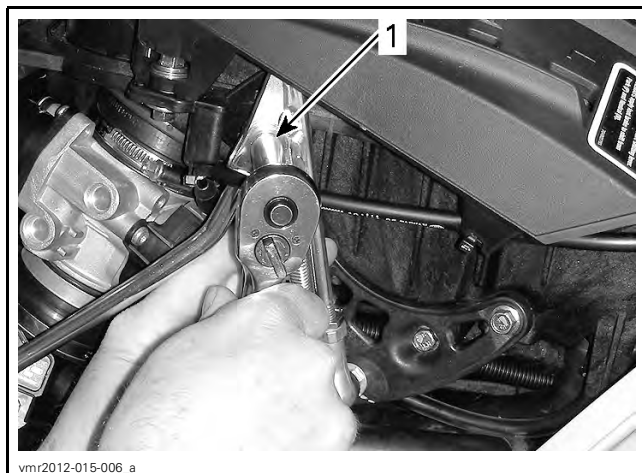
Intake Manifold Access

Refer to *BODY* subsection and remove the following:

- Console
- RH side panel and extension.

Removing the Intake Manifold

1. Release fuel pressure. Refer to *FUEL TANK AND FUEL PUMP* subsection.
2. Disconnect top of shift rod.

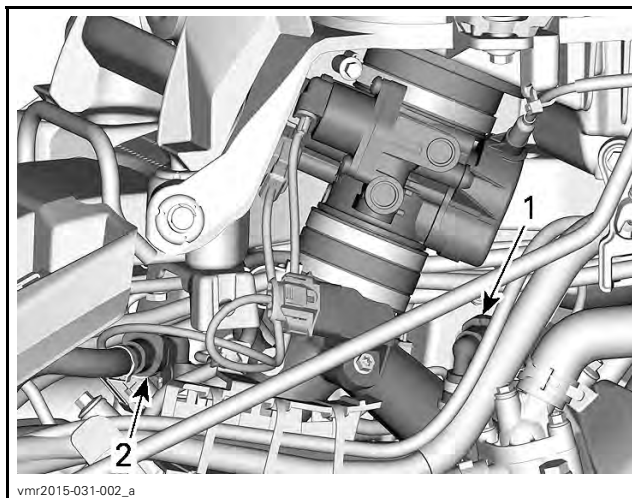


SHIFT ROD DISCONNECT

1. Remove screw, nut, and bushing

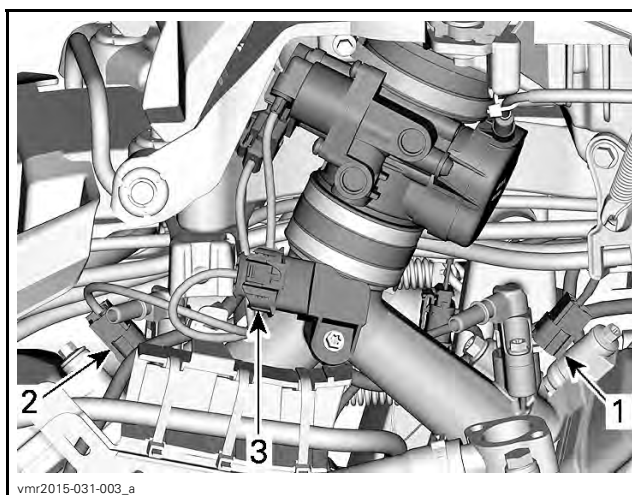
3. Disconnect the fuel hoses from fuel rails, refer to *ELECTRONIC FUEL INJECTION (EFI)* subsection.

⚠ CAUTION The fuel hose may still be under pressure.



1. Forward fuel rail disconnect
2. Rear fuel rail disconnect

4. Disconnect fuel injector electrical connectors.
5. Disconnect MAPTS connector.



1. Forward fuel injector connector
2. Rear fuel injector connector
3. MAPTS connector

6. Disconnect throttle body from intake manifold and air intake silencer. Refer to *ELECTRONIC FUEL INJECTION (EFI)* subsection.

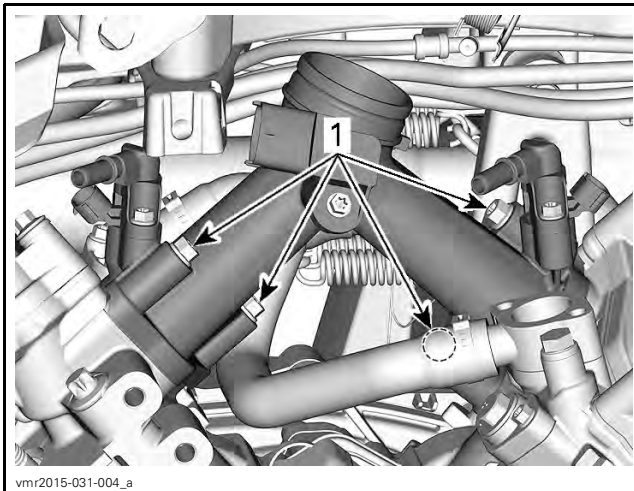
NOTE: Do not disconnect throttle cable needlessly.

7. Remove wiring harness support from engine.



1. Remove

8. Remove intake manifold from engine.



1. Manifold retaining screws (4x)

Inspecting the Intake Manifold

Check intake manifold for cracks, warping at flanges or any other damage. Replace if necessary.

Installing the Intake Manifold

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

Tighten intake manifold retaining screws to specified torque one cylinder at a time.

TIGHTENING TORQUE	
Intake manifold retaining screws	20 N•m ± 2 N•m (15 lbf•ft ± 1 lbf•ft)

Enable fuel pump using B.U.D.S.

TOP END

SERVICE TOOLS

Description	Part Number	Page
CRANKSHAFT LOCKING BOLT.....	529 035 617	106
ENGINE LEAK DOWN TEST KIT	529 035 661	92
PISTON CIRCLIP INSTALLER.....	529 035 921	109
TDC DIAL INDICATOR	414 104 700	92
VALVE GUIDE INSTALLER	529 036 140	104
VALVE GUIDE REMOVER 5 MM	529 035 924	104
VALVE SPRING COMPRESSOR CUP.....	529 035 764	100
VALVE SPRING COMPRESSOR	529 035 724	100

SERVICE TOOLS – OTHER SUPPLIER

Description	Part Number	Page
SNAP-ON PLIERS.....	YA 8230	102

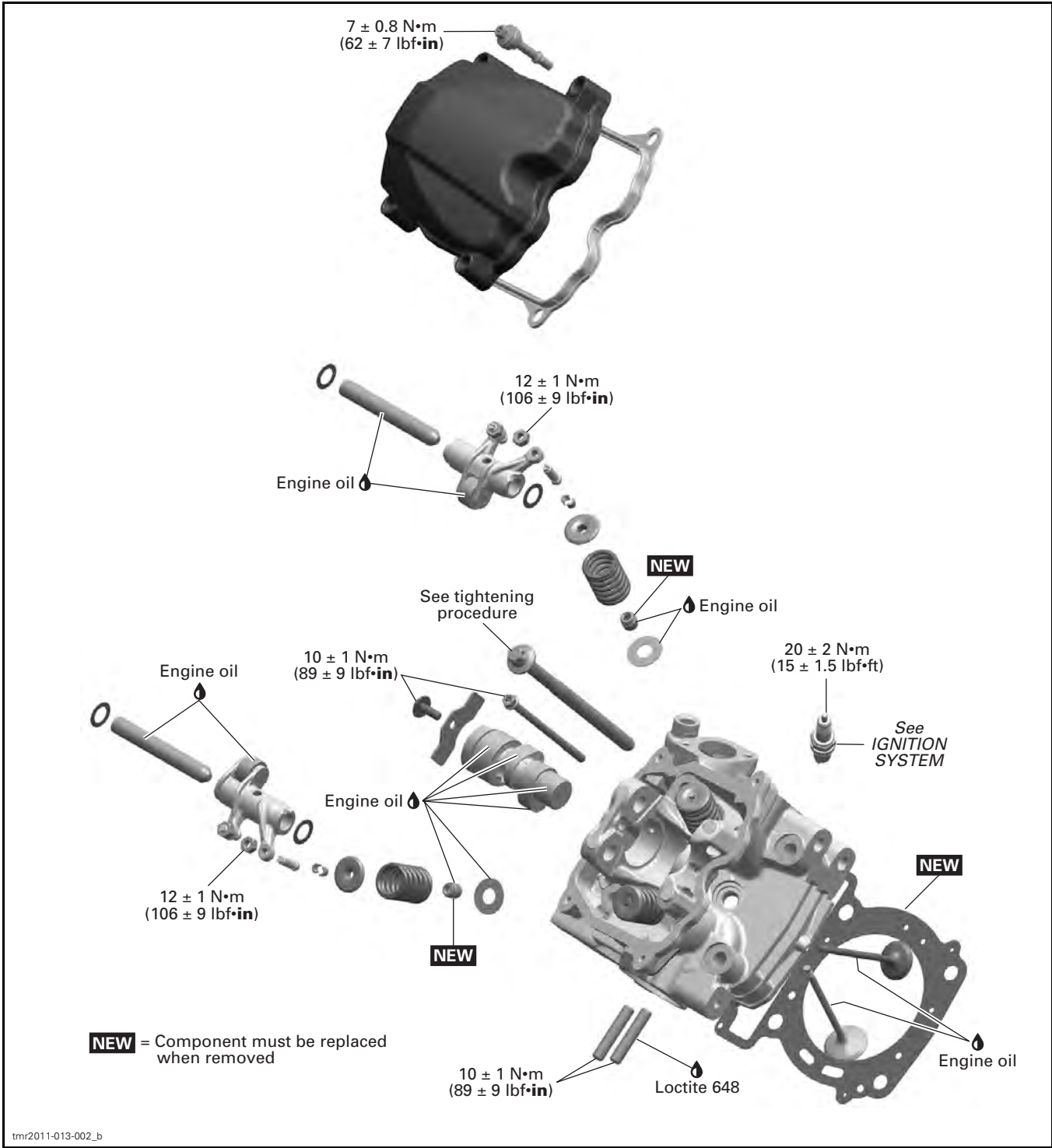
SERVICE PRODUCTS

Description	Part Number	Page
LOCTITE 767 (ANTISEIZE LUBRICANT)	293 800 070	104

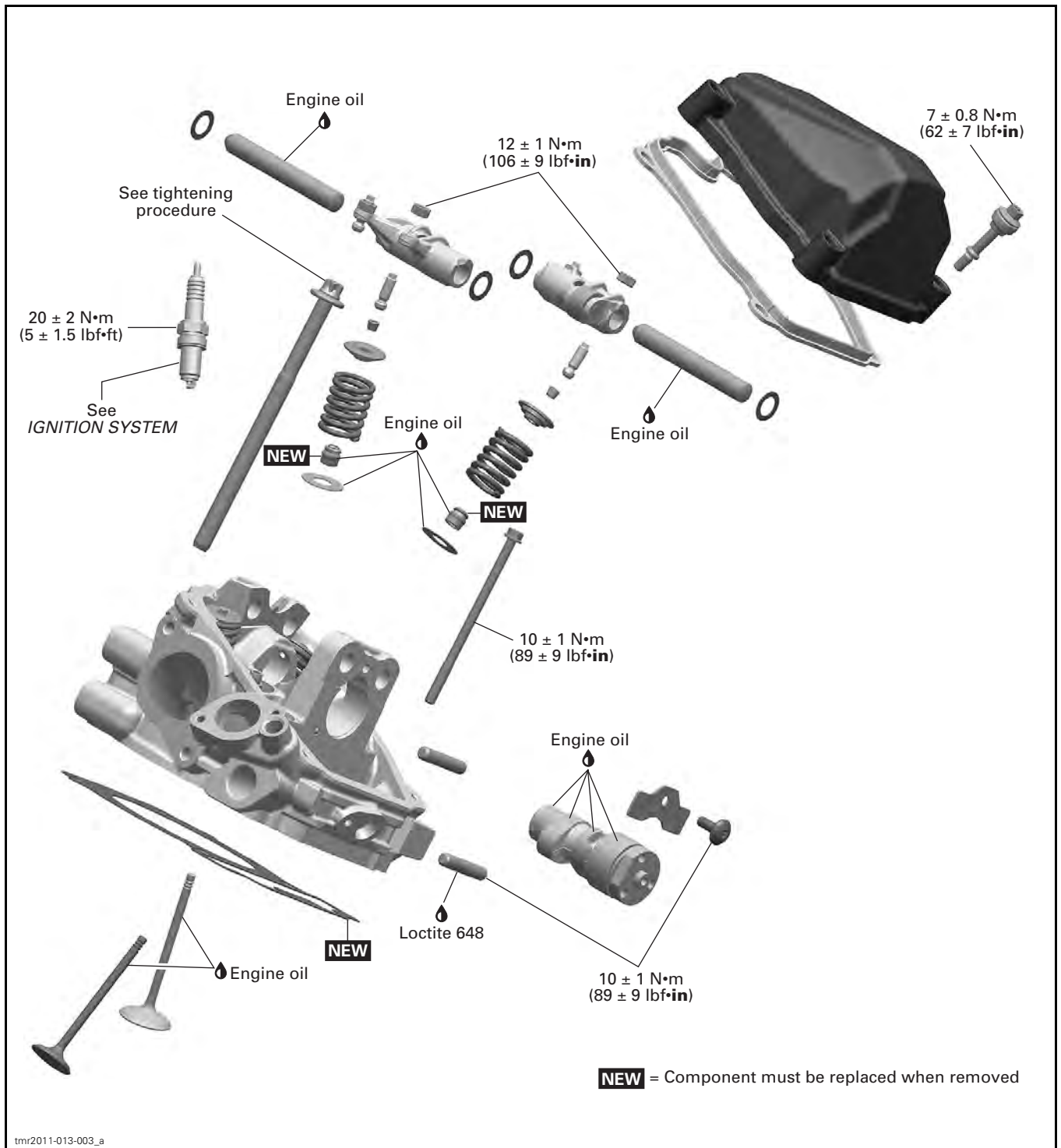
Section 03 ENGINE, CVT AND GEARBOX (570)

Subsection 08 (TOP END)

CYLINDER HEAD NO. 1



CYLINDER HEAD NO. 2



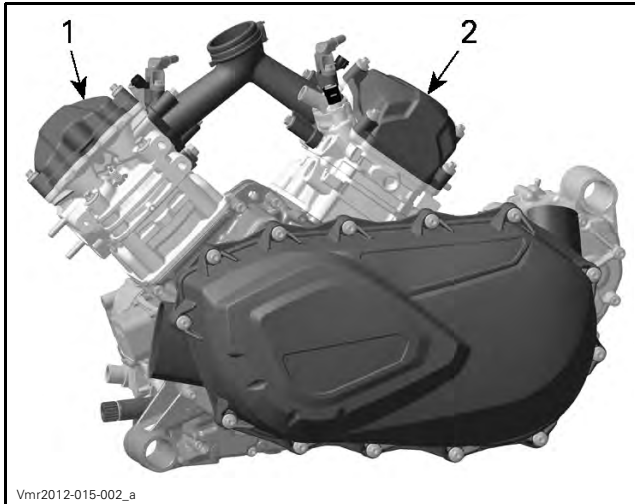
This exploded view diagram illustrates the assembly of an engine, highlighting the application of engine oil at various stages. The components shown include the cylinder block, piston rings, piston, connecting rod, and crankshaft. Key oil application points are indicated by lines and labels:

- Cylinder Block:** Oil is applied to the cylinder bore.
- Piston Rings:** Oil is applied to the rings before installation.
- Piston:** Oil is applied to the piston rings and the piston pin.
- Connecting Rod:** Oil is applied to the rod pin.
- Crankshaft:** Oil is applied to the crank pin.

 Several components are marked as **NEW**, indicating they are replacement parts. The diagram is labeled with 'Engine oil' at multiple points to ensure proper lubrication during assembly.

GENERAL

Special reference are made in the text for procedures which are different for cylinder no. 1 and cylinder no. 2.



1. Cylinder 1 (front)
2. Cylinder 2 (rear)

When diagnosing an engine problem, always perform a cylinder leak test.

NOTE: Even though the following procedures do not require the engine removal, many illustrations show the engine out of the vehicle for more clarity.

IMPORTANT: Note position of parts upon disassembly. This may help to find the root cause of a problem. A component that is not replaced should be reinstalled in the same position as originally mounted.

INSPECTION

LEAK TEST

Before performing the cylinder leak test, verify the following:

- Clamp(s) tightness
- Radiator and hoses.

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

⚠ WARNING

Prevent burning yourself on hot engine parts.

Preparing the Leak Test

1. Disconnect battery.

⚠ WARNING

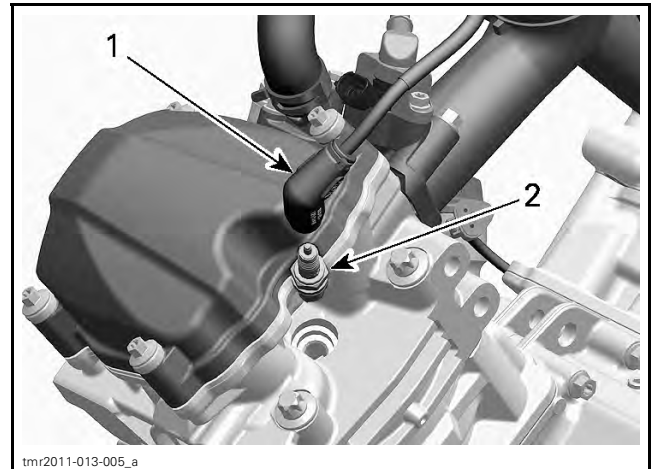
Always respect this order for disassembly; disconnect **BLACK (-)** cable first.

2. Remove radiator cap.

⚠ WARNING

To prevent burning yourself only remove the radiator cap by wearing the appropriate safety equipment.

3. Unplug spark plug cable.
4. Clean spark plug area and remove spark plug from cylinder head.



1. Spark plug cable
2. Spark plug

5. Remove **VALVE COVER**. See procedure in this subsection.
6. Rotate crankshaft until piston is at ignition TDC.
7. Turn crankshaft using one of the following two procedures.

First Procedure

Turn the drive pulley.

Second Procedure

1. Remove plug screw with O-ring from magneto cover.
2. Use a 14 mm Allen key and turn crankshaft.

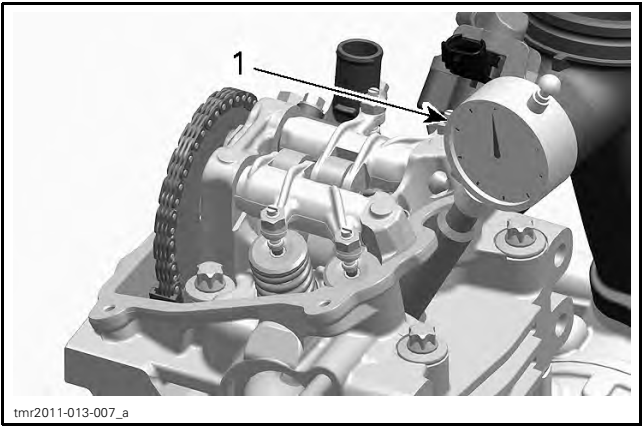
NOTICE Turn only clockwise to avoid loosening of magneto flywheel Allen screw.

3. Set the piston to precisely ignition TDC.

Section 03 ENGINE, CVT AND GEARBOX (570)

Subsection 08 (TOP END)

REQUIRED TOOL	
TDC DIAL INDICATOR (P/N 414 104 700)	

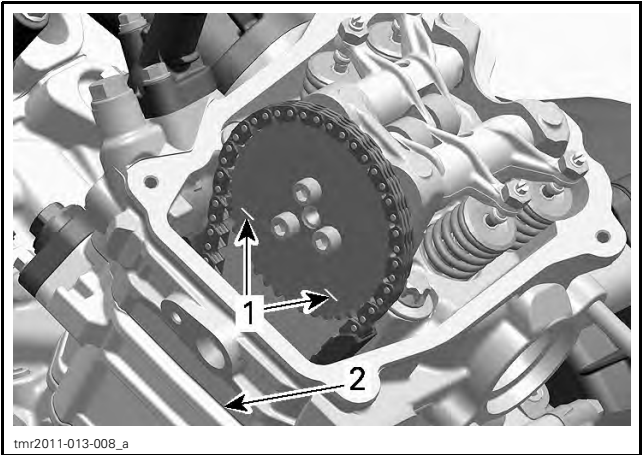


1. TDC dial indicator

NOTE: If a dial gauge is not available, use a screw-driver or another similarly suitable tool.

NOTICE Do not scratch or damage piston/cylinder surface.

NOTE: At ignition TDC the marks on the camshaft timing gear have to be parallel to cylinder head base as per following illustration.



1. Marks on camshaft timing gear
2. Cylinder head base

Leak Test

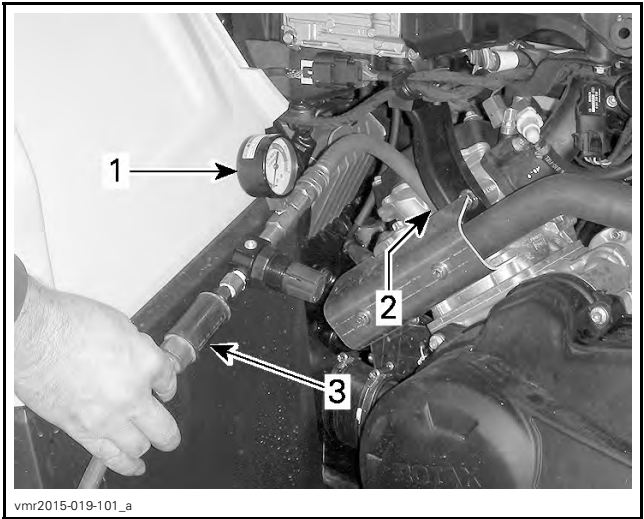
1. Install gauge adapter into spark plug hole.

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

2. Connect to adequate air supply.
3. Set needle of measuring gauge to zero.

NOTE: All testers have specific instructions on gauge operation and required pressure.

4. Install gauge adapter into previously cleaned spark plug hole.
5. Supply combustion chamber with air pressure.



TYPICAL
1. Leak tester
2. Leak tester installed in spark plug bore
3. Air supply hose

6. Note the amount or percentage of leakage (depending on tester).

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

NOTE: To make sure there is no false reading due to a valves not perfectly seated, tap each valve adjustment screw (on the rocker arm) using a soft hammer.

Diagnosis

Listen for air leaks.

- Air escaping in intake port/throttle body means leaking intake valve(s).
- Air escaping in exhaust port means leaking exhaust valve(s).
- Air bubbles in the coolant (radiator) means leaking cylinder head gasket.
- Air/coolant escaping from cylinder/head means damaged gasket(s) and/or loosened screws.

- Air escaping into crankcase area means excessively worn cylinder and/or broken piston rings.
- Air/oil escaping from crankcase means damaged gasket and/or loosened screws (refer to *BOTTOM END* subsection).

NOTE: For all checkpoints mentioned above, see appropriate engine section to diagnose and repair the engine.

Reassembly

Reverse the preparation procedure. Ensure to respect torque values and use of appropriate products/lubricants. Refer to exploded views in other subsections of this manual as required.

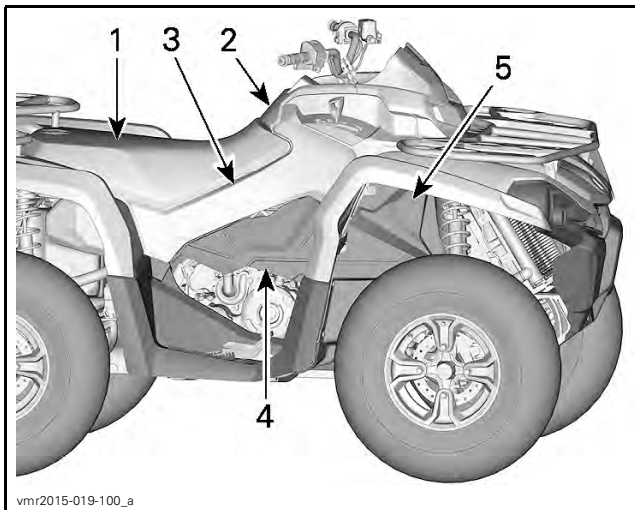
PROCEDURES

VALVE COVER

Valve Cover Access

Front Cylinder

Refer to *BODY* subsection and remove the following.



1. Seat
2. Console
3. RH side panel
4. RH side panel extension
5. RH inner fender panel

Rear Cylinder

Refer to *BODY* and remove:

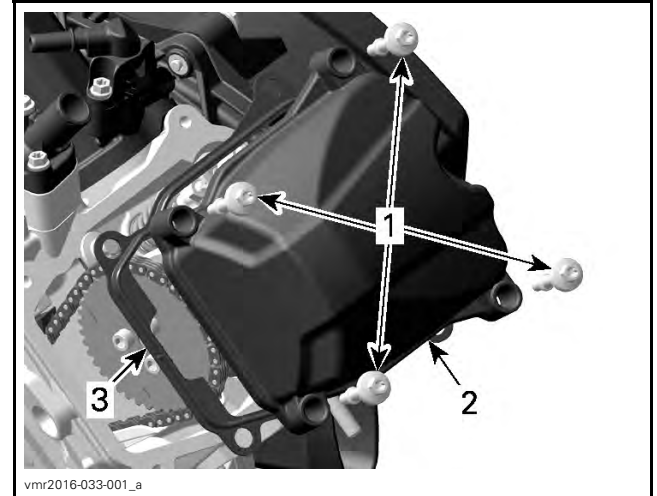
- Seat
- Console
- RH side panel and extension(s)
- LH side panel and extension(s).

Refer to *EXHAUST SYSTEM* and remove exhaust pipe.

Removing the Valve Cover

Remove:

- Valve cover screws
- Valve cover
- Gasket.



TYPICAL — FRONT CYLINDER SHOWN

1. Valve cover screws
2. Valve cover
3. Gasket

Inspecting the Valve Cover

Check the gasket on the valve cover if it is brittle, cracked or hard. If so, replace the gasket.

Installing the Valve Cover

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

Tighten valve cover retaining screws to specified torque in a criss-cross sequence.

TIGHTENING TORQUE	
Valve cover retaining screws	7 N•m ± 0.8 N•m (62 lbf•in ± 7 lbf•in)

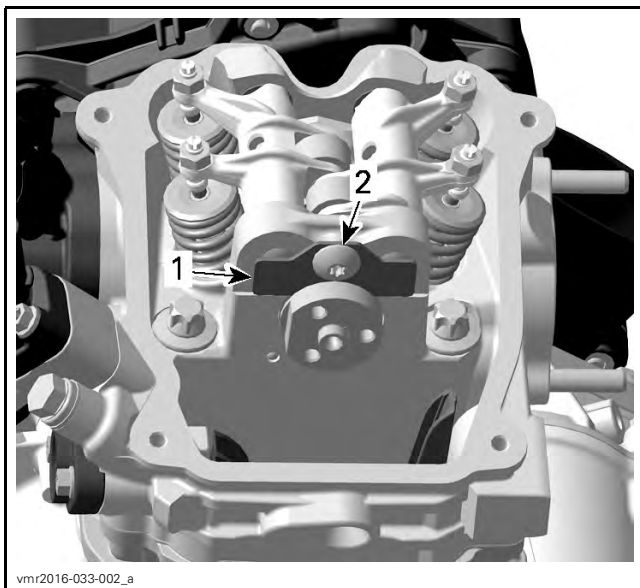
ROCKER ARM

Removing the Rocker Arm

1. Remove *VALVE COVER*. See procedure in this subsection.
2. Refer to *TIMING CHAIN* subsection and remove following parts:
 - Timing chain tensioner
 - Camshaft timing gear.
3. Remove pan head screw and camshaft retaining plate.

Section 03 ENGINE, CVT AND GEARBOX (570)

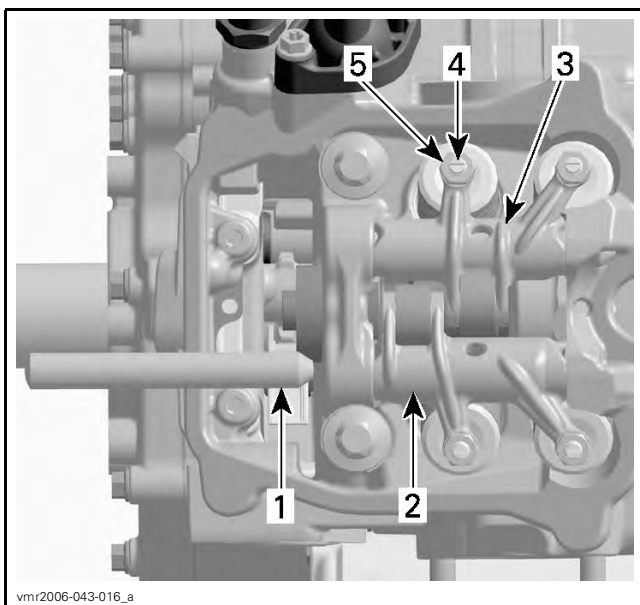
Subsection 08 (TOP END)



TYPICAL

1. Camshaft retaining plate
2. Pan head screw

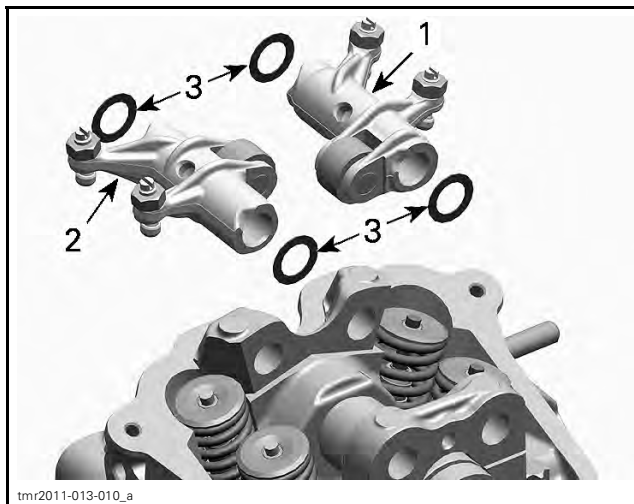
4. Remove rocker arm shafts.



1. Rocker arm shaft
2. Rocker arm (exhaust side)
3. Rocker arm (intake side)
4. Adjustment screw
5. Lock nut

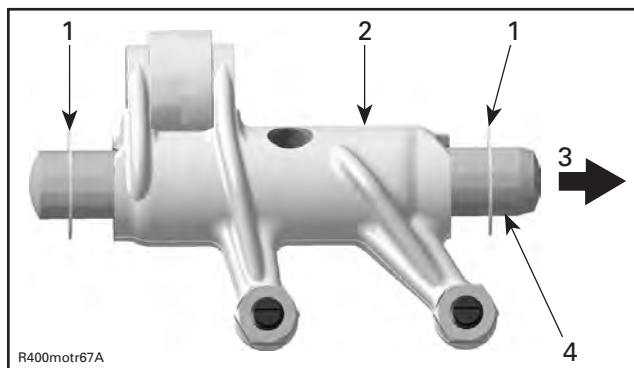
5. Remove rocker arm assembly (exhaust side and intake side) with adjustment screws and lock nuts.

6. Remove thrust washers.



1. Rocker arm (exhaust side)
2. Rocker arm (intake side)
3. Thrust washers

NOTICE Pay attention not to lose thrust washers or drop them into the timing chain compartment.

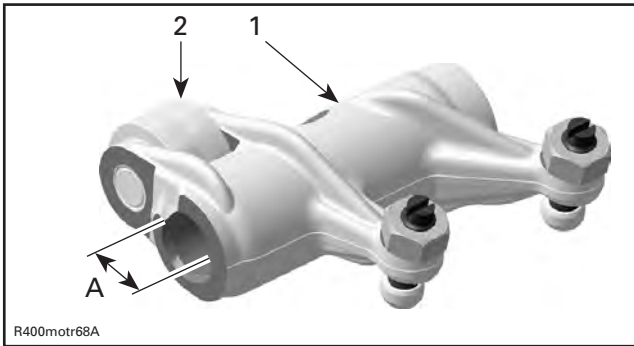


1. 2 thrust washers
2. Rocker arm (exhaust side)
3. Cylinder head (spark plug side)
4. Big taper to spark plug side

Inspecting the Rocker Arm

Inspect each rocker arm for cracks and scored friction surfaces. If so, replace rocker arm assembly.

Check the rocker arm rollers for free movement, wear and excessive radial play. Replace rocker arm assembly if necessary.

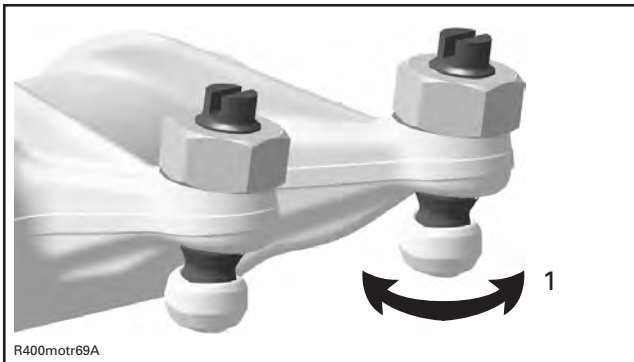


1. Rocker arm (exhaust side)
2. Roller
- A. Bore for rocker arm shaft

Measure rocker arm bore diameter. If diameter is out of specification, change the rocker arm assembly.

ROCKER ARM BORE DIAMETER	
NEW	12.036 mm to 12.050 mm (.4739 in to .4744 in)
SERVICE LIMIT	12.060 mm (.4748 in)

Check adjustment screws for free movement, cracks and/or excessive play.

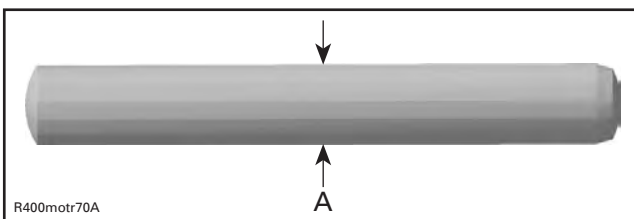


1. Free movement of adjustment screw top

Rocker Arm Shaft Inspection

Check for scored friction surfaces; if so, replace parts.

Measure rocker arm shaft diameter.



- A. Measure rocker arm shaft diameter here

ROCKER ARM SHAFT DIAMETER

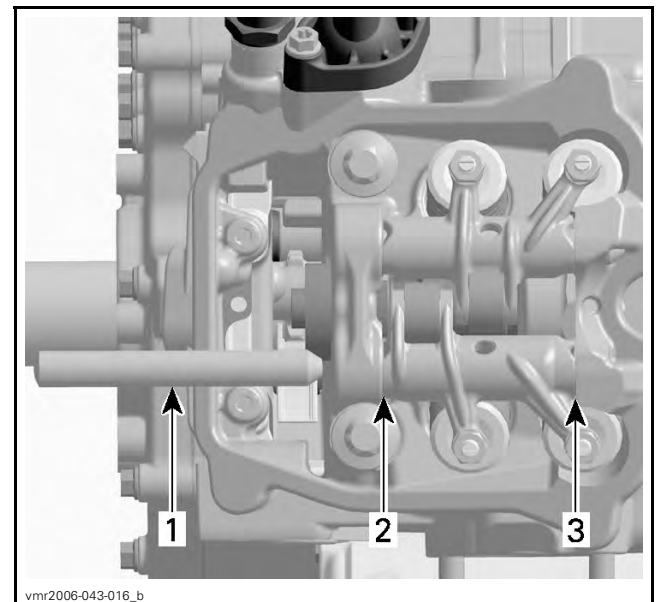
NEW	12.000 mm to 12.018 mm (.4724 in to .4731 in)
SERVICE LIMIT	11.990 mm (.472 in)

Any area worn excessively will require parts replacement.

Installing the Rocker Arm

NOTE: Use the same procedure for exhaust and intake rocker arm.

1. Apply engine oil on rocker arm shaft.
2. Insert a rocker arm shaft with the chamfered edge first through rocker arm pin bore.
3. Install a thrust washer at timing chain side, then the proper rocker arm (exhaust side or intake side).
4. Push in rocker arm shaft until its chamfer reaches the end of rocker arm bore.



1. Rocker arm shaft
2. Thrust washer (timing chain side)
3. Thrust washer (spark plug side)

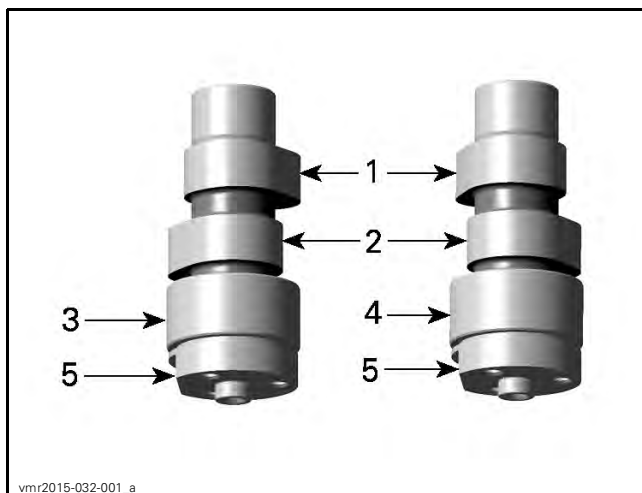
5. Place the other thrust washer and push rocker arm shaft to end position.
6. Install the camshaft retaining plate.
7. Adjust valve clearance, refer to *PERIODIC MAINTENANCE PROCEDURES* subsection.

CAMSHAFT

NOTE: The engine is equipped with two different camshafts.

Section 03 ENGINE, CVT AND GEARBOX (570)

Subsection 08 (TOP END)



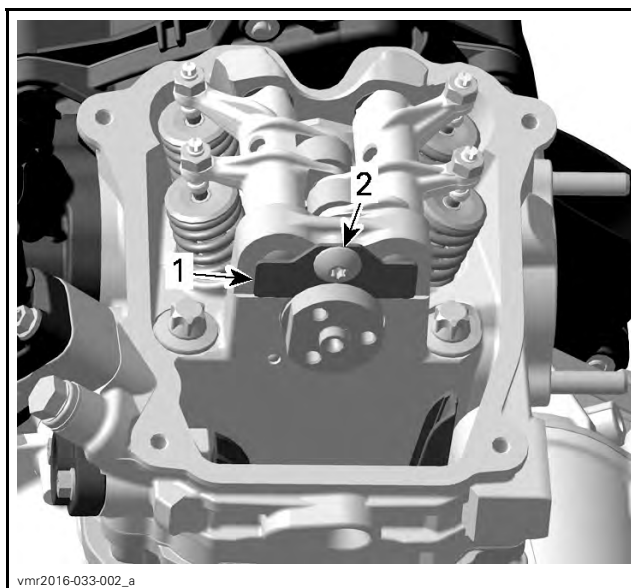
1. Intake cam
2. Exhaust cam
3. Camshaft of cylinder 1
4. Camshaft of cylinder 2
5. Flat spot

Removing the Camshaft

The removal procedure is the same for both camshafts.

NOTICE Each camshaft is different in design. Thus, it is important not to mix up any parts of the camshaft assembly with that of the other cylinder. Keep parts as a group.

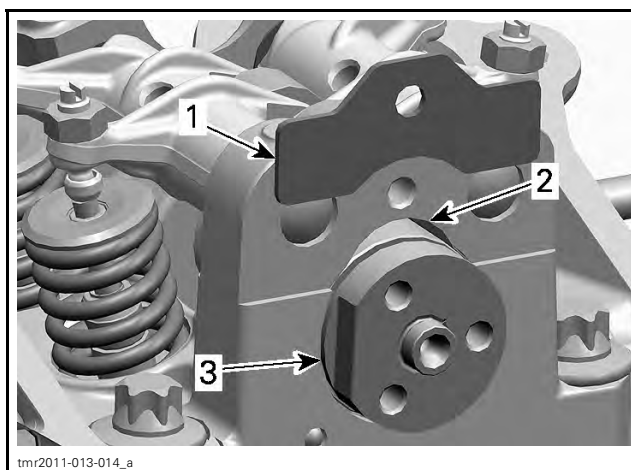
1. Remove valve cover (see *VALVE COVER* in this subsection).
2. Refer to the *TIMING CHAIN* subsection to remove the following parts:
 - Chain tensioner
 - Camshaft timing gear.
3. Remove the camshaft retaining plate.



1. Camshaft retaining plate
2. Pan head screw
3. Cylinder head

4. Remove rocker arms (see *ROCKER ARM* in this subsection).
5. Remove the camshaft.

NOTE: For removal rotate camshaft so that intake/exhaust lobe shows to upper side of cylinder head.



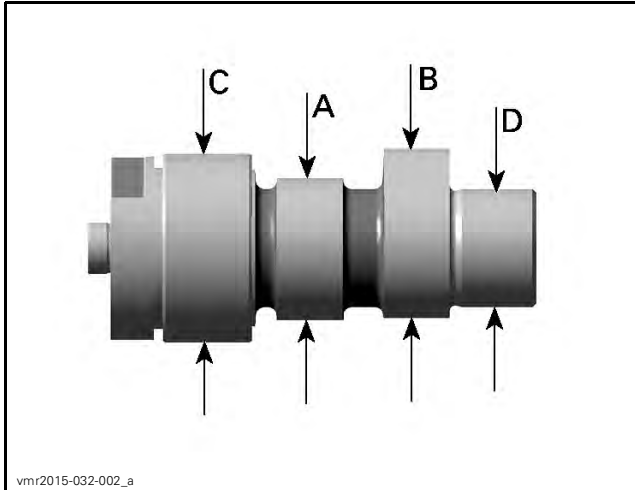
1. Camshaft retaining plate
2. Area for camshaft lobes
3. Camshaft

Inspecting the Camshaft

Inspecting the Camshaft Lobe

Check each lobe for scoring, scuffing, cracks or other signs of wear.

Measure camshaft lobe height using a micrometer.



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- A. Camshaft lobe (exhaust valves)
- B. Camshaft lobe (intake valves)
- C. Camshaft journal (timing chain side)
- D. Camshaft journal (spark plug side)

CAMSHAFT LOBE (INTAKE)	
NEW	31.830 mm to 32.030 mm (1.2531 in to 1.261 in)
SERVICE LIMIT	31.810 mm (1.2524 in)

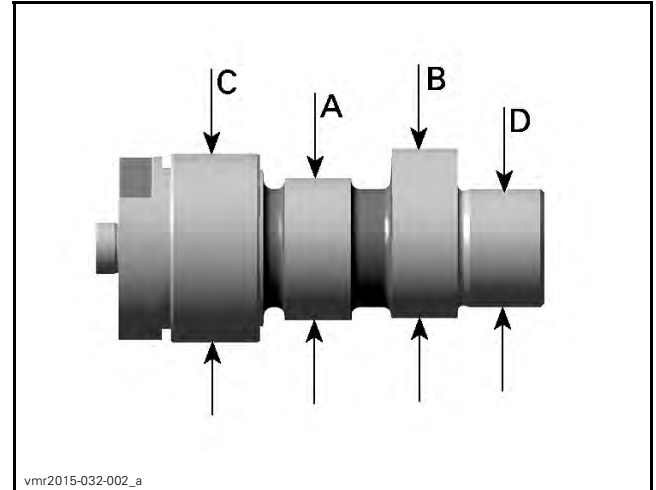
CAMSHAFT LOBE (EXHAUST)	
NEW	31.730 mm to 31.930 mm (1.2492 in to 1.2571 in)
SERVICE LIMIT	31.710 mm (1.2484 in)

Measure camshaft bearing in cylinder head. Refer to *CYLINDER HEAD INSPECTION* in this subsection.

Inspecting the Camshaft Journal

Check each journal for scoring, scuffing, cracks or other signs of wear.

Measure camshaft journal using a micrometer.



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- A. Camshaft lobe (exhaust valves)
- B. Camshaft lobe (intake valves)
- C. Camshaft journal (timing chain side)
- D. Camshaft journal (spark plug side)

CAMSHAFT JOURNAL (TIMING CHAIN SIDE)	
NEW	34.959 mm to 34.975 mm (1.3763 in to 1.377 in)
SERVICE LIMIT	34.950 mm (1.376 in)

CAMSHAFT JOURNAL (SPARK PLUG SIDE)	
NEW	21.959 mm to 21.980 mm (.8645 in to .8654 in)
SERVICE LIMIT	21.950 mm (.8642 in)

Installing the Camshaft

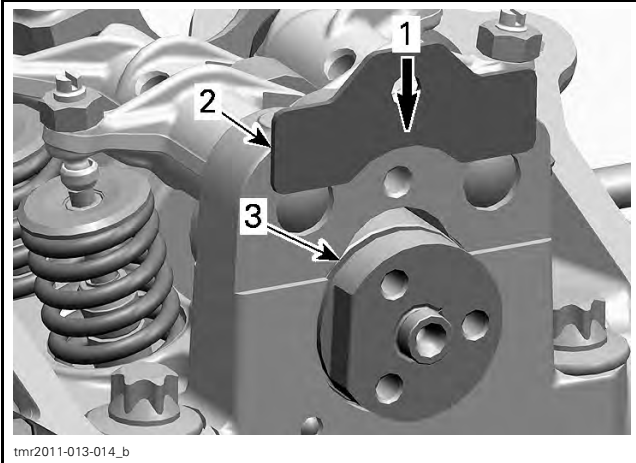
Reverse the removal procedure. Pay attention to the following details.

NOTICE The camshafts are not identical in design. Do not invert the camshafts during assembly. Any mix-up of the components will lead to engine damage.

Place the camshaft retaining plate in the slot of the camshaft.

Section 03 ENGINE, CVT AND GEARBOX (570)

Subsection 08 (TOP END)



1. Direction of movement
2. Camshaft retaining plate
3. Slot retaining camshaft

For other parts, refer to proper installation procedure.

CYLINDER HEAD

Cylinder Head Access

Refer to *VALVE COVER* in this subsection.

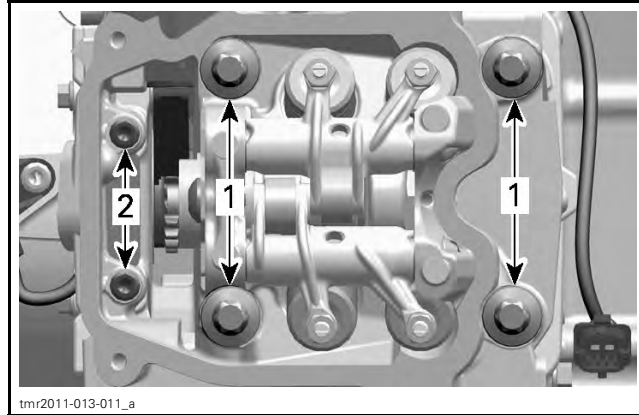
Removing the Cylinder Head

1. The removal procedure is the same for both cylinder heads.
2. Drain coolant (refer to *PERIODIC MAINTENANCE PROCEDURES* subsection).
3. Disconnect the coolant hose from the thermostat housing.

NOTE: Before removing cylinder head, blow out remaining coolant by air pressure. During cylinder head removal, the remaining coolant in cylinder head could overflow into the engine and a little quantity of coolant could drop into the engine. In this case, the engine oil will be contaminated.

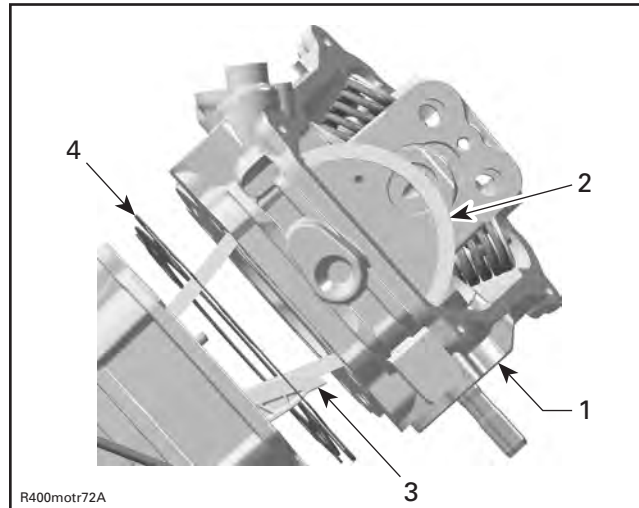
4. Refer to *EXHAUST SYSTEM* subsection and disconnect exhaust system head pipe from cylinder head.
5. Disconnect spark plug wire.
6. Disconnect temperature sensor connector, located at rear cylinder head.
7. Remove the intake manifold. Refer to *INTAKE MANIFOLD* subsection.
8. Remove the valve cover and its gasket (see *VALVE COVER* in this subsection).
9. Refer to the *TIMING CHAIN* subsection to remove the following parts:
 - Chain tensioner
 - Camshaft timing gear.

10. First remove the M6 cylinder head screws, then the cylinder head screws M10.



1. Cylinder head screws M10
2. Cylinder head screws M6

11. Pull up cylinder head.
12. Remove timing chain guide (fixed).
13. Remove and discard the cylinder head gasket.



1. Cylinder head
2. Timing chain
3. Chain guide (fixed)
4. Cylinder head gasket

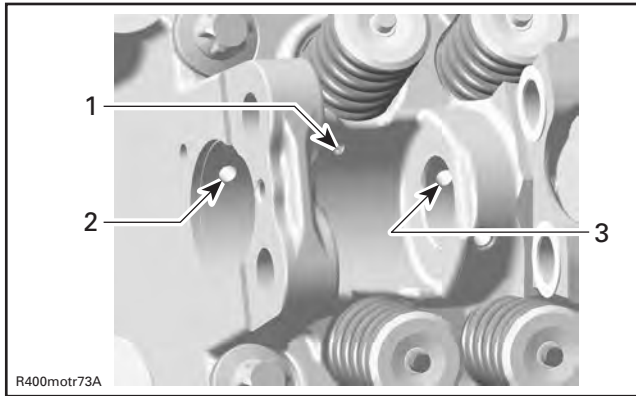
Inspecting the Cylinder Head

Inspect timing chain guide (fixed) for wear, cracks or other damages. Replace if necessary.

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

Check mating surface between cylinder and cylinder head for contamination. If so, clean both surfaces.

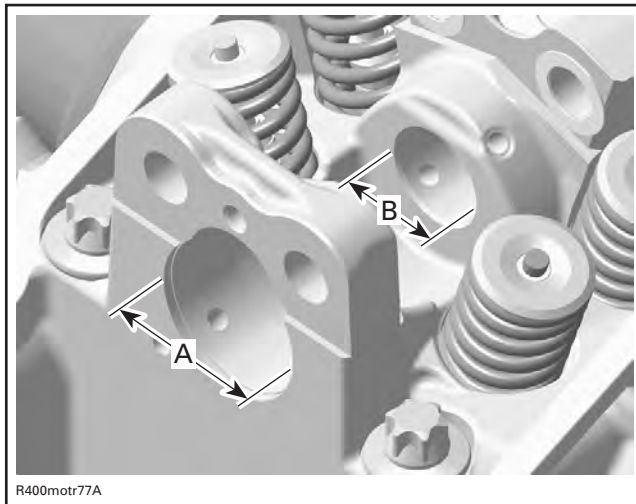
Clean oil support through the cylinder head from contamination.



1. Oil port to lubricate camshaft lobes intake/exhaust
2. Oil supply to camshaft bearing journal (timing chain side)
3. Oil supply to camshaft bearing journal (spark plug side)

Inspecting the Cylinder Head Camshaft Bearing

Measure camshaft bearing in cylinder head.



- A. Camshaft bearing (timing chain side)
- B. Camshaft bearing (spark plug side)

CAMSHAFT BEARING (TIMING CHAIN SIDE)	
NEW	35.000 mm to 35.025 mm (1.378 in to 1.3789 in)
SERVICE LIMIT	35.040 mm (1.3795 in)
CAMSHAFT BEARING (SPARK PLUG SIDE)	
NEW	22.000 mm to 22.021 mm (.8661 in to .867 in)
SERVICE LIMIT	22.040 mm (.8677 in)

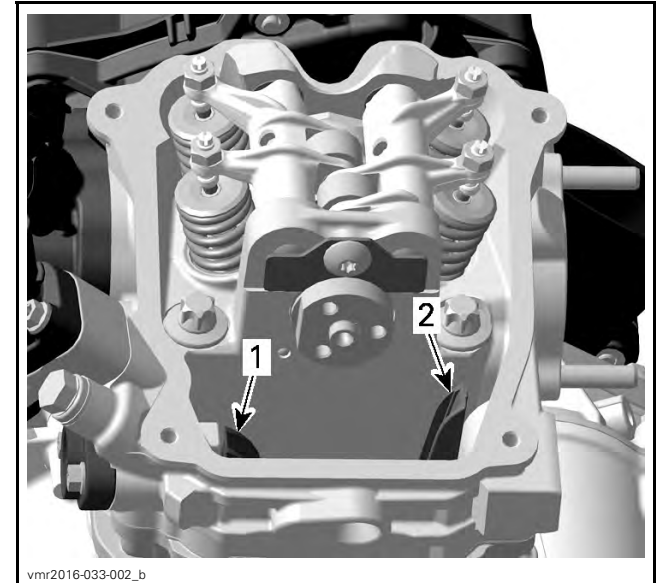
Installing the Cylinder Head

NOTE: Front and rear cylinder heads are not identical. **Never** interchange cylinder heads.

Reverse the removal procedure. Pay attention to the following details.

Ensure dowel pins are in place.

NOTICE Timing chain guide (fixed) has to be fixed between cylinder and cylinder head.



1. Timing chain guide (tensioner side) mounted in crankcase
2. Timing chain guide (fixed) between cylinder and cylinder head

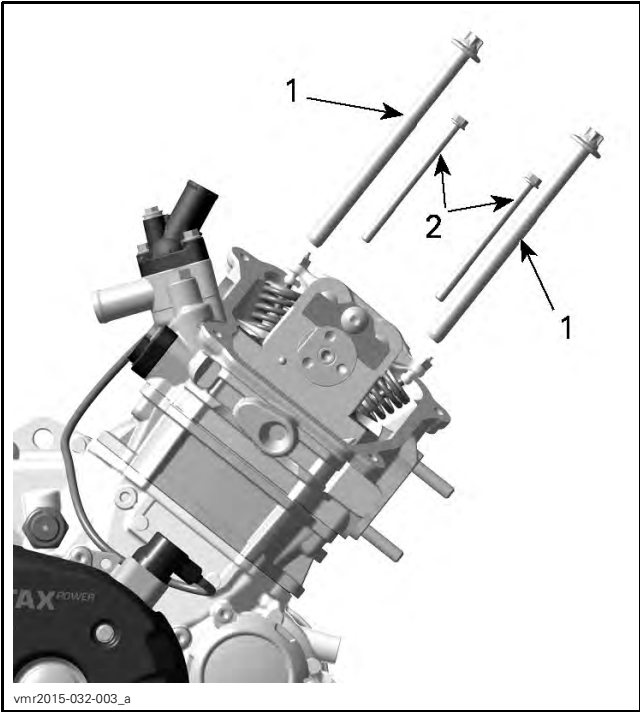
Install a **NEW** cylinder head gasket.

Install cylinder head screws in correct position.

NOTICE Cylinder head screws have different sizes and lengths.

Section 03 ENGINE, CVT AND GEARBOX (570)

Subsection 08 (TOP END)

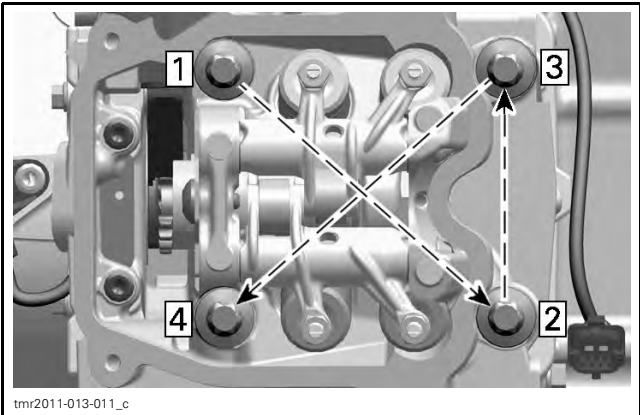


1. Location no. 1
2. Location no. 2

CYLINDER HEAD SCREW IDENTIFICATION	
Location no. 1	M10 x 140
Location no. 2	M6 x 85

Tighten M10 cylinder head screws FIRST as per following specifications.

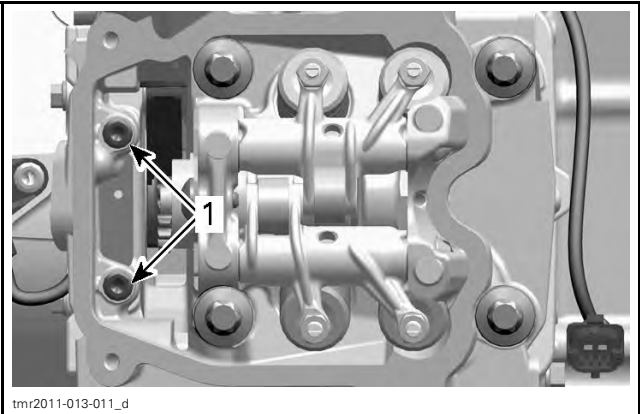
NOTE: Always perform one step on all M10 cylinder head screws before going to the next step.



TIGHTENING SEQUENCE - M10 CYLINDER HEAD SCREWS

TIGHTENING TORQUE		
M10 cylinder head screws	STEP A	20 N•m ± 1 N•m (15 lbf•ft ± 1 lbf•ft)
	STEP B	180° +/- 5°

Tighten M6 cylinder head screws as per following specification.



1. M6 Screws

TIGHTENING TORQUE	
M6 cylinder head screws	10 N•m ± 1 N•m (89 lbf•in ± 9 lbf•in)

Check timing chain guide (tensioner side) for movement.

Refer to applicable subsection for installation details of remaining removed parts.

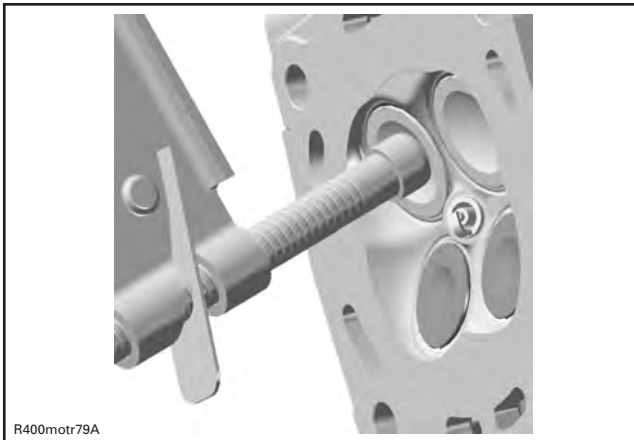
VALVE SPRINGS

Removing the Valve Spring

1. Refer to following procedures in this subsection to remove:
 - CAMSHAFT
 - CYLINDER HEAD.
2. Remove valve spring.

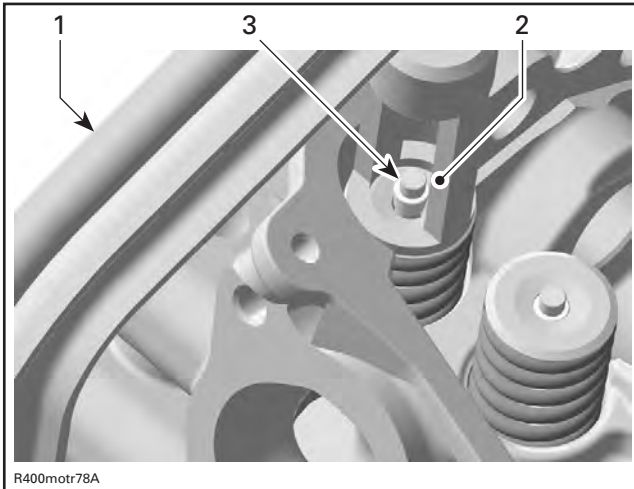
REQUIRED TOOL	
VALVE SPRING COMPRESSOR (P/N 529 035 724)	
VALVE SPRING COMPRESSOR CUP (P/N 529 035 764)	

WARNING
Always wear safety glasses when disassembling valve springs. Be careful when unlocking valves. Components could fly away because of the strong spring preload.



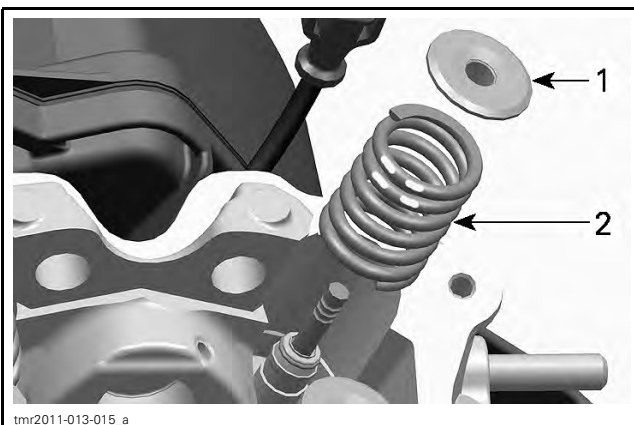
LOCATE VALVE SPRING COMPRESSOR CLAMP IN CENTER OF THE VALVE

3. Remove valve cotters.



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

4. Remove tools and withdraw valve spring retainer and valve spring.

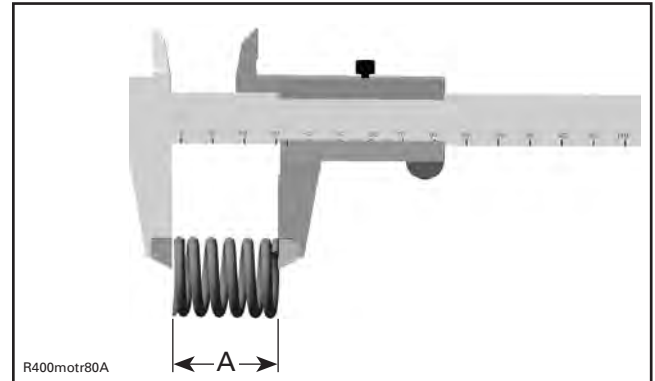


1. Valve spring retainer
2. Valve spring

Inspecting the Valve Spring

Check valve spring for visible damage. If so, replace valve spring.

Check valve spring for free length and straightness.



A. Valve spring length

VALVE SPRING FREE LENGTH	
NOMINAL NEW	40.81 mm (1.607 in)
SERVICE LIMIT	39.00 mm (1.535 in)

Replace valve springs if not within specifications.

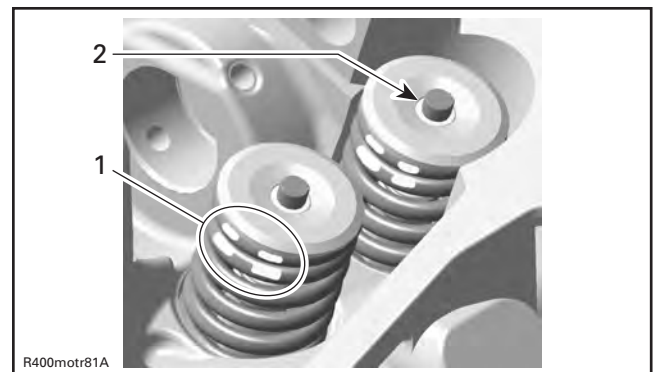
Installing the Valve Spring

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

Colored area of the valve spring must be placed on top.

To ease installation of cotters, apply oil or grease on them so that they remain in place while releasing the spring.

NOTE: Valve cotter must be properly engaged in valve stem grooves.



1. Position of the valve spring
2. Valve cotter

Section 03 ENGINE, CVT AND GEARBOX (570)

Subsection 08 (TOP END)

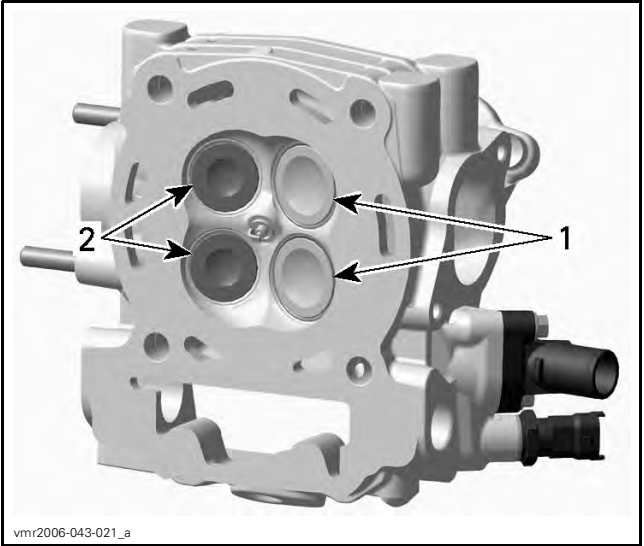
After spring is installed, ensure it is properly locked by tapping on valve stem end with a soft hammer so that valve opens and closes a few times.

NOTICE An improperly locked valve spring will cause engine damage.

VALVES

Removing the Valve

- 1. Remove valve spring, see *VALVE SPRING* in this subsection.
- 2. Push valve stem, then pull valves (intake and exhaust) out of valve guide.



- 1. Intake valves 31 mm
- 2. Exhaust valves 27 mm

- 3. Remove valve stem seal and discard it.

REQUIRED TOOL
SNAP-ON PLIERS (P/N YA 8230)



Inspecting the Valve

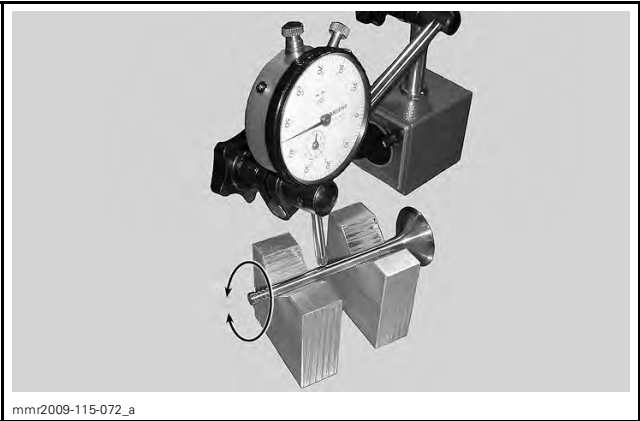
Whenever valves are removed always inspect valve guides. Refer to *VALVE GUIDES* in this subsection.

Valve Stem Seal

Always install **NEW** seals whenever valves are removed.

Inspecting the Valve

Inspect valve surface, check for abnormal stem wear and bending. If out of specification, replace by a new one.

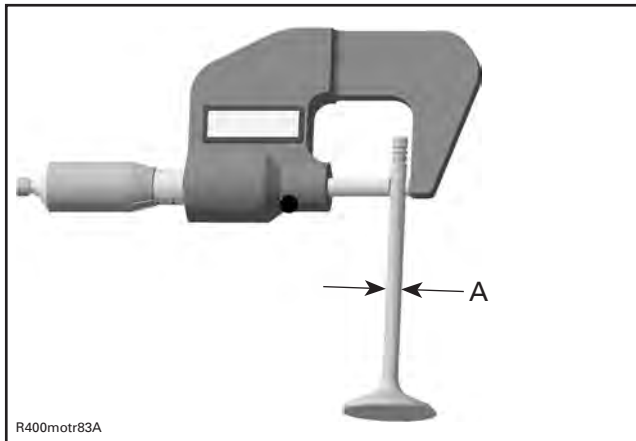


VALVE OUT OF ROUND (INTAKE AND EXHAUST VALVES)	
NEW	0.005 mm (.0002 in)
SERVICE LIMIT	0.06 mm (.0024 in)

Inspecting the Valve Stem

Measure valve stem in three places using a micrometer.

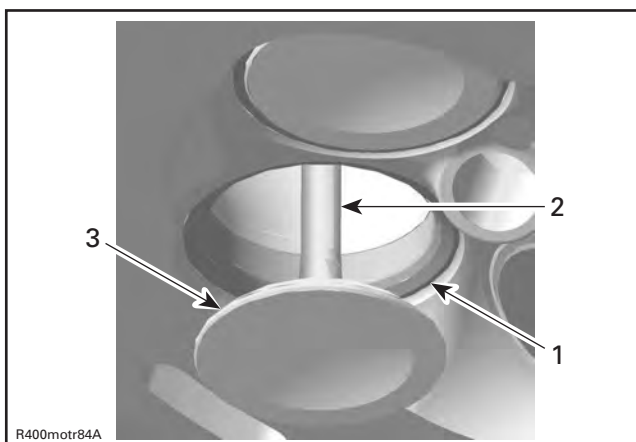
Replace valve if valve stem is out of specification or has other damages such as wear or friction surface.



A. Valve stem diameter

VALVE STEM DIAMETER	
EXHAUST VALVE	
NEW	4.956 mm to 4.970 mm (.1951 in to .1957 in)
SERVICE LIMIT	4.930 mm (.1941 in)
INTAKE VALVE	
NEW	4.966 mm to 4.980 mm (.1955 in to .1961 in)
SERVICE LIMIT	4.930 mm (.1941 in)

Inspecting the Valve Face and Seat



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

Check valve face and seat for burning or pitting and replace valve or cylinder head if there are signs of damage.

Ensure to seat valves properly. Apply some lapping compound to valve face and work valve on its seat with a lapping tool (see *VALVE GUIDES* in this subsection).

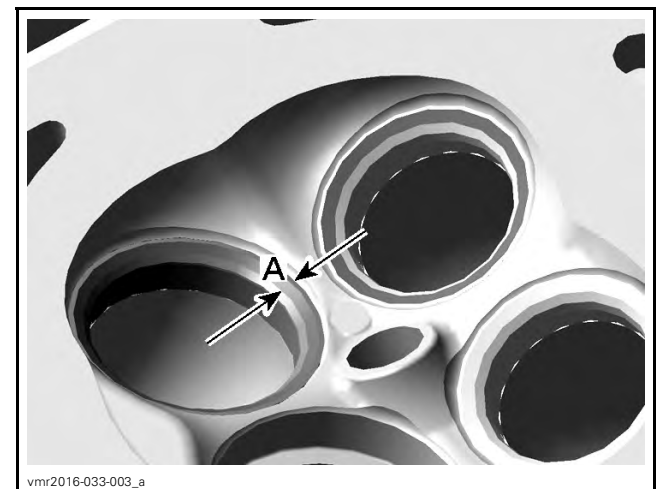
Measure valve face contact width.

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

Measure valve seat width using a caliper.

VALVE SEAT CONTACT WIDTH	
EXHAUST VALVE	
NEW	1.25 mm to 1.55 mm (.049 in to .061 in)
SERVICE LIMIT	2.00 mm (.079 in)
INTAKE VALVE	
NEW	1.05 mm to 1.35 mm (.041 in to .053 in)
SERVICE LIMIT	1.80 mm (.071 in)

If valve seat contact width is too wide or has dark spots, replace the cylinder head.



A. Valve seat contact width

Installing the Valve

Reverse the removal procedure. Pay attention to the following details.

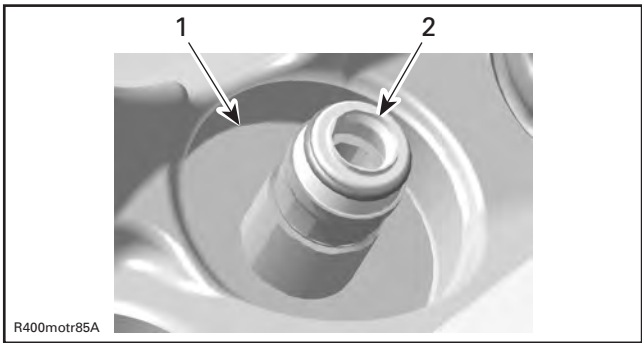
Install a **NEW** valve stem seal. Make sure thrust washer is installed before installing seal.

Apply engine oil on valve stem and install it.

NOTICE Be careful when valve stem is passed through sealing lips of valve stem seal.

Section 03 ENGINE, CVT AND GEARBOX (570)

Subsection 08 (TOP END)



- 1. Thrust washer
- 2. Sealing lips of valve stem seal

To ease installation of cotters, apply oil or grease on them so that they remain in place while releasing the spring.

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

NOTICE An improperly locked valve spring will cause engine damage.

VALVE GUIDES

Inspecting the Valve Guide

Always replace valve stem seals whenever valve guides are removed.

Measure valve guide in three places using a small bore gauge.

NOTE: Clean valve guide to remove carbon deposits before measuring.

Replace valve guide if it is out of specification or has other damages such as wear or friction surface.

VALVE GUIDE DIAMETER (INTAKE AND EXHAUST VALVES)	
NEW	4.998 mm to 5.018 mm (.1968 in to .1976 in)
SERVICE LIMIT	5.050 mm (.1988 in)

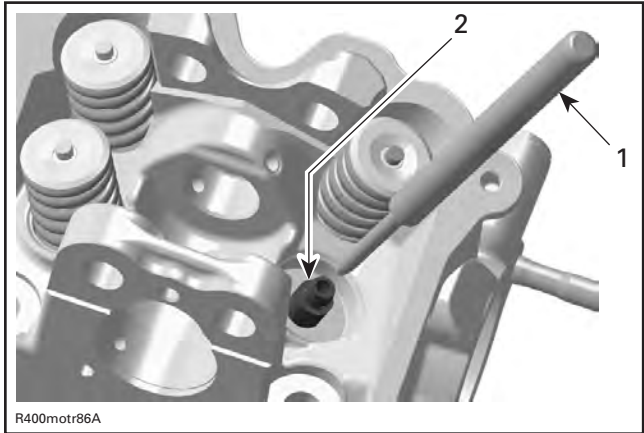
Removing the Valve Guide

- 1. Remove cylinder head (see *CYLINDER HEAD* in this subsection).
- 2. Remove valves (see *VALVES* in this subsection).

NOTE: Clean valve guide area from contamination before removal.

3. Drive valve guide out of cylinder head using specified tool.

REQUIRED TOOL	
VALVE GUIDE REMOVER 5 MM (P/N 529 035 924)	
Hammer	



- 1. Valve guide remover
- 2. Valve guide

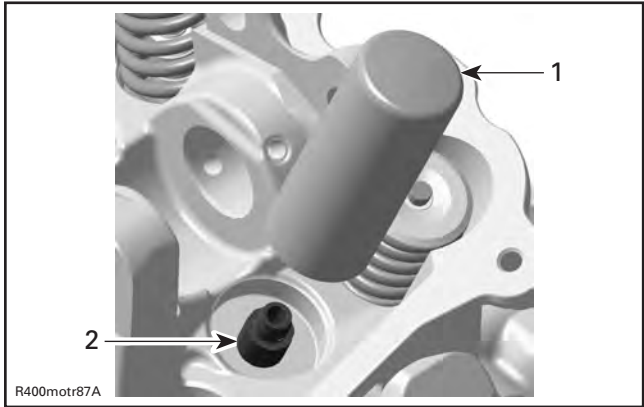
Installing the Valve Guide

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

Clean the valve guide bore before reinstalling the valve guide into cylinder head.

Install valve guide.

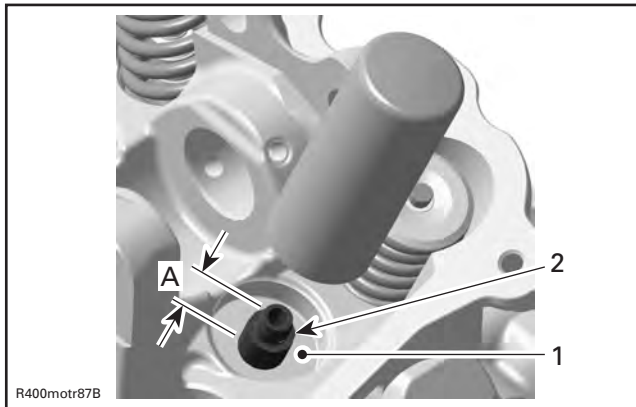
REQUIRED TOOL	
VALVE GUIDE INSTALLER (P/N 529 036 140)	



- 1. Valve guide installer
- 2. Valve guide

NOTE: Apply LOCTITE 767 (ANTISEIZE LUBRICANT) (P/N 293 800 070) on valve guide prior to install it into the cylinder head.

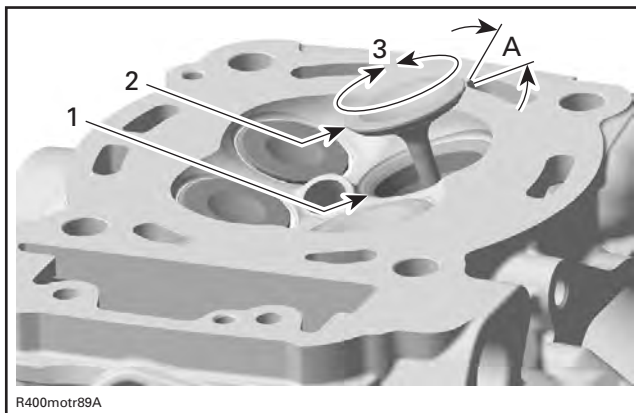
NOTICE Push valve guide in the cold cylinder head as per following illustration.



1. Thrust surface of cylinder head
2. Valve guide
- A. Measurement from thrust surface to valve guide top

VALVE GUIDE (MEASUREMENT A)	
NEW	14.00 mm to 14.40 mm (.5512 in to .5669 in)

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



1. Valve seat
2. Valve face (contact surface to valve seat)
3. Turn valve while pushing against cylinder head
- A. Valve seat angle 45°

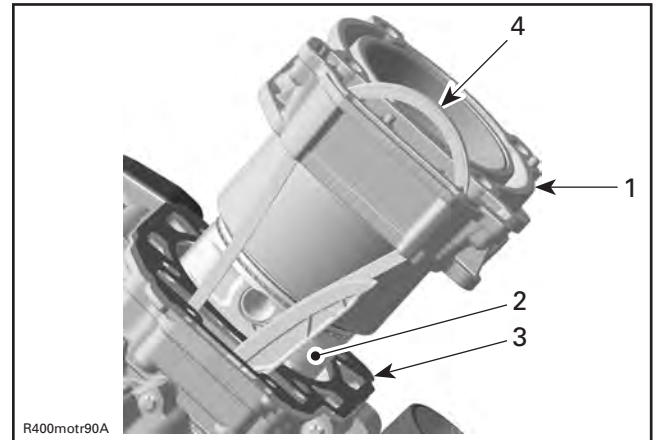
NOTE: Ensure to seat valves properly. Apply marking paste to ease checking contact pattern. Repeat procedure until valve seat/valve face fits together.

CYLINDER

Removing the Cylinder

1. Refer to the *TIMING CHAIN* subsection to remove the following parts:
 - Chain tensioner
 - Camshaft timing gear.

2. Remove the cylinder head (see *CYLINDER HEAD* in this subsection).
3. Pull cylinder.
4. Discard cylinder base gaskets.



1. Cylinder
2. Piston assembly
3. Cylinder base gasket
4. Camshaft timing chain

Inspecting the Cylinder

Check cylinder for cracks, scoring and wear ridges on the top and bottom of the cylinder. If so, replace cylinder.

Cylinder Taper

Measure cylinder bore at recommended positions.



- A. First measurement (from cylinder bottom)
- B. Second measurement
- C. Third measurement

Section 03 ENGINE, CVT AND GEARBOX (570)

Subsection 08 (TOP END)

CYLINDER TAPER MEASUREMENTS	
MEASUREMENT	SPECIFICATION
A	5 mm (.197 in)
B	63 mm (2.48 in)
C	37 mm (1.46 in)

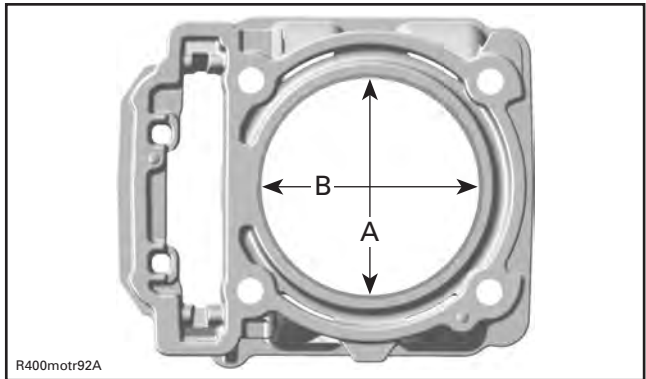
CYLINDER TAPER SPECIFICATION	
NEW (MAXIMUM)	0.038 mm (.0015 in)
SERVICE LIMIT	0.090 mm (.0035 in)

Distance between measurements should not exceed the service limit. Otherwise, replace cylinder and piston rings.

Cylinder Out of Round

Measure cylinder diameter in piston axis direction from top of cylinder. Take another measurement 90° from first one and compare.

NOTE: Take the same measuring points like described in *CYLINDER TAPER* above.



A. Perpendicular to crankshaft axis
B. Parallel to crankshaft axis

CYLINDER OUT OF ROUND	
NEW (MAXIMUM)	0.015 mm (.0006 in)
SERVICE LIMIT	0.020 mm (.0008 in)

Installing the Cylinder

Reverse the removal procedure. Pay attention to the following details.

NOTICE Always replace cylinder base gasket before installing the cylinder.

NOTE: Make sure piston rings are properly spaced, refer to *PISTON RINGS* in this subsection.

Apply engine oil:

- In the bottom area of the cylinder bore

- On the piston rings
- On the piston ring compressor.

Compress piston rings.

REQUIRED TOOL
Piston ring compressor with band width of 15 mm to 20 mm (.59 in to .79 in)

First mount cylinder 2.

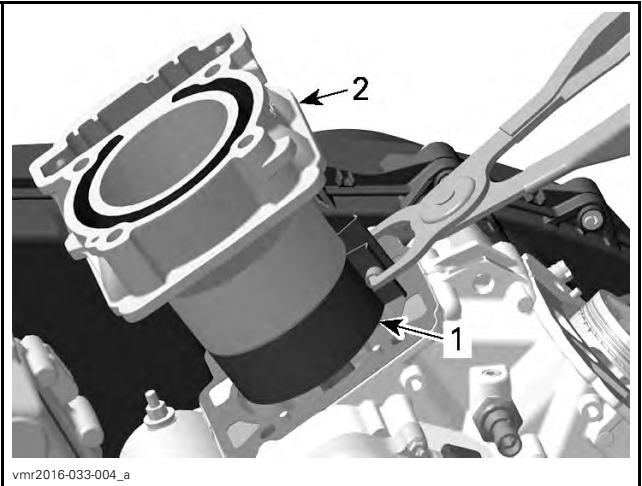
NOTE: The cylinder can not be pushed fully over the piston unless the piston is located at TDC.

Then remove the CRANKSHAFT LOCKING BOLT (P/N 529 035 617).

Crank the engine further and position piston 1 at TDC.

Mount cylinder 1.

Put timing chain through the chain passage, then slide cylinder over piston.



1. Piston ring compressor
2. Cylinder

NOTICE Chain guide has to be fixed between cylinder and cylinder head.

NOTE: After both cylinders are installed, turn crankshaft until piston of cylinder 2 is at TDC and lock crankshaft. Refer to *CRANKSHAFT* in the *BOTTOM END* subsection.

Install cylinder head and the other parts in accordance with the proper installation procedures.

PISTON

Removing the Piston

1. Refer to following procedures in this subsection and remove following parts:
 - Cylinder head
 - Cylinder.

- Place a rag under piston and in the area of timing chain compartment.

⚠ WARNING

Piston circlips are spring loaded.

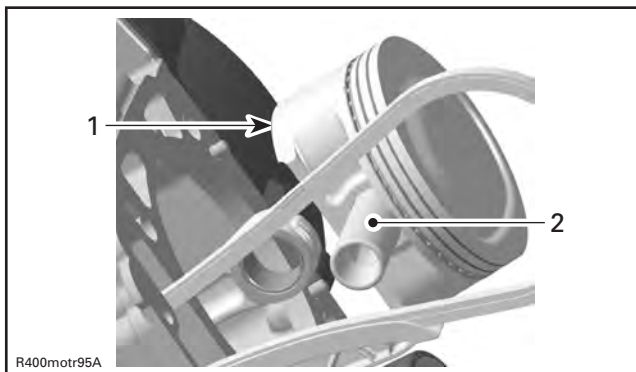
- Remove one piston circlip and discard it.



1. Piston circlip

NOTE: The removal of both piston circlips is not necessary to remove piston pin.

- Push piston pin out of piston.



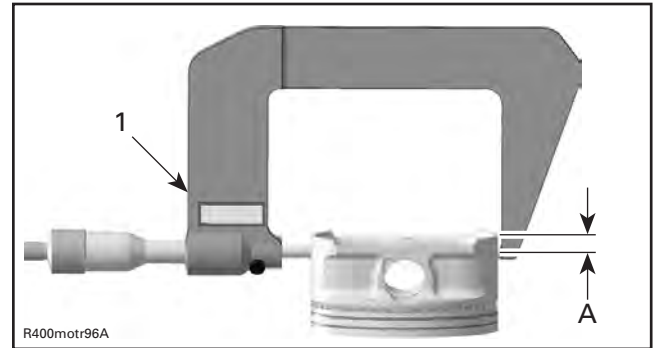
1. Piston
2. Piston pin

- Detach piston from connecting rod.

Inspecting the Piston

Inspect piston for scoring, cracking or other damages. Replace piston and piston rings if necessary.

Using a micrometer, measure piston at 8 mm (.315 in) perpendicularly (90°) to piston pin.



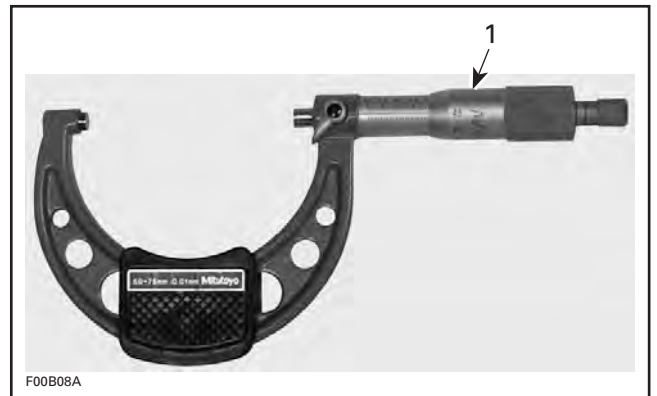
1. Measuring perpendicularly (90°) to piston pin
A. 8 mm (.315 in)

The measured dimension should be as described in the following tables. If not, replace piston.

PISTON MEASUREMENT	
NEW	83.950 mm to 83.966 mm (3.3051 in to 3.3057 in)
SERVICE LIMIT	83.850 mm (3.3012 in)

Piston/Cylinder Clearance

Adjust and lock a micrometer to the piston dimension.

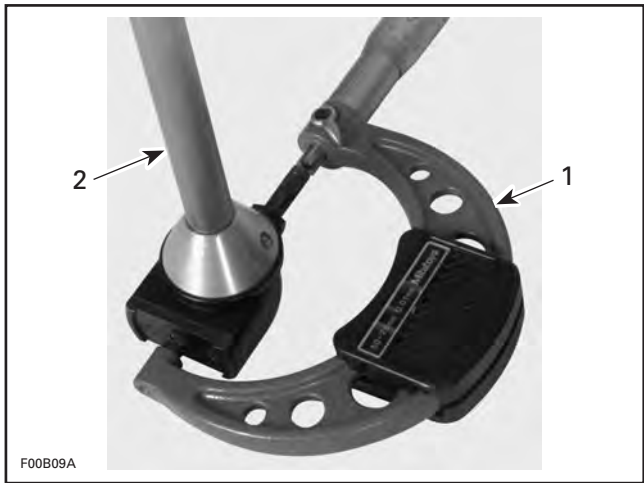


1. Micrometer set to the piston dimension

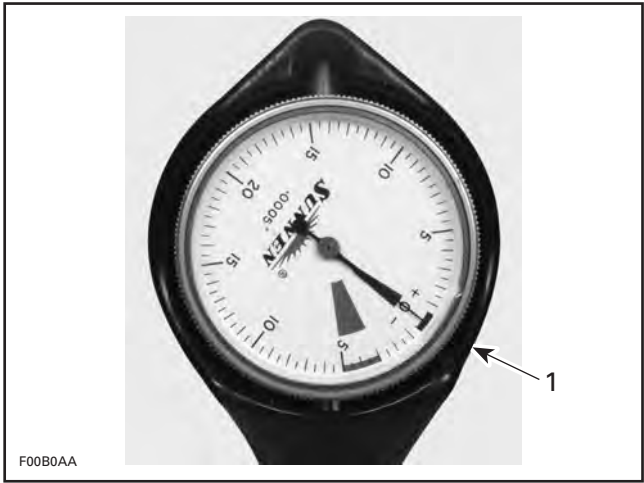
With the micrometer set to the dimension, adjust a cylinder bore gauge to the micrometer dimension and set the indicator to 0 (zero).

Section 03 ENGINE, CVT AND GEARBOX (570)

Subsection 08 (TOP END)



1. Use the micrometer to set the cylinder bore gauge
2. Dial bore gauge



- TYPICAL
1. Indicator set to 0 (zero)

Position the dial bore gauge 20 mm (.787 in) above cylinder base, measuring perpendicularly (90°) to piston pin axis.

Read the measurement on the cylinder bore gauge. The result is the exact piston/cylinder wall clearance.

PISTON/CYLINDER CLEARANCE	
NEW	0.057 mm to 0.087 mm (.0022 in to .0034 in)
SERVICE LIMIT	0.130 mm (.0051 in)

NOTE: Make sure used piston is not worn.
If clearance exceeds specified tolerance, replace piston by a new one and measure piston/cylinder clearance again.

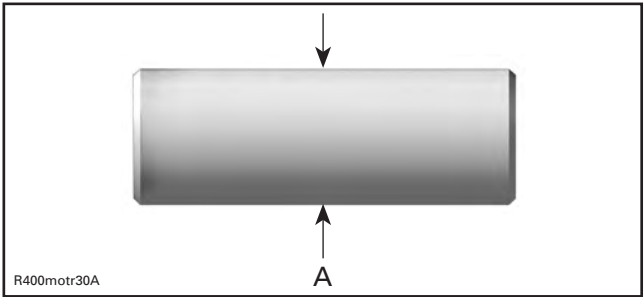
NOTE: Make sure the cylinder bore gauge indicator is set exactly at the same position as with the micrometer, otherwise the reading will be false.

Connecting Rod/Piston Pin Clearance

Using synthetic abrasive woven, clean piston pin from deposits.

Inspect piston pin for scoring, cracking or other damages.

Measure piston pin. See the following illustration for the proper measurement positions.

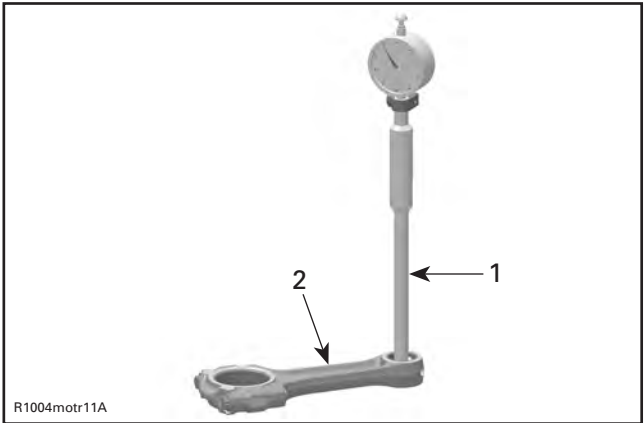


A. Piston pin diameter

PISTON PIN DIAMETER	
NEW	19.996 mm to 20.000 mm (.7872 in to .7874 in)
SERVICE LIMIT	19.980 mm (.7866 in)

Replace piston pin if diameter is out of specifications.

Measure inside diameter of connecting rod small end bushing.



1. Bore gauge
2. Connecting rod

CONNECTING ROD SMALL END DIAMETER	
NEW	20.010 mm to 20.020 mm (.7878 in to .7882 in)
SERVICE LIMIT	20.060 mm (.7898 in)

Replace connecting rod if diameter of connecting rod small end is out of specifications. Refer to *BOTTOM END* subsection for removal procedure.

Compare measurements to obtain the connecting rod/piston pin clearance.

CONNECTING ROD/ PISTON PIN CLEARANCE	
SERVICE LIMIT	0.080 mm (.0031 in)

Installing the Piston

Reverse the removal procedure. Pay attention to the following details.

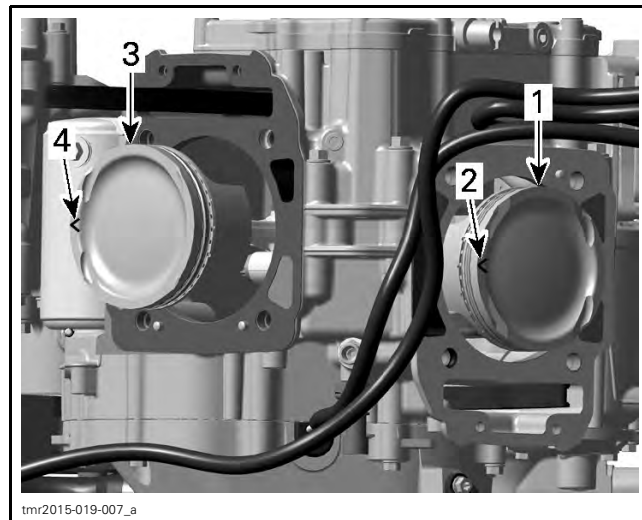
Apply engine oil on the piston pin.

Insert piston pin into piston and connecting rod.

For each cylinder, install piston with the punched arrow on piston dome pointing towards the rear side of the engine.

Front cylinder: Mark on top of piston must show to intake side.

Rear cylinder: Mark on top of piston must show to exhaust side.



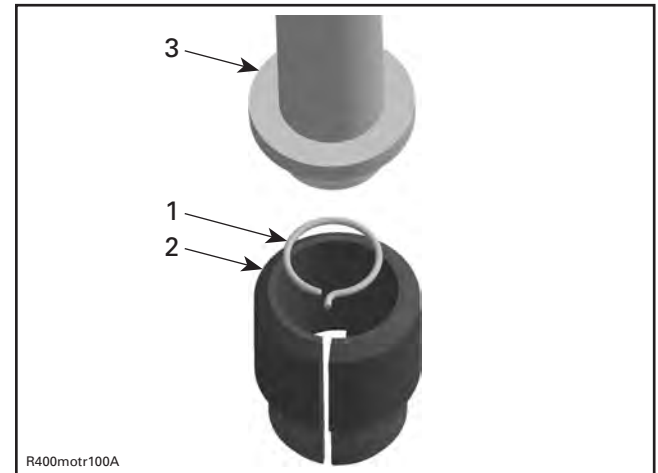
1. Piston of cylinder 1
2. Mark on piston must show to intake side of cylinder 1
3. Piston of cylinder 2
4. Mark on piston must show to exhaust side of cylinder 2

Use the piston appropriate circlip installer to assemble the NEW piston circlip as per following procedure:

REQUIRED TOOL	
PISTON CIRCLIP INSTALLER (P/N 529 035 921)	

NOTICE Always replace disassembled piston circlip(s) by NEW ones. Place a rag on cylinder base to avoid dropping the circlip inside the engine.

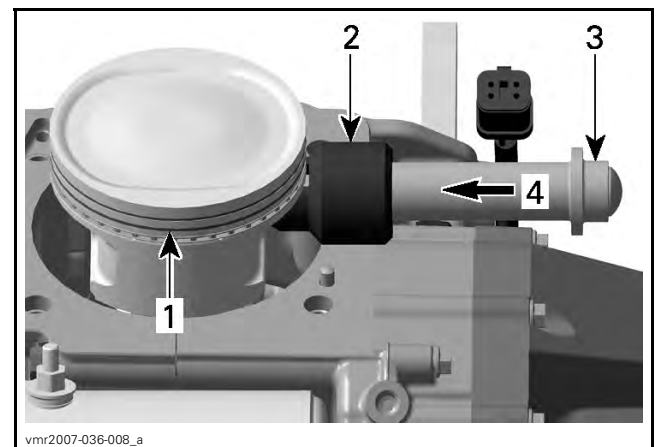
Place circlip in sleeve as per following illustration.



1. Circlip
2. Sleeve
3. Assembly jig from piston clip installer

Push taper side of assembly jig until circlip reaches middle of sleeve.

Align sleeve with piston pin axis and push assembly jig until circlip engages in piston.



1. Hold piston while pushing circlip in place
2. Sleeve
3. Assembly jig
4. Direction to push circlip

NOTE: Take care that the hook of the piston circlip is positioned properly.

Section 03 ENGINE, CVT AND GEARBOX (570)

Subsection 08 (TOP END)



CORRECT POSITION OF THE PISTON CIRCLIP

PISTON RINGS

Removing the Piston Rings

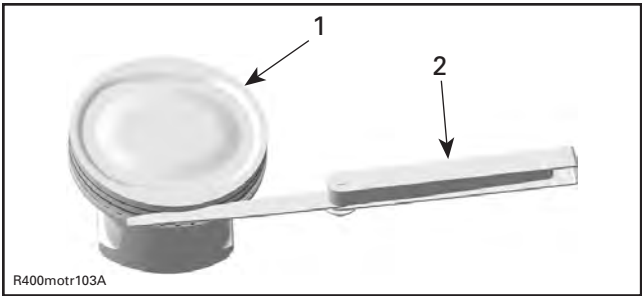
Remove the piston (see *PISTON* in this subsection).

Inspecting the Piston Rings

Ring/Piston Groove Clearance

Using a feeler gauge measure each ring/piston groove clearance. If the clearance is too large, the piston and the piston rings should be replaced.

RING/PISTON GROOVE CLEARANCE	
UPPER COMPRESSION RING	
NEW	0.025 mm to 0.070 mm (.001 in to .0028 in)
SERVICE LIMIT	0.100 mm (.0039 in)
LOWER COMPRESSION RING	
NEW	0.020 mm to 0.060 mm (.0008 in to .0024 in)
SERVICE LIMIT	0.150 mm (.0059 in)
OIL SCRAPER RING	
NEW	0.010 mm to 0.180 mm (.0004 in to .0071 in)
SERVICE LIMIT	0.250 mm (.0098 in)



- 1. Piston
- 2. Feeler gauge

Ring End Gap

RING END GAP	
UPPER COMPRESSION RING	
NEW	0.10 mm to 0.30 mm (.004 in to .012 in)
SERVICE LIMIT	0.40 mm (.016 in)
LOWER COMPRESSION RING	
NEW	0.35 mm to 0.55 mm (.014 in to .022 in)
SERVICE LIMIT	0.85 mm (.033 in)
OIL SCRAPER RING	
NEW	0.20 mm to 0.70 mm (.008 in to .028 in)
SERVICE LIMIT	1.00 mm (.039 in)

To measure the ring end gap place the ring in the cylinder in the area of 8 mm to 16 mm (5/16 in to 5/8 in) from top of cylinder.

NOTE: In order to correctly position the ring in the cylinder, use piston as a pusher.

Using a feeler gauge, check ring end gap. Replace ring if gap exceeds specified tolerance.

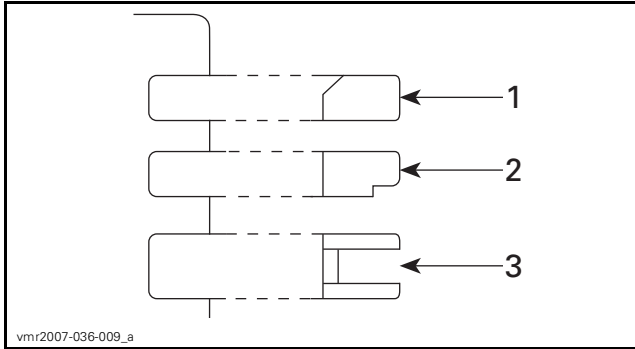
Installing the Piston Rings

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

NOTE: First install spring and then rings of oil scraper ring.

NOTE: Use a ring expander to prevent breakage during installation. The oil ring must be installed by hand.

Install the oil scraper ring first, then the lower compression ring with the word "N and TOP " facing up, then the upper compression ring with the word "N and TOP" facing up.

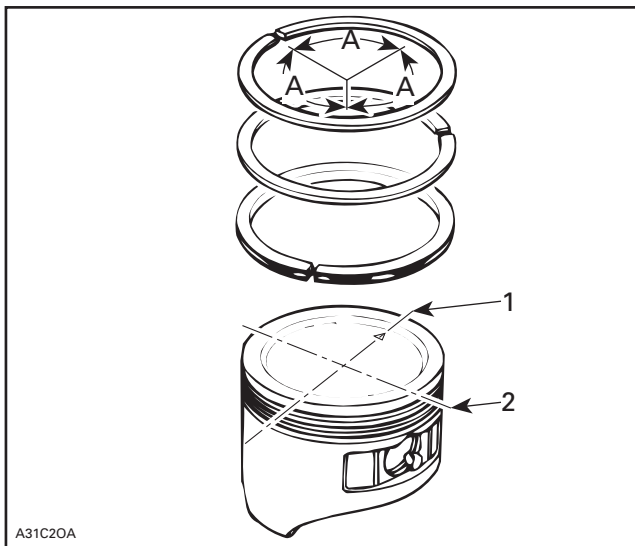


1. Upper compression ring
2. Lower compression ring
3. Oil scraper ring

NOTICE Ensure that top and second rings are not interchanged.

Check that rings rotate smoothly after installation.

Space the piston ring end gaps 120° apart and do not align the gaps with the piston pin bore or the thrust side axis.



1. DO NOT align ring gap with piston thrust side axis
2. DO NOT align ring gap with piston pin bore axis
- A. 120°

TIMING CHAIN

SERVICE TOOLS

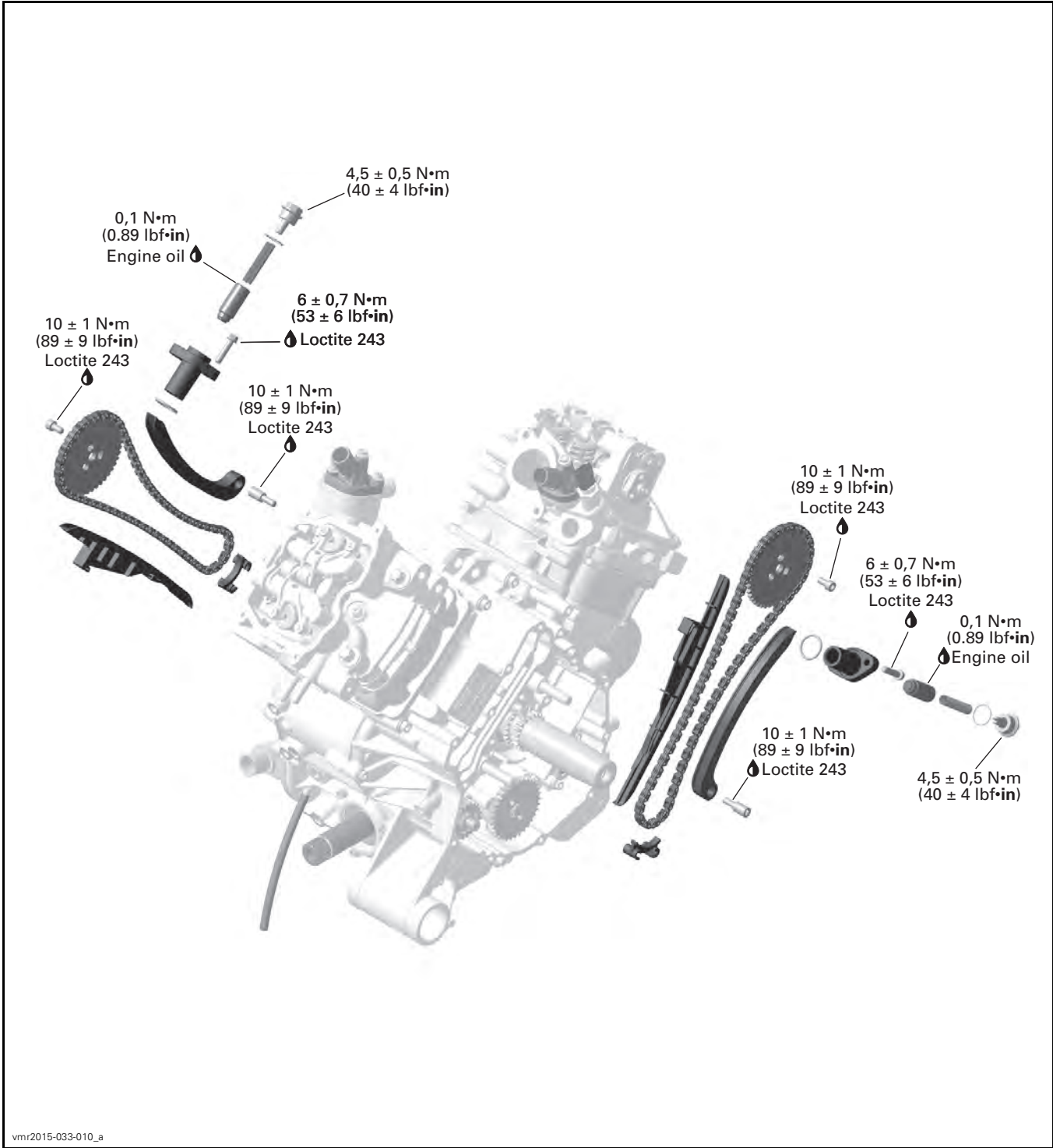
Description	Part Number	Page
CAMSHAFT TIMING TOOL.....	529 036 268	117
CRANKSHAFT TDC POSITION TOOL.....	529 036 201	117, 121

SERVICE PRODUCTS

Description	Part Number	Page
LOCTITE 243 (BLUE).....	293 800 060	118, 123

Section 03 ENGINE, CVT AND GEARBOX (570)

Subsection 09 (TIMING CHAIN)



TROUBLESHOOTING

UNUSUAL ENGINE NOISE OR VIBRATION

1. **IMPROPER VALVE CLEARANCE ADJUSTMENT AND/OR WORN OUT ROCKER ARM(S)**
- *Readjust valve clearance and/or replace defective part(s), refer to TOP END subsection.*
2. **DEFECTIVE CHAIN TENSIONER**
- *Replace chain tensioner.*
3. **WORN OUT TIMING CHAIN GUIDE(S)**
- *Replace timing chain guide(s).*
4. **STRETCHED TIMING CHAIN OR WORN OUT TIMING GEARS**
- *Replace timing chain and timing gears.*
5. **LOOSE TIMING GEAR RETAINING SCREWS**
- *Retighten screws to recommended torque.*
6. **INCORRECT CAMSHAFT TIMING**
- *Replace damaged components and readjust camshaft timing.*

ENGINE LACKS ACCELERATION OR POWER

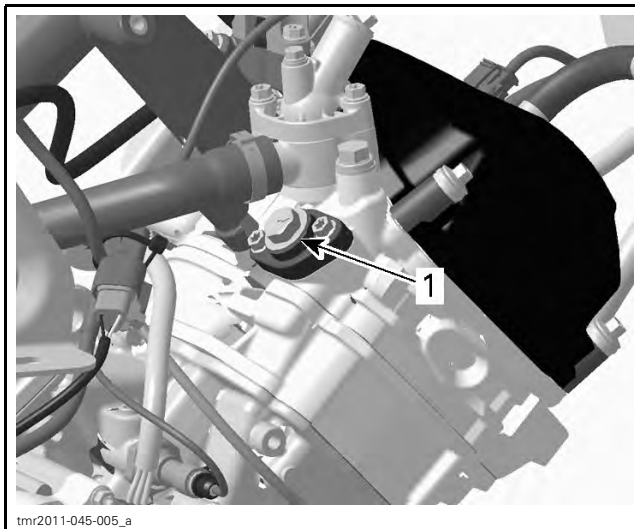
1. **INCORRECT CAMSHAFT TIMING**
- *Replace damaged components and readjust camshaft timing.*

PROCEDURES

TIMING CHAIN TENSIONERS

Timing Chain Tensioner Location

The timing chain tensioner is located on the back of each cylinder head.



1. Timing chain tensioner

Timing Chain Tensioner Access

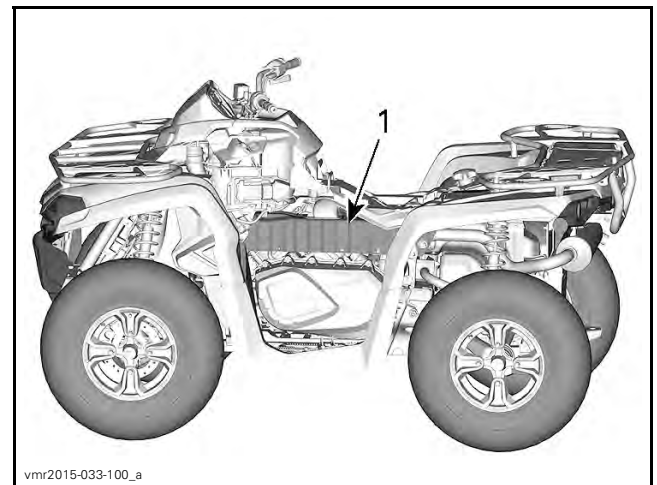
For the front cylinder chain tensioner, refer to *BODY* subsection and remove the following:

- Seat
- RH side panel and extension.

For the rear cylinder chain tensioner, refer to *BODY* subsection and remove the following:

- Seat
- LH side panel and extension.

For the rear cylinder chain tensioner, also remove the outer exhaust system heat shield. Refer to *EXHAUST SYSTEM* subsection.



1. Heat shield to remove

Removing the Timing Chain Tensioner

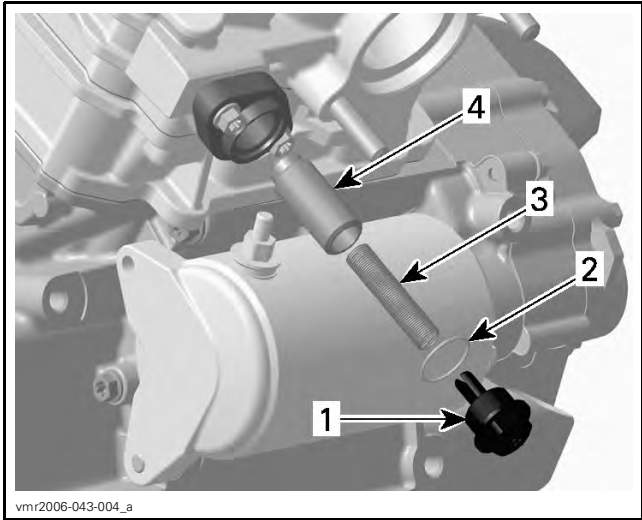
1. Make sure the applicable piston is set to TDC ignition. Refer to *CAMSHAFT TIMING GEARS* in this subsection.
2. Carefully remove chain tensioner screw plug and release spring tension.

⚠ CAUTION Tensioner is spring loaded.

3. Remove:
 - O-ring
 - Spring
 - Chain tensioner plunger.

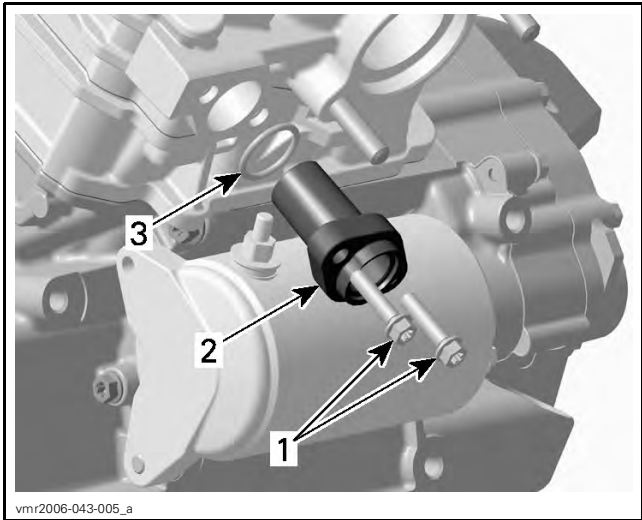
Section 03 ENGINE, CVT AND GEARBOX (570)

Subsection 09 (TIMING CHAIN)



- 1. Chain tensioner screw plug
- 2. O-ring
- 3. Spring
- 4. Chain tensioner plunger

4. Remove:
- Chain tensioner housing retaining screws
 - Chain tensioner housing
 - O-ring.



- 1. Screws
- 2. Chain tensioner housing
- 3. O-ring

Inspecting the Timing Chain Tensioner

Check chain tensioner housing and screw plug for cracks or other damages. Replace if necessary.

Check chain tensioner plunger for freedom of movement and/or scoring.

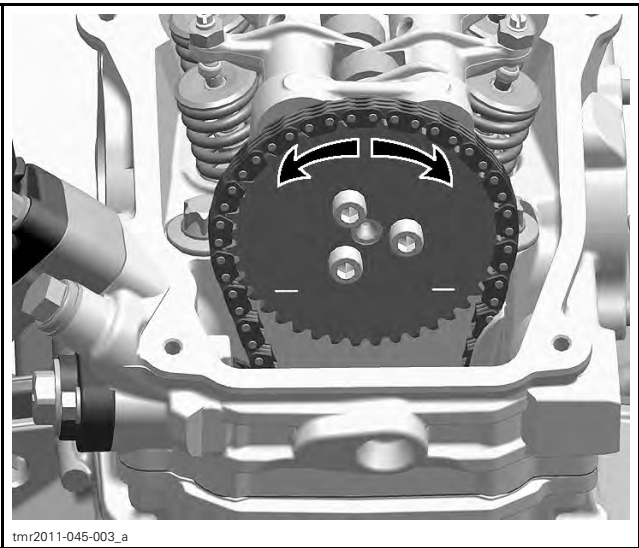
Ensure O-rings are not brittle, cracked or hard. Replace if necessary.

Check spring condition. Replace if bent, broken or worn.

Installing the Timing Chain Tensioner

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

NOTE: Before installing the chain tensioner, make sure the camshaft timing gear can be moved back and forth.



MOVE GEAR BACK AND FORTH

1. Apply engine oil on the chain tensioner plunger before installation.
2. Slightly turn the camshaft timing gear in order to move the timing chain excess play to the tensioner side.
3. Slightly screw in the plunger until the timing chain does not allow back and forth movement of the camshaft timing gear.
4. Screw the plunger in an additional 1/8 turn to obtain the required specified torque.

TIMING CHAIN TENSIONER ADJUSTMENT (TIGHTENING TORQUE)
0.1 N•m (.9 lbf•in)

NOTICE Improper adjustment of the timing chain will lead to severe engine damage.

5. Insert the spring on one side into the slot of the chain tensioner screw plug, and on the other side, into the plunger.

NOTE: Turn spring only clockwise in order to fit the spring end into the notch of the plunger to avoid loosening the plunger during spring installation. Do not preload the spring.

NOTE: Do not forget to place the O-ring on chain tensioner screw plug.

- Then compress the spring and screw the plug in.

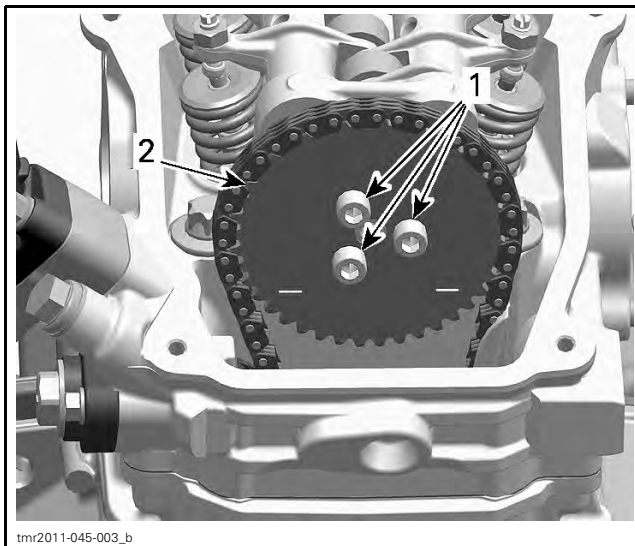
NOTE: To avoid overstressing the timing chain, the chain tensioner screw plug must engage in the tensioner bore threads within the first full turn.

- Remove locking tool and install all other removed parts.
- Tighten the chain tensioner screw plug.

CAMSHAFT TIMING GEARS

Removing the Camshaft Timing Gear

- Remove valve cover, refer to *TOP END* subsection.
- Set applicable piston to TDC ignition and lock magneto flywheel. Refer to *CAMSHAFT TIMING* in this subsection.
- Remove timing chain tensioner. Refer to *TIMING CHAIN TENSIONERS* in this subsection.
- Remove camshaft timing gear retaining screws.



TYPICAL

- Camshaft timing gear retaining screws
- Camshaft timing gear

- Remove the camshaft timing gear.

NOTE: Secure timing chain with a piece of wire.

Inspecting the Camshaft Timing Gear

Check camshaft timing gear for wear or deterioration.

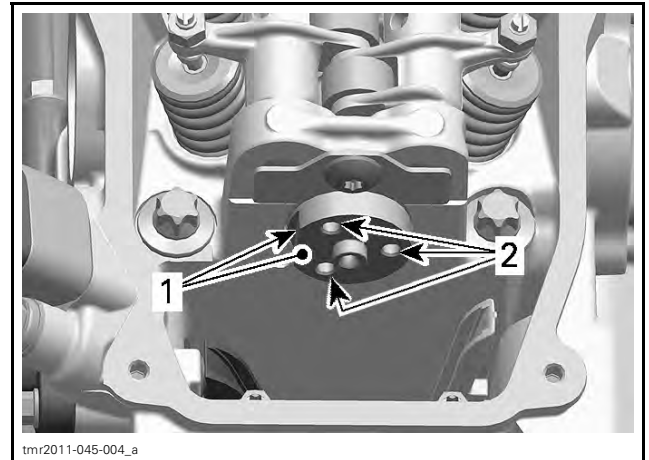
If timing gear is worn or damaged, replace it as a set with the timing chain.

For crankshaft gear inspection, refer to *CRANKSHAFT* in the *BOTTOM END* subsection.

Installing the Camshaft Timing Gear

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

- Clean camshaft mating surface and threads prior to installing camshaft timing gear.



- Camshaft mating surface
- Camshaft screw threads

- Set applicable piston to TDC ignition position and install the crankshaft position tool, refer to *CAMSHAFT TIMING* in this subsection.

REQUIRED TOOL	
CRANKSHAFT TDC POSITION TOOL (P/N 529 036 201)	

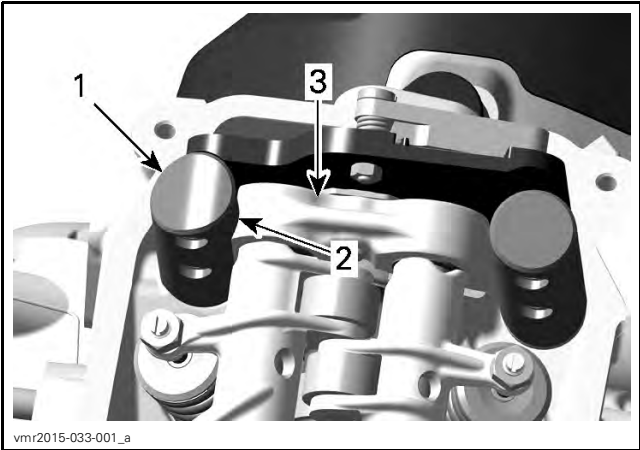
- Install camshaft timing tool on the cylinder head.

REQUIRED TOOL	
CAMSHAFT TIMING TOOL (P/N 529 036 268)	

NOTE: Properly align tube of camshaft timing tool with machined radius on cylinder head.

Section 03 ENGINE, CVT AND GEARBOX (570)

Subsection 09 (TIMING CHAIN)

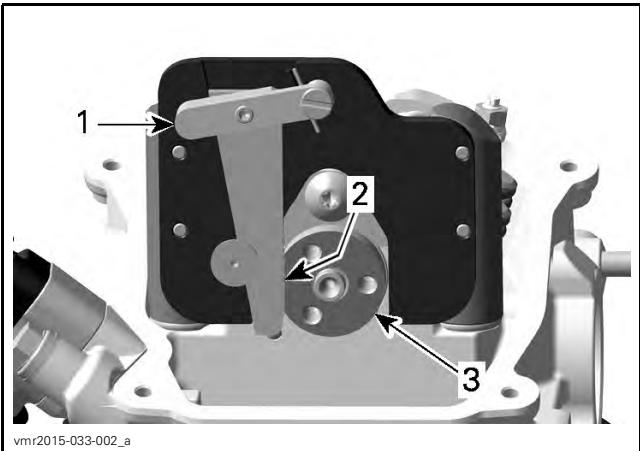


CAMSHAFT TIMING TOOL INSTALLED

- 1. Tube (camshaft timing tool)
- 2. Machined radius (camshaft timing tool)
- 3. Cylinder head

4. Set camshaft to TDC ignition position by aligning the flat portion on the camshaft flange with the tool lever.

NOTE: In addition, to ensure proper camshaft timing, press camshaft timing tool lever downwards.



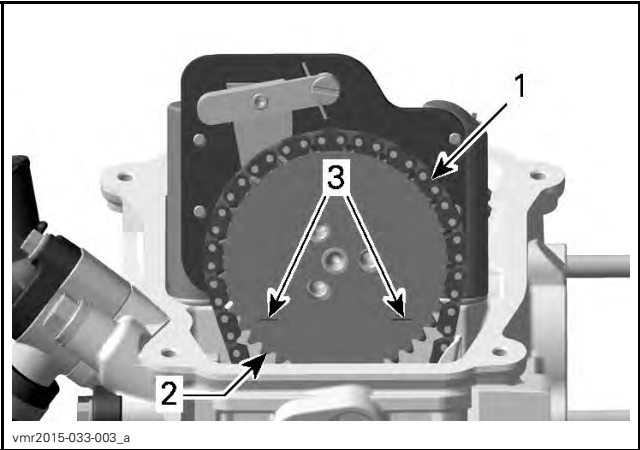
PRESS TOOL LEVER DOWN

- 1. Lever
- 2. Flat portion
- 3. Camshaft

NOTICE Crankshaft and camshaft must be locked at TDC ignition position to place camshaft timing gear and timing chain in the proper position.

5. Place camshaft timing gear and timing chain on the camshaft.

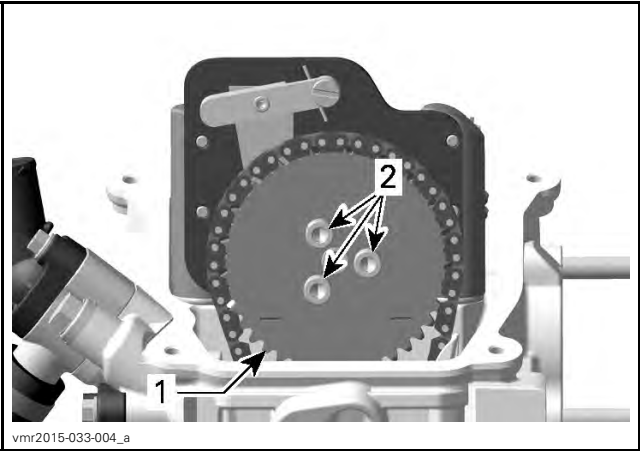
NOTE: The printed marks on the camshaft timing gear must be parallel to the cylinder head base.



- 1. Timing chain
- 2. Camshaft timing gear
- 3. Printed marks on camshaft timing gear

6. Install and adjust timing chain tensioner, refer to *TIMING CHAIN TENSIONER* in this subsection.

7. Install and tighten camshaft timing gear retaining screws to specified torque.



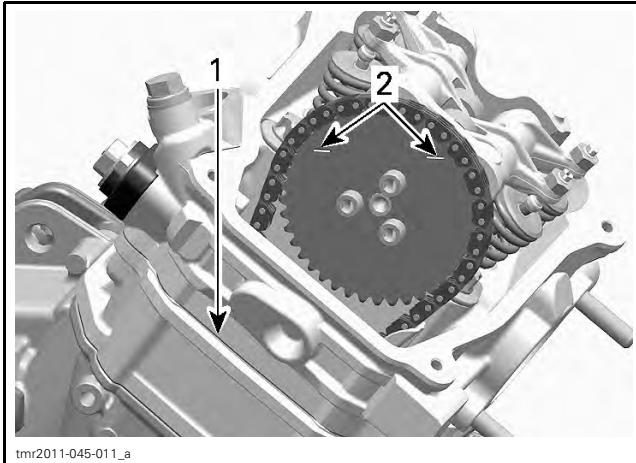
- 1. Camshaft timing gear
- 2. Timing gear retaining screws

SERVICE PRODUCT	
Camshaft timing gear retaining screws	LOCTITE 243 (BLUE) (P/N 293 800 060)
TIGHTENING TORQUE	
Camshaft timing gear retaining screws	10 N•m ± 1 N•m (89 lbf•in ± 9 lbf•in)

8. Remove the camshaft timing tool.

Camshaft Timing

NOTE: If a piston (cylinder 1 or 2) is set to TDC ignition, the camshaft timing gear of the opposite cylinder must be in the following position.

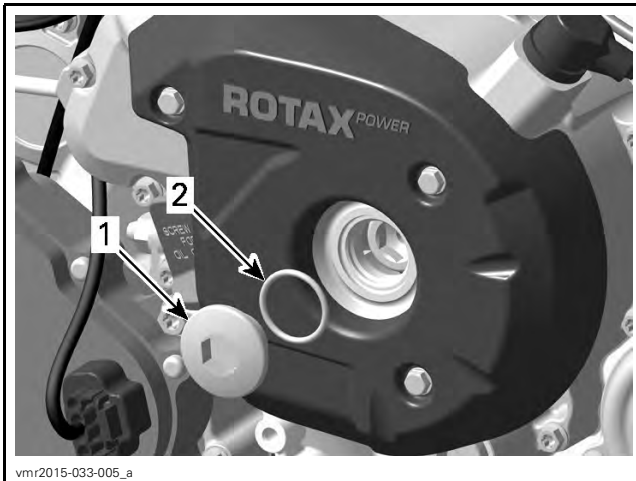


TYPICAL

1. Cylinder head base
2. Marks on timing gear of the opposite cylinder

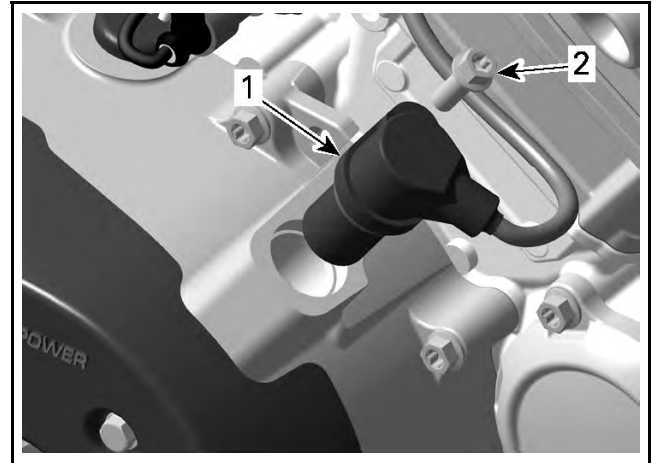
Camshaft Timing Piston No. 2 (rear)

1. Remove spark plugs of both cylinders.
2. Remove valve covers of both cylinders.
3. Remove the screw plug and O-ring from magneto cover.



1. Screw plug
2. O-ring

4. Remove the crankshaft position sensor (CPS).

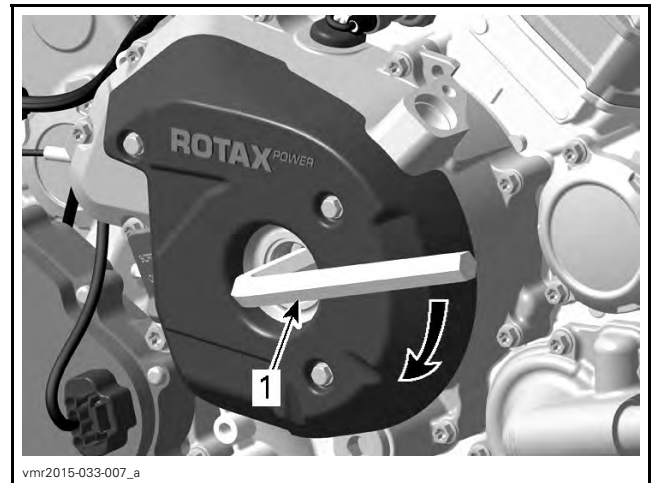


1. CPS
2. Screw

5. Set rear piston no. 2 to TDC ignition by turning the crankshaft clockwise.

REQUIRED TOOL

Allen key 14 mm



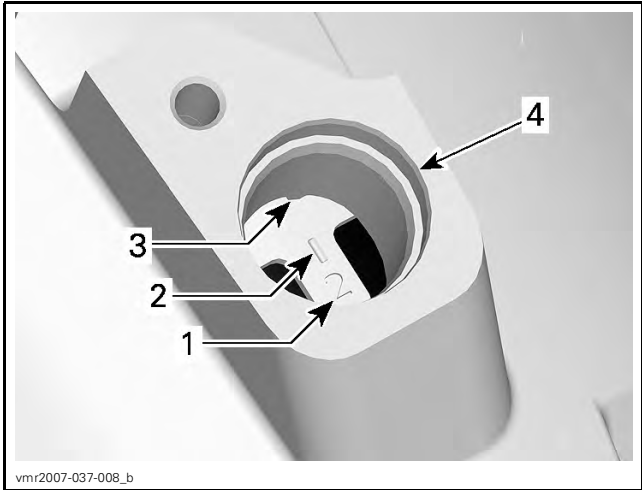
TURN CRANKSHAFT CLOCKWISE TO PISTON NO. 2 TDC

1. Allen key 14 mm

- 5.1 The rear piston is at TDC when it's index mark on the magneto flywheel is aligned with the notch in the magneto cover.

Section 03 ENGINE, CVT AND GEARBOX (570)

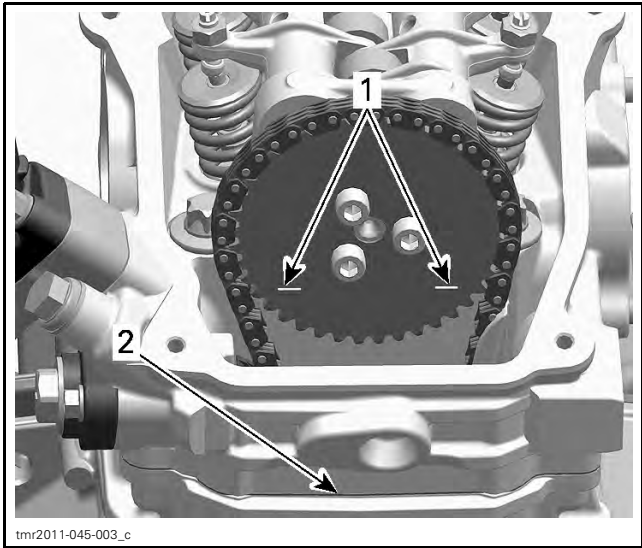
Subsection 09 (TIMING CHAIN)



PISTON NO. 2 AT TDC
1. Piston no. 2 identifier
2. Index mark on magneto flywheel
3. Notch on magneto cover
4. CPS bore in magneto cover

5.2 Confirm printed marks on the camshaft timing gear are parallel with cylinder head base, in the lowest position. In this position the piston is set to TDC ignition.

NOTE: If marks on camshaft timing gear are not as specified, turn crankshaft 360°.



TYPICAL - PISTON AT TDC IGNITION
1. Printed marks on camshaft timing gear
2. Cylinder head base

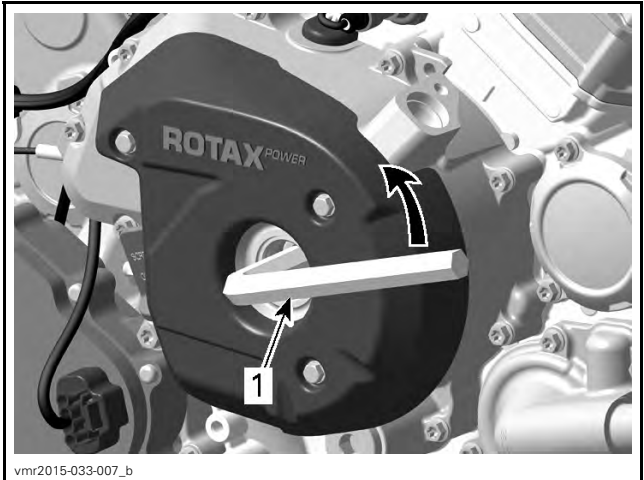
6. Install the crankshaft TDC position tool to lock crankshaft in position. Refer to *CRANKSHAFT TDC POSITION TOOL* in this subsection.

Camshaft Timing Piston No. 1 (front)

- 1. Set rear piston no. 2 to TDC ignition, see *CAMSHAFT TIMING PISTON NO. 2 (REAR)* in this subsection.
- 2. Remove crankshaft TDC position tool.

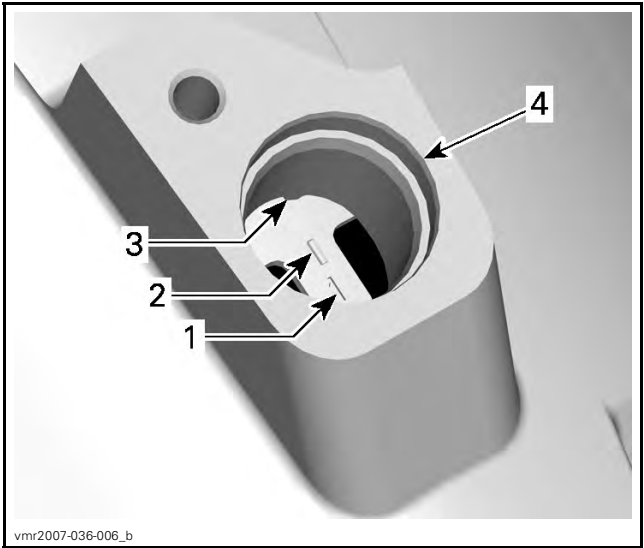
3. To set front piston no. 1 to TDC ignition turn crankshaft 280° counterclockwise.

REQUIRED TOOL
Allen key 14 mm



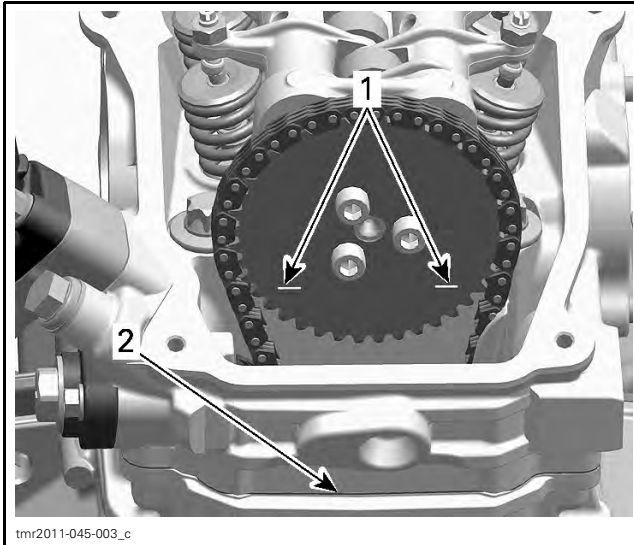
TURN COUNTERCLOCKWISE 280° TO NUMBER 1 PISTON TDC
1. Allen key 14 mm

3.1 The front piston is at TDC when it's index mark on the magneto flywheel is aligned with the notch in the magneto cover.



CYLINDER 1 AT TDC
1. Number 1 piston identifier
2. Index mark "1" on magneto flywheel
3. Notch on magneto cover
4. Crankshaft position sensor bore

3.2 Confirm printed marks on the camshaft timing gear are parallel with cylinder head base, in the lowest position. In this position the piston is set to TDC ignition.



TYPICAL - PISTON AT TDC IGNITION
 1. Printed marks on camshaft timing gear
 2. Cylinder head base

4. Insert the crankshaft TDC position tool to lock crankshaft in position. Refer to *CRANKSHAFT TDC POSITION TOOL INSTALLATION* in this subsection.

Crankshaft TDC Position Tool Installation

NOTICE Never use crankshaft TDC position tool to remove or tighten drive CVT screw or rotor retaining screw. Damage to the teeth of the trigger wheel on the rotor will occur.

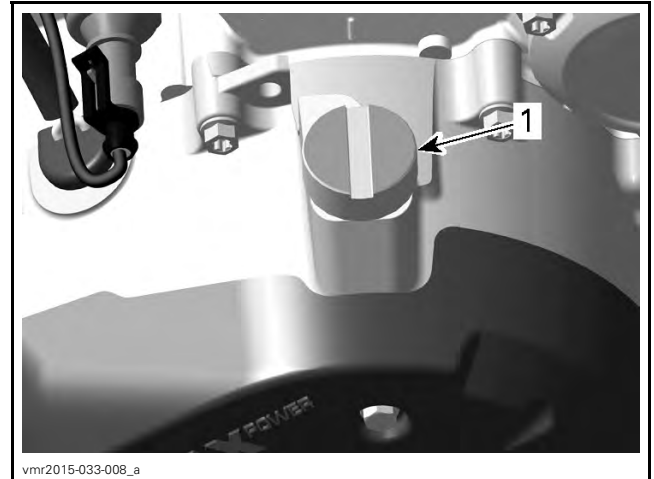
Install tool in magneto cover CPS bore.

REQUIRED TOOL	
CRANKSHAFT TDC POSITION TOOL (P/N 529 036 201)	

NOTE: Make sure to match the teeth on the crankshaft TDC position tool with the magneto rotor.



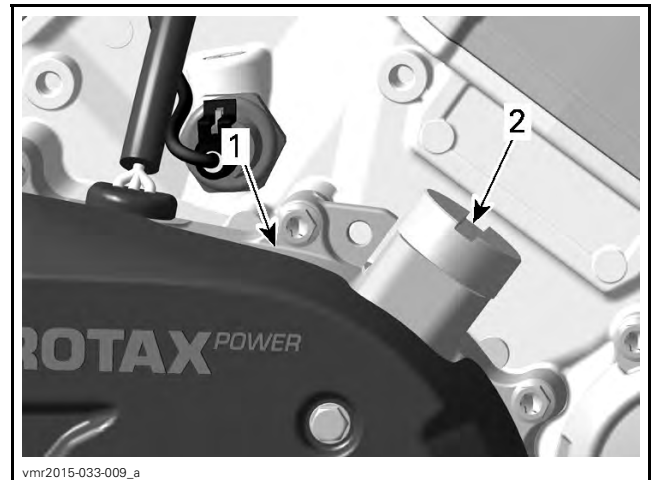
1. Crankshaft TDC position tool teeth (end view)



MAGNETO COVER

1. Crankshaft TDC position tool installed in CPS bore

NOTICE Tool must be fully inserted.



1. Magneto cover
2. TDC position tool

TIMING CHAIN

Timing Chain Location

The engine is equipped with two timing chains.

- MAG side timing chain is located behind the magneto cover.
- PTO side timing chain is located behind the PTO cover.

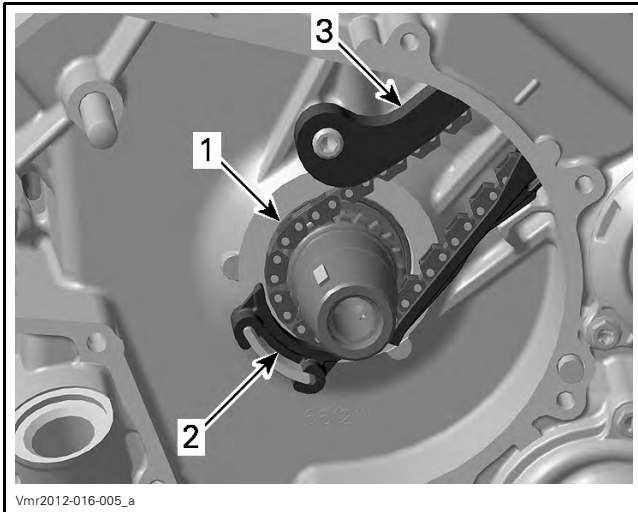
Removing the Timing Chain (MAG Side)

1. Refer to *MAGNETO AND STARTER* subsection and remove following parts:
 - Magneto cover
 - Rotor
 - Sprag clutch gear.

Section 03 ENGINE, CVT AND GEARBOX (570)

Subsection 09 (TIMING CHAIN)

2. Refer to *TOP END* subsection and remove the following part:
 - Valve cover.
3. Refer to following procedures in this subsection and remove following parts:
 - Chain tensioner
 - Camshaft timing gear.
4. Remove timing chain guide (tensioner side) and lower timing chain guide.



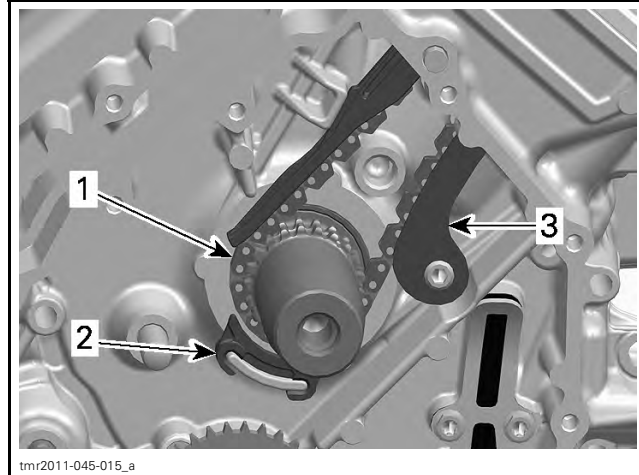
1. Timing chain
2. Lower timing chain guide
3. Timing chain guide (tensioner side)

NOTE: Mark the operating direction of the timing chain and check for excessive radial play before removal. Refer to *TIMING CHAIN INSPECTION*.

5. Carefully pull the timing chain downwards and sideways, then out of the crankcase.

Removing the Timing Chain (PTO Side)

1. Refer to *BOTTOM END* subsection and remove following parts:
 - PTO cover
 - Breather gear
 - Intermediate gear.
2. Refer to *TOP END* subsection and remove following part:
 - Valve cover.
3. Refer to applicable procedures in this subsection and remove following parts:
 - Chain tensioner
 - Camshaft timing gear.
4. Remove timing chain guide (tensioner side) and lower timing chain guide.



1. Timing chain
2. Lower timing chain guide
3. Timing chain guide (tensioner side)

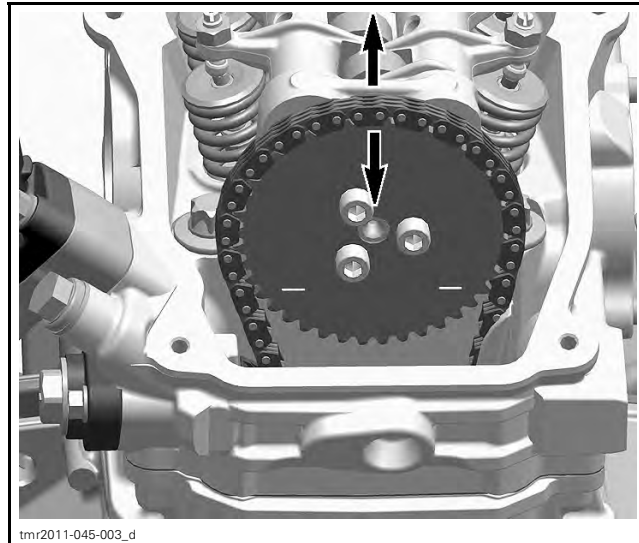
NOTE: Mark the operating direction of the timing chain and check for excessive radial play before removal. Refer to *TIMING CHAIN INSPECTION*.

5. Carefully pull the timing chain sideward and down from the crankcase.

Inspecting the Timing Chain

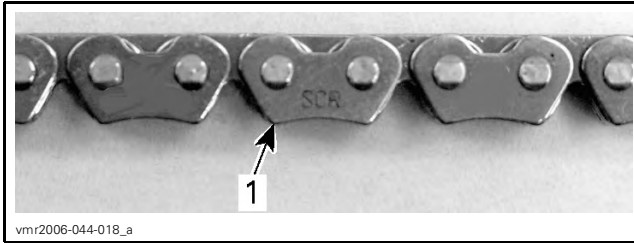
Inspection is the same for both timing chains.

Check timing chain on camshaft timing gear for excessive radial play.



CHECKING TIMING CHAIN RADIAL PLAY

Check chain condition for wear and teeth condition.



1. Timing chain

If chain is excessively worn or damaged, replace it as a set (camshaft timing gear and timing chain). Check timing chain guides for wear, cracks or deformation. Replace as required.

NOTE: Check also the timing chain guide (tensioner side).

Installing the Timing Chain

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

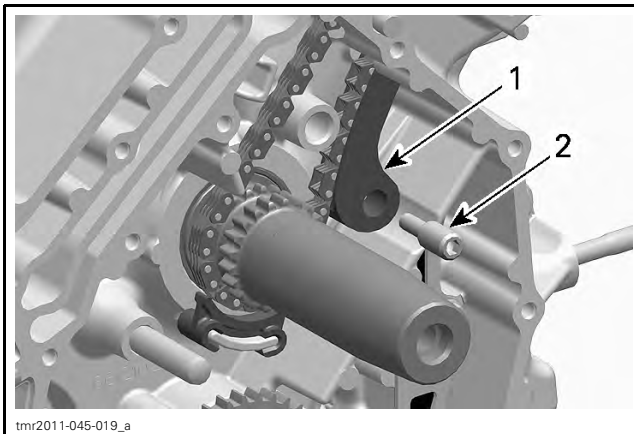
NOTE: Installation is the same for both timing chains.

Install timing chain with camshaft timing gear.

NOTE: Ensure to carry out proper valve timing, refer to *CAMSHAFT TIMING GEARS* in this subsection.

NOTICE Improper valve timing will damage engine components.

TIMING CHAIN GUIDE (TENSIONER SIDE)



1. Timing chain guide (tensioner side)
2. Bearing screw

Removing the Timing Chain Guide (Tensioner Side)

Refer to *TIMING CHAIN* in this subsection.

Inspecting the Timing Chain Guide (Tensioner Side)

Check timing chain guide for wear, cracks or deformation. Replace if necessary.

Installing the Timing Chain Guide (Tensioner Side)

The installation is the reverse of the removal procedure.

SERVICE PRODUCT	
Timing chain guide bearing screw	LOCTITE 243 (BLUE) (P/N 293 800 060)
TIGHTENING TORQUE	
Timing chain guide bearing screw	10 N•m ± 1 N•m (89 lbf•in ± 9 lbf•in)

BOTTOM END

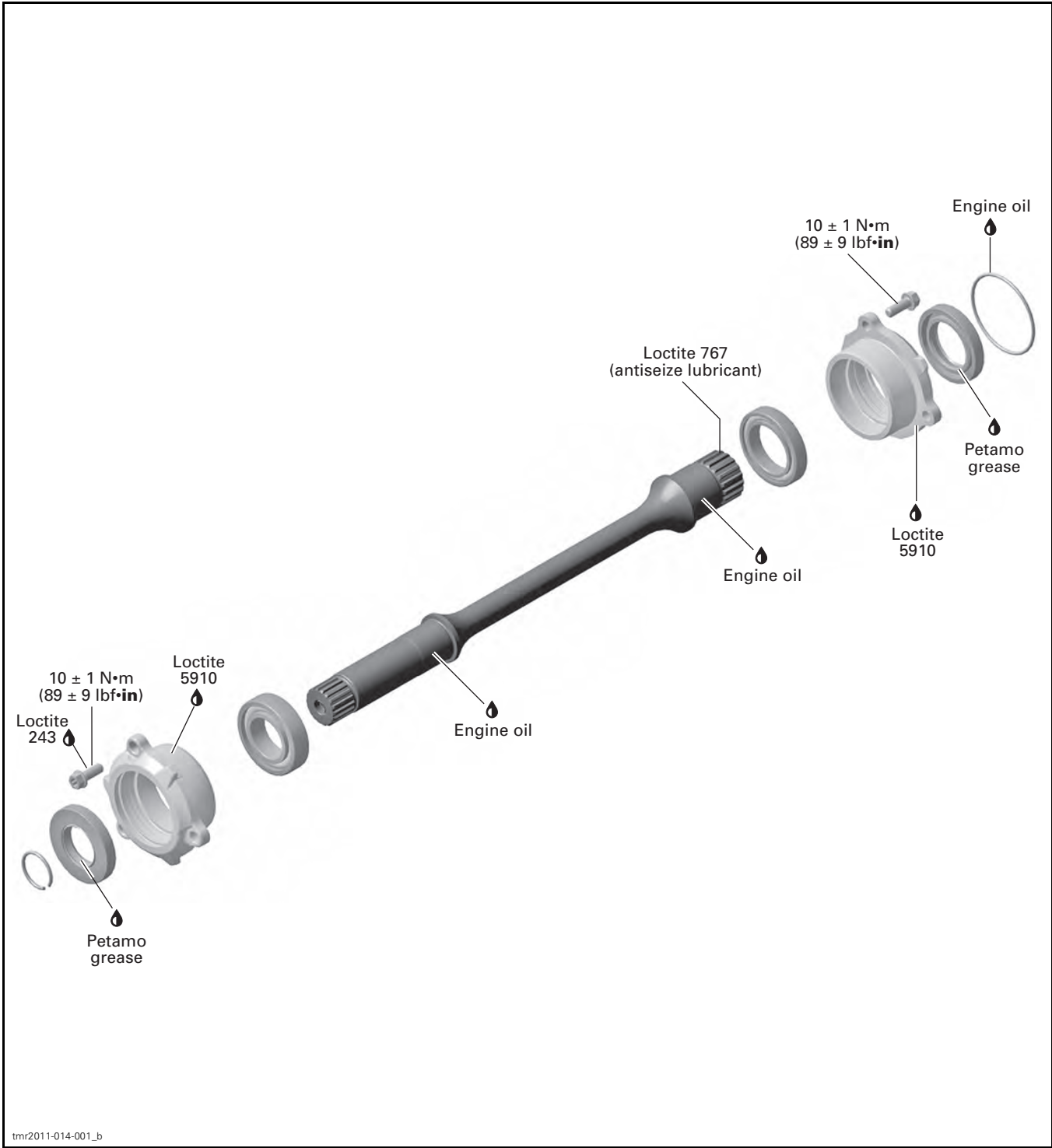
SERVICE TOOLS

Description	Part Number	Page
CRANKCASE SUPPORT MAG/PTO	529 036 031	139
CRANKSHAFT LOCKING BOLT.....	529 035 617	142
DRIVE SHAFT OIL SEAL INSTALLER	529 036 028	131–132
DRIVE SHAFT OIL SEAL PROTECTOR.....	529 036 029	130
PLAIN BEARING REMOVER/INSTALLER	529 035 917	139
PLAIN BEARING REMOVER/INSTALLER	529 036 032	134
PTO COVER OIL SEAL INSTALLER	529 036 033	133

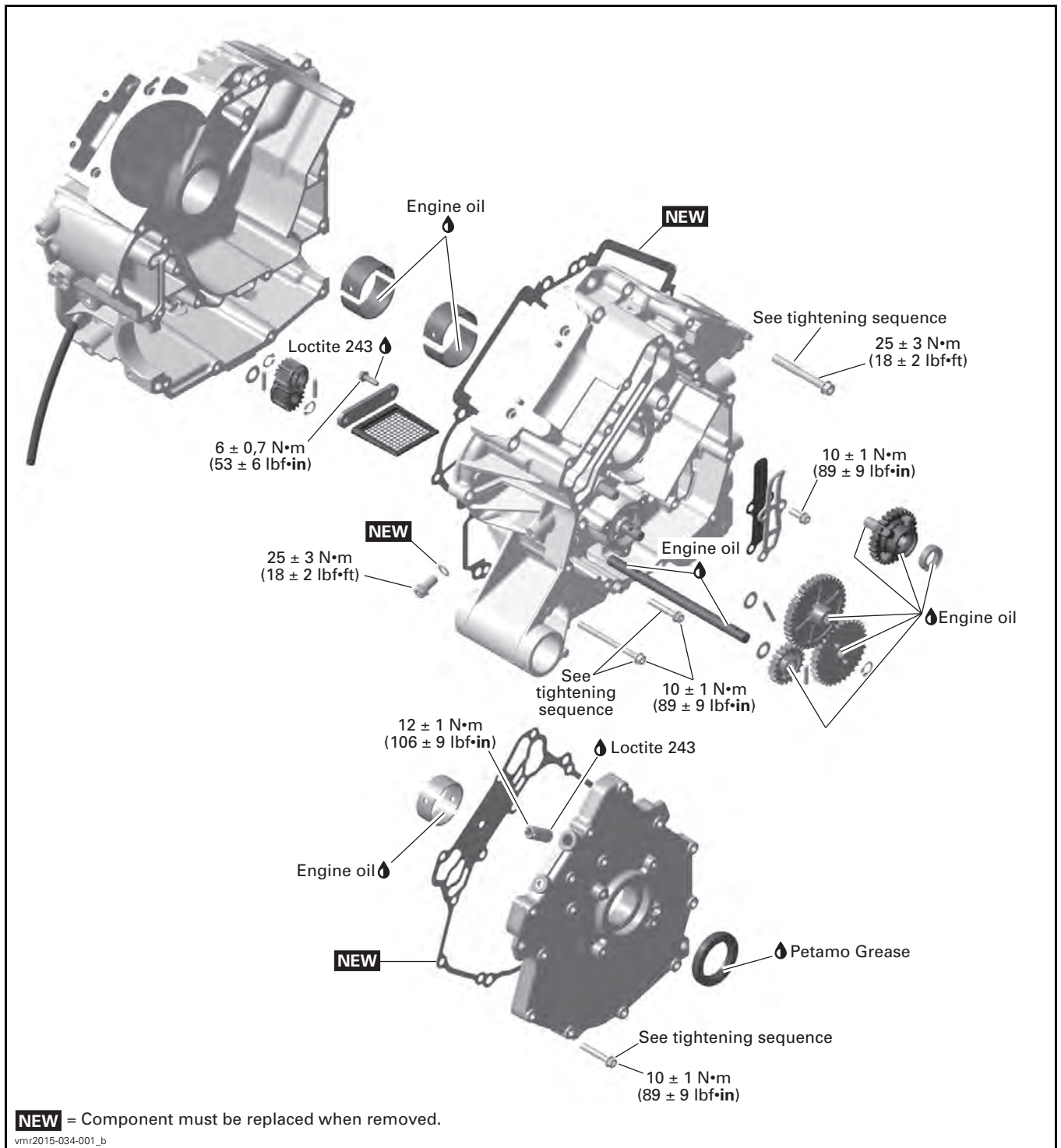
SERVICE PRODUCTS

Description	Part Number	Page
LOCTITE 243 (BLUE).....	293 800 060	131
LOCTITE 5910	293 800 081	130
LOCTITE CHISEL (GASKET REMOVER)	413 708 500	130

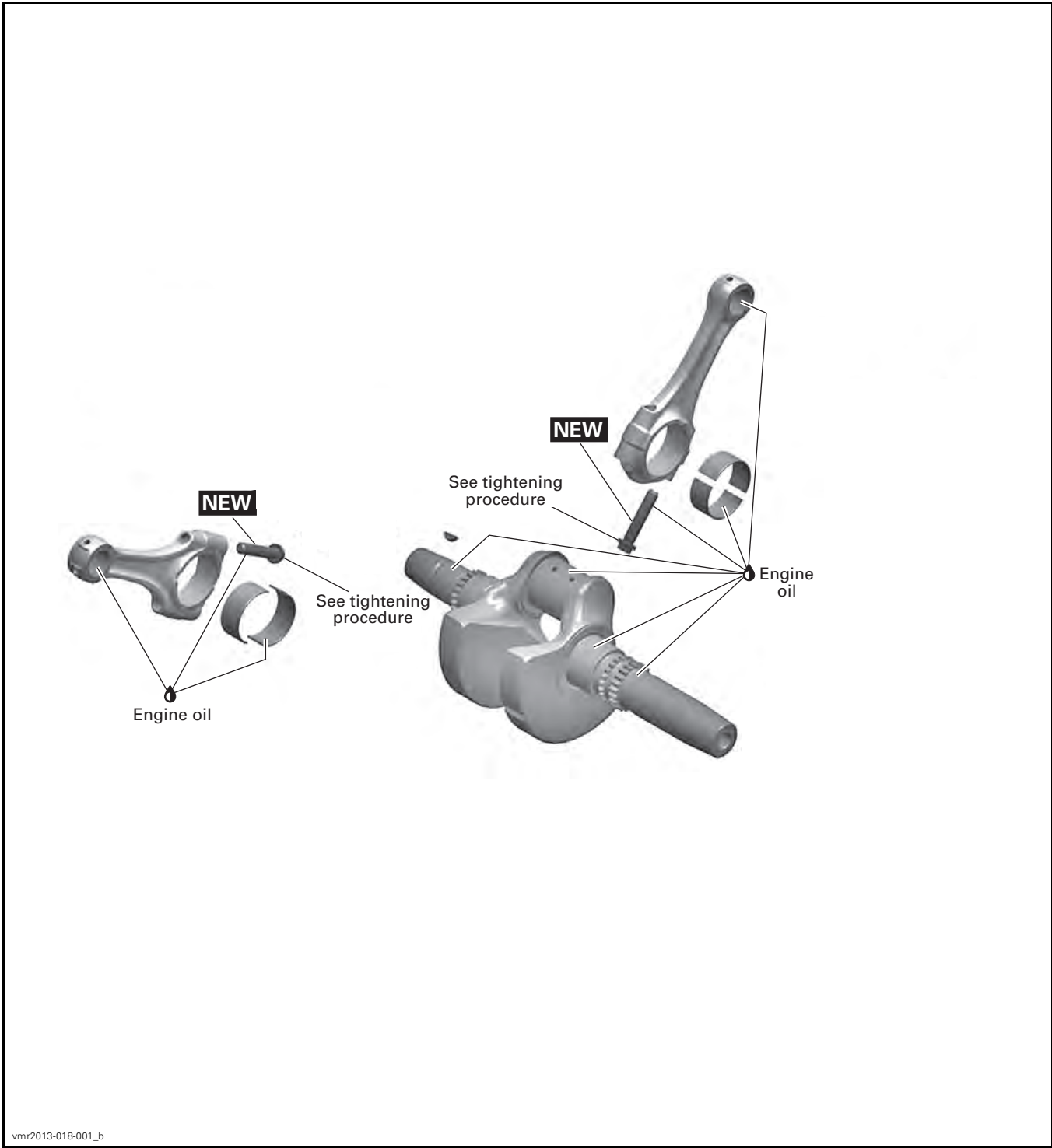
ENGINE DRIVE SHAFT



CRANKCASE AND PTO COVER



CRANKSHAFT



PROCEDURES

IMPORTANT: Note position of parts on disassembly. This may help to find the root cause of a problem. A component that is not replaced should be reinstalled in the same position as originally mounted.

ENGINE DRIVE SHAFT

NOTE: The engine drive shaft transmits the power from the gearbox to the front differential and is located inside the crankcase.

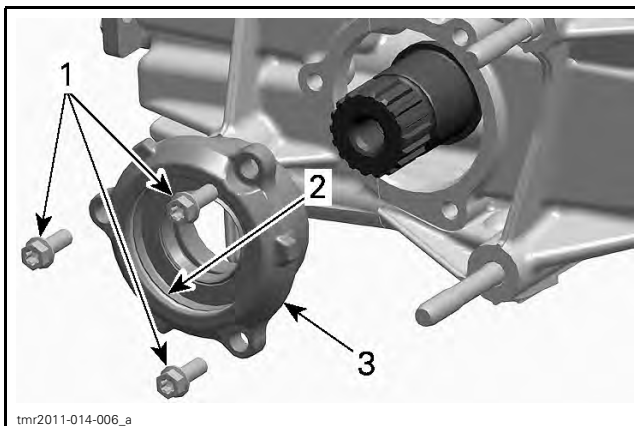
Removing the Engine Drive Shaft

Remove the engine. Refer to *ENGINE REMOVAL AND INSTALLATION* subsection.

Removing the Rear Bearing Cover

Detach gearbox from engine, refer to *GEARBOX AND 4X4 COUPLING UNIT* subsection.

At rear of engine, remove the bearing cover and its O-ring.

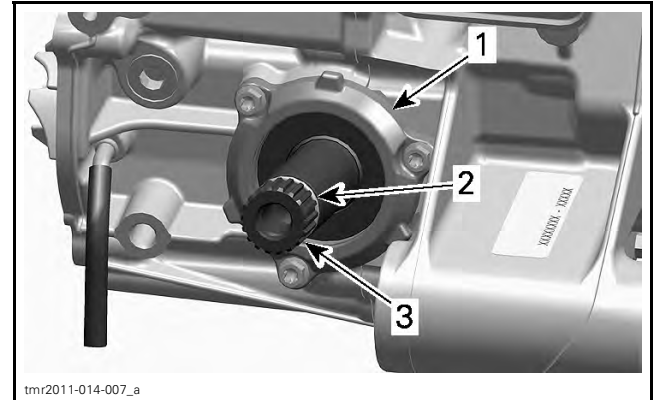


1. Bearing cover screws
2. O-ring
3. Bearing cover gearbox side

Removing the Front Bearing Cover

Remove the bearing cover at the front of the engine.

NOTICE Check ends of the circlip for sharp edges or burrs before removing the drive shaft, to avoid damaging the oil seal.

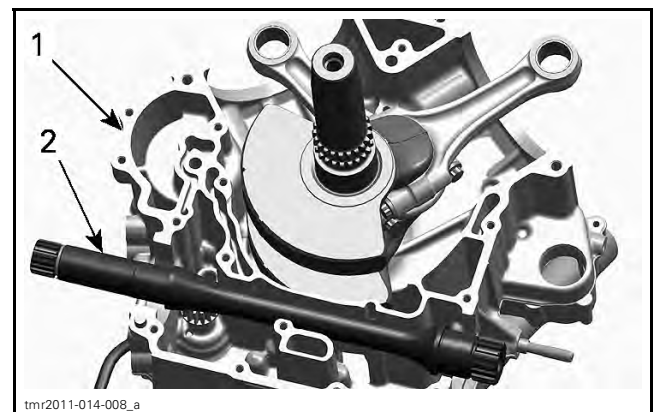


1. Bearing cover front drive side
2. Circlip
3. Drive shaft

Removing the Engine Drive Shaft

Split crankcase, refer to *CRANKCASE* in this subsection.

Remove engine drive shaft from the crankcase.



1. Crankcase MAG side
2. Engine drive shaft

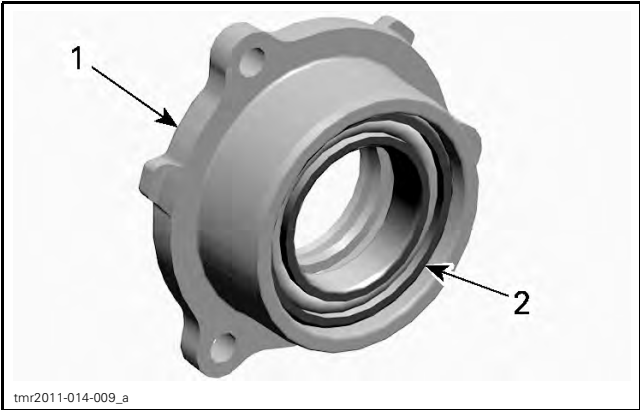
Inspecting the Engine Drive Shaft

Replace oil seals and/or O-ring (bearing cover gearbox side) if they are brittle, hard or damaged.

Check drive shaft bearings for contamination and/or metal shavings. Check if bearings turn freely and smoothly. Replace if necessary.

Section 03 ENGINE, CVT AND GEARBOX (570)

Subsection 10 (BOTTOM END)



1. Bearing cover
2. Drive shaft bearing

Check drive shaft for cracks, bend, pitting or other visible damages.

Check drive shaft splines for wear or damages.

Check oil seal running surface of the drive shaft for scratches. Replace if necessary.

Installing the Engine Drive Shaft

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

Clean all metal components in solvent.

Clean crankcase surfaces and bearing covers using a combination of LOCTITE CHISEL (GASKET REMOVER) (P/N 413 708 500) and a brass brush. First brush in one direction then make the final brushing perpendicularly (90°) to the first pass.

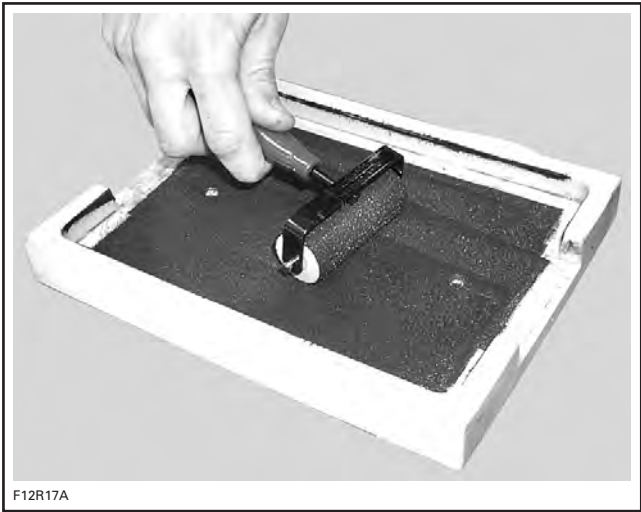
NOTICE Do not wipe with rags. Use a new clean hand towel only.

Use a suitable installer for installing bearings.

Use LOCTITE 5910 (P/N 293 800 081) on mating surfaces.

IMPORTANT: When beginning the application of the bearing cover sealant, the assembly and the first torquing should be done within 10 minutes. It is suggested to have all you need on hand to save time.

Use a plexiglass plate and apply some sealant on it. Use a soft rubber roller 50 mm - 75 mm (2 in - 3 in), available in arts products suppliers for printing, and roll the sealant to get a thin uniform coat on the plate (spread as necessary). When ready, apply the sealant on bearing cover surfaces.



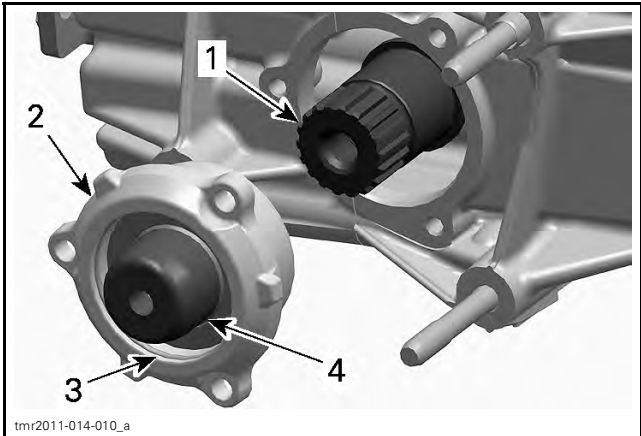
Do not apply in excess as it will spread out inside crankcase.

NOTE: It is recommended to apply this specific sealant as described here to get a uniform application without lumps. If you do not use the roller method, you may use your finger to uniformly distribute the sealant (using a finger will not affect the adhesion).

Installing the Rear Bearing Cover

For bearing cover installation on gearbox side, protect the oil seal to avoid damaging the sealing lip.

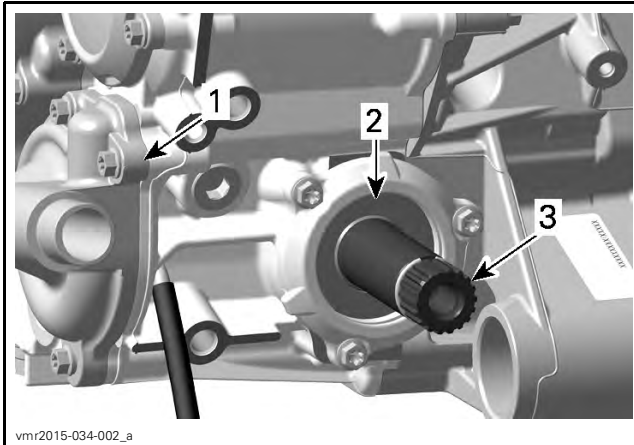
REQUIRED TOOL	
DRIVE SHAFT OIL SEAL PROTECTOR (P/N 529 036 029)	



1. Drive shaft
2. Bearing cover gearbox side
3. O-ring
4. Protection sleeve

TIGHTENING TORQUE	
Rear bearing cover screws	10 N•m ± 1 N•m (89 lbf•in ± 9 lbf•in)

Installing the Front Bearing Cover



FRONT OF ENGINE
 1. Water pump cover
 2. Oil seal front side
 3. Drive shaft

TIGHTENING TORQUE	
Service product	LOCTITE 243 (BLUE) (P/N 293 800 060)
Front bearing cover screws	10 N•m ± 1 N•m (89 lbf•in ± 9 lbf•in)

Installing the Engine Drive Shaft

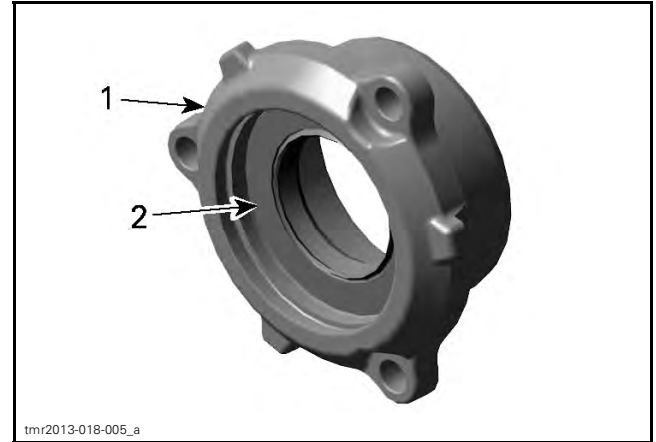
Finally check for axial play of the drive shaft.

FRONT OIL SEAL (ENGINE DRIVE SHAFT)

Replacing the Front Oil Seal (Engine Drive Shaft)

NOTE: The front oil seal can be replaced with the engine installed.

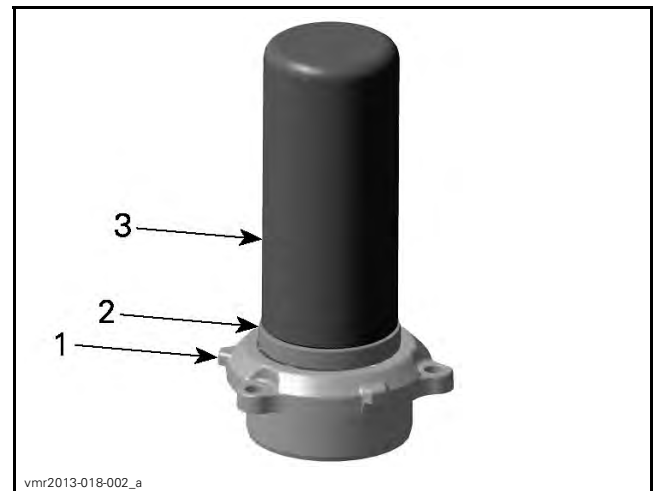
1. Remove front propeller shaft.
2. Remove adapter sleeve between propeller shaft and front engine drive shaft.
3. Remove the front bearing cover, refer to *ENGINE DRIVE SHAFT REMOVAL/INSTALLATION* in this subsection.
4. Remove drive shaft seal from bearing cover.



1. Bearing cover
 2. Oil seal

5. Install drive shaft oil seal using the following tool.

REQUIRED TOOL	
DRIVE SHAFT OIL SEAL INSTALLER (P/N 529 036 028)	



1. Bearing cover
 2. Oil seal
 3. Oil seal installer

6. Reinstall remaining parts in the reverse order of removal.

REAR OIL SEAL (ENGINE DRIVE SHAFT)

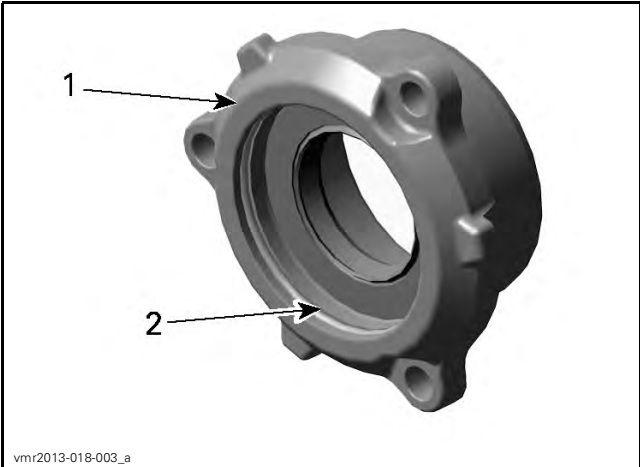
Replacing the Rear Oil Seal (Engine Drive Shaft)

1. Remove gearbox from the engine, refer to *GEARBOX AND 4X4 COUPLING UNIT* subsection.

Section 03 ENGINE, CVT AND GEARBOX (570)

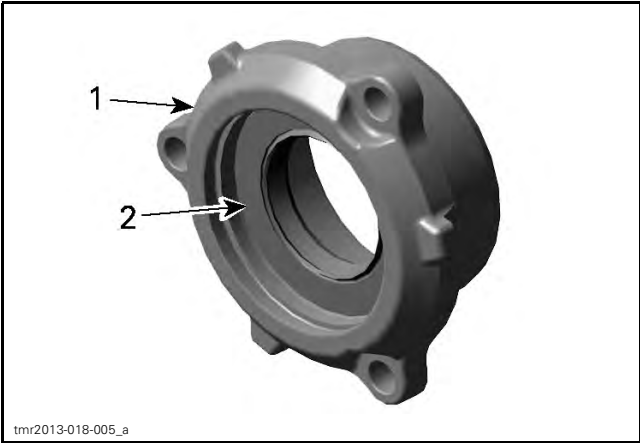
Subsection 10 (BOTTOM END)

- 2. Remove rear bearing cover, refer to *ENGINE DRIVE SHAFT REMOVAL/INSTALLATION* in this subsection.
- 3. Remove O-ring from bearing cover.



- 1. Bearing cover
- 2. O-ring

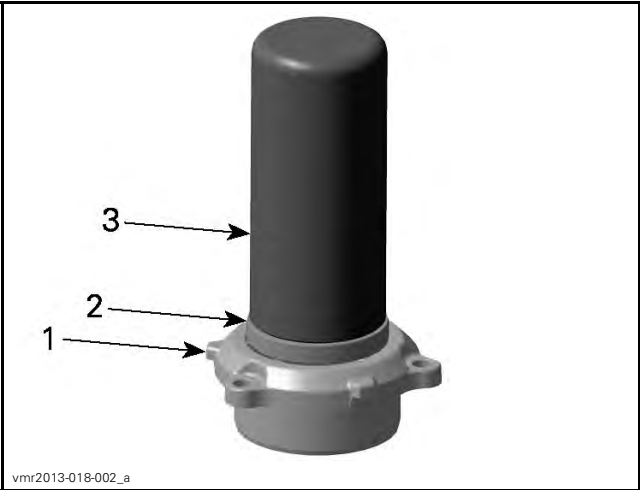
- 4. Remove drive shaft seal from bearing cover.



- 1. Bearing cover
- 2. Oil seal

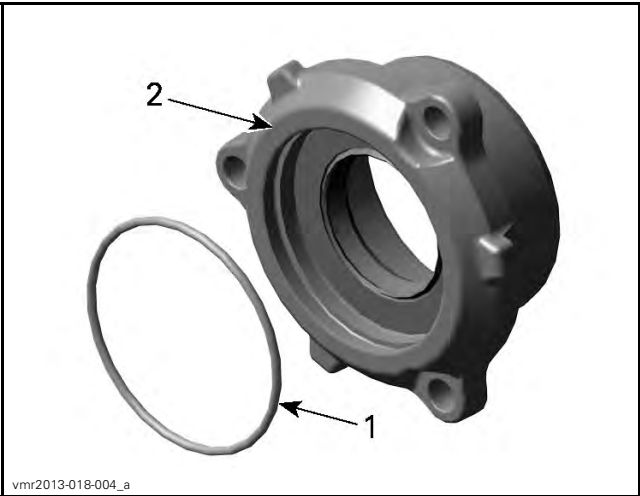
- 5. Install drive shaft oil seal using the following tool.

REQUIRED TOOL	
DRIVE SHAFT OIL SEAL INSTALLER (P/N 529 036 028)	



- 1. Bearing cover
- 2. Oil seal
- 3. Oil seal installer

- 6. Install O-ring in rear bearing cover.



- 1. O-ring
- 2. Bearing cover

- 7. Reinstall remaining parts in the reverse order of removal.

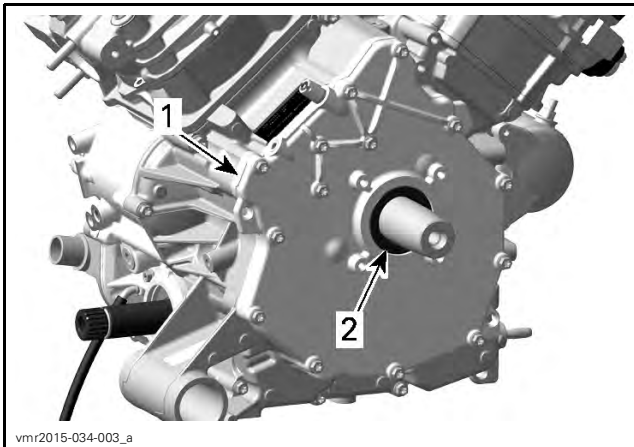
PTO COVER OIL SEAL

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

Removing the PTO Oil Seal

- 1. Refer to *CONTINUOUSLY VARIABLE TRANSMISSION (CVT)* subsection and remove the following parts:
 - CVT cover
 - Drive pulley
 - Driven pulley
 - CVT air guide.
- 2. Remove oil seal using a small flat screwdriver.

NOTICE Avoid scoring surfaces with tool.



1. PTO cover
2. Oil seal

Inspecting the PTO Oil Seal

Check oil seal running surface of crankshaft PTO side for grooves. Replace if necessary.

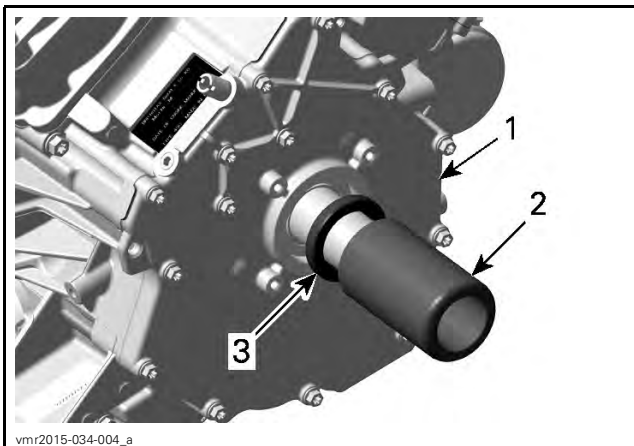
Installing the PTO Oil Seal

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

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

Push oil seal in place using the following tool.

REQUIRED TOOL	
PTO COVER OIL SEAL INSTALLER (P/N 529 036 033)	

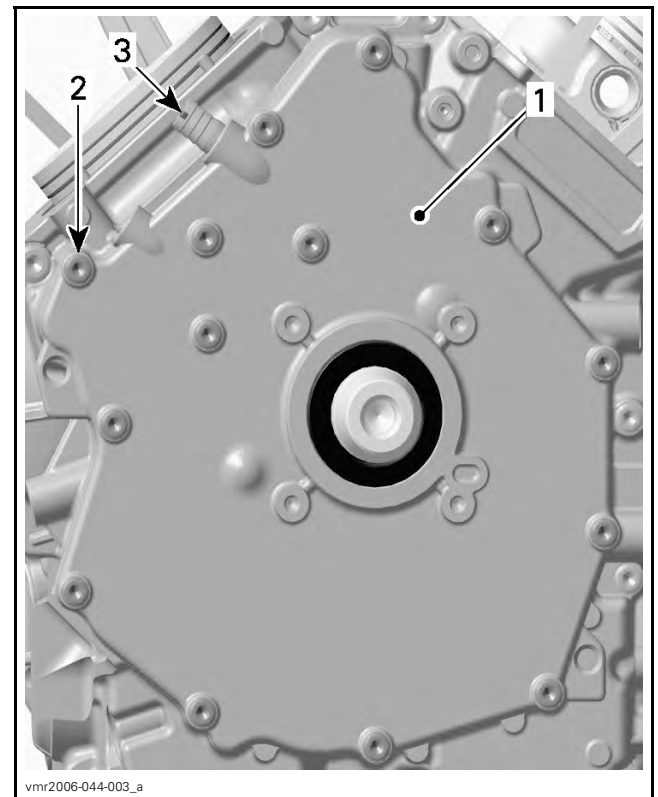


1. PTO cover
2. Oil seal installer
3. Oil seal

PTO COVER

Removing the PTO Cover

1. Refer to *CONTINUOUSLY VARIABLE TRANSMISSION (CVT)* subsection to remove the following parts:
 - CVT cover
 - Drive pulley
 - Driven pulley
 - CVT air guide.
2. Disconnect vent hose.
3. Remove PTO cover screws and pull on PTO cover to remove it.



1. PTO cover
2. PTO cover screws
3. Vent hose nipple

Inspecting the PTO Cover

1. Check the PTO cover for cracks or other damage.
2. Replace PTO cover if damaged.
3. Clean oil breather bore in PTO cover from contaminations with a parts cleaner then use pressurized air to dry it.

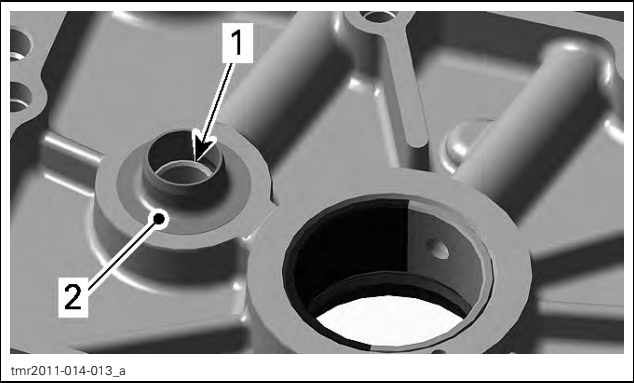
Section 03 ENGINE, CVT AND GEARBOX (570)

Subsection 10 (BOTTOM END)

⚠ WARNING

Always wear skin and eye protection. Chemicals can cause skin rash, skin burns and severe eye injury.

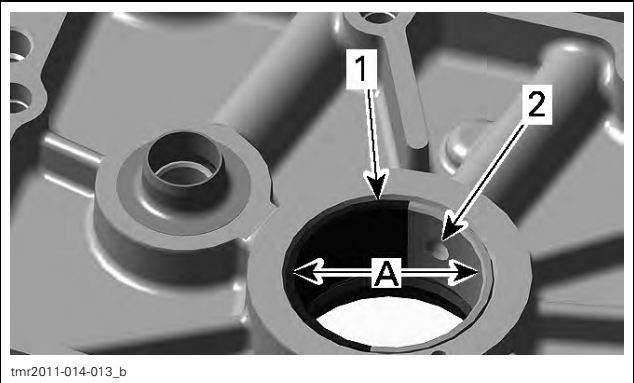
4. Check surface of sealing sleeve for wear or other damages. Replace PTO cover if damaged.



1. Oil breather bore
2. Surface of sealing sleeve

5. Check plain bearings for scoring or other damages.

NOTE: Measure plain bearing inside diameter (PTO cover) and compare to crankshaft bearing journal diameter (PTO cover bearing). Refer to *CRANKSHAFT* in this subsection. Replace if the measurement is out of specification.



1. Plain bearing
2. Oil bore
A. Measure plain bearing inside diameter

PLAIN BEARING INSIDE DIAMETER (PTO COVER)	
SERVICE LIMIT	34.120 mm (1.3433 in)

Replacing the Plain Bearing (PTO Cover)

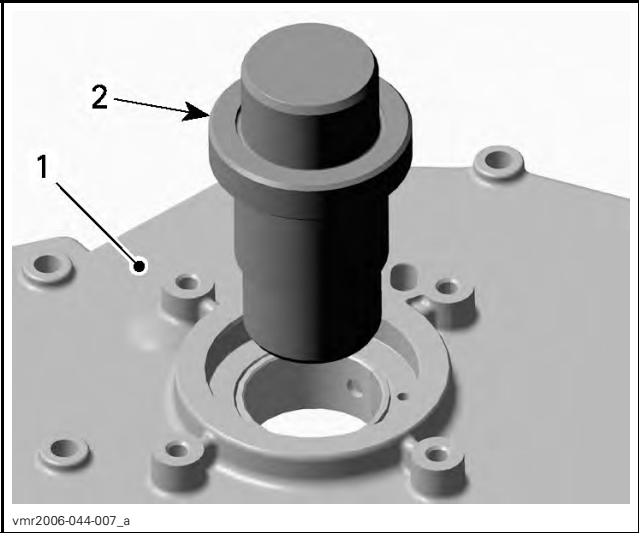
Removing the Plain Bearing

NOTICE Unless otherwise instructed, never use a hammer to install plain bearings. Always use a press.

1. Carefully remove the PTO oil seal with a screwdriver, without damaging the PTO cover.
2. Press out the plain bearings from the outside towards the inside.

REQUIRED TOOL	
PLAIN BEARING REMOVER/INSTALLER (P/N 529 036 032)	

NOTE: The PTO cover has to be supported from below on a suitable support with straight surface in order to prevent damage of the sealing surface.



1. PTO cover
2. Plain bearing remover/installer

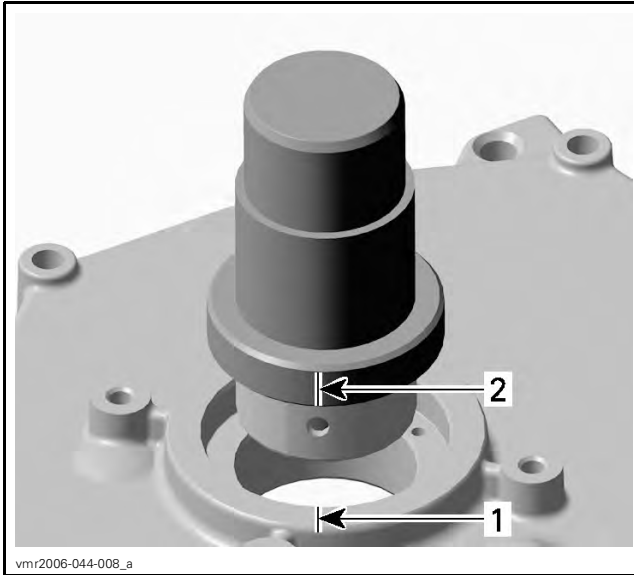
Installing the Plain Bearing

NOTE: Do not lubricate plain bearings or PTO cover for installation.

Install plain bearings in a cold PTO cover.

REQUIRED TOOL	
PLAIN BEARING REMOVER/INSTALLER (P/N 529 036 032)	

1. Mark position of oil bore on PTO cover and on plain bearing remover/installer.
2. Align mark on plain bearing remover/installer with mark on PTO cover.



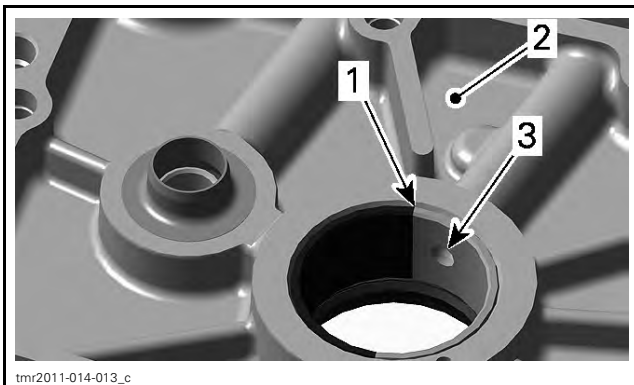
1. Mark position of oil bore on PTO cover
2. Mark position of oil bore on plain bearing remover/installer

NOTICE Misalignment of plain bearing and PTO cover oil bores will prevent proper oil supply to plain bearings.

3. Carefully press in the plain bearings in the same direction as during disassembly, from the outside towards the inside.

NOTE: Support PTO cover using a suitable support with a straight surface to prevent damage of the sealing surface.

NOTICE The joining surfaces of the plain bearings must be positioned near the oil bore in a counterclockwise direction.



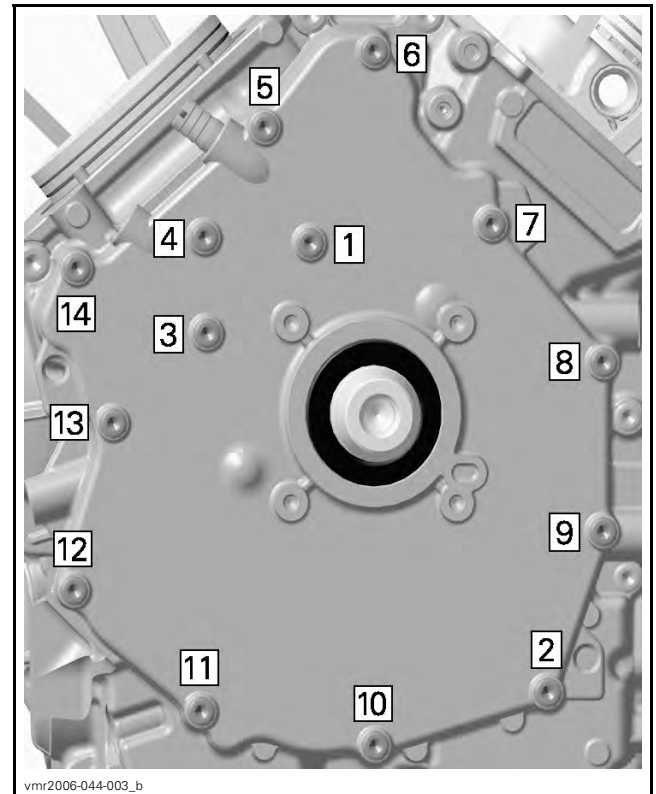
1. Plain bearing joint
2. PTO cover (inside surface)
3. Oil bore

Installing the PTO Cover

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

NOTE: At installation, replace PTO cover gasket and oil seal.

Tighten PTO cover screws following the sequence illustrated.



TIGHTENING SEQUENCE

TIGHTENING TORQUE	
PTO cover screws	10 N•m ± 1 N•m (89 lbf•in ± 9 lbf•in)

DRIVE GEARS

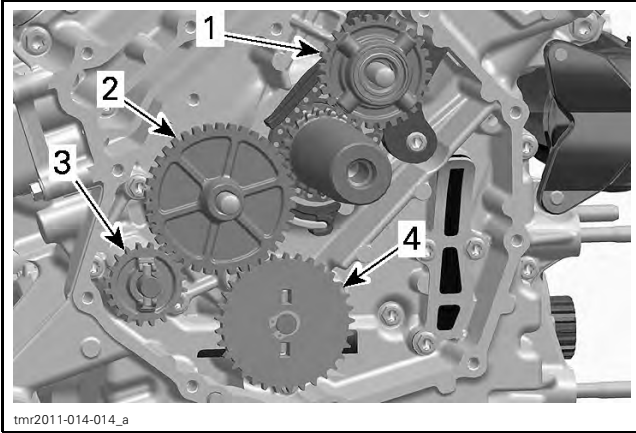
Drive Gears Location

The engine is equipped with a breather gear which prevents engine oil from seeping out through the breathing system into the air intake system.

The drive gears are located on the engine PTO side behind the PTO cover.

Section 03 ENGINE, CVT AND GEARBOX (570)

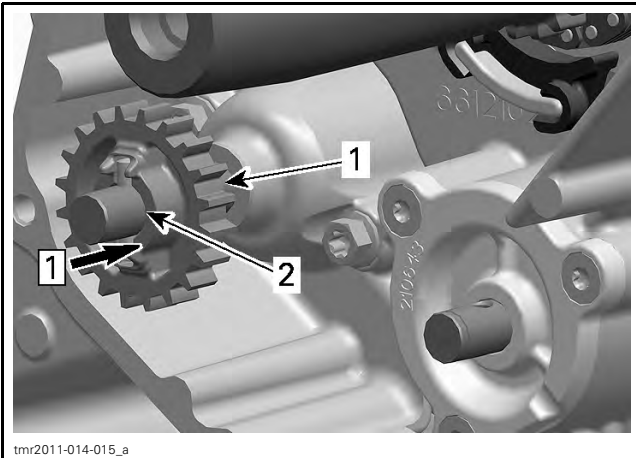
Subsection 10 (BOTTOM END)



1. Breather gear
2. Intermediate gear
3. Water pump drive gear
4. Oil pump drive gear

Removing the Drive Gears

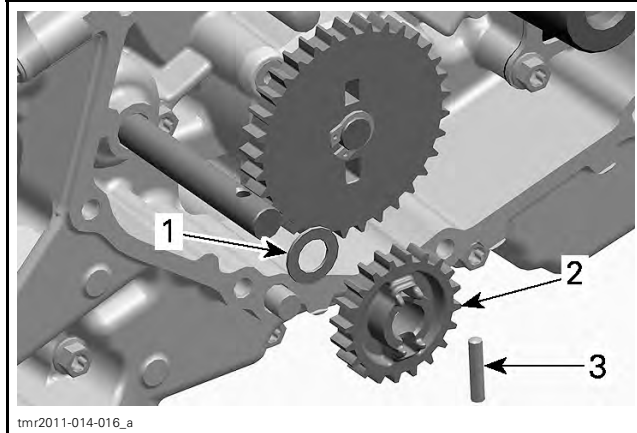
1. Remove PTO cover, refer to *PTO COVER* in this subsection.
2. Withdraw intermediate gear and breather gear.
3. Remove oil pump drive gear, refer to *OIL PUMP* in the *LUBRICATION SYSTEM* subsection.
4. To remove water pump drive gear, pull the shaft assembly slightly out and turn it about one tooth until it stays out.
5. Then push water pump drive gear in.



Step 1: Push gear in

1. Water pump drive gear
2. Intermediate shaft

6. Remove needle pin and pull water pump drive gear out.
7. Remove thrust washer from intermediate shaft.



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

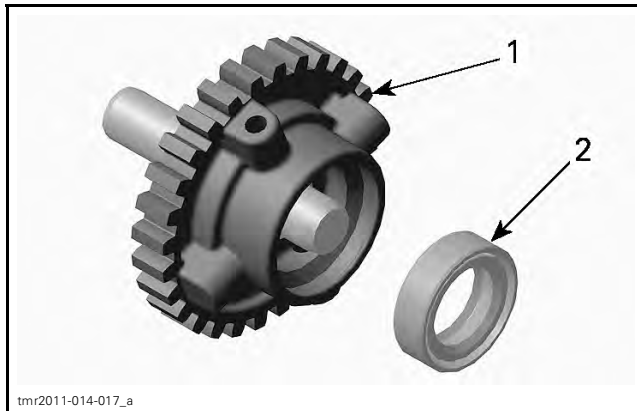
Inspecting the Drive Gears

Intermediate Gear/Oil Pump Drive Gear/Water Pump Drive Gear

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

Breather Gear

Check if oil seal is brittle, hard or damaged. Replace if necessary.



1. Breather gear
2. Oil seal

Inspect gear for wear or other damage.

Check ball bearing for excessive play and smooth operation. Replace breather gear assembly if necessary.

Installing the Drive Gears

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

Adequately oil the ball bearing of the breather gear.

CRANKCASE

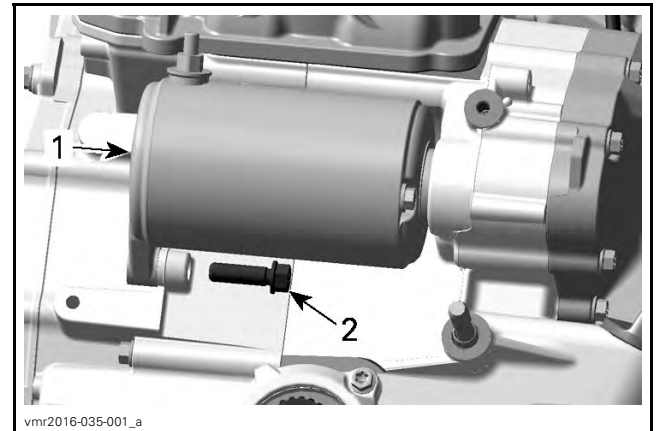
Disassembling the Crankcase

1. Refer to *PERIODIC MAINTENANCE PROCEDURES* subsection and carry out the following:
 - 1.1 Drain cooling system.
 - 1.2 Drain engine oil.
 - 1.3 Drain gearbox oil.
2. Lock crankshaft. Refer to *CRANKSHAFT LOCKING PROCEDURE* in the this subsection.
3. Refer to *CONTINUOUSLY VARIABLE TRANSMISSION (CVT)* subsection and remove the following parts:
 - CVT cover
 - Drive pulley
 - Driven pulley
 - CVT air guide.
4. Remove engine from vehicle. Refer to *ENGINE REMOVAL AND INSTALLATION* subsection.
5. Remove gearbox from engine.
6. Refer to *MAGNETO AND STARTER* subsection and remove the following parts:
 - Magneto cover
 - Rotor with sprag clutch gear
 - Starter drive gears.
7. Refer to applicable procedures in this subsection and remove the following parts:
 - PTO cover
 - Drive gears
 - Bearing covers of engine drive shaft.
8. Refer to *TIMING CHAIN* subsection and remove the following parts:
 - Chain tensioners
 - Camshaft timing gears
 - Timing chains
 - Timing chain guides.
9. Refer to *TOP END* subsection and remove the following parts:
 - Front cylinder head
 - Rear cylinder head
 - Cylinders.
10. Refer to *COOLING SYSTEM* subsection and remove the following parts:
 - Water pump housing.
11. Refer to *LUBRICATION SYSTEM* subsection and remove the following parts:
 - Oil filter

- Oil cooler
- Oil pump drive gear.

NOTE: Oil pump removal from crankcase is not necessary, but recommended to see condition of oil pump. Refer to *LUBRICATION SYSTEM* subsection.

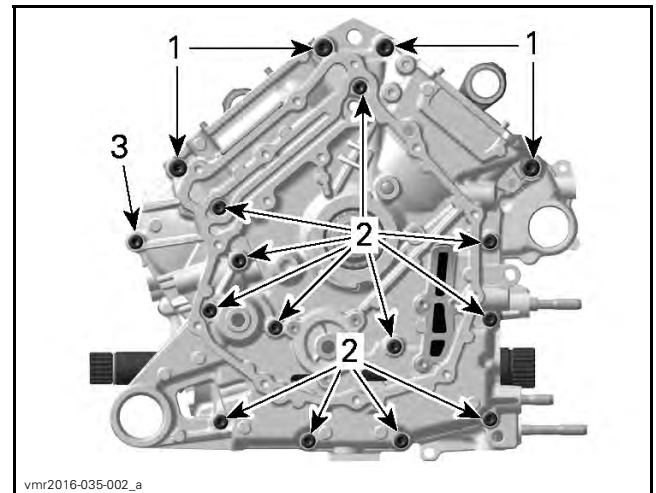
12. Remove electric starter.



1. Electric starter
2. Screw

NOTE: Before splitting the crankcase, measure crankshaft axial play. Refer to *CRANKSHAFT* in this subsection.

13. Remove crankcase retaining screws.

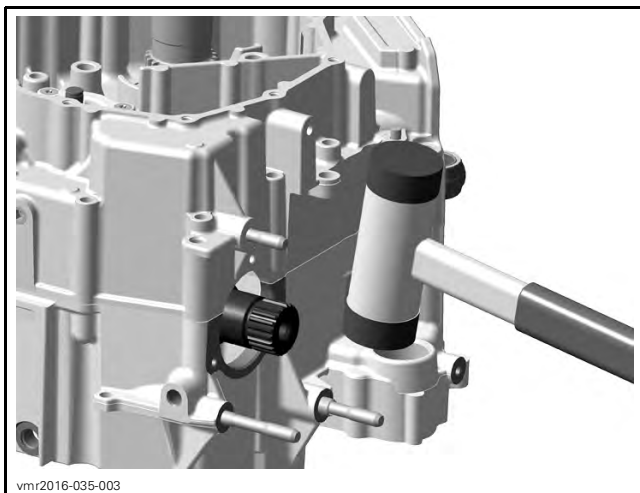


1. Four screws M8 x 65
2. 12 screws M6 x 75
3. One screw M6 x 25

14. Carefully split crankcase halves using a screwdriver and a soft hammer.

Section 03 ENGINE, CVT AND GEARBOX (570)

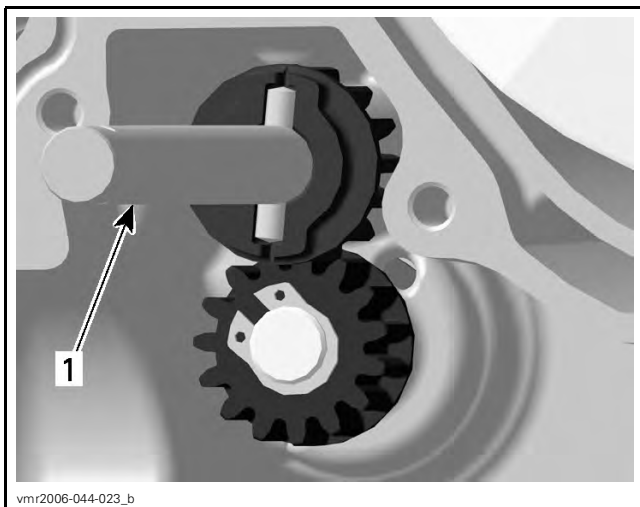
Subsection 10 (BOTTOM END)



NOTE: During disassembly, do not damage the sealing surfaces of the crankcase halves.

15. Pull crankshaft out of crankcase.

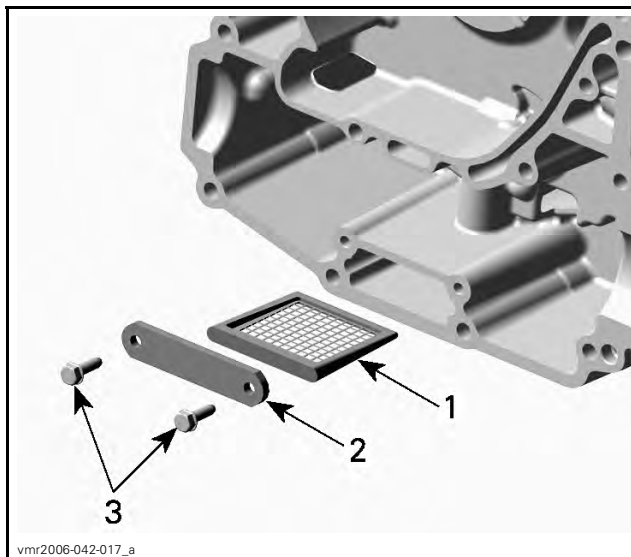
16. Remove the water pump intermediate shaft.



1. Water pump intermediate shaft

17. Remove engine oil strainer.

NOTE: Oil strainer removal for inspection and cleaning is recommended. Refer to *LUBRICATION SYSTEM* subsection.



1. Engine oil strainer
2. Retaining plate
3. Screws

Cleaning the Crankcase

⚠ WARNING

Use safety goggles to avoid eye injuries.

Clean crankcase using a part cleaner.

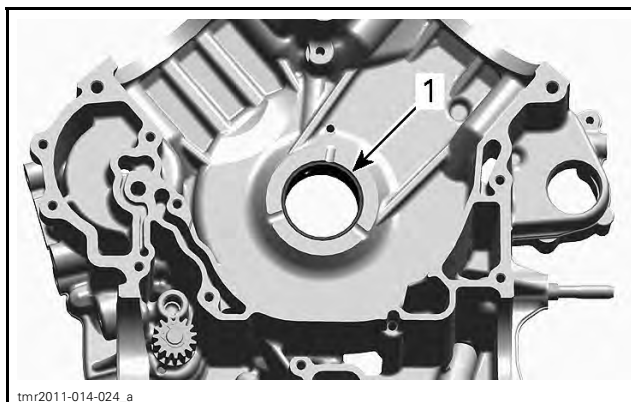
Dry crankcase using compressed air.

Blow low pressure filtered air through the oil supply lines.

Inspecting the Crankcase

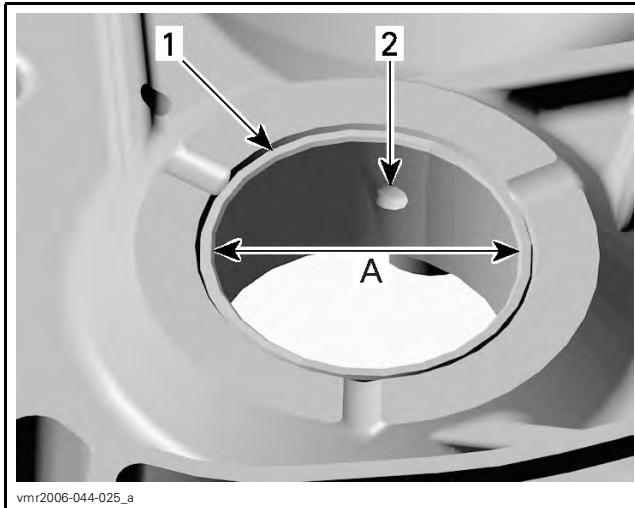
Check crankcase halves for cracks or other damage. Replace if damaged.

Check MAG and PTO plain bearings for scoring or other damages.



1. Plain bearing

Measure plain bearing inside diameter and compare to PTO/MAG main journal diameters of crankshaft, refer to *CRANKSHAFT* in this subsection. Replace if the measurements are out of specification.



- 1. Plain bearing
- 2. Oil bore
- A. Measure plain bearing inside diameter

MAIN BEARING INSIDE DIAMETER (PTO/MAG)

SERVICE LIMIT	42.100 mm (1.6575 in)
---------------	-----------------------

Replacing the Plain Bearing (Main)

Removing the Plain Bearing

NOTICE Always properly support crankcase halves when removing plain bearings. Damage to crankcase halves may occur if this procedure is not performed correctly.

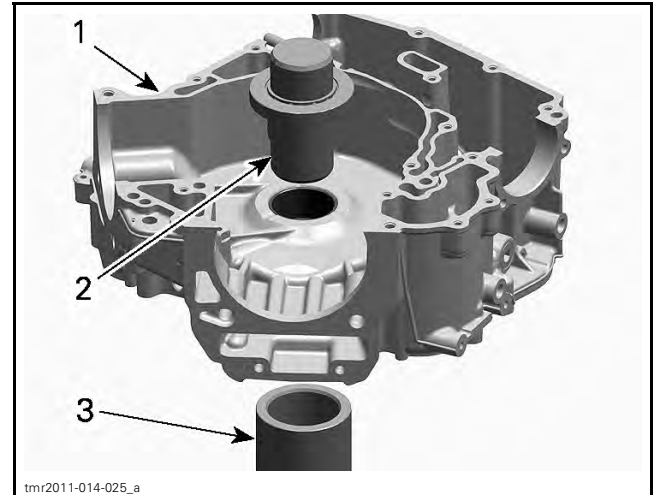
NOTE: Always use a press for removal of plain bearings.

Carefully press the plain bearings out from the crankcase half from the inside towards the outside.

NOTE: Place an appropriate support under crankcase halves before removing plain bearings.

REQUIRED TOOLS	
CRANKCASE SUPPORT MAG/PTO (P/N 529 036 031)	
PLAIN BEARING REMOVER/INSTALLER (P/N 529 035 917)	

NOTE: During disassembly, make sure not to damage the sealing surfaces of the crankcase halves.



PRESS PLAIN BEARINGS OUTSIDE

- 1. Crankcase half
- 2. Plain bearing remover/installer
- 3. Crankcase support sleeve (P/N 529 036 031)

Installing the Plain Bearing

NOTICE Unless otherwise instructed, never use a hammer to install plain bearings. Always use a press.

During reassembly, make sure not to damage the sealing surfaces of the crankcase halves.

NOTE: Place the proper crankcase support sleeve under crankcase halves before installing the plain bearings, refer to *PLAIN BEARING REMOVAL PROCEDURE* in this subsection.

Install plain bearings in a cold crankcase.

NOTE: Do not lubricate plain bearings and/or crankcase for installation.

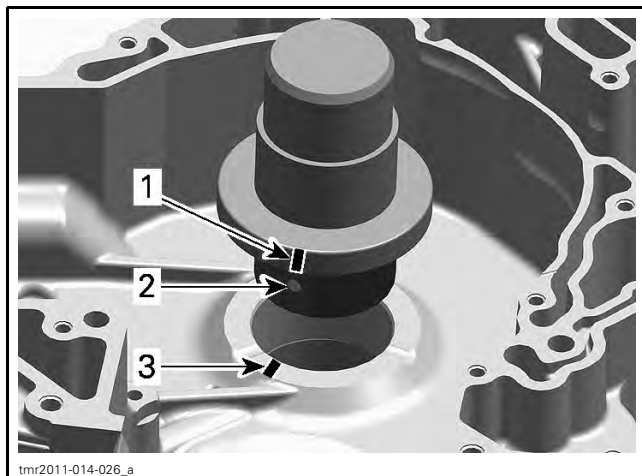
REQUIRED TOOL	
PLAIN BEARING REMOVER/INSTALLER (P/N 529 035 917)	

NOTE: Use an O-ring (Ø 42 x 1 mm to 1.5 mm (.04 in to .06 in) thickness) to hold plain bearings in place during installation. The O-ring will disappear in the groove of the plain bearing remover/installer.

1. Mark position of plain bearing oil bore on plain bearing remover/installer.
2. Mark position of oil bore on crankcase half.
3. Align mark on plain bearing remover/installer with mark on crankcase half.

Section 03 ENGINE, CVT AND GEARBOX (570)

Subsection 10 (BOTTOM END)

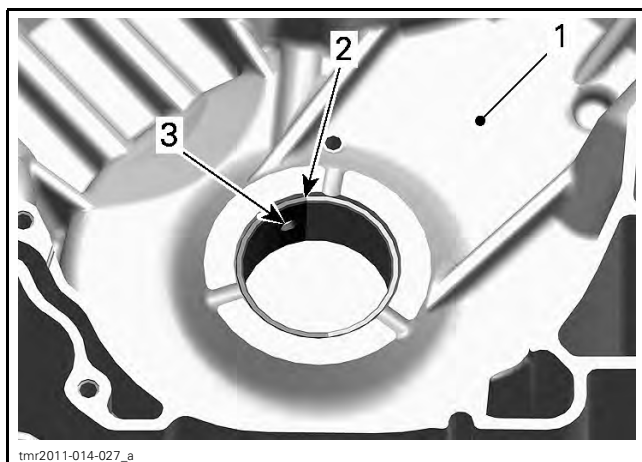


1. Oil bore position marked on plain bearing remover/installer
2. Plain bearing oil bore
3. Oil bore position marked on crankcase

NOTICE Misalignment of the plain bearing and crankcase oil bores will prevent proper oil supply to plain bearings.

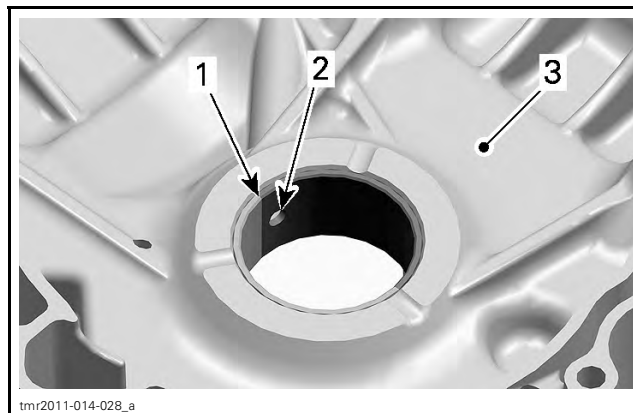
4. Carefully press in the plain bearings from inside the crankcase towards the outside.

NOTICE The joint of the plain bearings in crankcase half MAG side must be positioned near the oil bore in a clockwise direction.



1. Crankcase half MAG (inside surface)
2. Partition
3. Oil bore

NOTICE The joint of the plain bearings in the crankcase half PTO side must be positioned near the oil bore in the counterclockwise direction.



1. Plain bearing joint
2. Oil bore
3. Crankcase half PTO (inside surface)

Assembling the Crankcase

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

Clean oil passages and make sure they are not clogged.

Clean all metal components in a solvent.

Install a **NEW** crankcase gasket.

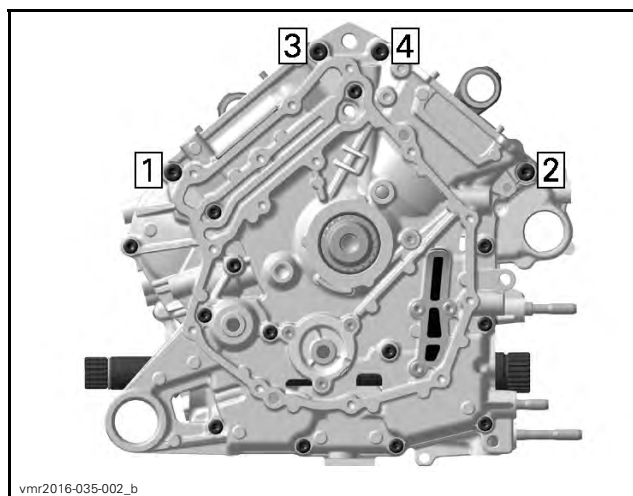
Oil the plain bearings before mounting the crankshaft.

Reinstall crankshaft, see procedure in this subsection

Properly reinstall engine oil strainer and screws. Refer to *LUBRICATION SYSTEM* subsection.

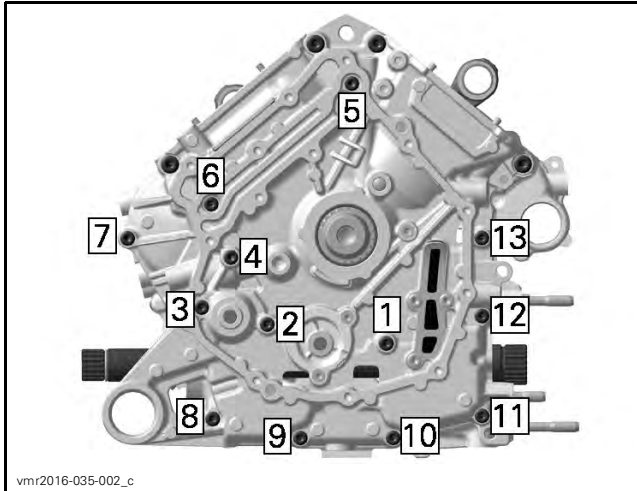
Reinstall water pump intermediate shaft and gears, refer to *WATER PUMP GEARS* in the *COOLING SYSTEM* subsection.

Tighten crankcase retaining screws as per following sequence.



M8 SCREWS TIGHTENING SEQUENCE

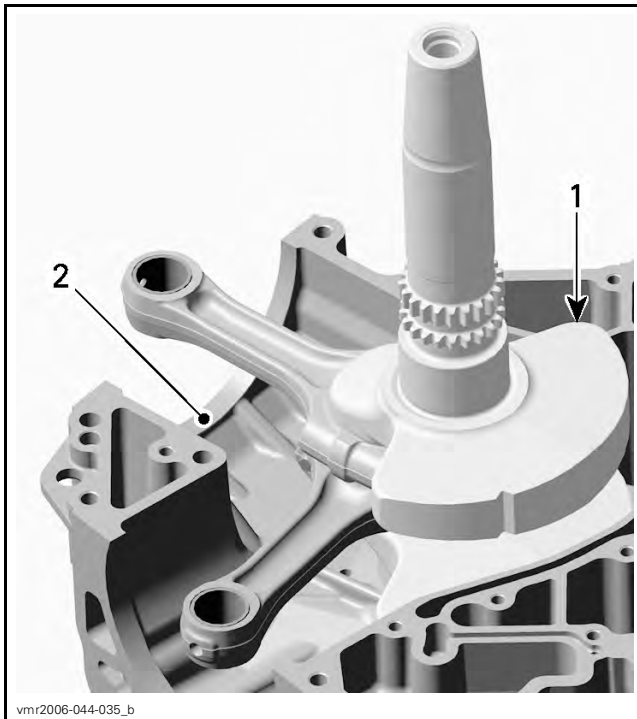
TIGHTENING TORQUE	
M8 crankcase screws	25 N•m ± 3 N•m (18 lbf•ft ± 2 lbf•ft)



vmr2016-035-002_c
M6 SCREWS TIGHTENING SEQUENCE

TIGHTENING TORQUE	
M6 crankcase screws	10 N•m ± 1 N•m (89 lbf•in ± 9 lbf•in)

CRANKSHAFT



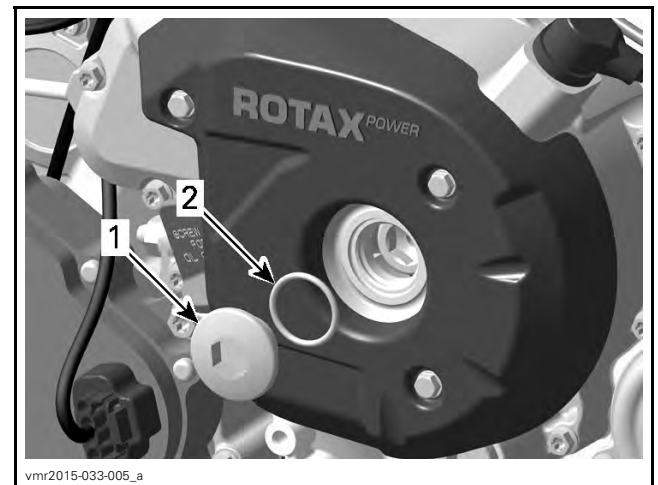
vmr2006-044-035_b
1. Crankcase MAG
2. Crankshaft

Crankshaft Locking Procedure

NOTE: When the crankshaft is locked, the rear piston no. 2 is at TDC (top dead center). The crankshaft cannot be locked with front piston no. 1 at TDC.

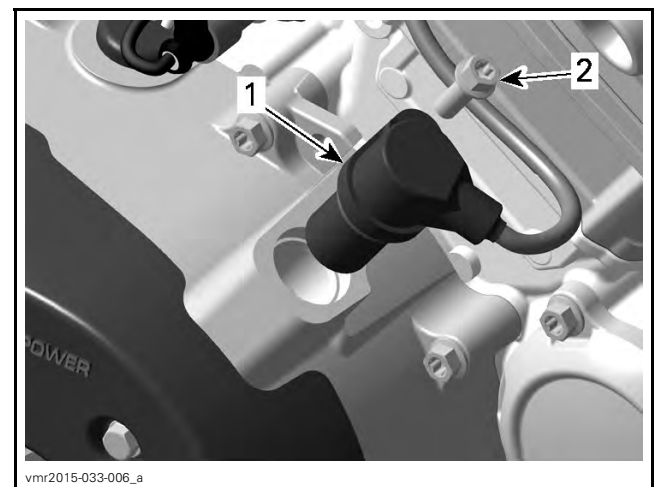
NOTICE To see if the rear piston no. 2 is at TDC ignition, refer to *CAMSHAFT TIMING GEAR* in the *TIMING CHAIN* subsection.

1. Remove spark plug cables and spark plugs from both cylinders.
2. Remove screw plug and O-ring from magneto cover.



vmr2015-033-005_a
1. Plug screw
2. O-ring

3. Remove crankshaft position sensor.

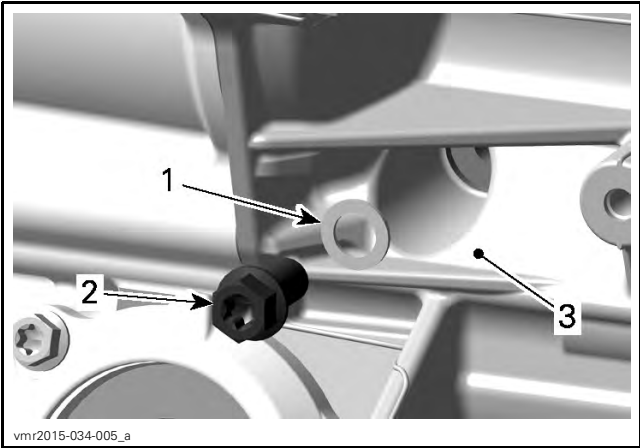


vmr2015-033-006_a
1. Crankshaft position sensor
2. Screw

4. Remove screw plug and discard sealing ring.

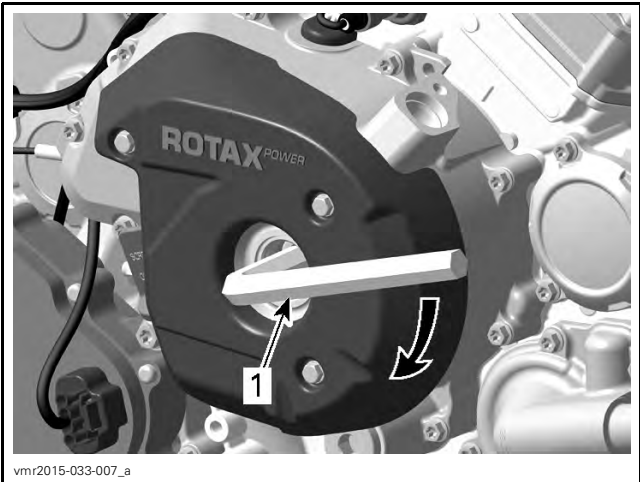
Section 03 ENGINE, CVT AND GEARBOX (570)

Subsection 10 (BOTTOM END)



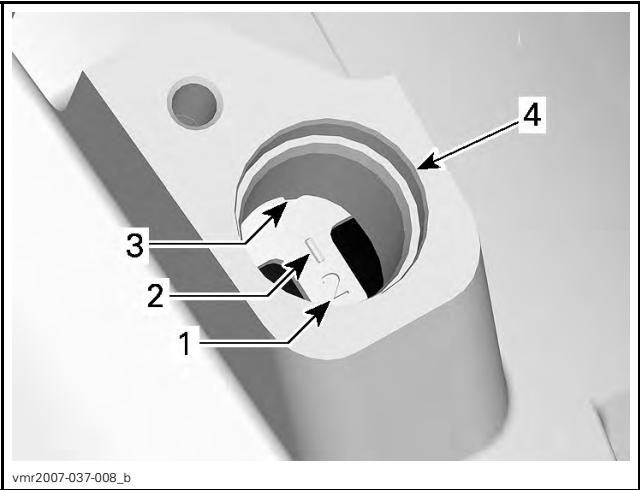
- 1. Sealing ring
- 2. Plug screw
- 3. Crankcase PTO side, front side

5. Use a 14 mm Allen key to turn crankshaft until the rear piston no. 2 is at TDC.



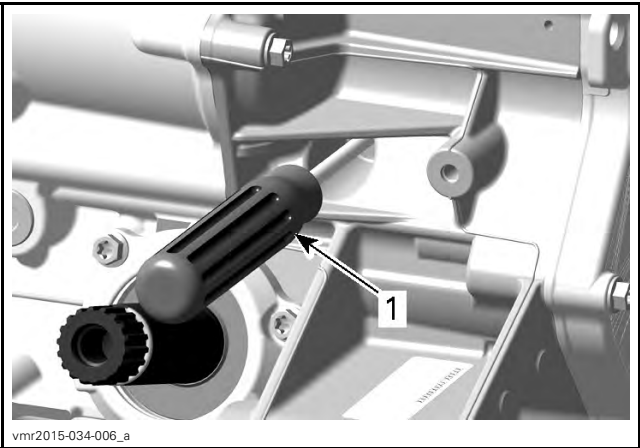
- 1. Allen key 14 mm

NOTE: When the piston no. 2 is at TDC, the number 2 piston index mark on the magneto flywheel and the notch on the magneto cover are aligned.



- CYLINDER 2 AT TDC**
- 1. Number 2 piston identifier
 - 2. Index mark on magneto flywheel
 - 3. Notch on magneto cover
 - 4. CPS bore in magneto cover

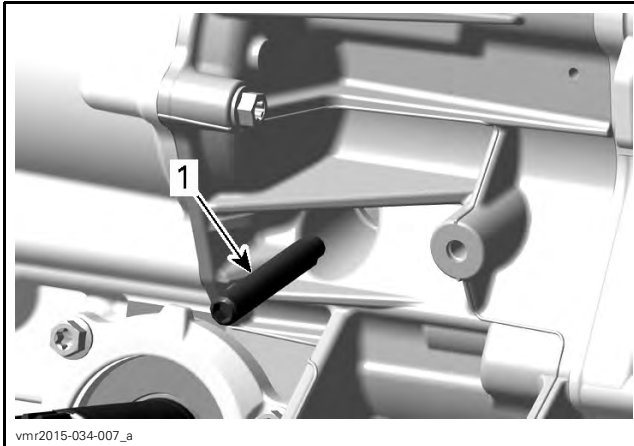
6. Use a screwdriver to check if the groove in the crankshaft is aligned with the crankshaft locking tool orifice.



- 1. Screwdriver

7. Lock crankshaft.

REQUIRED TOOL	
CRANKSHAFT LOCKING BOLT (P/N 529 035 617)	



1. Crankshaft locking bolt

8. Gradually insert the tool in the crankshaft groove. Make sure that the tool tip enters the groove and does not jam on the crankshaft balancer surface.

Crankshaft Removal

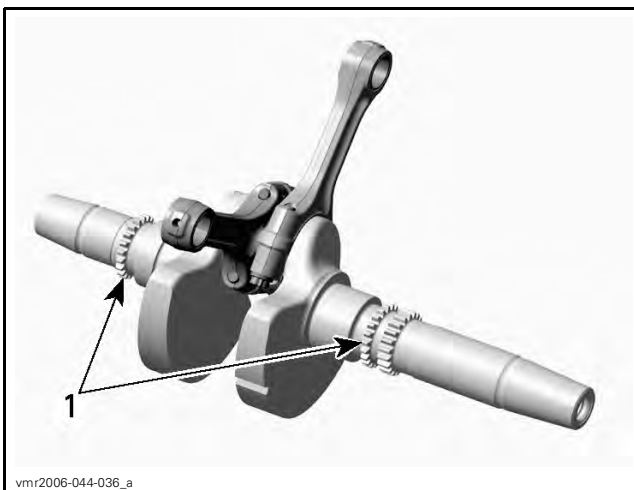
Refer to *CRANKCASE*.

Crankshaft Inspection

NOTE: Check each crankshaft bearing journal for scoring, scuffing, cracks or other signs of wear.

NOTE: Replace crankshaft if the crankshaft timing gears are worn or otherwise damaged.

NOTICE Components out of specifications must always be replaced. If this is not observed, severe damage may be caused to the engine.



1. Crankshaft timing gears

Crankshaft Axial Play

NOTE: Axial play must be measured before splitting the crankcase.

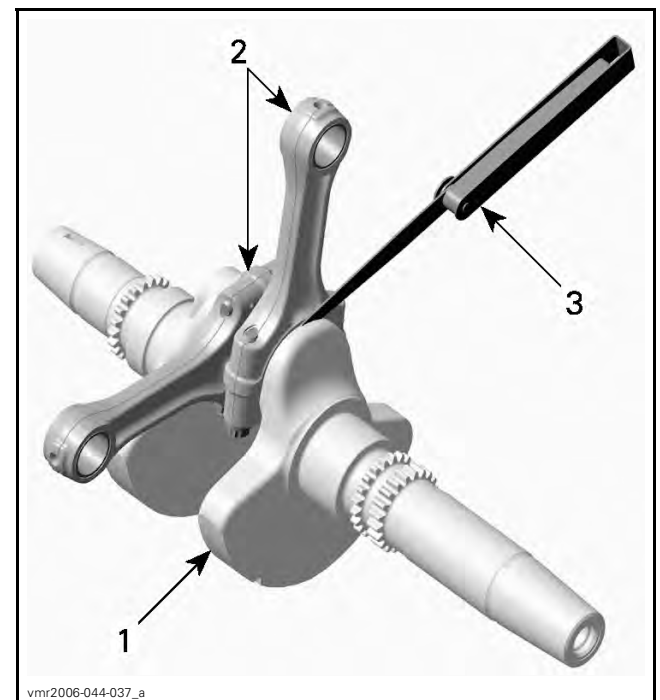
Measure axial play on PTO end of crankshaft using a dial indicator.

CRANKSHAFT AXIAL PLAY	
NEW	0.200 mm to 0.500 mm (.008 in to .02 in)
SERVICE LIMIT	0.600 mm (.024 in)

If axial play is out of specification, replace crankcase and/or crankshaft.

Connecting Rod Big End Axial Play

Using a feeler gauge, measure between face of connecting rods and crankshaft counterweight. If the measurement exceeds specified tolerance, replace the crankshaft.



1. Crankshaft
2. Connecting rods
3. Feeler gauge

CONNECTING ROD BIG END AXIAL PLAY	
NEW	0.200 mm to 0.500 mm (.008 in to .02 in)
SERVICE LIMIT	0.600 mm (.024 in)

Connecting Rod/Piston Pin Clearance

Refer to *TOP END* subsection.

Section 03 ENGINE, CVT AND GEARBOX (570)

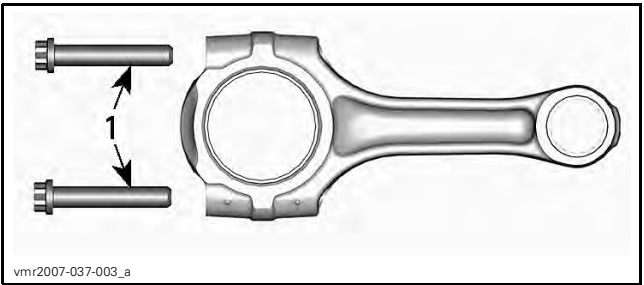
Subsection 10 (BOTTOM END)

Connecting Rod Big End Radial Play

NOTE: Prior to removing connecting rod from the crankshaft, mark big end halves together to ensure a correct reinstallation (cracked surface fits in only one position).

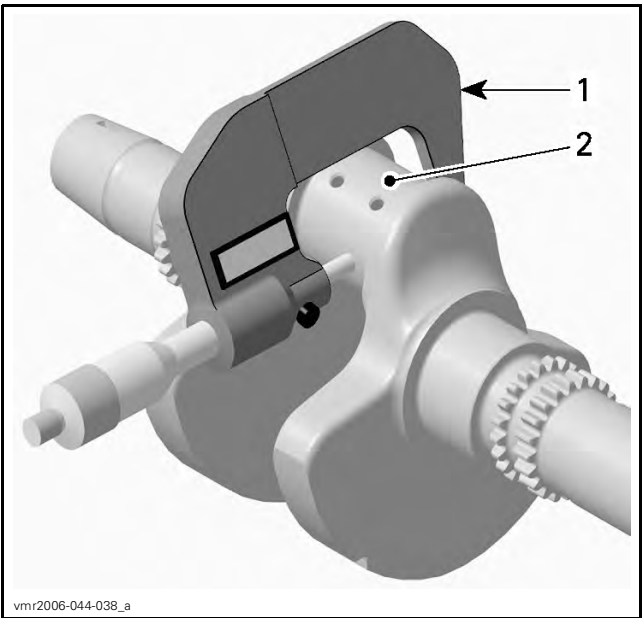
1. Remove connecting rods from crankshaft.

NOTICE Connecting rod screws are not reusable. Always discard screws and replace with NEW ones. It is recommended to install new plain bearings when reinstalling connecting rods.



1. Connecting rod screws

2. Measure crankpin. Compare to inside diameter of connecting rod big end.



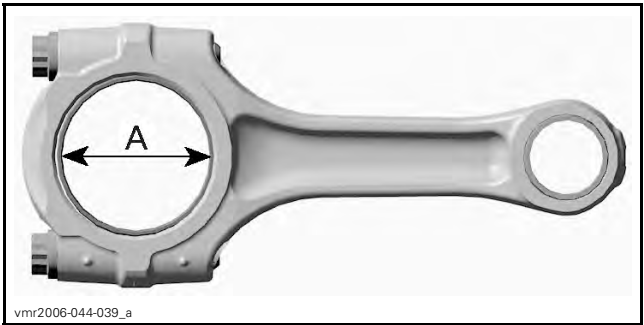
1. Micrometer
2. Crankpin

CRANK PIN DIAMETER	
NEW	40.001 mm to 40.025 mm (1.5748 in to 1.5758 in)
SERVICE LIMIT	39.990 mm (1.5744 in)

If the crank pin diameter is out of specification, replace crankshaft.

NOTE: To measure the connecting rod big end diameter, use the OLD connecting rod screws.

3. Install the OLD plain bearings as they were mounted initially.
4. Carry out the tightening procedure described in *CRANKSHAFT ASSEMBLY* in this subsection.



A. Connecting rod big end plain bearing

CONNECTING ROD BIG END DIAMETER	
SERVICE LIMIT	40.100 mm (1.5787 in)

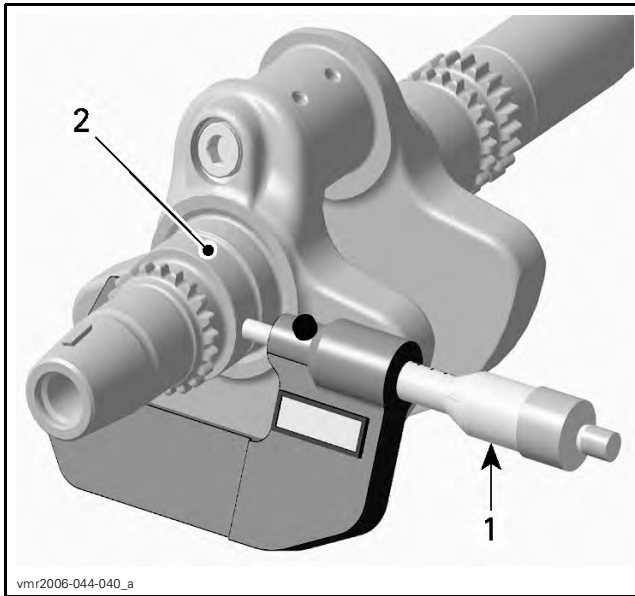
If connecting rod big end diameter is out of specification, replace plain bearings and recheck.

CONNECTING ROD BIG END RADIAL CLEARANCE	
SERVICE LIMIT	0.09 mm (.0035 in)

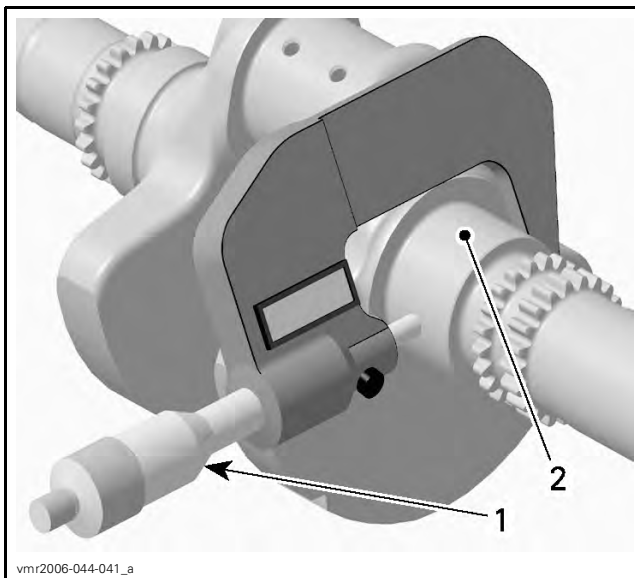
If connecting rod big end radial clearance is out of specification, replace plain bearings and recheck.

Crankshaft Radial Play MAG/PTO Side

Measure crankshaft main bearing journals on MAG and PTO sides. Compare to inside diameter of MAG and PTO plain bearings, refer to *CRANKCASE* in this subsection.



1. Micrometer
2. Crankshaft MAG side main bearing journal



1. Micrometer
2. Crankshaft PTO side main bearing journal

CRANKSHAFT MAIN BEARING JOURNAL DIAMETER (MAG/PTO SIDE)

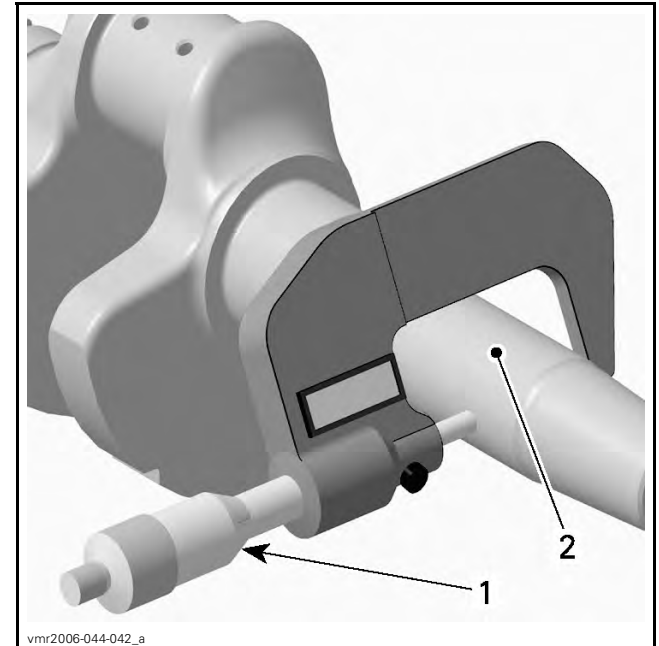
NEW	42.016 mm to 42.040 mm (1.6542 in to 1.6551 in)
SERVICE LIMIT	42.000 mm (1.6535 in)

CRANKSHAFT RADIAL PLAY (MAG/PTO SIDE)

SERVICE LIMIT	0.07 mm (.0028 in)
---------------	--------------------

Crankshaft Radial Play (PTO Cover Bearing)

Measure crankshaft journal diameter (PTO cover bearing). Compare to plain bearing inside diameter (PTO cover). Refer to *PTO COVER* in this subsection.



1. Micrometer
2. Crankshaft journal (PTO support bearing)

CRANKSHAFT JOURNAL DIAMETER (PTO COVER BEARING)

NEW	34.004 mm to 34.020 mm (1.3387 in to 1.3394 in)
SERVICE LIMIT	33.998 mm (1.3385 in)

CRANKSHAFT RADIAL PLAY (PTO COVER BEARING)

SERVICE LIMIT	0.10 mm (.0039 in)
---------------	--------------------

If crankshaft journal diameter is out of specification, replace crankshaft.

If crankshaft radial play (PTO cover bearing) is out of specification, replace plain bearings and recheck.

Assembling the Crankshaft

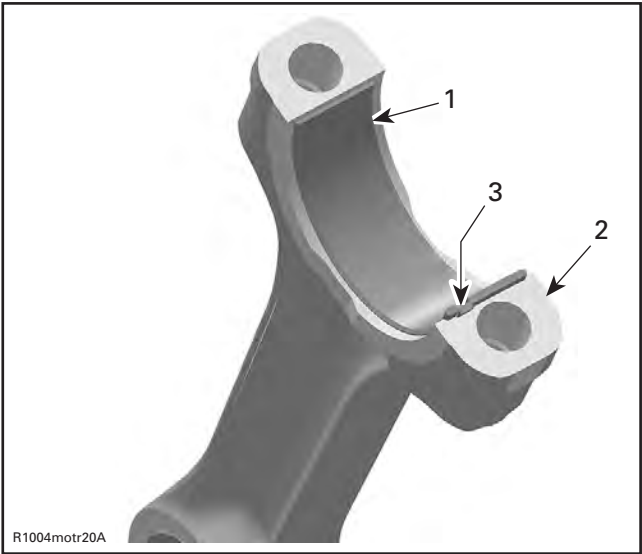
For assembly, reverse the disassembly procedure however, pay attention to following details.

Clean the split surface on both sides (cracked area) carefully with compressed air.

Insert plain bearings in the connecting rods as illustrated.

Section 03 ENGINE, CVT AND GEARBOX (570)

Subsection 10 (BOTTOM END)



- 1. Half plain bearing of connecting rod big end
- 2. Mating surface of the connecting rod
- 3. Joining surface of plain bearing in line with connecting rod groove

Oil the plain bearing surface of the connecting rod and crankshaft pin before installation.

NOTICE Lower cap and rod must match together since there is a cracked surface.

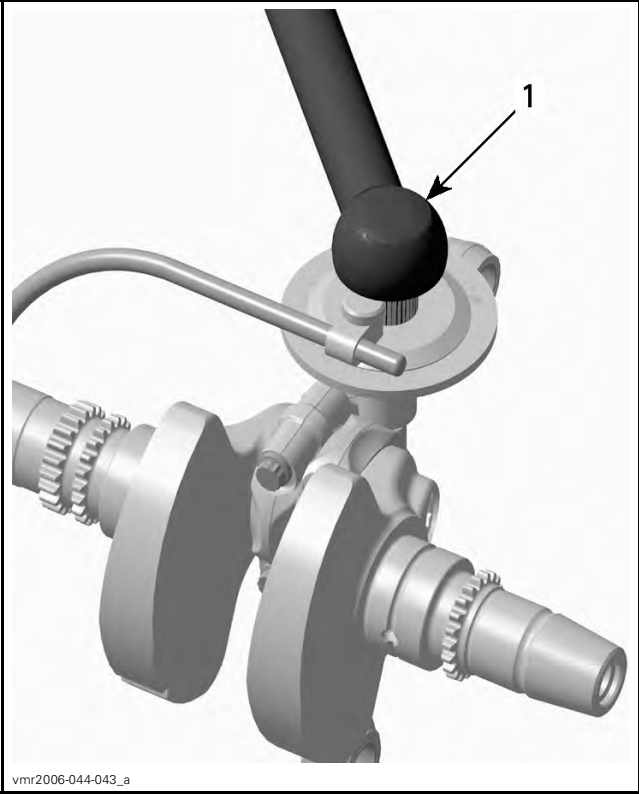
Oil **NEW** connecting rod screws.

Thread screws in the connecting rods, then tighten as per following procedure.

NOTICE Strictly adhere following instructions:

- Always use **NEW** connecting rod screws at final assembly. They are **not reusable**.
- Do not apply any thread locker.
- The running direction of the big end bearings and of the piston pins must not change.
- Always perform each step on both connecting rod screws before going to the next step.
- Failure to strictly follow procedure may cause connecting rod screws to loosen and lead to severe engine damage.

REQUIRED TOOLS
Torque wrench
Angle torque wrench



1. Angle torque wrench

NEW connecting rods can be installed either way.

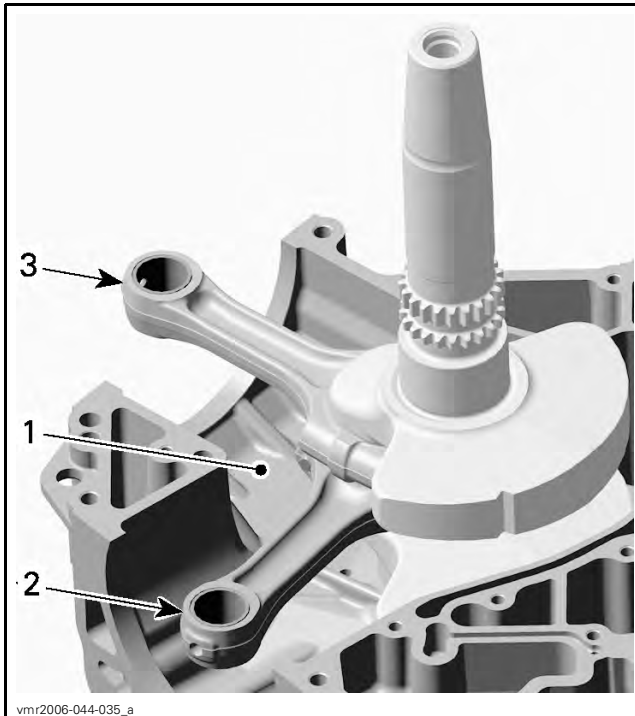
TIGHTENING TORQUE		
Connecting rod screws	Step A	Tighten to 1/2 of specified torque
	Step B	Tighten to 20 N•m ± 2 N•m (15 lbf•ft ± 1 lbf•ft)
	Step C	Torque an additional 60 ± 5° turn using an angle torque wrench

Installing the Crankshaft

For installation of crankshaft in crankcase reverse the removal procedure. However, pay attention to the following details.

Do not interchange the connecting rods of pistons 1 and 2 during installation.

NOTICE Observe the correct installation position when fitting the crankshaft with the connecting rods. The connecting rod **MAG** side has to face cylinder no. 1.



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1. Crankcase half MAG side
2. Connecting rod cylinder 1
3. Connecting rod cylinder 2

CONTINUOUSLY VARIABLE TRANSMISSION (CVT)

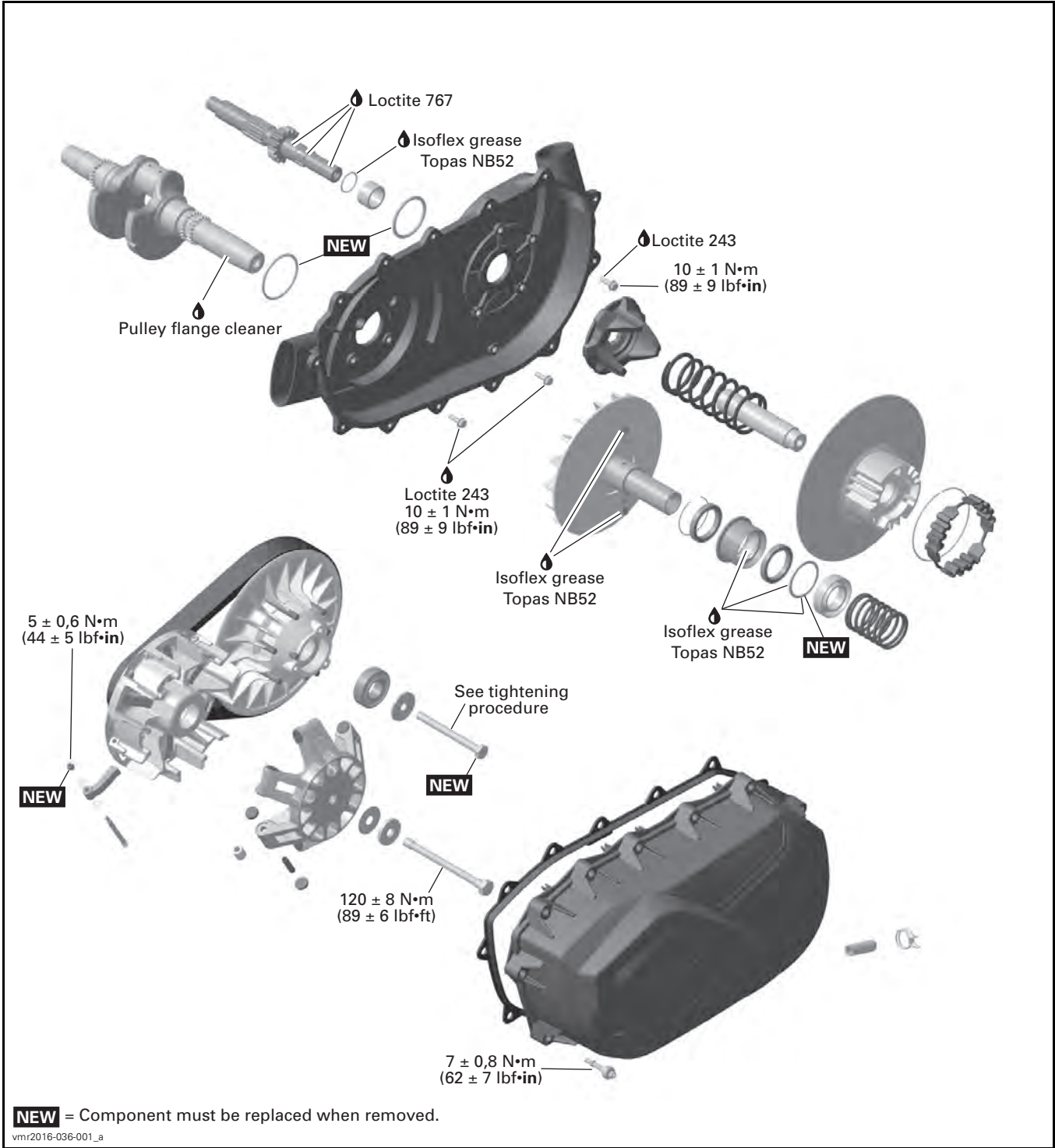
SERVICE TOOLS

Description	Part Number	Page
CLUTCH HOLDER.....	529 036 238	154, 162, 167
CLUTCH PULLER	529 035 746	154
PULLER/LOCKING TOOL.....	529 036 098	153, 167

SERVICE PRODUCTS

Description	Part Number	Page
ISOFLEX GREASE TOPAS NB 52	293 550 021	160
LOCTITE 767 (ANTISEIZE LUBRICANT)	293 800 070	166
PULLEY FLANGE CLEANER	413 711 809	157, 163–164, 166

Section 03 ENGINE, CVT AND GEARBOX (570)
Subsection 11 (CONTINUOUSLY VARIABLE TRANSMISSION (CVT))



Subsection 11 (CONTINUOUSLY VARIABLE TRANSMISSION (CVT))



GENERAL

NOTE: For a better understanding, the following illustrations are taken with engine out of vehicle. To perform the following instructions, it is not necessary to remove engine.

 **WARNING**

Never touch CVT while engine is running.
Never drive vehicle when CVT cover is removed.

 **WARNING**

Any drive pulley repairs must be performed by an authorized Can-Am dealer. Subcomponent installation and assembly tolerances require strict adherence to procedures detailed.

 **WARNING**

The clutch assembly is a precisely balanced unit. Never replace parts with used parts from another clutch assembly.

PROCEDURES

CVT COVER

CVT Cover Access

Refer to *BODY* subsection and remove the following:

- LH side and extension panels
- LH footboard panel.

Draining the CVT Cover

If water is present in CVT cover, it can be drained as follows:

1. Remove drain reservoir from CVT cover.



Vmr2012-018-003_b

1. Drain reservoir
2. Spring clip

2. Let water drain from CVT cover.
3. Reinstall drain reservoir.

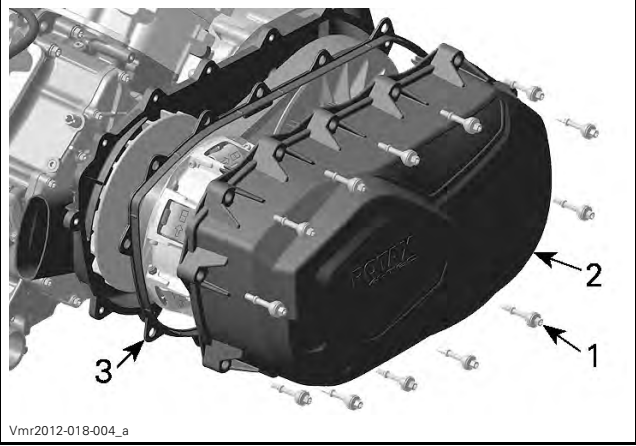
NOTICE If an appreciable amount of water or any debris entered the CVT cover, CVT must be cleaned and inspected.

Removing the CVT Cover

Remove CVT cover screws.

NOTE: Do not use and impact tool to remove CVT cover screws. To support the CVT cover remove the top center screw last.

Remove the CVT cover and its gasket.



Vmr2012-018-004_a

1. CVT cover screw
2. CVT cover
3. Gasket

Installing the CVT Cover

Install the top center screw of first.

NOTE: Do not use and impact tool to install CVT cover screws.

Tighten the CVT cover screws as per following sequence.



Vmr2012-018-003_a

CVT COVER TIGHTENING SEQUENCE

TIGHTENING TORQUE	
CVT cover screws	7 N•m ± 0.8 N•m (62 lbf•in ± 7 lbf•in)

DRIVE BELT

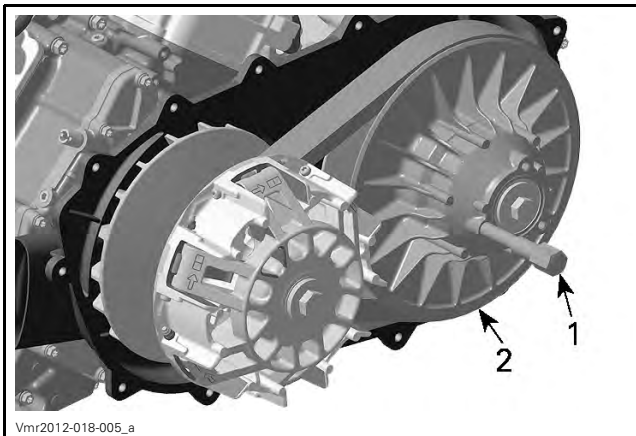
Removing the Drive Belt

NOTICE In case of a drive belt failure, the CVT, cover, drain reservoir and air outlet must be cleaned and inspected for obstruction.

1. Remove *CVT COVER*.
2. Open driven pulley.

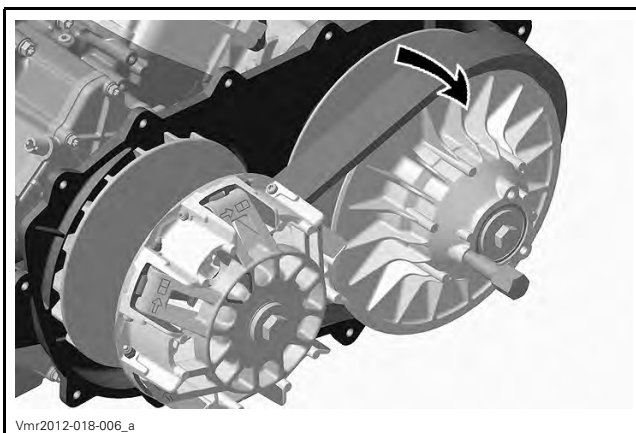
REQUIRED TOOL	
PULLER/LOCKING TOOL (P/N 529 036 098)	

3. Screw tool in the threaded hole of driven pulley and tighten to open the pulley.



1. Puller/locking tool
2. Fixed sheave of driven pulley

4. Slide the belt over the top edge of fixed sheave to remove it.



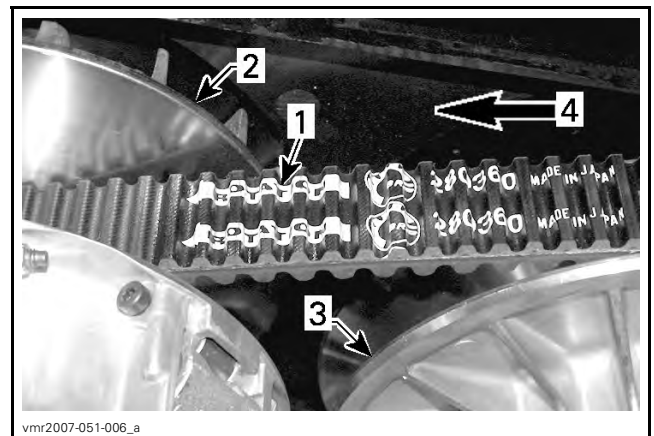
Inspecting the Drive Belt

For drive belt inspection refer to *DRIVE BELT INSPECTION* in the *PERIODIC MAINTENANCE PROCEDURES* subsection.

Installing the Drive Belt

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

The maximum drive belt life span is obtained when the drive belt has the proper rotation direction. Install it so that the arrow printed on belt is pointing towards front of the vehicle, viewed from top.



1. Arrow printed on belt
2. Drive pulley (front)
3. Driven pulley (rear)
4. Rotation direction

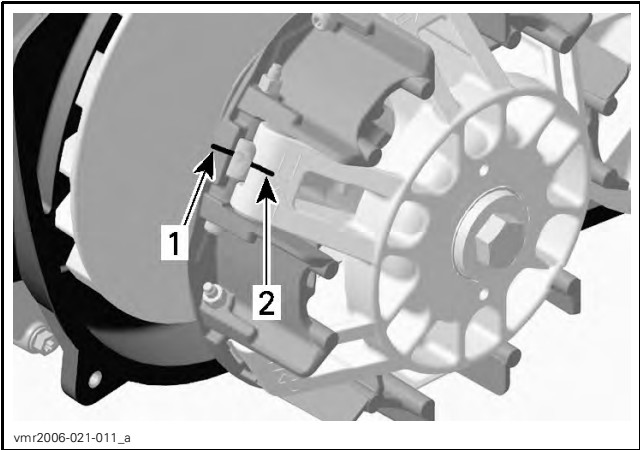
DRIVE PULLEY

Removing the Drive Pulley

1. Remove *DRIVE BELT*, see procedure in this subsection.
2. Prior to removing the drive pulley, mark sliding sheave and governor cup to ensure correct indexation at reinstallation.

Section 03 ENGINE, CVT AND GEARBOX (570)

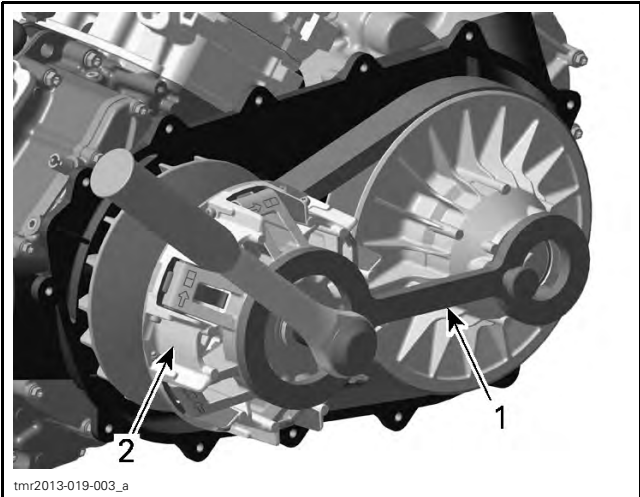
Subsection 11 (CONTINUOUSLY VARIABLE TRANSMISSION (CVT))



1. Mark on drive pulley sliding sheave
2. Mark on governor cup

3. Lock the drive pulley.

REQUIRED TOOL	
CLUTCH HOLDER (P/N 529 036 238)	



1. Clutch holder
2. Drive pulley sliding sheave

4. Loosen the drive pulley screw.

NOTICE Never use any type of impact wrench for drive pulley removal.

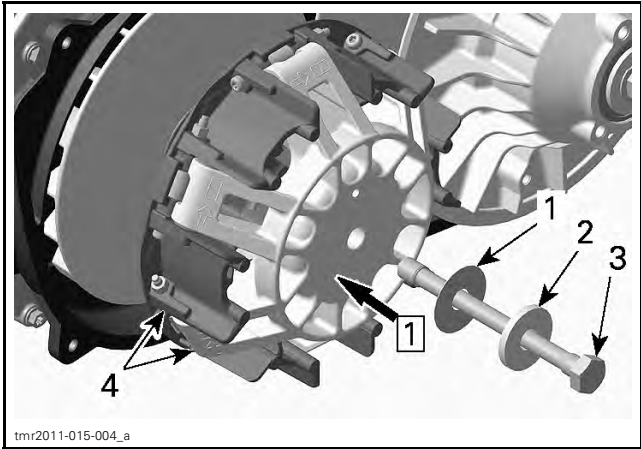
NOTE: Do not unscrew the drive pulley screw completely. If governor cup is stuck, hit it using a soft hammer.

5. Remove service tool.

6. Apply axial pressure with your hand on the sliding sheave and governor cup.

7. Remove drive pulley screw with its conical spring washer and thrust washer.

CAUTION Sliding sheave of drive pulley is spring loaded.

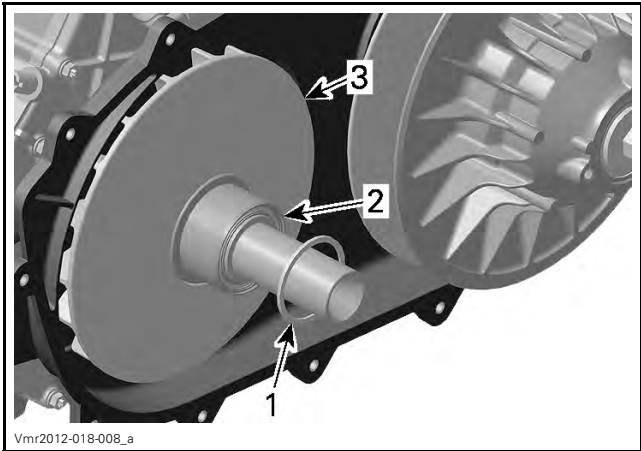


Step 1: Push

1. Thrust washer
2. Conical spring washer
3. Drive pulley screw
4. Sliding sheave with governor cup

8. Slowly release and remove sliding sheave.

9. Remove friction washer.

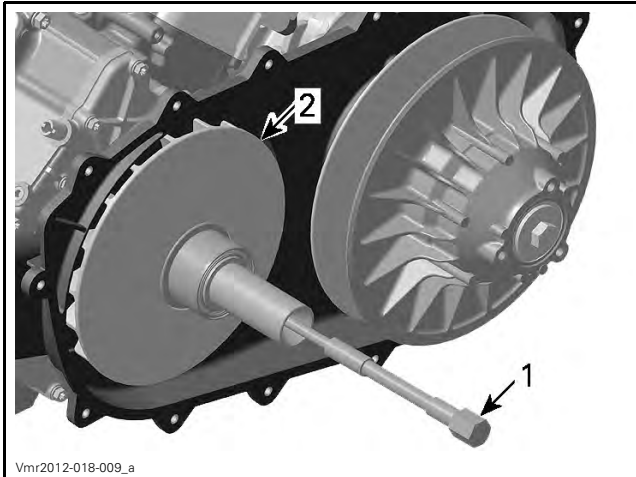


1. Friction washer
2. One way clutch
3. Drive pulley fixed sheave

10. Screw clutch puller in fixed sheave to remove fixed pulley.

NOTICE Use only recommended tool.

REQUIRED TOOL	
CLUTCH PULLER (P/N 529 035 746)	



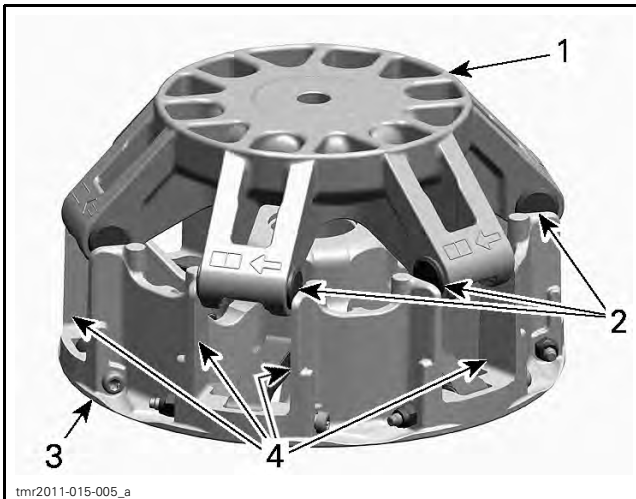
Vmr2012-018-009_a

1. Drive pulley puller
2. Fixed sheave

Disassembling the Drive Pulley

Governor Cup

1. Carefully lift governor cup until slider shoes move to their highest position in the guides.

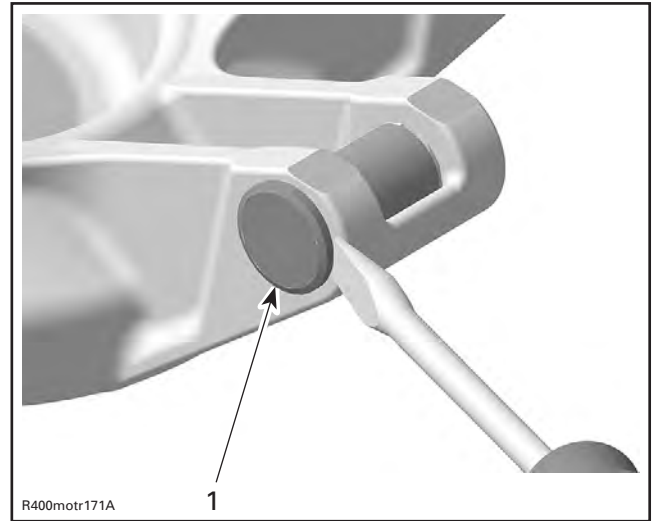


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1. Governor cup
2. Slider shoes
3. Sliding sheave
4. Guides

NOTE: The following steps are not necessary except if roller must be removed. Refer to *INSPECTION* before proceeding.

2. Remove slider shoes from governor cup arm. Use a flat screwdriver if necessary.



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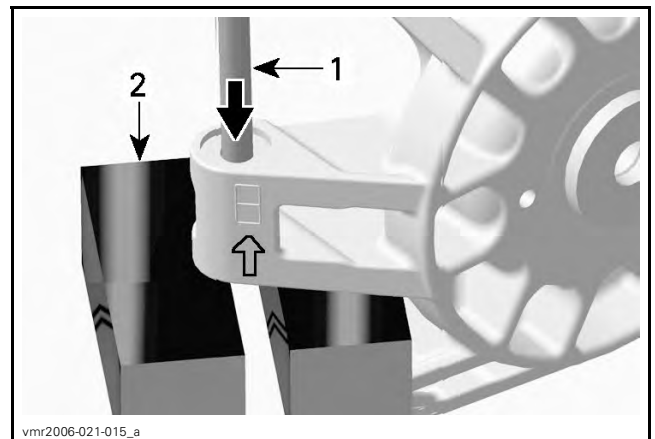
1. Slider shoe

3. Place the governor cup on a vice to push out the roller sleeve in the direction illustrated (against insertion arrow marked on governor cup arm). Use an appropriate punch (diameter of punch must be smaller than the diameter of the sleeve bore in the governor cup arm).

NOTICE Do not clamp the governor cup in the vice to push out roller sleeve. Governor cup will be damaged.

NOTE: Use protection plates to avoid marks and/or damages to the governor cup.

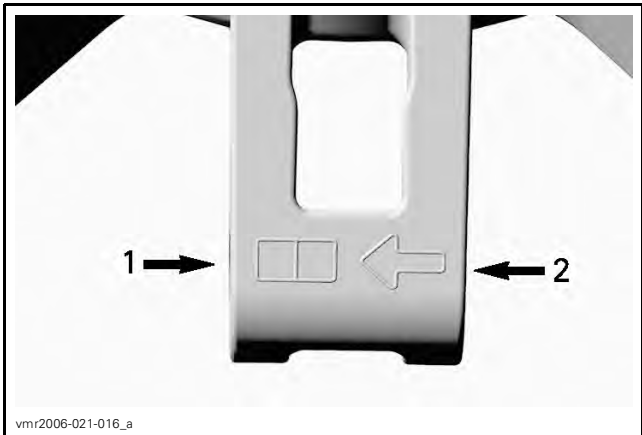
NOTICE Always replace all rollers as a set. Partly worn rollers may cause damage to the CVT system.



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1. Punch
2. Vice

Section 03 ENGINE, CVT AND GEARBOX (570)
Subsection 11 (CONTINUOUSLY VARIABLE TRANSMISSION (CVT))



- 1. Removal direction
- 2. Assembly direction

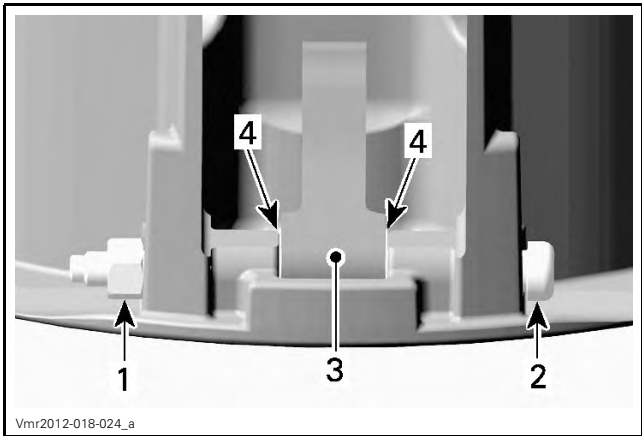
NOTE: Whenever removing a governor cup which already has two marked boxes, replace it by a new one.



Sliding Sheave

Unscrew lock nut and remove centrifugal lever pivot bolt. This drive pulley is equipped with 4 levers.

Remove centrifugal lever and both thrust washers.



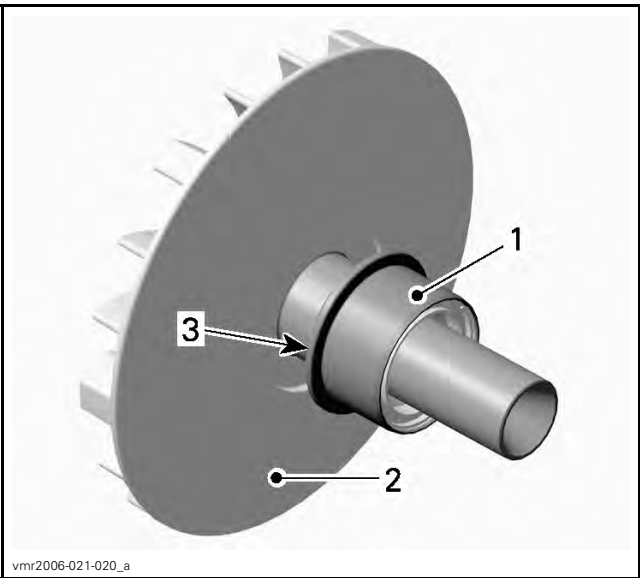
- 1. Lock nut
- 2. Centrifugal lever pivot bolt
- 3. Centrifugal lever
- 4. Thrust washers

Fixed Sheave

**WARNING**

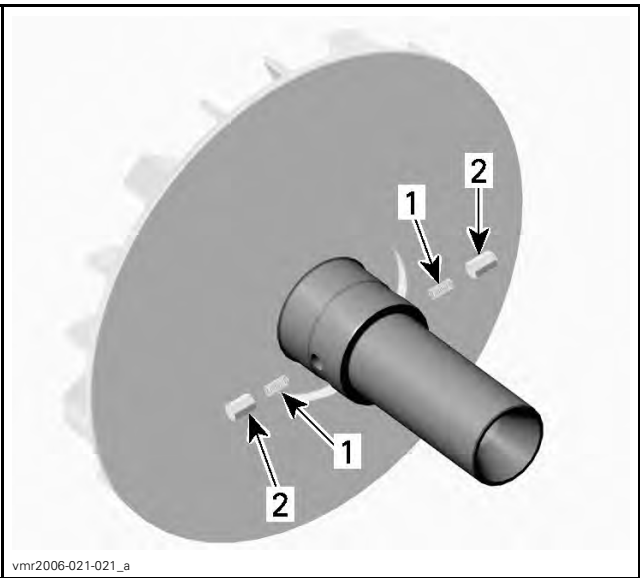
Always wear safety glasses to remove spring sleeves.

Pull and rotate one-way clutch slowly until the spring sleeves are visible.



- 1. One-way clutch
- 2. Fixed sheave
- 3. Spring sleeve area

Hold both spring sleeves with fingers and carefully remove them when the one-way clutch is disengaged.



- 1. Springs
- 2. Spring sleeves

Cleaning the Drive Pulley

Clean pulley faces and shaft with fine steel wool and a dry cloth.

Using a paper towel with the recommended cleaning solvent, clean:

- Crankshaft tapered end
- Taper inside the fixed sheave of the drive pulley
- Crankshaft threads
- Drive pulley screw threads.

REQUIRED PRODUCT
PULLEY FLANGE CLEANER (P/N 413 711 809)

NOTICE Avoid contact between cleaner and crankshaft seal as damage may occur.

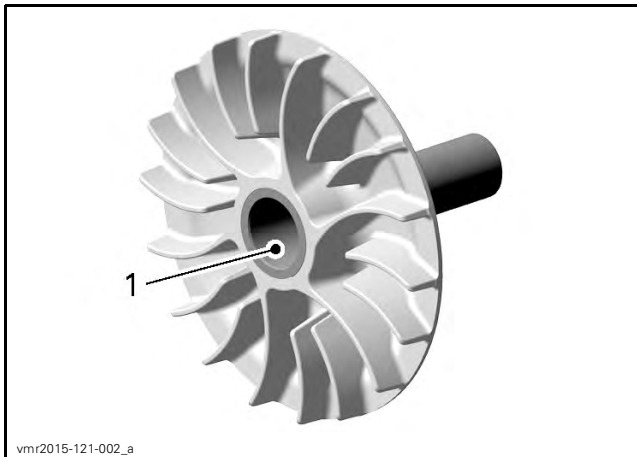
Remove all hardened oil deposits that have baked on the crankshaft and pulley tapered surfaces using coarse or medium steel wool, and/or sand paper no. 600.

NOTICE Do not use any other type of abrasive.

Reclean mounting surfaces with paper towel and PULLEY FLANGE CLEANER (P/N 413 711 809).

Wipe off the mounting surfaces with a clean, dry paper towel.

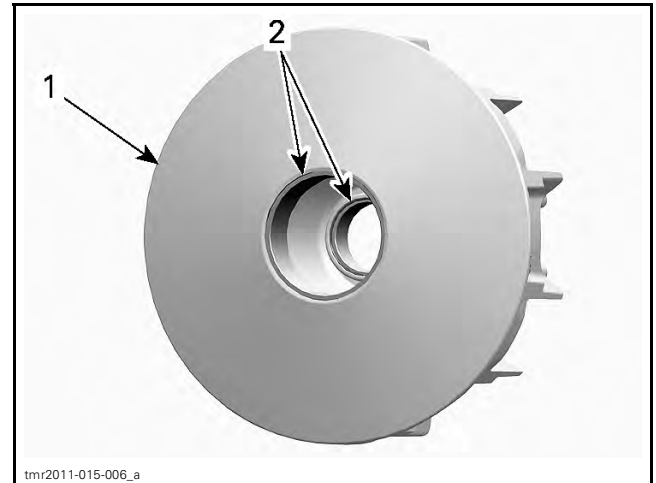
NOTICE Mounting surfaces must be free of any oil, cleaner or towel residue.



1. Taper of fixed sheave

Only use petrol base cleaner when cleaning sliding sheave bushings.

NOTICE Do not use acetone to clean bushing.



1. Sliding sheave
2. Bushings

Inspecting the Drive Pulley

Bushings

For bushing inspection, refer to *SLIDING SHEAVE* in this subsection.

Governor Cup

Check governor cup for cracks or other visible damage. Replace if necessary.

Roller and Slider Shoe

Check each roller for roundness of external diameter.

Check if rollers move freely.

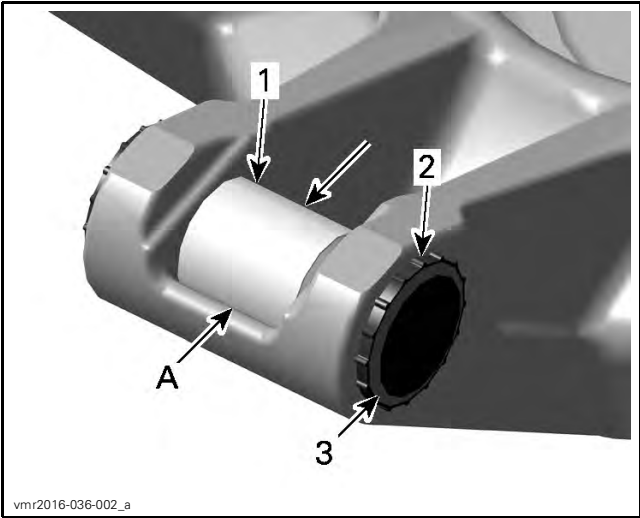
NOTICE Whenever replacing rollers and slider shoes, always replace all rollers and slider shoes as a set.

Check slider shoes for visible wear. If chamfer is not present anymore, replace **ALL** slider shoes.

NOTE: If necessary, use a screwdriver to remove slider shoes.

Section 03 ENGINE, CVT AND GEARBOX (570)

Subsection 11 (CONTINUOUSLY VARIABLE TRANSMISSION (CVT))

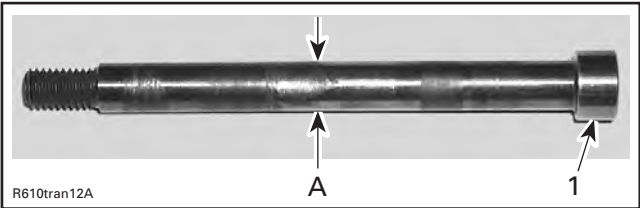


1. Roller
2. Slider shoe
3. Chamfer
A. Roller outer diameter

ROLLER OUTER DIAMETER	
NEW	13.80 mm to 14.00 mm (.543 in to .551 in)
SERVICE LIMIT	13.20 mm (.519 in)
ROLLER INNER DIAMETER	
NEW	8.025 mm to 8.175 mm (.316 in to .322 in)
SERVICE LIMIT	9 mm (.354 in)

Centrifugal Lever Pivot Bolt

Measure diameter of centrifugal lever pivot bolt; replace if out of specification.

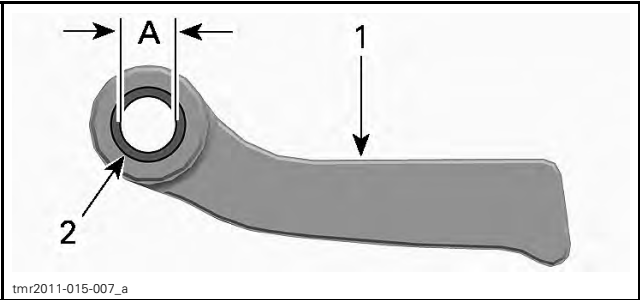


1. Centrifugal lever pivot bolt
A. Measure diameter here

CENTRIFUGAL LEVER PIVOT BOLT DIAMETER	
NEW	6.078 mm to 6.100 mm (.239 in to .24 in)
SERVICE LIMIT	6.00 mm (.236 in)

Centrifugal Lever

Check bushing diameter in the centrifugal lever for wear. Replace centrifugal lever if necessary.

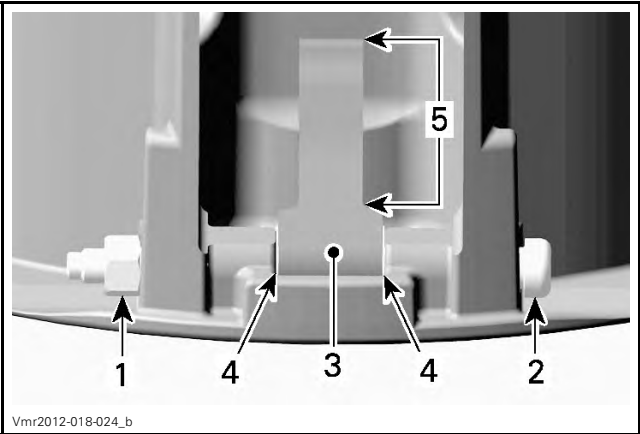


1. Centrifugal lever
2. Bushing
A. Bushing inner diameter

CENTRIFUGAL LEVER BORE DIAMETER	
NEW	6.035 mm to 6.078 mm (.238 in to .239 in)
SERVICE LIMIT	6.200 mm (.244 in)

Inspect and replace as necessary the following items if their contact surfaces are heavy worn:

- Centrifugal lever
- Thrust washers
- Centrifugal lever pivot bolts
- Lock nuts.



1. Lock nut
2. Centrifugal lever pivot bolt
3. Centrifugal lever
4. Thrust washers
5. Contact surface to the roller

**WARNING**

Whenever replacing centrifugal levers, always replace all levers as a set. Otherwise, drive pulley unbalance will occur.

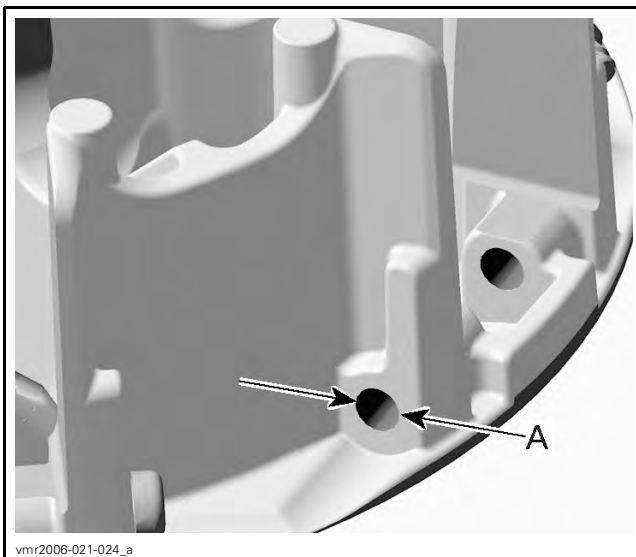
Sliding Sheave

Check sliding sheave for cracks and sliding contact surface for excessive wear. Replace sliding sheave if necessary.

Measure centrifugal lever pivot bolt bores. Replace sliding sheave if bores are out of specification or otherwise damaged.

Section 03 ENGINE, CVT AND GEARBOX (570)

Subsection 11 (CONTINUOUSLY VARIABLE TRANSMISSION (CVT))

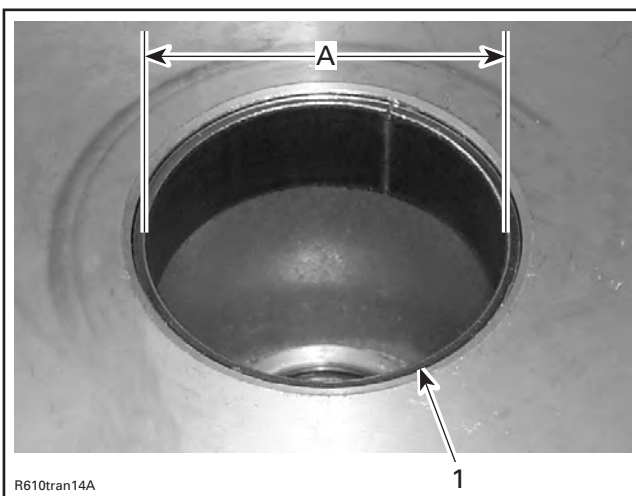


A. Centrifugal lever pivot bolt bore diameter

CENTRIFUGAL LEVER PIVOT BOLT BORE DIAMETER	
NEW	6.113 mm to 6.171 mm (.241 in to .243 in)
SERVICE LIMIT	6.300 mm (.248 in)

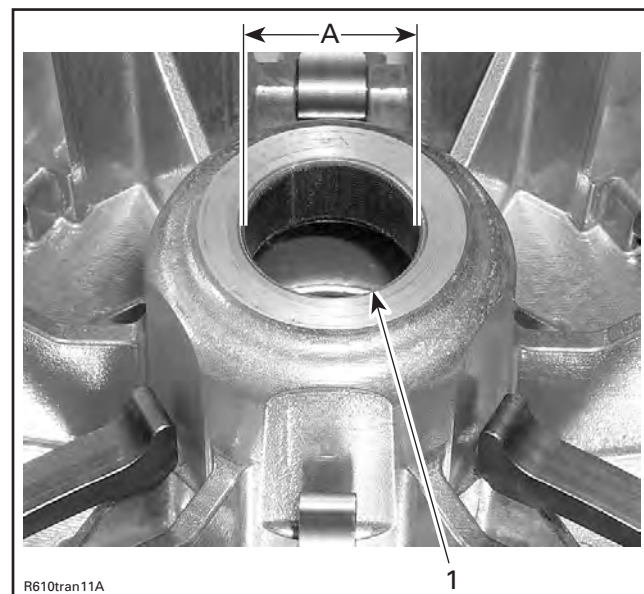
Measure bushing diameters of sliding sheave.

REQUIRED TOOL
Dial bore gauge
MEASURING POINT
At least 5 mm (1/4 in) from bushing edge



1. Bushing on fixed sheave side
A. Bore diameter of bushing

SLIDING SHEAVE LARGE BUSHING	
NEW	55.000 mm to 55.040 mm (2.165 in to 2.167 in)
SERVICE LIMIT	55.200 mm (2.173 in)



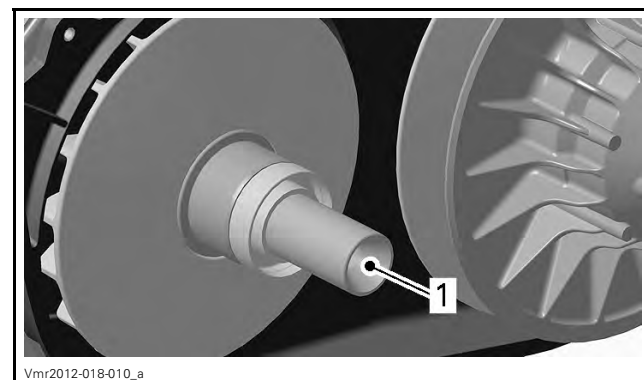
1. Bushing on governor cup side
A. Bore diameter of bushing

SLIDING SHEAVE SMALL BUSHING	
NEW	32.000 mm to 32.040 mm (1.26 in to 1.261 in)
SERVICE LIMIT	32.200 mm (1.268 in)

Replace sliding sheave if one of the bushings is out of specification. Visually inspect coatings for wear.

Fixed Sheave

Check fixed sheave contact surface to the governor cup for scratches or other damages. If damaged, replace fixed sheave.



1. Visually check here

Section 03 ENGINE, CVT AND GEARBOX (570)
Subsection 11 (CONTINUOUSLY VARIABLE TRANSMISSION (CVT))

Check for any marks on fixed sheave plate. Replace if necessary.

Spring

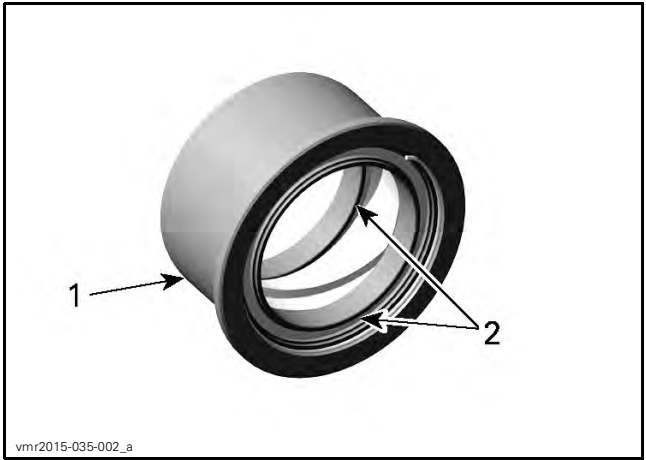
Measure spring free length and squareness. If spring is out of specification, replace by a new one.

CLUTCH SPRING FREE LENGTH	
SERVICE LIMIT	
85 MM (3.35 IN)	
CLUTCH SPRING SQUARENESS	
SERVICE LIMIT	
4 MM (.157 IN)	

One-Way Clutch

Check bearings for excessive play and smooth operation. Replace bearings if necessary.

NOTICE Be careful not to damage the inside of one-way clutch during bearing removal.



- 1. One-way clutch
- 2. Bearings

Measure length of spring sleeves and check if edges on top of the spring sleeve are excessively worn. If out of specification, replace both spring sleeves at the same time.

SPRING SLEEVE LENGTH	
NEW	9.2 mm to 9.4 mm (.362 in to .37 in)
SERVICE LIMIT	9.0 mm (.354 in)

Assembling the Drive Pulley

For assembly, reverse the disassembly procedure. Pay attention to following details.

One-Way Clutch

Clean parts.

Lubricate springs, spring sleeves and between one way clutch bearings using recommended product.

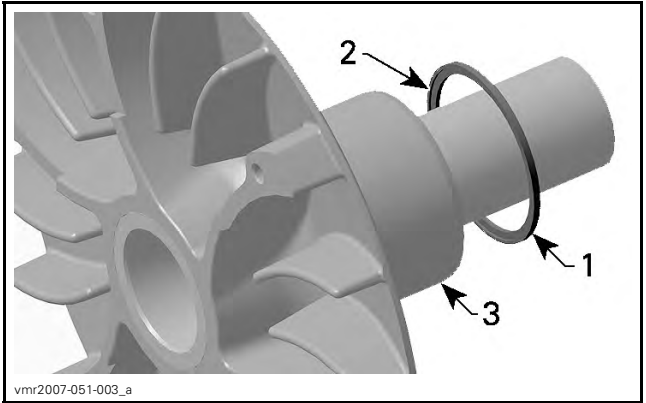
REQUIRED PRODUCT
ISOFLEX GREASE TOPAS NB 52 (P/N 293 550 021)

Friction Washer

NOTE: Apply recommended grease on both sides of friction washer.

REQUIRED PRODUCT
ISOFLEX GREASE TOPAS NB 52 (P/N 293 550 021)

NOTE: Friction washer must be assembled with collar towards one way clutch.



- 1. Friction washer
- 2. Collar
- 3. One way clutch

Sliding Sheave

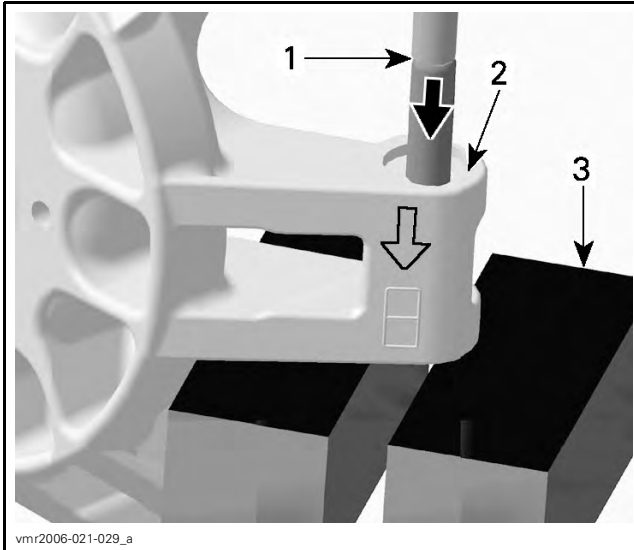
Install centrifugal levers with their thrust washers.

NOTICE Centrifugal levers must move easily after installation.

Governor Cup

Rebuild governor cup with new roller sleeves, rollers and slider shoes.

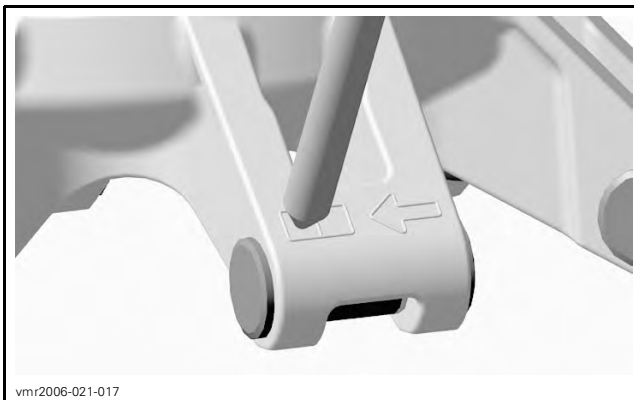
NOTICE Final position of roller sleeves must be flush with the sleeve bore in the governor cup arm (no protrusion).



1. Top edge of roller sleeve
2. Mating surface of slider shoes
3. Vice

Whenever replacing the roller sleeves, make a mark in the box on the governor arm using a punch.

NOTICE Do not tap too hard. Severe damage to the governor cup may appear.



NOTICE Rollers must move easily after installation.

Carefully press slider shoes in the governor cup arm so they **bottom out evenly** in the machined portion of the governor cup arm.

NOTICE Slider shoes must be pressed in evenly to ensure they are centered in the arm and slide properly in the guides.

Installing the Drive Pulley

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

⚠ WARNING

Do not apply antiseize or any lubricant on crankshaft and drive pulley tapers.

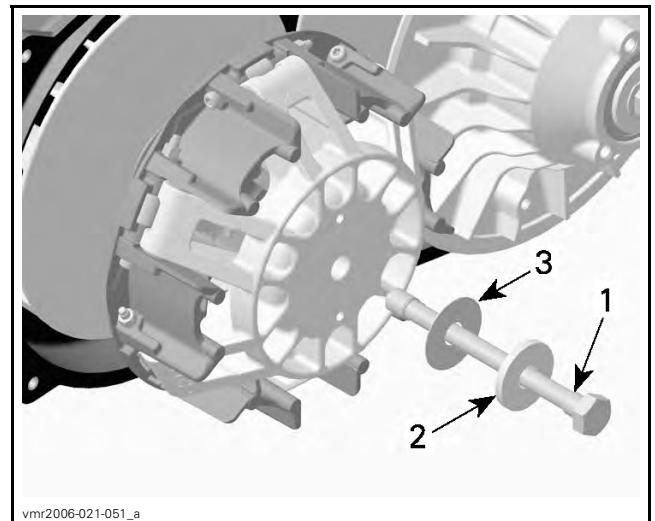
NOTICE Never use any type of impact wrench for drive pulley removal and installation.

Clean mounting surfaces as described in *DRIVE PULLEY CLEANING*.

Install drive pulley on crankshaft extension.

NOTICE Do not forget to install thrust washer and conical spring washer as per illustration that follows.

NOTE: Install conical spring washer with its concave side towards drive pulley.



1. Drive pulley screw
2. Conical spring washer
3. Thrust washer

⚠ WARNING

Never substitute conical spring washer and/or screw with aftermarket parts. Always use genuine BRP parts.

Lock the drive pulley as per removal procedure.

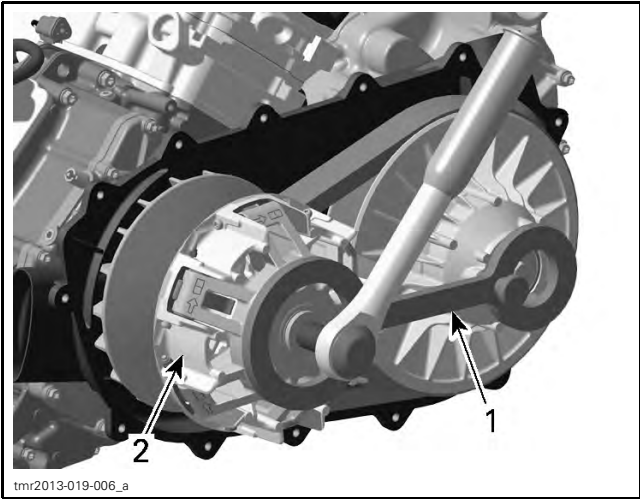
Tighten drive pulley screw to specification.

NOTICE Never use any type of impact wrench for drive pulley installation.

TIGHTENING TORQUE

Drive pulley screw	120 N•m ± 8 N•m (89 lbf•ft ± 6 lbf•ft)
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Section 03 ENGINE, CVT AND GEARBOX (570)
Subsection 11 (CONTINUOUSLY VARIABLE TRANSMISSION (CVT))



- 1. Clutch holder (P/N 529 036 238)
- 2. Drive pulley

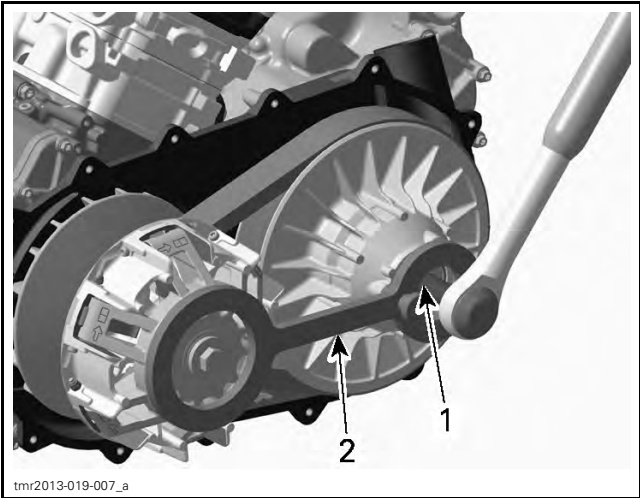
DRIVEN PULLEY

Removing the Driven Pulley

- 1. Remove drive belt, refer to *DRIVE BELT REMOVAL* in this subsection.
- 2. Hold the driven pulley and loosen the driven pulley screw.

NOTE: Do not completely remove the driven pulley screw.

REQUIRED TOOL	
CLUTCH HOLDER (P/N 529 036 238)	

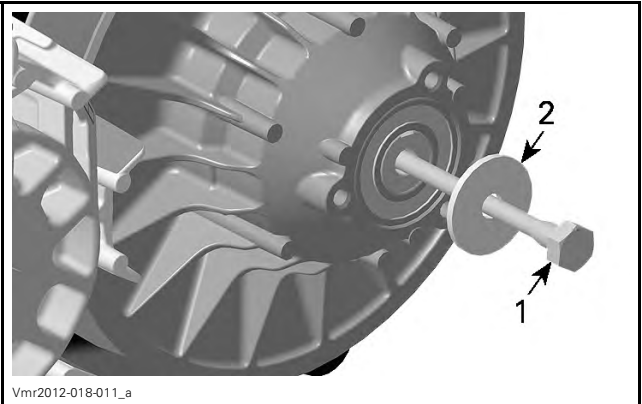


- 1. Driven pulley screw
- 2. Clutch holder (P/N 529 036 238)

- 3. Remove service tool.
- 4. Apply axial pressure with your hand on driven pulley and maintain during screw removal.

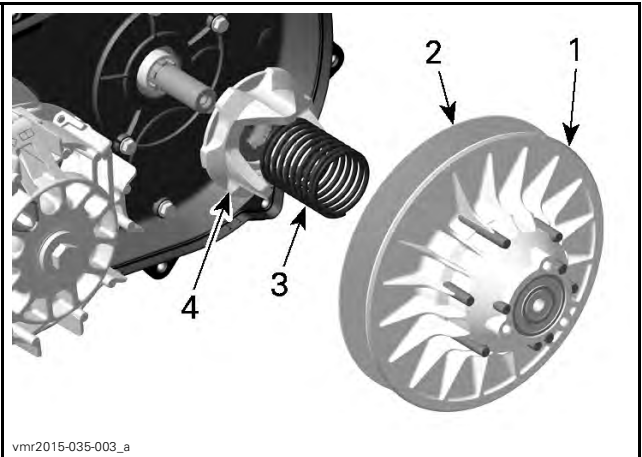
- 5. Remove driven pulley screw and washer. Discard driven pulley screw.

⚠ CAUTION Driven pulley is spring loaded. Hold driven pulley tight and slowly remove the driven pulley screw to release spring tension.



- 1. Driven pulley screw
- 2. Thrust washer

- 6. Remove the driven pulley with the spring and the cam.



- 1. Fixed sheave of driven pulley
- 2. Sliding sheave of driven pulley
- 3. Spring
- 4. Cam

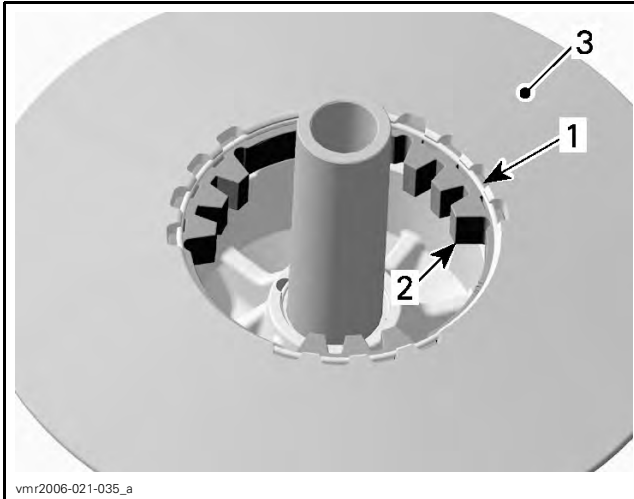
Disassembling the Driven Pulley

Fixed Sheave

- 1. Remove retaining ring and lift torque gear.

Section 03 ENGINE, CVT AND GEARBOX (570)

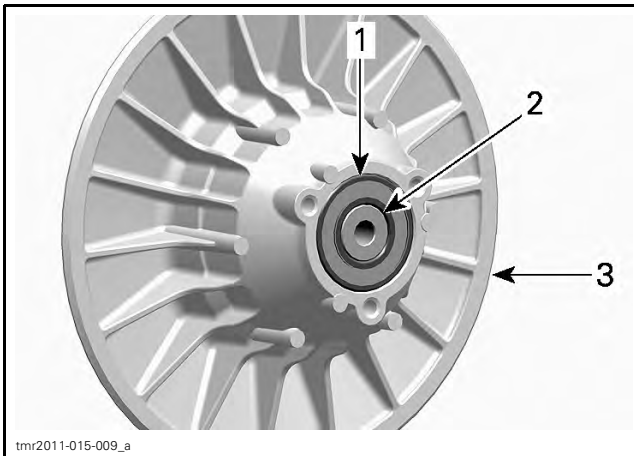
Subsection 11 (CONTINUOUSLY VARIABLE TRANSMISSION (CVT))



1. Retaining ring
2. Torque gear
3. Fixed sheave of driven pulley

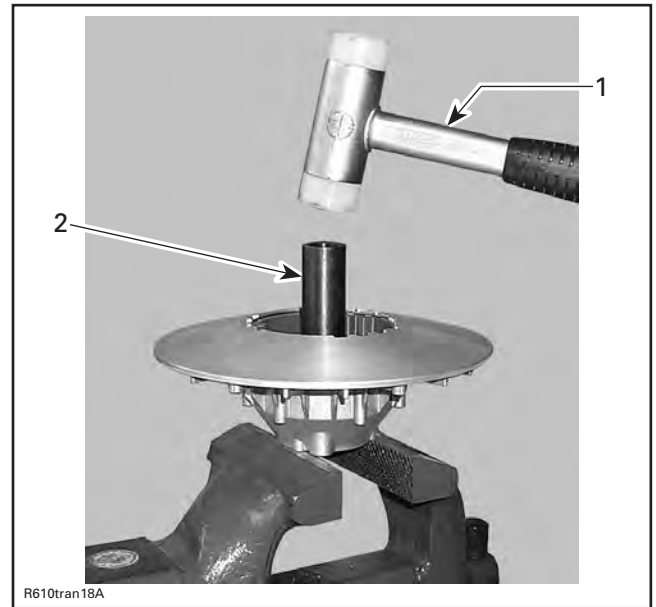
NOTE: The following procedure is not necessary except if ball bearing or shaft must be removed. Refer to *INSPECTION* before proceeding.

2. Heat ball bearing area up to 100°C (212°F) before removing ball bearing.



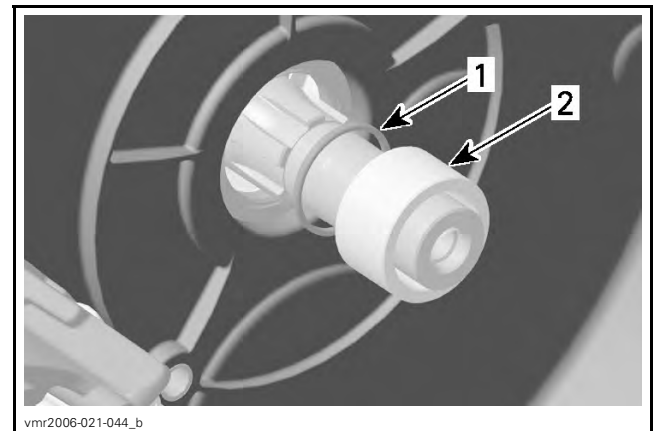
1. Ball bearing
2. Shaft
3. Fixed sheave of driven pulley

3. Use a soft hammer to push shaft and bearing out of fixed sheave.



1. Soft hammer
2. Shaft

4. Remove shaft from ball bearing.
5. Remove distance sleeve and O-ring from countershaft.
6. Replace O-ring if brittle, hard or damaged.



1. O-ring
2. Distance sleeve

Cleaning the Driven Pulley

When a dust deposit has to be removed from the cam or the shaft, use a dry cloth.

Clean pulley faces and shaft using fine steel wool and a dry cloth.

Clean driven pulley using the recommended product.

RECOMMENDED PRODUCT
PULLEY FLANGE CLEANER (P/N 413 711 809)

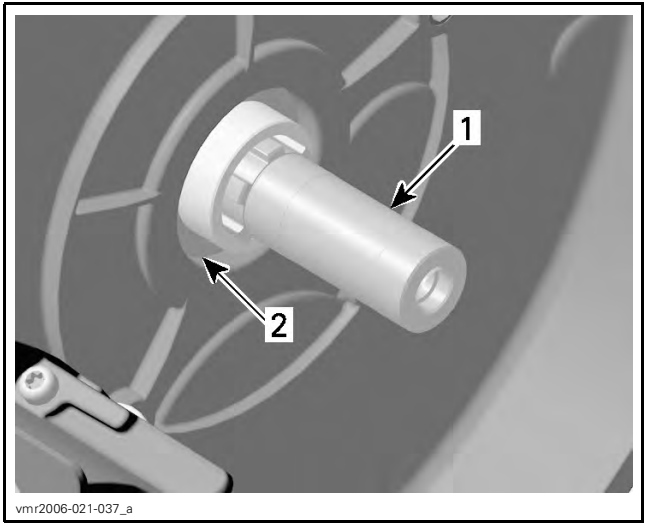
Clean the CVT air guide area from contamination.

Section 03 ENGINE, CVT AND GEARBOX (570)

Subsection 11 (CONTINUOUSLY VARIABLE TRANSMISSION (CVT))

Using a paper towel with PULLEY FLANGE CLEANER (P/N 413 711 809), clean countershaft end and shaft bore.

NOTICE To avoid damage, make sure cleaner does not contact the countershaft oil seal.



1. Countershaft support
2. Countershaft oil seal

Inspecting the Driven Pulley

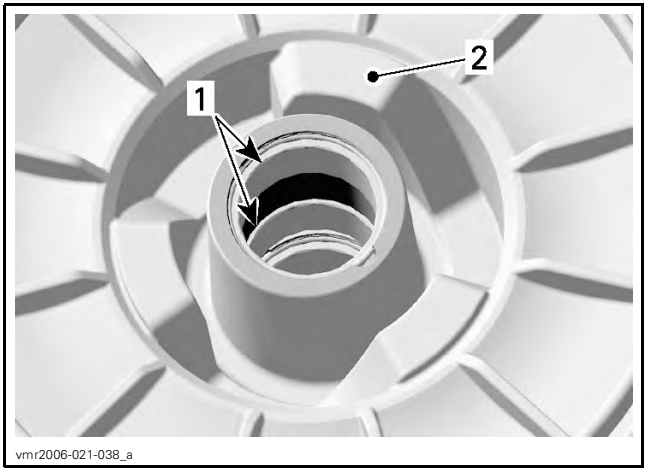
Sliding Sheave

Check sliding sheave for cracks and sliding contact surface for excessive wear. Replace sliding sheave if necessary.

Check bushings for cracks, scratches and for freedom of movement when assembled to sliding sheave.

Measure bushing inner diameter.

NOTE: Bushings cannot be replaced. Replace sliding sheave if bushings are out of specification. Visually inspect coatings.



1. Bushings
2. Backside of sliding sheave of driven pulley

REQUIRED TOOL	
Dial bore gauge	
MEASURING POINT	
At least 5 mm (1/4 in) from bushing edge	
BUSHING INNER DIAMETER	
NEW	30.060 mm to 30.100 mm (1.183 in to 1.185 in)
SERVICE LIMIT	30.200 mm (1.189 in)

Fixed Sheave

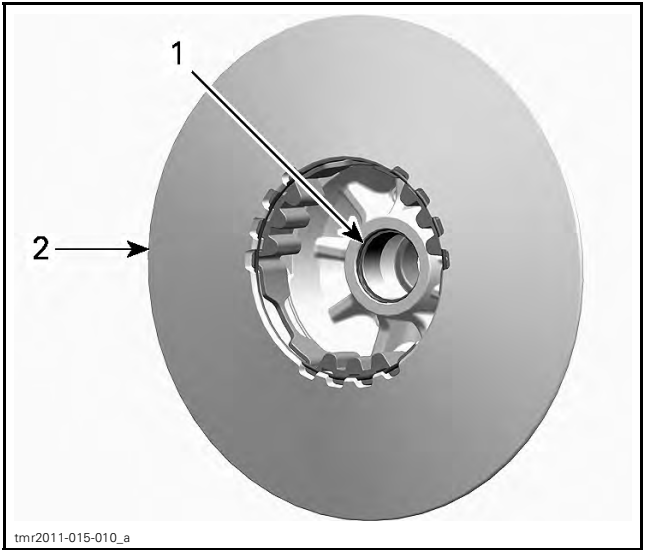
Check fixed sheave for cracks and excessive wear. Replace fixed sheave if necessary.

Check ball bearing for free play and smooth operation. Replace if necessary.

Check shaft for heavy wear or visible damage. Replace if necessary.

If the shaft is removed, measure bushing inner diameter.

NOTE: This bushing cannot be replaced. Replace fixed sheave if bushing is out of specification. Visually inspect coatings.



1. Bushing
2. Fixed sheave of driven pulley

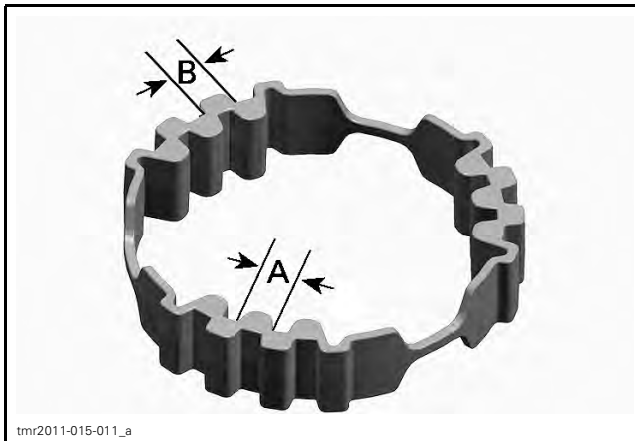
REQUIRED TOOL	
Dial bore gauge	
MEASURING POINT	
At least 5 mm (1/4 in) from bushing edge	

Section 03 ENGINE, CVT AND GEARBOX (570)

Subsection 11 (CONTINUOUSLY VARIABLE TRANSMISSION (CVT))

BUSHING INNER DIAMETER	
NEW	30.060 mm to 30.100 mm (1.183 in to 1.185 in)
SERVICE LIMIT	30.200 mm (1.189 in)

Check torque gear for visible damage and cracks.
Measure for wear limit using a caliper.

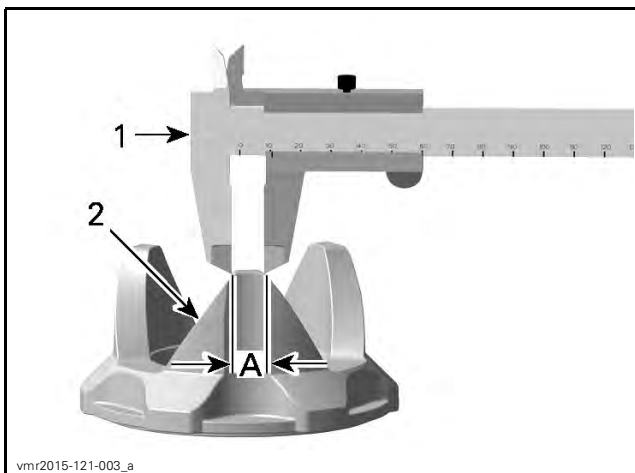


A. Measurement inside
B. Measurement outside

WEAR ON TEETH (BOTH SIDES)	
SERVICE LIMIT	7.500 mm (.295 in)

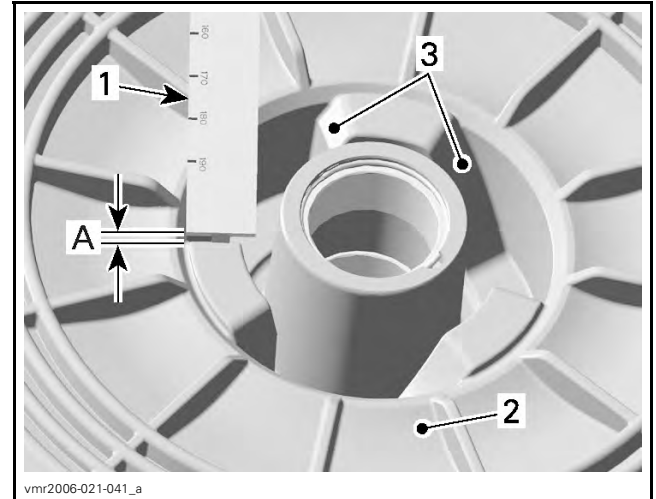
Cam

Check cam for visible damage and measure for wear using a caliper.



1. Caliper
2. Contact surface
A. Width to be measured due to wear on contact surface

WIDTH ON TOP SURFACE	
SERVICE LIMIT	4.5 mm (.177 in)



1. Caliper
2. Sliding sheave
3. Contact surface
A. Wear to be measured

WEAR ON CONTACT SURFACE	
SERVICE LIMIT	1.00 mm (.039 in)

Spring

Measure spring free length and squareness. If spring is out of specification, replace by a new.

SPRING FREE LENGTH	
SERVICE LIMIT	125 MM (4.92 IN)
CLUTCH SPRING SQUARENESS	
SERVICE LIMIT	3.8 MM (.15 IN)

Assembling the Driven Pulley

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

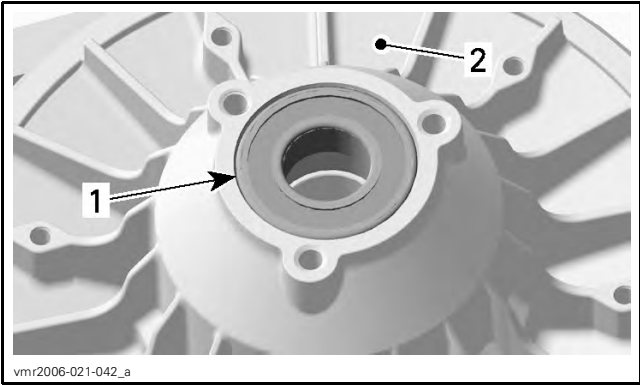
Heat ball bearing area up to 100°C (212°F) before ball bearing installation.

NOTE: Place new ball bearing in a freezer for 10 minutes before installation.

Install ball bearing with the writing on top and press it in using only the outer race.

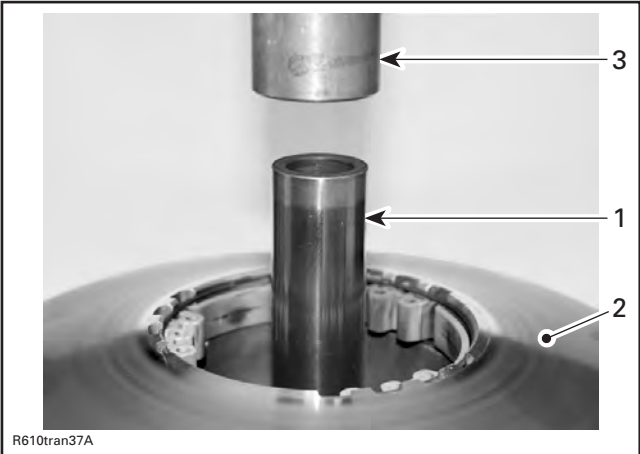
Section 03 ENGINE, CVT AND GEARBOX (570)

Subsection 11 (CONTINUOUSLY VARIABLE TRANSMISSION (CVT))



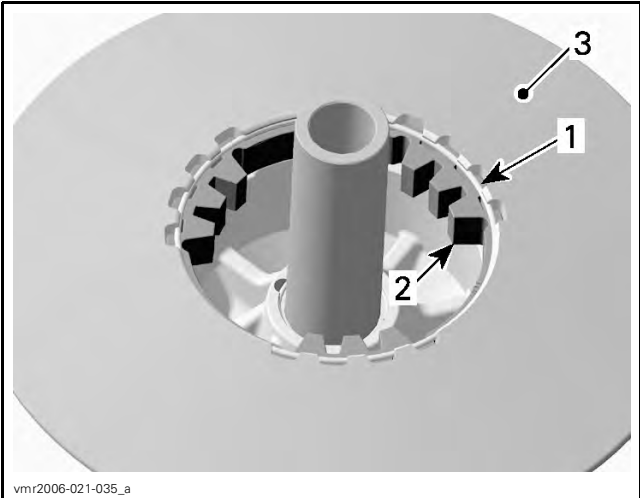
- 1. Ball bearing
- 2. Fixed sheave of driven pulley

NOTICE Do not use a hammer, bearing must be pressed in only.



- 1. Shaft
- 2. Fixed sheave
- 3. Press machine

Install torque gear then secure it with the retaining ring.



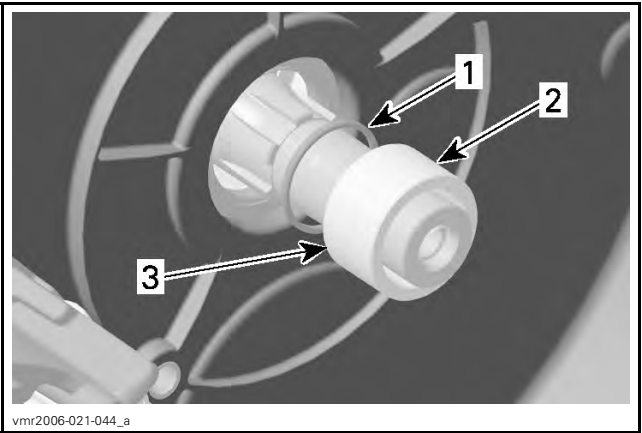
- 1. Retaining ring
- 2. Torque gear
- 3. Fixed sheave of driven pulley

Installing the Driven Pulley

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

Place O-ring on countershaft splines and move it and the distance sleeve into position.

NOTICE Chamfer on inside diameter of the distance sleeve must face to gearbox side.



- 1. O-ring
- 2. Distance sleeve
- 3. Chamfered area of distance sleeve

NOTICE Threads of gearbox countershaft and driven pulley screw must be free of oil and grease. Lubricants in threads will create too high preload to tightened driven pulley screw.

Clean threads using PULLEY FLANGE CLEANER (P/N 413 711 809).

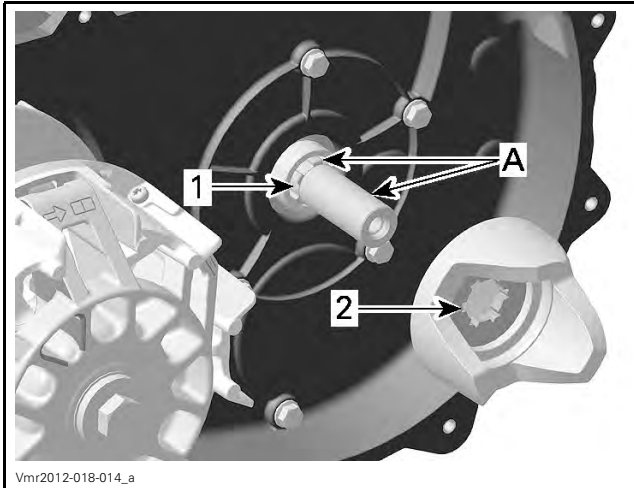
Install cam on countershaft.

NOTICE Cam splines must engage on countershaft splines.

REQUIRED PRODUCT	
Countershaft splines and countershaft end	LOCTITE 767 (ANTISEIZE LUBRICANT) (P/N 293 800 070)

Section 03 ENGINE, CVT AND GEARBOX (570)

Subsection 11 (CONTINUOUSLY VARIABLE TRANSMISSION (CVT))

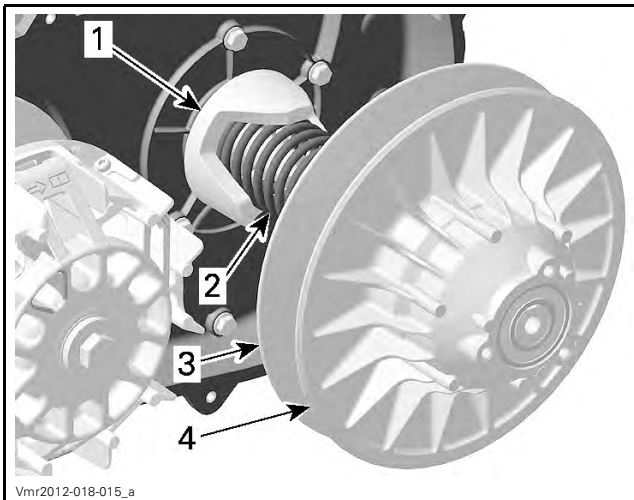


TYPICAL

1. Countershaft splines
2. Cam splines
- A. Loctite 767 here

Insert sliding sheave in fixed sheave.

Place spring behind sliding sheave then align driven pulley with cam.



TYPICAL

1. Cam
2. Spring
3. Sliding sheave
4. Fixed sheave

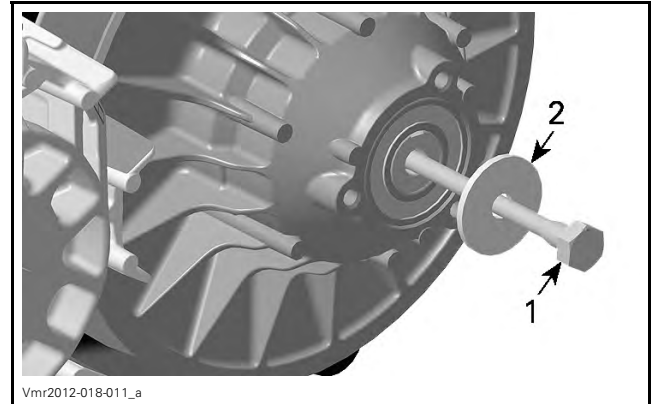
With your hand, push the driven pulley onto the shaft to compress the spring.

NOTICE A cam not correctly engaged will cause damage to the driven pulley and cam.

As you hold the pulley compressed, install a **NEW** driven pulley screw and thrust washer.

NOTICE This assembly uses a stretch screw. Always install a **NEW** screw.

NOTE: Tighten the screw with your hand sufficiently for the cam to remain engaged.

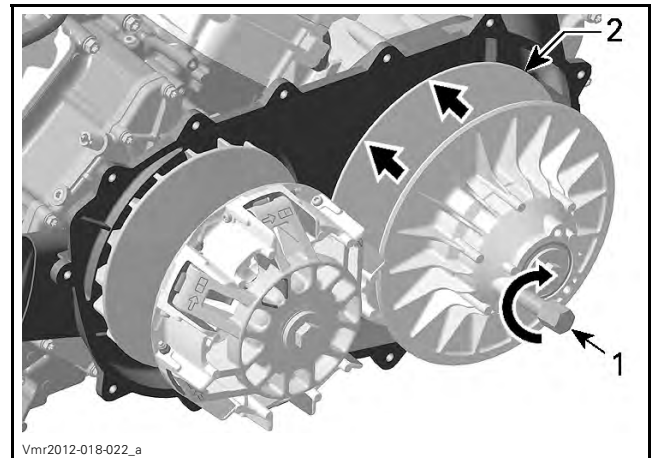


1. Driven pulley screw
2. Thrust washer

Install drive belt. Refer to *DRIVE BELT* in this subsection.

REQUIRED TOOL

PULLER/LOCKING
TOOL
(P/N 529 036 098)



1. Puller/locking tool
2. Sliding sheave

NOTE: If driven pulley sheaves cannot be opened when the service tool is screwed in, the cam is not correctly engaged in the sliding sheave.

Tighten driven pulley screw to specification.

REQUIRED TOOL

CLUTCH HOLDER
(P/N 529 036 238)



TIGHTENING TORQUE		
Driven pulley screw	Step A	20 N•m ± 1 N•m (15 lbf•ft ± 1 lbf•ft)
	Step B	180° ± 5°

Check driven pulley end play.

SPECIFICATION	
Driven pulley end play	0 mm (0 in)

CVT AIR GUIDE

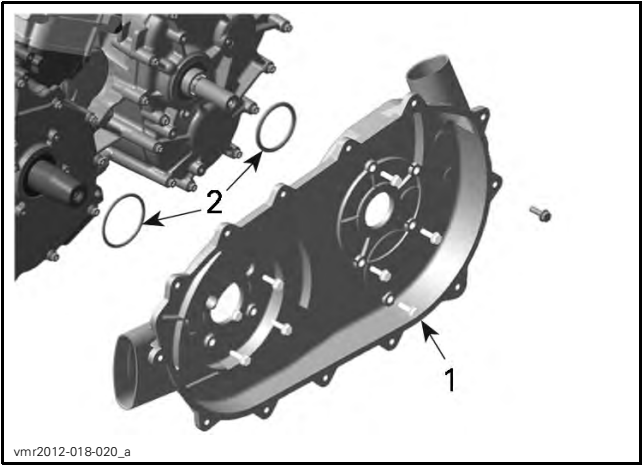
Removing the CVT Air Guide

- 1. Remove the *DRIVE PULLEY* and the *DRIVEN PULLEY*.
- 2. Unscrew the clamps retaining the CVT air hoses.
- 3. Remove CVT air guide.

Inspecting the CVT Air Guide

Clean CVT air guide from contamination

Check O-rings. If brittle, hard or damaged, replace as necessary.



- 1. CVT air guide
- 2. O-rings

Installing the CVT Air Guide

For installation reverse the removal procedure.

CONTINUOUSLY VARIABLE TRANSMISSION (CVT)

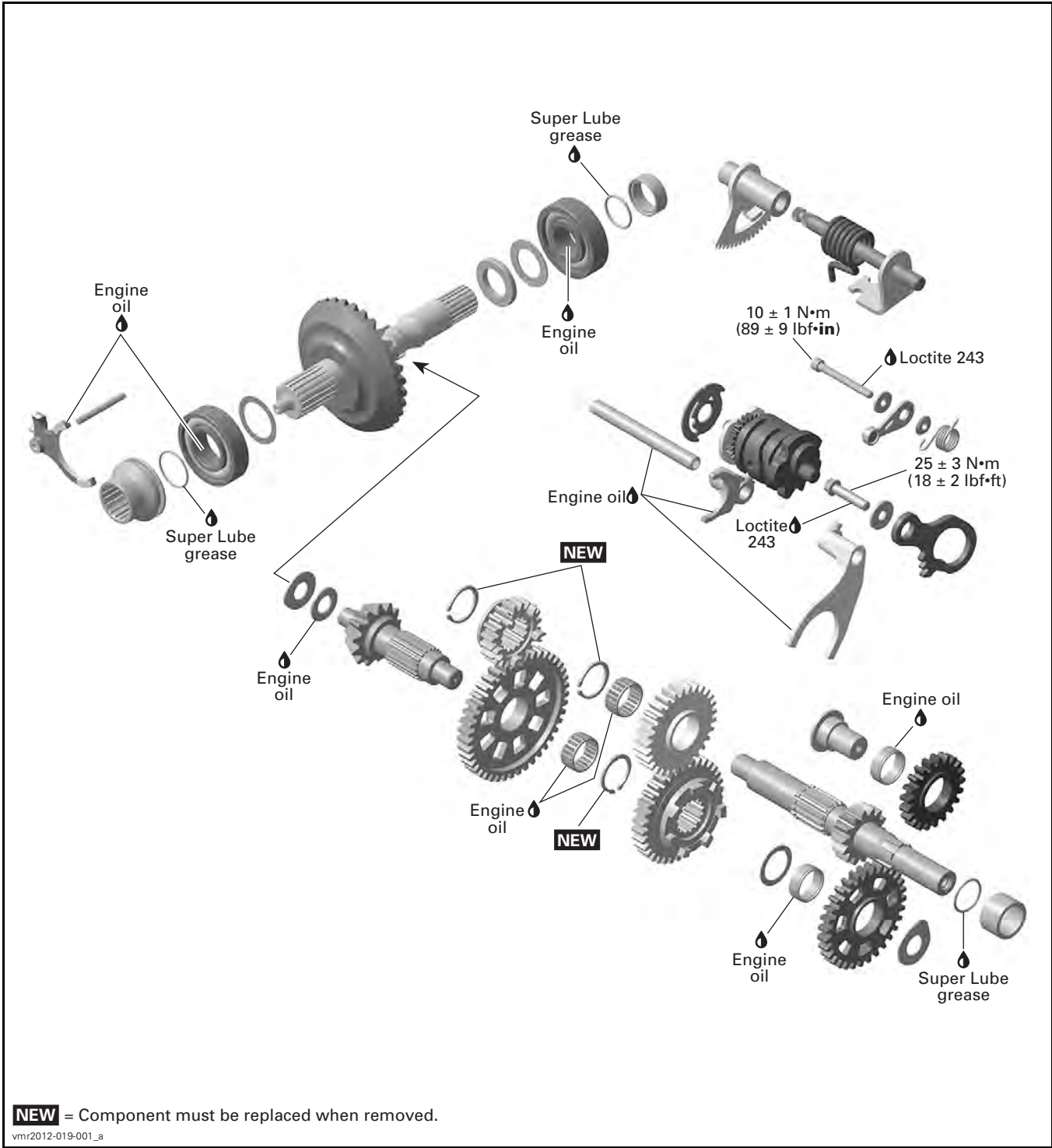
SERVICE TOOLS

Description	Part Number	Page
CLUTCH HOLDER.....	529 036 238	154, 162, 167
CLUTCH PULLER	529 035 746	154
PULLER/LOCKING TOOL.....	529 036 098	153, 167

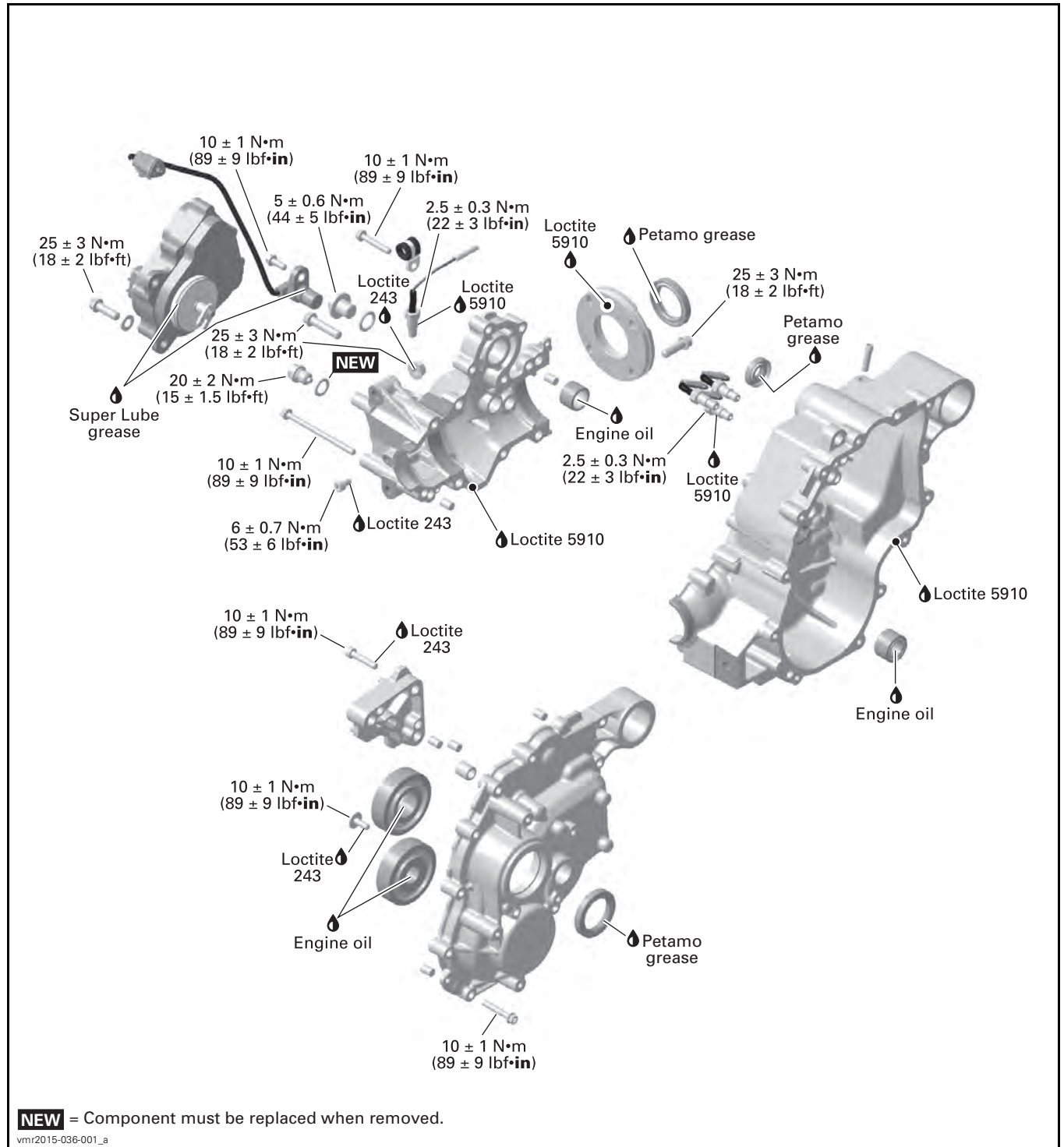
SERVICE PRODUCTS

Description	Part Number	Page
ISOFLEX GREASE TOPAS NB 52	293 550 021	160
LOCTITE 767 (ANTISEIZE LUBRICANT)	293 800 070	166
PULLEY FLANGE CLEANER	413 711 809	157, 163–164, 166

GEARBOX COMPONENTS AND 4X4 COUPLING MECHANISM

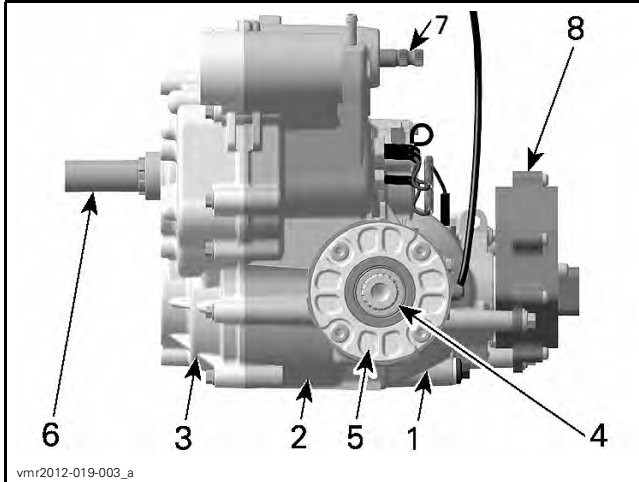


GEARBOX HOUSING AND 4X4 ACTUATOR UNIT



GENERAL

OVERVIEW



1. Right housing
2. Center housing
3. Left housing
4. Output shaft
5. Bearing cover
6. Countershaft
7. Shift shaft
8. Actuator

TROUBLESHOOTING

UNUSUAL GEARBOX NOISE AND/OR VIBRATIONS

1. Low oil level in gearbox.
 - Oil leakage from gearbox. Replace damaged gasket(s) and/or oil seal(s).
2. Defective bearings.
 - Bearing(s) do(es) not turn smoothly. Replace bearing(s).
3. Damaged or worn gears.
 - Inspect gears for damages or missing teeth. Replace respective gears.

GEAR INDICATION FAILS

1. Check contact screws on gear housing center.
 - Contact(s) is (are) corroded and/or connectors to wiring harness got loose.
 - Damaged wires. Repair as required.
 - Shifting indicator switch(es) pin(s) is (are) worn and/or damaged. Replace shifting indicator switch(es).

GEAR(S) IS (ARE) HARD TO SHIFT

1. Incorrect shift rod adjustment.
 - Adjust shift rod (refer to SHIFT ROD in SHIFTER subsection).

4 WHEEL DRIVE INDICATION FAILS

1. 4WD indicator switch failure.
 - Test 4WD indicator switch. Replace as required.
 - Bad contact. Check for corrosion or loose connector.
 - Damaged wires. Repair as required.

4 WHEEL DRIVE DOES NOT ENGAGE OR DISENGAGE

1. Defective 4WD switch.
 - Check 4WD switch operation.
2. Defective actuator.
 - Test actuator.
3. Damaged or worn shifting fork or sleeve.
 - Remove actuator and inspect shifting fork and sleeve.

PROCEDURES

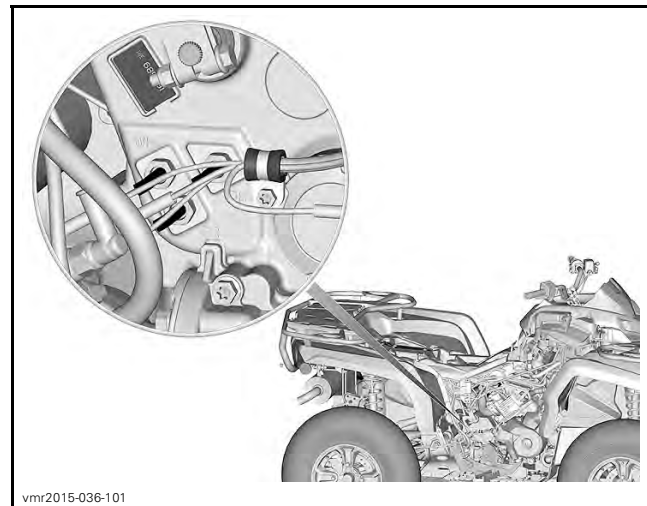
GEARBOX POSITION INDICATOR SWITCHES

NOTE: First ensure shifter link rod is properly adjusted, refer to *SHIFTER* subsection.

Gearbox Position Indicator Switch Access

Refer to *BODY* subsection and remove the following:

- Seat
- Console
- RH side panel and extension(s)
- RH footrest panel.



Testing the Gearbox Position Indicator Switch Continuity

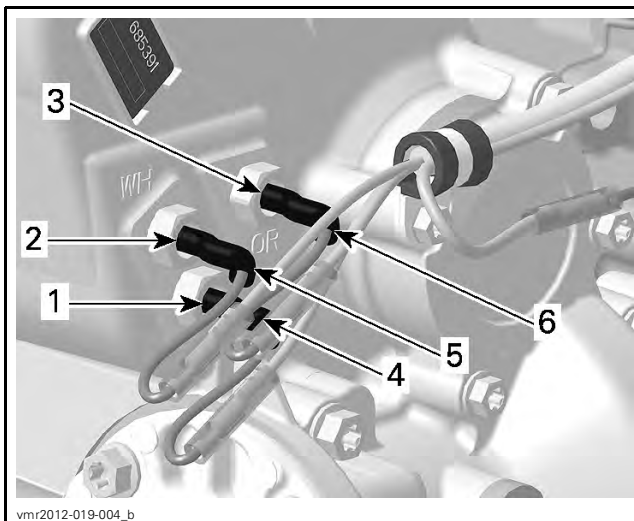
1. Remove parts required for access, refer to *GEARBOX POSITION INDICATOR SWITCH ACCESS* in this subsection.

NOTE: Take note of corresponding switch position and wire color.

2. Disconnect wires from switches.

NOTE: Remove insulating paint to obtain correct readings.

3. Using a multimeter, measure the resistance from the indicator switch to engine ground while selecting the gearbox to each position. Compare results with the logic table below.



1. Gearbox position indicator switch - position 1
2. Gearbox position indicator switch - position 2
3. Gearbox position indicator switch - position 3
4. BROWN/GREY wire
5. WHITE/RED wire
6. ORANGE/GREY wire

SHIFTER POSITION	CORRESPONDING SWITCH		
	BROWN/GREY	WHITE/RED	ORANGE/GREY
	Position 1	Position 2	Position 3
L	X		X
H			X
N		X	X
R		X	
P	X	X	

An "X" indicates switch is making ground contact, thus there should be continuity (R is close to 0 Ohms).

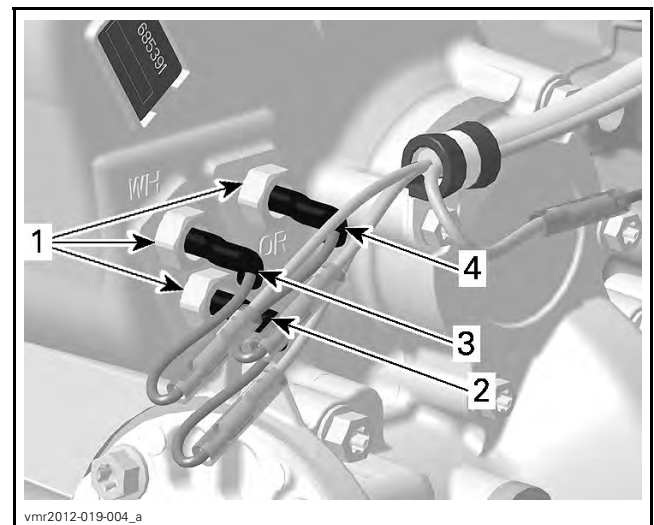
A blank space indicates switch is not making contact, there should be no continuity (R = infinite).

If the indicator switch is good, check the vehicle harness and/or indicator lights.

Removing the Gearbox Position Indicator Switch

NOTE: Clean area of dirt before removing gearbox indicator position switch(es). Take note of corresponding switch position and wire color.

Disconnect indicator switch from engine wiring harness.



1. Gearbox position indicator switches
2. BROWN/GREY wire
3. WHITE/RED wire
4. ORANGE/GREY wire

Unscrew switch.

Installing the Gearbox Position Indicator Switch

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

Take care to avoid damaging threads in switch bores during installation.

Carefully apply some sealant on threads of shift indicator switches.

NOTICE Do not apply Loctite 5910 on switch plunger as it will lead to switch malfunction.

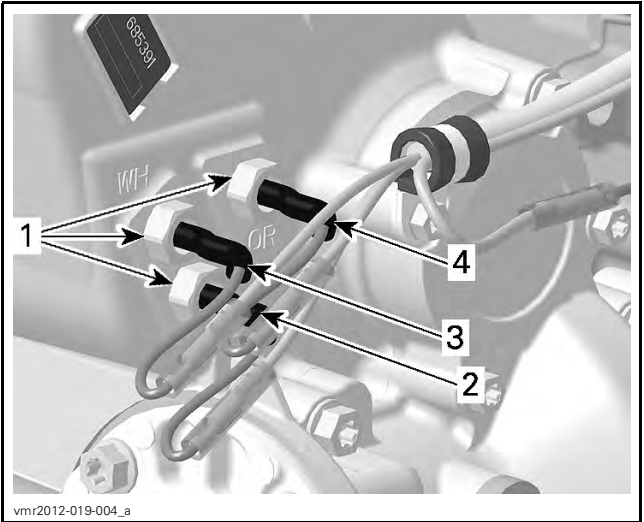
SERVICE PRODUCT	
Indicator switches	LOCTITE 5910 (P/N 293 800 081)

Section 03 ENGINE, CVT AND GEARBOX (570)

Subsection 12 (GEARBOX AND 4X4 COUPLING UNIT)

TIGHTENING TORQUE	
Indicator switches	2.5 N•m ± 0.3 N•m (22 lbf•in ± 3 lbf•in)

If all switches are removed, make sure to put the wires back in the correct location as noted prior to removal.



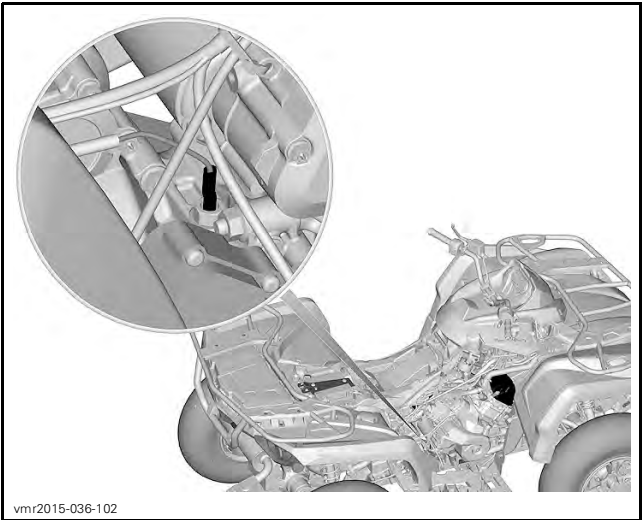
- 1. Indicator switches
- 2. BROWN/GREY wire
- 3. WHITE/RED wire
- 4. ORANGE/GREY wire

4WD INDICATOR SWITCH

4WD Indicator Switch Access

Refer to *BODY* subsection and remove the following:

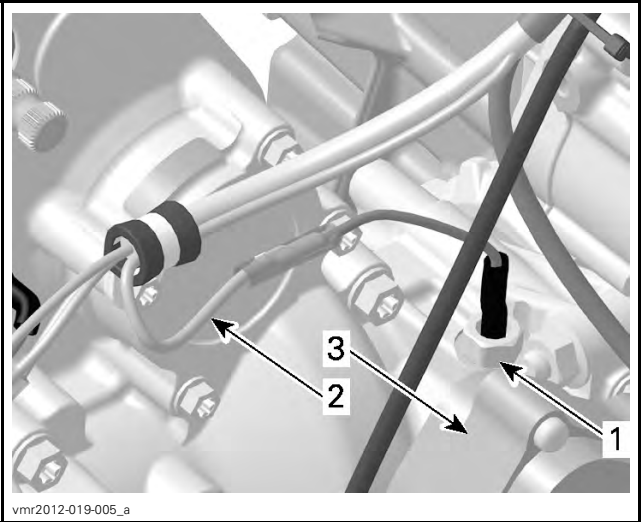
- Seat
- Console
- RH side panel and extension(s)
- RH footrest panel.



4WD INDICATOR SWITCH LOCATIONS

Removing the 4WD Indicator Switch

Disconnect 4WD indicator switch connector from engine wiring harness.



- 1. 4WD indicator switch
- 2. BLACK/BEIGE wire for contact to 4WD
- 3. Actuator

Testing the 4WD Indicator Switch

Measure switch resistance as follows.

SWITCH POSITION	SWITCH WIRE		RESISTANCE
2WD	BLACK/BEIGE	Engine ground	Close to 0 Ω
4WD			Infinite (OL)

If the resistance is out of specification, replace the 4WD indicator switch.

Installing the 4WD Indicator Switch

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

Take care to avoid damaging threads in switch bore during installation.

Carefully apply some sealant on threads of indicator switch.

NOTICE Do not apply Loctite 5910 on switch plunger, as it will lead to switch malfunction.

SERVICE PRODUCT	
4WD indicator switch	LOCTITE 5910 (P/N 293 800 081)

TIGHTENING TORQUE	
4WD indicator switch	2.5 N•m ± 0.3 N•m (22 lbf•in ± 3 lbf•in)

4WD ACTUATOR

4WD Actuator Access

To access the actuator, refer to *BODY* subsection and remove the following parts:

- Seat
- Console
- RH side panel and extension(s)
- RH footrest panel.

Testing the 4WD Actuator

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

1. Unplug 4WD actuator connector.
2. Turn ignition key ON.
3. Set emergency engine stop switch to RUN.
4. Measure voltage as follows.

SWITCH POSITION	SWITCH WIRE		VOLTAGE
2WD	WHITE/BLUE	WHITE	Battery voltage
4WD	WHITE/BLACK		

If the selector is out of specifications, check wires, connectors and replace the selector if necessary.

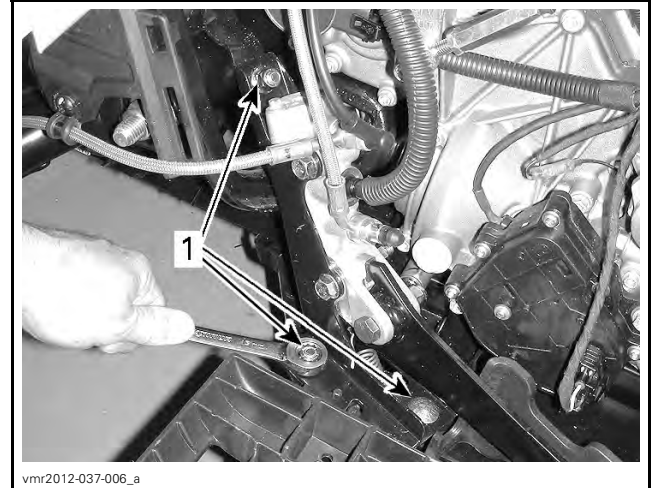
If the selector is good, check the vehicle harness.

If the vehicle harness is good, replace the actuator.

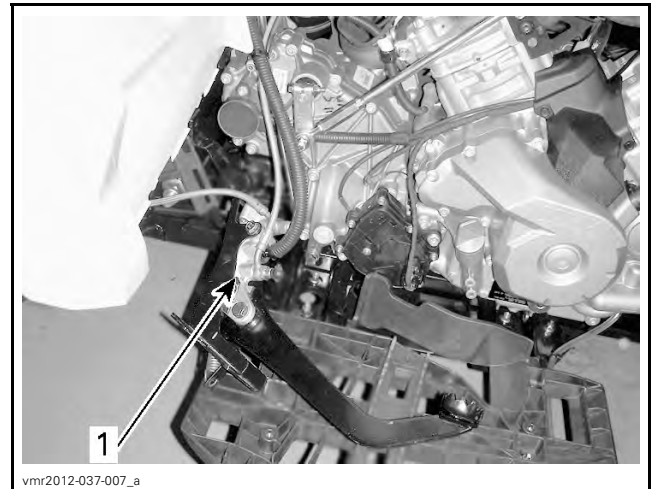
Removing the 4WD Actuator

NOTE: Before beginning any servicing on the actuator, make sure the vehicle is in 4WD position. No need to remove engine from vehicle.

1. Detach brake master cylinder from frame.

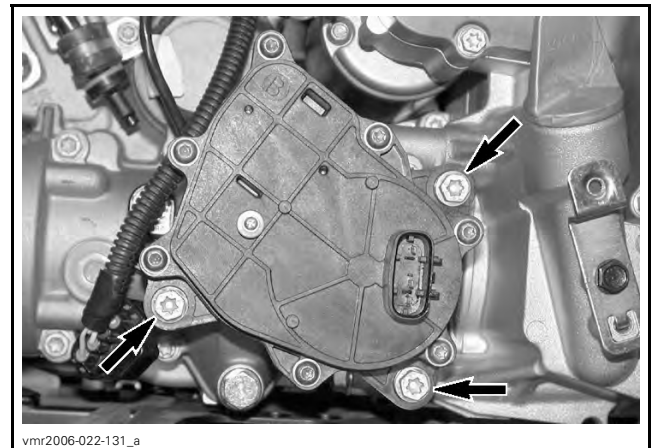


1. Remove retaining screws from master cylinder support



1. Master cylinder moved apart

2. Unplug actuator connector.
3. Place a drain pan under actuator.
4. Unscrew actuator bolts.

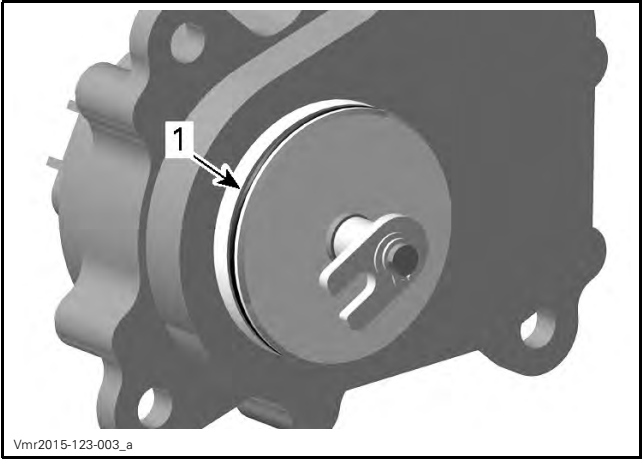


5. When all actuator bolts are removed, pull the actuator out of housing.

Installing the 4WD Actuator

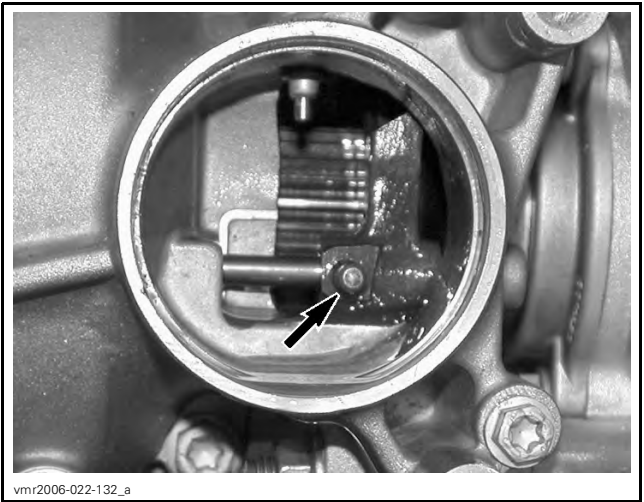
1. Lubricate actuator O-ring.

SERVICE PRODUCT	
Actuator O-ring	SUPER LUBE GREASE (P/N 293 550 030)

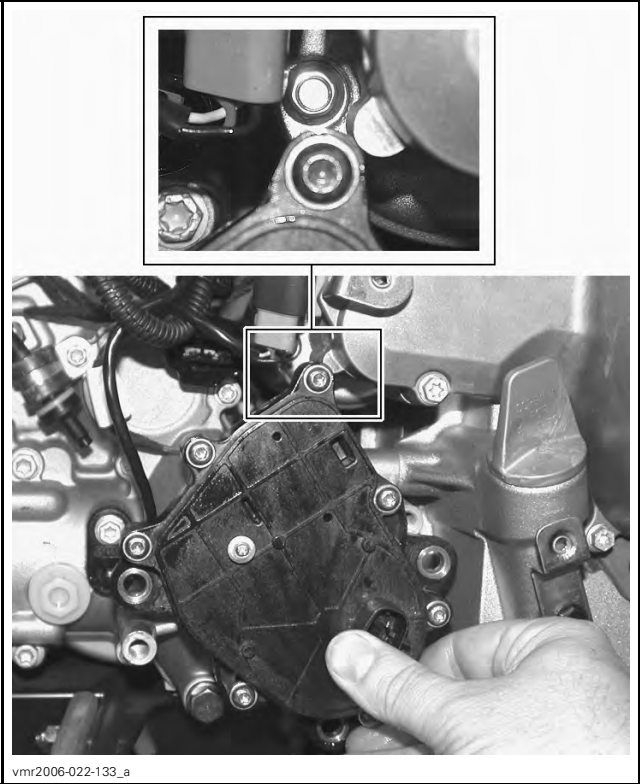


1. Actuator O-ring

2. Verify if coupling fork is in 4WD position. The coupling fork should be positioned toward the front of vehicle.



3. Align the actuator fork with the pin on coupling fork then push the actuator in the housing. See the following illustration to position the actuator correctly.



4. Rotate the actuator counterclockwise until it orients itself to mounting position.

NOTICE Do not cut or break the actuator O-ring.

5. Install all actuator bolts then torque them to specification.

TIGHTENING TORQUE	
Actuator screws	25 N•m ± 3 N•m (18 lbf•ft ± 2 lbf•ft)

6. Connect actuator.

7. Lift the front of vehicle.

8. Turn front wheels. The front propeller shaft should not turn (the PARK position must be selected).

If the front propeller shaft turns, the actuator is not installed correctly. Remove actuator and reinstall it.

9. Set ignition switch to ON.

10. Set emergency engine stop switch to RUN.

11. Select the 2WD position.

12. Turn front wheel again. The front propeller shaft. The shaft should turn easily.

If the front propeller shaft does not turn, the actuator is not installed correctly. Remove actuator and reinstall it.

NOTICE Refill missing gearbox oil, refer to *PERIODIC MAINTENANCE PROCEDURES* subsection.

13. Install all other removed parts.

GEARBOX OIL SEALS

Replacing the Gearbox Oil Seals

Replace oil seals if they are brittle, hard or damaged.

A small flat screwdriver can be used to remove most of these oil seals.

NOTICE Avoid scoring parts during oil seal removal.

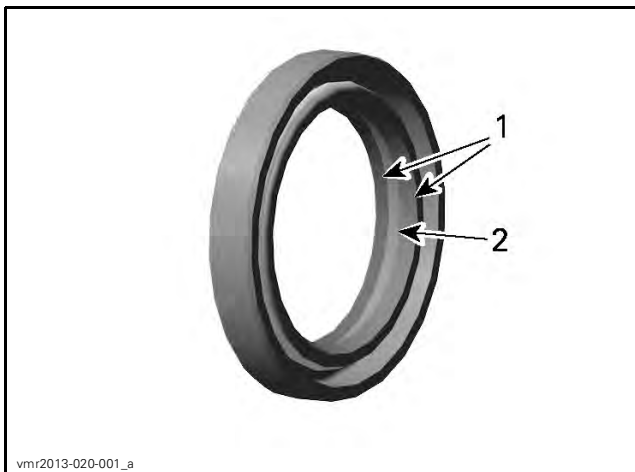
When replacing an oil seal, take this opportunity to inspect the following:

- Check bearings behind each oil seal for contamination and/or metal shavings.
- Check oil seal running surfaces for scratches.

Lubricating the Oil Seal

When installing or reinstalling oil seals, use PETAMO GREASE GHY 133N (P/N 420 899 271) to:

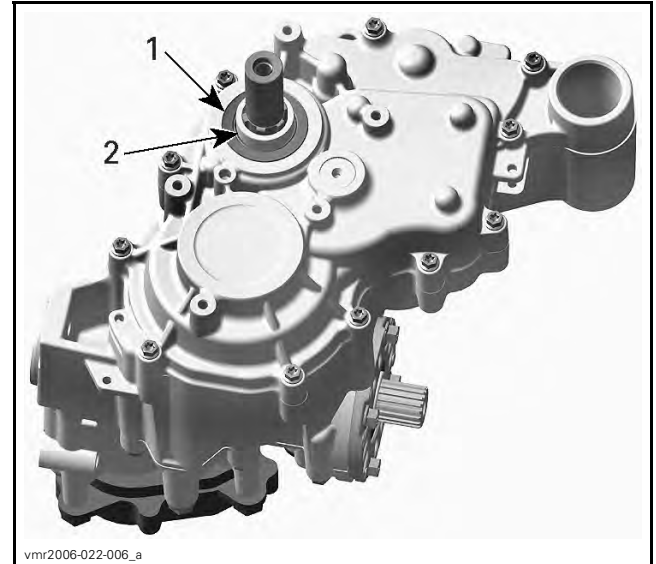
- Lubricate sealing lips all around.
- Fill up the room between sealing lips halfway around the perimeter.



1. Sealing lips
 2. Room between sealing lips

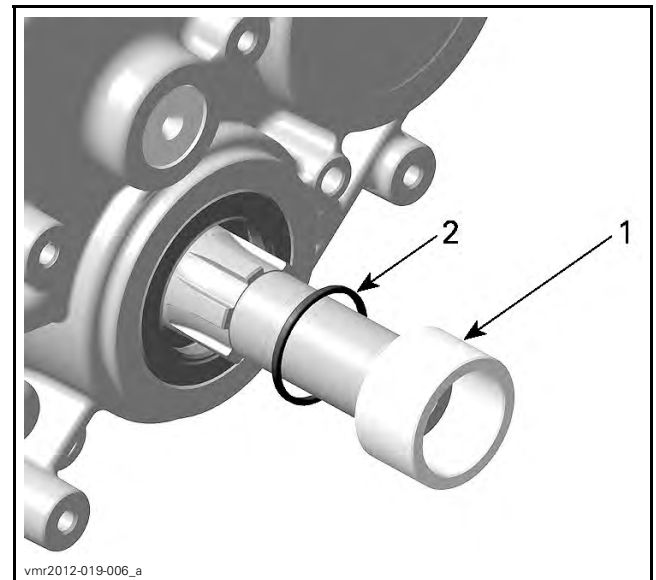
Countershaft Oil Seal

The countershaft oil seal can be removed without removing gearbox from vehicle. Remove drive and driven pulley and CVT air guide.



1. Countershaft oil seal
 2. Distance sleeve

NOTE: When oil seal is removed also inspect O-ring.



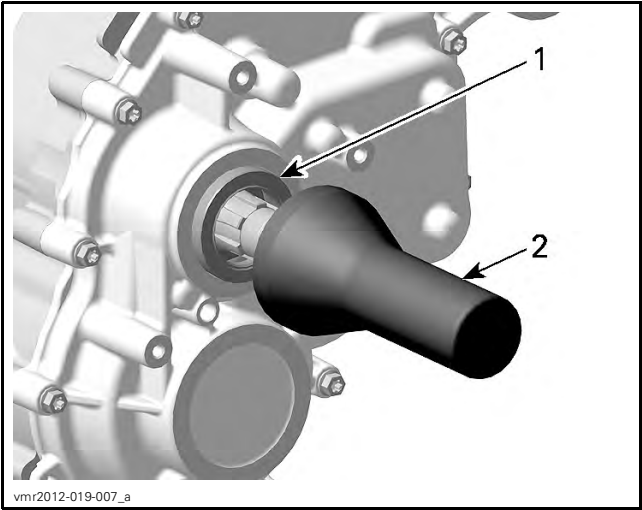
1. Distance sleeve
 2. O-ring

For countershaft oil seal installation use the following service tool.

REQUIRED TOOL	
COUNTERSHAFT OIL SEAL PUSHER (P/N 529 036 222)	

Section 03 ENGINE, CVT AND GEARBOX (570)

Subsection 12 (GEARBOX AND 4X4 COUPLING UNIT)



1. Countershaft oil seal
2. Oil seal pusher

Shift Shaft Oil Seal

The shift shaft oil seal can be removed without removing the gearbox from the vehicle.

To replace the shift shaft oil seal, refer to *BODY* subsection and remove:

- Seat
- Console
- RH side panel
- RH footrest panel
- Shift plate from shift shaft (refer to *SHIFTER* subsection).

Using a suitable tube with the proper diameter to install the shift shaft oil seal.

If gearbox housing is apart, the following tools can be used for shift shaft oil seal installation.

REQUIRED TOOL	
OIL SEAL INSTALLER (GEARBOX) (P/N 529 035 758)	
HANDLE (P/N 420 877 650)	

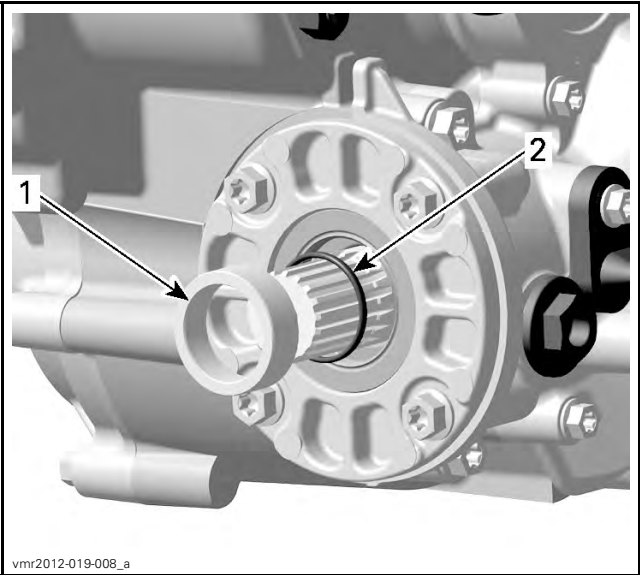
NOTICE Oil seal must be installed with sealing lip toward gearbox.

Output Shaft Oil Seal

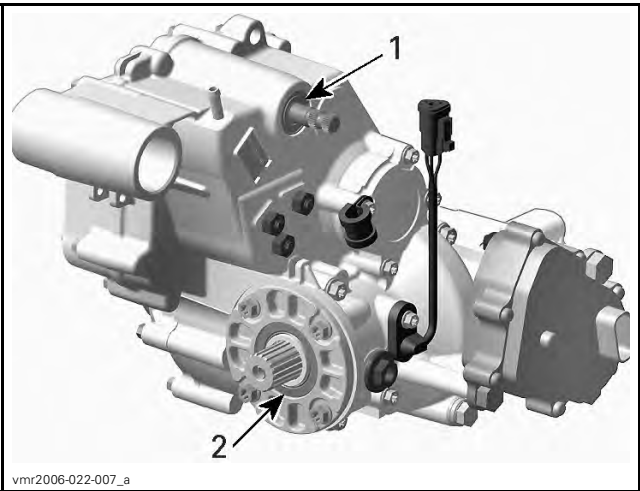
Remove propeller shaft. Refer to *REAR DRIVE* subsection.

Punch a sharp screwdriver through oil seal for removal.

NOTE: When oil seal is removed also inspect O-ring.



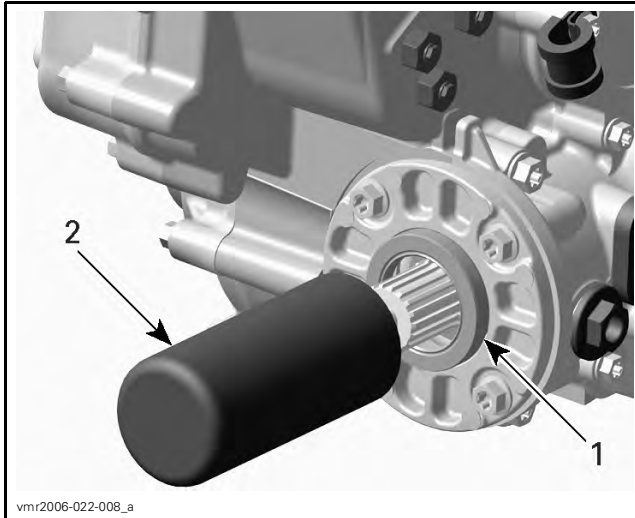
1. Distance sleeve
2. O-ring



1. Shift shaft oil seal
2. Output shaft oil seal

For output shaft oil seal installation use the following service tool.

REQUIRED TOOL	
DRIVE SHAFT OIL SEAL INSTALLER (P/N 529 036 028)	



1. Output shaft oil seal
 2. Oil seal installer

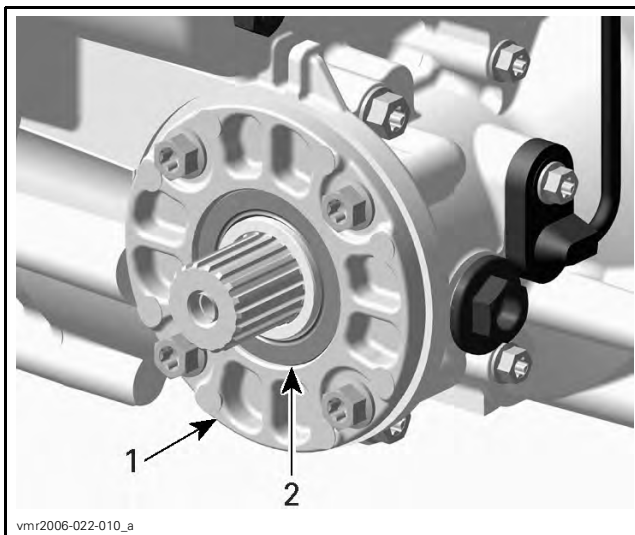
OUTPUT SHAFT AND COUPLING MECHANISM

Remove gearbox. Refer to *GEARBOX* in this subsection.

Before removing the right housing and output shaft measure the backlash on output shaft. This measure will indicate if output shaft adjustment is necessary.

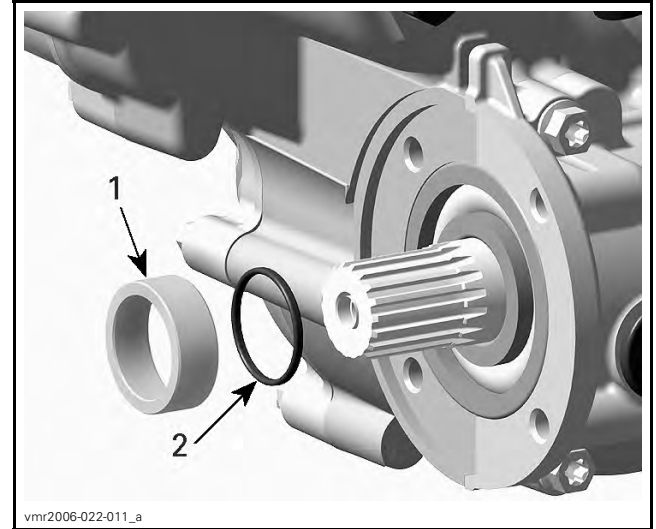
Output Shaft Backlash Procedure

1. Engage PARK position on the gear shaft to block gearbox.
2. Remove bearing cover with oil seal



1. Bearing cover
 2. Oil seal

3. Remove:
 - Distance sleeve
 - O-ring.



1. Distance sleeve
 2. O-ring

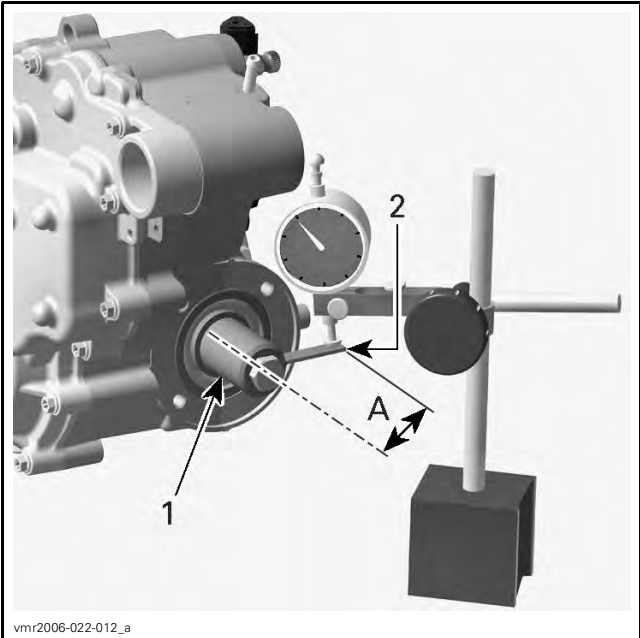
4. Install the measurement tool at the end of output shaft.

REQUIRED TOOL	
BACKLASH MEASUREMENT TOOL (P/N 529 036 030)	

5. From center of tool bolt, measure 47 mm (1.85 in) and place a mark on the tab.

Section 03 ENGINE, CVT AND GEARBOX (570)

Subsection 12 (GEARBOX AND 4X4 COUPLING UNIT)



- 1. Backlash measurement tool
- 2. Mark on tab
- A. 47 mm (1.85 in)

6. Position the head of the dial indicator, against the tab at a 90° angle and on the line. Then, gently rotate the output shaft.

This reading gives the backlash measurement. Refer to the following table for backlash specifications.

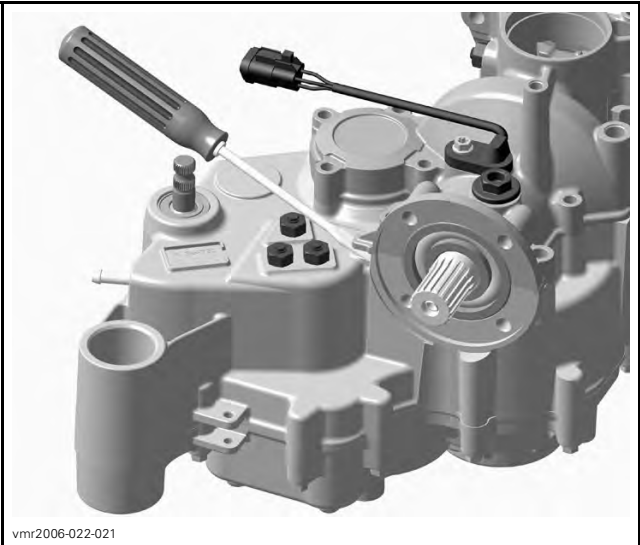
OUTPUT SHAFT BACKLASH	
NEW	0.10 to 0.20 mm (.0039 to .0079 in)
SERVICE LIMIT	0.25 mm (.0098 in)

If backlash is not within the specification, remove the output shaft and select the next thicker or thinner shim to meet the specifications.

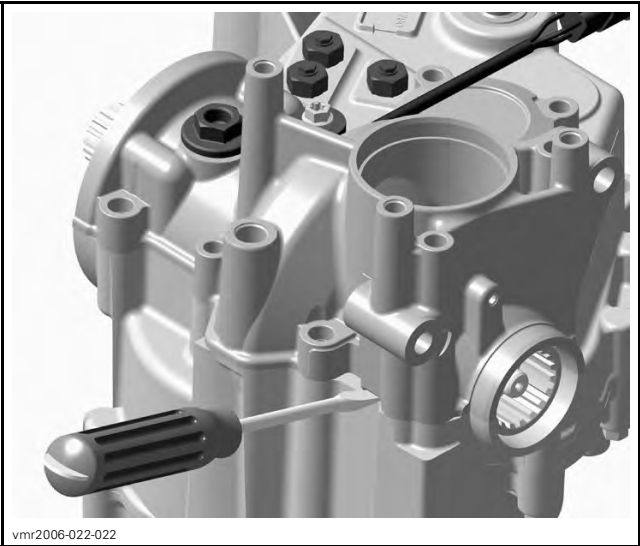
NOTE: Use next thicker shim to increase backlash and next thinner shim to reduce backlash.

Removing the Output Shaft and Coupling Mechanism

- 1. Remove actuator.
- 2. Remove the bearing cover with oil seal.
- 3. Unscrew all bolts retaining the right housing to the center housing.
- 4. To remove right housing, use 2 big screwdrivers.



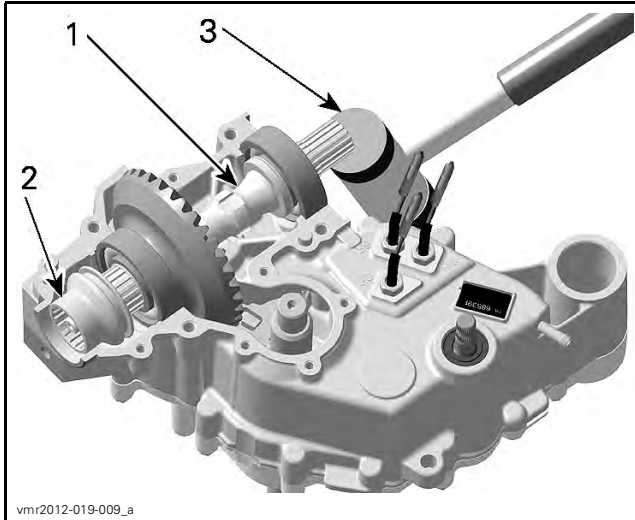
vmr2006-022-021
POSITION FOR BIG FLAT SCREWDRIVER



vmr2006-022-022
POSITION FOR BIG FLAT SCREWDRIVER

5. Remove output shaft.

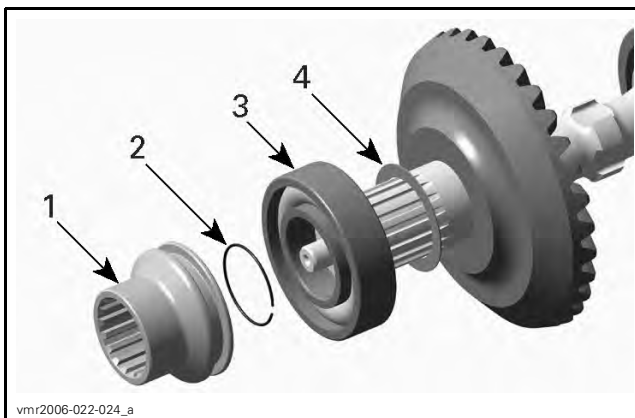
REQUIRED TOOL
Soft hammer



1. Output shaft
2. Coupling sleeve
3. Soft hammer

6. Remove:

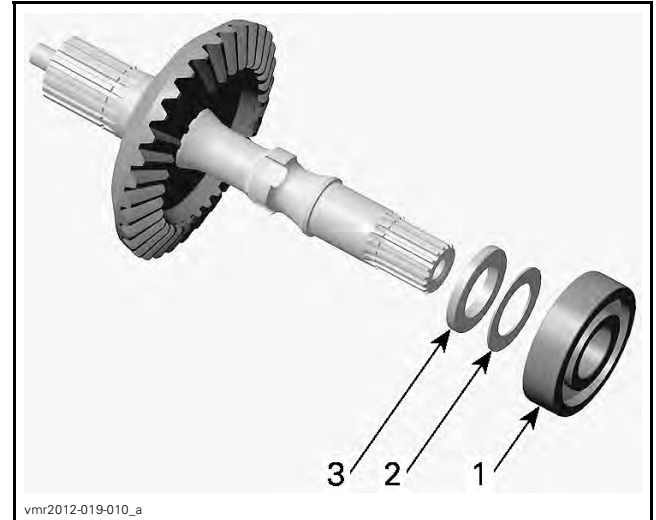
- Coupling sleeve
- O-ring
- Ball bearing
- Thrust washer.



1. Coupling sleeve
2. O-ring
3. Ball bearing
4. Thrust washer

7. Remove:

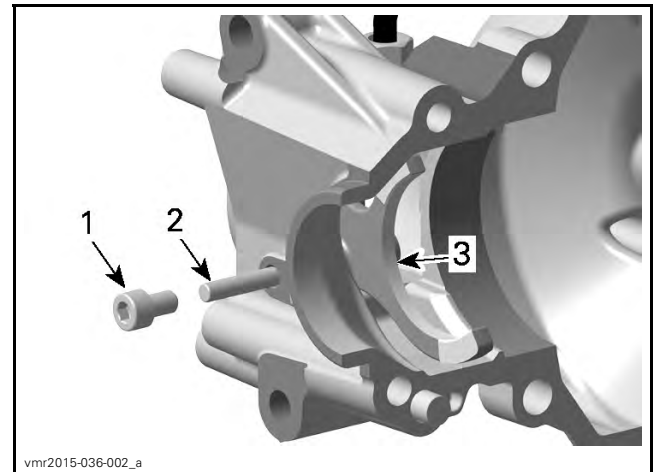
- Ball bearing
- Thrust washer.



1. Ball bearing
2. Thrust washer
3. Distance ring

8. Remove:

- Screw
- Pin
- Coupling fork.



1. Screw
2. Pin
3. Coupling fork

Inspecting the Output Shaft and Coupling Mechanism

Check output shaft and its gear for cracks, bend, pitting or other visible damages.

Check output shaft splines for wear or other damages.

NOTICE Always replace output shaft and bevel gear shaft at the same time. Adjust these components upon replacement.

Check if the output shaft ball bearings turn freely and smoothly. Replace if necessary, refer to *GEARBOX ADJUSTMENT* in this subsection.

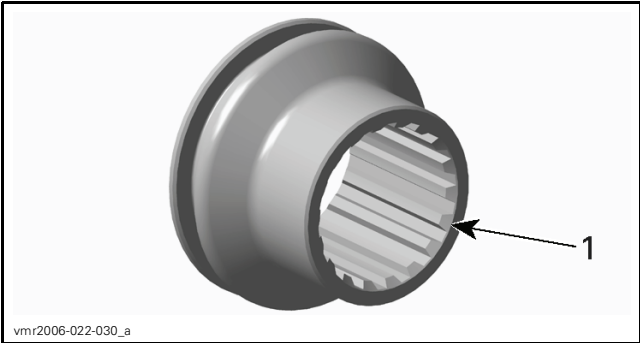
Section 03 ENGINE, CVT AND GEARBOX (570)

Subsection 12 (GEARBOX AND 4X4 COUPLING UNIT)

Replace oil seal if brittle, hard or damaged.

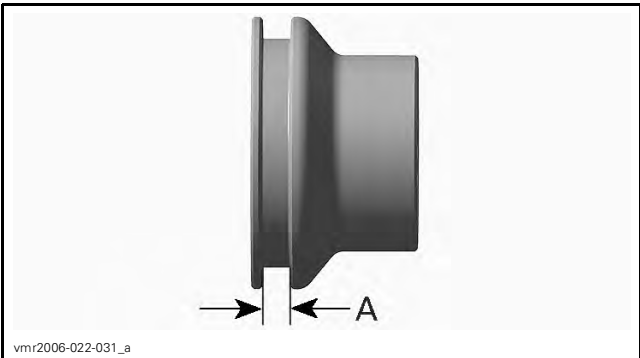
Replace O-rings if brittle, hard or damaged.

Check splines of coupling sleeve for wear or other damages.



1. Inspect splines

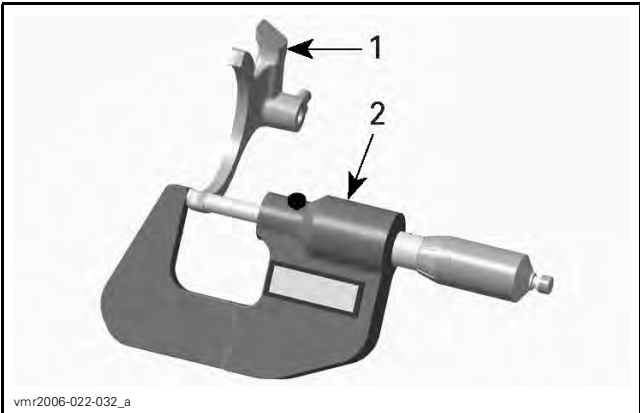
Measure the coupling sleeve groove width.



A. Groove width

COUPLING SLEEVE GROOVE WIDTH	
NEW	5.25 to 5.35 mm (.207 to .211 in)
SERVICE LIMIT	5.50 mm (.217 in)

Check coupling fork claw thickness.



1. Coupling fork
2. Micrometer

COUPLING FORK CLAW THICKNESS	
NEW	4.95 to 5.05 mm (.195 to .199 in)
SERVICE LIMIT	4.80 mm (.189 in)

Clean housing split surface and especially the bearing areas from metal particles or other contamination.

Installing the Output Shaft and Coupling Mechanism

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

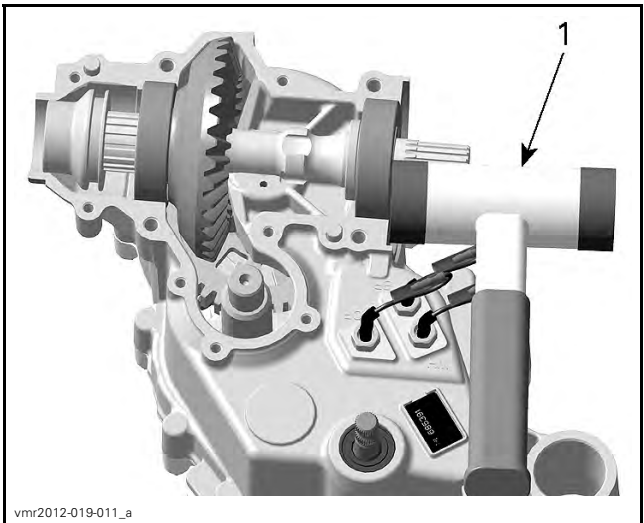
Install thrust washer, bearing, O-ring and coupling sleeve onto the output shaft.

Install distance ring, thrust washer and ball bearing.

NOTE: O-ring and distance sleeve are not installed at this time.

Place the output shaft into the center housing.

Use soft hammer to put bearing exactly in place against center housing.



1. Soft hammer

Clean the bearing cover location then attach bearing cover with oil seal to the housing.

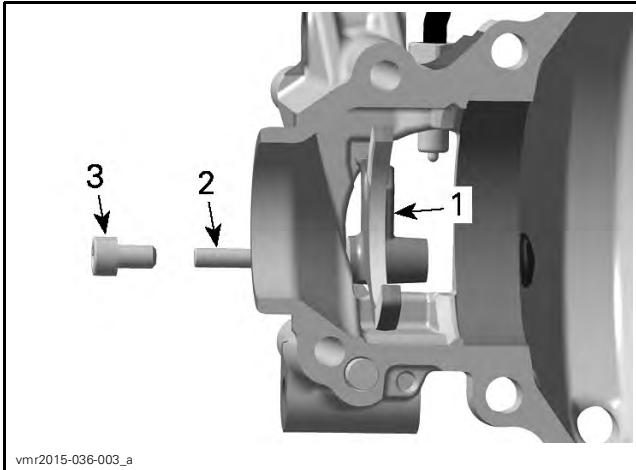
Temporarily install the right housing with the four (4) M8 TORX screws beside bearing seats.

NOTE: Prior to tightening the TORX screws, tap on the gear end of output shaft with a soft hammer to take up all gear free play.

Verify output shaft backlash. Refer to *OUTPUT SHAFT BACKLASH PROCEDURE* in this subsection. Adjust as required.

If backlash is within specifications, remove dial indicator, backlash measuring tool, bearing cover and right housing.

NOTE: Install coupling fork, pin and screw in right housing before applying sealant to the mating surface.



1. Coupling fork
2. Pin
3. Screw

Clean all metal components in a solvent.

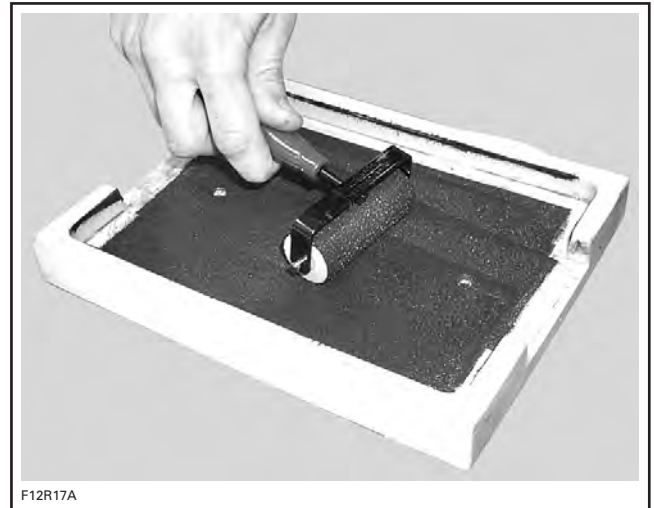
Housing mating surfaces are best cleaned using a combination of LOCTITE CHISEL (GASKET REMOVER) (P/N 413 708 500) and a brass brush. Brush a first pass in one direction then make the final brushing perpendicularly (90°) to the first pass cross (hatch).

NOTICE Do not wipe with rags. Use a new clean hand towel only.

IMPORTANT: When beginning the application of sealant, the assembly and the first torquing should be done within 10 minutes. It is suggested to have all you need on hand to save time.

Use LOCTITE 5910 (P/N 293 800 081) on mating surfaces.

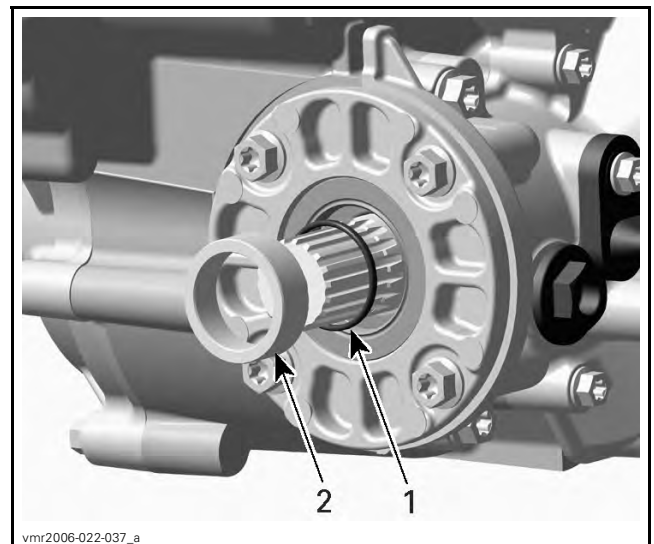
Use a plexiglass plate and apply some sealant on it. Use a soft rubber roller (50 - 75 mm (2 - 3 in)), available in arts products suppliers for printing, and roll the sealant to get a thin uniform coat on the plate (spread as necessary). When ready, apply the sealant on housing mating surfaces.



Do not apply in excess as it will spread out inside housings.

NOTE: It is recommended to apply this specific sealant as described here to get a uniform application without lumps. If you do not use the roller method, you may use your finger to uniformly distribute the sealant (using a finger will not affect the adhesion).

Install all other screws on right housing then the O-ring and the distance sleeve on end of output shaft. Chamfered bore of distance sleeve has to face the engine.



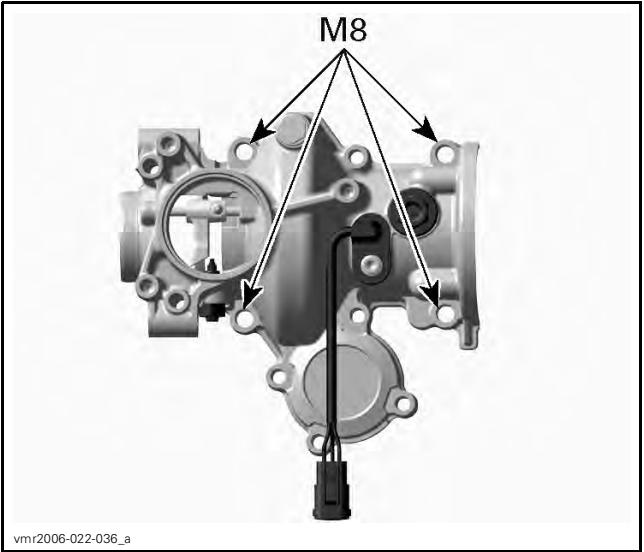
1. O-ring
2. Distance sleeve

NOTE: To install the right housing align the coupling fork with the groove in the coupling sleeve. Torque the four (4) M8 Torx screws in a crisscross sequence to following specification.

Section 03 ENGINE, CVT AND GEARBOX (570)

Subsection 12 (GEARBOX AND 4X4 COUPLING UNIT)

TIGHTENING TORQUE		
Right housing M8 screws	Step A	Hand tightened
	Step B	25 N•m ± 3 N•m (18 lbf•ft ± 2 lbf•ft)



Tighten all M6 Torx screws to specification

TIGHTENING TORQUE	
Right housing M6 screws	10 N•m ± 1 N•m (89 lbf•in ± 9 lbf•in)

Before installing bearing cover, apply LOCTITE 5910 (P/N 293 800 081) on the housing and SUPER LUBE GREASE (P/N 293 550 030) on oil seal.

Install the actuator, refer to *ACTUATOR* in this subsection.

Once this is done, complete final assembly.

GEARBOX

Removing the Gearbox

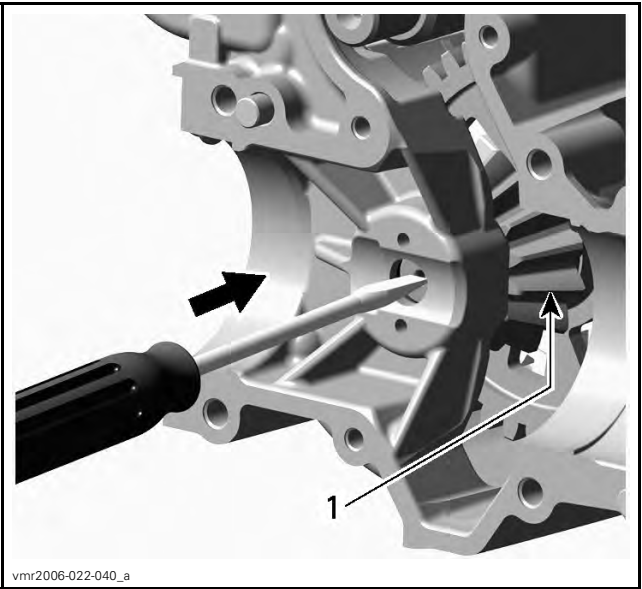
1. Remove engine from vehicle and place it on footrest support. Refer to *ENGINE REMOVAL AND INSTALLATION* subsection for the procedure.
2. Drain gearbox. Refer to *GEARBOX OIL DRAINING PROCEDURE* in *PERIODIC MAINTENANCE PROCEDURES* subsection.
3. Remove drive and driven pulley and CVT air guide, refer to *CONTINUOUSLY VARIABLE TRANSMISSION (CVT)* subsection.
4. Unscrew the three (3) nuts that attach the gearbox to the engine.
5. Pull gearbox to separate it from engine.

Disassembling the Gearbox

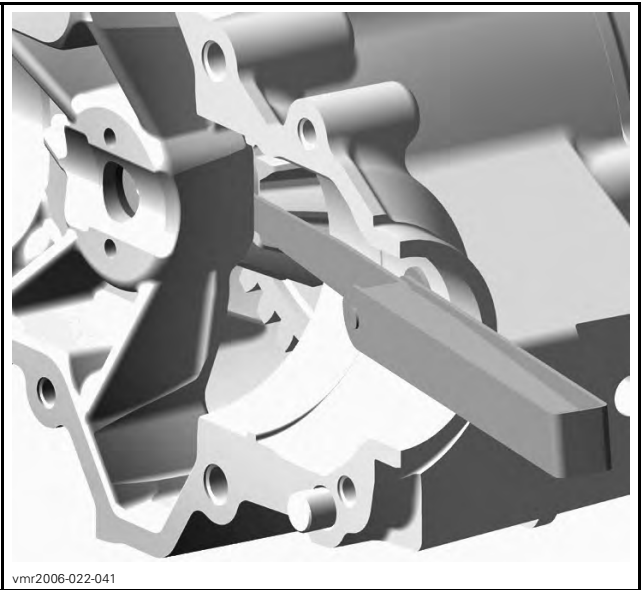
NOTE: During gearbox disassembly, inspect the condition of each part closely.

1. Remove the output shaft. Refer to *OUTPUT SHAFT AND COUPLING MECHANISM* in this subsection.
2. Push bevel gear with a pin slightly down and measure the axial clearance of bevel gear with a feeler gauge.

NOTE: Bevel gear axial clearance must be measured before center and left housings separation.



1. Bevel gear

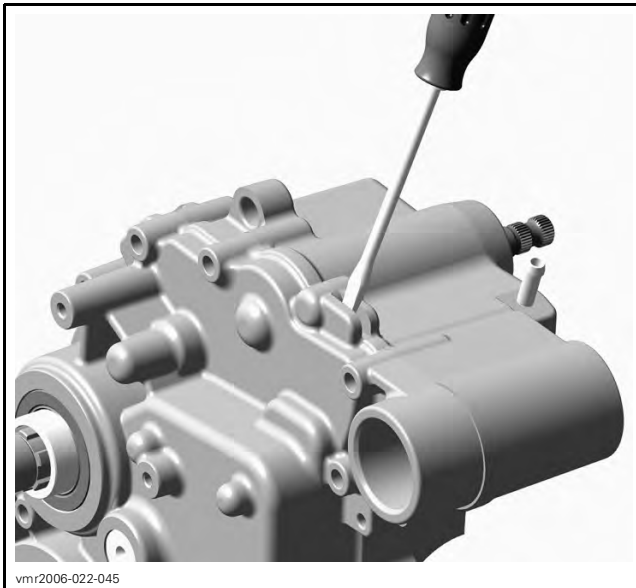


MEASURE AXIAL CLEARANCE OF BEVEL GEAR

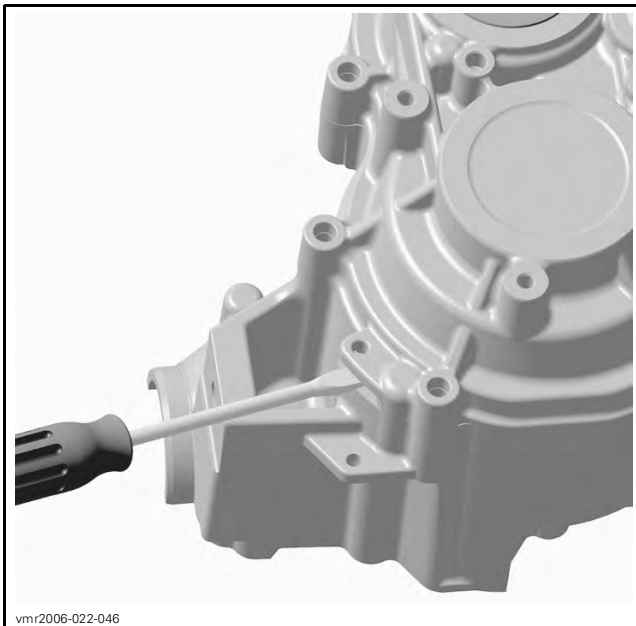
Section 03 ENGINE, CVT AND GEARBOX (570)
Subsection 12 (GEARBOX AND 4X4 COUPLING UNIT)

BEVEL GEAR AXIAL CLEARANCE	
NEW	0.02 to 0.15 mm (.00079 to .0059 in)
SERVICE LIMIT	0.19 mm (.0075 in)

3. Unscrew the left housing screws.
4. Place the left housing on a wood stand, center housing pointing upwards.
5. Using 2 big flat screwdrivers, lift the center housing.

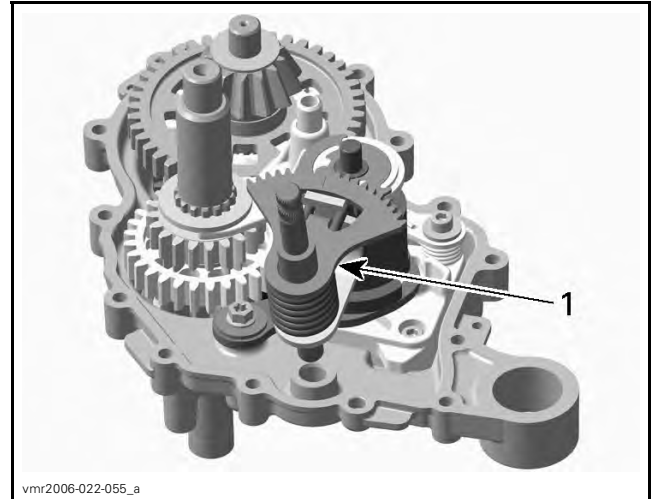


POSITION FOR BIG FLAT SCREWDRIVER



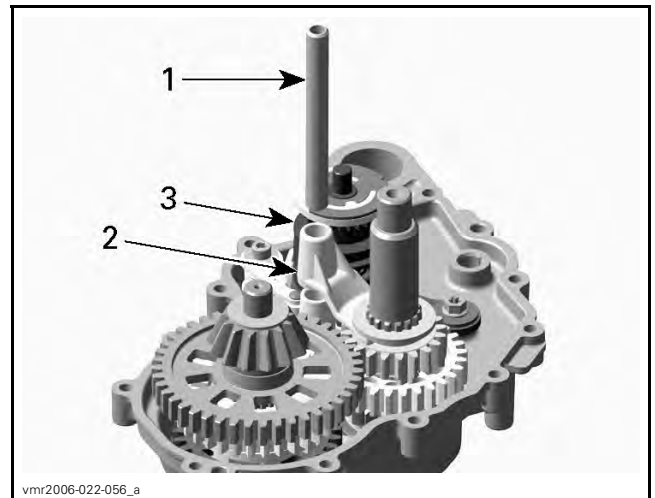
POSITION FOR BIG FLAT SCREWDRIVER

6. Remove center housing completely.
7. Remove shift shaft assembly.



1. Shift shaft assembly

8. Remove shift fork shaft.
9. Disengage shift forks from shift drum and remove shift fork.

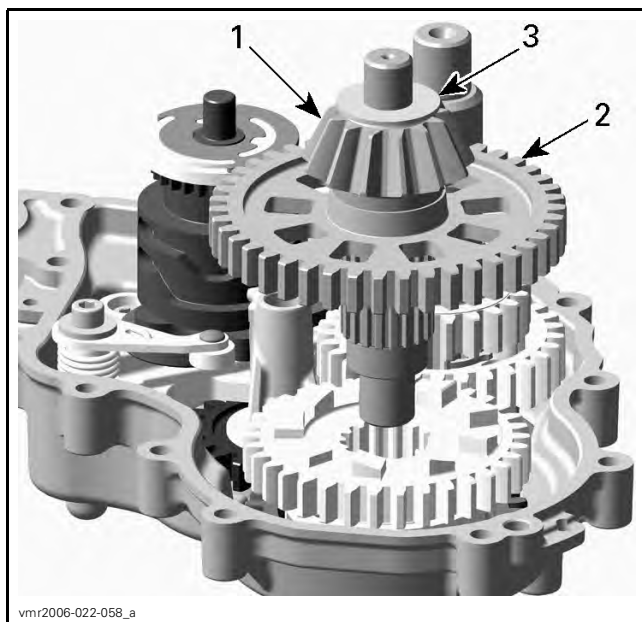


1. Shift fork shaft
2. Shift fork
3. Shift drum

10. Remove bevel gear shaft with low range gear assembly and shim.

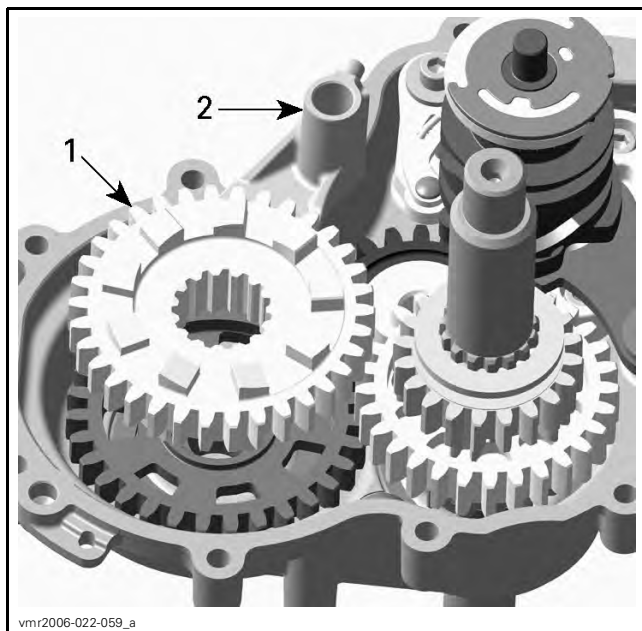
Section 03 ENGINE, CVT AND GEARBOX (570)

Subsection 12 (GEARBOX AND 4X4 COUPLING UNIT)



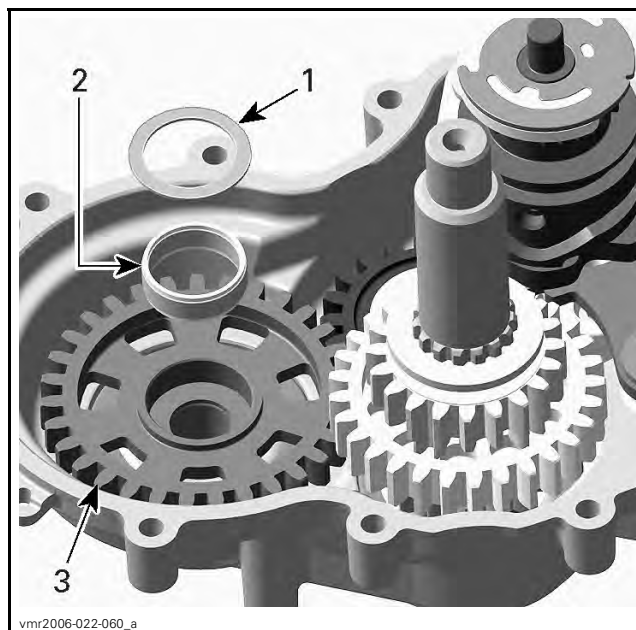
- 1. Bevel gear
- 2. Low range gear
- 3. Shim

11. Remove sliding gear with shift fork.



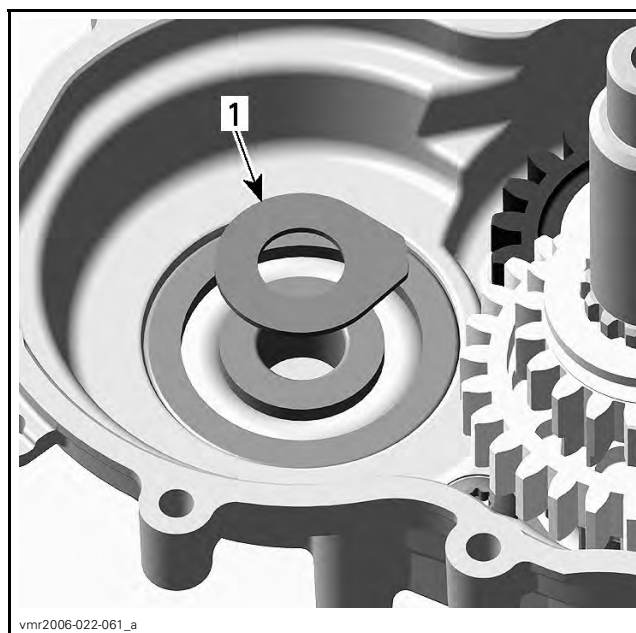
- 1. Sliding gear
- 2. Shift fork

12. Remove thrust washer, needle bearing and reverse gear.



- 1. Thrust washer
- 2. Needle bearing
- 3. Reverse gear

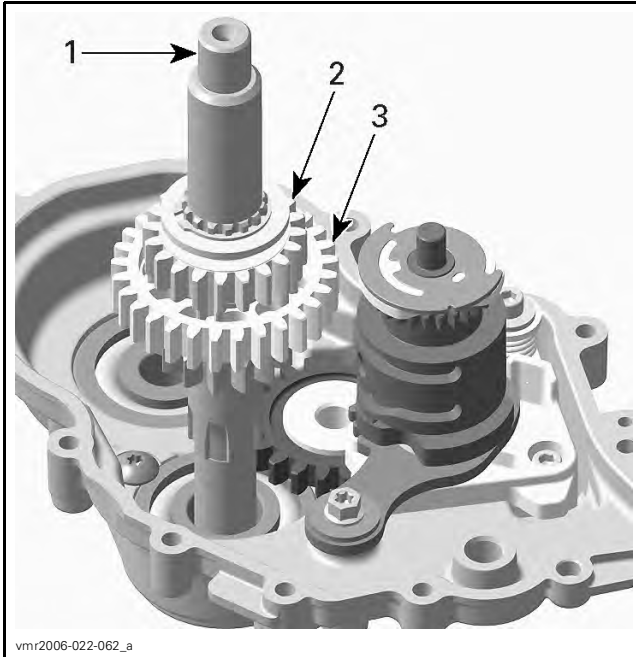
13. Remove shim on CVT side.



- 1. Shim on CVT side

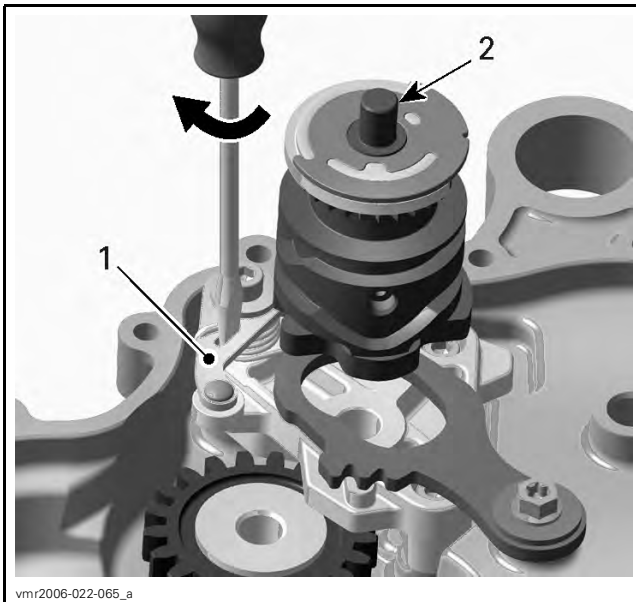
14. Remove countershaft with low range gear and high range gear assembly.

Section 03 ENGINE, CVT AND GEARBOX (570)
Subsection 12 (GEARBOX AND 4X4 COUPLING UNIT)



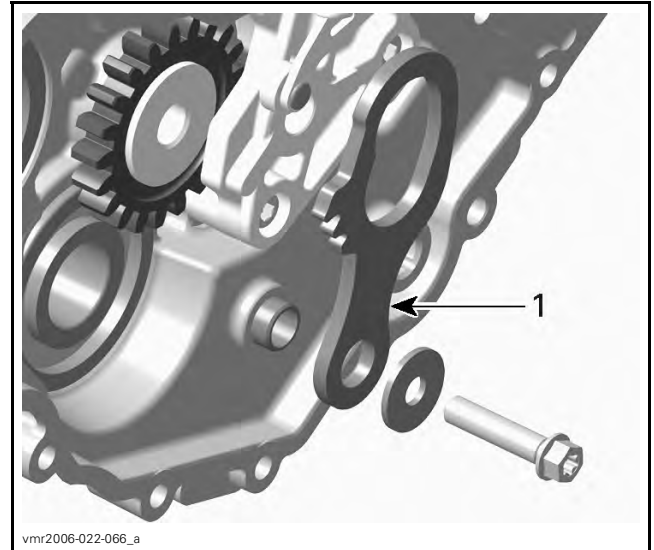
- 1. Countershaft
- 2. Low range gear
- 3. High range gear

15. Insert a flat screwdriver in the slot of index lever. Turn screwdriver clockwise and remove shift drum.



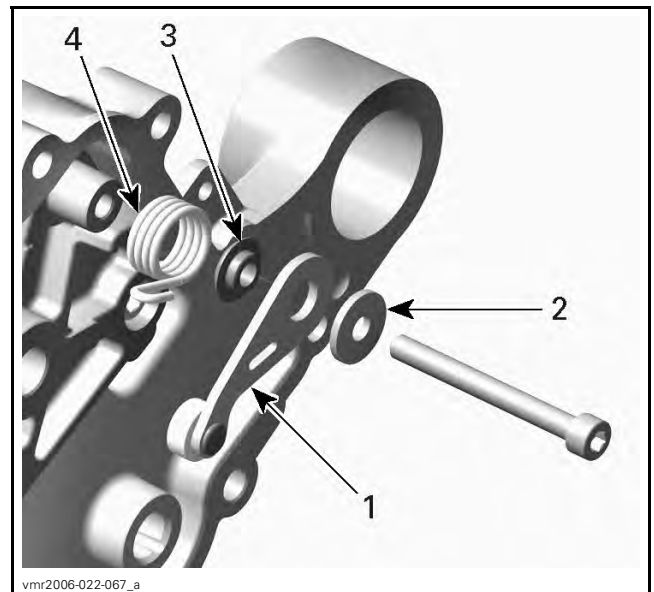
- 1. Index lever
- 2. Shift drum

16. Remove parking lock lever.



- 1. Parking lock lever

17. Remove index lever with washer, step ring and spring.

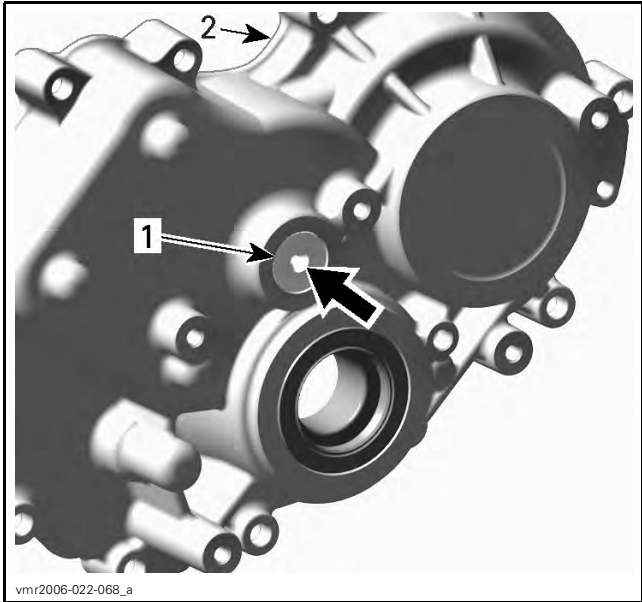


- 1. Index lever
- 2. Washer
- 3. Step ring
- 4. Index spring

18. Remove support flange.

NOTE: To remove intermediate gear and needle bearing, use a press bench to push out the intermediate gear shaft.

Section 03 ENGINE, CVT AND GEARBOX (570)
Subsection 12 (GEARBOX AND 4X4 COUPLING UNIT)



PRESS SHAFT IN THE DIRECTION AS SHOWN BY THE ARROW
1. Intermediate gear shaft
2. Left housing

Removing the Bearings

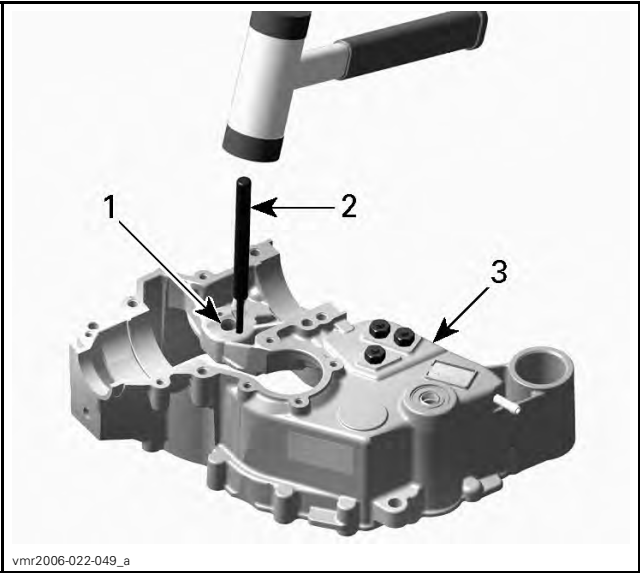
If necessary heat housing up to 100°C (212°F) before removing ball bearings or needle bearings.

**WARNING**

Clean oil, outside and inside, from housing before heating.

NOTICE Always support gearbox housings properly when ball bearings or needle bearings are removed. Housing damages may occur if this procedure is not performed correctly.

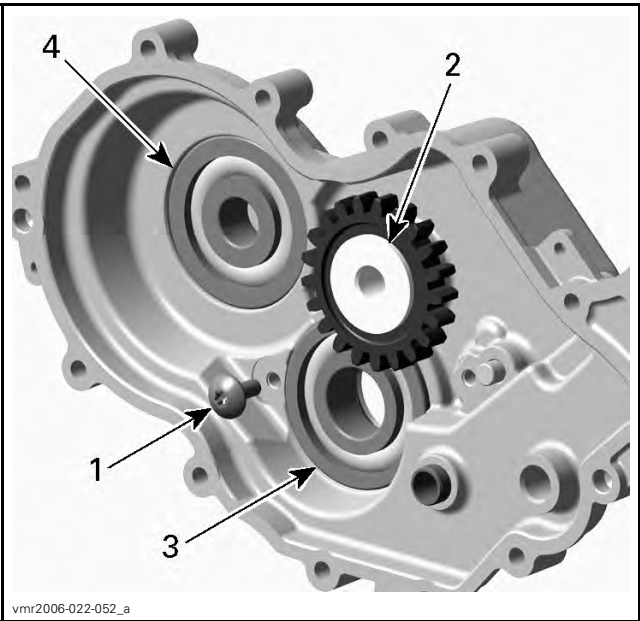
To remove bevel gear needle bearing use a punch.



- 1. Bevel gear needle bearing
- 2. Punch
- 3. Center housing

To remove ball bearings of bevel gear and needle bearing of countershaft, use a blind hole bearing puller.

For countershaft ball bearing, remove screw and intermediate gear shaft, then push with a suitable puller from outside in.



- 1. Screw
- 2. Intermediate gear shaft
- 3. Ball bearing countershaft
- 4. Bevel gear ball bearing

Inspecting the Gearbox

Always verify for the following when inspecting gearbox components:

- Gear teeth damage
- Worn or scoured bearing surfaces

Section 03 ENGINE, CVT AND GEARBOX (570)

Subsection 12 (GEARBOX AND 4X4 COUPLING UNIT)

- Worn or scoured shift fork
- Worn or scoured shift fork shaft
- Rounded engagement dogs and slots
- Bent shift forks
- Bent shift fork shaft
- Worn shift fork engagement pins
- Worn tracks on shift drum
- Worn shift fork engagement groove
- Worn splines on shafts and gears.

Bearings

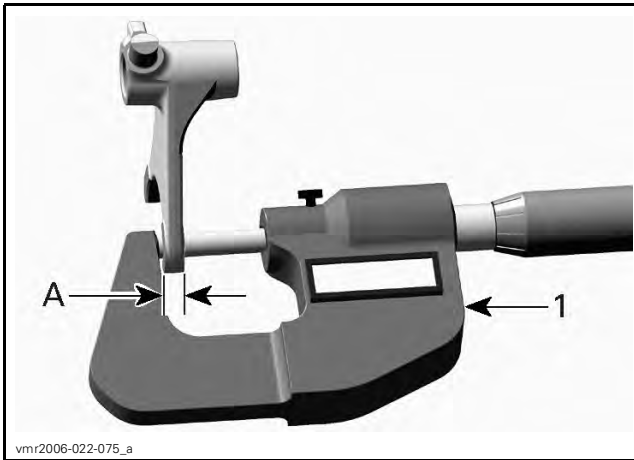
Check if ball bearings and needle bearings turn freely and smoothly.

Check all bearings, bearing points, tooth flanks, taper grooves and annular grooves. Annular grooves must have sharp edges.

Shift Forks

Check both shift forks for visible damage, wear or bent shift fork claws.

Measure the shift fork claw thickness.



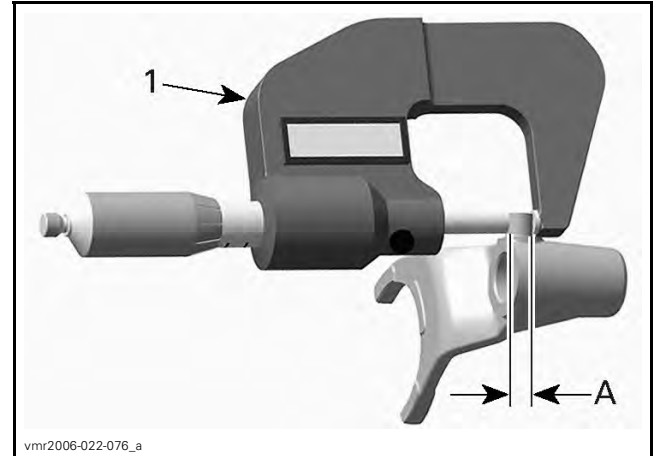
1. Micrometer

A. Shift fork claw thickness

SHIFT FORK CLAW THICKNESS (HIGH GEAR SHIFTING)	
NEW	4.80 to 4.90 mm (.189 to .193 in)
SERVICE LIMIT	4.70 mm (.185 in)

SHIFT FORK CLAW THICKNESS (LOW/REVERSE GEAR SHIFTING)	
NEW	5.10 to 5.20 mm (.200 to .205 in)
SERVICE LIMIT	5.00 mm (.197 in)

Measure shift fork pins.



1. Micrometer

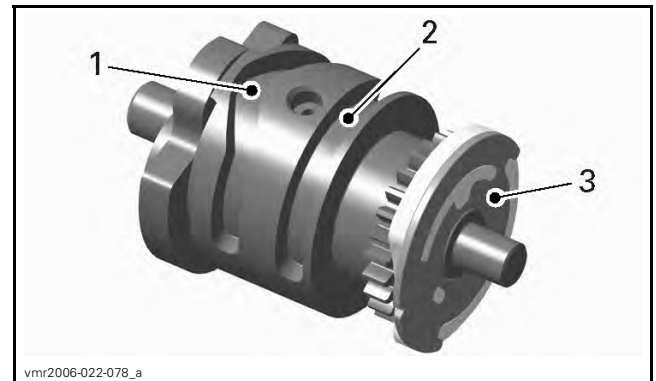
A. Shift fork pin diameter

SHIFT FORK PIN DIAMETER	
NEW	6.920 to 6.970 mm (.272 to .274 in)
SERVICE LIMIT	6.850 mm (.270 in)

Shift Drum

Check shift drum tracks for scouring or heavy wear, like rounded engagement slots.

Replace isolating washer if there are signs of wear or visible damages.



1. Track for the low/reverse gear shift fork

2. Track for the high gear shift fork

3. Isolating washer on the shift drum

Levers

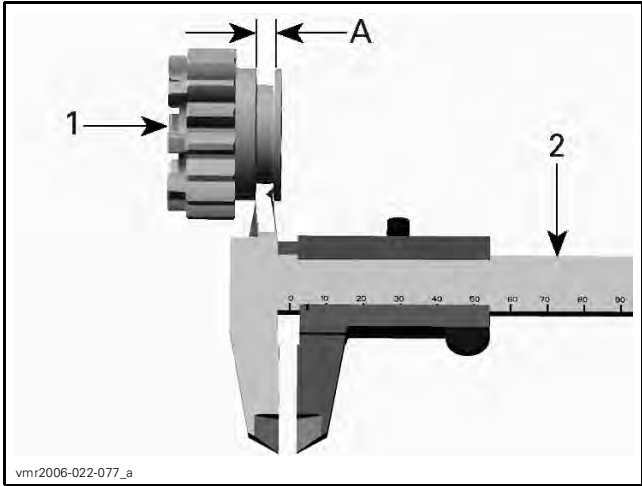
Check parking lever for cracks or other damages. Index lever with roller must move freely.

Gears

NOTE: Replace gears only together with the corresponding meshing gears. Always replace circlips and use special pliers to install them.

Measure the width of shift fork engagement groove.

Section 03 ENGINE, CVT AND GEARBOX (570)
Subsection 12 (GEARBOX AND 4X4 COUPLING UNIT)

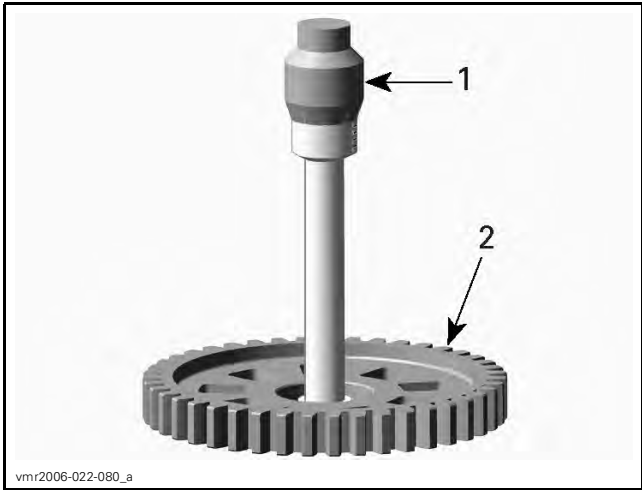


1. Main gear
2. Caliper
A. Width for engagement of shift fork

WIDTH OF SHIFT FORK ENGAGEMENT GROOVE (HIGH GEAR SHIFTING)	
NEW	5.00 to 5.10 mm (.197 to .201 in)
SERVICE LIMIT	5.20 mm (.205 in)

WIDTH OF SHIFT FORK ENGAGEMENT GROOVE (LOW/REVERSE GEAR SHIFTING)	
NEW	5.30 to 5.40 mm (.209 to .213 in)
SERVICE LIMIT	5.50 mm (.217 in)

Check free pinions for wear.

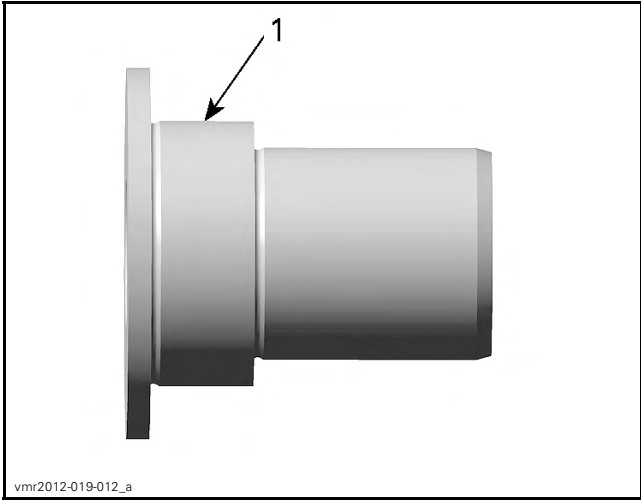


- TYPICAL**
1. Micrometer
2. Free pinion

DIAMETER FREE PINION	
NEW	29.000 to 29.013 mm (1.1417 to 1.1422 in)
SERVICE LIMIT	29.015 mm (1.1423 in)

Shafts

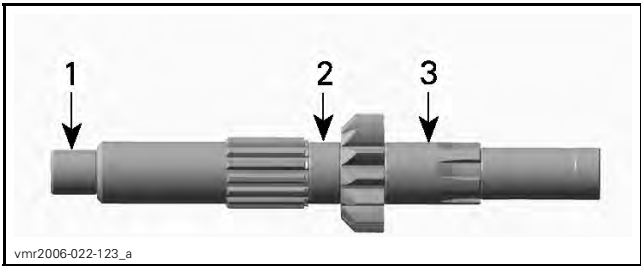
Check shift shaft for worn splines and gears.
Check intermediate shaft for wear.



1. Intermediate gear bearing

INTERMEDIATE GEAR SHAFT	
NEW	24.979 to 25.000 mm (.9834 to .9842 in)
SERVICE LIMIT	24.977 mm (.9833 in)

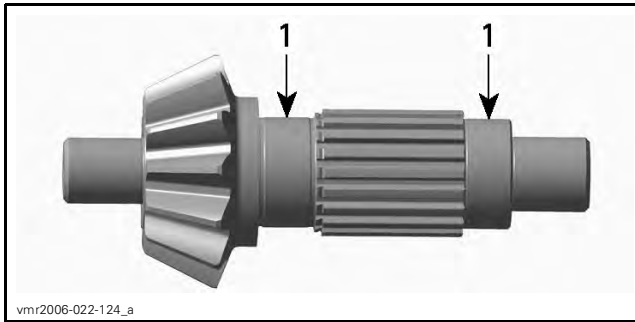
Check countershaft for wear.



1. MAG side
2. Free pinion bearing
3. CVT side

COUNTERSHAFT	
SERVICE LIMIT	
MAG SIDE	17.990 mm (.708 in)
FREE PINION BEARING	24.970 mm (.983 in)
CVT SIDE	24.970 mm (.983 in)

Check bevel gear shaft.



1. Free pinion bearings

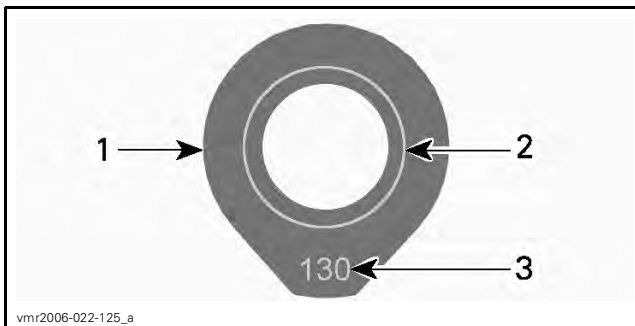
BEVEL GEAR SHAFT	
SERVICE LIMIT	
FREE PINION BEARING	24.984 mm (.9836 in)

a brass brush. Brush a first pass in one direction then make the final brushing perpendicularly (90°) to the first pass cross (hatch).

NOTICE Do not wipe with rags. Use a new clean hand towel only.

Shims

Always replace shim by a new one with the same thickness, when reassembling the gearbox with existing output shaft and bevel gear shaft.



1. Shim for adjusting the bevel gear on center housing side
2. Area where wear signs appear
3. Thickness of the shim

Adjusting the Gearbox

Bevel Gear

NOTE: Only necessary if the backlash and axial clearance of the bevel gear is out of specification or if parts are changed (output shaft, bevel gear shaft or housing).

There are 2 adjustments to perform on the bevel gear.

- Bevel gear backlash on center housing
- Bevel gear axial clearance on left housing.

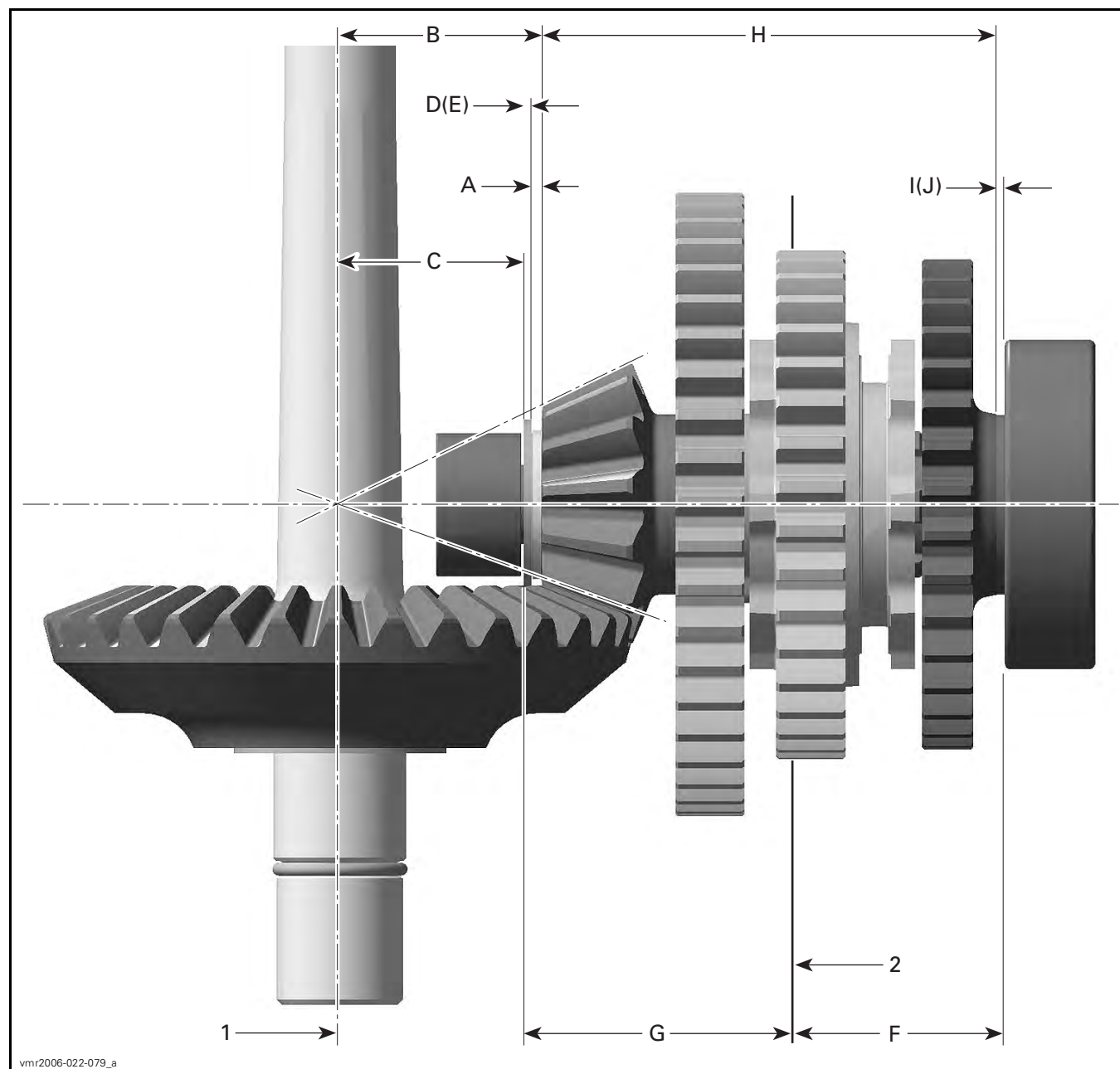
The bevel gear backlash is adjusted by finding the proper shim thickness E as per following illustration.

The bevel gear axial clearance is adjusted by finding the proper shim thickness J as per following illustration.

Clean mating surface of housing before taking measurements using a combination of LOCTITE CHISEL (GASKET REMOVER) (P/N 413 708 500) and

Section 03 ENGINE, CVT AND GEARBOX (570)

Subsection 12 (GEARBOX AND 4X4 COUPLING UNIT)



1. Mating surface — output shaft
2. Mating surface — left housing

Bevel Gear Backlash Procedure

Use the following course of calculation to determine the theoretical shim thickness D:

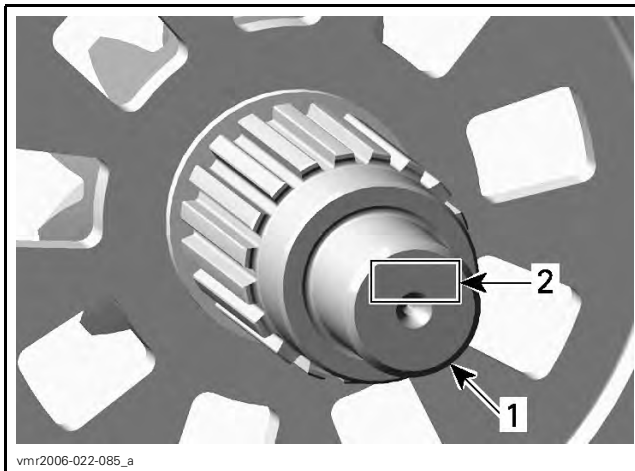
$$D = B - C - A$$

B = The distance between the thrust surface of the bevel gear and the theoretical center of its taper. This is defined by manufacturer and is written on the bevel gear shaft.

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Subsection 12 (GEARBOX AND 4X4 COUPLING UNIT)

This bevel gear reference number could be between - 10 and + 10.



1. Bevel gear
2. Bevel gear reference number

Use following formula to find out value B.

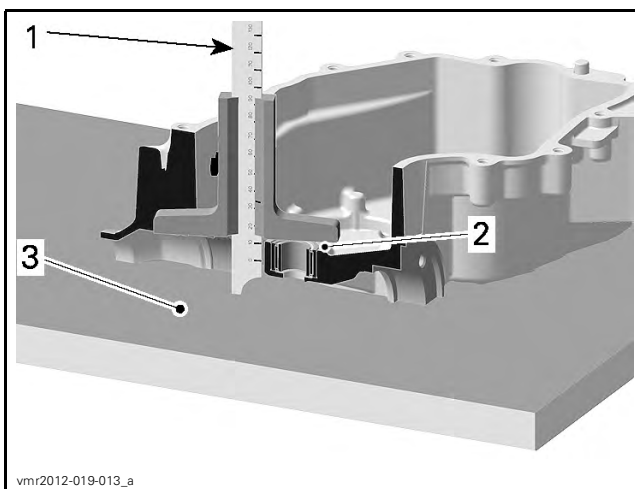
$$B = \left(\frac{\text{Bevel gear reference number}}{100} \right) + 37.8$$

For example: bevel gear reference number = - 3.

$$B = (- 3/100) + 37.8 = 37.77$$

C = Distance between the shim thrust surface in the center housing and the mating surface to right housing.

NOTE: For a better understanding following illustration is made as a cutaway.



1. Deep gauge — measurement C
2. Shim surface in center housing
3. Mating surface to right housing

A = 2 mm (.0787 in) nominal thickness of axial needle bearing.

When the measurements are taken, calculate the theoretical shim thickness D using the formula: (D = B - C - A).

Take the obtained theoretical shim thickness D and choose the corresponding shim number E according to the following table.

THEORETICAL SHIM THICKNESS -D-	SHIM NUMBER -E-
1.20 mm to 1.29 mm (.0472 to .0508 in)	120
1.30 mm to 1.39 mm (.0512 to .0547 in)	130
1.40 mm to 1.49 mm (.0551 to .0587 in)	140
1.50 mm to 1.59 mm (.0591 to .0626 in)	150
1.60 mm to 1.69 mm (.0630 to .0665 in)	160
1.70 mm to 1.79 mm (.0669 to .0705 in)	170
1.80 mm to 1.89 mm (.0709 to .0744 in)	180

NOTE: For example, if the theoretical shim thickness D is 1.53 mm (.0602 in), choose the corresponding shim number 150 E. The shim number 150 represents a nominal value equal to 1.50 mm (.0591 in).

Bevel Gear Axial Clearance Procedure

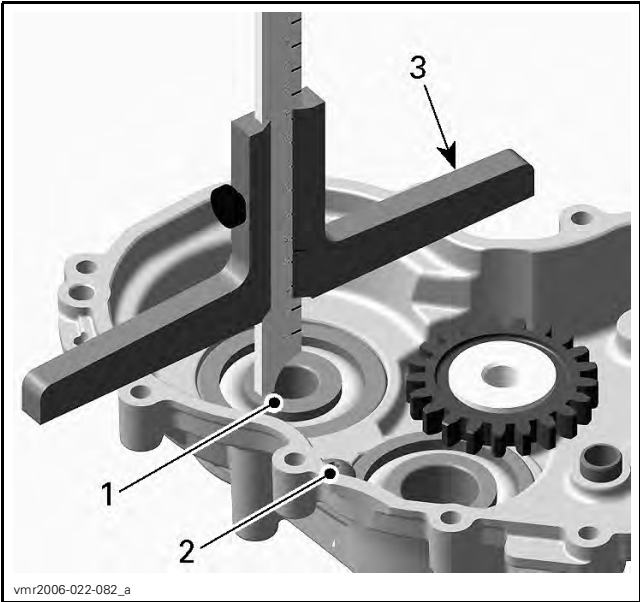
Use the following course of calculation to determine the theoretical shim thickness I:

$$I = F + G - H - A - E$$

F = Distance between mating surface of left housing to ball bearing inner race.

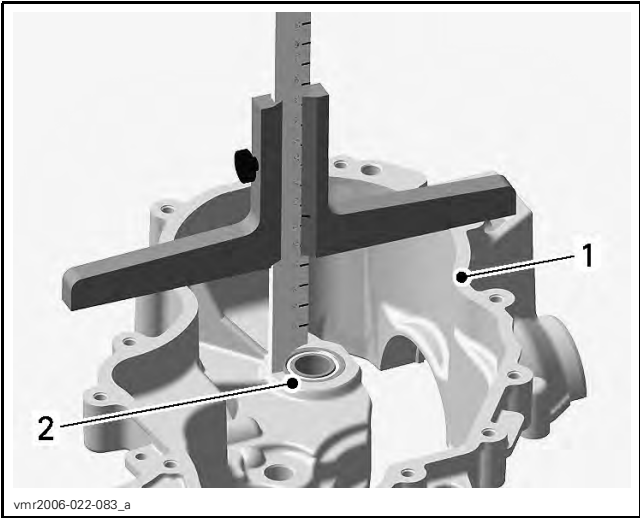
Section 03 ENGINE, CVT AND GEARBOX (570)

Subsection 12 (GEARBOX AND 4X4 COUPLING UNIT)



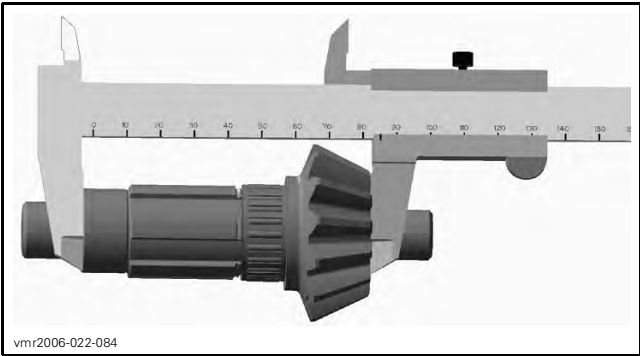
1. Ball bearing inner race
2. Mating surface of left housing
3. Depth gauge

G = Distance between mating surface of center housing and shim surface.



1. Mating surface of center gear housing
2. Shim surface

H = Distance between thrust surfaces of bevel gear shaft.



A = 2 mm (.0787 in) nominal thickness of axial needle bearing.

E = The shim number nominal value as found in the *BEVEL GEAR BACKLASH PROCEDURE*. For example, shim number 150 represents a value of 1.50 mm (.0591 in).

When the measurements are taken, calculate the theoretical shim thickness I using the formula:
(I = F + G - H - A - E).

Take the obtained theoretical shim thickness I and choose the corresponding shim number J according to the following table.

THEORETICAL SHIM THICKNESS -I-	SHIM NUMBER -J-
1.22 mm to 1.31 mm (.0480 to .0516 in)	120
1.32 mm to 1.41 mm (.0519 to .0555 in)	130
1.42 mm to 1.51 mm (.0559 to .0594 in)	140
1.52 mm to 1.61 mm (.0598 to .0634 in)	150
1.62 mm to 1.71 mm (.0638 to .0673 in)	160
1.72 mm to 1.81 mm (.0677 to .0713 in)	170
1.82 mm to 1.91 mm (.0717 to .0752 in)	180

For example, if the theoretical shim thickness I is 1.53 mm (.0602 in), choose the corresponding shim number 150 J.

Bevel gear axial clearance of 0.02 to 0.11 mm (.00079 to .00433 in) is included in the above table.

Assembling the Gearbox

Reverse the disassembly procedure. However, pay attention to the following details.

Installing the Bearings

Unless otherwise instructed, never use hammer to install ball bearings or needle bearings. Use press machine only.

If necessary heat housings up to 100°C (212°F) before installing ball bearings or needle bearings.

 **WARNING**

Clean oil, outside and inside, from housing before heating.

Section 03 ENGINE, CVT AND GEARBOX (570)

Subsection 12 (GEARBOX AND 4X4 COUPLING UNIT)

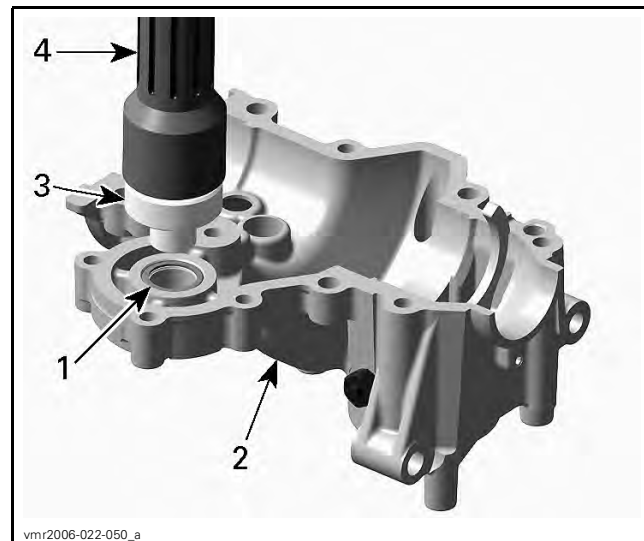
Place new bearing in freezer for 10 minutes before installation.

Use a suitable installer for installing ball bearings of countershaft and bevel gear.

NOTE: Place gearbox housings on a wood stand before installing ball bearings.

Install countershaft needle bearing in right housing.

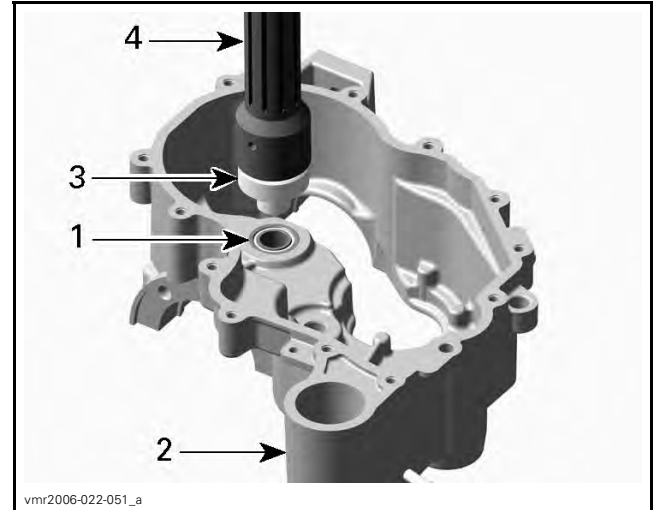
REQUIRED TOOL	
BEARING INSTALLER (GEARBOX) (P/N 529 035 762)	
HANDLE (P/N 420 877 650)	



1. Countershaft needle bearing
2. Right housing
3. Needle bearing installer
4. Installer handle

Install bevel gear needle bearing.

REQUIRED TOOL	
BEARING INSTALLER (GEARBOX) (P/N 529 035 763)	
HANDLE (P/N 420 877 650)	



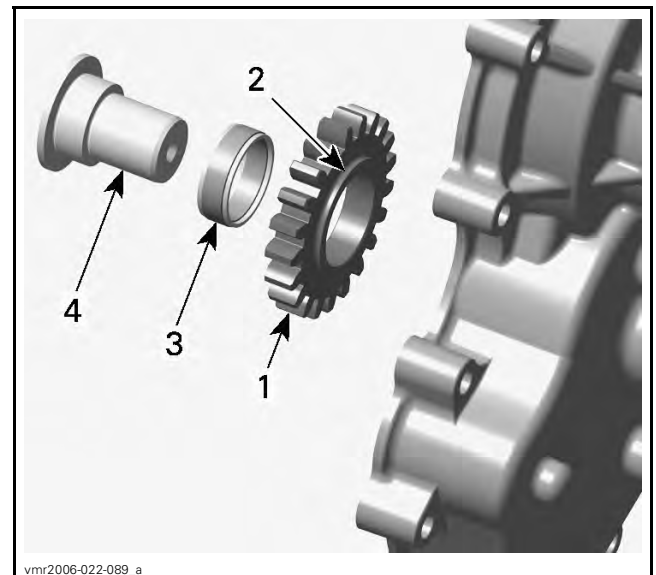
1. Bevel gear needle bearing
2. Center housing
3. Needle bearing installer
4. Installer handle

Install new oil seals with the proper installer (refer to *GEARBOX OIL SEALS* in this subsection).

Other Gearbox Components

Fit intermediate gear with needle bearing on intermediate gear shaft.

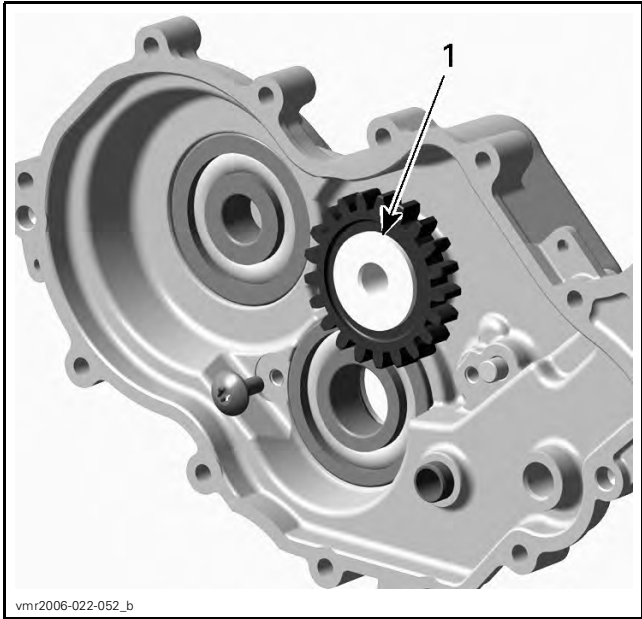
NOTE: Fit gear with collar facing to housing side on the intermediate shaft.



1. Intermediate gear
2. Collar facing housing
3. Needle bearing
4. Intermediate gear shaft

Press intermediate gear shaft in the left housing.

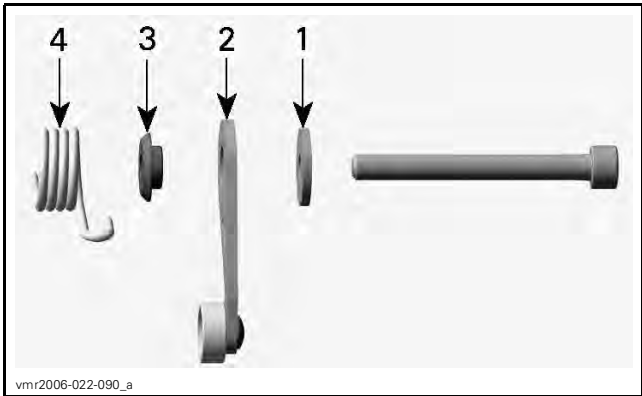
Section 03 ENGINE, CVT AND GEARBOX (570)
Subsection 12 (GEARBOX AND 4X4 COUPLING UNIT)



1. Intermediate gear shaft

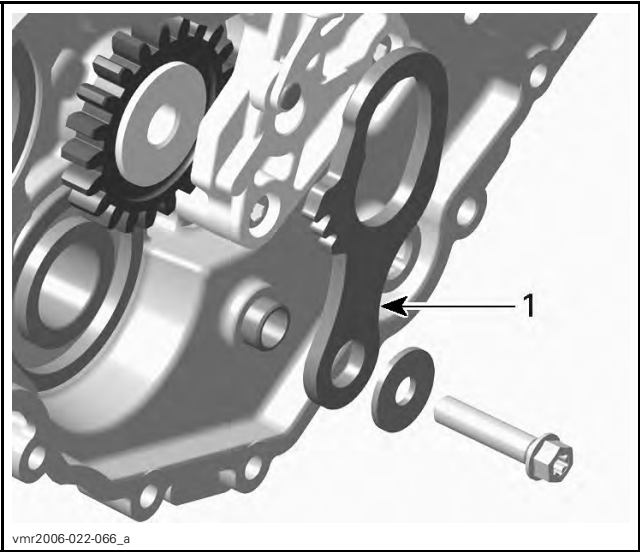
Fit support flange in the left housing and install index lever.

NOTE: Fit step ring into index lever.



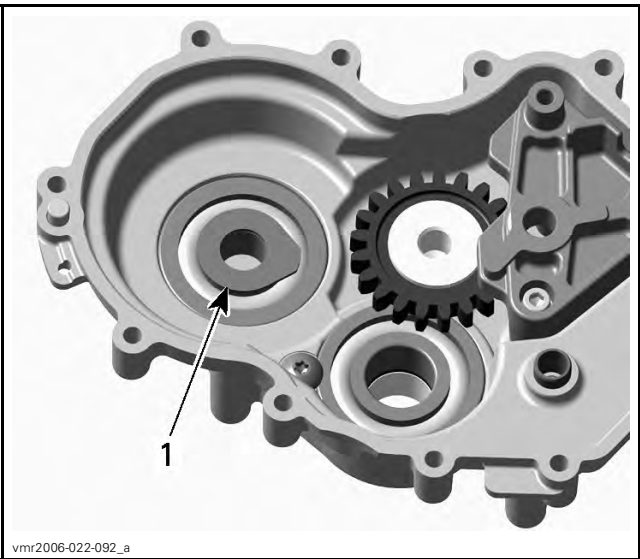
- 1. Washer
- 2. Index lever
- 3. Step ring
- 4. Index spring

Install parking lock lever, teeth showing to countershaft.



1. Parking lock lever

Place shim of CVT side on bearing.



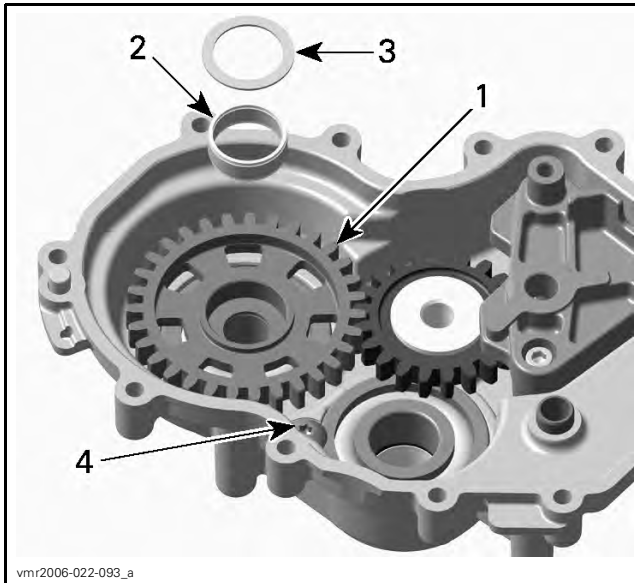
1. Shim CVT side

Place reverse gear with needle bearing and thrust washer.

NOTE: Check if the screw to secure countershaft bearing is installed.

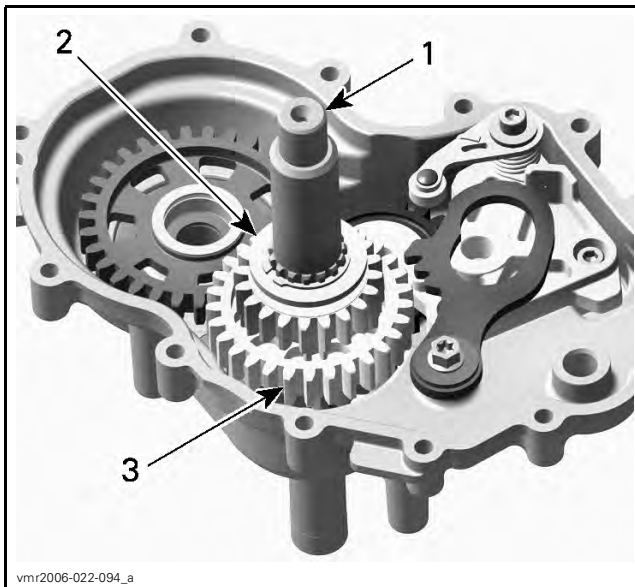
Section 03 ENGINE, CVT AND GEARBOX (570)

Subsection 12 (GEARBOX AND 4X4 COUPLING UNIT)



1. Reverse gear
2. Needle bearing
3. Thrust washer
4. Countershaft bearing screw

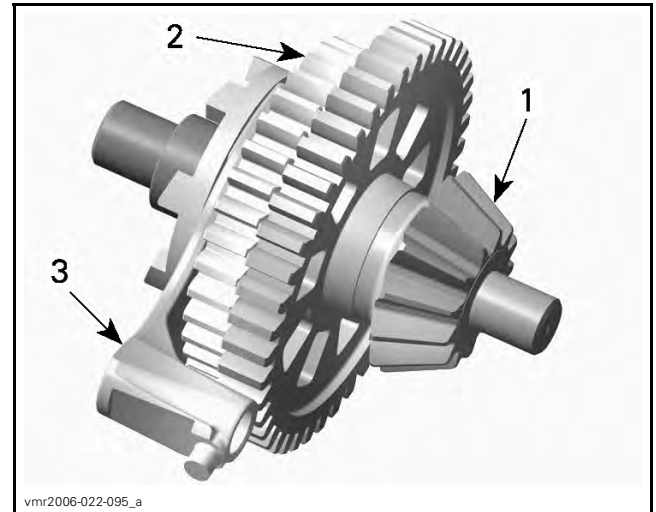
Install countershaft with low gear and high gear assembly.



1. Countershaft
2. Low gear
3. High gear

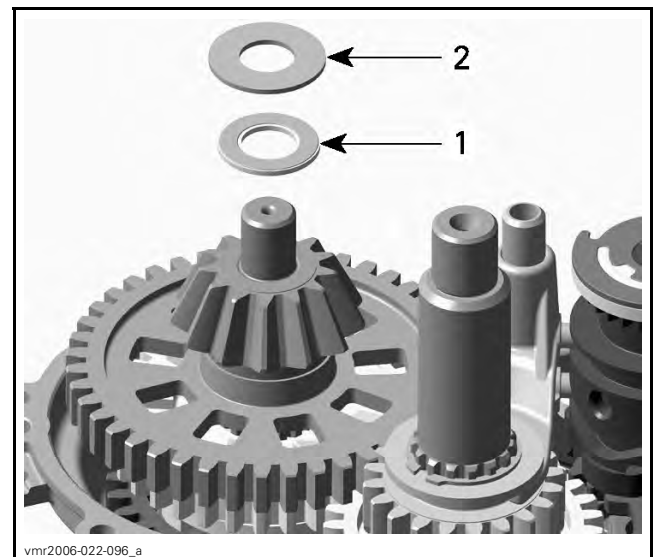
Install a new shim onto bevel gear shaft, fork side.
Install bevel gear with sliding gear assembly together with shift fork.

NOTE: If a new bevel gear and output shaft are used, it is necessary to verify the shim adjustment prior to finalize assembly. Refer to *ADJUSTMENT* in this subsection. If the existing bevel gear is used, it is mandatory to use a new shim with the same thickness, a new needle bearing and shim.



1. Bevel gear
2. Sliding gear
3. Shift fork

Install a new needle bearing and shim.

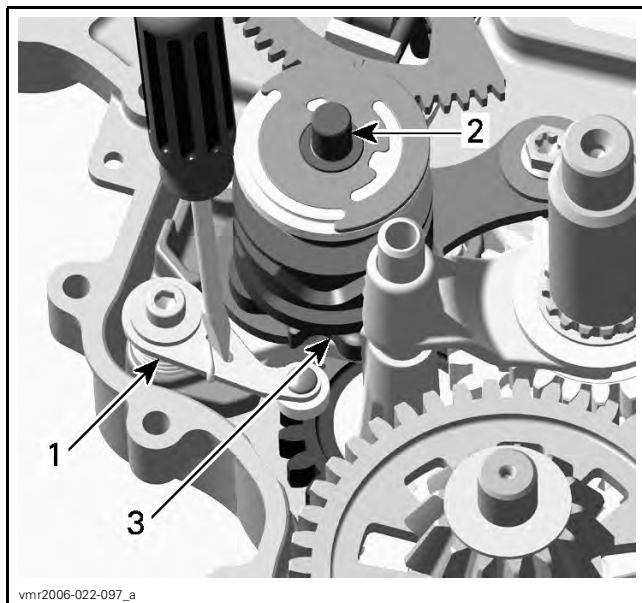


1. Needle bearing
2. Shim

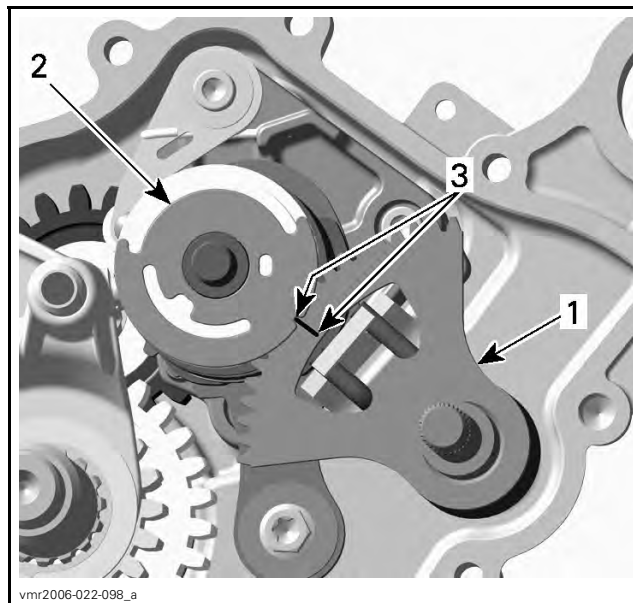
Insert a flat screwdriver in the slot of the index lever, turn screwdriver clockwise and install shift drum on neutral position as per following illustration.

Section 03 ENGINE, CVT AND GEARBOX (570)

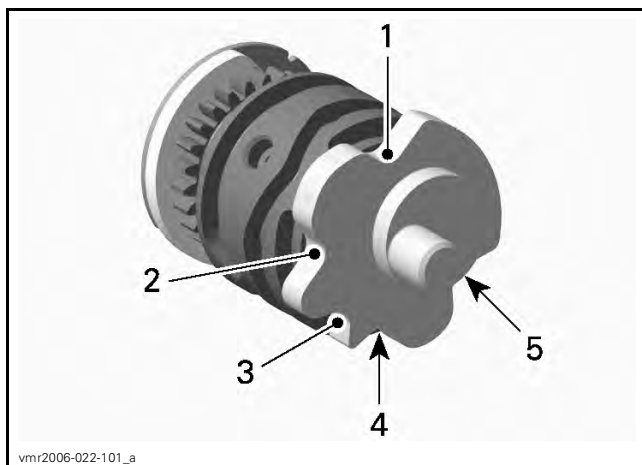
Subsection 12 (GEARBOX AND 4X4 COUPLING UNIT)



1. Index lever
2. Shift drum
3. Neutral position



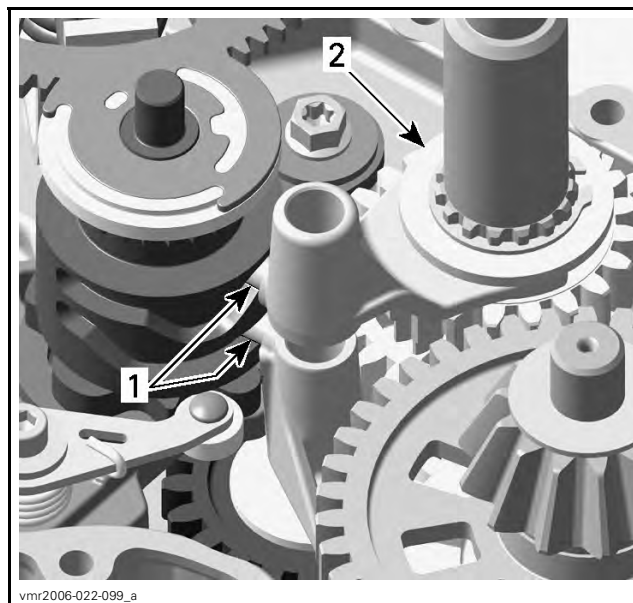
1. Shift shaft assembly
2. Isolating washer
3. Marks



1. Parking stop location
2. Reverse stop location
3. Neutral stop location
4. High gear stop location
5. Low gear stop location

Install shift shaft assembly.

NOTE: Marks on shift drum/isolating washer and shift shaft must align.



1. Shift fork pins
2. Sliding gear

Install shift fork shaft.

NOTE: Run all gears as a final function check before installing center housing.

Now, close the housings by doing the following:
Clean all metal components in a solvent.

Section 03 ENGINE, CVT AND GEARBOX (570)

Subsection 12 (GEARBOX AND 4X4 COUPLING UNIT)

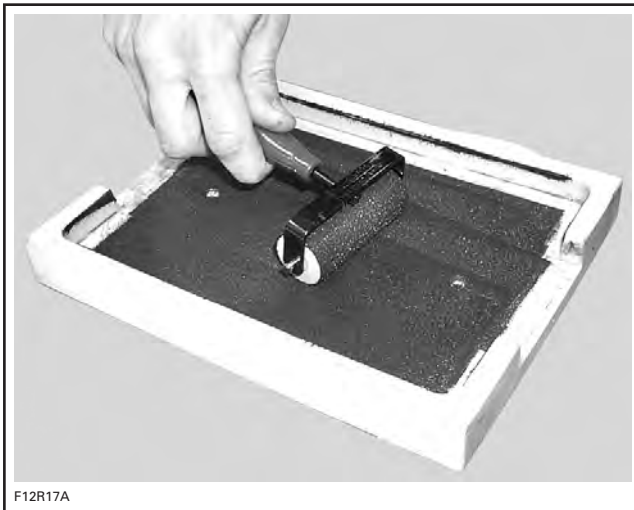
Gearbox housing mating surfaces are best cleaned using a combination of LOCTITE CHISEL (GASKET REMOVER) (P/N 413 708 500) and a brass brush. Brush a first pass in one direction then make the final brushing perpendicularly (90°) to the first pass cross (hatch).

NOTICE Do not wipe with rags. Use a new clean hand towel only.

IMPORTANT: When beginning the application of the gear housing sealant, the assembly and the first torquing should be done within 10 minutes. It is suggested to have all you need on hand to save time.

Use LOCTITE 5910 (P/N 293 800 081) on mating surfaces.

Use a plexiglass plate and apply some sealant on it. Use a soft rubber roller (50 - 75 mm (2 - 3 in)), available in arts products suppliers for printing, and roll the sealant to get a thin uniform coat on the plate (spread as necessary). When ready, apply the sealant on gear housing mating surfaces.



Do not apply in excess as it will spread out inside gear housing.

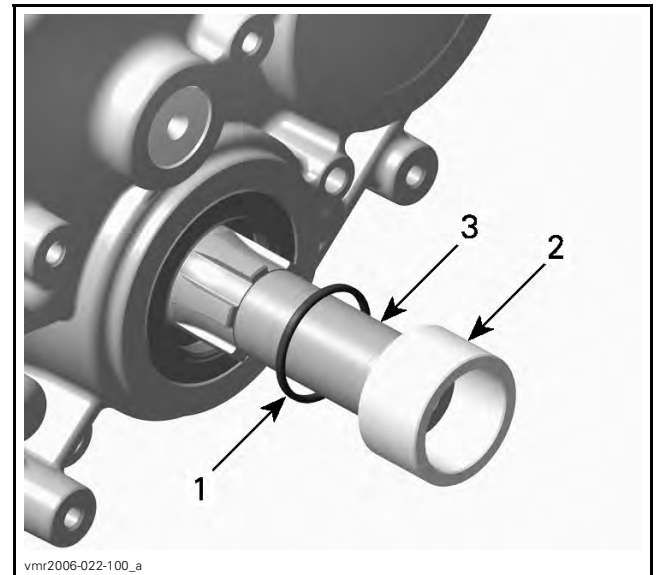
NOTE: It is recommended to apply this specific sealant as described here to get a uniform application without lumps. If you do not use the roller method, you may use your finger to uniformly distribute the sealant (using a finger will not affect the adhesion).

Tighten gear housing screws in a crisscross sequence.

TIGHTENING TORQUE		
Gear housing screws	Step A	Hand tightened
	Step B	10 N•m ± 1 N•m (89 lbf•in ± 9 lbf•in)

Install O-ring including distance sleeve on counter-shaft CVT side.

NOTICE Place O-ring including distance sleeve right away. Chamfered bore of distance sleeve has to face the gearbox.



COUNTERSHAFT END CVT SIDE

1. O-ring
2. Distance sleeve
3. Countershaft end CVT side

Refer to *OUTPUT SHAFT AND COUPLING MECHANISM* to install these components. Measure the output shaft backlash.

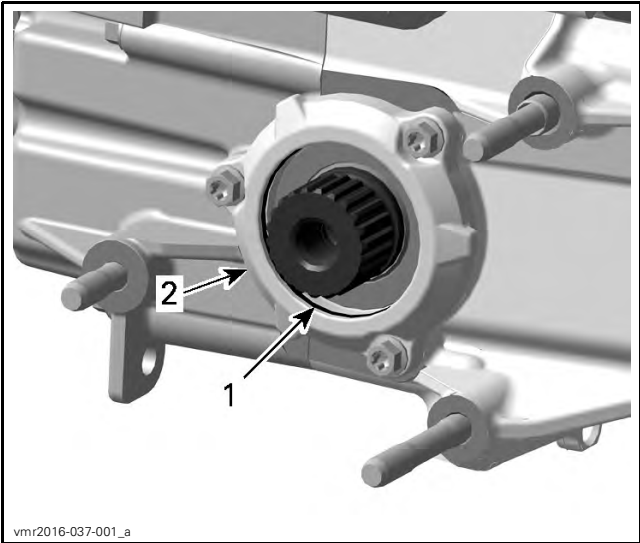
Installing the Gearbox

The installation is the reverse of the removal procedure.

Before gearbox installation check O-ring in bearing cover if brittle, hard or damaged. Replace if necessary.

Section 03 ENGINE, CVT AND GEARBOX (570)

Subsection 12 (GEARBOX AND 4X4 COUPLING UNIT)



1. O-ring
2. Bearing cover

Tighten the three (3) nuts that attaching the gear-box to the engine.

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

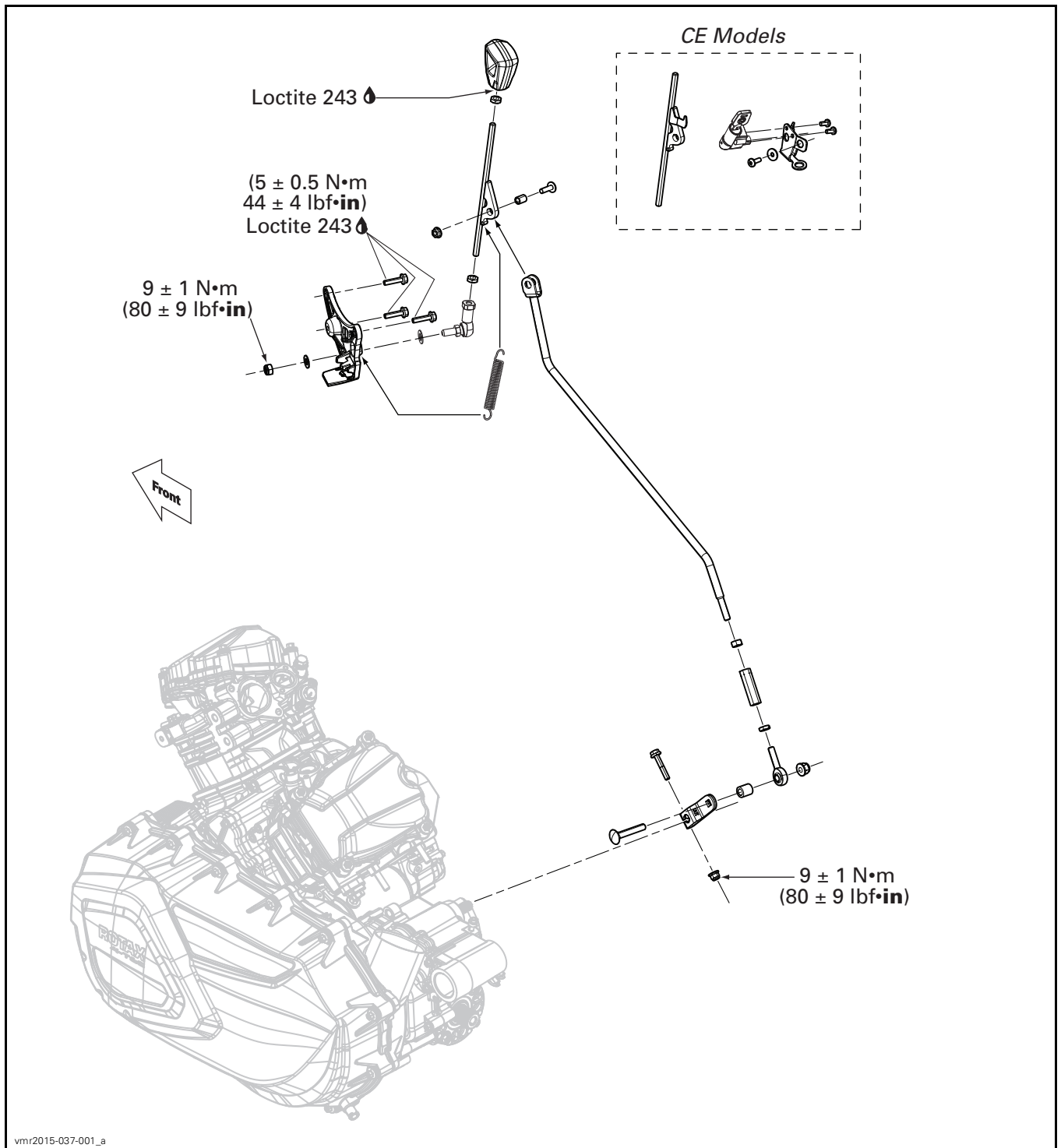
TIGHTENING TORQUE	
Gearbox retaining nuts	25 N•m ± 3 N•m (18 lbf•ft ± 2 lbf•ft)

After installation refill gearbox oil, refer to *PERIODIC MAINTENANCE PROCEDURES*.

SHIFTER

SERVICE PRODUCTS

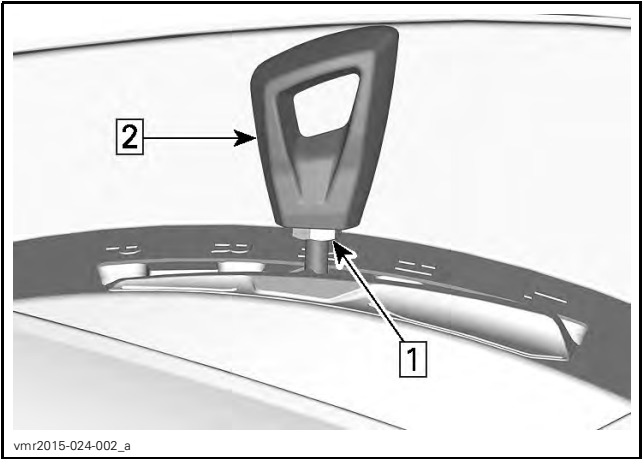
Description	Part Number	Page
LOCTITE 243 (BLUE).....	293 800 060	202



PROCEDURES

HANDLE

Handle Removal



Step 1: Loosen lock nut
Step 2: Unscrew shift lever handle

Handle Installation

Reverse the removal procedure.

SERVICE PRODUCT	WHERE USED
LOCTITE 243 (BLUE) (P/N 293 800 060)	Shift lever threads

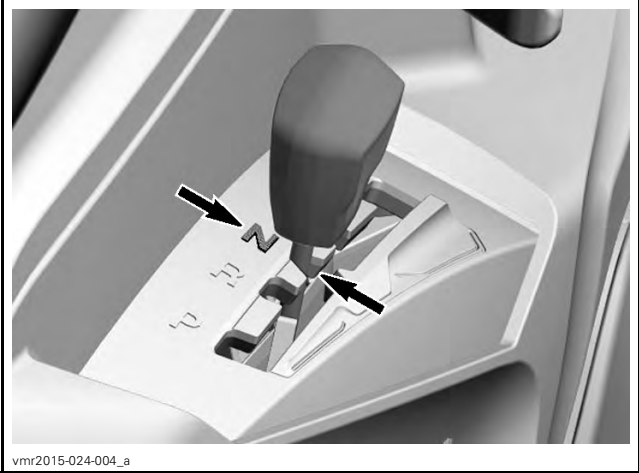
SHIFT LEVER

Shift Lever Access

1. Refer to *BODY* subsection and remove the following components:
 - Seat
 - Console
 - RH side panel.

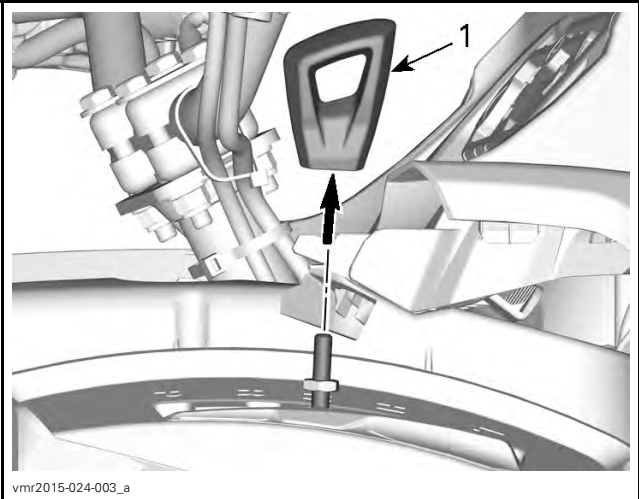
Shift Lever Removal

1. Remove body parts as required. Refer to *SHIFT LEVER ACCESS* in this subsection.
2. Secure vehicle using wheel blocks.

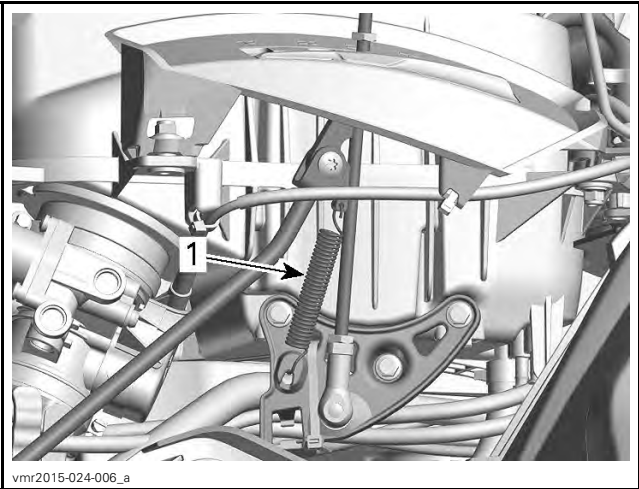


SHIFT LEVER POSITION

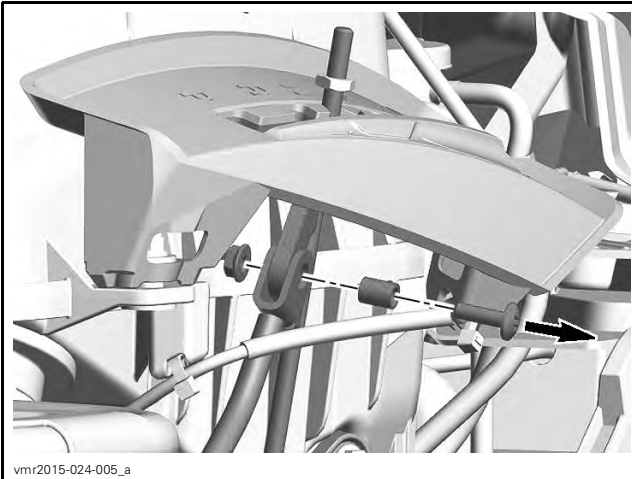
3. Remove parts as indicated in following illustrations.



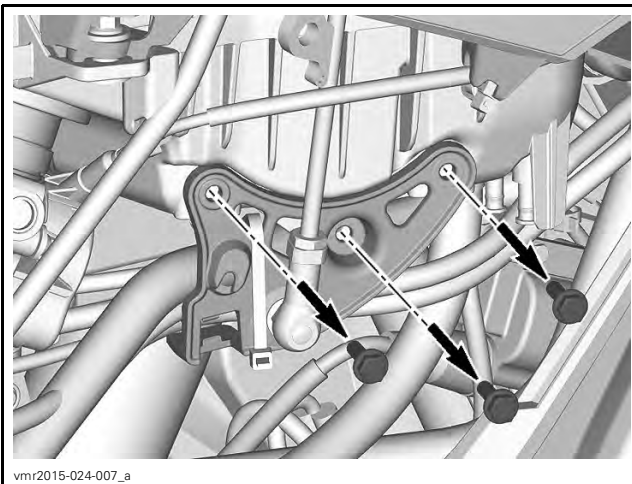
1. Shift lever handle



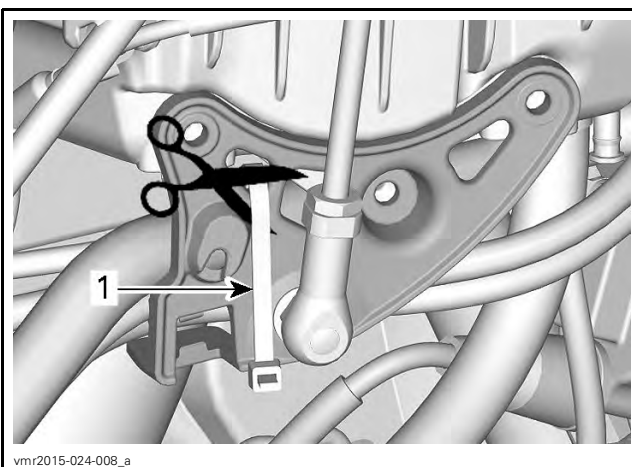
TYPICAL
1. Remove spring



TYPICAL



TYPICAL



TYPICAL

1. Locking tie to cut

4. Remove shift lever with shift lever support.

Shift Lever Inspection

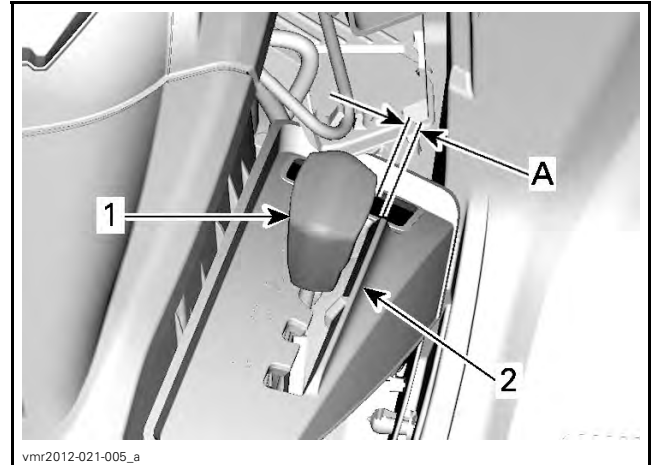
Check shift lever for bending or cracks.
Check spring and bushing condition.

Check ball joint condition.
Replace all damaged parts.

Shift Lever Installation

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

Adjust shift lever handle as per following illustration.



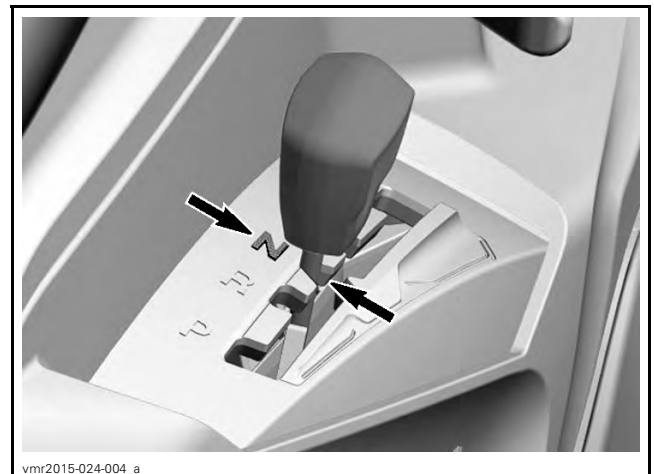
SHIFT LEVER HANDLE ALIGNMENT

1. Handle
2. Ridge

A. Handle parallel with ridge

Check if shift lever works properly in all positions. Ensure throttle cable does not interfere with shift lever in all positions.

NOTE: Shift lever must be perfectly centered with the neutral position indicator when transmission is engaged in neutral.



SHIFT LEVER ALIGNMENT WITH NEUTRAL POSITION INDICATOR

NOTE: If adjustment is required, refer to *SHIFT ROD ADJUSTMENT* in this subsection.

Section 03 ENGINE, CVT AND GEARBOX (570)

Subsection 13 (SHIFTER)

SHIFT ROD

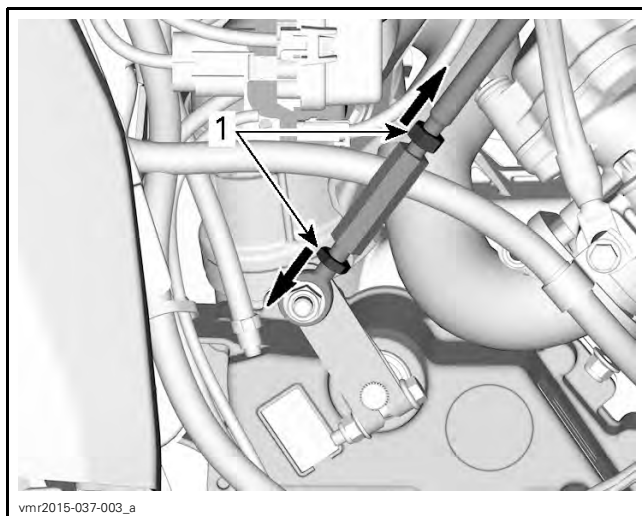
Shift Rod Adjustment

1. Place shift lever in **NEUTRAL** position.

NOTICE Move vehicle back and forth to ensure gearbox is set in neutral position.

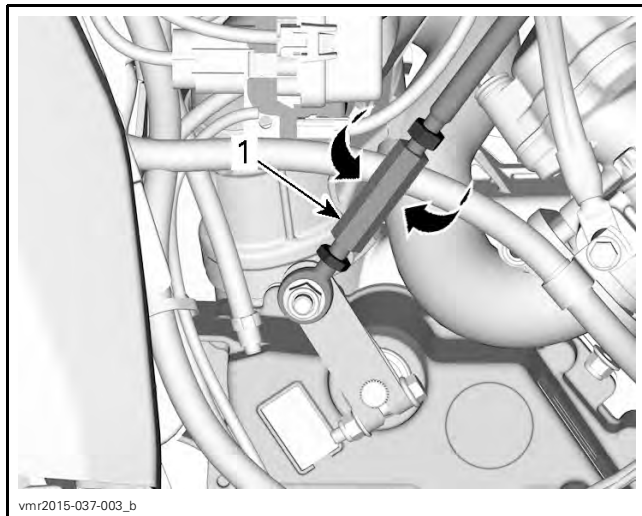
2. Secure vehicle using wheel blocks.
3. Remove body parts as required. Refer to *SHIFT LEVER ACCESS* in this subsection.
4. Remove RH footboard.
5. Loosen shift rod adjustment nuts.

NOTE: Be aware that one of the adjuster lock nuts has LH threads, while the other has RH threads.

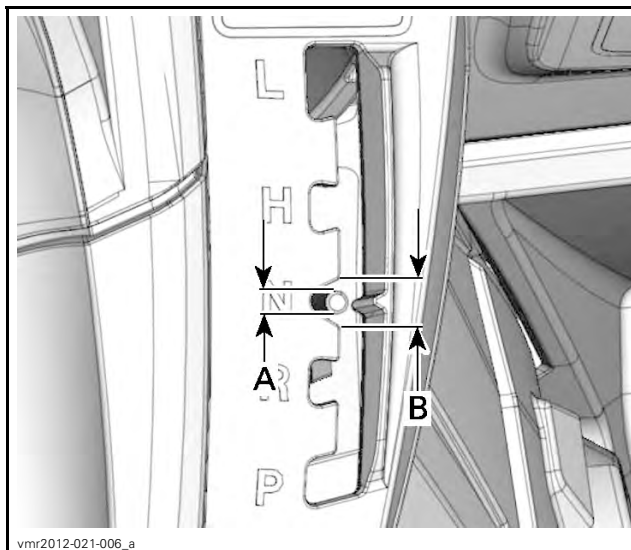


1. Adjustment nuts

6. Turn rod adjuster to center shift lever in neutral notch.



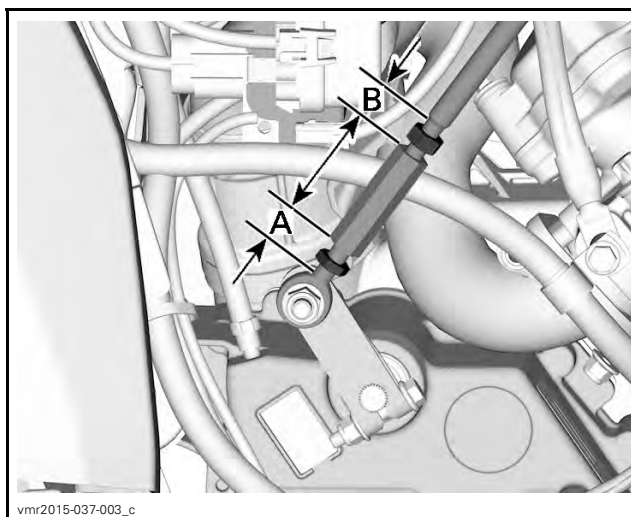
1. Shift rod adjuster



SHIFT LEVER CENTERED WITHIN NEUTRAL NOTCH

A. Shift lever
B. Neutral notch

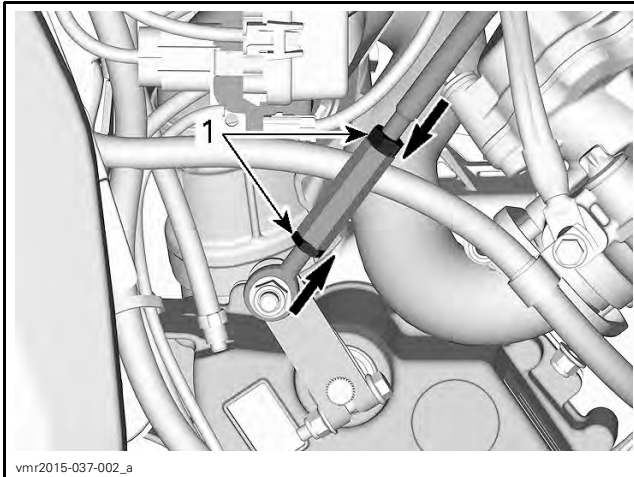
NOTE: Ensure there is the same thread length each side of rod adjuster.



EQUAL THREAD LENGTH BOTH SIDES OF ADJUSTER

A. Thread length ball joint end
B. Thread length shift rod end

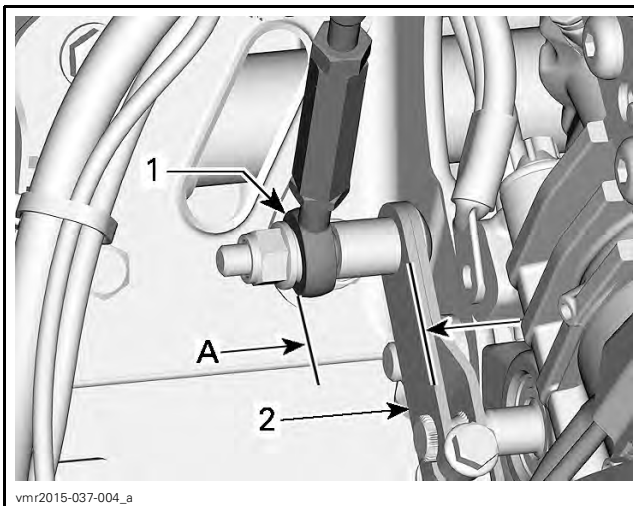
7. Move shift lever in **R** position then in **H** position.
8. Place shift lever in **NEUTRAL** position.
9. Check if shift lever is properly centered in neutral notch. Readjust as required.
10. Hold adjuster steady and tighten lock nuts.



1. Adjuster lock nuts tightened

11. Test the shifter to confirm that the system works properly in all positions.

NOTE: Ensure shift rod ball joint is parallel with shift plate. It may be necessary to realign shift rod ball joint to ensure freedom of movement.



1. Shift rod ball joint
2. Shift plate
A. Parallel within $\pm 5^\circ$

WARNING

After adjustment, make sure the PARK position is also properly set.

SHIFT PLATE

Shift Plate Removal

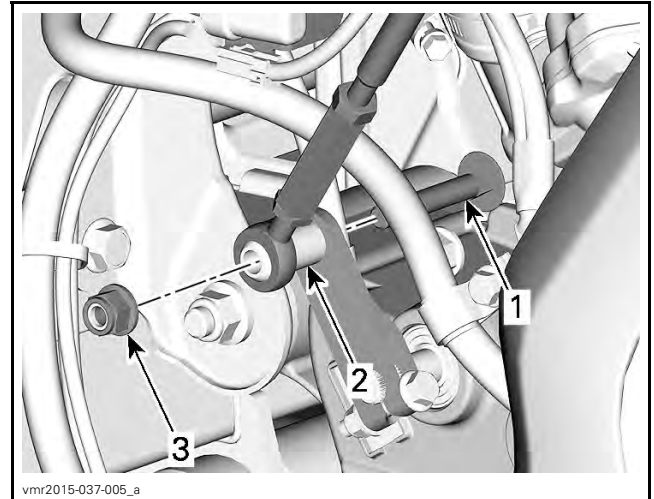
NOTE: Do not remove shift plate needlessly.

1. Refer to *BODY* subsection and remove the following components:

- Seat
- Console

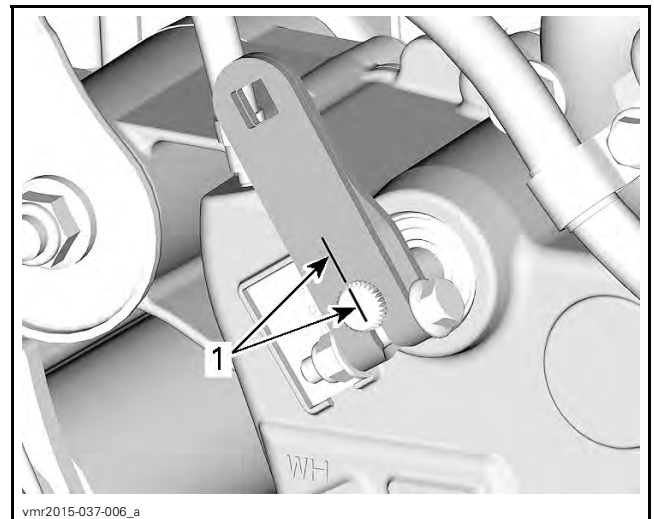
- RH side panel
- RH footrest panel.

2. Remove shift rod from shift plate.



1. Bolt
2. Spacer
3. Nut

3. Trace an index mark on shift plate and shift shaft.

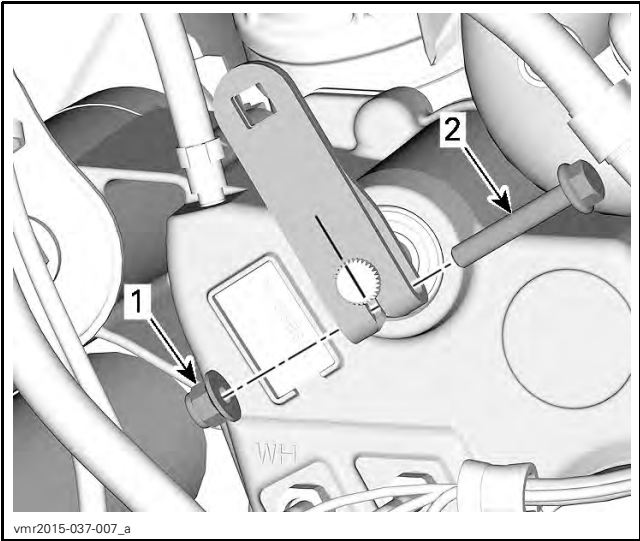


1. Trace a mark on both parts

4. Remove shift plate nut and bolt.

Section 03 ENGINE, CVT AND GEARBOX (570)

Subsection 13 (SHIFTER)



1. Shift plate nut

5. Remove shift plate.

Shift Plate Inspection

Check shift plate for:

- Cracks
- Bending
- Spline condition.

Shift Plate Installation

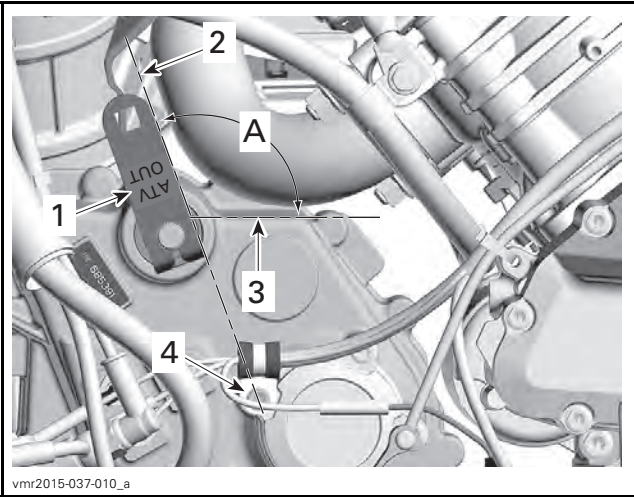
The installation is the reverse of the removal procedure. However, pay attention to the following.

Place gearbox in **NEUTRAL** position before shift plate installation.

Position shift plate with the marking "ATV OUT" visible outward.

Align shift plate using marks previously traced.

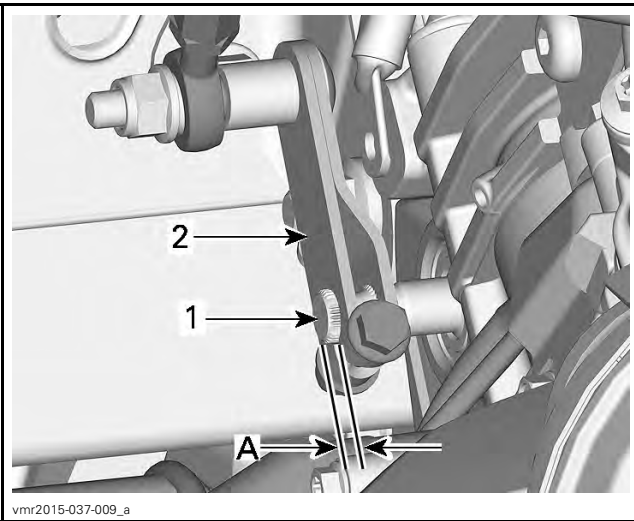
If there are no index marks, adjust shift plate as per following illustrations.



SHIFT PLATE ALIGNMENT

1. "ATV OUT" marking this side
 2. Forward edge of shift plate
 3. Horizontal plane (top forward surface crankcase)
 4. Center of bolt (secondary alignment reference)
- A. $110^{\circ} \pm 2.5^{\circ}$

Ensure that shift shaft protrudes shift plate as per illustration.



1. Shift shaft end
 2. Shift plate
- A. $2.5\text{ mm} \pm 1\text{ mm}$ (.1 in $\pm$.040 in)

Adjust shift rod, refer to *SHIFT ROD ADJUSTMENT* in this subsection.

Tighten shift plate nut to specification.

TIGHTENING TORQUE	
Shift plate nut	$9\text{ N}\bullet\text{m} \pm 1\text{ N}\bullet\text{m}$ (80 lbf•in $\pm$ 9 lbf•in)

DIAGNOSTIC AND FAULT CODES

GENERAL

MONITORING SYSTEM

The Engine Management System (EMS) features a monitoring system that self-diagnoses various electrical and electronic components. This mode becomes active when the ignition key is turned ON.

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

The monitoring system continuously validates that the components (control modules, sensors and actuators) are not faulty or defective. When a malfunction is detected, the related electronic module(s):

- Sets an active fault code.
- Adapts the proper protection strategy according to the failure.
- Sends out signals to the multifunction gauge to inform the rider of a particular condition.

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

If a minor fault occurs, the engine and vehicle will continue to operate without noticeable loss of performance.

If a more important fault occurs, engine RPM may be limited. The engine/vehicle will continue to operate with reduced performance.

If a major component of the EMS fails, engine RPM will be limited as well as vehicle speed.

These strategies are used to protect engine/electrical system from damage and to maintain safe operation of the vehicle. In extreme cases, the engine may also be completely shut down.

Pilot Lamps for Problematic Conditions

When a problem is detected, a pilot lamp will turn on or blink in the multifunction gauge. If the fault that caused the pilot lamp to come on is momentary, the pilot lamp may turn off automatically, or may need to be reset by powering down the vehicle and then restarting it.

A message may also be displayed to provide additional information related to the fault that turned on the pilot lamp. Refer to the following chart.

NOTE: In some cases, the CHECK ENGINE message can be displayed along with other messages.

PILOT LAMP	MULTI-FUNCTION GAUGE MESSAGE	CAUSE
	LO BATT VOLT	Low system voltage
	HIGH BATT VOLT	High system voltage
	LOW OIL PRESSURE STOP ENGINE	Low engine oil pressure
	LIMP HOME MODE	An important engine management component is not working properly. Vehicle performance is purposely limited
	CHECK ENGINE	An engine management component is not functioning properly
	MAINTENANCE REQUIRED	Periodic maintenance required
	ECM NOT RECOGNIZED	Communication error between gauge and ECM
	CHECK DPS	DPS malfunction (DPS model only)
	TRANSMISSION SIGNAL FAULT	Gauge receives an invalid gear position data
	BRAKE	Displayed when brake is applied for more than 15 seconds (while riding)
	HI TEMP	High engine temperature

Limp Home Mode

When a major component of the EMS is not operating properly, limp home mode will be set.

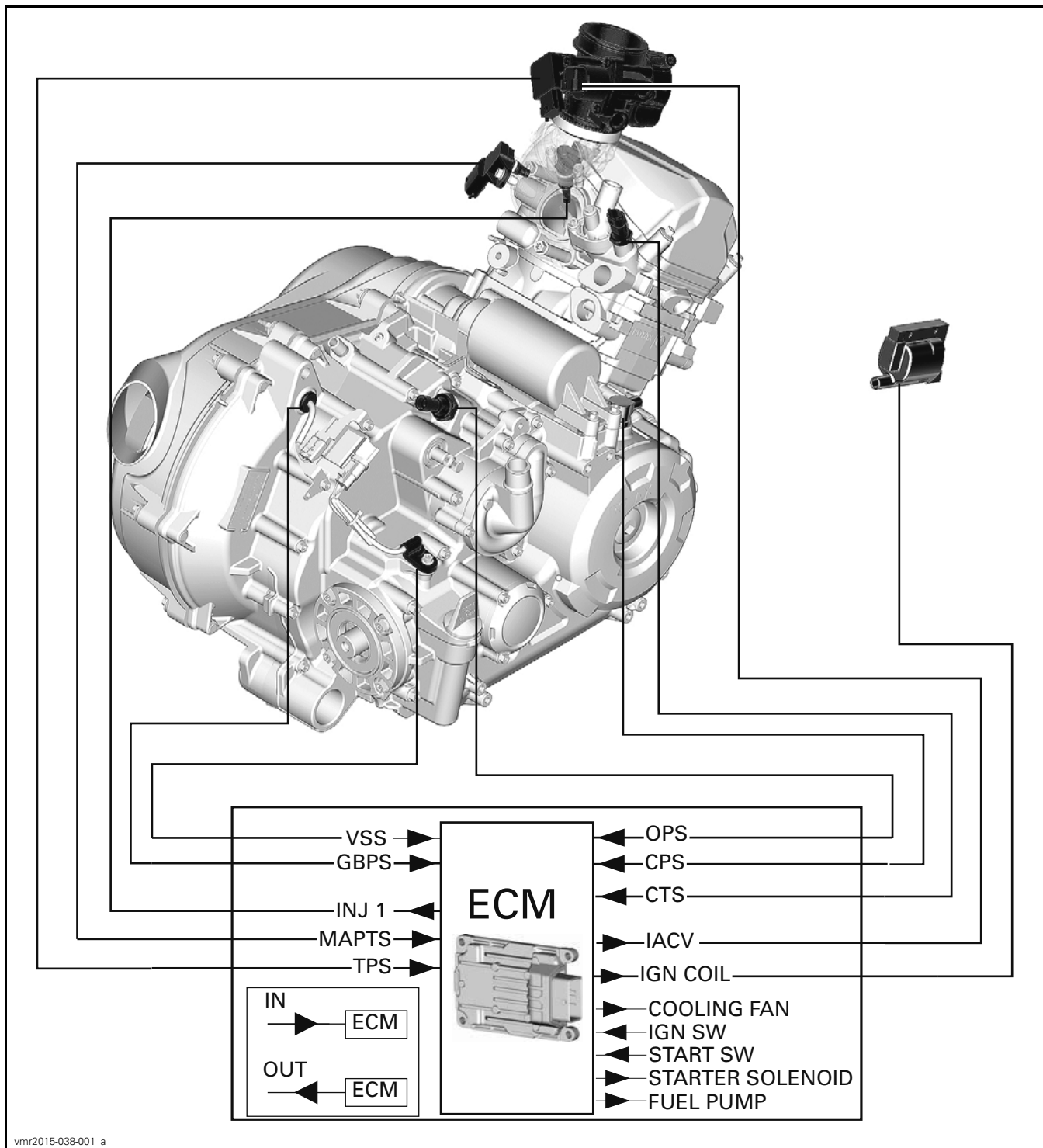
Engine RPM will be limited and/or engine behavior and control may be modified depending on the cause of the failure.

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

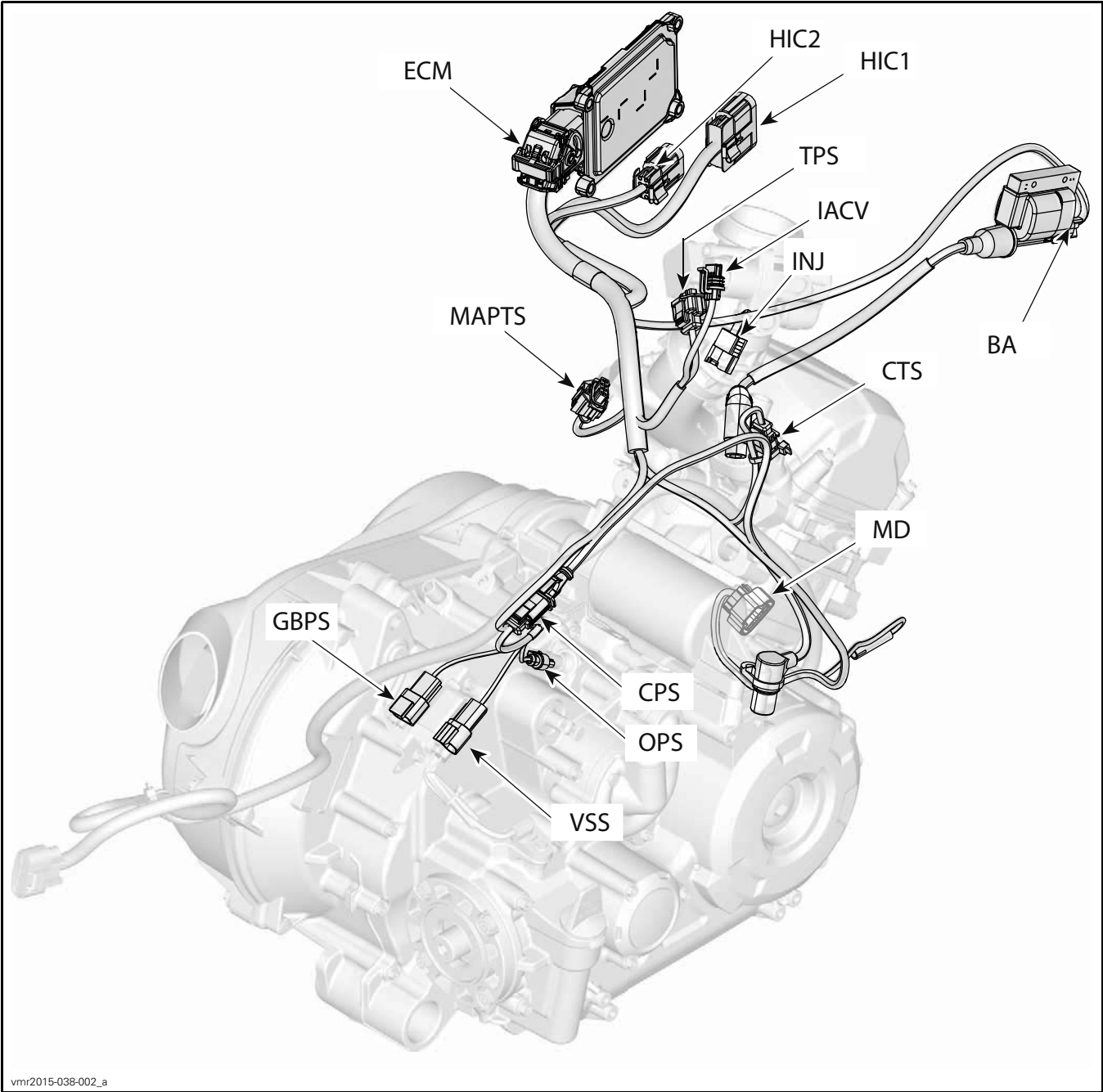
LIMP HOME will be displayed in the multifunction gauge and the CHECK ENGINE light symbol will be on in the gauge.

ENGINE MANAGEMENT SYSTEM (450)

GENERAL



Section 04 ELECTRONIC MANAGEMENT SYSTEM
Subsection 01 (ENGINE MANAGEMENT SYSTEM (450))



vmr2015-038-002_a

ABBREVIATION	DEFINITION
BA	Ignition coil
CPS	Crankshaft position sensor
CTS	Coolant temperature sensor
ECM	Electronic control module
GBPS	Gear box position sensor
HIC1‡	Harness interconnect 1
HIC2‡	Harness interconnect 2
IACV	Idle air control valve
INJ1	Injector 1 (front)

ABBREVIATION	DEFINITION
MAPTS	Manifold absolute pressure and temperature sensor
MD	4WD Actuator
OPS	Oil pressure switch
SD	4WD Signal
TPS	Throttle position sensor
VSS	Vehicle speed sensor
‡Refer to applicable <i>WIRING HARNESS AND CONNECTORS</i> subsection for the vehicle harness.	

SYSTEM DESCRIPTION

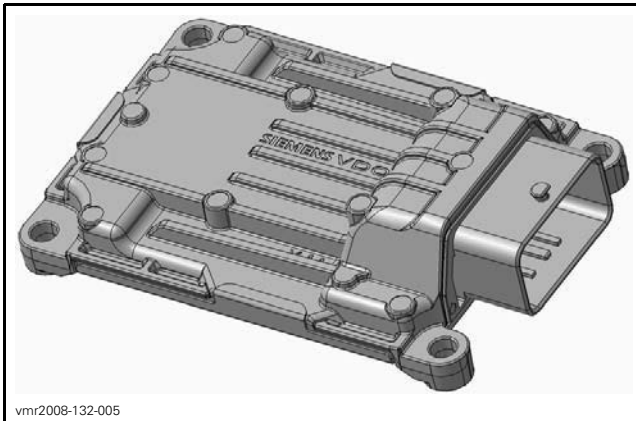
The HIC# connectors connect the vehicle harness to the powertrain harness.

The MD connector connects to the 4 wheel drive actuator.

There are 4 main systems that are controlled by the engine management system (EMS):

1. Electronic fuel injection (EFI)
2. Ignition system
3. Starting system
4. Cooling system.

ENGINE CONTROL MODULE (ECM)



ECM

The ECM controls the electrical system and the engine management functions, by processing the information given by various sensors.

The ECM is located on the left hand side of the air filter housing.

Engine RPM Limiter

The ECM will limit the maximum engine speed when vehicle shifter is in:

- Forward position (Hi and LO individually)
- Neutral position
- Park position
- Reverse position.

The ECM uses the CPS and the GBPS for this function.

An override switch, on the handlebar, allows the engine speed to run higher than the RPM limiter when more power is needed in reverse operation. Refer to *LIGHTS, GAUGE AND ACCESSORIES*.

Vehicle Speed Limiter

The ECM will limit the maximum vehicle speed both in 2WD and in 4WD. For this purpose, the ECM uses the VSS and the GBPS .

Drowned Mode (Flooded Engine)

If engine is fuel-flooded and does not start, this special mode can be activated to prevent fuel injection and ignition while cranking. Proceed as follows to activate it.

With ignition key in ignition switch at ON position while engine is stopped, press and HOLD throttle lever at WOT position.

Press the start button. The mode is now on.

Releasing throttle lever will bring back the normal mode.

Monitoring System

The ECM monitors the electronic components of the fuel injection system and also parts of the electrical system.

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

Limp Home Mode

The ECM may automatically set default parameters to the engine management to ensure the adequate operation of the engine if a component of the fuel injection system is not operating properly. The engine will operate with reduced performance to protect the engine. In more severe cases, the engine RPM will be limited, also to protect the engine.

These performance-reduced modes allow the rider to go back home which would not be otherwise possible without this advanced system. Refer to the *MONITORING SYSTEM/FAULT CODES*.

Diagnostic Mode

The ECM features a self-diagnostic mode when ignition key is turned on. However, some components need the engine to be running so that they can be monitored. Some problems will turn on a warning lamp or will set the engine in limp home mode. Refer to *DIAGNOSTIC AND FAULT CODES* section for more information.

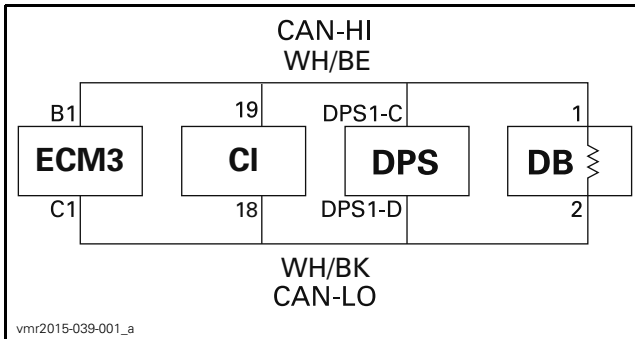
CONTROLLER AREA NETWORK (CAN)

GENERAL

SYSTEM DESCRIPTION

The Controller Area Network (CAN) protocol is an ISO standard for serial data communication. The CAN bus links the ECM, multifunction gauge and DPS module together so that they can communicate to each other and interact as required. The components (modules) are connected together by 2 wires and are in constant communication at a rate of about every 20 milliseconds. CAN lines consist of a pair of wires (WH/BE and WH/BK).

If a component or system malfunction is detected, a module (ECM, multifunction gauge or DPS) may generate a fault code, which it transmits through the CAN bus as a signal. The fault signal may be used for various functions such as triggering the display of an error message in the multifunction gauge cluster, turning on a fault indicator light, limiting or inhibiting vehicle or engine operation, or viewed using the B.U.D.S. software for troubleshooting.



CI: Multifunction Gauge
DB: Diagnostic Connector
ECM3: Engine Control Module
DPS: Dynamic Power Steering
WH/BE: (wire color code)
WH/BK: (wire color code)

COMMUNICATION TOOLS AND B.U.D.S.

SERVICE TOOLS

Description	Part Number	Page
MPI-2 DIAGNOSTIC CABLE.....	710 000 851	431
MPI-2 INTERFACE CARD	529 036 018	431

SERVICE TOOLS – OTHER SUPPLIER

Description	Part Number	Page
MALE-FEMALE EXTENSION SERIAL CABLE.....	DB9	431

GENERAL

Refer to *PROCEDURES* for instructions on the communication tools.

If communication problems occur, refer to *TROUBLESHOOTING* in this subsection.

TROUBLESHOOTING

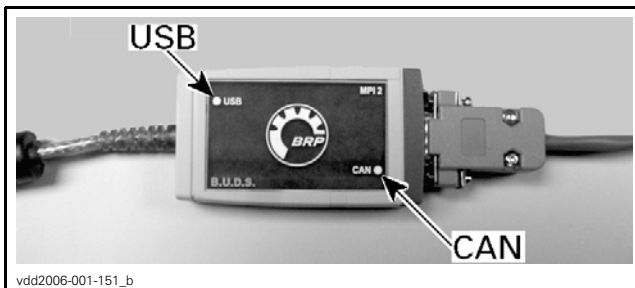
DIAGNOSTIC TIPS

IMPORTANT: Make sure all connections are made and vehicle is powered up **before starting B.U.D.S.** to allow proper communication between the vehicle and B.U.D.S.

MPI-2 Connection Troubleshooting

MPI-2 Status Lights

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



Prerequisite for USB Communication:

- PC Computer turned on.
- MPI-2 connected to PC computer.

USB LIGHT	
STATUS	WHAT TO DO
Light is OFF	Check USB connection between MPI-2 and PC computer. Check USB operation on PC computer (hardware or Windows drivers)
Light is GREEN	Connections are GOOD. Communication can take place on USB side

Prerequisite for CAN Communication:

- MPI-2 connected to diagnostic connector on vehicle.
- ECM turned on (electrical system powered up without engine started).
- Ignition key installed and turned to ON.
- B.U.D.S. started and logged on.

CAN LIGHT	
STATUS	WHAT TO DO
Light is OFF	Check connection between MPI-2 and diagnostic connector on vehicle
Light is RED	Check CAN wires/connectors on vehicle
Light is GREEN	Connections are GOOD. Communication can take place on CAN side

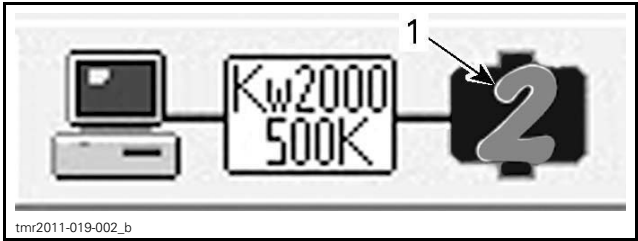
Communication Problems when Using B.U.D.S.

Missing Module

Ensure the appropriate number of modules is shown at the bottom RH side of B.U.D.S. screen.

Section 04 ELECTRONIC MANAGEMENT SYSTEM
Subsection 04 (COMMUNICATION TOOLS AND B.U.D.S.)

MODEL	NUMBER OF MODULES
Models without DPS	2 (ECM and multifunction gauge)
Models with DPS	3 (ECM, DPS and multifunction gauge)

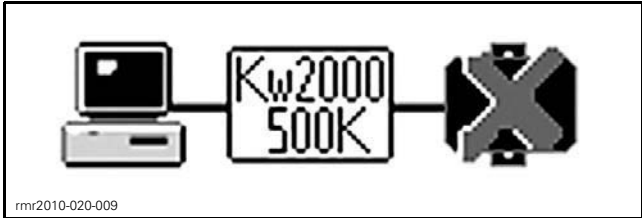


TYPICAL
1. Number of modules

If one or more "ECU" is not communicating with the MPI, refer to *DIAGNOSTIC SYSTEM AND FAULT CODES*.

No Vehicle is Detected

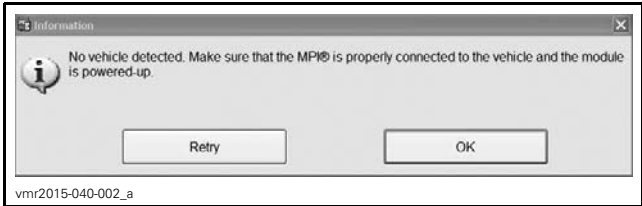
If an "X" is shown in the status bar and the protocol indication is blinking between Kw2000 500K and KW2000, it means that no "ECU" is communicating with the MPI.



Check the following:

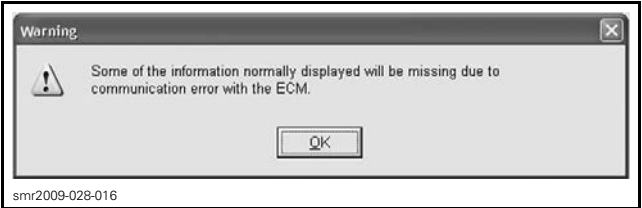
- Connections between the PC computer and the vehicle.
- The multifunction gauge is powered up.

If B.U.D.S. does not automatically exit the following message box, click the **Retry** button. This will manually establish the communication with the vehicle.



Message Box: "Some of the Information Normally Displayed..."

If the following message box is displayed in B.U.D.S.:



1. Click on the **OK** button in the box.
2. Click on the **Read Data** button in B.U.D.S.

PROCEDURES

MULTI-PURPOSE INTERFACE-2 (MPI-2)

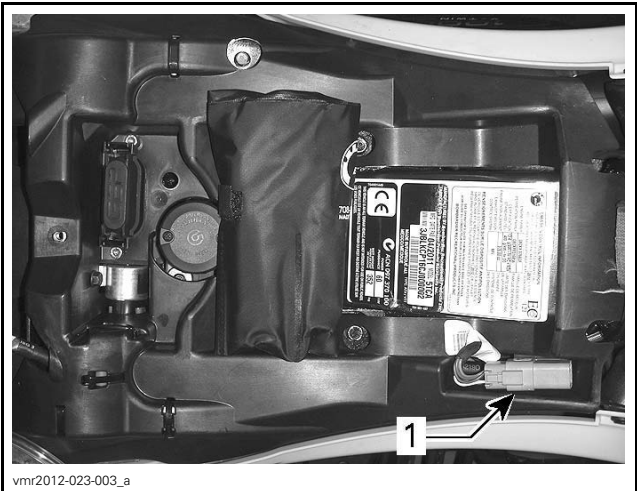
The MPI-2 (Multi-Purpose Interface-2) in conjunction with the MPI-2 diagnostic cable is used with B.U.D.S. to communicate with the ECM (engine control module) and other modules.

MPI-2 Power

The MPI-2 interface card uses the power from the PC computer's USB port.

Diagnostic Connector Location

The 6-pin diagnostic connector is located under the seat, stored in it's protective cap.



1. Diagnostic connector

Connecting the PC to the Vehicle

⚠ WARNING

If the computer you are using is connected to the 110 Vac power outlet, there is a potential risk of electrocution when working in contact with water. Be careful not to touch water while working with the VCK.

1. Locate the 6-pin diagnostic connector, refer to *DIAGNOSTIC CONNECTOR LOCATION* in this subsection.
2. Disconnect the 6-pin diagnostic connector from its holder (protective cap).
3. Connect one end of the MPI-2 DIAGNOSTIC CABLE (P/N 710 000 851) to the vehicle connector.

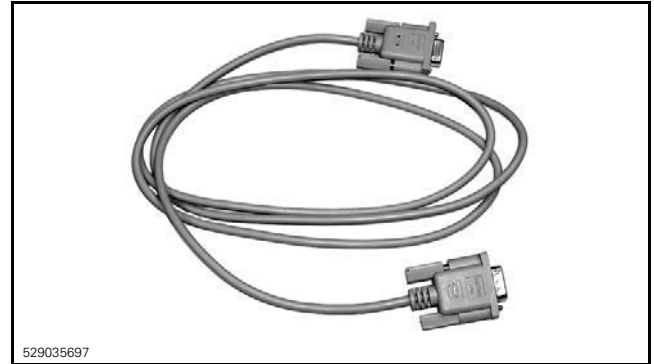


DIAGNOSTIC CABLE CONNECTED TO VEHICLE

4. Connect the other end of diagnostic cable to the MPI-2 INTERFACE CARD (P/N 529 036 018).



NOTE: An optional MALE-FEMALE EXTENSION SERIAL CABLE (P/N DB9) available at electronic retail outlets can be used between diagnostic cable and MPI-2 interface. Do not exceed 7.6 m (25 ft).

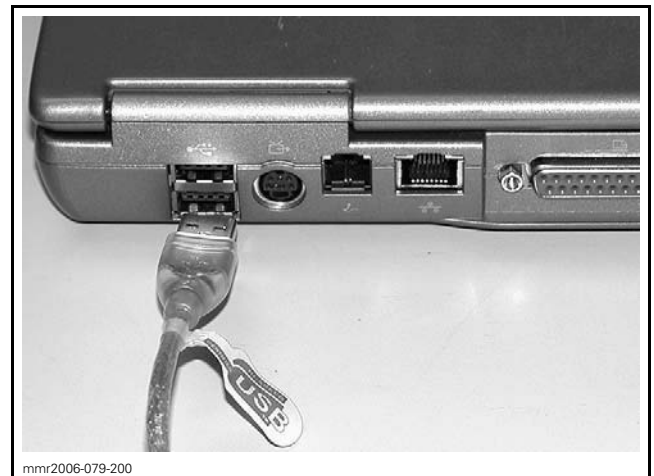


OPTIONAL MALE-FEMALE EXTENSION SERIAL CABLE

5. Connect the MPI-2 INTERFACE CARD (P/N 529 036 018) to the USB port of a PC (personal computer).



DIAGNOSTIC CABLE CONNECTED TO MPI-2 INTERFACE CARD



MPI-2 INTERFACE CARD CONNECTED TO USB PORT

6. Use B.U.D.S. as described further in *B.U.D.S.*

B.U.D.S.

B.U.D.S. (Bombardier Utility and Diagnostic Software) is designed to allow programming key(s) to the vehicle, allow electrical and electronic component monitoring, activation of certain components for diagnostic purposes, and to carry out setting changes.

Section 04 ELECTRONIC MANAGEMENT SYSTEM
Subsection 04 (COMMUNICATION TOOLS AND B.U.D.S.)

For more information pertaining to the use of the B.U.D.S., use its **Help** menu which contains detailed information on its functions.

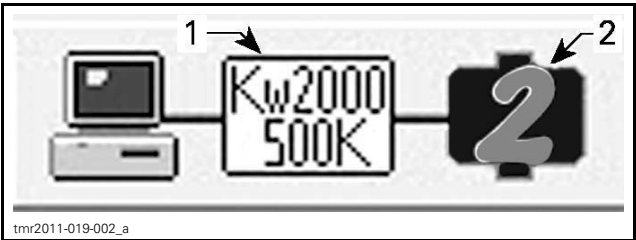
Always use the latest applicable B.U.D.S. version available on BOSSWeb.

How to Establish Communication Using B.U.D.S. Software

IMPORTANT: Ensure all connections have been made **before starting B.U.D.S.** to allow proper operation. Refer to *MPI-2* in this subsection.

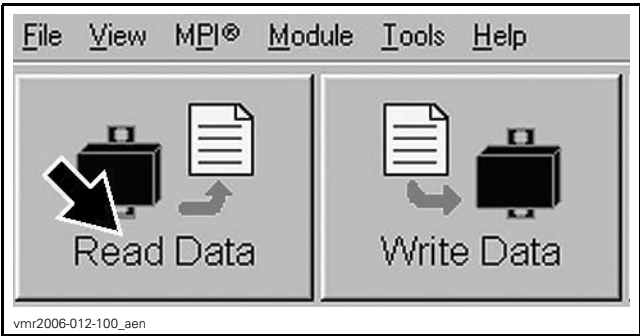
- 1. Turn ignition switch to ON using any of the keys provided with the vehicle. Do not start the engine.
- 2. Set the emergency engine stop switch to RUN.
- 3. Start B.U.D.S. and logon.
- 4. Ensure the status bar shows the Kw2000 (500K) protocol and the appropriate number of modules to its right according to the vehicle model.

VEHICLE MODEL	PROTOCOL	NUMBER OF MODULES
Models without DPS	Kw2000 (500K)	2
Models with DPS		3



TYPICAL - SUCCESSFUL CONNECTION
1. Connection protocol
2. Number of modules read

- 5. Read ECUs by clicking the **Read Data** button.



B.U.D.S. is now ready to use.

When clicking on the **Read Data** button, B.U.D.S. will read the modules through CAN bus.

Electronic Modules (ECU) Updates

NOTICE Failure to strictly follow a procedure to update a module may permanently damage the module.

Whenever B.U.D.S. is started, check for an update icon in the B.U.D.S. status bar.

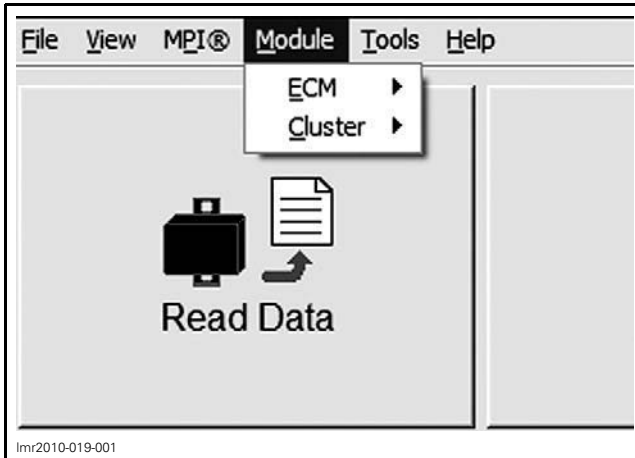


TYPICAL

If the icon is visible, it indicates that a file is available in B.U.D.S. to update at least one of the electronic modules:

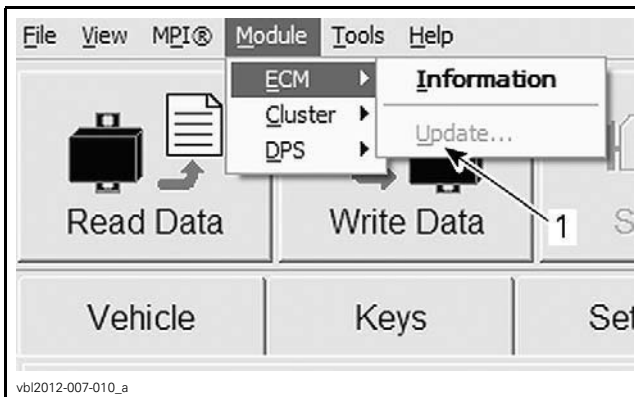
NOTE: If an update file is available on BOSSWeb but the B.U.D.S. software being used is not up to date, the update icon will not appear. Refer to the *SERVICE BULLETINS* to see if there is an update available.

Use the **Module** submenu and check all modules one at a time to see which module(s) can be updated.



TYPICAL - MODULE SUBMENU LIST

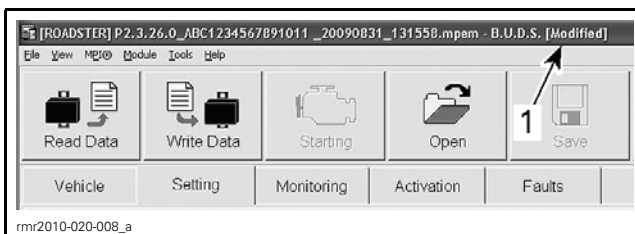
1. If the **Update** option is **greyed out**, no update file is available for this module.
2. If the **Update** option is **black**, an update file is available for this module.



1. Greyed out: No update to perform
 Black: Update file available

Writing Changes (Saving) in a Module

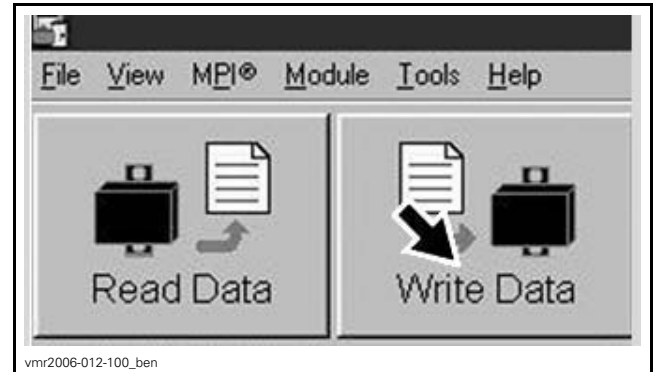
If the word **Modified** appears in the vehicle file identification number at the top of the B.U.D.S. page, then a change has been made that requires selecting the **Write Data** to save the change.



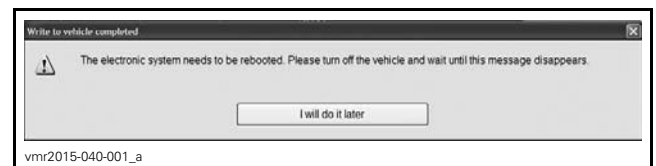
TYPICAL

1. Indicate setting or data modified; Write Data to save

Click the **Write Data** button.

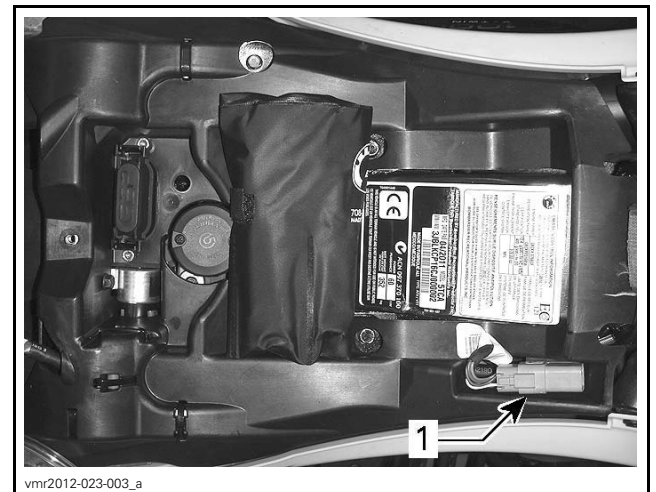


After clicking on **Write Data**, the following message may appear.



In such a case, turn ignition switch OFF, then wait for the message to disappear before disconnecting the MPI.

Disconnect MPI and store the vehicle diagnostic connector in its protective cap.



1. Diagnostic connector in its storage cap

NOTICE Failure to secure the diagnostic connector in its protective cap may result in corrosion or other damage to the terminals.

DIAGNOSTIC AND FAULT CODES

GENERAL

MONITORING SYSTEM

The Engine Management System (EMS) features a monitoring system that self-diagnoses various electrical and electronic components. This mode becomes active when the ignition key is turned ON.

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

The monitoring system continuously validates that the components (control modules, sensors and actuators) are not faulty or defective. When a malfunction is detected, the related electronic module(s):

- Sets an active fault code.
- Adapts the proper protection strategy according to the failure.
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If a minor fault occurs, the engine and vehicle will continue to operate without noticeable loss of performance.

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When a problem is detected, a pilot lamp will turn on or blink in the multifunction gauge. If the fault that caused the pilot lamp to come on is momentary, the pilot lamp may turn off automatically, or may need to be reset by powering down the vehicle and then restarting it.

A message may also be displayed to provide additional information related to the fault that turned on the pilot lamp. Refer to the following chart.

NOTE: In some cases, the CHECK ENGINE message can be displayed along with other messages.

PILOT LAMP	MULTI-FUNCTION GAUGE MESSAGE	CAUSE
	LO BATT VOLT	Low system voltage
	HIGH BATT VOLT	High system voltage
	LOW OIL PRESSURE STOP ENGINE	Low engine oil pressure
	LIMP HOME MODE	An important engine management component is not working properly. Vehicle performance is purposely limited
	CHECK ENGINE	An engine management component is not functioning properly
	MAINTENANCE REQUIRED	Periodic maintenance required
	ECM NOT RECOGNIZED	Communication error between gauge and ECM
	CHECK DPS	DPS malfunction (DPS model only)
	TRANSMISSION SIGNAL FAULT	Gauge receives an invalid gear position data
	BRAKE	Displayed when brake is applied for more than 15 seconds (while riding)
	HI TEMP	High engine temperature

Limp Home Mode

When a major component of the EMS is not operating properly, limp home mode will be set.

Engine RPM will be limited and/or engine behavior and control may be modified depending on the cause of the failure.

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

LIMP HOME will be displayed in the multifunction gauge and the CHECK ENGINE light symbol will be on in the gauge.

FAULT CODES

Fault Code Categories

A fault code consists of an alphanumeric designator followed by a hexadecimal number of 3 digits. The alphanumeric designator defines the category of the fault code while the hexadecimal number refers to a unique fault.

FAULT CODE CATEGORIES		
ALPHANUMERIC DESIGNATOR	MODULE/ SYSTEM	EXAMPLE OF FAULT CODE
From P0 to P3	Power train, TCM and DPS	P0116
From U0 to U3	Communication between module and sensors	U0073

RELATED MODULE AND FAULTS	
MODULE	FAULT CODE CATEGORY
ECM	P and U
DPS	P and U
Cluster	P and U

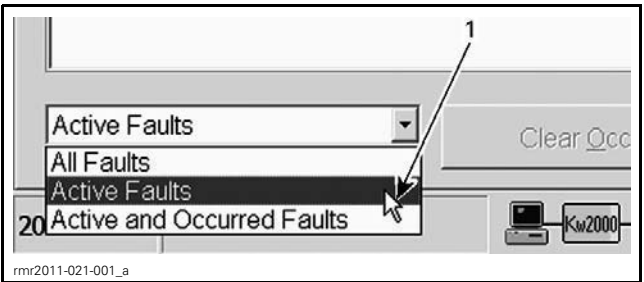
Fault Code States

Fault codes have 3 possible states:

- Active
- Occurred
- Inactive.

Click the **Fault** tab then click on the drop-down list on the LH lower corner.

Choose the fault code state you want to display.



TYPICAL
1. Drop down list

Active Fault Codes

An active fault code is an indication of a fault that is currently triggered.

The active fault may or may not compromise normal operation of the system(s). Service action should be taken to correct the problem that caused the fault code.

Once the fault condition(s) of the active fault is no longer present, its state will change to "occurred".

Occurred Fault Codes

An occurred fault code indicates a fault that was active, but **no longer** is.

The occurred fault does not presently affect system or component operation but is retained as a history of the faults that were detected.

The fault may have been generated due to a system or component that was momentarily operating outside normal parameters. Repeated occurred faults of this type should be considered when troubleshooting a problem, and may require that maintenance action be taken.

An occurred fault may also be generated when disconnecting and reconnecting a component, replacing a burnt fuse, when the software update of an electronic module has been carried out, or may be due to a momentary high or low voltage.

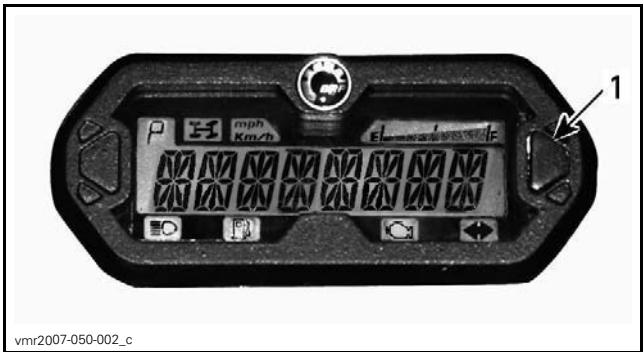
Inactive Fault Codes

An inactive fault code represents a fault code that is neither active, nor occurred. It is simply part of a list of all possible faults that can be monitored by the ECM and multifunction gauge, which may become active or occurred if the monitoring system detects an applicable fault. These codes can be viewed in B.U.D.S.

How to Display Fault Codes in the Multifunction Gauge

NOTE: A fault code must be in an "Active" state to be displayed in the multifunction gauge. B.U.D.S. must be used to read all fault codes states.

1. Use the selector button or mode button and scroll to Engine Hour (EH) on the gauge.



RENEGADE
1. Selector button

Section 04 ELECTRONIC MANAGEMENT SYSTEM

Subsection 05 (DIAGNOSTIC AND FAULT CODES)

- Press and HOLD mode button while QUICKLY toggling HI - LO beam.

NOTE: A minimum of 3 HI - LO toggles must be completed within 2 seconds.



TYPICAL

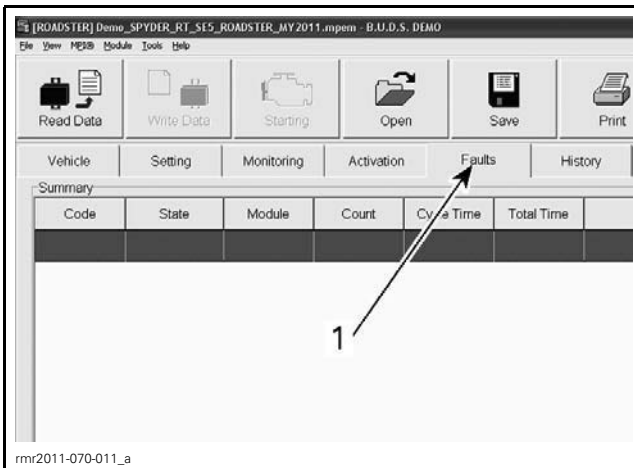
Step 1: Press and hold

Step 2: Quickly toggle HI - LO beam

How to Read Fault Codes Using B.U.D.S.

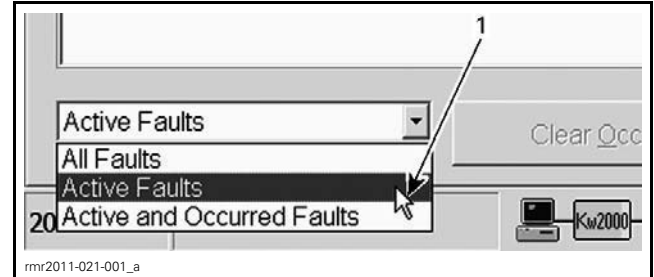
NOTE: All fault code (regardless of their state) can be read with B.U.D.S.

- Connect vehicle to the latest applicable B.U.D.S. Refer to *COMMUNICATION TOOLS AND B.U.D.S.* subsection.
- Click on the **Read Data** button.
- Click on the **Faults** tab.



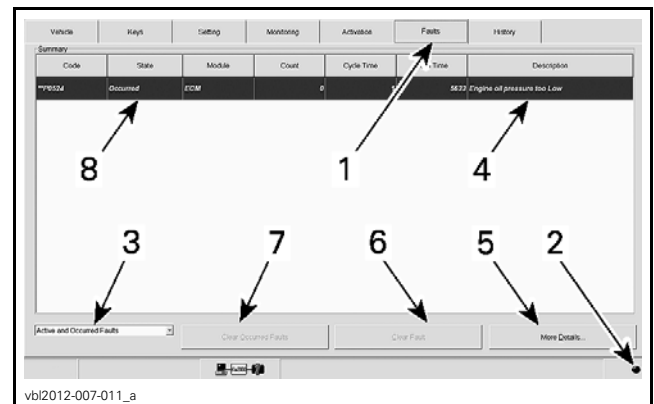
- Fault tab

- Click on the drop-down list on the LH lower corner.
- Choose the fault state to display.



- Drop down list

FAULT STATE	INFORMATION
All faults	Display all possible faults regardless of state
Active faults	Display only faults matching this state Empty area if there is no active fault
Active and occurred faults	Display only faults that have either state Empty area if there is neither active nor occurred fault



FAULT PAGE

- Fault tab
- Fault indicator light
- Fault code state drop box
- Fault description
- More Details button
- Clear Fault button
- Clear Occurred Faults button
- Selected fault

FAULT PAGE DESCRIPTION	
ITEM	INFORMATION
Fault tab	Click tab to display the fault page
Fault indicator light	When flashing, it indicates there is active fault(s)
Fault code state drop box	Click drop box to select the type of faults to display
Fault nomenclature	Display specific information and statistics related to the fault (see fault nomenclature table)

Section 04 ELECTRONIC MANAGEMENT SYSTEM

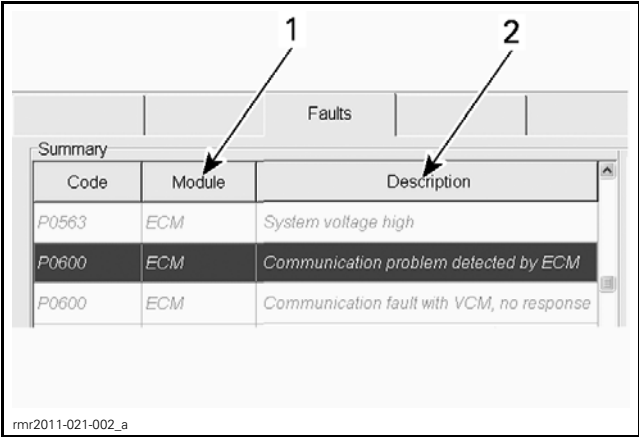
Subsection 05 (DIAGNOSTIC AND FAULT CODES)

FAULT PAGE DESCRIPTION	
ITEM	INFORMATION
More Details button	To display possible causes and service actions related to the selected fault
Clear Fault button	To clear occurred faults one at a time
Clear Occurred Faults button	To clear all occurred faults in related ECU(s)
Selected fault	When a fault is selected, additional information pertaining to that fault will be displayed when clicking the "More details" button. To select a fault, click on the fault with the mouse or use the cursor up or down to scroll to the desired fault

FAULT NOMENCLATURE	
COLUMN	INFORMATION
Code	Fault code number. When 2 stars (**) precedes the code, detailed conditions when the fault occurred, can be displayed by clicking the "More details" button
State	Display the fault state (active, occurred, inactive)
Module	Displays the module that reports the fault code. This is the module that detects or has received a message of an anomaly and reports it. List of modules: - Cluster (multifunction gauge) - DPS (dynamic power steering) - ECM (engine control module)
Count	Number of times this fault occurred within the driving cycle. Value: From 0 to 255
Cycle time	Not to be used. Value: From 0 to 255 minutes
Total time	Not to be used. Value: From 0 to 64 255 minutes
Description	Provides a short description of the fault

When reading a fault code in B.U.D.S., pay particular attention to which module reports a fault. It is indicated in the **Module** column.

The **Description** column gives a short description of the fault.

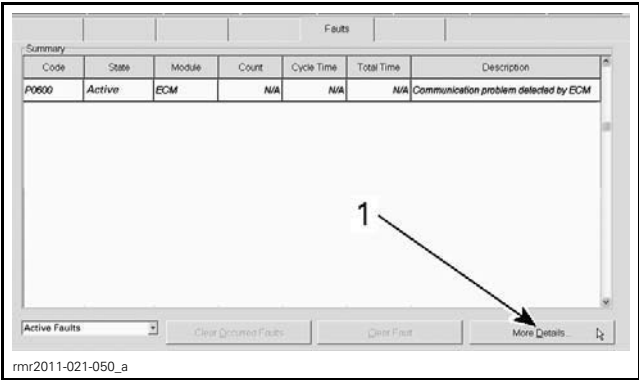


SOME COLUMNS REMOVED FOR CLARITY PURPOSE

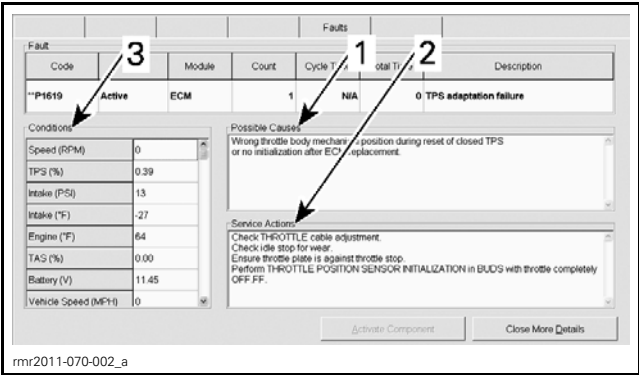
1. Module that reports a fault

2. Fault description

Click on the **More Details** button, on the RH lower corner, to display the "Possible Causes" and the "Service Actions" to step further in the diagnosis.



1. Click here



MORE DETAILS PAGE

1. Possible causes related to the selected fault

2. Service actions

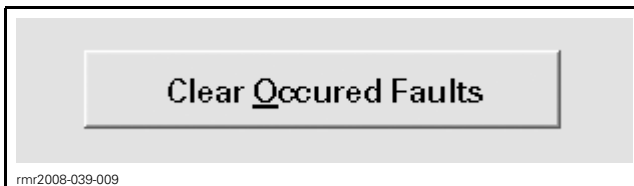
3. Operating conditions when fault occurred

MORE DETAILS PAGE DESCRIPTION	
ITEM	INFORMATION
Possible causes	List the possible causes that triggered the fault
Service actions	List the possible actions to perform to solve the fault
Conditions when fault occurred	List the operating conditions of the engine and/or vehicle when the fault was triggered

How to Clear Fault Codes Using B.U.D.S.

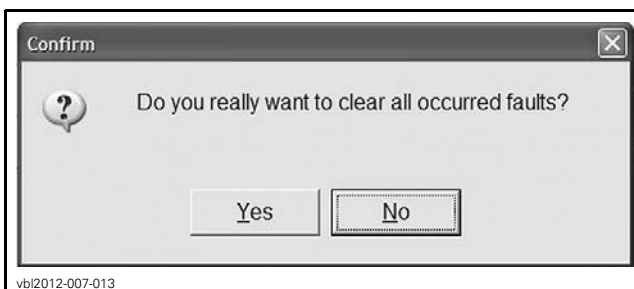
1. Connect vehicle to the latest applicable B.U.D.S. software. Refer to *COMMUNICATION TOOLS AND B.U.D.S.* subsection.
2. Click on the **Read Data** button.
3. Click on the **Faults** tab.

The fault(s) (occurred state only) can be cleared by pressing the **Clear Occurred Faults** or **Clear Fault** buttons in B.U.D.S.

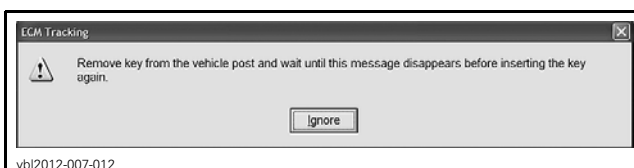


FAULTS PAGE TAB, CLEAR OCCURRED FAULTS

4. Click YES on the following message box.



The following message will appear.



5. Turn ignition OFF and wait until the message disappears.

This will reset the appropriate counter(s) and will also record that the problem has been fixed in the related ECU memory.

NOTE: An active fault code cannot be cleared. In other words, the problem relevant to the fault code must be repaired before the fault can be cleared.

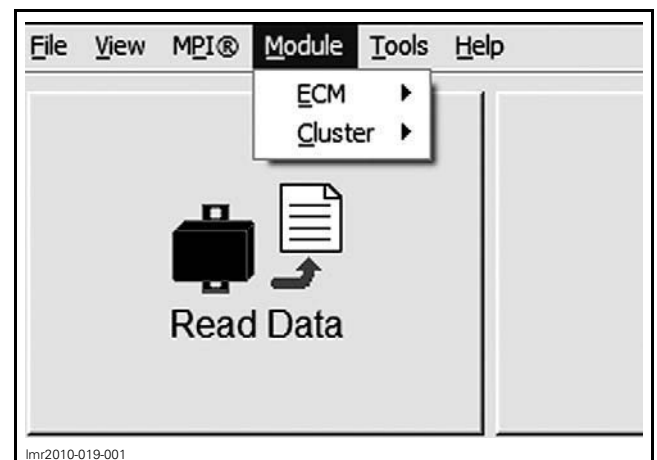
FAULT CODE DIAGNOSTIC

Missing Module

If a module is missing, several fault codes will appear.

To quickly find which module is missing, perform the following:

1. Connect vehicle to the latest applicable B.U.D.S. software. Refer to *COMMUNICATION TOOLS AND B.U.D.S.* subsection.
2. Click on the **Read Data** button.
3. Click **Module** in the menu bar.
4. Look at the list of modules.
5. If a module is not visible, then it is not communicating through the CAN bus (controller area network).



TYPICAL - MODULE SUBMENU LIST

6. Refer to the following table to find the appropriate subsection in this manual to diagnose the missing module.

MISSING MODULE	SECTION TO REFER TO
ECM	<i>ELECTRONIC FUEL INJECTION (EFI)</i>
Cluster	<i>LIGHTS, GAUGE AND ACCESSORIES</i>
DPS	<i>DYNAMIC POWER STEERING (DPS)</i>

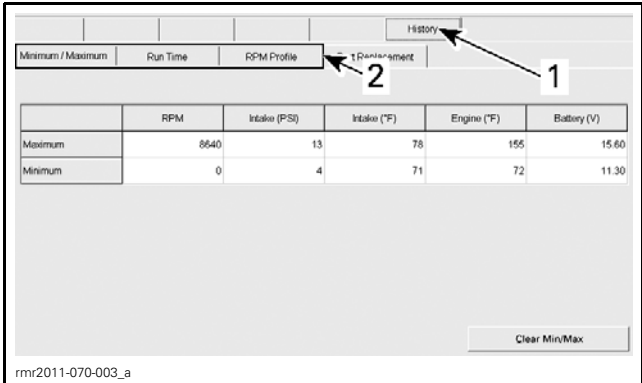
Diagnostic Tips

To see the last minute of operating conditions, click on the **History** tab in B.U.D.S.

Section 04 ELECTRONIC MANAGEMENT SYSTEM

Subsection 05 (DIAGNOSTIC AND FAULT CODES)

NOTE: The page displays data whatever there is fault code(s) or not.



1. History tab
2. Additional history pages

HISTORY PAGE DESCRIPTION	
ITEM	INFORMATION
Minimum/Maximum	Display the minimum and maximum values encountered. Click "Clear Min/Max" to reset the values
Run time	Display the time proportion in what mode the engine was running in
RPM profile	Display the RPM range proportion in which the engine was running in

When a minor fault occurs:

- Turn ignition key OFF.
- Wait 30 seconds.
- Turn ignition key ON.

This should change the fault state from "Active" to "Occurred".

The vehicle should then operate normally.

If a sensor-related fault persists, you may try disconnecting/reconnecting the sensor.

Read the following for a general approach to troubleshoot fault codes (active or occurred).

GENERAL GUIDELINES TO SOLVE FAULT CODES	
CONDITION	ACTION
Troubleshooting vehicle	Use B.U.D.S. to: Read fault codes. Display "Active" faults to see components currently not operating normally. Display "Occurred" faults to troubleshoot intermittent problems. Monitor system(s), sensor(s), switches and actual conditions. Activate component(s) for troubleshooting. Set components (resets etc). Know the last minute of operating conditions by using the "History" page. Know the operating conditions, if available, when a fault code occurred by using the "More details" button in the fault page.
New fault(s) appear after a vehicle maintenance or repair	Check sensor connections or mixed up connections. Before vehicle maintenance: Read the electronic modules with B.U.D.S. After vehicle maintenance: Read the electronic modules with B.U.D.S. Compare the fault code(s) before and after the maintenance using the printed copy and the current B.U.D.S. reading. Investigate only the newly fault codes. Clear all occurred faults in B.U.D.S.
Communication faults displayed as "Occurred" after module flashing	Normal behavior when flashing a module. Clear all occurred faults and check again.
Sensor "Active" fault	Read the fault description in B.U.D.S. Click on the "More Details" button. Look at the "Conditions" when available. Read the "Possible Causes". Apply the "Service Actions".

Section 04 ELECTRONIC MANAGEMENT SYSTEM

Subsection 05 (DIAGNOSTIC AND FAULT CODES)

GENERAL GUIDELINES TO SOLVE FAULT CODES	
CONDITION	ACTION
Low system voltage on one module. Power problem on sensor(s)	Check related fuse(s) and relay. Check related power and ground wires. Check for common power supply to several sensors/modules (refer to <i>POWER DISTRIBUTION AND GROUNDS</i>). NOTE: Some sensors are supplied by the battery while others are supplied by a module.
Low system voltage on several modules (several communication faults will also appear)	Check battery condition and connections. Check related fuse(s) and relay. Check voltage regulator/rectifier.
High system voltage on several modules	A battery charger has likely been used to substitute the vehicle battery. Clear all occurred faults and check again. Check voltage regulator/rectifier.
When all modules report that a module is missing	Check the module that is reported as missing. Check related fuse(s) and relay. Check related power and ground wires.
When several modules are in fault	Search for a common problem such as a faulty sensor.
CAN bus OFF	When several modules and sensors report that a module is missing. The missing module may report CAN bus off. Check related CAN wires (continuity, short to ground, short between CAN low and high). Check module pins and wiring terminals. Then, the other modules should stop reporting that module is missing.
Occurred fault(s)	May have been generated due to a system or component that was momentarily operating outside normal parameters.
	May be generated when disconnecting and reconnecting a component, replacing a burnt fuse, or may be due to a momentary high or low voltage.
	Before being "Occurred", a fault has always been "Active" for a certain time, indicating that an unexpected condition or problem has been present during the driving cycle. A frequent momentarily fault or an intermittent fault may never be seen as "Active" in B.U.D.S. while there is still a pending problem. This type of malfunctions can be discovered by looking at the "Occurred" faults and then by evaluating the fault count. As long as a fault is present, it is displayed as "Active".
Fault count (0 - 255)	Low value: Suggests handling problems (connections, terminal contact/shape etc.). High value: Suggests a frequent and unsolved problem. The problem should be investigated.
Fault conditions (more details button)	Look for abnormal, excessive values.
Hard to find problems	When the basic troubleshooting has been done and the fault code(s) persists, often the problem is related to the wiring harness, connections or electromechanical components. Short to ground, to battery or between wires. Wire splices, chafing, terminal problems (pulled out, bent, out of shape, corroded etc.). Bad contacts in switch or relay.

Section 04 ELECTRONIC MANAGEMENT SYSTEM

Subsection 05 (DIAGNOSTIC AND FAULT CODES)

ECUs share information and their systems may interact with each other. Certain faults may cause more than one ECU to set a fault code or indication (pilot lamp or message) as the failure of some components may affect the operation of several systems.

FAULT CODE TABLE

ACRONYMS USED IN THE FAULT CODE TABLE	
USED IN FAULT CODE TABLE	MEANING
ECM	Engine Control Module
DPS	Dynamic Power Steering
CAN	Controller Area Network
TPS	Throttle Position Sensor
GBPS	Gearbox Position Sensor

HOW TO FIND FAULT CODE
DESCRIPTIONS

For the latest fault code table, use the **Info Center** submenu in BOSSWeb and enter the following search criteria:

- Enclose the search within quotes " "
- Enter: "ATV DTC (All engines) 2015".

DIAGNOSTIC AND FAULT CODES

GENERAL

FAULT CODE TABLE

PCODE	MODULE	DESCRIPTION	CAUSE	ACTION
C2109	SCM-XMR	Release valve activation delay exceeded	Pressure did not drop to desired set point after predefined delay Release valve tube momentary blocked Blown valve fuse Damaged circuit wires or connectors Faulty valve block Faulty SCM	1- Go to Activations - SCM and start Rear Test routine. If the test passed, the system is working properly. Check the harness and connection to see a potential source of intermittent dysfunction, if nothing is found clear the occurred fault and no more actions have to be done. Mud, dust or water in the release tube may explain the fault code. If the Test status shows a Fail_release, proceed to next action step. 2-Verify the release tube (orange) for obstruction. If nothing is found go to next action step. 3- Unplug the valves block connector and measure that 12V is present between pin D of the connector on the SCM side and the battery negative post. If not, verify the valve fuse and relay (refer to schematics for more information). Verify the harness and the connection between the valve and the SCM. If everything is fine, go to next action step. 4- Verify the release valve activation by disconnecting the valve block electrical connector and applying 12V across pin D and H on valve connector. If the release valve is operating, change the SCM, otherwise change the valve block.

Subsection XX (DIAGNOSTIC AND FAULT CODES)

PCODE	MODULE	DESCRIPTION	CAUSE	ACTION
C2111	SCM-XMR	Auxiliary line pressure sensor value out of range	Too many values of the external sensor out of range (negative pressure) Sensor disconnect Damaged circuit wires or connectors Faulty auxiliary line sensor Faulty SCM	1- Go to Activations - SCM and start Rear Test routine. Verify that the Shock Absorber Pressure and the Auxiliary Line Pressure correlates in BUDS. If the test is done with no fault, the system is working properly. Check the harness and connection to see a potential source of intermittent dysfunction, if nothing is found clear the occurred fault and no more actions have to be done. If the Test Status shows a Fail_Comparison_Sensor_Test, verify for leak. If no leak found, verify the wiring and connector of the external sensor and the SCM. In the next action step, verify which of Shock absorber or Auxiliary Line Pressure sensors is defective. 2-Make sure to have no pressure in the system by activating the relief valve in Activation -SCM. Connect the supplied air hose into the compressor fitting and plug it to a known pressure supply in the range of 30 to 120 psi (as car tire) and compare it to the Shock absorber pressure and Auxiliary line pressure, it should be similar. If the Shock absorber pressure is off, change the SCM module. Go to next action step to perform Auxiliary Line Pressure sensor test. 3-Back probe the signal coming from the sensor between the pin 3 of the SCM electrical connector and the negative battery post (this action must be done with special probe to not damage the connector seal). The value must be between 0.9 and 8.3 Volts for a pressure range of 0 - 100 psi. If not go to next action step. If the value is in the range, the Auxiliary Line Pressure sensor is fine, change the SCM. 5- Unplug the Auxiliary Line Pressure sensor and make sure to have 12V between pin 3 and 1 on the connector coming from SCM. If 12V is present change the sensor, if not change the SCM.

Subsection XX (DIAGNOSTIC AND FAULT CODES)

PCODE	MODULE	DESCRIPTION	CAUSE	ACTION
C21E0	SCM-XMR	System rear suspension pumping delay exceeded	Pressure did not reach to desired set point after predefined delay Leak in the system Jammed compressor intake tube Damaged circuit wires or connectors Blown compressor fuse Corroded or disconnected compressor GND Faulty relay Faulty compressor Jammed check valve Faulty SCM	1- Check for leaks. If no leak found go to next action step. 2- Go to Activations - SCM and start Rear Test routine. If the test is done with no fault, the system is working properly. Check the harness and connector to see a potential source of intermittent dysfunction, if nothing is found clear the occurred fault and no more actions have to be done. If the compressor is not starting check the compressor GND, harness and connection then continue to the next action step. If the compressor is running and the Test Status show a Fail_Pumping_Rear go to action step 6. 3-Test the compressor with an external power supply (as a 12V battery). If the compressor is functional go to next action step. 4-Unplug the relay and make sure to have 12V between battery negative post and relay pin 30. If not, check the compressor fuse and harness. If 12V is present, test the relay. If the relay is functional plug it back and go to next action step. 5- Disconnect the SCM, take a jumper wire and connect pin 8 to the battery negative post. If then the compressor starts, change the SCM. 6- Verify that the compressor intake tube (transparent) is not blocked or kinked. Unplug the SCM air tube (yellow) and start the compressor. If air blow out of the tube change the SCM. If not go to next action step. 7- During the Rear Test routine verify the pressure sensors value. If the Shock Absorber Pressure and Auxiliary Line Pressure is not going up verify the first check valve at the exit of the compressor. If only the Shock Absorber Pressure is not going up verify the second check valve after green tube.
C21E1	SCM-XMR	System rear suspension high leakage detected	Leak in the system	1- Verify suspension system for air leaks.

Subsection XX (DIAGNOSTIC AND FAULT CODES)

PCODE	MODULE	DESCRIPTION	CAUSE	ACTION
C21E2	SCM-XMR	System rear suspension valve failure	Too many occurrence of pressure pumping and release in short delay Rear valve tube blocked Blown valve fuse Faulty valve block Damaged circuit wires or connectors Faulty SCM	1- Disconnect the air line to the rear shocks. Go to Activations - SCM and start Rear Test routine. If the air blows out the system is working properly. Check the harness and connection to see a potential source of intermittent dysfunction, if nothing is found clear the occurred fault and no more actions have to be done. If the air do not blow out continue to next action step. 2- Verify the air tube (black) from the valve to the rear suspension. If nothing found go to next action step. 3- Unplug the valve block electrical connector and verify that 12V is present between pin A and battery negative post. If not verify valve fuse, relay and harness (refer to schematics for more information). If 12V is read go to next action step. 4- Verify the rear valve activation by disconnecting the valve block electrical connector and applying 12V across pin A and E while compressor running (Go to Activations - SCM and start Rear Test routine). If the rear valve is opening and filling the shocks change the SCM. If the rear valve is not opening, change the block valve.

Subsection XX (DIAGNOSTIC AND FAULT CODES)

PCODE	MODULE	DESCRIPTION	CAUSE	ACTION
C21F0	SCM-XMR	System front suspension pumping delay exceeded	Pressure did not reach to desired set point after predefined delay Leak in the system Jammed compressor intake tube Damaged circuit wires or connectors Blown compressor fuse Corroded or disconnected compressor GND Faulty relay Faulty compressor Jammed check valve Faulty SCM	1- Check for leaks. If no leak found go to next action step. 2- Go to Activations - SCM and start Rear Front routine. If the test is done with no fault, the system is working properly. Check the harness and connector to see a potential source of intermittent dysfunction, if nothing is found clear the occurred fault and no more actions have to be done. If the compressor is not starting check the compressor GND, harness and connection then continue to the next action step. If the compressor is running and the Test Status show a Fail_Pumping_Rear go to action step 6. 3-Test the compressor with an external power supply (as a 12V battery). If the compressor is functional go to next action step. 4-Unplug the relay and make sure to have 12V between battery negative post and relay pin 30. If not, check the compressor fuse and harness. If 12V is present, test the relay. If the relay is functional plug it back and go to next action step. 5- Disconnect the SCM, take a jumper wire and connect pin 8 to the battery negative post. If then the compressor starts, change the SCM. 6- Verify that the compressor intake tube (transparent) is not blocked or kinked. Unplug the SCM air tube (yellow) and start the compressor. If air blow out of the tube change the SCM. If not go to next action step. 7- During the Front Test routine verify the pressure sensors value. If the Shock Absorber Pressure and Auxiliary Line Pressure is not going up verify the first check valve at the exit of the compressor. If only the Shock Absorber Pressure is not going up verify the second check valve after green tube.
C21F1	SCM-XMR	System front suspension high leakage detected	Leak in the system	1- Verify suspension system for air leaks.

Subsection XX (DIAGNOSTIC AND FAULT CODES)

PCODE	MODULE	DESCRIPTION	CAUSE	ACTION
C21F2	SCM-XMR	System front suspension valve failure	Too many occurrence of pressure pumping and release in short delay Front valve tube blocked Blown valve fuse Faulty valve block Damaged circuit wires or connectors Faulty SCM	1- Disconnect the air line from the front shocks. Go to Activations - SCM and start Front Test routine. If the air blows out of both shocks the system is working properly. Check the harness and connection to see a potential source of intermittent dysfunction, if nothing is found clear the occurred fault and no more actions have to be done. If the air does not blow out even from one shock continue to next action step. 2- Verify the air tubes (blue) from the valves to both front shocks. If clear go to next action step. 3- Unplug the valve block electrical connector and verify that 12V is present between pin B and battery negative post (right) / between pin C and battery negative post (left). If not verify valve fuse, relay and harness (refer to schematics for more information). If both 12V are read go to next action step. 4- Verify the front valves activation by disconnecting the valve block electrical connector and applying 12V across pin B and F (right) or C and G (wrong in wire diagram) (left) while compressor running (Go to Activations - SCM and start Front Test routine.). If the front valves are opening and filling the shocks change the SCM. If either of the front valves are not opening, change the block valve.
P0008	ECM	Lost of Synchronisation	Engine Synchronisation Check Failed	Check for Crankshaft Position Sensor fault Check for dirty Crankshaft Position Sensor. Check compression on engine

Subsection XX (DIAGNOSTIC AND FAULT CODES)

PCODE	MODULE	DESCRIPTION	CAUSE	ACTION
P0107	ECM	Manifold Air Pressure Sensor voltage too Low	Damaged sensor, damaged circuit wires, damaged connector or damaged ECM pins, ECM voltage supply Low	Make sure sensor connector is fully inserted. Measure voltage between harness connector pins 1 and 3 . (Expected value: 4.8 to 5.1 volts) Measure resistance from connector: ECM-F3 to MAPTS-2 (Expected value: < 2 ohms) Measure resistance from connector: ECM-A1 to MAPTS-3 (Expected value: < 2 ohms) Measure resistance from connector: ECM-G2 to MAPTS-1 (Expected value: < 2 ohms) Measure resistance from connector: ECM-F2 to MAPTS-4 (Expected value: < 2 ohms)
P0108	ECM	Manifold Air Pressure Sensor voltage too High	Damaged sensor, wires shorted to battery +, ECM voltage supply too High.	Make sure sensor connector is fully inserted. Measure voltage between harness connector pins 1 and 3 . (Expected value: 4.8 to 5.1 volts) Measure resistance from connector: ECM-F3 to MAPTS-2 (Expected value: < 2 ohms) Measure resistance from connector: ECM-A1 to MAPTS-3 (Expected value: < 2 ohms) Measure resistance from connector: ECM-G2 to MAPTS-1 (Expected value: < 2 ohms) Measure resistance from connector: ECM-F2 to MAPTS-4 (Expected value: < 2 ohms)
P0112	ECM	Intake Air Temperature Sensor 1 circuit Low	Damaged sensor, damaged circuit wires, damaged connector or damaged ECM pins, ECM voltage supply Low	Make sure sensor connector is fully inserted. Measure voltage between harness connector pins 1 and 3 . (Expected value: 4.8 to 5.1 volts) Measure resistance from connector: ECM-F3 to MAPTS-2 (Expected value: < 2 ohms) Measure resistance from connector: ECM-A1 to MAPTS-3 (Expected value: < 2 ohms) Measure resistance from connector: ECM-G2 to MAPTS-1 (Expected value: < 2 ohms) Measure resistance from connector: ECM-F2 to MAPTS-4 (Expected value: < 2 ohms)

Subsection XX (DIAGNOSTIC AND FAULT CODES)

PCODE	MODULE	DESCRIPTION	CAUSE	ACTION
P0113	ECM	Intake Air Temperature Sensor 1 circuit High	Damaged sensor, wires shorted to battery +, ECM voltage supply too High.	Make sure sensor connector is fully inserted. Measure voltage between harness connector pins 1 and 3 . (Expected value: 4.8 to 5.1 volts) Measure resistance from connector: ECM-F3 to MAPTS-2 (Expected value: < 2 ohms) Measure resistance from connector: ECM-A1 to MAPTS-3 (Expected value: < 2 ohms) Measure resistance from connector: ECM-G2 to MAPTS-1 (Expected value: < 2 ohms) Measure resistance from connector: ECM-F2 to MAPTS-4 (Expected value: < 2 ohms)
P0114	ECM	Intake Air Temperature Sensor Intermittent	Damaged sensor, damaged circuit wires, damaged connector or damaged ECM pins, ECM voltage supply	Make sure sensor connector is fully inserted. Measure voltage between harness connector pins 1 and 3 . (Expected value: 4.8 to 5.1 volts) Measure resistance from connector: ECM-F3 to MAPTS-2 (Expected value: < 2 ohms) Measure resistance from connector: ECM-A1 to MAPTS-3 (Expected value: < 2 ohms) Measure resistance from connector: ECM-G2 to MAPTS-1 (Expected value: < 2 ohms) Measure resistance from connector: ECM-F2 to MAPTS-4 (Expected value: < 2 ohms)
P0116	ECM	Engine Coolant Temperature Sensor 1 circuit range/performance	Damaged sensor, wires shorted to battery +, ECM voltage supply.	Disconnect the sensor. Measure resistance from connector: ECM-F4 to CTS-1 (Expected value: < 2 ohms) Measure resistance from connector: ECM-C3 to CTS-2 (Expected value: < 2 ohms) Measure CTS resistance value (Expected value: 2280 to 2736 ohms at 19 to 21°C (66 to 70°F))
P0117	ECM	Engine Coolant Temperature Sensor 1 circuit Low	Engine temperature sensor or circuit wires shorted to ground.	Disconnect the sensor. Measure resistance from connector: ECM-F4 to CTS-1 (Expected value: < 2 ohms) Measure resistance from connector: ECM-C3 to CTS-2 (Expected value: < 2 ohms) Measure CTS resistance value (Expected value: 2280 to 2736 ohms at 19 to 21°C (66 to 70°F))

Subsection XX (DIAGNOSTIC AND FAULT CODES)

PCODE	MODULE	DESCRIPTION	CAUSE	ACTION
P0118	ECM	Engine Coolant Temperature Sensor 1 circuit High	Disconnected sensor, or sensor resistance too High.	Disconnect the sensor. Measure resistance from connector: ECM-F4 to CTS-1 (Expected value: < 2 ohms) Measure resistance from connector: ECM-C3 to CTS-2 (Expected value: < 2 ohms) Measure CTS resistance value (Expected value: 2280 to 2736 ohms at 19 to 21°C (66 to 70°F))
P011A	ECM	Engine Coolant Temperature Correlation Check failed	Correlation Check failed	Check for coolant fluid leak and coolant fluid level Check radiator condition Check for other fault, Check thermostat
P0122	ECM	Throttle Position Sensor (TPS) Short circuit to GND	Damaged circuit wires, damaged sensor or damaged ECM pins.	Make sure sensor connector is fully inserted. Measure resistance from connector: ECM-A1 to TPS-1 (Expected value: < 2 ohms) Measure resistance from connector: ECM-G3 to TPS-3 (Expected value: < 2 ohms) Measure resistance from connector: ECM-G2 to TPS-2 (Expected value: < 2 ohms)
P0123	ECM	Throttle Position Sensor (TPS) shorted to battery +	Damaged circuit wires, damaged sensor or damaged ECM pins.	Make sure sensor connector is fully inserted. Measure resistance from connector: ECM-A1 to TPS-1 (Expected value: < 2 ohms) Measure resistance from connector: ECM-G3 to TPS-3 (Expected value: < 2 ohms) Measure resistance from connector: ECM-G2 to TPS-2 (Expected value: < 2 ohms)
P0217	ECM	Engine Coolant over temperature condition	Coolant fluid temperature too high	Check for coolant fluid leak and coolant fluid level Check radiator condition Check for other fault, Check thermostat
P0219	ECM	Engine Overspeed Condition detected	Engine speed too high	

Subsection XX (DIAGNOSTIC AND FAULT CODES)

PCODE	MODULE	DESCRIPTION	CAUSE	ACTION
P0231	ECM	Fuel Pump circuit shorted to ground, or open circuit	Blown fuse, damaged or disconnected fuel pump relay, damaged circuit wires, damaged connectors or damaged ECM output pins.	Check fuse Measure voltage between harness connector PF1-12B and ground (Expected value: 11 to 13 volts) Measure voltage between harness connector PF1-11B and ground (Expected value: 11 to 13 volts) Measure resistance from harness connector: ECM-J1 to PF1-12A (Expected value: < 2 ohms) Measure resistance from harness connector: PF1-11A to FP-3 (Expected value: < 2 ohms) Measure resistance from harness connector: FP-4 to ground (Expected value: < 2 ohms)
P0232	ECM	Fuel Pump circuit shorted to battery +	Blown fuse, damaged or disconnected fuel pump relay, damaged circuit wires, damaged connectors or damaged ECM output pins.	Check fuse Measure voltage between harness connector PF1-12B and ground (Expected value: 11 to 13 volts) Measure voltage between harness connector PF1-11B and ground (Expected value: 11 to 13 volts) Measure resistance from harness connector: ECM-J1 to PF1-12A (Expected value: < 2 ohms) Measure resistance from harness connector: PF1-11A to FP-3 (Expected value: < 2 ohms) Measure resistance from harness connector: FP-4 to ground (Expected value: < 2 ohms)
P0261	ECM	Cylinder 1 injector open circuit or shorted to ground	Blown fuse, damaged or disconnected injector, damaged or disconnected circuit wires, damaged ECM output pins.	Disconnect injector 1 Measure resistance between injector pin 1 and 2 (Expected value = 14 to 15 ohms). Measure resistance from harness connector: INJ1-1 to INJ1-2 (Expected value: > OPEN) Measure voltage between harness connector INJ1-2 and ground. (Expected value: 11 to 13 volts) Measure resistance from harness connector: ECM-K4 to INJ1-1 (Expected value: < 2 ohms)

Subsection XX (DIAGNOSTIC AND FAULT CODES)

PCODE	MODULE	DESCRIPTION	CAUSE	ACTION
P0262	ECM	Cylinder 1 injector shorted to battery +	Damaged injector, damaged circuit wires, damaged connector or damaged ECM output pins.	Disconnect injector 1 Measure resistance between injector pin 1 and 2 (Expected value = 14 to 15 ohms). Measure resistance from harness connector: INJ1-1 to INJ1-2 (Expected value: > OPEN) Measure voltage between harness connector INJ1-2 and ground. (Expected value: 11 to 13 volts) Measure resistance from harness connector: ECM-K4 to INJ1-1 (Expected value: < 2 ohms)
P0264	ECM	Cylinder 2 injector open circuit or shorted to ground	Blown fuse, damaged or disconnected injector, damaged or disconnected circuit wires, damaged ECM output pins.	Disconnect injector 2 Measure resistance between injector pin 1 and 2 (Expected value = 14 to 15 ohms). Measure resistance from harness connector: INJ2-1 to INJ2-2 (Expected value: > OPEN) Measure voltage between harness connector INJ2-2 and ground. (Expected value: 11 to 13 volts) Measure resistance from harness connector: ECM-L4 to INJ2-1 (Expected value: < 2 ohms)
P0265	ECM	Cylinder 2 injector shorted to battery +	Damaged injector, damaged circuit wires, damaged connector or damaged ECM output pins.	Disconnect injector 2 Measure resistance between injector pin 1 and 2 (Expected value = 14 to 15 ohms). Measure resistance from harness connector: INJ2-1 to INJ2-2 (Expected value: > OPEN) Measure voltage between harness connector INJ2-2 and ground. (Expected value: 11 to 13 volts) Measure resistance from harness connector: ECM-L4 to INJ2-1 (Expected value: < 2 ohms)
P0338	ECM	Crankshaft Position Sensor Spike detected	Damaged CPS, damaged circuit wires, damaged connector or damaged ECM output pins. Wrong mounting position of sensor	Make sure sensor connector is fully inserted. Measure resistance from connector: ECM-E1 to CPS-1 (Expected value: < 2 ohms) Measure resistance from connector: ECM-D1 to CPS-2 (Expected value: < 2 ohms)
P0339	ECM	Crankshaft Position Sensor Intermittent	Incorrect number of tooth detected Damaged CPS, damaged circuit wires, damaged connector or damaged ECM output pins. Wrong mounting position of sensor	Make sure sensor connector is fully inserted. Measure resistance from connector: ECM-E1 to CPS-1 (Expected value: < 2 ohms) Measure resistance from connector: ECM-D1 to CPS-2 (Expected value: < 2 ohms)

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PCODE	MODULE	DESCRIPTION	CAUSE	ACTION
P0480	ECM	Radiator cooling fan relay	Blown fuse, damaged or disconnected relay, damaged circuit wires or connectors, damaged ECM output pins, damaged Relay.	Check fuse Disconnect relay. Measure resistance between terminals 85 and 86 on relay. (Expected value: 70 to 90 Ohms) Measure resistance between harness connector PF-1E and ground. (Expected value > OPEN). Measure resistance from harness connector: ECM-B3 to PF1-1E (Expected value: < 2 ohms)
P0500	DPS	Invalid or missing vehicle speed	No vehicle speed available & Vehicle is in (H or L Gear) with Engine RPM over 4000RPM. Damaged Vehicle Speed sensor circuit, Damaged sensor, Wrong mounting position of speed sensor.	Check if vehicle speed is available in Monitoring page in BUDS. Measure voltage between harness connector CV-A (red) and CV-C (ground black). (Expected value: 11 to 13 volts) Measure resistance from connector: CI-9 to CV-B (pink) (Expected value: < 5 ohms) on ATV
P0508	ECM	Idle Air Control System Circuit Low	Damaged IDLE, damaged circuit wires, damaged connector or damaged ECM output pins.	Make sure IDLE connector is fully inserted. Measure resistance from connector: ECM-D4 to IDLE-D (Expected value: < 2 ohms) Measure resistance from connector: ECM-D3 to IDLE-A (Expected value: < 2 ohms) Measure resistance from connector: ECM-E4 to IDLE-B (Expected value: < 2 ohms) Measure resistance from connector: ECM-C4 to IDLE-C (Expected value: < 2 ohms)
P0509	ECM	Idle Air Control System Circuit High	Damaged IDLE, damaged circuit wires, damaged connector or damaged ECM output pins.	Make sure IDLE connector is fully inserted. Measure resistance from connector: ECM-D4 to IDLE-D (Expected value: < 2 ohms) Measure resistance from connector: ECM-D3 to IDLE-A (Expected value: < 2 ohms) Measure resistance from connector: ECM-E4 to IDLE-B (Expected value: < 2 ohms) Measure resistance from connector: ECM-C4 to IDLE-C (Expected value: < 2 ohms)
P0513	ECM	Invalid Access Key Detected	A non stored access key was detected when key switch was turned to ON.	Use a stored access key to turn key switch. If no stored access keys are available program one and try again

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PCODE	MODULE	DESCRIPTION	CAUSE	ACTION
P0523	ECM	Engine oil pressure sensor sticking	Damaged switch, damaged circuit wires, damaged connector, damaged ECM pins.	Measure resistance between harness connector OPS and ground When engine stopped. (Expected value < 2 ohms) Measure resistance between harness connector OPS and ground When engine running. (Expected value = open) Measure resistance from harness connector: OPS to ECM-E2 (Expected value: < 2 ohms)
P0524	ECM	Engine oil pressure too Low	Damaged switch, damaged circuit wires, damaged connector, damaged ECM pins.	Measure resistance between harness connector OPS and ground When engine stopped. (Expected value < 2 ohms) Measure resistance between harness connector OPS and ground When engine running. (Expected value = open) Measure resistance from harness connector: OPS to ECM-E2 (Expected value: < 2 ohms)
P0551	DPS	TORQUE_SENSOR_OPEN	Damaged DPS	External troubleshooting is not possible Replace the DPS.
P0552	DPS	TORQUE_SENSOR_SHORT_GND	Damaged DPS	External troubleshooting is not possible Replace the DPS.
P0553	DPS	TORQUE_SENSOR_SHORT_5V	Damaged DPS	External troubleshooting is not possible Replace the DPS.
P0562	DPS	System voltage low	Blown fuse, battery low (damaged magneto/regulator), damaged circuit wires or connection, intense winch usage	Check the two DPS fuses Validate that all the DPS connectors are secured Measure voltage between harness connector DPS2-A&B and ground. (Expected value = 11 to 13 volts) Measure battery voltage with engine stopped. (Expected value: 11 to 13 volts) Check ground and positive connections on battery.
P0562	ECM	System voltage low	Blown fuse FC, battery failure, voltage regulator failure, damaged circuit wires or connection, damaged magneto generator. An external battery charger may have been used. Intense winch usage	Measure battery voltage with engine stopped. (Expected value: 11 to 13 volts) Measure battery voltage with engine running. (Expected value: 13 to 14.7 volts) Check connections on voltage regulator. Check ground and positive connections on battery. Check ground on vehicle frame

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PCODE	MODULE	DESCRIPTION	CAUSE	ACTION
P0563	DPS	system voltage high	Rectifier failure, damaged circuit wires or connection.	Measure battery voltage with engine stopped. (Expected value: 11 to 13 volts) Measure battery voltage with engine Running at 3500RPM. (Expected value: 13 to 14.7 volts) Check connections on voltage regulator. Check ground and positive connections on battery.
P0563	ECM	System voltage high	Damaged regulator. An external battery charger may have been used.	Measure battery voltage with engine stopped. (Expected value: 11 to 13 volts) Measure battery voltage with engine running. (Expected value: 13 to 14.7 volts) Check connections on voltage regulator. Check ground and positive connections on battery. Check ground on vehicle frame
P0601	DPS	CALIBRATION FAULT	DPS not calibrated or damage DPS	Try updating the DPS
P0601	SCM-XMR	Bad checksum of Calibration memory section	Lost of power on reflash	If an update file is available reflash the SCM, if not clear the fault, if it returns, replace the SCM.
P0615	ECM	Starter Relay circuit open	Damaged relay, Danaged start switch, damaged circuit wires, damaged connector, damaged ECM pins.	Check start button, Check Run/Stop button, check if free weeling diode is in the good way. Disconnect starter solenoid relay Measure resistance from harness connector: ECM-L3 to SS2 (Expected value: < 2 ohms) Measure resistance from harness connector: MG2-6 to SS1 (Expected value: < 2 ohms) Measure resistance between terminals SS1 and SS2. (Expected value: 3 to 6 ohms)
P0616	ECM	Starter Relay circuit shorted to ground	Damaged relay, Danaged start switch, damaged circuit wires, damaged connector, damaged ECM pins.	Check start button, Check Run/Stop button, check if free weeling diode is in the good way. Disconnect starter solenoid relay Measure resistance from harness connector: ECM-L3 to SS2 (Expected value: < 2 ohms) Measure resistance from harness connector: MG2-6 to SS1 (Expected value: < 2 ohms) Measure resistance between terminals SS1 and SS2. (Expected value: 3 to 6 ohms)

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PCODE	MODULE	DESCRIPTION	CAUSE	ACTION
P0617	ECM	Starter Relay circuit shorted to battery +	Damaged relay, Damaged start switch, damaged circuit wires, damaged connector, damaged ECM pins.	Check start button, Check Run/Stop button, check if free wheeling diode is in the good way. Disconnect starter solenoid relay Measure resistance from harness connector: ECM-L3 to SS2 (Expected value: < 2 ohms) Measure resistance from harness connector: MG2-6 to SS1 (Expected value: < 2 ohms) Measure resistance between terminals SS1 and SS2. (Expected value: 3 to 6 ohms)
P0636	DPS	MOTOR LOW CURRENT FAULT	Internal error or damaged DPS	External troubleshooting is not possible Replace the DPS.
P0637	DPS	MOTOR HIGH CURRENT FAULT	Internal error or damaged DPS	External troubleshooting is not possible Replace the DPS.
P0642	ECM	Sensor Reference Voltage Low	Damaged sensor connected to ECM voltage supply, Damaged ECM voltage supply output.	Measure voltage between harness connector ECM-A1 and ground. (Expected value: 4.8 to 5.1 volts) Check sensor connected to ECM voltage supply output
P0643	ECM	Sensor Reference Voltage High	Damaged sensor connected to ECM voltage supply, Damaged ECM voltage supply output.	Measure voltage between harness connector ECM-A1 and ground. (Expected value: 4.8 to 5.1 volts) Check sensor connected to ECM voltage supply output
P0658	DPS	PHASE A_LOW	DPS motor supply Damaged DPS	External troubleshooting is not possible Replace the DPS.
P0659	DPS	PHASE A_HIGH	DPS motor supply Damaged DPS	External troubleshooting is not possible Replace the DPS.
P0666	DPS	HIGH TEMPERATURE	High temperature of the DPS. Extreme usage of the unit.	Let the unit cool down.

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PCODE	MODULE	DESCRIPTION	CAUSE	ACTION
P0685	ECM	Accessory relay circuit	diagnosis related to Accessories or Light relay, Blown fuse, damaged or disconnected relay, damaged circuit wires, damaged connectors or damaged ECM output pins	Check fuse Disconnect Accessory relay and Lights relay & turn key switch (on w/lights) Measure voltage between harness connector PF1-10E and ground. (Expected value: 11 to 13 volts) Measure voltage between harness connector PF1-6D and ground. (Expected value: 11 to 13 volts) Measure resistance from harness connector: ECM-K2 to PF1-12D (Expected value: < 2 ohms) Measure resistance from harness connector: ECM-K2 to PF1-7C (Expected value: < 2 ohms) Measure resistance between terminals 85 and 86 on the 2 relays. (Expected value: 70 to 90 ohms)
P0686	ECM	Accessory relay circuit shorted to ground or open circuit	diagnosis related to Accessories or Light relay, Blown fuse, damaged or disconnected relay, damaged circuit wires, damaged connectors or damaged ECM output pins	Check fuse Disconnect Accessory relay and Lights relay & turn key switch (on w/lights) Measure voltage between harness connector PF1-10E and ground. (Expected value: 11 to 13 volts) Measure voltage between harness connector PF1-6D and ground. (Expected value: 11 to 13 volts) Measure resistance from harness connector: ECM-K2 to PF1-12D (Expected value: < 2 ohms) Measure resistance from harness connector: ECM-K2 to PF1-7C (Expected value: < 2 ohms) Measure resistance between terminals 85 and 86 on the 2 relays. (Expected value: 70 to 90 ohms)
P0687	ECM	Accessory relay circuit shorted to battery +	diagnosis related to Accessories or Light relay, Damaged relay, damaged circuit wires, damaged connector or damaged ECM output pins.	Check fuse Disconnect Accessory relay and Lights relay & turn key switch (on w/lights) Measure voltage between harness connector PF1-10E and ground. (Expected value: 11 to 13 volts) Measure voltage between harness connector PF1-6D and ground. (Expected value: 11 to 13 volts) Measure resistance from harness connector: ECM-K2 to PF1-12D (Expected value: < 2 ohms) Measure resistance from harness connector: ECM-K2 to PF1-7C (Expected value: < 2 ohms) Measure resistance between terminals 85 and 86 on the 2 relays. (Expected value: 70 to 90 ohms)

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PCODE	MODULE	DESCRIPTION	CAUSE	ACTION
P0691	ECM	Radiator fan circuit shorted to ground or open circuit	Blown fuse, damaged or disconnected fan relay, damaged circuit wires, damaged connectors or damaged ECM output pins.	Check fuse Disconnect radiator fan relay Measure voltage between harness connector PF1-3D and ground. (Expected value: 11 to 13 volts) Measure resistance from harness connector: ECM-B3 to PF1-1E (Expected value: < 2 ohms) Measure resistance between terminals 85 and 86 on relay. (Expected value: 70 to 90 ohms)
P0692	ECM	Radiator fan circuit shorted to battery +	Damaged fan relay, damaged circuit wires, damaged connector or damaged ECM output pins.	Check fuse Disconnect radiator fan relay Measure voltage between harness connector PF1-3D and ground. (Expected value: 11 to 13 volts) Measure resistance from harness connector: ECM-B3 to PF1-1E (Expected value: < 2 ohms) Measure resistance between terminals 85 and 86 on relay. (Expected value: 70 to 90 ohms)
P0705	ECM	Subtransmission Internal switch Combinations error	Wrong Switch Combinations Damaged Switch, damaged circuit wires, damaged connectors or damaged ECM pins.	Check for disconnected transmission connector. Check for misplaced terminal on gearbox Measure resistance from each switch to ground in all position (PR & N) (Expected value if switch activated: < 2 ohms) Measure resistance from harness connector: ECM-J3 to PRN-1 (Expected value: < 2 ohms) Measure resistance from harness connector: ECM-H2 to PRN-2 (Expected value: < 2 ohms) Measure resistance from harness connector: ECM-H4 to PRN-3 (Expected value: < 2 ohms)
P0706	ECM	GBPS invalide gear position	GBPS position not plausible	Verify that gear position information change when you change the position of gear on vehicle. Disconnect GBPS Measure voltage between harness connector GBPS-1 and GBPS-3. (Expected value: 4.8 to 5.1 volts) Measure resistance from connector: ECM-D2 to GBPS-2 (Expected value: < 2 ohms) Measure resistance from connector: ECM-C3 to GBPS-3 (Expected value: < 2 ohms) Replace GBPS sensor

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PCODE	MODULE	DESCRIPTION	CAUSE	ACTION
P0707	ECM	Gear position sensor shorted to ground, or open circuit		Verify that gear position information change when you change the position of gear on vehicle. Disconnect GBPS Measure voltage between harness connector GBPS-1 and GBPS-3. (Expected value: 4.8 to 5.1 volts) Measure resistance from connector: ECM-D2 to GBPS-2 (Expected value: < 2 ohms) Measure resistance from connector: ECM-C3 to GBPS-3 (Expected value: < 2 ohms) Replace GBPS sensor
P0708	ECM	Gear position sensor circuit shorted to battery +		Verify that gear position information change when you change the position of gear on vehicle. Disconnect GBPS Measure voltage between harness connector GBPS-1 and GBPS-3. (Expected value: 4.8 to 5.1 volts) Measure resistance from connector: ECM-D2 to GBPS-2 (Expected value: < 2 ohms) Measure resistance from connector: ECM-C3 to GBPS-3 (Expected value: < 2 ohms) Replace GBPS sensor
P1562	ECM	System voltage low (from Key switch)	Blown fuse FC, battery failure, voltage regulator failure, damaged circuit wires or connection, damaged magneto generator. An external battery charger may have been used.	Measure battery voltage with engine stopped. (Expected value: 11 to 13 volts) Measure battery voltage with engine running. (Expected value: 13 to 14.7 volts) Check connections on voltage regulator. Check ground and positive connections on battery. Check ground on vehicle frame
P1563	ECM	System voltage high (from Key switch)	Damaged regulator. An external battery charger may have been used.	Measure battery voltage with engine stopped. (Expected value: 11 to 13 volts) Measure battery voltage with engine running. (Expected value: 13 to 14.7 volts) Check connections on voltage regulator. Check ground and positive connections on battery. Check ground on vehicle frame
P1619	ECM	TPS adaptation failure	Wrong throttle body mechanical position during reset of closed TPS or no initialization after ECM replacement.	Replace gauge if necessary.

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PCODE	MODULE	DESCRIPTION	CAUSE	ACTION
P1F01	DPS	Power output overload	Motor short circuit or power output failed	Reset fault, If fault re-occur, replace DPS unit
P1F02	DPS	Power output overload (18V).	High voltage at the unit input.	Measure battery voltage with engine stopped. (Expected value: 11 to 13 volts) Measure battery voltage with engine running. (Expected value: 13 to 14.7 volts) test charging system as per shop manual
P1F03	DPS	Electronic Circuit Overheat	Hi temperature detected by on board temperature sensor.	Fault may become Active in extreme use situations. Reset fault and let DPS cool down. If fault re-occur in normal riding conditions, replace DPS unit
P1F05	DPS	Motor current sensor range/performance	Motor input vs output Current correlation check failed	External troubleshooting is not possible Replace the DPS.
P2300	ECM	Cylinder 1 Ignition output shorted to ground	Damaged ignition coil, damaged circuit wires, damaged connector or damaged ECM output pins.	Open the ECM Activation page in BUDS Perform an ignition coil activation and check if ignition coil is reacting as expected Measure resistance from harness connector: ECM-M2 to BA-3 (Expected value: < 2 ohms) Measure voltage between harness connector BA-2 and ground. (Expected value: 11 to 13 volts) Refer to the service manual for detailed ignition coil testing procedure.
P2301	ECM	Cylinder 1 Ignition output short to V +	Damaged ignition coil, damaged circuit wires, damaged connector or damaged ECM output pins.	Open the ECM Activation page in BUDS Perform an ignition coil activation and check if ignition coil is reacting as expected Measure resistance from harness connector: ECM-M2 to BA-3 (Expected value: < 2 ohms) Measure voltage between harness connector BA-2 and ground. (Expected value: 11 to 13 volts) Refer to the service manual for detailed ignition coil testing procedure.

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PCODE	MODULE	DESCRIPTION	CAUSE	ACTION
P2303	ECM	Cylinder 2 Ignition output shorted to ground	Damaged ignition coil, damaged circuit wires, damaged connector or damaged ECM output pins.	Open the ECM Activation page in BUDS Perform an ignition coil activation and check if ignition coil is reacting as expected Measure resistance from harness connector: ECM-M1 to BA-1 (Expected value: < 2 ohms) Measure voltage between harness connector BA-2 and ground. (Expected value: 11 to 13 volts) Refer to the service manual for detailed ignition coil testing procedure.
P2304	ECM	Cylinder 2 Ignition output short to V +	Damaged ignition coil, damaged circuit wires, damaged connector or damaged ECM output pins.	Open the ECM Activation page in BUDS Perform an ignition coil activation and check if ignition coil is reacting as expected Measure resistance from harness connector: ECM-M1 to BA-1 (Expected value: < 2 ohms) Measure voltage between harness connector BA-2 and ground. (Expected value: 11 to 13 volts) Refer to the service manual for detailed ignition coil testing procedure.
P2670	DPS	PHASE B_LOW	DPS motor supply Damaged DPS	External troubleshooting is not possible Replace the DPS.
P2671	DPS	PHASE B_HIGH	DPS motor supply Damaged DPS	External troubleshooting is not possible Replace the DPS.
P280A	ECM	Gear position sensor adaptation not plausible	GBPS learning position failure Wrong transmission mechanical position during GBPS reset, No initialization after ECM replacement.	Using BUDS performe a GBPS initialization.

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PCODE	MODULE	DESCRIPTION	CAUSE	ACTION
P3000	SCM-LTD	Auxiliary line pressure sensor value out of range	Too many values of the external sensor out of range (negative pressure) Sensor disconnect Damaged circuit wires or connectors Faulty auxiliary line sensor Faulty SCM	1- Go to Activations - SCM and start Test routine. Verify that the Shock Absorber Pressure and the Auxiliary Line Pressure correlates in BUDS. If the test is done with no fault, the system is working properly. Check the harness and connection to see a potential source of intermittent dysfunction, if nothing is found clear the occurred fault and no more actions have to be done. If the Test Status shows a Fail_Comparison_Sensor_Test, verify for leak. If no leak found, verify the wiring and connector of the external sensor and the SCM. In the next action step, verify which of Shock absorber or Auxiliary Line Pressure sensors is defective. 2-Make sure to have no pressure in the system by activating the relief valve in Activation -SCM. Connect the supplied air hose into the compressor fitting and plug it to a known pressure supply in the range of 30 to 120 psi (as car tire) and compare it to the Shock absorber pressure and Auxiliary line pressure, it should be similar. If the Shock absorber pressure is off, change the SCM module. Go to next action step to perform Auxiliary Line Pressure sensor test. 4-Back probe the signal coming from the sensor between the pin 3 of the SCM electrical connector and the negative battery post (this action must be done with special probe to not damage the connector seal). The value must be between 0.9 and 8.3 Volts for a pressure range of 0 - 100 psi. If not go to next action step. If the value is in the range, change the SCM. 5- Unplug the Auxiliary Line Pressure sensor and make sure to have 12V between pin 3 and 1 on the connector coming from SCM. If 12V is present change the sensor, if not change the SCM.

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PCODE	MODULE	DESCRIPTION	CAUSE	ACTION
P3001	SCM-LTD	System suspension pumping delay exceeded	Pressure did not reach to desired set point after predefined delay Leak in the system Jammed compressor intake tube Damaged circuit wires or connectors Blown compressor fuse Corroded or disconnected compressor GND Faulty relay Faulty compressor Jammed check valve Faulty SCM	1- Check for leaks. If no leak found go to next action step. 2- Go to Activations - SCM and start Test routine. If the test is done with no fault, the system is working properly. Check the harness and connector to see a potential source of intermittent dysfunction, if nothing is found clear the occurred fault and no more actions have to be done. If the compressor is not starting check the compressor GND, harness and connection then continue to the next action step. If the compressor is running and the Test Status show a Fail_Pumping go to action step 6. 3-Test the compressor with an external power supply (as a 12V battery). If the compressor is functional go to next action step. 4-Unplug the relay and make sure to have 12V between battery negative post and relay pin 30. If not, check the compressor fuse and harness. If 12V is present, test the relay. If the relay is functional plug it back and go to next action step. 5- Disconnect the SCM, take a jumper wire and connect pin 8 to the battery negative post. If then the compressor starts, change the SCM. 6- Verify that the compressor intake tube (transparent) is not blocked or kinked. Unplug the SCM air tube (yellow) and start the compressor. If air blow out of the tube change the SCM. If not go to next action step. 7- During the Test routine verify the pressure sensors value. If the Shock Absorber Pressure and Auxiliary Line Pressure is not going up verify the first check valve at the exit of the compressor. If only the Shock Absorber Pressure is not going up verify the second check valve after green tube.

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PCODE	MODULE	DESCRIPTION	CAUSE	ACTION
P3002	SCM-LTD	Release valve activation delay exceeded	Pressure did not drop to desired set point after predefined delay Release valve momentary blocked Blown valve fuse Damaged circuit wires or connectors Faulty valve block Faulty SCM	1- Go to Activations - SCM and start Test routine. If the test passed, the system is working properly. Check the harness and connection to see a potential source of intermittent dysfunction, if nothing is found clear the occurred fault and no more actions have to be done. Mud, dust or water in the release valve may explain the fault code. If the Test status shows a Fail_release, proceed to next action step. 2-Verify the release valve for obstruction. If nothing is found go to next action step. 3- Unplug the valve connector and verify that 12V is present between pin 1 of the connector on the SCM side and the battery negative post. If not, verify the valve fuse and relay (refer to schematics for more information). Verify the harness and the connection between the valve and the SCM. If everything is fine, go to next action step. 4- Verify the release valve activation by disconnecting the valve block electrical connector and applying 12V across pin 1 and 2 on valve connector. If the release valve is operating, change the SCM, otherwise change the valve block.
P3003	SCM-LTD	System high leakage detected	Leak in the system	1- Verify suspension system for air leaks
P3004	SCM-LTD	Bad checksum of Calibration memory section	Lost of power on reflash	If an update file is available reflash the SCM, if not clear the fault, if it returns, replace the SCM.
P3005	SCM-LTD	Communication network disconnected	Lost of CAN communication	1- Verify if all the module are present in BUDS (under Module Menu), if they are the vehicle is working properly. 2- Check continuity between the cluster, ECM and SCM CAN network.
U0073	DPS	CAN bus off, no messages	Damaged circuit wires or damaged DPS pins.	Disconnect MPI2 from DB connector. Measure resistance between DB-1 and DB-2 (Expected value = 50 to 70 ohms). Measure resistance between DB-1 and DPS1-C (Expected value < 5 ohms). Measure resistance between DB-2 and DPS1-D (Expected value < 5 ohms).

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PCODE	MODULE	DESCRIPTION	CAUSE	ACTION
U0073	ECM	CAN bus off, no messages	Damaged circuit wires or damaged CLUSTER pins.	Disconnect MPI2 from DB connector. Measure resistance between DB-1 and DB-2 (Expected value = 50 to 70 ohms). Measure resistance between DB-1 and ECM-B1 (Expected value < 2 ohms). Measure resistance between DB-2 and ECM-C1 (Expected value < 2 ohms).
U0100	DPS	Lost communication with ECM (lost of CAN ID's)	Damaged CAN Bus wires to ECM, damaged DPS/ECM pins.	Disconnect MPI2 from DB connector. Measure resistance between DB-1 and DB-2 (Expected value = 50 to 70 ohms). Measure resistance between DB-1 and ECM B1 (Expected value < 5 ohms). Measure resistance between DB-2 and ECM C1 (Expected value < 5 ohms).
U0155	DPS	Lost communication with CLUSTER	Damage CAN Bus wires to cluster Damaged circuit wires or damaged Cluster module pins.	Measure voltage between harness connector CL-17 and ground. (Expected value = 11 to 13 volts) Disconnect MPI2 from DB connector. Measure resistance between DB-1 and DB-2 (Expected value = 50 to 70 ohms). Measure resistance between DB-1 and CL-4 (Expected value < 5 ohms). Measure resistance between DB-2 and CL-19 (Expected value < 5 ohms).
U0155	ECM	Lost communication with CLUSTER	Missing CLUSTER CAN ID Module internal error Damaged circuit wires or damaged module pins.	Measure voltage between harness connector CL-17 and ground. (Expected value = 11 to 13 volts) Disconnect MPI2 from DB connector. Measure resistance between DB-1 and DB-2 (Expected value = 50 to 70 ohms). Measure resistance between DB-1 and ECM-B1 (Expected value < 2 ohms). Measure resistance between DB-2 and ECM-C1 (Expected value < 2 ohms). Measure resistance between DB-1 and CL-19 (Expected value < 2 ohms). Measure resistance between DB-2 and CL-18 (Expected value < 2 ohms).

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PCODE	MODULE	DESCRIPTION	CAUSE	ACTION
U0155	ECM	Lost communication with CLUSTER (lost of CAN ID's)	Missing CAN ID Module internal error Damaged circuit wires or damaged module pins.	Check for Cluster fault or ECM fault Measure voltage between harness connector CL-17 and ground. (Expected value = 11 to 13 volts) Disconnect MPI2 from DB connector. Measure resistance between DB-1 and DB-2 (Expected value = 50 to 70 ohms). Measure resistance between DB-1 and ECMB-C1 (Expected value < 2 ohms). Measure resistance between DB-2 and ECMB-C2 (Expected value < 2 ohms). Measure resistance between DB-1 and CL-19 (Expected value < 2 ohms). Measure resistance between DB-2 and CL-18 (Expected value < 2 ohms).
U0155	SCM-XMR	Communication network disconnected	Lost of CAN communication	1- Verify if all the module are present in BUDS (under Module Menu), if they are the vehicle is working properly. 2- Check continuity between the cluster, ECM and SCM CAN network.
U0167	ECM	Lost communication with Vehicle Immobilizer Control Module	The Vehicle Immobilizer is reporting an electrical fault on the communication line.	Check for dirty or oxidized Key contact. Clean key contact if needed. Check for broke key contact Ensure sensor connector is fully inserted. Measure resistance between ECMB-A1 and CC-C (Expected value < 2 ohms). Measure resistance between ECMB-C2 and CC-E (Expected value < 2 ohms).
U0167	ECM	Lost communication with Vehicle Immobilizer Control Module	The Vehicle Immobilizer is reporting an electrical fault on the communication line.	Check for dirty or oxidized Key contact. Clean key contact if needed. Check for broke key contact Ensure sensor connector is fully inserted. Measure resistance between ECMB-A1 and CC-C (Expected value < 2 ohms). Measure resistance between ECMB-C2 and CC-E (Expected value < 2 ohms).
U0300	ECM	Invalid Security Exchange received	Incorrect ECM or CLUSTER, Incorrect software version.	Install the proper ECM or CLUSTER on vehicle. Update security coding using BUDS
U0400	DPS	Variant Coding failure Software incompatibility	Faulty variant coding Faulty programming	Check in the BUDS Tab "vehicle configuration" if the DPS option is checked. Reflash the DPS with the latest software

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PCODE	MODULE	DESCRIPTION	CAUSE	ACTION
U0400	SCM-XMR	Variant coding failure	Faulty variant coding Faulty programming	1- Verify in Setting - Vehicle Configuration page is correctly set up. 2- If Update File is available reflash the SCM. If not, clear the fault, if it returns replace the SCM.
U0400	SCM-LTD	Variant coding failure	Faulty variant coding Faulty programming	1- Verify in Setting - Vehicle Configuration page is correctly set up. 2- If Update File is available reflash the SCM. If not, clear the fault, if it returns replace the SCM.
U0426	ECM	Invalid Data Received From Vehicle Immobilizer Control Module	The Vehicle Immobilizer could not read the number of the access key.	Check for dirty or oxidized Key contact. Clean key contact if needed. Check for broke key contact Ensure sensor connector is fully inserted. Measure resistance between ECMB-A1 and CC-C (Expected value < 2 ohms). Measure resistance between ECMB-C2 and CC-E (Expected value < 2 ohms).
U3001	DPS	Module improper shutdown	Lost of power on DPS that can be caused by damaged circuit wires or damaged DPS pins.	Check the two DPS fuses Ensure DPS connector is fully inserted. Check for Damaged tail light, DPS, Cluster circuit wires Check for damaged DPS pins.

ELECTRONIC FUEL INJECTION (570)

SERVICE TOOLS

Description	Part Number	Page
ECM ADAPTER TOOL.....	529 036 166	.241, 245, 251, 254, 256, 258
FLUKE 115 MULTIMETER	529 035 868	241, 245, 251, 256, 258
OETIKER PLIERS.....	295 000 070	247

SERVICE PRODUCTS

Description	Part Number	Page
LOCTITE 243 (BLUE).....	293 800 060	247, 252, 257
XPS SYNTHETIC GREASE.....	293 550 010	254

GENERAL

WARNING

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

WARNING

Fuel lines remain under pressure at all times. Always proceed with care and use appropriate safety equipment when working on pressurized fuel system. Wear safety glasses. Wipe off any fuel spillage. Do not allow fuel to spill on hot engine parts and/or on electrical connectors.

WARNING

Replace any damaged, leaking or deteriorated fuel lines or connections. Always, pressurize the fuel system if any fuel related component was disconnected or removed. Proceed with care when removing/installing high pressure test equipment.

SYSTEM DESCRIPTION

Refer to the appropriate *ENGINE MANAGEMENT SYSTEM* subsection for a general layout of the various EFI system components.

The electronic fuel injection system (EFI) is comprised of various sensors used for detecting ongoing operating conditions of the engine and vehicle, and includes all the components that perform the required adjustments to the engine.

Electrical System

ECM (Electronic Control Module)

The ECM controls the electrical system and the engine management functions, by processing the information given by various sensors.

EFI Sensors

The ECM reads the inputs from the sensors which it compares to predetermined parameters stored in the ECM, makes computations, and activates the outputs accordingly (injectors, ignition coils etc.).

Signals from sensors are used by the ECM to determine the injection and ignition parameters (referenced to fuel maps) as required to maintain the optimum air-fuel ratio.

Air Intake System

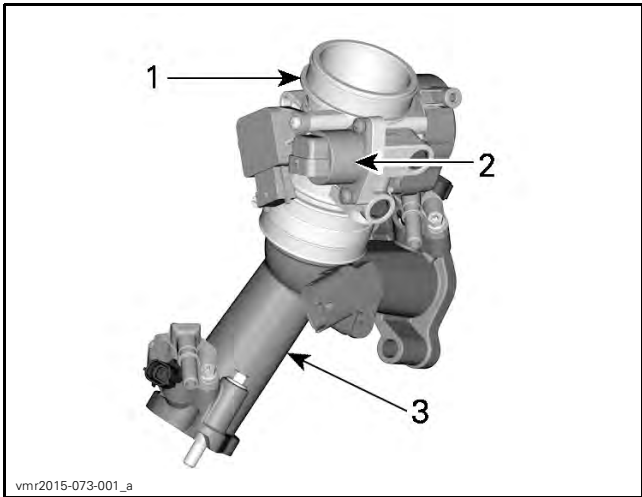
Refer to the applicable *AIR INTAKE SYSTEM* subsection for additional information.

Throttle Body

The throttle body is mounted on the intake manifold.

Air for combustion, drawn in by the engine, flows through the air intake system, then through the throttle body where it is regulated by a throttle plate.

Section 05 FUEL SYSTEM
Subsection 02 (ELECTRONIC FUEL INJECTION (570))



TYPICAL
1. Throttle body
2. Idle air control valve (IACV)
3. Intake manifold

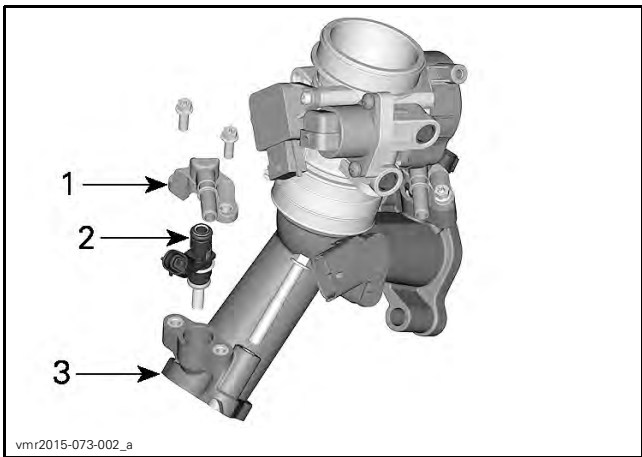
Fitted on the throttle body, a throttle plate regulates the amount of air that enters the engine.

A TPS is incorporated on the throttle body. It provides a signal to the ECM of the actual throttle plate position.

An idle air control valve (IACV) is also incorporated on the throttle body, It allows the ECM to control the idle speed while the throttle plate is closed.

Fuel System

Refer to the applicable *FUEL TANK AND FUEL PUMP* subsection for additional information.



1. Fuel rail
2. Fuel Injector
3. Intake manifold

Fuel Rail

Two fuel rails, one for each injector, are mounted on the intake manifold. The fuel rails, which are used to secure the injectors to the manifold, also provide to the injectors the fuel pressure that they receive from the fuel pump.

The fuel pressure applied to the fuel rails is regulated by the fuel pressure regulator located in the fuel pump module.

Fuel Injectors

The fuel injectors are used to inject fuel into the intake ports of the cylinder head. One injector is used per cylinder.

Fuel Pump

An electric fuel pump with an integrated pressure regulator and fuel system filters is used. For more details on the fuel pump unit, refer to *FUEL TANK AND FUEL PUMP* subsection.

ADJUSTMENT

IDLE SPEED

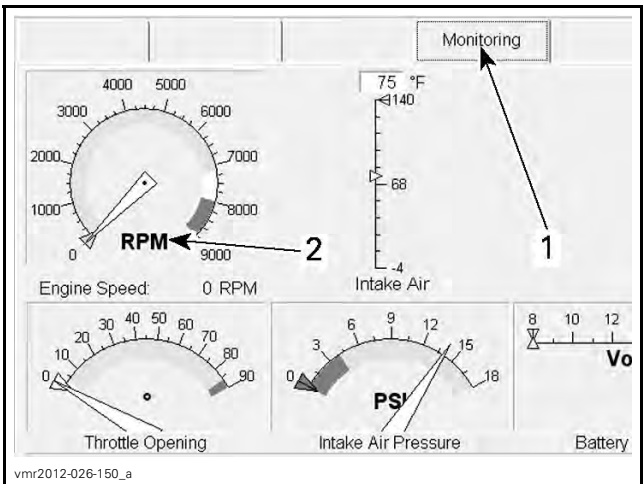
Idle speed is not adjustable. The ECM controls the IACV.

NOTICE Never attempt to adjust the sealed idle stop screw. It is calibrated at the factory. If the screw adjustment is changed, the throttle body must be replaced.

The vehicle multifunction gauge can provide an accurate digital readout of the engine's idle speed.

The engine RPM may also be verified using the applicable B.U.D.S. software version, refer to *COMMUNICATION TOOLS AND B.U.D.S.* subsection.

- In B.U.D.S., click the following:
- Read Data button
 - Monitoring tab
 - ECM tab.



VERIFYING ENGINE RPM USING B.U.D.S.
1. Monitoring tab
2. Engine RPM indication

NOTE: The multifunction gauge and B.U.D.S. use the same signal to provide the engine RPM indication.

CLOSED THROTTLE AND IDLE ACTUATOR RESET

This operation performs a reset of the values in the ECM.

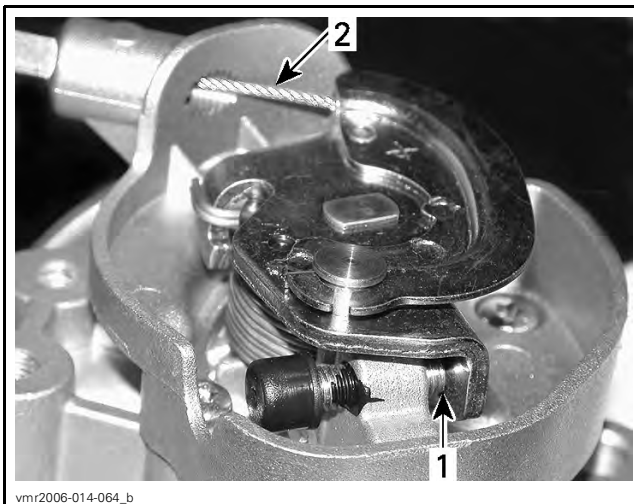
This reset is very important. The setting of the TPS will determine the basic parameters for all fuel mapping and several ECM calculations and the setting of the idle air control valve will determine the basic parameters for the idle speed control of the engine.

Closed throttle and idle actuator reset must be done if:

- TPS is loosened, removed or replaced
- Throttle body is replaced
- Idle air control valve is replaced
- ECM is replaced.

NOTICE An improperly set TPS or IACV may lead to poor engine performance and emission compliance could possibly be affected. In addition, improper IACV reset may lead to poor engine starting, improper idle (too low or too high) and engine stop on deceleration.

Remove throttle body cap and ensure the throttle cam of throttle body rests against set screw without any tension in the cable.

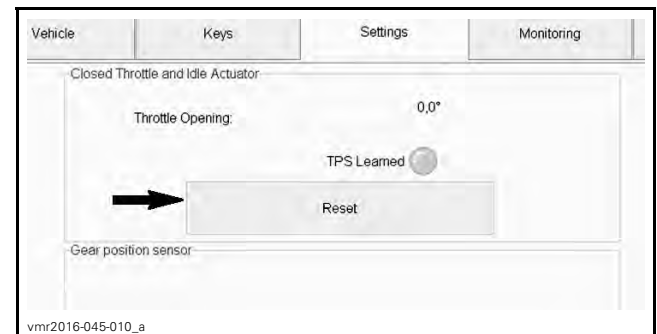


1. Contact here
2. Free-play here

Open throttle approximately one quarter then quickly release. Repeat 2 - 3 times to settle throttle plate. If stopper does not rest against its stop lever, perform throttle cable adjustment. Refer to *THROTTLE CABLE* in this subsection.

To reset IACV and TPS, perform the following:

1. Connect the vehicle to the latest applicable B.U.D.S. version, refer to *COMMUNICATION TOOLS AND B.U.D.S.* subsection.
2. In B.U.D.S., click the following:
 - **Read Data** button
 - **Setting** tab
 - **ECM** tab
3. Click on the Reset button in the **Closed Throttle and Idle Actuator** area.



If operation is wrong, an error message will be displayed.

If TPS is not within the allowed range while resetting the Closed Throttle and Idle Actuator, the ECM will generate a fault code and will not accept the setting. Repeat the reset procedure.

4. Start engine and make sure it operates normally through its full engine RPM range. If fault codes appear, refer to *DIAGNOSTIC AND FAULT CODES* subsection for more information.

TROUBLESHOOTING

DIAGNOSTIC TIPS

Engine problems are not necessarily related to the fuel injection system.

It is important to ensure that the engine and propulsion system, fuel delivery and electrical systems are functioning normally.

For diagnostics purposes, use B.U.D.S. software. See *COMMUNICATION TOOLS AND B.U.D.S.* subsection.

Section 05 FUEL SYSTEM

Subsection 02 (ELECTRONIC FUEL INJECTION (570))

After a problem has been solved, be sure to clear the fault(s) in the ECM using the B.U.D.S. software.

⚠ WARNING

Electrical actuators and electronic modules may be powered up as soon as the ignition switch is set to ON and emergency engine stop switch is set to RUN. Always disconnect the battery prior to disconnecting any electrical or electronic parts.

Never use a battery charger to temporarily substitute the battery as it may cause the ECM to function erratically, or not at all.

Check related-circuit fuse solidity and condition with an ohmmeter. A visual inspection could lead to a false diagnosis.

Electrical Related Problems

It is important to check the following in the electrical system:

- Battery voltage
- Fuses
- Ground connections
- Wiring and connectors.

Ensure that all electronic components are genuine OEM. Any modification to the wiring harness may lead to poor system operation or generate fault codes.

Electrical Connections

Pay particular attention to ensure that terminals and pins are not out of their connectors, corroded, or out of shape.

When probing terminals, pay attention not to deform the terminals as this could cause a loose or intermittent connection that would be difficult to troubleshoot.

PROCEDURES

ENGINE CONTROL MODULE (ECM)

As a first troubleshooting step, always check for applicable fault codes using B.U.D.S. software.

Quick Test to Validate ECM Operation

Turn ignition key to ON.

Set emergency engine stop switch to RUN.

NOTE: This wakes up the ECM, which then turns on the following. If the following do not turn on, check ECM fuse (PF1 (F5 and F8)).

QUICK INDICATION THAT ECM IS FUNCTIONING (assuming the observed component is in good working order)
Multifunction gauge turns ON.
Fuel pump turns on for approx. 5 seconds.
Rear lights turn on.
Headlamps turn on (ignition key on with lights position).

ECM Access

Refer to *BODY* and remove the LH panel.



LH PANEL REMOVED
1. ECM location

ECM Connector

There is one connector connected to the ECM. It links:

- Engine harness
- Vehicle system control harness.

For connector information, cleaning and probing, refer to *WIRING HARNESS AND CONNECTORS* subsection.

Testing the ECM Power Supply

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

1. Disconnect ECM connector.
2. Install ECM connector on the ECM ADAPTER TOOL (P/N 529 036 166).
3. Install a jumper wire between K1 and M4 on the ECM adapter tool.
4. Turn the ignition switch to ON.
5. Set emergency engine stop switch to RUN.
6. Set multimeter to Vdc and check for voltage as follows.

ECM ADAPTER	BATTERY	VOLTAGE
L1	Negative post	Battery voltage

If voltage is not measured, check the following:

- ECM fuse
- Main relay
- Wiring and connections, refer to the *WIRING DIAGRAM*.

Testing the Continuity of ECM Ground Circuits

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

1. Disconnect ECM connector.
2. Install the ECM ADAPTER TOOL (P/N 529 036 166) on ECM connector.
3. Set multimeter to Ω and probe adapter terminals as per following table.

ECM ADAPTER	BATTERY POST	RESISTANCE
Pins M3 and M4	Ground	Close to 0 Ω (continuity)

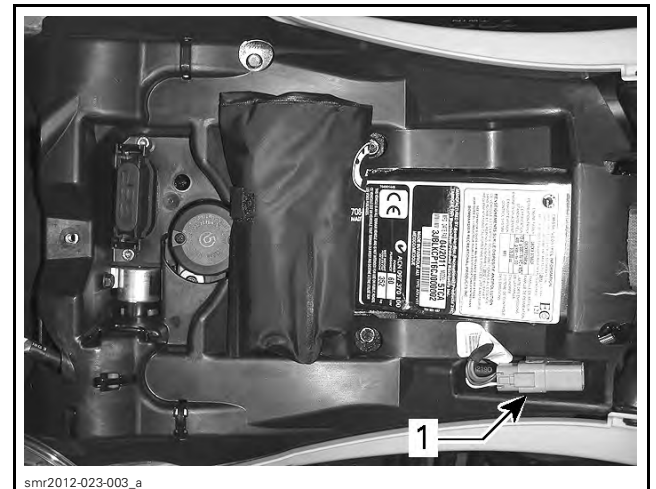


If any measurement is out of specification, refer to *POWER DISTRIBUTION* and check all grounds.

Testing the CAN Resistor

Remove the DPS1 connector (4-pin connector) from DPS module (if so equipped). Refer to *STEERING SYSTEM* subsection.

1. Remove seat to access the diagnostic link connector (DB).
2. Remove diagnostic link connector from its holder.



TYPICAL

1. Diagnostic link connector (DB)

3. Set a multimeter to Ω setting.

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

4. Measure the resistance of the CAN resistors as per following table.

Section 05 FUEL SYSTEM

Subsection 02 (ELECTRONIC FUEL INJECTION (570))

CAN RESISTOR TEST	
DIAGNOSTIC LINK CONNECTOR	RESISTANCE
Pins 1 and 2	Approximately 60 Ω

TEST RESULT	
READING	RESULT
Approximately 60 Ω	ECM and CLUSTER CAN wires and resistors good
Approximately 120 Ω	ECM CAN resistor open, or CLUSTER CAN resistor open, or CAN wire to CLUSTER or ECM open
Infinite (open circuit)	CAN wire to DB connector open circuit

If 120 ohms is read, isolate the CLUSTER from CAN by disconnecting it and measuring again at the diagnostic link connector.

If 120 ohms is still read, the ECM CAN resistor and wires are good. Check for continuity of the CLUSTER CAN wires, refer to *WIRING DIAGRAM*.

If an open circuit is read, the ECM CAN resistor (or wire) is open. Check for continuity of the ECM CAN wires, refer to *WIRING DIAGRAM* to determine if the wires or the resistor is at fault.

If the CAN resistor of a module is at fault, replace that module.

If a module cannot communicate and the CAN resistor and wires test good, try a new module.

5. Reconnect DPS1 to DPS module,

Removing the ECM

NOTE: If a new ECM is to be installed, first read the procedures in *ECM REPLACEMENT* in this subsection.

1. Disconnect battery cables.

NOTICE Always disconnect the BLACK (–) battery cable first, then disconnect RED (+) cable.

2. Disconnect ECM connector.

3. Unscrew all retaining screws and pull out ECM.

Installing the ECM

Reverse removal procedure however, pay attention to the following.

1. Reconnect ECM connector.

2. Reconnect battery cables.

WARNING

Always reconnect the RED (+) battery cable first, then reconnect BLACK (–) cable.

3. If a new ECM is installed, refer to *ECM REPLACEMENT* in this subsection.

Replacing the ECM

1. Transfer ECM data. Refer to *ECM DATA TRANSFER* for complete procedure.

2. Perform the *CLOSED THROTTLE AND IDLE ACTUATOR RESET*.

3. Program the vehicle ignition key(s) in the new ECM.

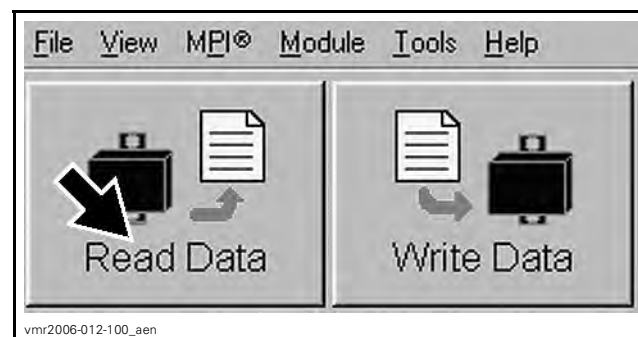
4. Calibrate the IACV. Refer to *IACV CALIBRATION* in this subsection.

ECM Data Transfer

To transfer the original ECM recorded information to the new ECM, use the B.U.D.S. software and proceed as follows.

1. Connect the original ECM to vehicle.

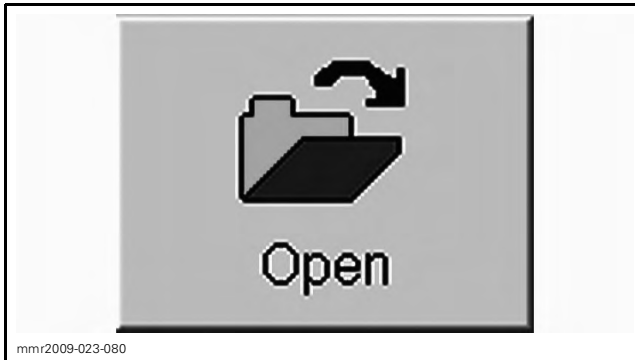
2. In B.U.D.S., click the Read Data button to load the information from the original ECM.



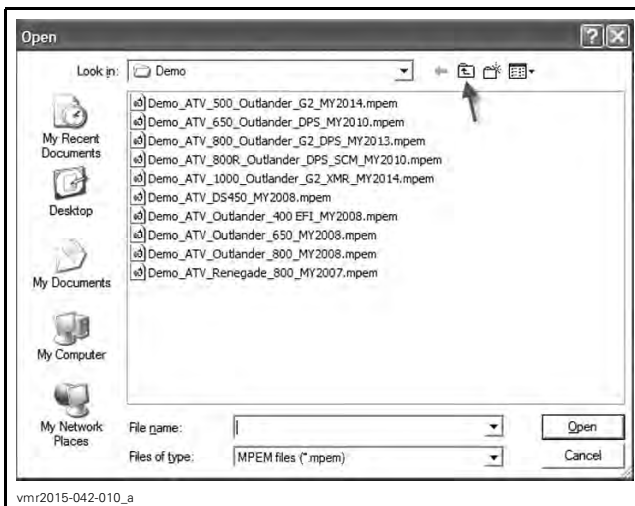
NOTE: Keep B.U.D.S. running while replacing ECMs. The data will remain stored in the PC computer as long as B.U.D.S. is running.

3. Get the Data from the saved .mpem file.

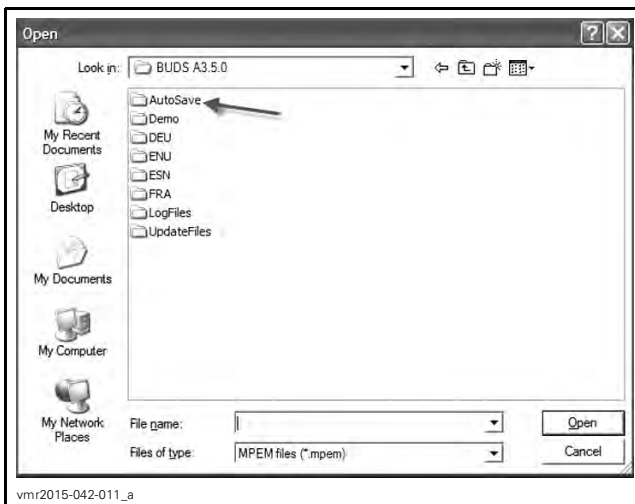
3.1 Click on the Open button.



3.2 Click once on the Folder Up button in the open box.

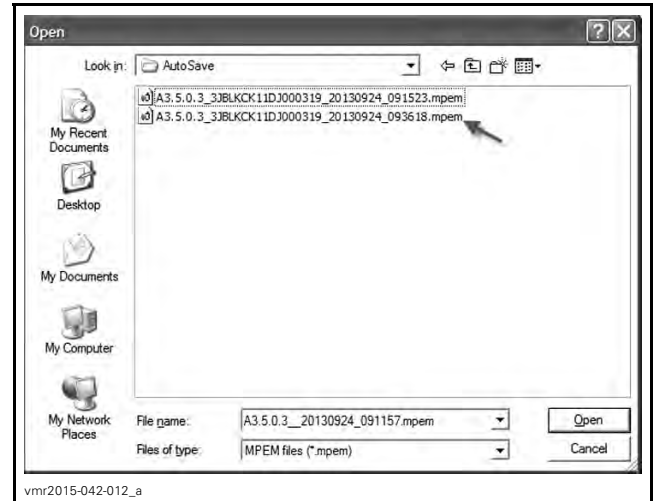


3.3 Double click on the AutoSave folder.



NOTE: You may have to go to another AutoSave folder from a previous version of B.U.D.S.

3.4 Choose the latest file saved for this specific vehicle.



IMPORTANT: Ensure to use the file that specifically matches the vehicle you are servicing.

NOTE: The file name structure is as follows:

BUDS version_VIN_date read (yyyymmdd)_hour read (hhmmss).mpem

Example:

A3.5.0.3_3JBLKCK11DJ000319_20130924_093618.mpem

B.U.D.S. version = A3.5.0.3

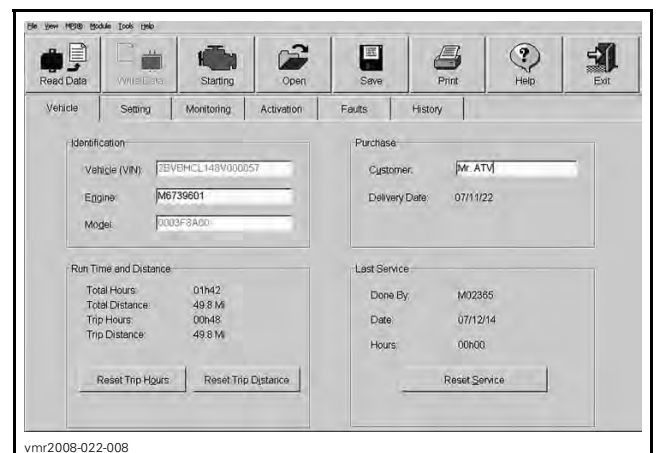
VIN = 3JBLKCK11DJ000319

Date file was read = 2013-09-24

Hour file was read = 09h 36m 18s

4. Go to the Vehicle tab and record the following information.

- Vehicle (V.I.N.) number
- Engine number (without the leading “M”)
- Model number
- Customer.



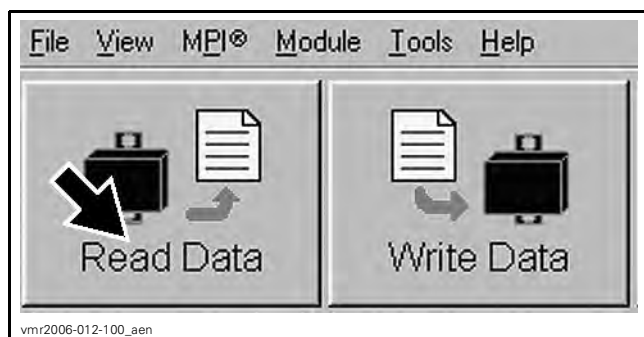
5. Remove the original ECM.

6. Install the new ECM.

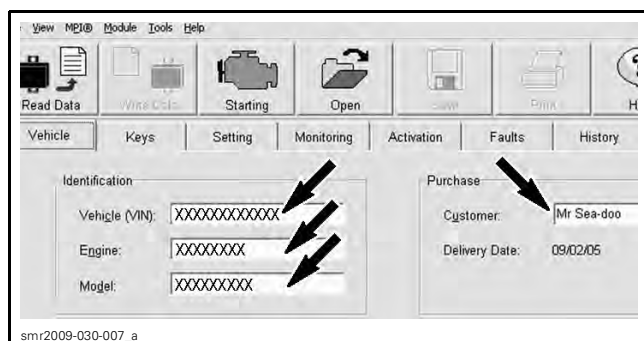
7. In B.U.D.S., click the **Read Data** button to read the new ECM.

Section 05 FUEL SYSTEM

Subsection 02 (ELECTRONIC FUEL INJECTION (570))

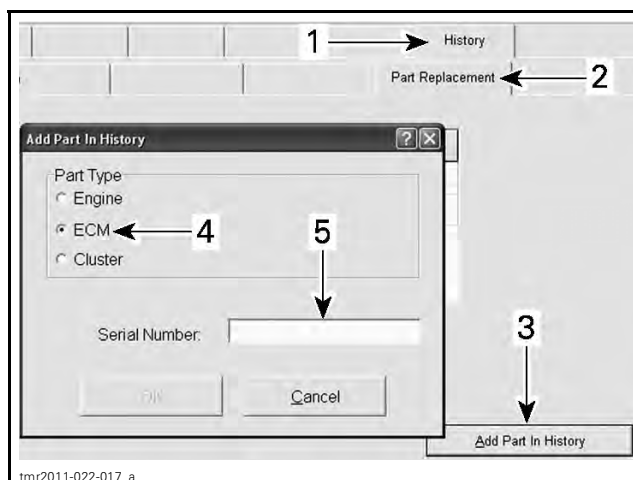


8. Select the **Vehicle** tab and enter the information you recorded previously.
- Vehicle serial number
 - Engine number (do not enter the “M” at the beginning of the engine number)
 - Enter model number.
 - Customer name.



VEHICLE TAB

9. Click on the following tabs:
- **History**
 - **Part Replacement**
 - **Add Part in History**.
10. Enter the **old** ECM serial number in the Add Part In History window.



ADDING PART IN HISTORY

1. History tab
2. Part Replacement tab
3. Add part in history button
4. ECM selection
5. Add ECM serial number here

NOTE: The ECM serial number can be found on the ECM sticker that also identifies the part number.

11. Click on the **OK** button.
12. Click on the **Write Data** button.



FUEL INJECTOR

Refer to the applicable *ENGINE MANAGEMENT SYSTEM* subsection for component and connector locations.

Fuel Injector Leak Test

Carry out the *FUEL PUMP PRESSURE TEST* as detailed in the *FUEL TANK AND FUEL PUMP* subsection.

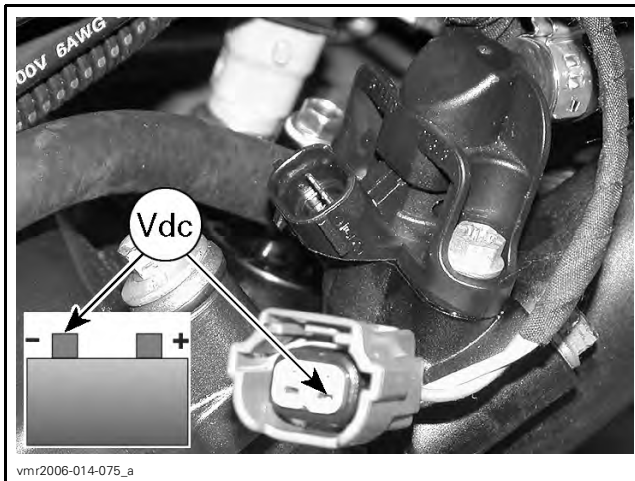
Testing the Fuel Injector Input Voltage

Disconnect the fuel injector electrical connector.
Turn on ignition switch.
Set emergency engine stop switch to RUN.

NOTE: Ensure to read voltage before ECM automatically turns off.

Use a multimeter and set it to Vdc. Read voltage.

CYLINDER	INJECTOR CONNECTOR		MEASUREMENT
	WIRE		
FRONT	INJ1-2	BAT2 (-)	Battery voltage
REAR	INJ2-2		



TYPICAL

If supply voltage is not good, check fuse and if good, perform an *INJECTOR POWER CIRCUIT RESISTANCE TEST*.

If supply voltage is good, perform a *FUEL INJECTOR RESISTANCE TEST*.

Testing the Injector Power Circuit Resistance

Check continuity between main relay and injector as follows:

- Remove main relay.
- Disconnect the fuel injector connector.
- Use a multimeter and set it to Ω .
- Read resistance.

CYLINDER	INJECTOR CIRCUIT		MEASUREMENT
	WIRE		
FRONT	INJ1-2	PF1-B2	Close to 0 Ω
REAR	INJ2-2		

If continuity is not good, repair or replace wiring going to injector.

If continuity is good, perform the *FUEL INJECTOR RESISTANCE TEST*.

Testing the Fuel Injector Resistance

Disconnect ECM connector.

Install the ECM connector on the ECM ADAPTER TOOL (P/N 529 036 166).

Connect the fuel injector connector.

Using a FLUKE 115 MULTIMETER (P/N 529 035 868), check resistance value between terminals as follows.

FUEL INJECTOR RESISTANCE TEST AT ECM ADAPTER			
INJECTOR	FUSE BOX TERMINAL	ECM ADAPTER	RESISTANCE @ 20°C (68°F)
FRONT	PF1-B2	K4	11.4 - 12.6 Ω
REAR		L4	

If resistance value obtained is incorrect, perform an *INJECTOR GROUND CIRCUIT RESISTANCE TEST*.

Testing the Injector Ground Circuit Resistance

Disconnect the fuel injector connector.

Disconnect ECM connector.

Install ECM connector on the ECM ADAPTER TOOL (P/N 529 036 166).

Using a FLUKE 115 MULTIMETER (P/N 529 035 868), check resistance value between terminals as follows.

CYLINDER	INJECTOR GROUND CIRCUIT		MEASUREMENT
	WIRE	ECM ADAPTER	
FRONT	INJ1-1	K4	Close to 0 Ω
REAR	INJ2-1	L4	

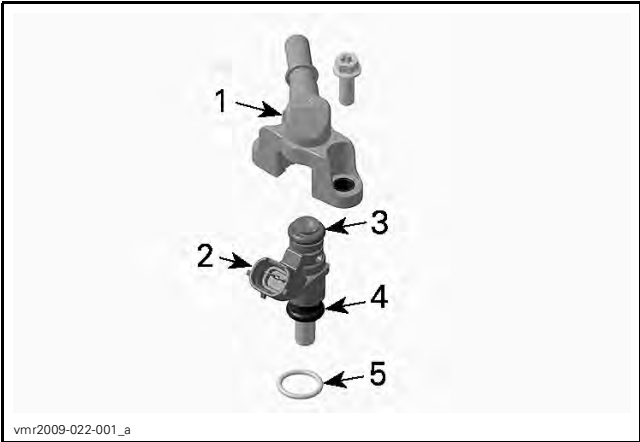
If continuity is not good, repair or replace wiring going to injector.

If continuity is good, replace the injector.

Removing the Fuel Injector

Remove the fuel rail. Refer to *FUEL RAIL* in this subsection.

Section 05 FUEL SYSTEM
Subsection 02 (ELECTRONIC FUEL INJECTION (570))



TYPICAL - FUEL RAIL ASS'Y

- 1. Fuel rail
- 2. Fuel injector
- 3. Injector top O-ring
- 4. Injector bottom O-ring
- 5. Manifold O-ring

Pull fuel injector out of the fuel rail.

Installing the Fuel Injector

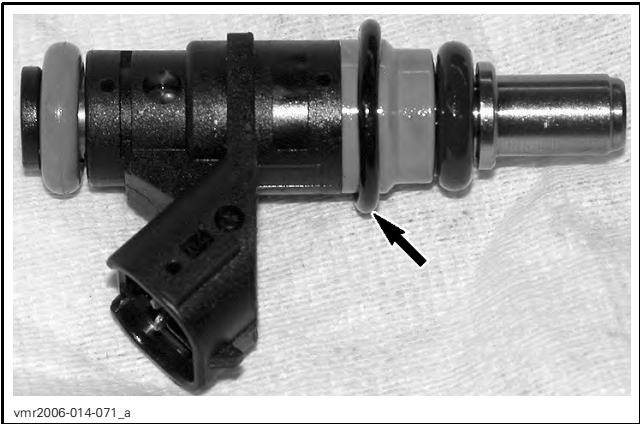
For the installation, reverse the removal procedure. Pay attention to the following details.

Apply a thin film of engine oil to O-rings to ease insertion in rail.

Install fuel injector with your hand. Do not use any tool.

FUEL INJECTOR INSTALLATION		
O-RINGS	New	Lubricate with engine oil

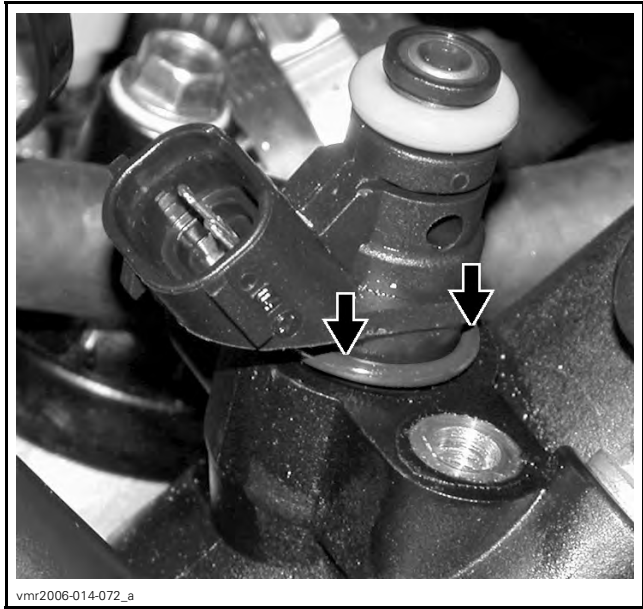
Position the manifold O-ring on injector as in following illustration.



TYPICAL - MANIFOLD O-RING POSITION

Carefully insert injector in manifold paying attention to the manifold O-ring.

NOTICE Gently push O-ring in evenly all around while inserting injector. O-ring must be completely inserted and not visible, before completing the insertion of the injector.



Firmly push injector until it bottoms out.

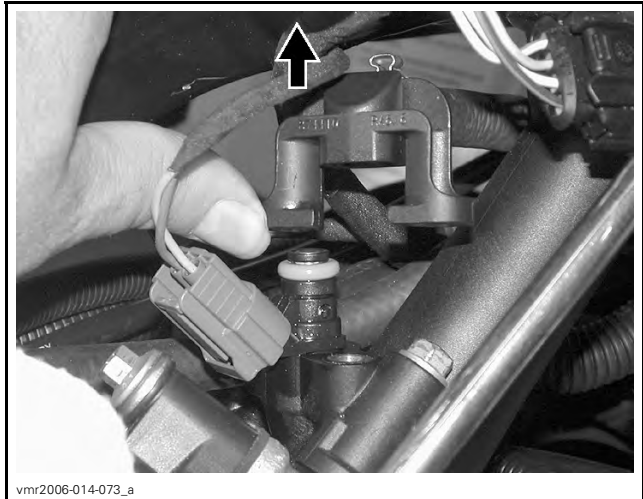
Reinstall fuel rail.

FUEL RAIL

Replacing the Fuel Rail

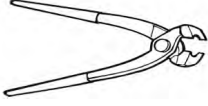
Removing the Fuel Rail

- 1. Disconnect fuel line to reach the rear injector. Refer to *FUEL TANK AND FUEL PUMP* subsection.
- 2. Unscrew rail retaining screws.
- 3. Gently pull rail off by hand.



TYPICAL

To disconnect fuel rail from hose, cut clamp on fuel hose. Refer to *FUEL TANK AND FUEL PUMP* for clamp removal/installation procedures.

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

NOTE: If fuel rail is removed for access to fuel injector, it is not necessary to cut hose clamp. Only to replace fuel rail.

Installing the Fuel Rail

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

Install new clamps using pliers as per removal (if fuel rail was replaced).

Apply a thin film of engine oil to injector O-rings to ease insertion in rail.

INJECTOR O-RINGS	
SERVICE PRODUCT	Lubricate with engine oil

Install fuel rail and evenly tighten screws a little at a time each side.

TIGHTENING TORQUE	
Service product	LOCTITE 243 (BLUE) (P/N 293 800 060)
Fuel rail retaining screws	10 N•m ± 1 N•m (89 lbf•in ± 9 lbf•in)

NOTE: Activate fuel pump a few times to built fuel pressure.

 WARNING
Perform a fuel pressure test and ensure that there is no leak. Refer to <i>FUEL TANK AND FUEL PUMP</i> .

THROTTLE CABLE

Removing the Throttle Cable

Remove steering cover.

Remove LH side panel.

Disconnect throttle cable from throttle body. Refer to procedure in this subsection.

Disconnect throttle cable from throttle lever.

Remove throttle cable.

Installing the Throttle Cable

Reverse removal procedure.

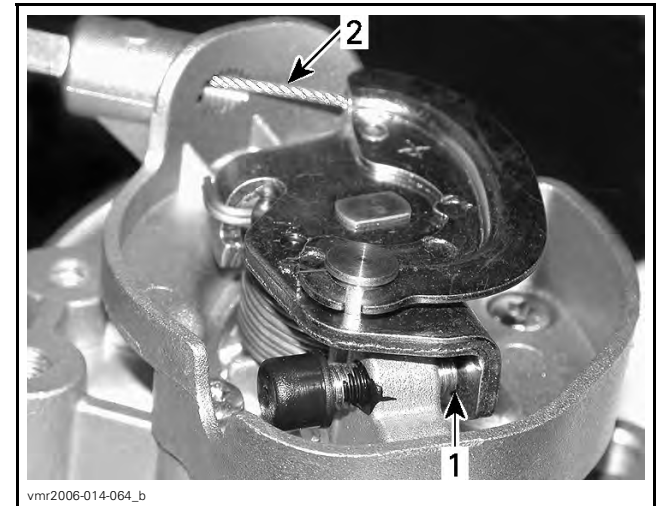
Proceed with *THROTTLE CABLE ADJUSTMENT* in this subsection.

Adjusting the Throttle Cable

Mechanically adjust the throttle cable as follows.

Handlebar and throttle cable must be at their normal position. Throttle cable routing must have been performed before adjusting cable.

Activate throttle lever a few times. Make sure throttle cam of throttle body rests against set screw without any tension in the cable.



1. Contact here
2. Free-play here

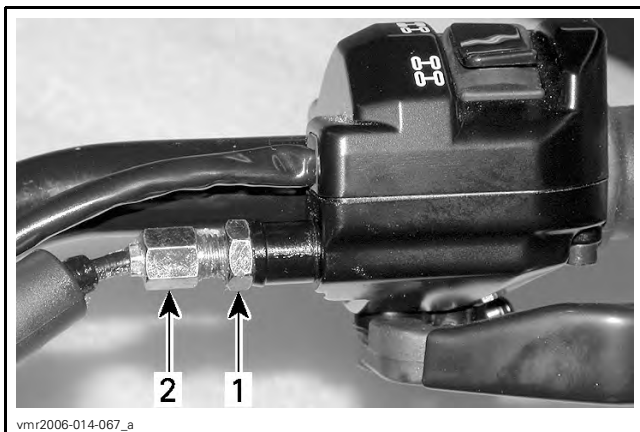
CAUTION If there is no free-play at idle position, it may cause poor idling and startability problems. Improper cable adjustment will cause strain on cable and/or damage cable bracket or throttle lever at handlebar.

 WARNING
Make sure idle speed stopper contacts throttle cam when throttle lever is fully released at handlebar.

If adjustment is needed, proceed with adjuster at handlebar. Adjust to have 2 mm (.079 in) free-play at the end of throttle lever. When done, slide back cable protector over adjuster.

Section 05 FUEL SYSTEM

Subsection 02 (ELECTRONIC FUEL INJECTION (570))



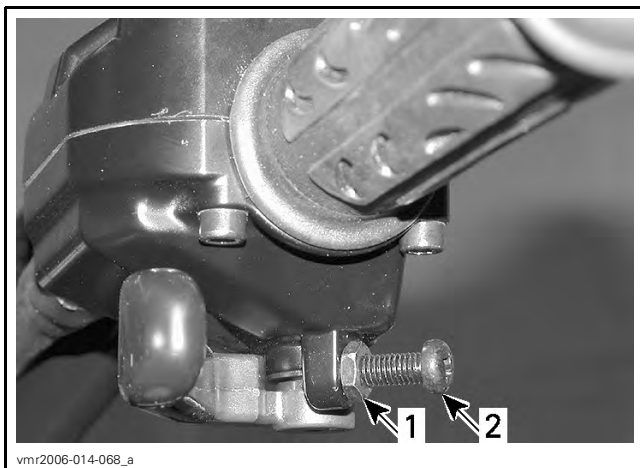
TYPICAL

1. Adjuster lock nut
2. Adjuster

Turn handlebar side to side and ensure there is still free-play in each position.

To ensure there is no strain in the cable at wide open position:

- Fully depress throttle lever and hold.
- Loosen adjuster lock nut/adjuster until it just releases lever.
- Turn adjuster clockwise until it touches lever again.
- From there, tighten adjuster 1/2 turn (to remove strain in cable).
- Tighten lock nut.
- Release throttle lever.

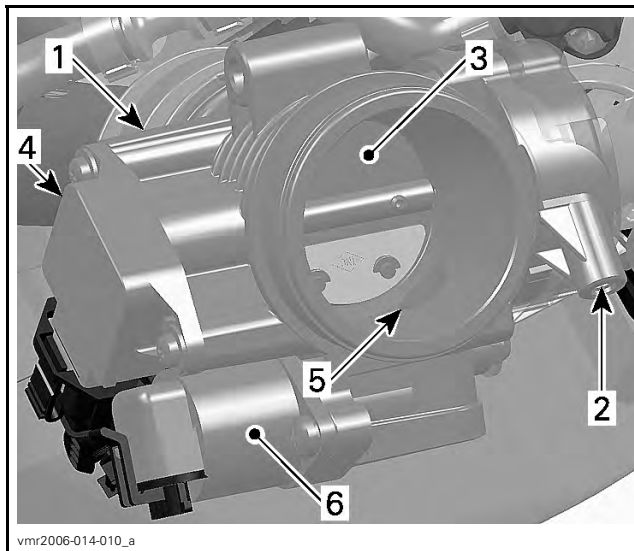


1. Adjuster lock nut
2. Adjuster

Reinstall throttle cable cover.

THROTTLE BODY

Throttle Body Description



1. Throttle body
2. Throttle cable attachment
3. Throttle plate
4. TPS
5. Idle air bypass channel
6. Idle air control valve

Throttle Body Access

Remove the RH side panel. Refer to *BODY* sub-section.

Inspecting the Throttle Body

Check that the throttle plate moves freely and smoothly when depressing throttle lever.

- Check if throttle body idle set screw is loose or worn.
- Check if TPS is loose.
- Check if idle air control valve is loose.
- Check for corroded or damaged connectors.

NOTICE The throttle body must be replaced if idle set screw is loose or worn.

Cleaning the Throttle Body

1. Check throttle body cleanliness using a flashlight. Fully open throttle plate and verify:
 - Throttle body bore
 - Throttle plate edge.

Look for:

- Dirt
- Oily surfaces
- Carbon and salt deposits on throttle plate and the surrounding bore.

2. Clean as necessary.

3. Use a throttle body cleaner such as GUNK INTAKE MEDIC or an equivalent. Refer to manufacturer's instructions.

NOTICE Only use an appropriate throttle body cleaner that will not damage O-rings and EFI sensors.

4. To avoid getting dirt into engine, spray cleaner on a clean rag then rub rag against throttle plate and bore. A toothbrush may also be used.
5. Gently open throttle plate and hold fully open to reach all surfaces.
6. To remove residual dirt, spray cleaner on throttle plate and on bore.
7. Reinstall removed parts.

Removing the Throttle Body

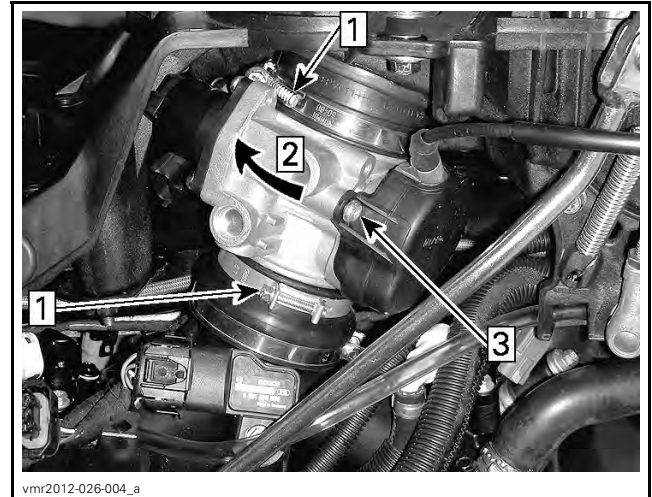
1. Remove the air intake silencer retaining screws.



TYPICAL

1. Remove these screws

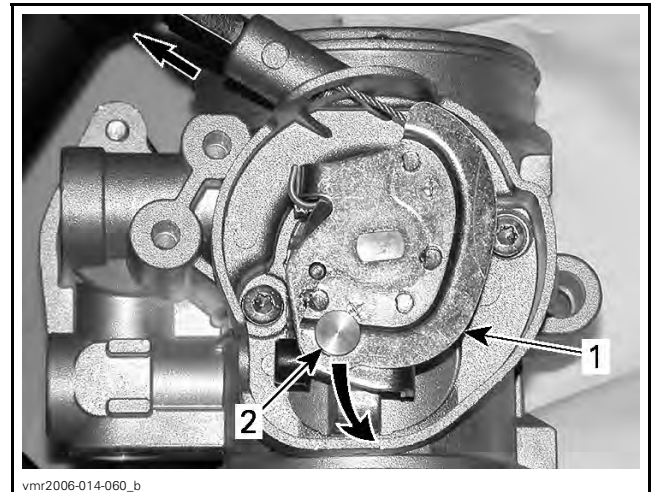
2. Lift rear of air intake silencer as much as possible and block in this position.
3. Unplug connectors from TPS and IACV.
4. Loosen both throttle body clamps.
5. Rotate throttle body to gain access to throttle cable.
6. Remove throttle cable cover.



TYPICAL

- Step 1: Loosen
- Step 2: Rotate
- Step 3: Remove

7. Rotate throttle lever and pull out cable barrel.



TYPICAL

1. Throttle lever
2. Cable barrel

8. Remove barrel from cable.
9. Pull out throttle cable.
10. Pull out throttle body.

Installing the Throttle Body

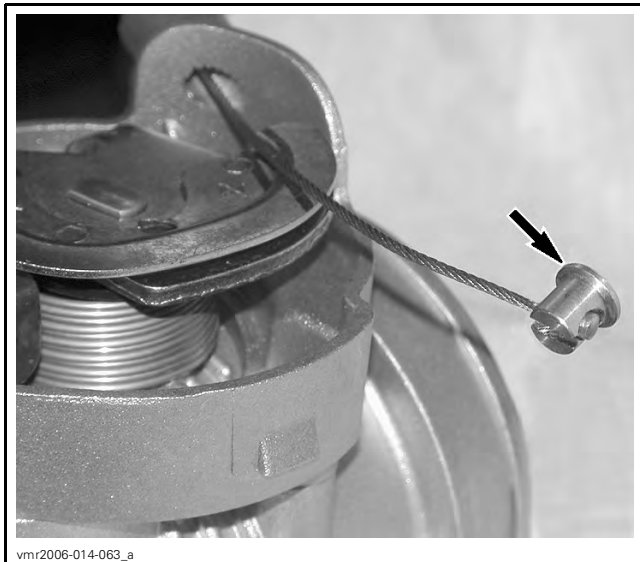
Installation of the throttle body is the reverse of the removal procedure. However, pay attention to the following.

Temporarily install throttle body into position.

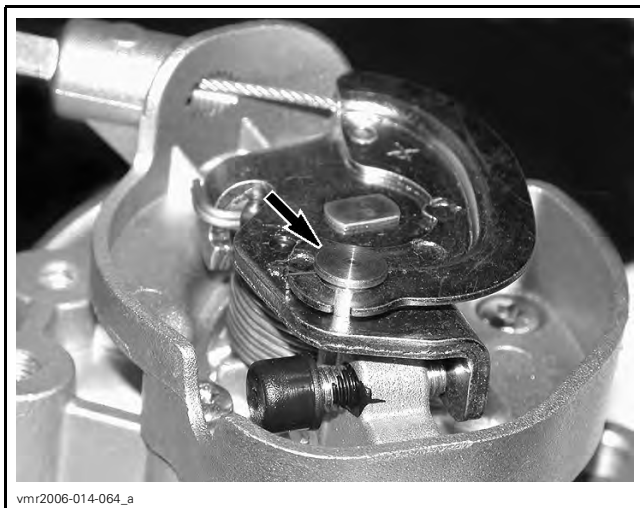
Properly install cable barrel to throttle cable end.

Section 05 FUEL SYSTEM

Subsection 02 (ELECTRONIC FUEL INJECTION (570))



Hook cable to throttle lever.



Rotate throttle body into position and ensure to index throttle body tab with boot notch.



Tighten clamps.

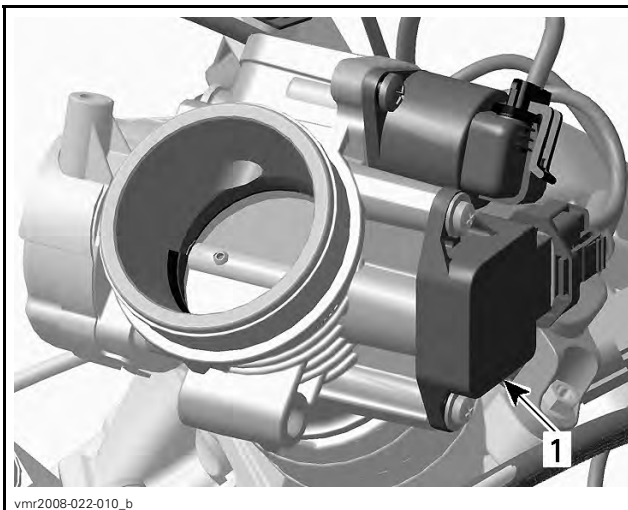
- Check throttle cable adjustment. Refer to *THROTTLE CABLE* in this subsection.
- If throttle body was replaced, perform the **Closed Throttle And Idle Actuator Reset** and the *IACV CALIBRATION*. See procedures in this subsection.

THROTTLE POSITION SENSOR (TPS)

Refer to the applicable *ENGINE MANAGEMENT SYSTEM* subsection for component and connector locations.

General

The throttle position sensor (TPS) is a potentiometer that sends a signal to the ECM which is proportional to the throttle plate angle.



1. Throttle position sensor (TPS)

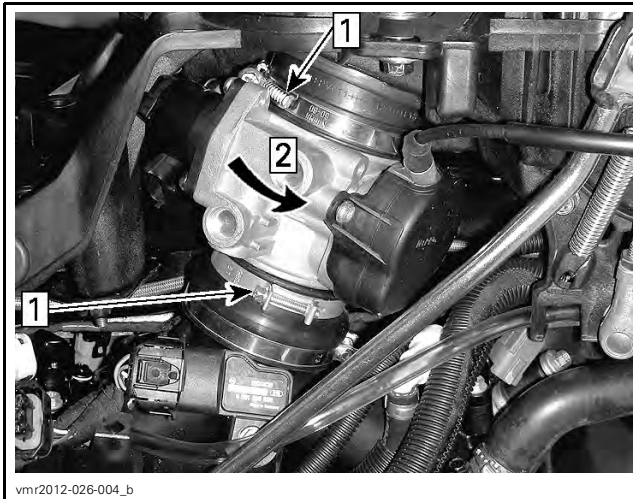
The ECM may generate several fault codes pertaining to the TPS. Refer to *DIAGNOSTIC AND FAULT CODES* subsection for more information.

TPS Access

Remove the RH side panel. Refer to *BODY* subsection.

Loosen both throttle body clamps.

Rotate throttle body to gain access to TPS.



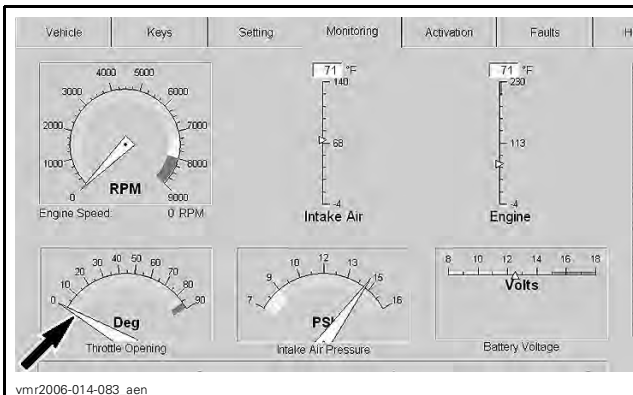
TYPICAL
 Step 1: Loosen
 Step 2: Rotate

Testing the TPS Wear

IMPORTANT: Prior to testing the TPS, ensure that mechanical components of throttle body are checked.

While engine is not running, activate throttle and pay attention for smooth operation without physical stops of the cable.

Using the B.U.D.S. software, use the Throttle Opening display under Monitoring.



TYPICAL

Slowly and regularly depress the throttle. Observe the needle movement. It must change gradually and regularly as you move the throttle. If the needle "sticks", bounces, suddenly drops or if any discrepancy between the throttle movement and the needle movement is noticed, it indicates that the TPS needs to be replaced or the computer used may be too slow to transfer data fast enough for real time display.

Testing the TPS Resistance

Ensure correct throttle cable adjustment. Refer to *THROTTLE CABLE ADJUSTMENT* in this subsection.

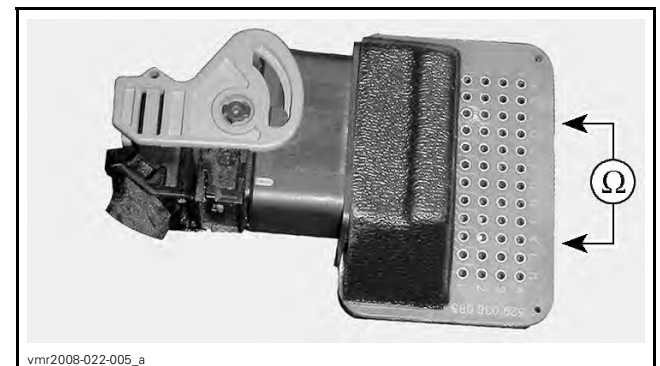
Ensure TPS is connected to wiring harness.

Disconnect the ECM connector.

Using the following tools, check resistance values.

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

ECM ADAPTER		THROTTLE IDLE POSITION	WIDE OPEN THROTTLE POSITION
PIN		RESISTANCE (Ω) @ 20°C (68°F)	
G3	G2	900-1600	2600-3100
G2	A1	1800-2200	1800-2200
G3	A1	2200-3100	800-1200



NOTE: The resistance value should change smoothly and proportionally to throttle movement. Otherwise, replace TPS.

If resistance values are correct, perform the *TPS INPUT VOLTAGE TEST* below.

If resistance values are incorrect, check wiring harness. If wiring is faulty, repair/replace. If wiring is good, replace TPS.

Section 05 FUEL SYSTEM
Subsection 02 (ELECTRONIC FUEL INJECTION (570))

Reconnect ECM connector.

Testing the TPS Input Voltage

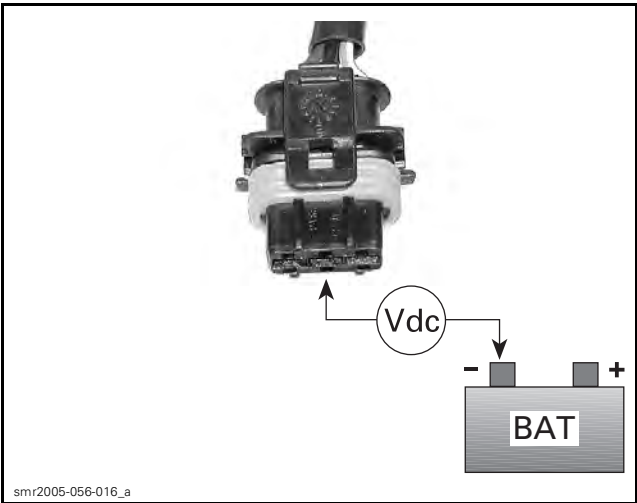
Disconnect connector from TPS.

Turn ignition key ON.

Set emergency engine stop switch to RUN.

Check the voltage readings from harness connector as follows.

CONNECTION	VOLTAGE
Pin 1 with battery ground	5.0 V
Pin 2 with battery ground	0 V



If voltage test is not good, check/repair wiring harness. If wiring tests good, refer to *ECM REPLACEMENT*.

If voltage test is good, everything is in order (assuming resistance test was performed).

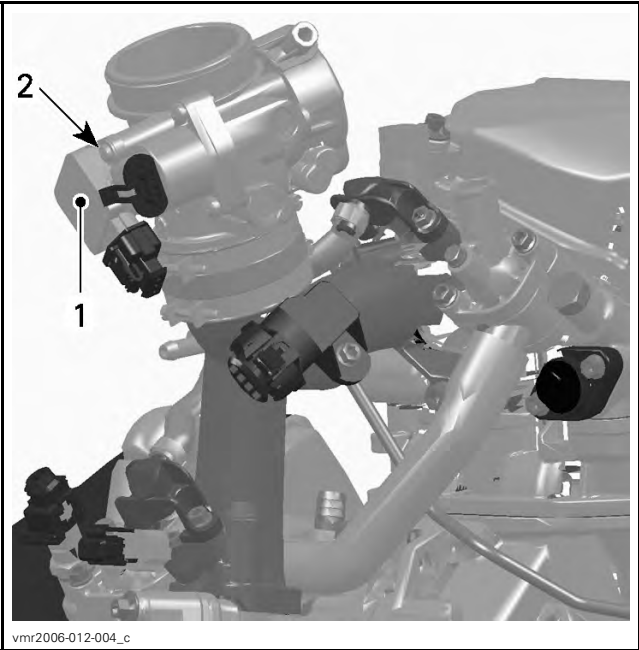
TPS Replacement

Refer to *TPS ACCESS* in this subsection to gain access to TPS.

Unplug connector from TPS.

Loosen TPS retaining screws.

Remove TPS.



TYPICAL – THROTTLE BODY
1. TPS
2. Screws

Install the new TPS and tighten retaining screws to specification.

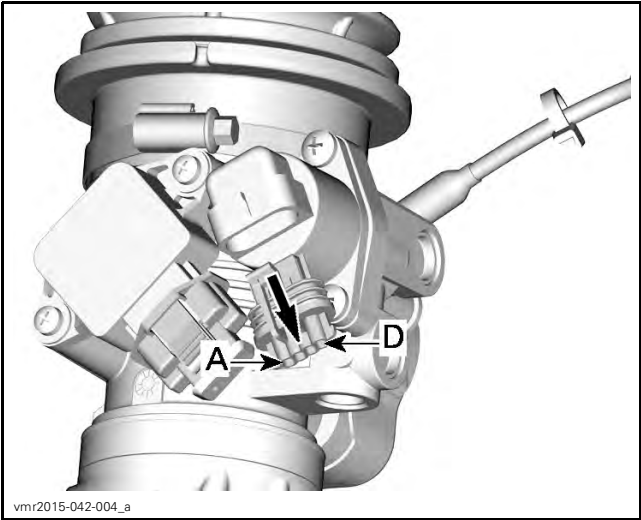
TIGHTENING TORQUE	
Service product	LOCTITE 243 (BLUE) (P/N 293 800 060)
TPS retaining screws	3 N•m (27 lbf•in)

Perform the **Closed Throttle And Idle Actuator Reset** procedure. Refer to *CLOSED THROTTLE AND IDLE ACTUATOR RESET* in this subsection.

IDLE AIR CONTROL VALVE (IACV)

Refer to the applicable *ENGINE MANAGEMENT SYSTEM* subsection for component and connector locations.

An idle air control valve with good resistance measurement can still be faulty. It is also possible that a mechanical failure occurs which is not detectable without measuring the air flow. Replacing the IACV may be necessary as a test.



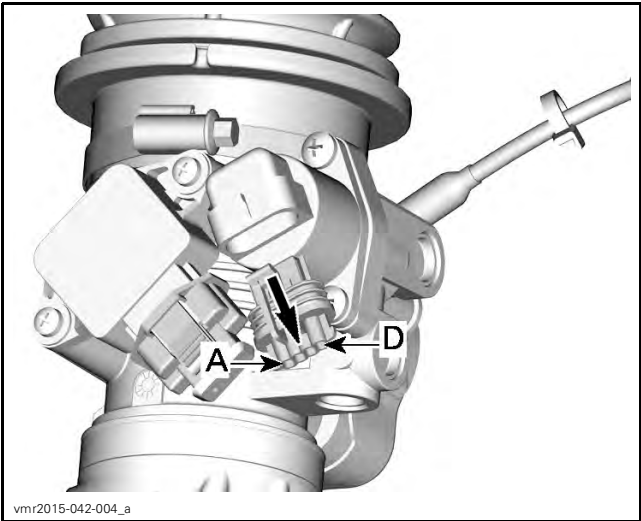
IACV Access

Refer to *TPS ACCESS* in this subsection to gain access to IACV.

Testing the IACV Resistance

Disconnect IACV from the wiring harness.
Using a multimeter, check the resistance in both windings.
Check the resistance between pins as shown.

IDLE AIR CONTROL VALVE		MEASUREMENT
PIN		RESISTANCE (Ω) @ 20°C (68°F)
A	D	50 ± 5
B	C	



If the resistance of any winding is not good, replace the idle air control valve.

If resistance test of valve windings is good, check continuity of circuits C4, D3, D4, E4. If not good, check/repair wiring/connectors.

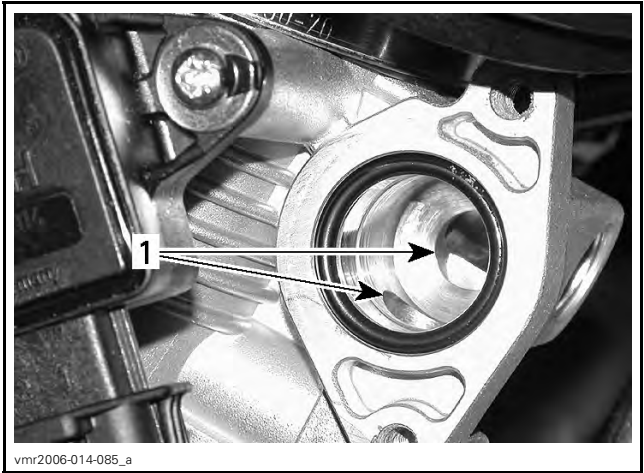
Inspecting the IACV Visual

NOTE: Make sure the ignition key is turned off during the following procedure.
Remove Idle air control valve from throttle body.
Check the piston and bypass channel for dirt/deposits which can cause a sticking piston.

NOTICE Always keep the ignition key turned OFF, while the idle air control valve is removed.

NOTICE Do not try to operate the piston of the idle air control valve when it is dismounted. Also do not move the piston by hand. The drive screw is very sensitive and may be destroyed.

Using a part cleaner, clean idle bypass in throttle body from contamination then blow compressed air to dry it.



1. Clean bore from contamination

Clean all remaining parts and install the idle air control valve on the throttle body.
Proceed with the **Closed Throttle and Idle Actuator Reset** and the *IACV CALIBRATION*. See procedures in this subsection.

IACV Calibration

The IACV calibration is required to avoid a potential erratic or frozen RPM needle.

1. Start the vehicle to increase engine temperature.
2. Let engine run at **idle** until the cooling fan performed a complete cycle (ON/OFF).

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- 3. When the cycle is done, turn ignition key to OFF position.
- 4. The calibration is completed.

CRANKSHAFT POSITION SENSOR (CPS)

Refer to applicable *ENGINE MANAGEMENT SYSTEM* subsection for component and connector locations.

NOTE: Take into account that a CPS fault can be triggered by bent or missing encoder wheel teeth. First check fault codes using B.U.D.S., then check the encoder wheel teeth condition if necessary. Refer to *MAGNETO AND STARTER* subsections.

CPS Access

Remove the RH side panel. Refer to *BODY* subsection.

To reach the CPS connector, remove protector from engine.

Testing the CPS Resistance

Disconnect the ECM connector.

Install ECM connector on ECM ADAPTER TOOL (P/N 529 036 166).



Using a multimeter, measure resistance as per table.

ECM ADAPTER		MEASUREMENT
PIN		RESISTANCE Ω @ 20°C (68°F)
D1	E1	700 - 900 Ω

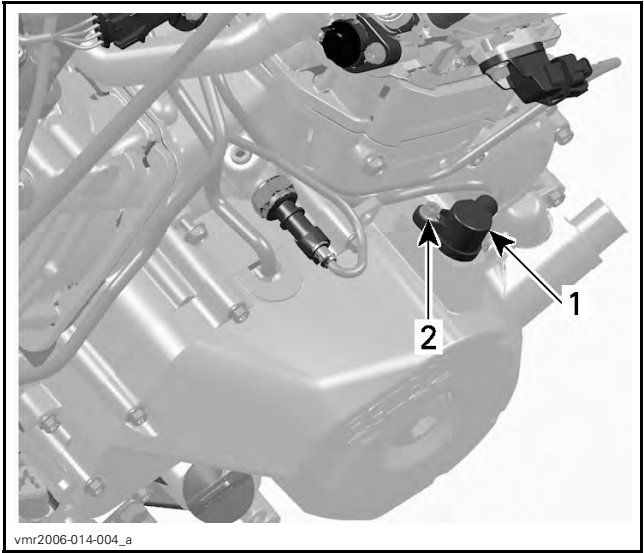
If resistance value is incorrect, check or repair the connectors and the wiring harness between ECM connector and the CPS. If resistance value is still incorrect, replace CPS.

CPS Replacement

Refer to *CPS ACCESS* in this subsection to reach CPS.

Disconnect CPS connector and cut harness locking tie (if applicable).

Remove CPS retaining screw and pull up on CPS to remove it.



TYPICAL
1. CPS
2. Retaining screw

Lubricate O-ring of CPS.

O-RING	
Service product	XPS SYNTHETIC GREASE (P/N 293 550 010)

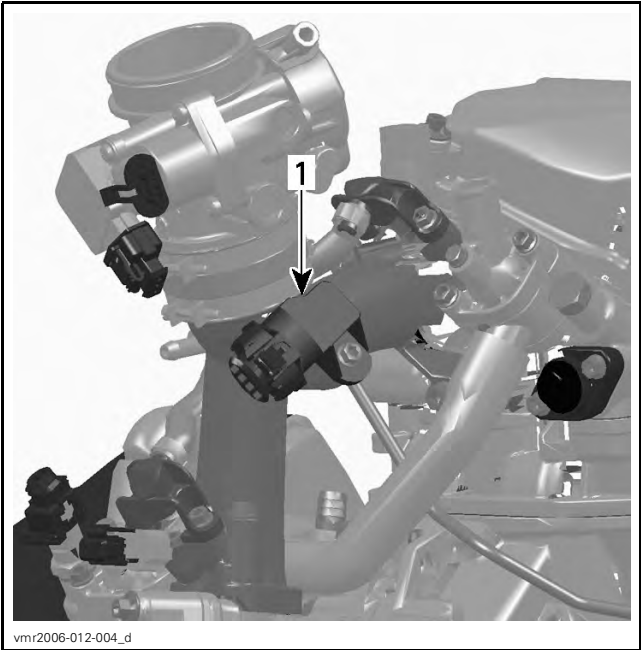
Install new CPS and secure harness with a new locking tie (as applicable).

Tighten CPS retaining screw to specification.

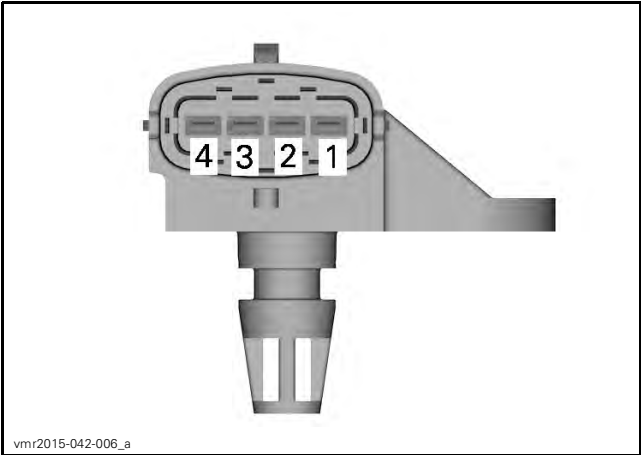
TIGHTENING TORQUE	
CPS retaining screw	10 N•m $\pm$ 1 N•m (89 lbf•in $\pm$ 9 lbf•in)

MANIFOLD ABSOLUTE PRESSURE AND TEMPERATURE SENSOR (MAPTS)

Refer to applicable *ENGINE MANAGEMENT SYSTEM* subsection for component and connector locations.



1. Manifold absolute pressure and temperature sensor (MAPTS)



NOTE: This sensor is a multifunction device.

MAPTS Access

Remove the RH side panel. Refer to *BODY* sub-section.

MAPTS Pressure Function

Before the engine is started, when power is applied to the system, the sensor measures the ambient air atmospheric pressure. The ambient pressure is, at that moment, stored in the ECM. Thereafter, once the engine is started, it measures the air pressure in the intake manifold at operating RPMs.

The sensor must be correctly installed on intake manifold. Otherwise, the MAPTS could generate a fault code for an unexpected sensor range at idle when it reads the atmospheric pressure. If this is the case, remove sensor and check for oil or

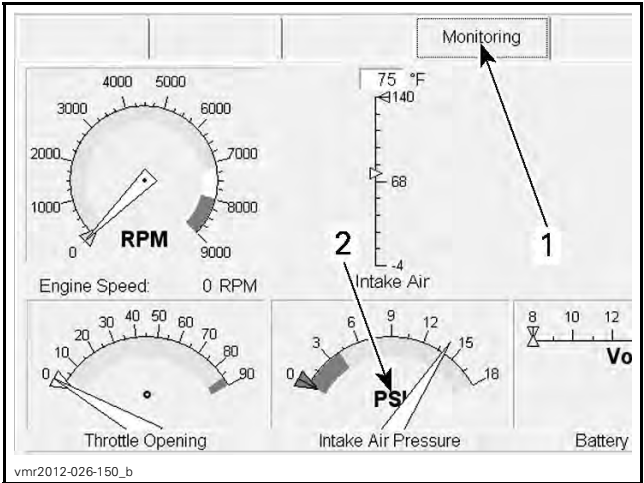
dirt on its end and if problem persists, check throttle plate condition/position and the wiring harness. Perform the following tests.

MAPTS Pressure Function Quick Test

1. Connect vehicle to the latest applicable B.U.D.S. software version.
2. In B.U.D.S., click the following:

Monitoring tab

ECM tab.



TYPICAL
1. Monitoring tab
2. MAPTS pressure reading

3. Look for and take note of the MAPTS pressure reading while the engine is stopped.
4. Perform the same test with a new MAPTS and compare both readings.

Values have to be within ± 3.4 kPa (.5 PSI).

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		

Testing the MAPTS Input Voltage

Check the voltage output from ECM to the pressure sensor.

1. Turn ignition key ON.
2. Set emergency engine stop switch to RUN.
3. Remove electrical connector from MAPTS.

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4. Using a FLUKE 115 MULTIMETER (P/N 529 035 868), measure for input voltage as per following table.

Table with 2 columns: MAPTS CONNECTOR, MEASUREMENT. It shows a measurement of 5 Vdc at PIN 3 of connector 1.

If voltage test is good, replace the MAPTS.
If voltage test is not good, carry out the MAPTS CIRCUIT CONTINUITY TEST (PRESSURE FUNCTION).

Testing the MAPTS Circuit Continuity (Pressure Function)

- 1. Disconnect the ECM connector.
- 2. Install ECM connector on ECM ADAPTER TOOL (P/N 529 036 166).
- 3. Using a multimeter, check continuity of the following circuits.

Table with 3 columns: ECM ADAPTER, MAPTS CONNECTOR, RESISTANCE VALUE. It shows resistance values for different pins (A1, F2, G2) and connectors (Pin 3, Pin 4, Pin 1), all close to 0 Ohms.

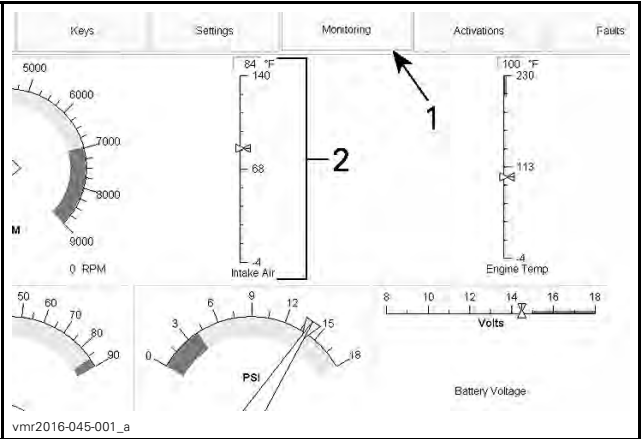
If resistance is not within specification, repair or replace the wiring harness between ECM connector and the MAPTS.

MAPTS Temperature Function

The sensor monitors the temperature in the intake manifold.

Testing the MAPTS Temperature Function

- 1. Connect vehicle to the applicable B.U.D.S. software version.
- 2. In B.U.D.S., click the following:
- Monitoring tab
- ECM tab.
- 3. Look for the Intake Air temperature reading while the engine is stopped.



TYPICAL
1. Monitoring tab
2. MAPTS temperature reading

4. Perform the same test with a new MAPTS and compare both readings.

If the engine MAPTS temperature reading is significantly different than the new MAPTS, replace it.

NOTE: Both sensors must feel the same ambient air temperature.

If there is no reading, carry out a MAPTS RESISTANCE TEST (TEMPERATURE FUNCTION).

Testing the MAPTS Resistance (Temperature Function)

Disconnect the connector from the MAPTS.

Using the FLUKE 115 MULTIMETER (P/N 529 035 868), check the resistance of the sensor itself as shown.

Table with 2 columns: MAPTS, MEASUREMENT. It shows a resistance range of 2280 - 2740 Ohms at 20°C (68°F) for pins 1 and 2.

If resistance is not within specification, replace the MAPTS.

If resistance tests good, reconnect the MAPTS and disconnect the ECM connector.

Install ECM connector on ECM ADAPTER TOOL (P/N 529 036 166).



Using a multimeter, recheck resistance value as per following table.

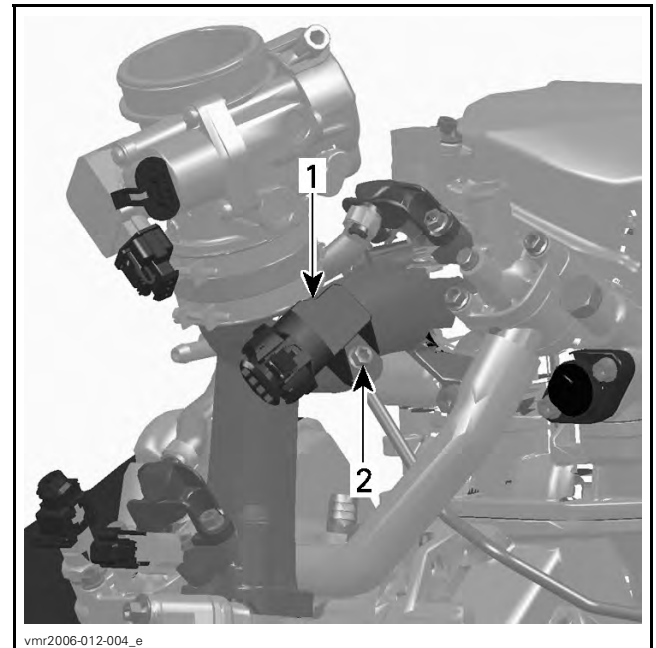
ECM ADAPTER		MEASUREMENT
PIN		RESISTANCE Ω @ 20°C (68°F)
F3	G2	2280 - 2740

MAPTS TEMPERATURE SENSOR TEST RESULTS			
RESULT	SERVICE ACTION		
NO READING	Circuit Continuity Test of MAPTS Temperature Function	MAPTS Input Voltage Test	Repair or replace wiring
INCORRECT RESISTANCE VALUE	Replace MAPTS		

Testing the MAPTS Circuit Continuity (Temperature Function)

MAPTS CIRCUIT CONTINUITY TEST (TEMPERATURE FUNCTION)		
ECM ADAPTER	MAPTS CONNECTOR	RESISTANCE VALUE
G2	Pin 1	Close to 0 Ω
F3	Pin 2	

MAPTS Replacement



1. MAPTS
2. Retaining screw

Disconnect MAPTS connector and remove the MAPTS.

Install new MAPTS as per following table.

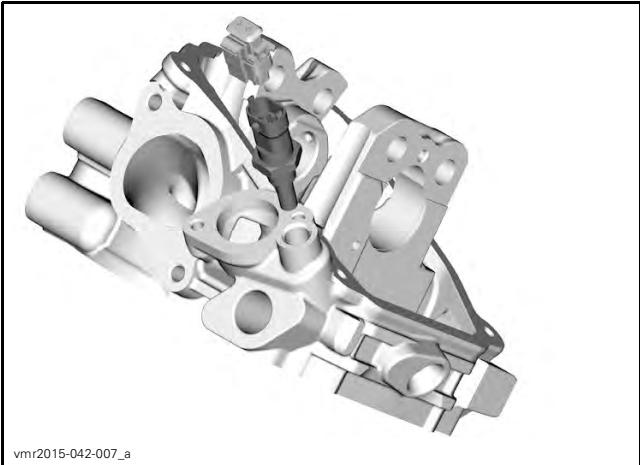
TIGHTENING TORQUE	
Service product	LOCTITE 243 (BLUE) (P/N 293 800 060)
MAPTS retaining screw	6 N•m $\pm$ 0.7 N•m (53 lbf•in $\pm$ 6 lbf•in)

CTS (COOLANT TEMPERATURE SENSOR)

Refer to appropriate *ENGINE MANAGEMENT SYSTEM* subsection for component and connector locations.

Section 05 FUEL SYSTEM

Subsection 02 (ELECTRONIC FUEL INJECTION (570))



Testing the CTS Resistance

- 1. Disconnect the ECM connector.
- 2. Using the following tools, check resistance values.

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

- 3. Install ECM connector on the following tool.

ECM ADAPTER		MEASUREMENT
PIN		RESISTANCE (Ω) @ 20°C (68°F)
C3	F4	2280 - 2736

If resistance value is incorrect, check wiring continuity between ECM connector and the CTS. Refer to *CTS CIRCUIT CONTINUITY TEST* in this subsection.

Testing the CTS Circuit Continuity

- 1. Disconnect connector from CTS and check the circuit continuity.

CTS CIRCUIT CONTINUITY TEST		
ECM ADAPTER	CTS CONNECTOR	RESISTANCE VALUE
Pin F4	Pin 1	Close to 0 Ω
Pin C3	Pin 2	

If resistance value is incorrect, repair or replace wiring or connectors/terminals.

If resistance test is good, replace the CTS.

Replacing the CTS

- 1. Refer to *CTS ACCESS* in this subsection to reach CTS.
- 2. Remove heat shield over exhaust pipe to expose CTS. Refer to *EXHAUST SYSTEM* subsection.



LH SIDE OF VEHICLE
1. CTS

CTS Access

Remove the LH panel. Refer to *BODY* subsection.
Remove the CVT duct.



TYPICAL
1. Pull out



1. CTS

3. Disconnect CTS connector and remove CTS.
4. Install the new CTS and torque as specified.

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

5. Reinstall remaining removed parts.
6. Refill and bleed the cooling system. Refer to *COOLING SYSTEM* subsection.

FUEL TANK AND FUEL PUMP (570)

SERVICE TOOLS

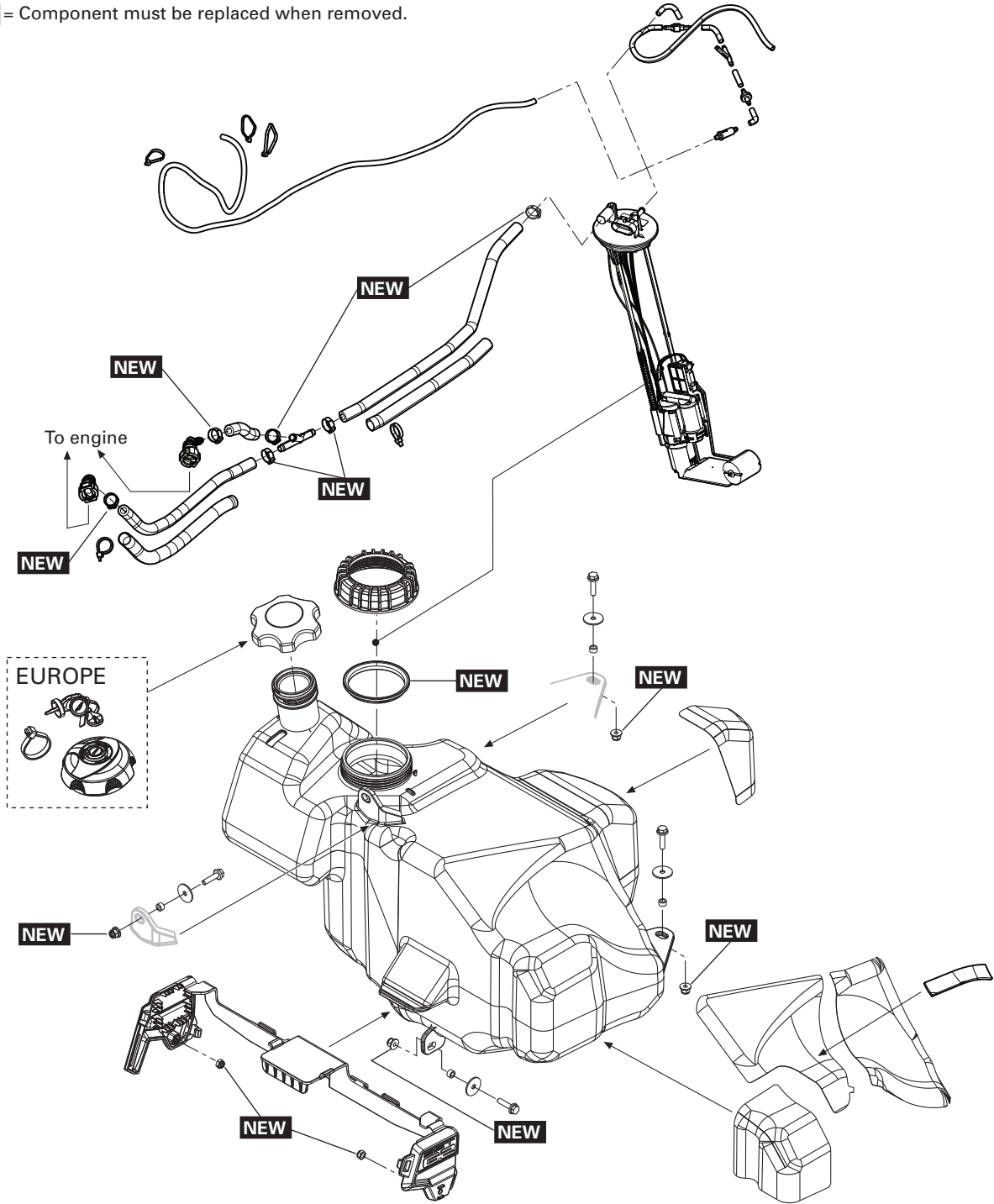
Description	Part Number	Page
FLUKE 115 MULTIMETER	529 035 868	270
FUEL HOSE ADAPTER.....	529 036 023	265
FUEL PUMP NUT TOOL	529 035 899	272
OETIKER PLIERS.....	295 000 070	267
PRESSURE GAUGE.....	529 035 709	265
SMALL HOSE PINCHER	295 000 076	275
VACUUM/PRESSURE PUMP	529 021 800	264

SERVICE TOOLS – OTHER SUPPLIER

Description	Part Number	Page
FLUKE RIGID BACK PROBE	TP88	270

Section 05 FUEL SYSTEM
Subsection 04 (FUEL TANK AND FUEL PUMP (570))

NEW = Component must be replaced when removed.



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GENERAL

⚠ WARNING

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

⚠ WARNING

Always disconnect battery prior disconnecting a fuel system pressure hose.

⚠ WARNING

Always proceed with care and use appropriate safety equipment when working on pressurized fuel system. Wear safety glasses.

⚠ WARNING

Do not allow fuel to spill on hot engine parts and/or on electrical connectors.

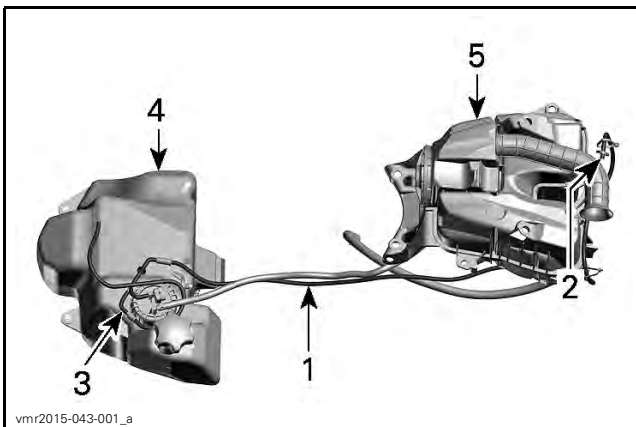
When the repair is completed, ensure that all hoses are connected and secured. Perform the *FUEL PRESSURE TEST* and the *FUEL TANK LEAK TEST* as explained in this subsection.

Fuel lines remain under pressure at all times. Proceed with care when removing/installing high pressure test equipment.

SYSTEM DESCRIPTION

Fuel Tank Vent System

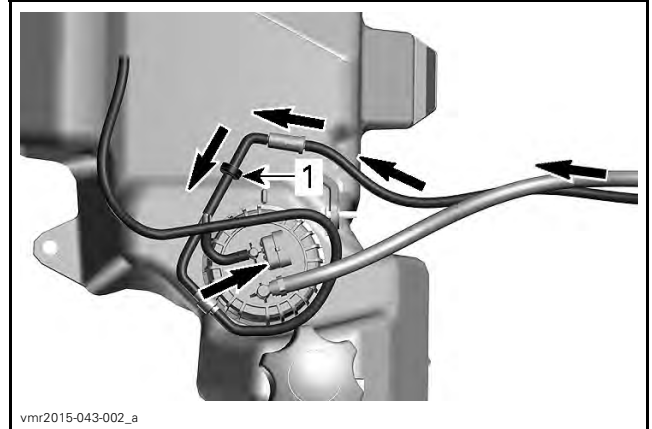
The fuel tank is equipped with a vent system that provides over pressure relief and negative pressure relief of the fuel tank.



FUEL TANK VENT SYSTEM

1. Vent hose
2. Vent system hose inlet
3. Vent system connected to fuel pump
4. Fuel tank
5. Engine air intake system

Air can enter the fuel tank at all times through the vent system INLET check valve. This prevents negative pressure within the fuel tank which could cause fuel starvation.

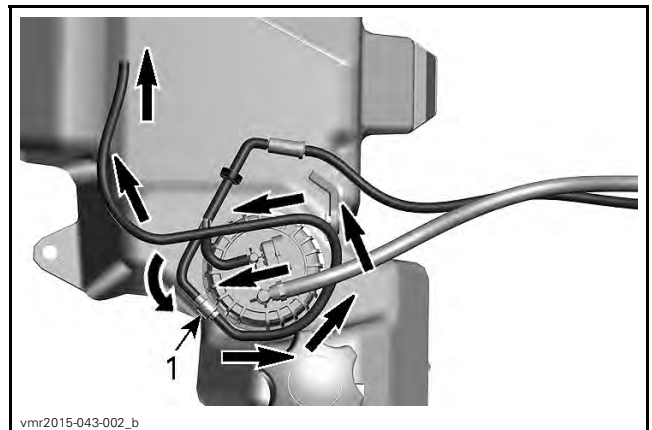


AMBIENT AIR PRESSURE IN

1. Vent inlet check valve

The vent inlet check valve also prevents fuel from flowing out through the inlet of the vent system.

If the pressure in the fuel tank builds up and exceeds 2.5 kPa - 7.6 kPa (.36 PSI - 1.1 PSI), the pressure relief valve opens and lets the excess pressure evacuate through the vent system outlet hose.



OVER PRESSURE RELIEF

1. Outlet pressure relief valve

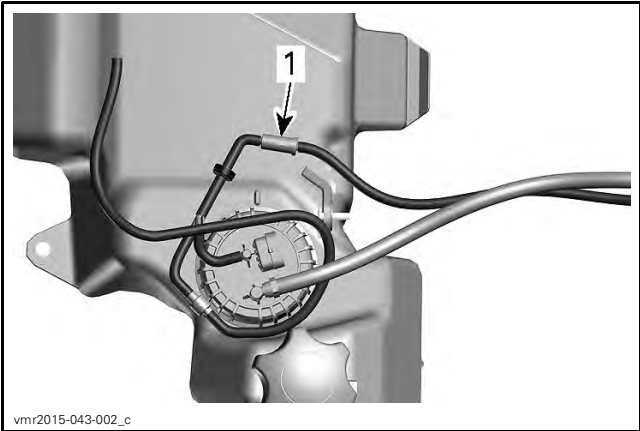
Fuel Tank Vent Breather Filter

The vent system is equipped with an in-line breather filter that prevents entry of particles such as dust or small insects. It is located next to the fuel pump, on the inlet hose, before the air inlet check valve.

To access the fuel tank vent breather filter, remove the rear body module.

Section 05 FUEL SYSTEM

Subsection 04 (FUEL TANK AND FUEL PUMP (570))



1. Fuel tank vent breather filter

Fuel Pump Module

The fuel pump module is inserted in the fuel tank. It provides fuel delivery for the EFI system and encompasses the following components:

- Electric fuel pump
- Fuel pump pre-filter (replaceable)
- Fuel pressure regulator
- Fuel level sender.

Fuel Filters

The system comprises a replaceable prefilter element attached to the bottom of the fuel pump.

Fuel Pump Pressure Regulator

The fuel pressure regulator is integral to the fuel pump module. The pressure regulator maintains proper fuel pressure for the EFI system.

INSPECTION

FUEL TANK LEAK TEST

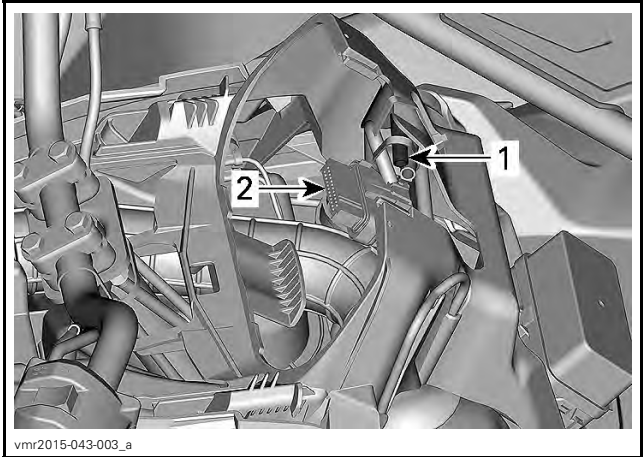
⚠ WARNING

Always carry out a fuel tank leak test whenever the fuel tank shows signs of wear or damage which may cause a leak, or when the fuel pump has been removed or replaced, or if you suspect a leak. If the fuel tank is damaged, the fuel tank should be replaced even if no leak is present. Do not attempt to repair the fuel tank.

1. Refill fuel tank and ensure fuel tank cap is in good condition and properly installed.
2. Remove the gauge support for access to the fuel vent inlet hose.

3. Using the VACUUM/PRESSURE PUMP (P/N 529 021 800), pressurize the fuel tank through the vent hose.

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



1. Fuel tank vent inlet hose
2. Gauge connector

PRESSURE	TIME WITHOUT PRESSURE DROP
14 kPa (2 PSI)	3 minutes

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

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

To ease locating leak(s), spray soapy water on all hose connections and components; bubbles will indicate the leak location(s).

NOTE: For access to the fuel tank vent system, refer to *FUEL PUMP ACCESS* in this subsection.

FUEL SYSTEM PRESSURE TEST

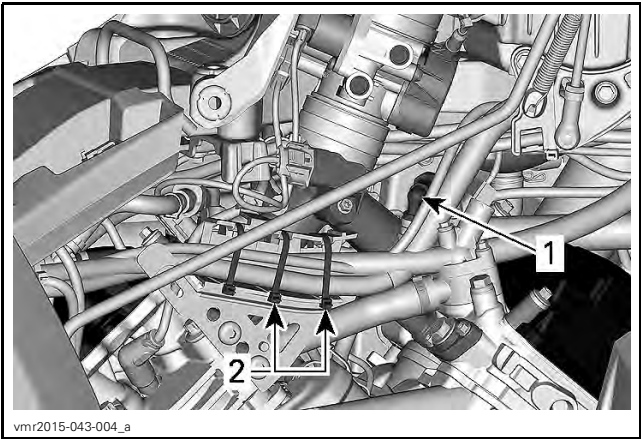
The pressure test will show the available pressure in the system. It validates the pressure regulator and the fuel pump, and allows for checking the fuel system for leaks (high pressure side).

NOTE: Refer to the *FUEL SYSTEM DIAGNOSTIC FLOW CHART* in this subsection to help diagnose a fuel system related problem.

1. Ensure the fuel level in the tank is sufficient.
2. Ensure the battery voltage is over 12 volts.
3. Remove seat.

4. Remove LH side body panel, refer to *BODY* subsection.
5. Remove heat shield, refer to *EXHAUST* subsection.
6. Disconnect the fuel pressure hose from the fuel injector fuel rail. Refer to *DISCONNECTING A FUEL PRESSURE HOSE* in *FUEL HOSE AND OETIKER CLAMPS*.
7. Remove the 2 most forward locking ties securing the fuel hose to the upper cable support.

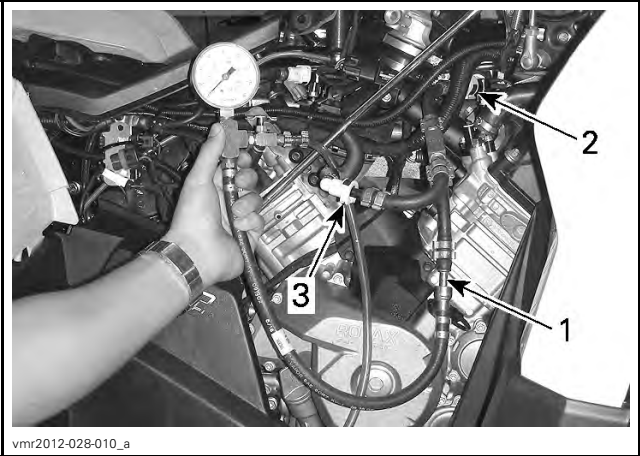
NOTE: This is required to provide more hose length for proper connection to test equipment.



1. Forward injector rail fitting
2. Locking ties

8. Install the fuel pressure gauge and fuel hose adapter between the disconnected injector hose and fuel rail (in-line installation).

REQUIRED TOOLS	
PRESSURE GAUGE (P/N 529 035 709)	
FUEL HOSE ADAPTER (P/N 529 036 023)	



PRESSURE GAUGE SETUP
1. Pressure gauge to fuel hose adapter
2. Fuel hose adapter to fuel rail
3. Fuel hose adapter to fuel pump pressure hose

9. Reinstall the fuel pump relay (R4) in the forward fuse box.
10. Turn ignition key ON and observe fuel pressure.

FUEL PRESSURE (Valid at 12v $\pm$ 0.1v)	350 kPa $\pm$ 10 kPa (51 PSI $\pm$ 1 PSI)
---	--

11. Start engine and observe fuel pressure.
12. Stop engine.
13. Remove test equipment and reconnect fuel hose to injector fuel rail by proceeding in the same manner as for its installation.

Test Conclusion

The fuel pressure should be within specification in static or dynamic tests.

Rapid Pressure Drop

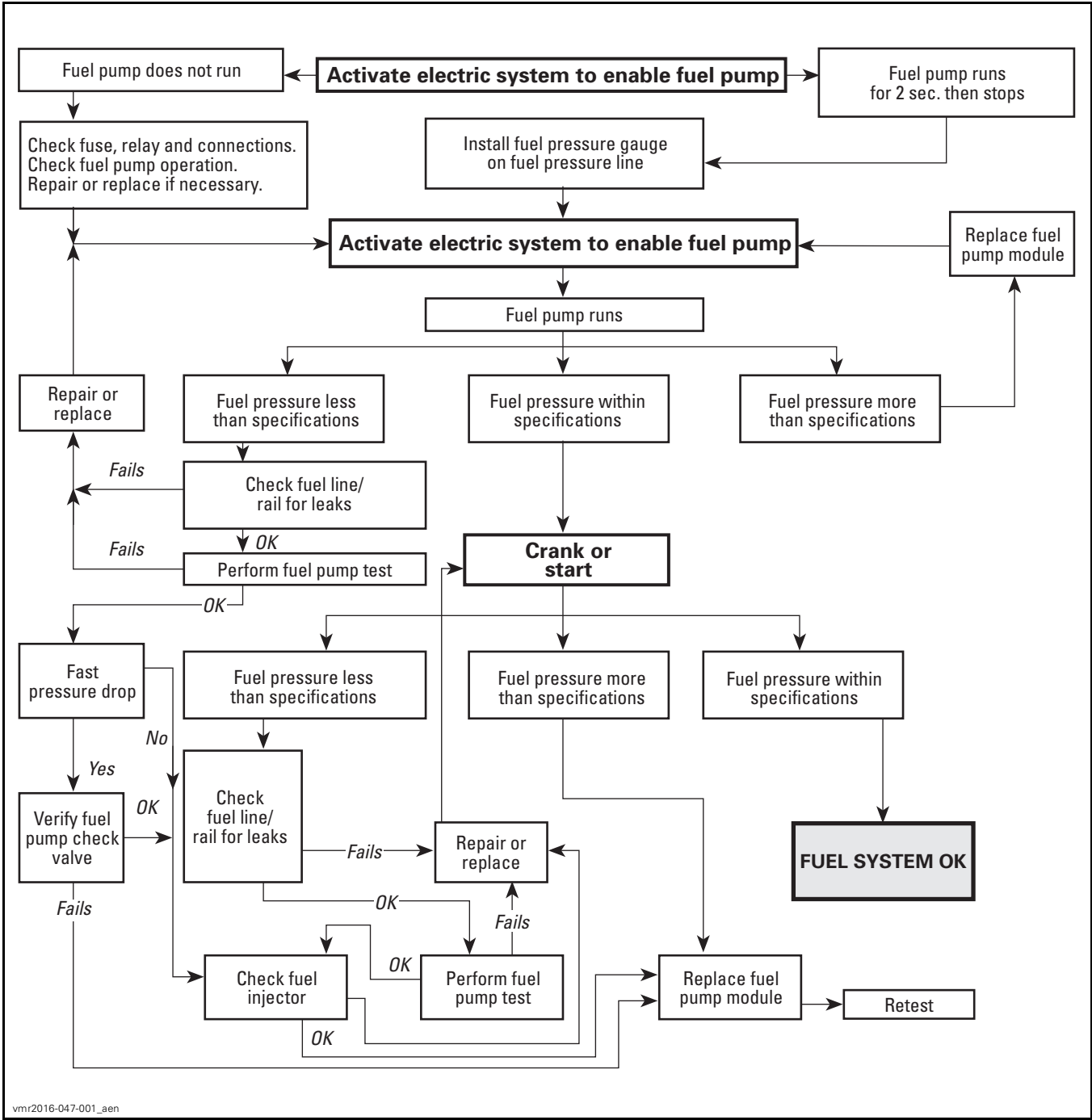
- If there is a rapid pressure drop after the engine is stopped, check for leakage at:
- A fuel hose
 - A fuel rail.

NOTE: The fuel pump check valve integral to the fuel pump module may also be at fault.
If no leak is detected, replace fuel pump.

Slow Pressure Drop

- If there is a slow pressure drop after the engine is stopped, check for a fuel injector leak. Refer to *ELECTRONIC FUEL INJECTION (EFI)* subsection.
- NOTE:** The fuel pressure regulator or fuel pump check valve integral to the fuel pump module may also be at fault.
If no leak is detected, replace fuel pump.

TROUBLESHOOTING
FUEL SYSTEM DIAGNOSTIC FLOW CHART

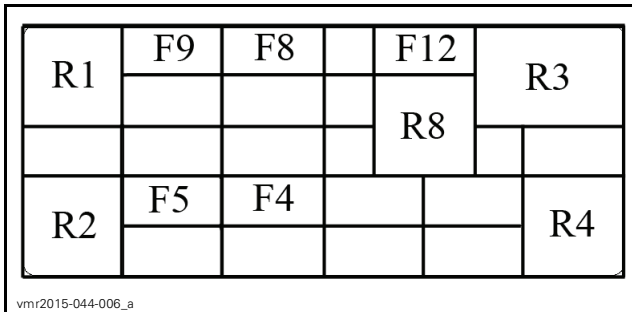


PROCEDURES

FUEL HOSE AND OETIKER CLAMPS

Disconnecting a Fuel Pressure Hose

1. Remove the fuel pump relay (R4) in the front fuse box.



2. Release fuel pressure by running engine until it runs out of fuel.
3. Carefully disconnect the fuel hose fitting from the injector fuel rail by pressing on the release tab of the quick disconnect fitting.

Fuel Hose Replacement

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

⚠ WARNING

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

⚠ WARNING

Whenever removing a hose in the fuel system, always use new Oetiker clamps at assembly. Then validate fuel system tightness by performing a fuel pressure test.

Oetiker Clamp Replacement

REQUIRED TOOL

OETIKER PLIERS
(P/N 295 000 070)



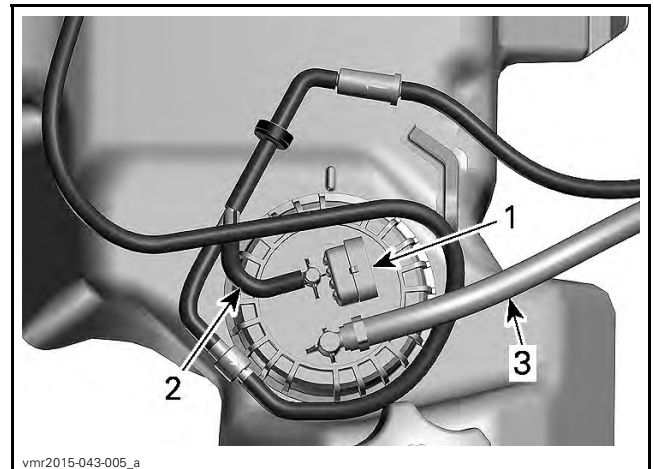
FUEL TANK

Fuel Tank Draining

Remove fuel tank cap and siphon fuel into an approved fuel container.

Fuel Tank Removal

1. Drain fuel tank. Refer to *FUEL TANK DRAINING* in this subsection.
2. Disconnect the fuel pressure hose from the fuel injector fuel rail. Refer to *DISCONNECTING A FUEL PRESSURE HOSE* in *FUEL HOSE AND OETIKER CLAMPS*.
3. Disconnect and remove the battery, refer to *CHARGING SYSTEM* subsection.
4. Remove the rear body module, refer to *BODY* subsection.
5. Reinstall fuel tank cap to prevent foreign objects from entering the fuel tank.
6. Refer to *EXHAUST SYSTEM* and remove the following:
 - Muffler assembly
 - Muffler/exhaust pipe heat shield.
7. Disconnect the following from the fuel pump module:
 - Fuel pump electric connector
 - Fuel system vent hose
 - Fuel pump pressure hose.

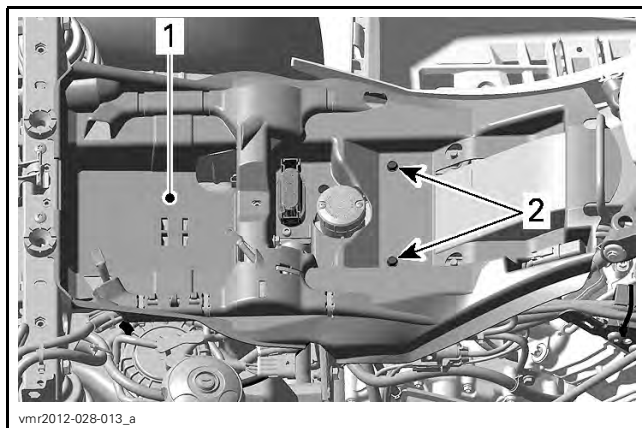


1. Fuel pump connector
2. Vent hose
3. High pressure fuel hose

8. Disconnect the RED (+) battery cable from the starter solenoid.
9. Remove the 2 screws that secure the front of the battery support.

Section 05 FUEL SYSTEM

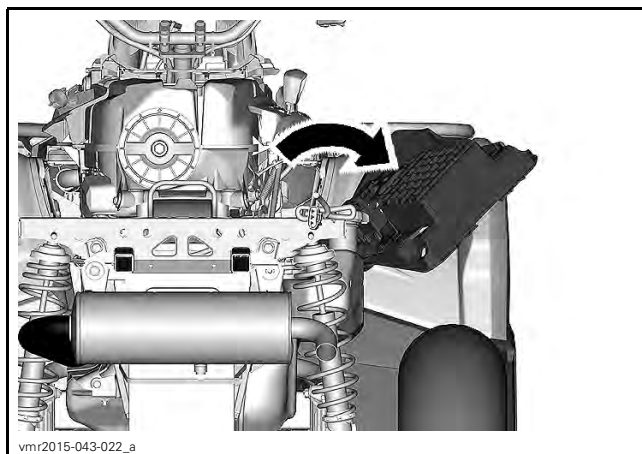
Subsection 04 (FUEL TANK AND FUEL PUMP (570))



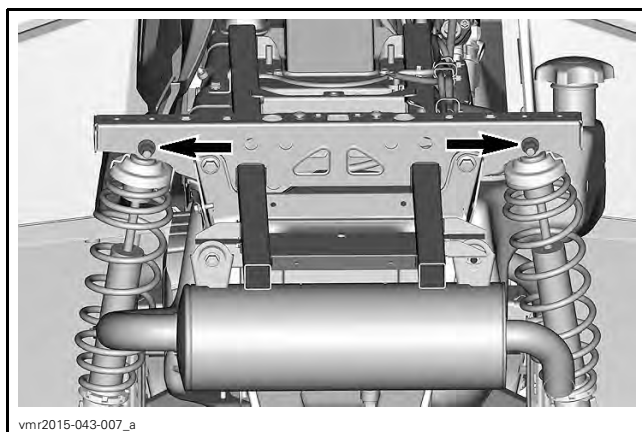
1. Battery support
2. Support retaining screws

NOTE: It is not necessary to remove the wiring harness or other components from the battery support.

10. Flip the battery support over towards the RH side of the vehicle for access to the rear frame extension.



11. Remove the upper mounting bolt from both rear shock absorbers.



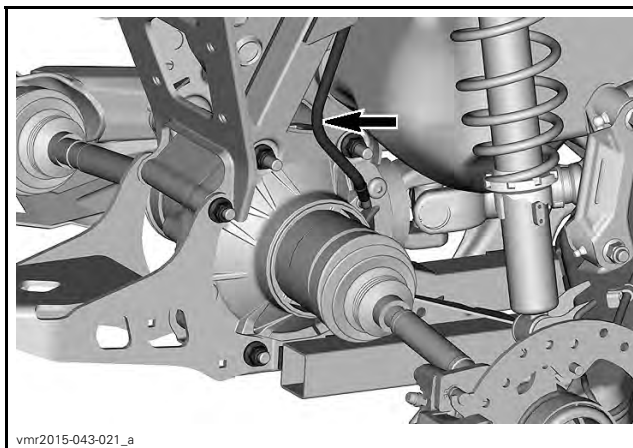
12. Block the front wheels with wheel chocks.

13. Lift back end of vehicle and properly support under the lower rear portion of the frame, near the final drive.

⚠ WARNING

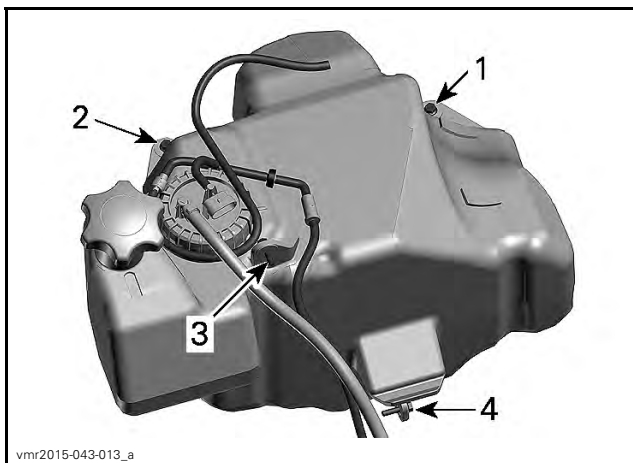
Before working on vehicle, ensure the vehicle is securely supported.

14. Remove vent tube from final drive.



15. Remove fuel tank retaining screws (4).

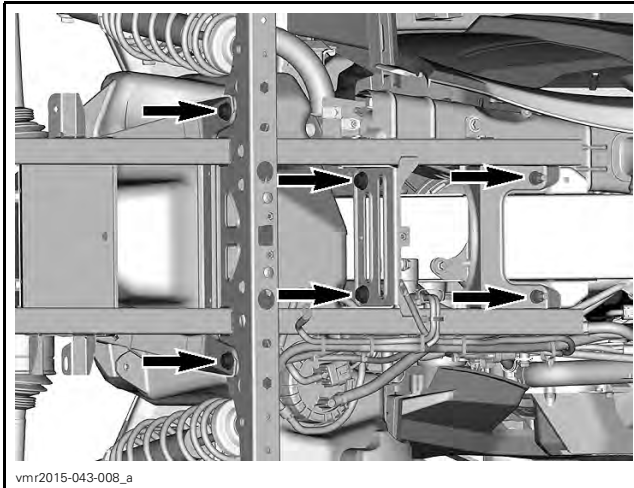
NOTE: Note position of washers and bushings on each screw.



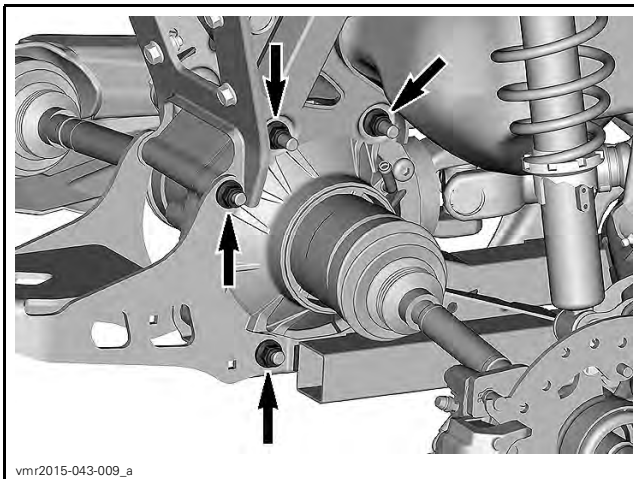
FUEL TANK MOUNTING SCREWS (4)

1. LH rear
2. RH rear
3. Forward top
4. Forward bottom

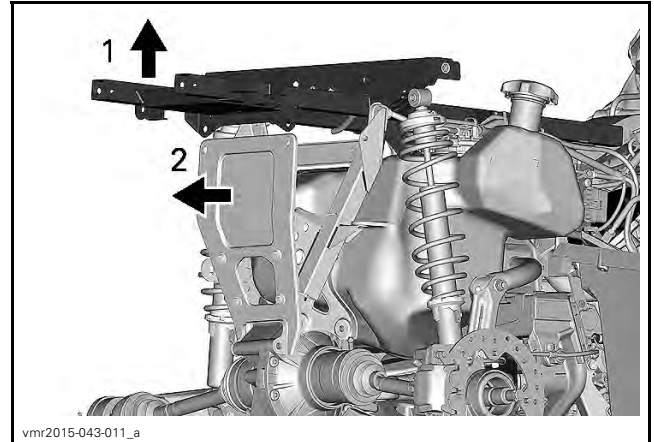
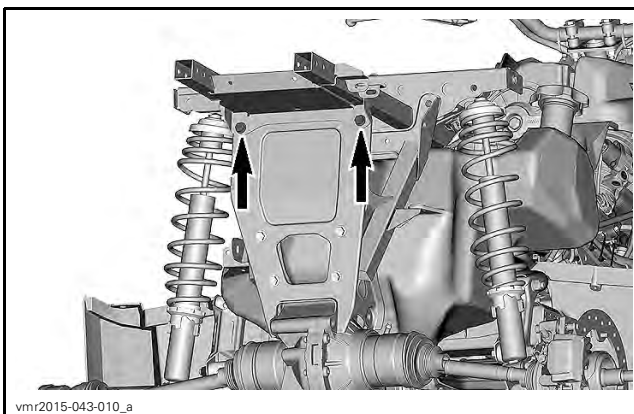
16. Loosen the front 2 nuts and remove the 4 screws retaining the rear frame extension.



17. Remove nuts and screws securing trailer hitch and rear frame support to rear final drive.

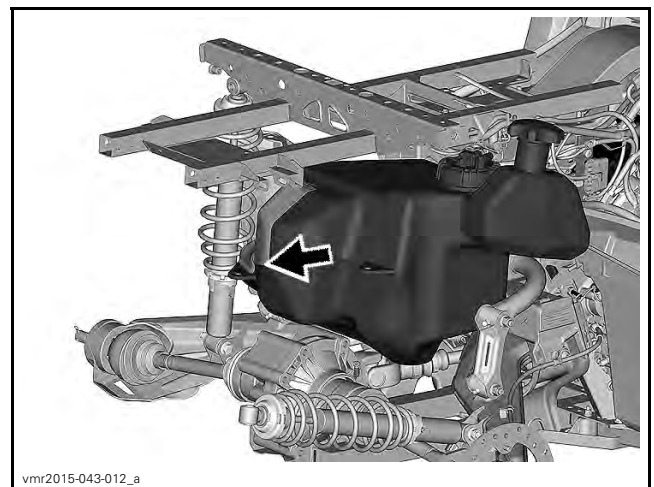


18. Remove 2 nuts and screws securing rear frame support to rear frame section.



19. Lift up on rear frame extension and pull fuel tank out of vehicle.

NOTE: When lifting up on the rear frame extension, the shock absorbers will fall backwards.



Fuel Tank Inspection

Inspect fuel tank for any damages or cracks which may result in fuel leaks.

Inspect fuel tank and fuel tank protector on frame for damages.

Inspect protector for damages.

If cracks, gouges or other damages which may lead to a fuel leak, or damages to attachment points that could prevent the tank from being secure are found, replace fuel tank.

Fuel Tank Installation

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

Install a bushing on each fuel tank mounting screw. The bushing inserts within the fuel tank screw hole cavity.

Section 05 FUEL SYSTEM

Subsection 04 (FUEL TANK AND FUEL PUMP (570))

Be sure to install the washers between the fuel tank and the fastener as noted at removal.

Install **all** fuel tank fasteners loosely.

NOTICE The fuel tank fasteners must not be tightened to specified torque until complete assembly in vehicle.

Install all frame component fasteners loosely, then apply torque as specified in the *FRAME* subsection.

Apply specified torque to fuel tank retaining screws.

TIGHTENING TORQUE	
Fuel tank retaining screws	6.5 N•m ± 0.5 N•m (58 lbf•in ± 4 lbf•in)

Be sure to properly connect and route:

- Fuel tank vent tube
- Fuel pump pressure hose
- Electrical connectors.

Refuel tank and ensure there are no leaks by performing a *FUEL TANK LEAK TEST* and a *FUEL PUMP PRESSURE TEST* as described in this subsection.

FUEL PUMP

Fuel Pump Pressure Test

Refer to *INSPECTION* in this subsection.

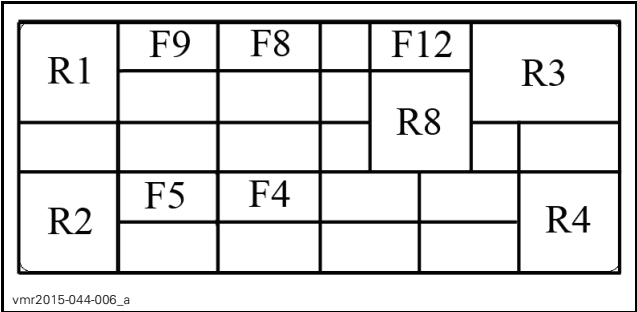
Fuel Pump Quick Test

1. Turn ignition key to ON.
2. Listen for fuel pump operation.

NOTE: Fuel pump should come ON for a few seconds, then stop.

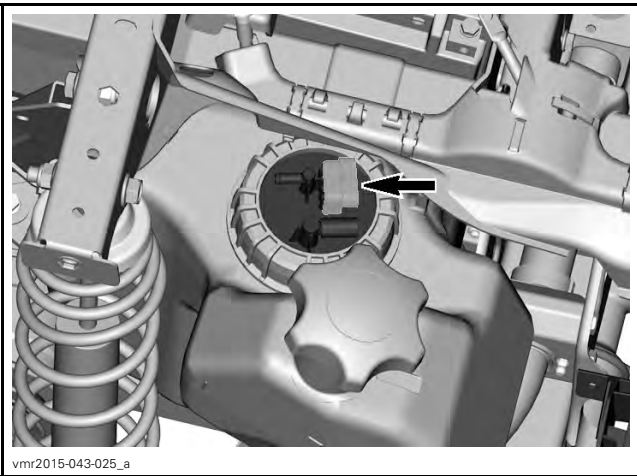
If fuel pump does not come ON, carry out the following:

- Check fuel pump relay fuse (F5) and fuel pump relay (R4).
- Check in B.U.D.S. for applicable fault codes. Refer to *COMMUNICATION TOOLS AND B.U.D.S.* subsection.
- Carry out a fuel pump input voltage test.



Fuel Pump Connector Access

Remove rear body module. Refer to *BODY* subsection.



Fuel Pump Input Voltage Test

1. Disconnect the fuel pump connector.
2. Turn ignition key ON.
3. Read voltage as follows.

NOTE: The fuel pump voltage will be read only when the fuel pump is activated.

REQUIRED TOOLS	
FLUKE 115 MULTIMETER (P/N 529 035 868)	
FLUKE RIGID BACK PROBE (P/N TP88)	

FUEL PUMP INPUT VOLTAGE TEST		
TEST PROBES		VOLTAGE READING
Fuel pump connector Pin 3	Fuel pump connector Pin 4	Battery voltage

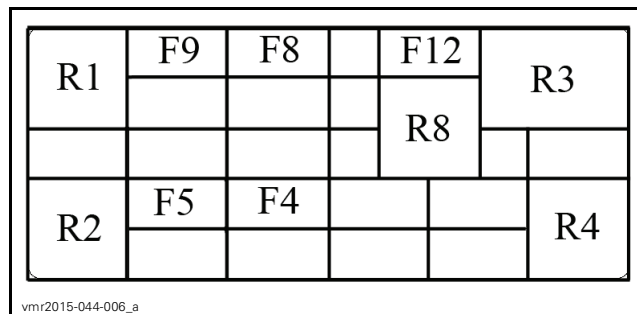
If battery voltage is read, carry out a fuel pump resistance test.

Subsection 04 (FUEL TANK AND FUEL PUMP (570))

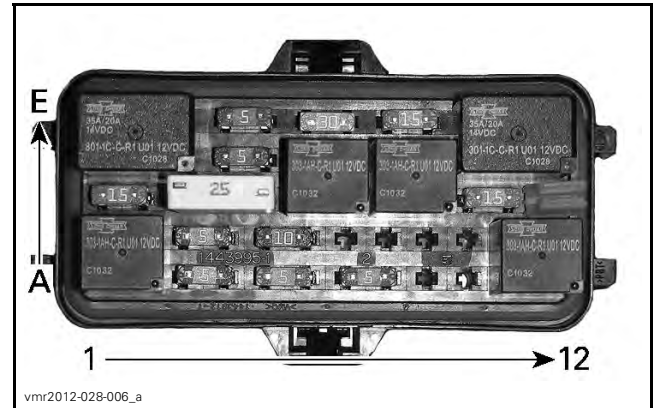
FUEL PUMP POWER WIRE TEST		
TEST PROBES		VOLTAGE READING
Fuel pump connector Pin 3	Battery ground	Battery voltage

- If battery voltage is still not read, check fuel pump:
- Fuse (F5)
- Fuel pump relay (R4)
- Fuel pump relay input voltage (control and power circuits)
- Fuel pump relay control circuit continuity to ECM-J1
- Fuel pump power circuit
- Wiring and connectors.

1. Ensure fuel pump connector is properly connected.
2. Remove fuel pump relay (R4).



FUEL PUMP RESISTANCE TEST (AT FUSE BOX)		
TEST PROBES		RESISTANCE Ω @ 20°C (68°F)
Fuse box contact B12	Battery ground	Approximately 2 Ω



If resistance test failed, disconnect fuel pump connector and measure resistance at fuel pump connector.

FUEL PUMP RESISTANCE TEST (AT FUEL PUMP CONNECTOR)	
Pins 3 and 4	Approximately 2 Ω

- Fuse box to fuel pump
- Fuel pump to battery ground.

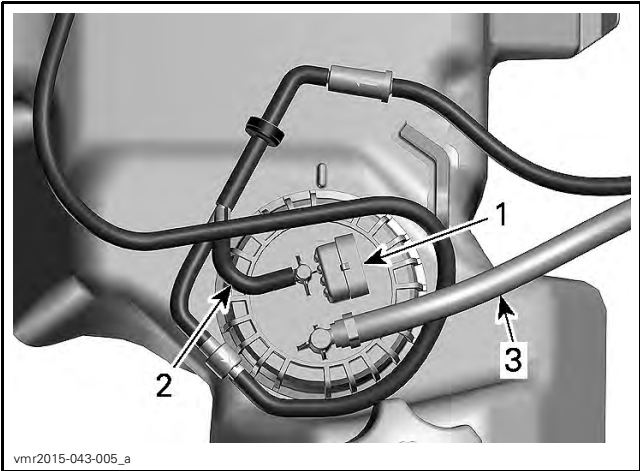
Repair or replace as necessary.

Remove rear body module, refer to *BODY* subsection.

Refer to *DISCONNECTING A FUEL PRESSURE HOSE* in this subsection.

1. Release the pressure of the fuel system.
2. Disconnect the following from the fuel pump:
 - Fuel pump electric connector
 - Fuel system vent hose
 - Fuel pump pressure hose.

Section 05 FUEL SYSTEM
Subsection 04 (FUEL TANK AND FUEL PUMP (570))



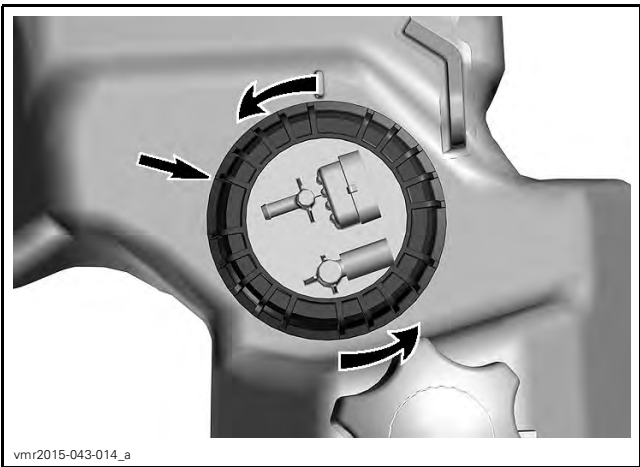
1. Fuel pump connector
2. Vent hose
3. High pressure fuel hose

3. Remove fuel pump retaining nut.

WARNING
Fuel vapors are flammable and explosive under certain conditions. Use only non-sparking tools.

NOTICE Replace fuel pump gasket whenever fuel pump retaining nut is loosened.

REQUIRED TOOL	
FUEL PUMP NUT TOOL (P/N 529 035 899)	



4. Carefully pull out and rotate fuel pump as required.

NOTICE Pay attention not to damage fuel sender and fuel pump prefilter.

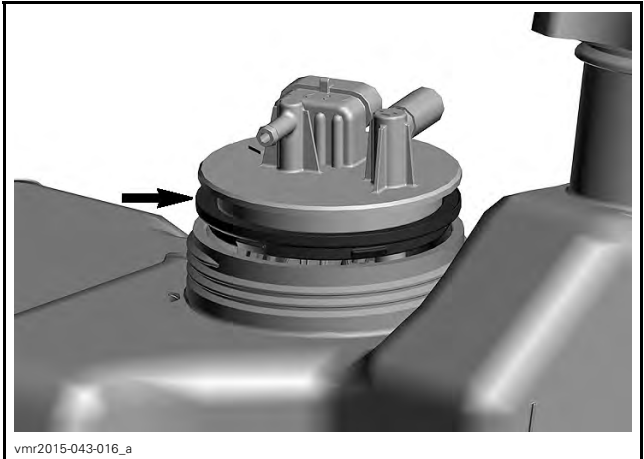
5. Discard gasket ring.
6. Wipe off any fuel spillage.

Fuel Pump Installation

The installation is the reverse of the removal procedure. However, pay attention to the following: Rotate fuel pump during insertion as per removal procedure.

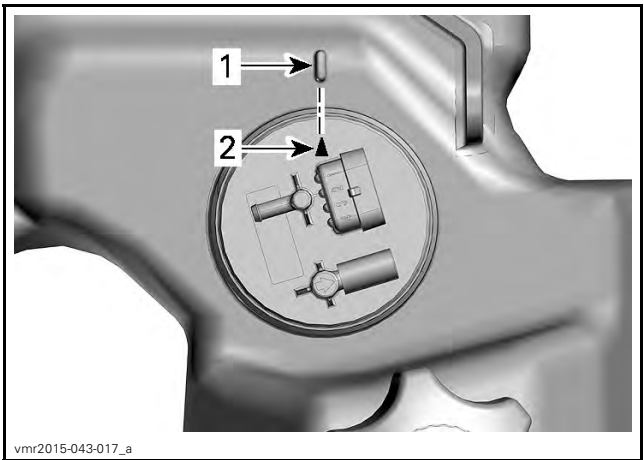
NOTICE Pay attention not to damage fuel sender and fuel pump prefilter.

1. Install a **NEW** gasket ring.
2. Place gasket so that it is properly located between fuel pump and fuel pump mounting neck on fuel tank.



NOTICE Ensure gasket ring makes good contact all around fuel pump and fuel pump mounting neck on fuel tank.

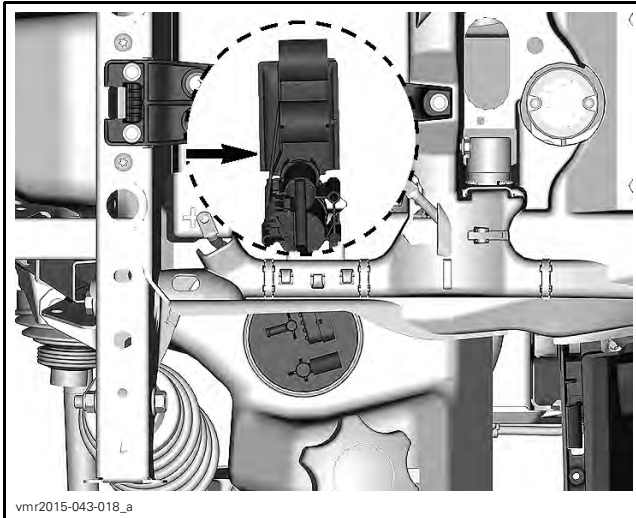
3. Ensure proper fuel pump orientation as in following illustration.



1. Fuel tank pump index
2. Fuel pump index

Section 05 FUEL SYSTEM

Subsection 04 (FUEL TANK AND FUEL PUMP (570))

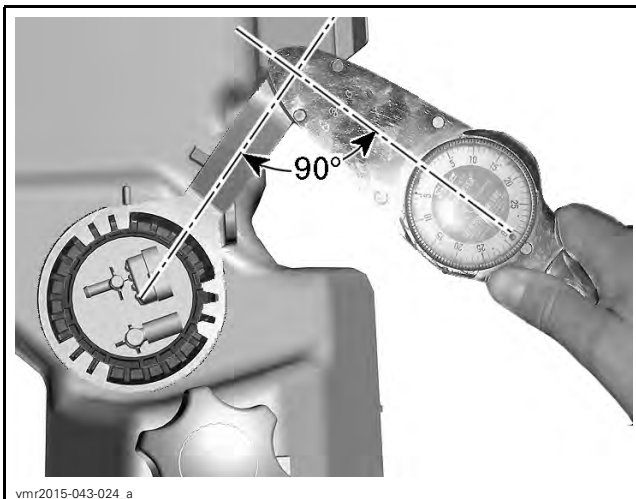


ALIGNMENT OF FUEL PUMP IN TANK

4. Insert fuel pump retaining nut over the fuel pressure hose and electrical wiring connector.
5. While firmly holding pump against tank, engage fuel pump retaining nut on fuel tank flange.

NOTE: If necessary, move the pump in order to ensure the flange is sitting completely flat on the tank.

6. Tighten fuel pump retaining nut to specification.
 - 6.1 Ensure pump locking ring is fully engaged.
 - 6.2 To apply the proper torque to the fuel pump retaining nut, install the fuel pump nut tool on a torque wrench with it's handle perpendicularly (90°) to the torque wrench.
 - 6.3 Ensure pump is properly aligned with index marks after nut it tightened to specification.



TORQUE WRENCH PERPENDICULAR TO TOOL HANDLE

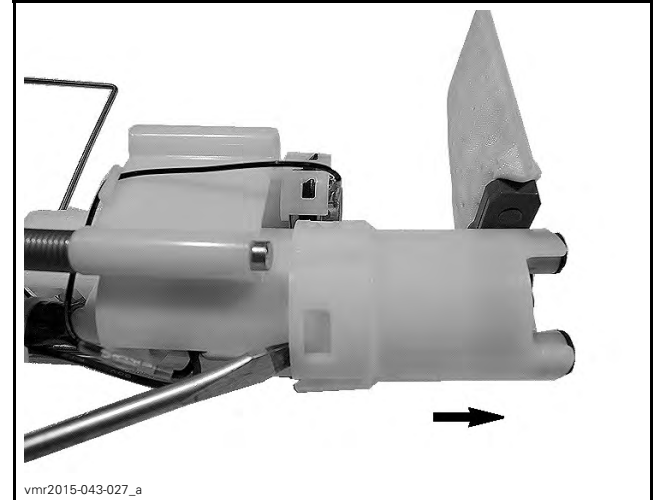
TIGHTENING TORQUE	
Fuel pump retaining nut	29 N•m ± 1 N•m (21 lbf•ft ± 1 lbf•ft)

7. Install fuel pressure hose on fuel pump using a **NEW** Oetiker clamp.
8. Install fuel vent tube on fuel pump.
9. Install electrical connector on fuel pump.
10. Install fuel pump relay (R4).
11. Refuel tank and ensure there are no leaks by performing a *FUEL TANK LEAK TEST* and a *FUEL PUMP PRESSURE TEST* as described in this subsection.
12. Check fuel level sender operation.

FUEL PUMP PRE-FILTER (STRAINER)

Fuel Pump Pre-filter Replacement

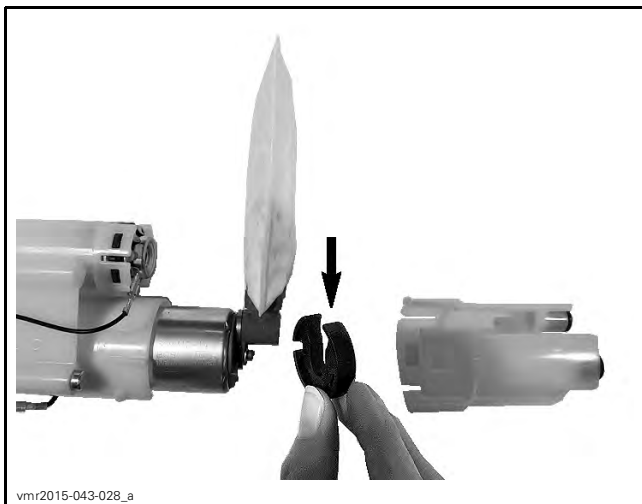
1. Remove *FUEL PUMP*, see *FUEL PUMP REMOVAL* in this subsection.
2. Unlock 3 tabs on strainer plastic ring.



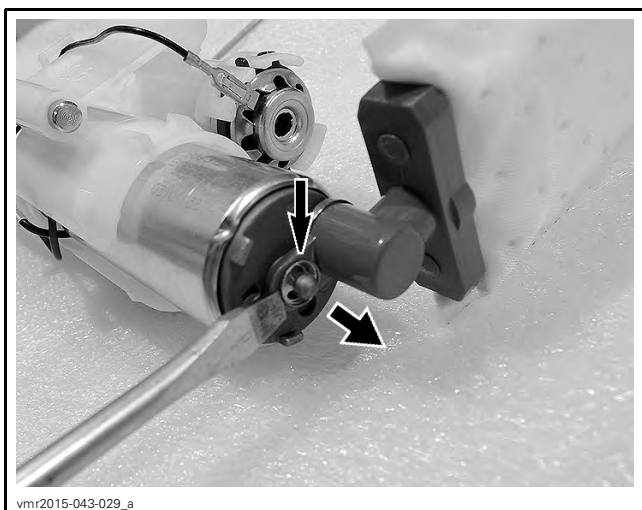
3. Remove rubber pad.

Section 05 FUEL SYSTEM

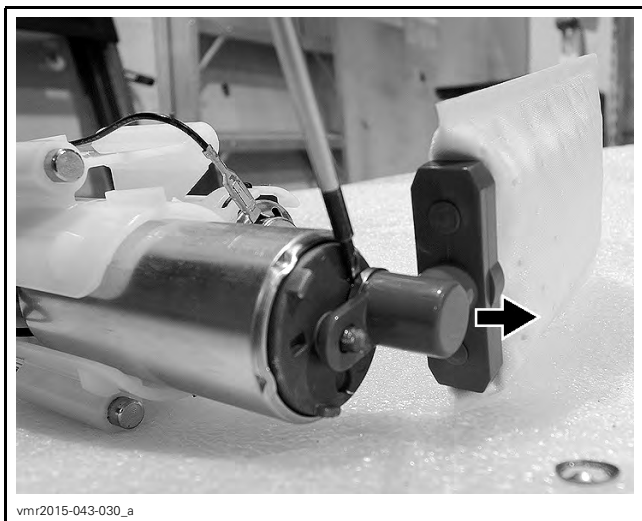
Subsection 04 (FUEL TANK AND FUEL PUMP (570))



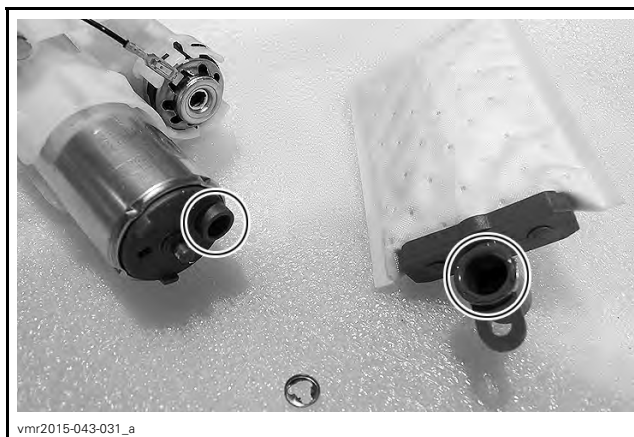
4. Remove push nut securing strainer to fuel pump. Be careful not to break the assembly locator pin.



5. Pull strainer off fuel pump.



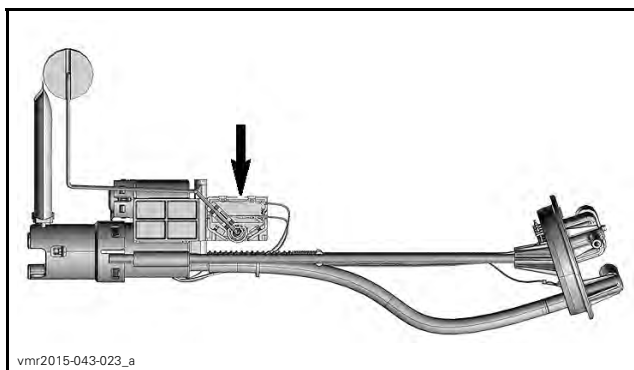
6. Lubricate assembly area of new strainer and fuel pump with O-ring lubricant or clean oil



7. Insert the new strainer on fuel pump making sure to press it in tightly against the fuel pump surface.
8. Using a small nut socket, press in a **NEW** push nut to secure strainer.
9. Reinstall remaining removed parts.

FUEL LEVEL SENDER

The fuel level sender is a float actuated variable resistance type that is part of the fuel pump.

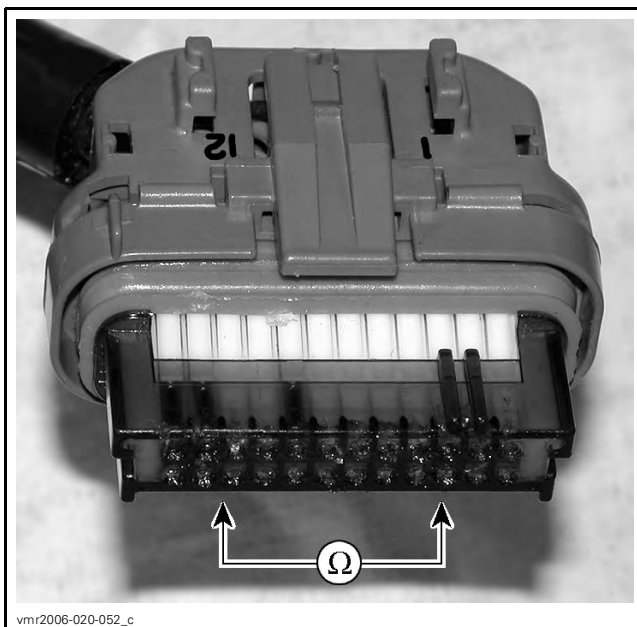


FUEL LEVEL SENDER

Fuel Level Sender Resistance Test (Fuel Pump Module Installed)

1. Disconnect multifunction gauge, refer to the *LIGHTS/GAUGE/ACCESSORIES* subsection.
2. Using a multimeter, measure the resistance of the fuel level sender as follows.

FUEL LEVEL SENDER RESISTANCE TEST		
FUEL LEVEL	GAUGE CONNECTOR	RESISTANCE Ω @ 20°C (68°F)
Full	Pins 4 and 21	5 $\Omega \pm 1$
Empty		100 $\Omega \pm 5$



If readings are out of specification, refer to *FUEL LEVEL SENDER RESISTANCE TEST (AT FUEL PUMP CONNECTOR)*.

If readings are as specified, refer to *FUEL LEVEL SENDER INPUT VOLTAGE TEST*.

Fuel Level Sender Resistance Test (at Fuel Pump Connector)

FUEL LEVEL SENDER RESISTANCE TEST		
FUEL LEVEL	FUEL PUMP CONNECTOR	RESISTANCE Ω @ 20°C (68°F)
Full	Pins 1 and 2	5 $\Omega \pm 1$
Empty		100 $\Omega \pm 5$

If resistance test at fuel pump connector is failed, replace fuel pump module.

Fuel Level Sender Input Voltage Test

- Set ignition switch to ON.
- Disconnect fuel pump connector, refer to *FUEL PUMP CONNECTOR ACCESS* in this subsection.
- Using a multimeter, measure input voltage as follows.

FUEL LEVEL SENDER INPUT VOLTAGE TEST		
FUEL PUMP CONNECTOR	BATTERY	VOLTAGE
Pin 2	Negative terminal	5V

TEST RESULT	SERVICE ACTION
5V is not read	Test wiring continuity between fuel level sender and multifunction gauge
Wiring continuity is good	Replace multifunction gauge
Wiring continuity is not obtained	Repair or replace wiring

Fuel Level Sender Replacement

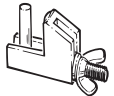
Replace fuel pump. Refer to *FUEL PUMP* in this subsection.

FUEL TANK VENT VALVES

Fuel Tank Vent Valve Test

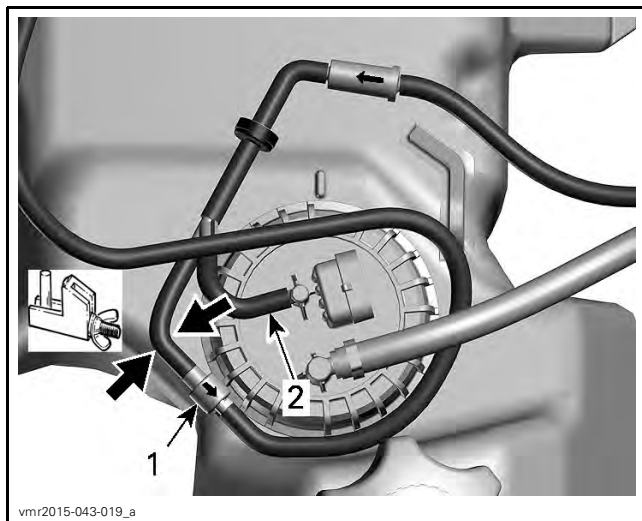
Inlet Check Valve Test

- Remove rear body module, refer to *BODY* subsection.
- Remove multifunction gauge for access to the vent system inlet hose, refer to the *LIGHTS/GAUGE/ACCESSORIES* subsection.
- Install a small hose pincher between the vent pressure relief valve and the fuel pump vent inlet.

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

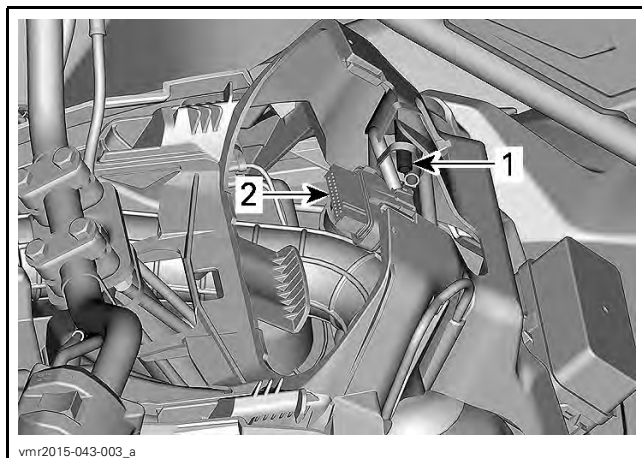
Section 05 FUEL SYSTEM

Subsection 04 (FUEL TANK AND FUEL PUMP (570))



1. Pressure relief valve
2. Fuel pump vent inlet

4. Connect the vacuum/pressure pump to the fuel tank vent hose inlet.



1. Fuel tank vent hose inlet
2. Gauge connector

5. Remove fuel tank cap.

6. Set vacuum/pressure pump to **PRESSURE** and activate pump. The gauge on the pump **should not change in reading**.

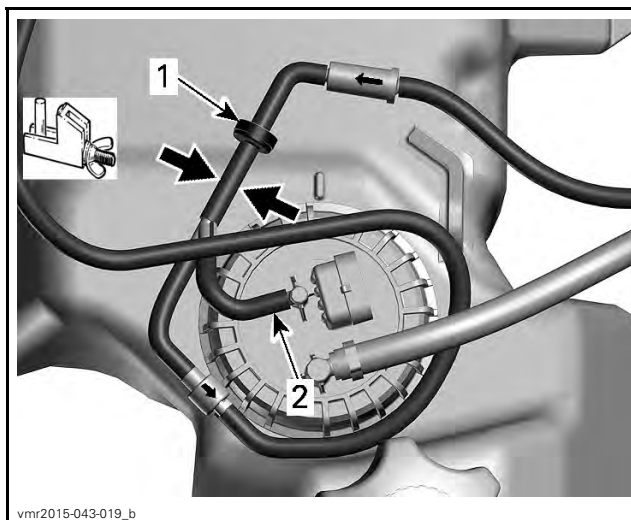
7. Set vacuum/pressure pump to **VACUUM** and activate pump. The **gauge should increase in reading**.

If the test failed, carry out the following:

- Ensure breather filter is properly installed, refer to *PERIODIC MAINTENANCE PROCEDURES*.
- Ensure inlet check valve is properly installed, refer to *FUEL TANK VENT VALVE INSTALLATION* in this subsection.
- Test inlet check valve separately. If good, replace the breather filter, refer to *PERIODIC MAINTENANCE PROCEDURES*.

Pressure Relief Valve Test

1. Install the small hose pincher between the inlet check valve and the fuel pump vent inlet fitting.



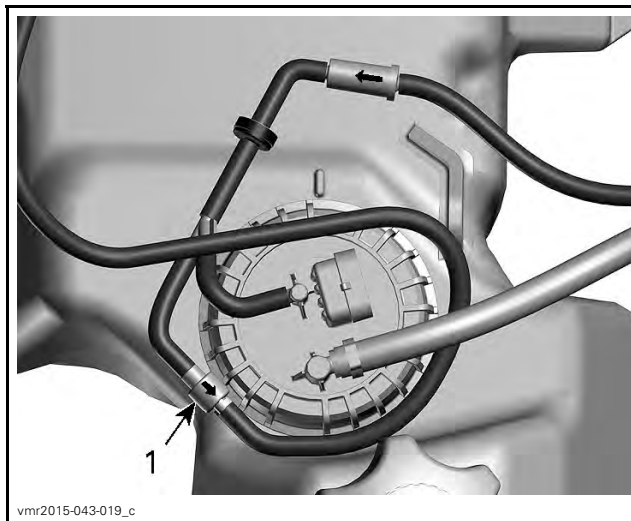
1. Inlet check valve
2. Fuel pump vent inlet fitting

2. Set vacuum/pressure pump to **PRESSURE** and activate pump. The **gauge should increase in reading**.

3. Set vacuum/pressure pump to **VACUUM** and activate pump. The gauge on the pump **should not change in reading**.

If the test failed, carry out the following:

- Ensure pressure relief valve is properly installed, refer to *PRESSURE RELIEF VALVE INSTALLATION* in this subsection.
- Replace pressure relief valve if it fails the test.

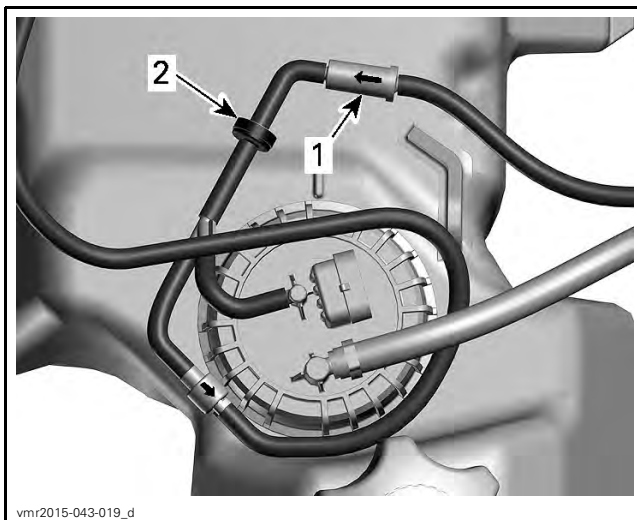


1. Pressure relief valve flow direction arrow

Fuel Tank Vent Valve Installation

Inlet Check Valve Installation

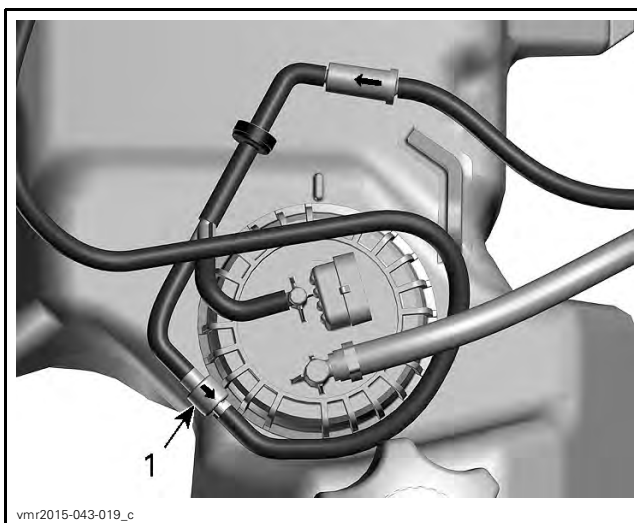
Ensure white portion of inlet check valve is towards the vent breather filter.



1. Vent breather filter
2. White portion of inlet check valve

Pressure Relief Valve Installation

Ensure pressure relief valve flow arrow is pointing away from fuel pump vent fitting.



1. Pressure relief valve flow direction arrow

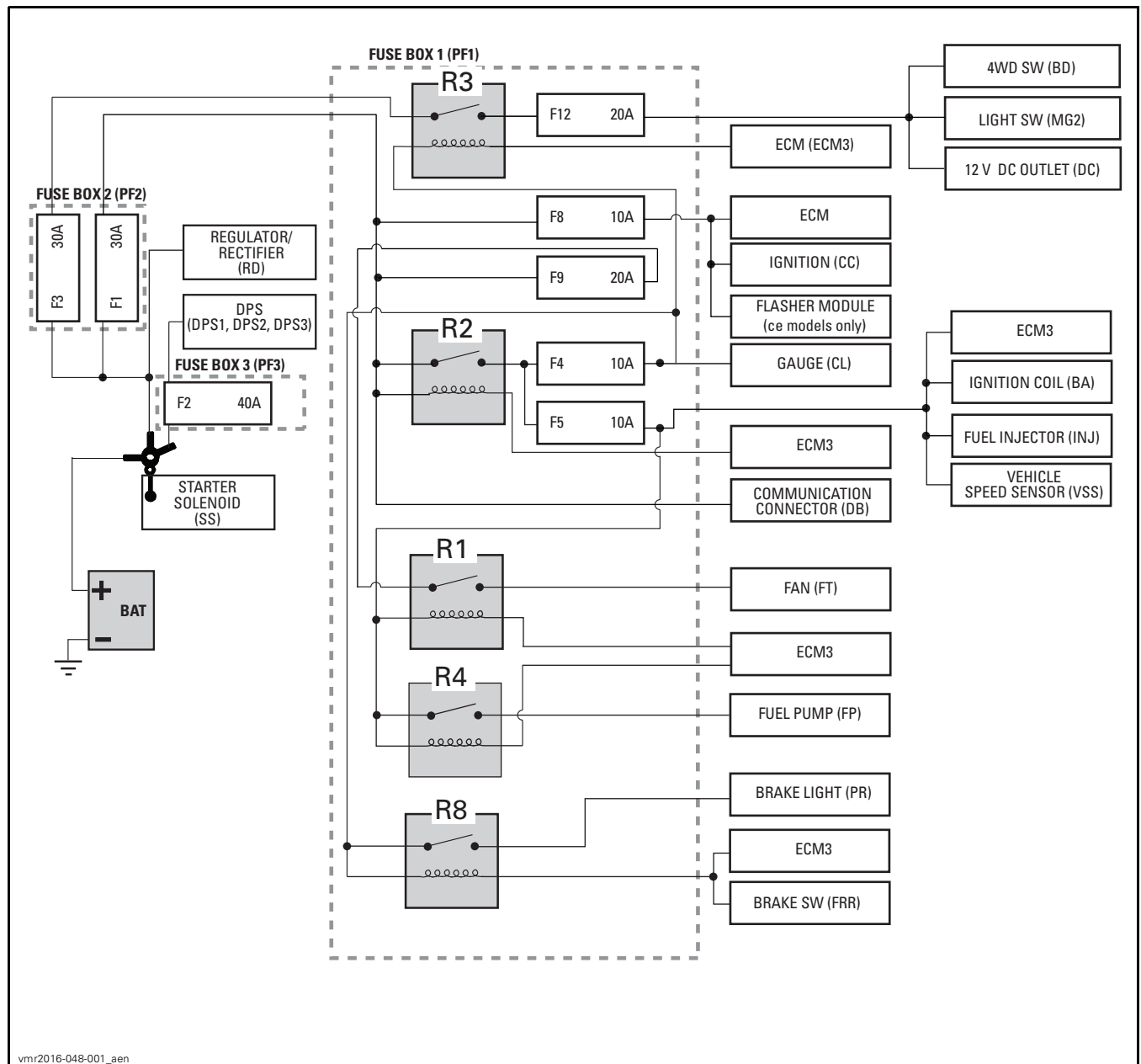
POWER DISTRIBUTION AND GROUNDS

SERVICE TOOLS

Description	Part Number	Page
FLUKE 115 MULTIMETER	529 035 868	280

GENERAL

POWER DISTRIBUTION DIAGRAM



Refer to *WIRING HARNESS AND CONNECTORS* for wiring harness layout and component locations.

Section 06 ELECTRICAL SYSTEM

Subsection 01 (POWER DISTRIBUTION AND GROUNDS)

FUSE BOX 1



R1	F9	F8		F12	R3
				R8	
R2	F5	F4			R4

RELAY IDENTIFICATION	
RELAY STATE (ON)	RELAY STATE (OFF)
R1 (Cooling Fan)	
See <i>COOLING SYSTEM</i>	
R2 (Main)	
When ignition key is turned ON AND Run/Stop switch is set to RUN	Approximately 30 seconds after ignition key is turned OFF
R3 (Accessories)	
Same as main relay	When ignition key is turned OFF OR When engine speed is less than 1000 RPM for at least 50 minutes
R4 (Fuel Pump)	
See <i>FUEL TANK AND FUEL PUMP</i>	
R8 (Brake Lights)	
See <i>BRAKES</i>	

FUSE IDENTIFICATION			RATING
Fuse	4	Speedo / Relay	10 A
	5	Injector(s) / Ignition / Fuel Pump	10 A
	8	Key Switch / Starter Solenoid	10 A
	9	Cooling Fan	20 A
	12	DC Out. / Lights / Acc.	20 A

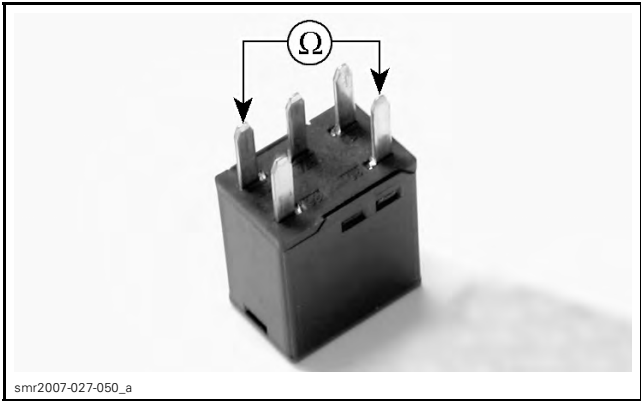
RELAY CONTINUITY TEST

1. Remove relay.
2. Set multimeter to Ω .

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

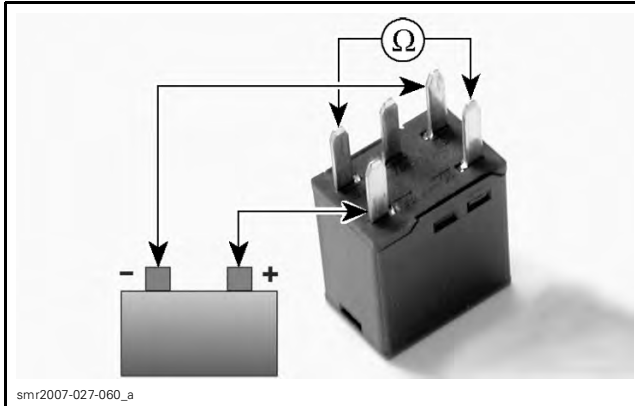
3. Probe relay as follows.

TERMINAL		RESISTANCE
30	87	Open circuit (OL)



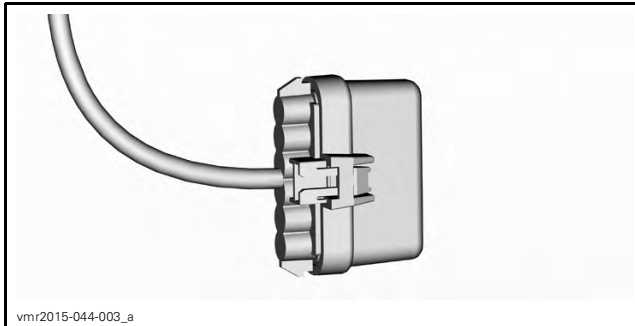
4. Connect battery as shown and probe relay again as follows.

TERMINAL		RESISTANCE
30	87	0.5 Ω max. (continuity)



If relay failed any test, replace it.

FUSE BOX 2 (PF2)



FUSE IDENTIFICATION			
Fuse	1	Main	30 A
	-	Spare	30 A
	3	Fan / Accessories	30 A

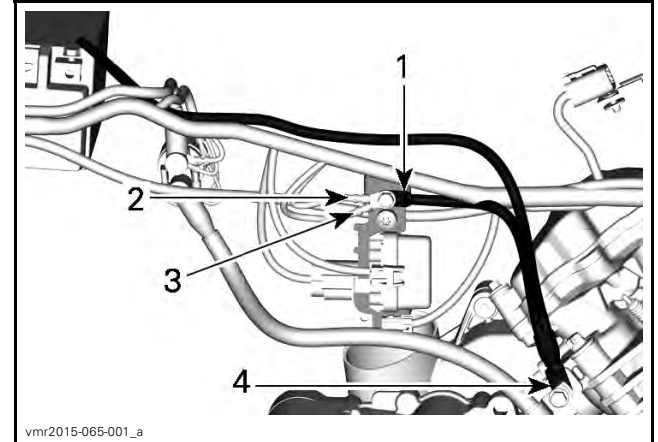
FUSE BOX 3 (PF3)



FUSE IDENTIFICATION			
Fuse	2	DPS	40 A

GROUNDS

All grounds are grouped at the same location on RH side of frame.



RH SIDE

1. Battery ground
2. Harness ground (BN1)
3. BN2
4. Engine ground

WIRING HARNESS AND CONNECTORS

SERVICE TOOLS

Description	Part Number	Page
CRIMPING TOOL (HEAVY GAUGE WIRE)	529 035 730	541
ECM ADAPTER TOOL.....	529 036 166	539
ECM TERMINAL REMOVER 2.25.....	529 036 175	539
ECM TERMINAL REMOVER 3.36.....	529 036 174	539

SERVICE TOOLS – OTHER SUPPLIER

Description	Part Number	Page
GM TERMINAL EXTRACTOR.....	12094430	540
SNAP-ON TERMINAL REMOVER TOOL	TT600-4	536

Section 06 ELECTRICAL SYSTEM

Subsection 02 (WIRING HARNESS AND CONNECTORS)

GENERAL

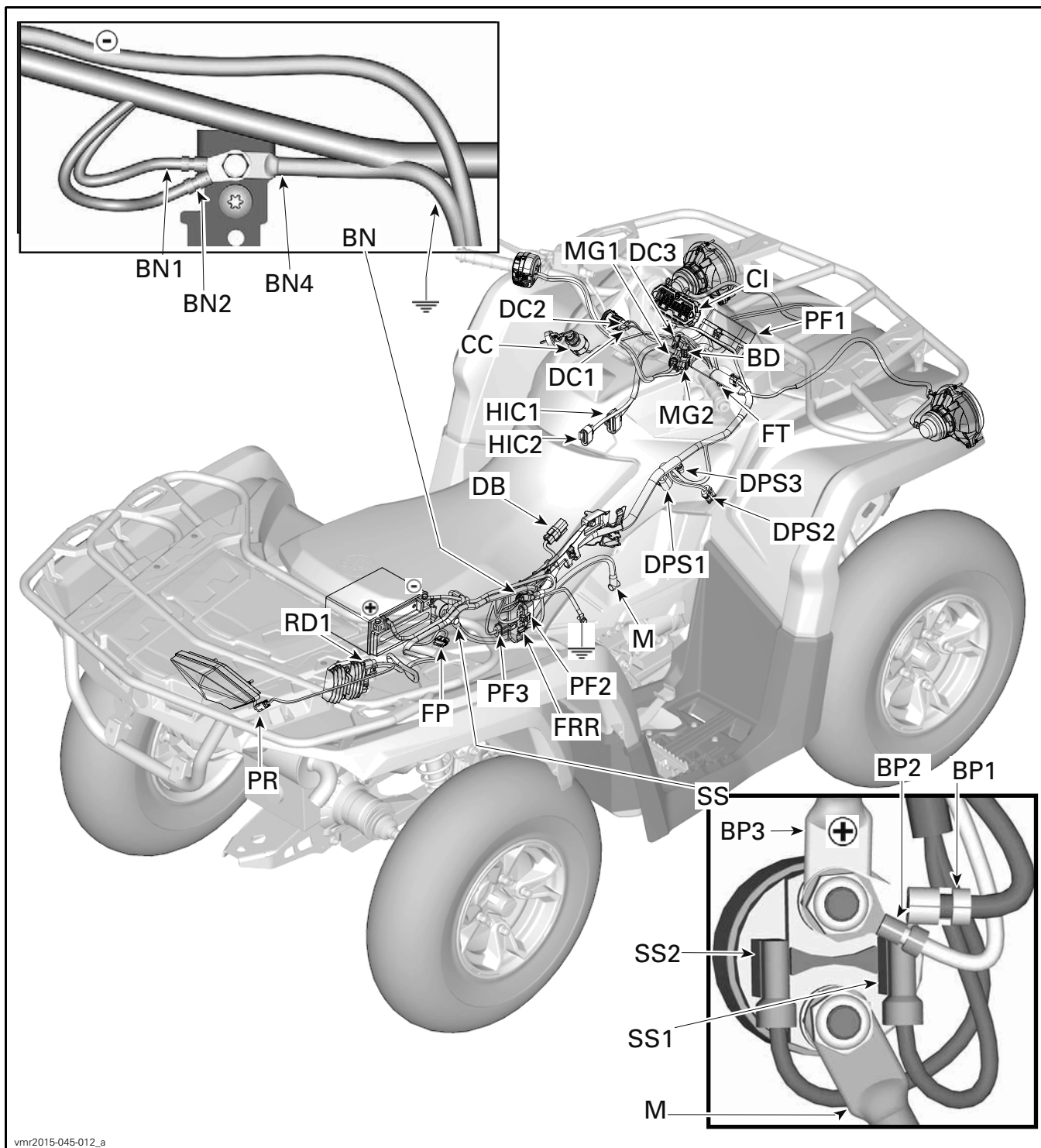
The illustrations in this subsection are typical. Several variants of the connector types, such as different number of pin cavities, are used on the vehicle.

CONNECTOR ABBREVIATION DESCRIPTION

ABBREVIATION	DESCRIPTION
BD	RH multifunction switch
BN1	Ground terminal
BN2	Ground terminal
BN4	Ground terminal
BP1	Positive terminal
BP2	Positive terminal (DPS model only)
BP3	Positive terminal
RFF	RH front turn light
LFF	LH front turn light
RRF	RH rear turn light
LRF	LH rear turn light
CC	Ignition switch
CL	Cluster
CAD	Rear RH turn light
CAG	Rear LH turn light
DB	Diagnostic connector
DC1	Accessory outlet
DC2	Accessory outlet
DC3	Accessory outlet
DPS1	Dynamic power steering
DPS2	Dynamic power steering
DPS3	Dynamic power steering
FP	Fuel pump
FRR	Rear brake light switch
FT	Cooling fan
HIC1‡	Harness interconnect 1
HIC2‡	Harness interconnect 2
HICa	Harness interconnect
KX1	Horn
KX2	Horn

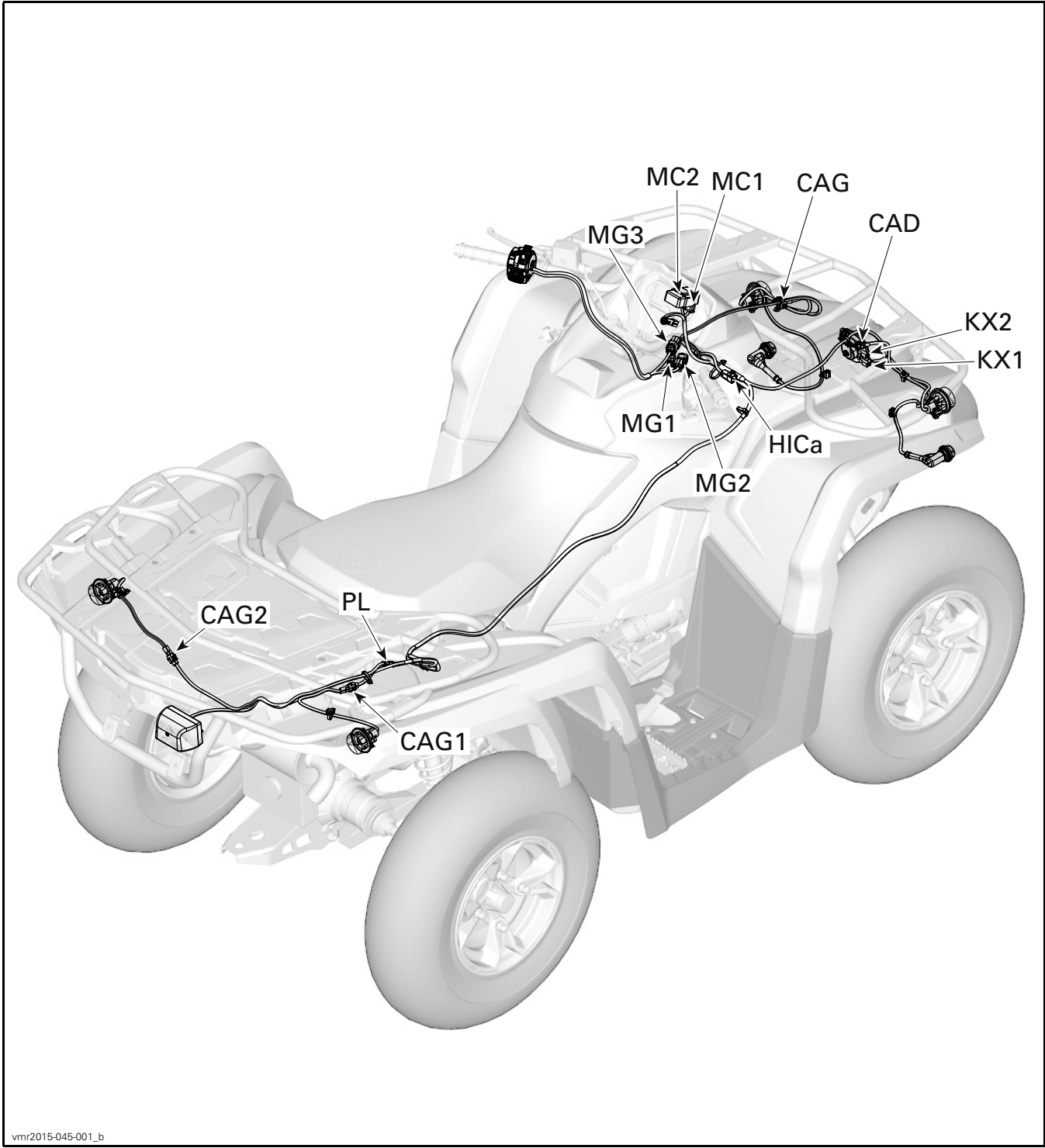
ABBREVIATION	DESCRIPTION
M	Starter positive terminal
MC1	Turn light relay
MC2	Turn light relay
MD	4WD actuator
MG1	LH multifunction switch
MG2	LH multifunction switch
MG3	LH multifunction switch
PF1	Front Fuse box
PF2	Rear fuse holder (main and accessories)
PF3	Rear fuse holder (DPS)
PG	LH headlight
PD	RH headlight
LL	License plate light
RPL	RH marker light
LPL	LH marker light
PR	Park/Brake light
RD	Voltage regulator/rectifier
SS1	Starter solenoid
SS2	Starter solenoid
‡ Refer to applicable <i>EMS</i> subsection for powertrain harness.	

WIRING HARNESS ARRANGEMENT



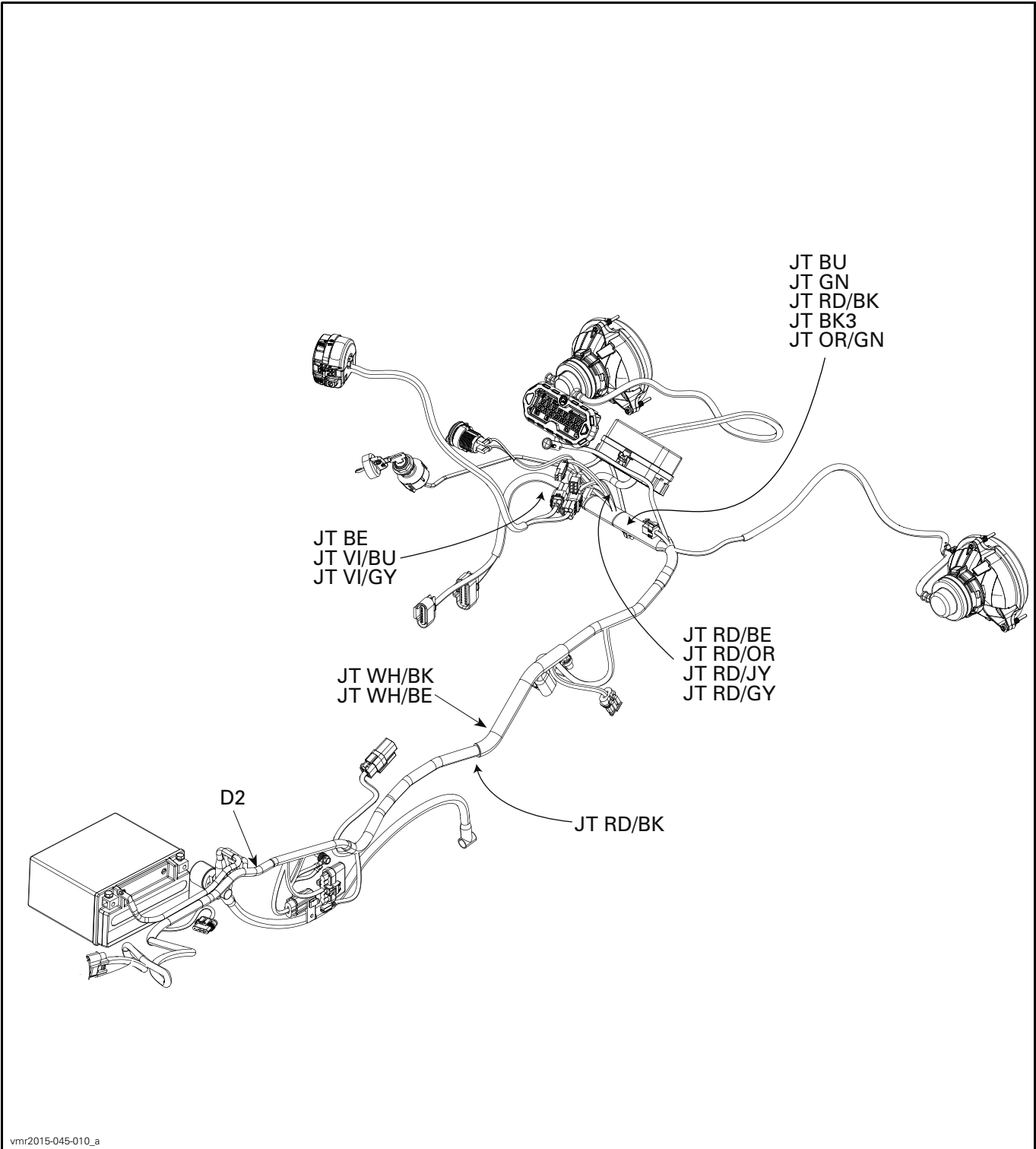
Section 06 ELECTRICAL SYSTEM
Subsection 02 (WIRING HARNESS AND CONNECTORS)

CE models



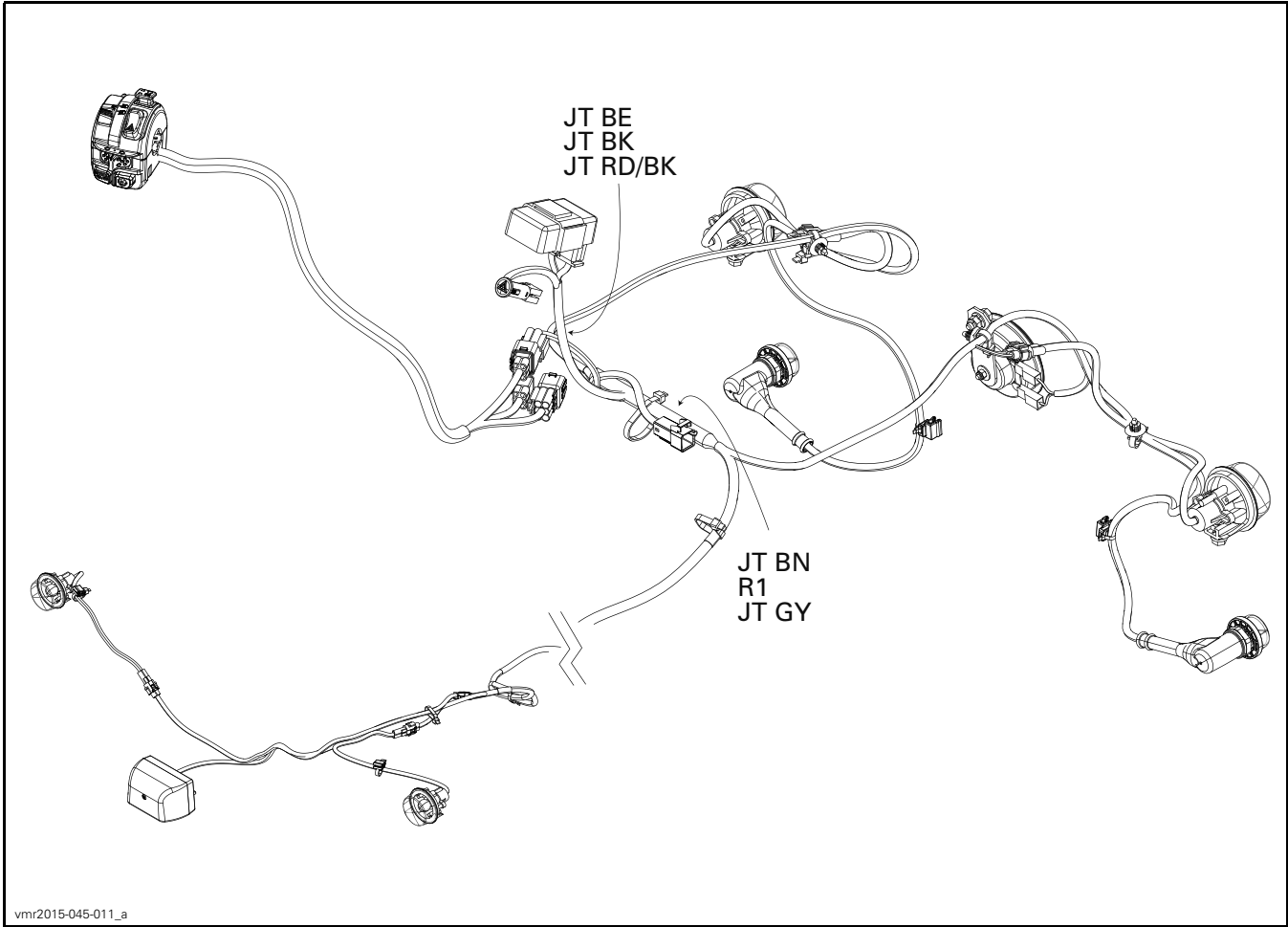
vmr2015-045-001_b

DIODE AND JOINT TERMINAL LOCATIONS



Section 06 ELECTRICAL SYSTEM
Subsection 02 (WIRING HARNESS AND CONNECTORS)

CE models



PROCEDURES

DEUTSCH CONNECTORS

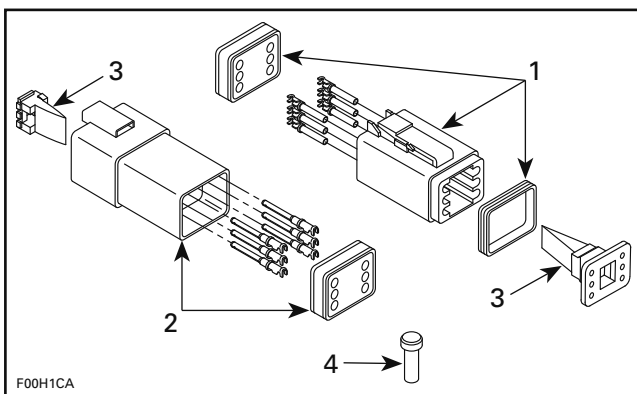
Deutsch Connector Application

A variety of Deutsch connectors are used on various systems:

- Diagnostic connector
- Vehicle speed sensor (VSS) connector.

The following procedures may be used on each as they are similar in construction.

Deutsch Connector Disassembly and Reassembly



TYPICAL —DEUTSCH CONNECTOR

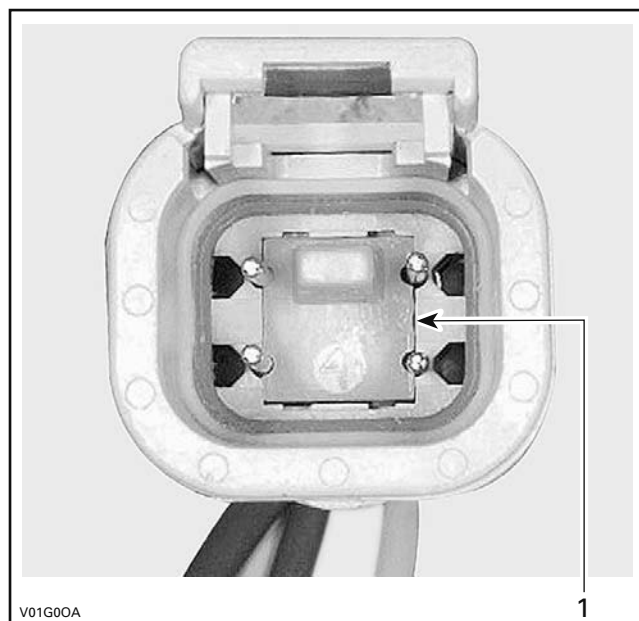
1. Male connector
2. Female connector
3. Secondary lock
4. Sealing cap

NOTICE Do not apply dielectric grease on terminal inside connector.

Terminal Removal

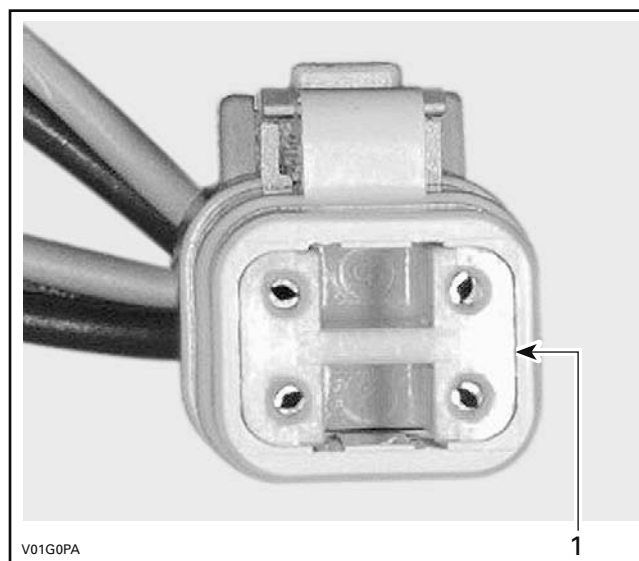
To remove terminals from connector, proceed as follows:

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



TYPICAL — FEMALE CONNECTOR

1. Female lock

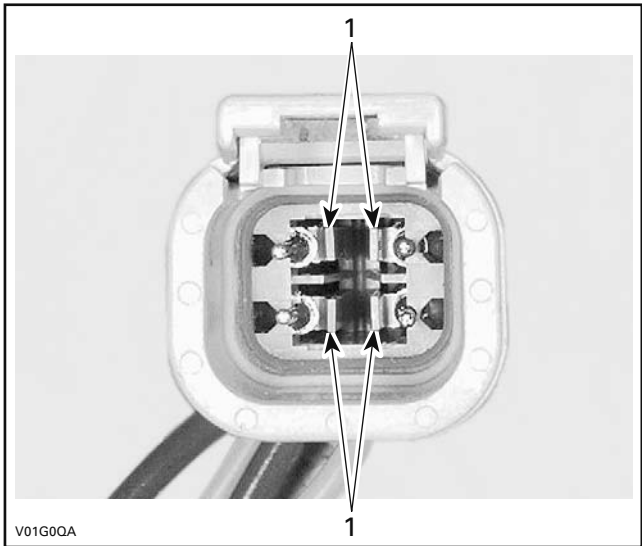


TYPICAL — MALE CONNECTOR

1. Male lock

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

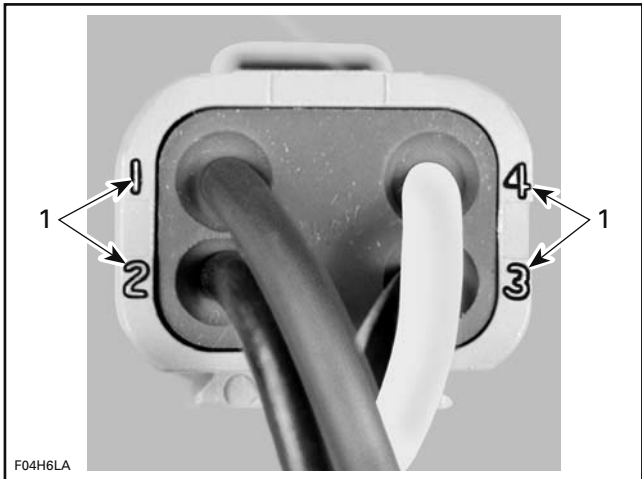
2. Insert a 4.8 mm (.189 in) wide screwdriver blade inside the front of the terminal cavity.
3. Pry the retaining tab away from the terminal while gently pulling the wire and terminal out of the back of the connector.



TYPICAL — FEMALE CONNECTOR
1. Retaining tabs

Terminal Insertion

1. For insertion of a terminal, ensure the secondary 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 be sure the retaining tabs 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

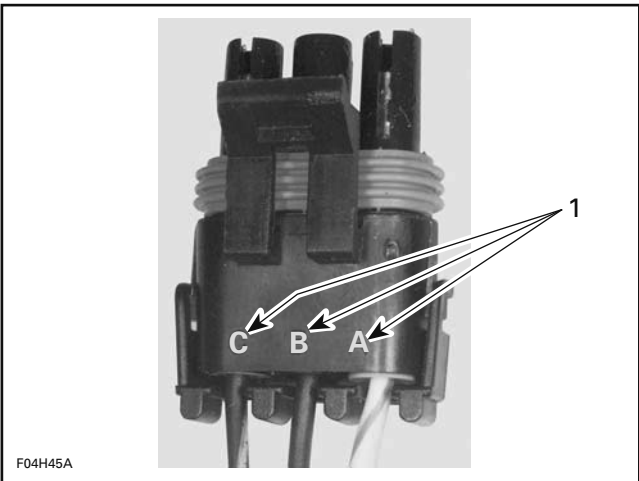
PACKARD CONNECTORS

Packard Connector Application

Packard connectors are used to connect:

- Electrical harnesses
- Gauges.

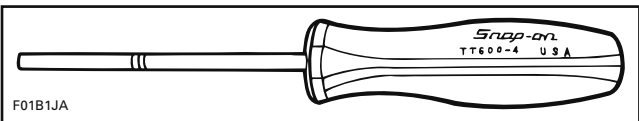
3-Pin Packard Connector



VIEW OF A 3-PIN PACKARD CONNECTOR
1. Identification letters

NOTE: This type of connector also comes in other pin configurations.

To remove a terminal from a 3-pin Packard connector, use the SNAP-ON TERMINAL REMOVER TOOL (P/N TT600-4).



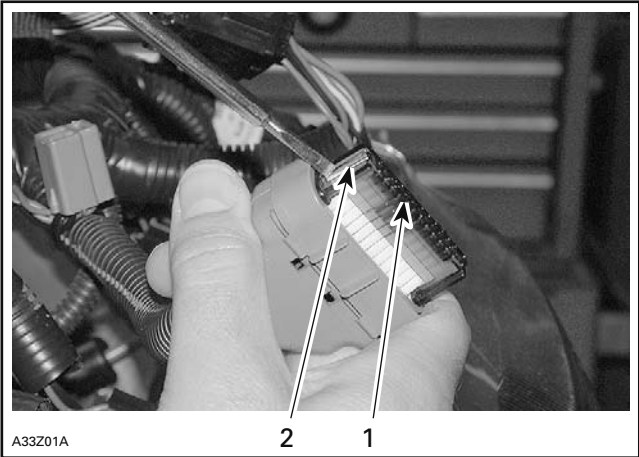
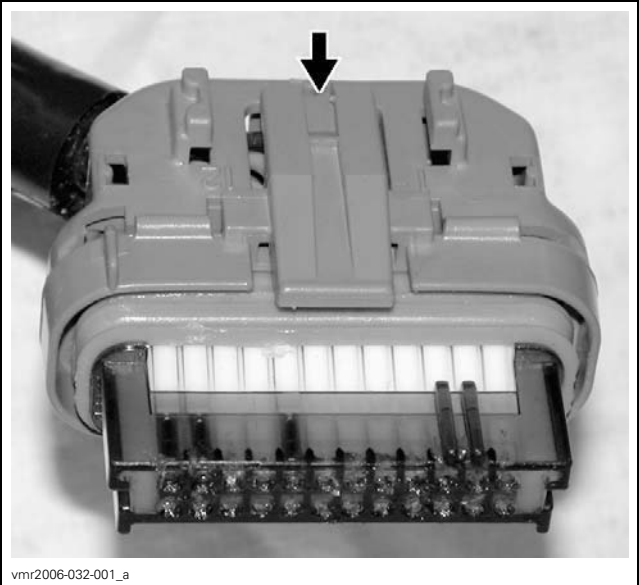


WARNING

Ensure all terminals are properly crimped on wires and connectors are properly fastened.

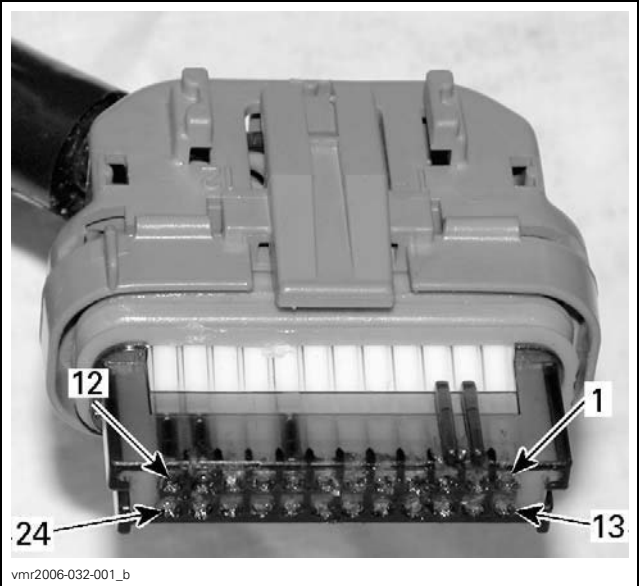
PACKARD CONNECTOR
(MULTIFUNCTION GAUGE)

Firmly push down tab and hold to unlock connector while pulling it out.



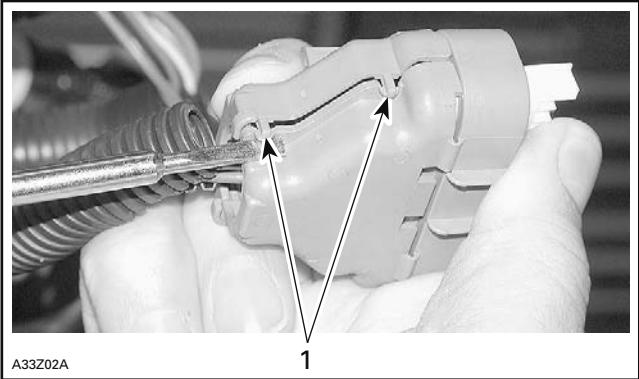
TYPICAL
1. Retainer
2. Tab (one on each side)

Open housing by lifting 4 tabs.



CONNECTOR PINOUT

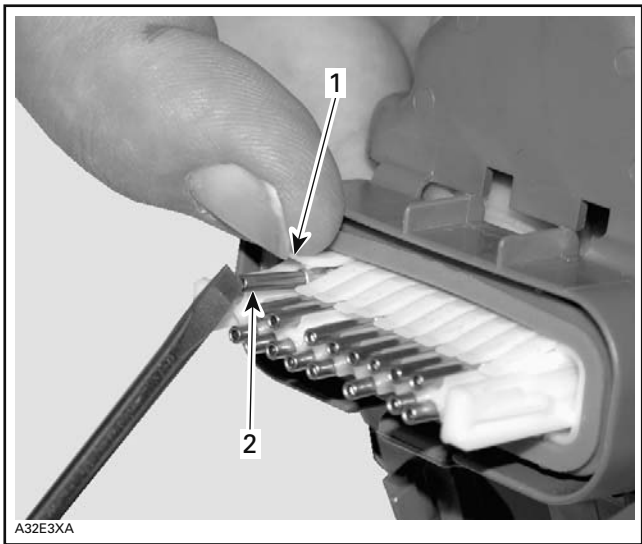
Push on both tabs to remove retainer.



TYPICAL
1. Tabs (2 on each side)

Lift the top plastic lock of the female terminal to be removed and hold in position. Lift the female terminal to unlock from the housing and push out of housing.

Section 06 ELECTRICAL SYSTEM
Subsection 02 (WIRING HARNESS AND CONNECTORS)



TYPICAL
1. Lift and hold plastic lock
2. Lift to unlock and push out

MOLEX CONNECTOR

Molex Connector Application

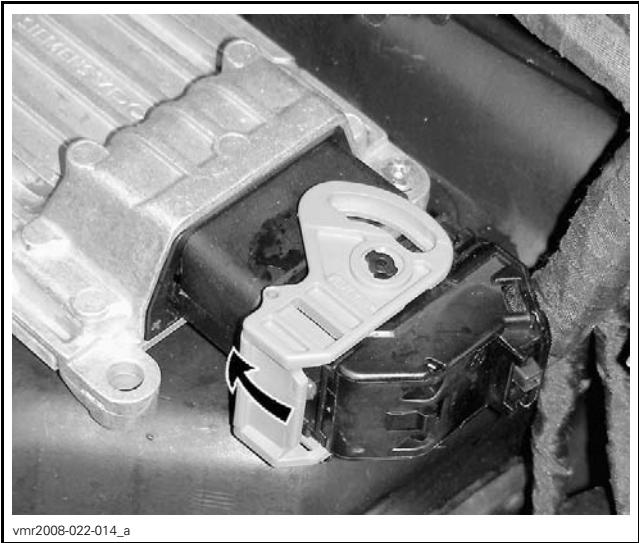
Molex connectors are used on the following system:
– ECM

Molex Connector Removal

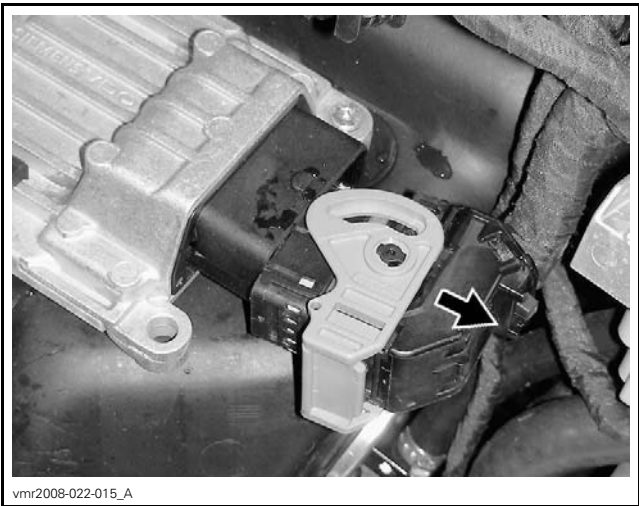
Push and hold the locking tab.



Rotate connector lock until it stops.

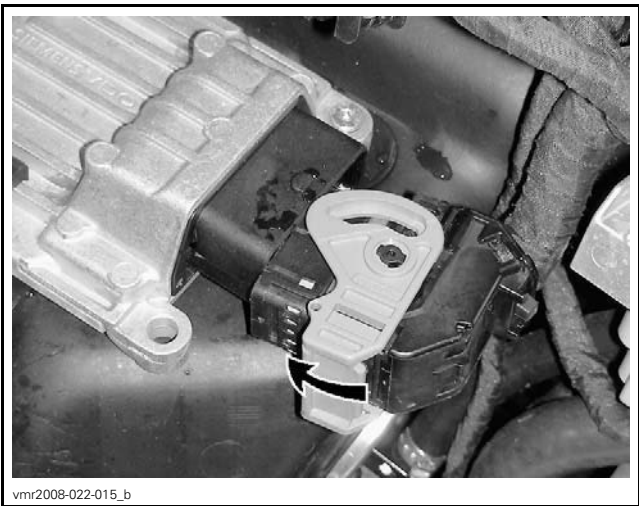


Pull out connector.



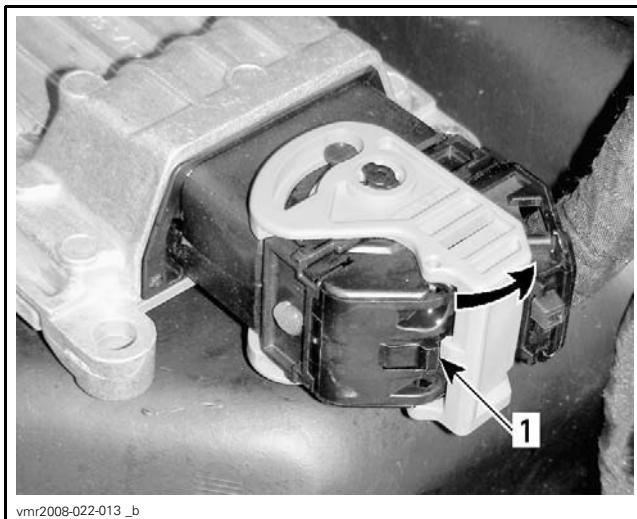
Molex Connector Installation

Fully open connector lock.



Install connector to ECM.

Rotate connector lock until it snaps locked.



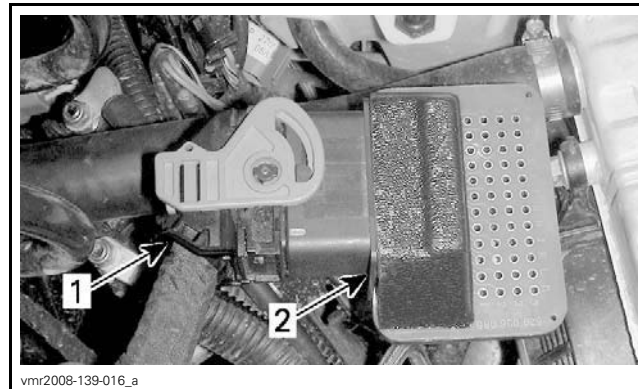
1. Locked here

Molex Connector Probing

The most recommended and safest method to probe ECM connector terminals is to use the ECM ADAPTER TOOL (P/N 529 036 166). This tool will prevent deforming or enlarging terminals which would lead to bad ECM terminal contact creating intermittent or permanent problems.



Disconnect the ECM connector and reconnect on the tool connector. Probe required terminals directly in the tool holes.



1. ECM connector (harness side)
2. ECM adapter

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

Molex Connector Inspection

Before replacing an ECM, always check electrical connections.

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

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

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

Molex Connector Terminal Removal (Harness Connector)

To remove a signal terminal from the ECM harness connector, use the ECM TERMINAL REMOVER 2.25 (P/N 529 036 175).

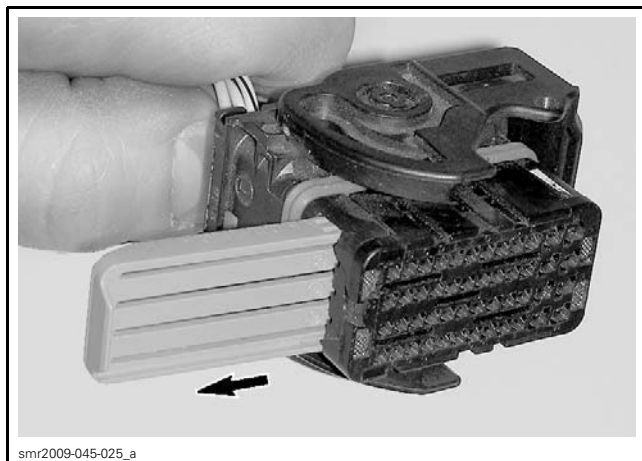
To remove a power terminal, use the ECM TERMINAL REMOVER 3.36 (P/N 529 036 174).

Section 06 ELECTRICAL SYSTEM

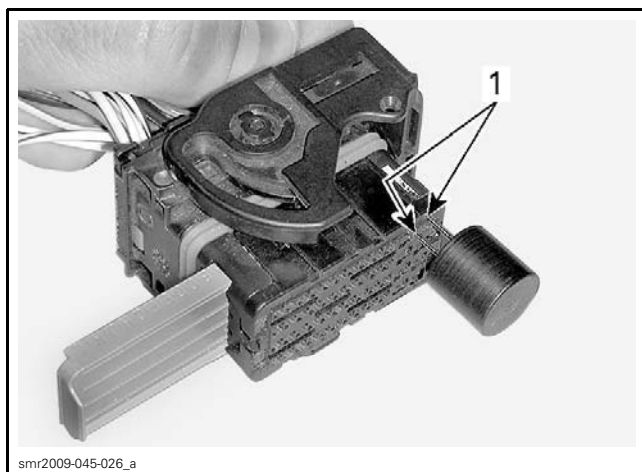
Subsection 02 (WIRING HARNESS AND CONNECTORS)



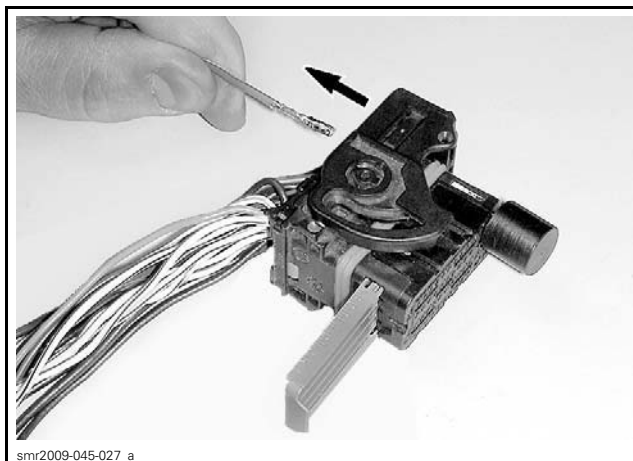
1. Remove rear protector from connector.
2. Pull out the connector lock.



3. Insert tool to unlock terminal.



1. *Unlock here*
4. Gently pull on the wire to extract the terminal out the back of the connector.



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

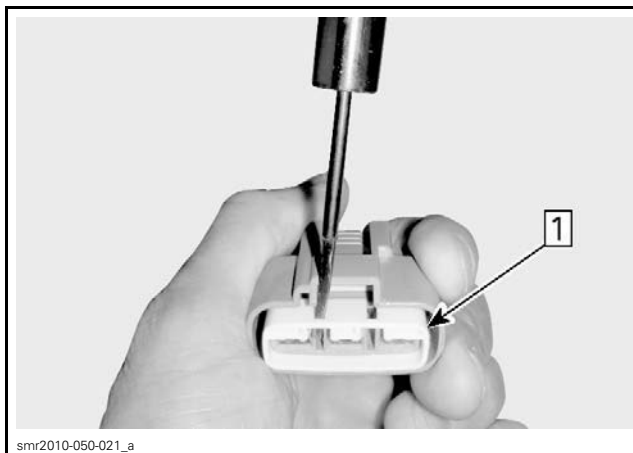
FURUKAWA CONNECTOR

Furukawa Connector Application

Voltage regulator/rectifier.

Terminal Removal

1. Remove the secondary lock (plastic insert).

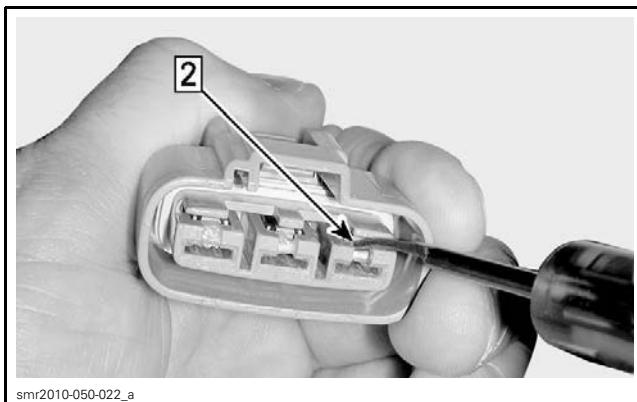


Step 1: Remove the secondary lock

2. Carefully insert the GM TERMINAL EXTRACTOR (P/N 12094430) between the lock and the pin to release the pin.

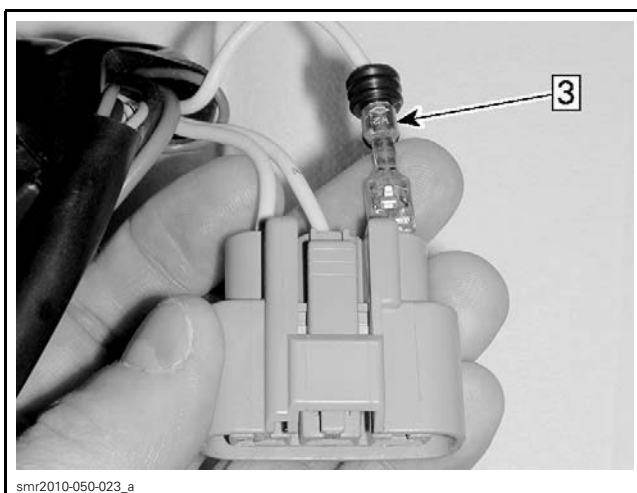


GM TERMINAL EXTRACTOR (P/N 12094430)



Step 2: Insert GM terminal extractor tool (P/N 12094430)

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



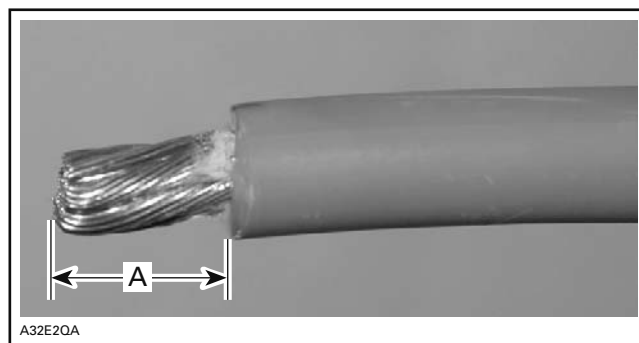
Step 3: Pull wire to extract pin

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

BATTERY AND STARTER CABLE TERMINALS

Cable Crimping

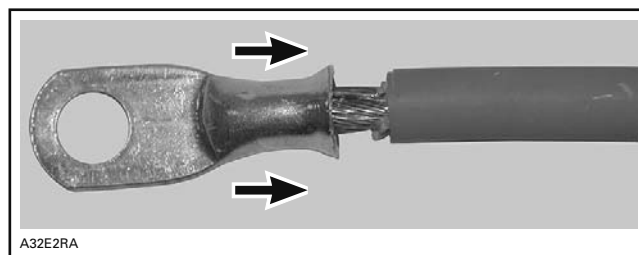
Carefully strip the wire approximately to 10 mm (3/8 in) in length, using a wire stripping tool or sharp blade/knife.



A. 10 mm (3/8 in)

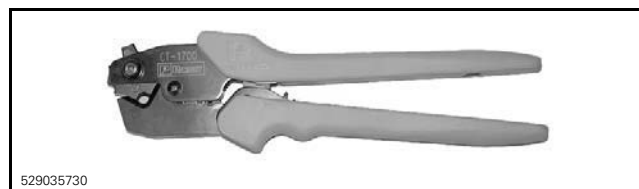
NOTE: Make sure not to cut wire strands while stripping the wire.

Install the appropriate terminal on the wire according to the requirement. Refer to appropriate *PARTS CATALOG*.



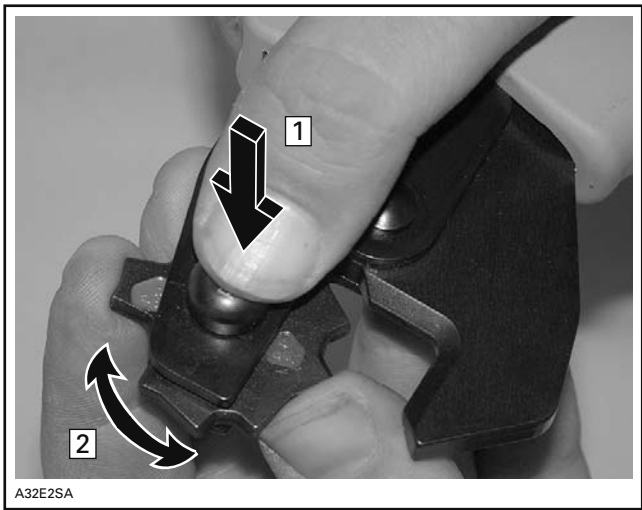
INSTALLATION OF TERMINAL

Follow the instructions provided with the CRIMPING TOOL (HEAVY GAUGE WIRE) (P/N 529 035 730) to select the proper position of the tool.



NOTE: Different wires require different crimping pliers settings.

Section 06 ELECTRICAL SYSTEM
Subsection 02 (WIRING HARNESS AND CONNECTORS)

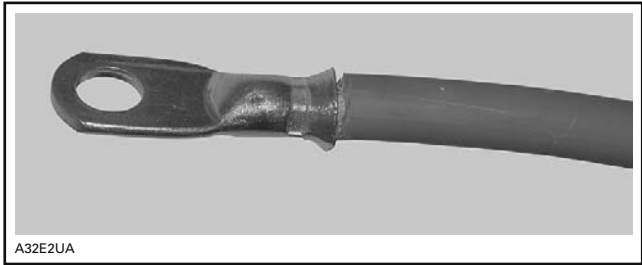


POSITIONING THE CRIMPING PLIERS
Step 1: Press
Step 2: Rotate

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.

IGNITION SYSTEM (570)

SERVICE TOOLS

Description	Part Number	Page
ECM ADAPTER TOOL.....	529 036 166	284, 286
FLUKE 115 MULTIMETER	529 035 868	285–286

GENERAL

SYSTEM DESCRIPTION

The battery supplies the primary side of ignition coils through the main relay (R2) while the ECM completes the circuit for each cylinder by switching it to ground at the right moment. The ECM can detect an open and short circuit in the primary winding but it does not check the secondary winding.

The Engine Management System (EMS) controls the ignition system. For more information, refer to *ENGINE MANAGEMENT* subsection.

Ignition Timing

Ignition timing is not adjustable.

TROUBLESHOOTING

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

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

Refer to *POWER DISTRIBUTION AND GROUNDS* for fuse and relay information.

Refer to *WIRING HARNESS AND CONNECTORS* for vehicle wiring harness layout and component locations.

Refer to *ENGINE MANAGEMENT SYSTEM (EMS)* for powertrain wiring harness layout and component locations.

DIAGNOSTIC GUIDELINES

The following is provided to help in diagnosing the probable cause of a problem. It is a guideline and should not be assumed to list all possible causes.

ENGINE WILL NOT START (ENGINE TURNS OVER)

1. Fouled or defective spark plug
 - Replace.

2. Defective CPS

- Check operation of CPS and replace if necessary. Refer to *ELECTRONIC FUEL INJECTION (EFI)* subsection.

3. Defective trigger wheel

- Inspect trigger wheel. Refer to *MAGNETO AND STARTER* subsection.

4. Defective ignition circuit

- Check fuse 5 of fuse box 1, ignition coil and wiring condition.

5. Defective fuel pump

- Check fuel pump, refer to *FUEL TANK AND FUEL PUMP* subsection.

6. Defective fuel injectors or circuit

- Check fuel injectors, refer to *ENGINE MANAGEMENT SYSTEM* subsection.

ENGINE HARD TO START

1. Spark plug faulty, fouled or worn out

- Check spark plug condition. Replace if necessary.

2. Low fuel pressure

- Test fuel pressure, refer to *FUEL TANK AND FUEL PUMP* subsection.

ENGINE MISFIRES, RUNS IRREGULARLY

1. Fouled, defective, worn spark plugs

- Check/verify heat range/gap/replace.

2. Damaged trigger wheel/loose CPS

- Inspect trigger wheel. Refer to *MAGNETO AND STARTER* subsection.

3. Defective ignition circuit

- Check ignition coil, fuse 5, and wiring condition.

4. Poor engine grounds

- Check/clean/repair.

ENGINE CONTINUALLY BACKFIRES

1. Fouled, defective spark plugs

- Clean/replace spark plugs.

- 2. Damaged trigger wheel/defective or loose CPS
- Inspect trigger wheel and CPS, refer to MAGNETO AND STARTER and ELECTRONIC FUEL INJECTION (EFI) subsections.

PROCEDURES

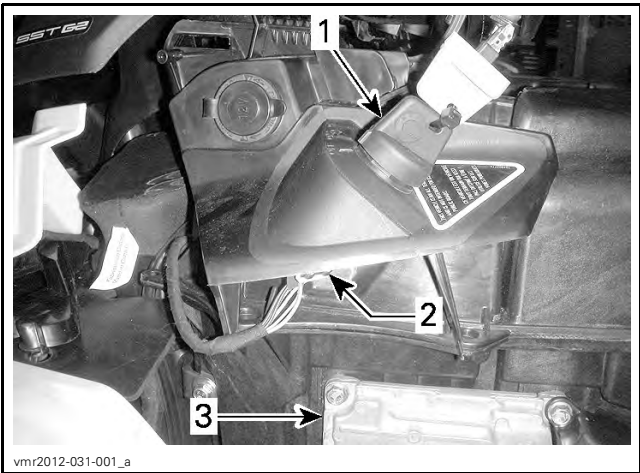
IGNITION SWITCH

Ignition Switch Quick Test

Turn ignition switch to ON position.
If multifunction gauge turns on (assuming it works), the ignition switch is good.
If multifunction gauge does not turn on, check the following in this order:
- Battery
- Fuse 1 of fuse box 2
- Fuse 4, 5 and 8 of fuse box 1
- ECM is properly powered (refer to ELECTRONIC FUEL INJECTION (EFI) subsection)
- Ignition switch
- Emergency engine stop switch.

Ignition Switch Access

Refer to BODY subsection and remove the LH side panel.

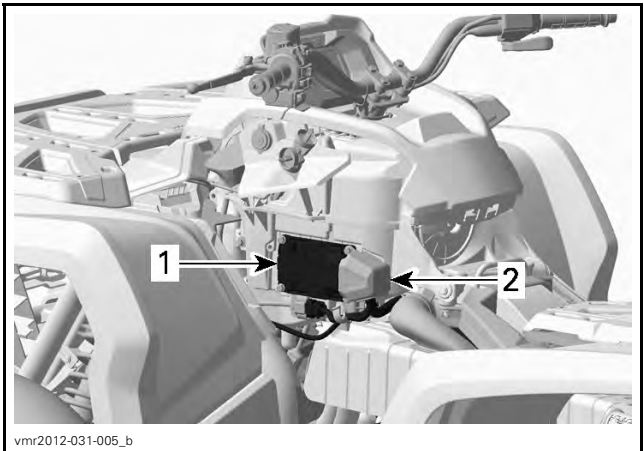


TYPICAL
1. Ignition key
2. Ignition switch connector
3. ECM

EMERGENCY ENGINE STOP SWITCH

Testing the Emergency Engine Stop Switch at ECM

- 1. Disconnect ECM connector and install it on the ECM adapter tool.



TYPICAL
1. ECM
2. ECM connector cover

Table with 2 columns: REQUIRED TOOL, ECM ADAPTER TOOL (P/N 529 036 166)

- 2. Remove ignition key switch fuse (F8), refer to POWER DISTRIBUTION AND GROUNDS subsection.
3. Turn ignition key to ON position.
4. Test for continuity as per following table.

Table with 4 columns: FUNCTION, FUSE BOX CONTACT, ECM ADAPTER, RESULT. It details the testing procedure for the emergency engine stop switch in RUN and STOP positions.

If switch fails the test, refer to TESTING THE EMERGENCY ENGINE STOP SWITCH AT MULTIFUNCTION SWITCH CONNECTORS.

Testing the Emergency Engine Stop Switch at Multifunction Switch Connectors

Refer to *WIRING HARNESS AND CONNECTORS* subsection for connector locations.

The emergency engine stop switch is wired into the LH multifunction switch connectors (MG1 and MG2).

1. Remove gauge support, refer to *LIGHTS, GAUGE AND ACCESSORIES* subsection.
2. Disconnect MG1 and MG2 connectors.
3. Test switch continuity as per following table.

EMERGENCY ENGINE STOP SWITCH PIN-OUT		
FUNCTION	PROBE	RESULT
RUN position	MG1-2 to MG2-3	Open circuit
	MG1-1 to MG1-3	Close to 0 Ω
STOP position	MG1-2 to MG2-3	
	MG1-1 to MG1-3	Open circuit

If switch tests good, test continuity of wiring. Refer to *WIRING DIAGRAM*.

IGNITION COIL



Ignition Coil Access

Refer to *BODY* subsection and remove RH inner fender panel(s) for access to the ignition coil.



TYPICAL
1. Ignition coil location

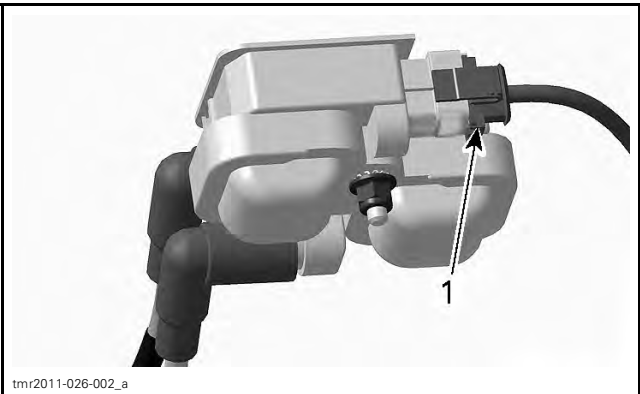
Installing the Ignition Coil

Install a new elastic nut and tighten to the specified torque.

TIGHTENING TORQUE	
Ignition coil retaining bolt	8 N•m ± 1 N•m (71 lbf•in ± 9 lbf•in)

Testing the Ignition Coil Input Voltage

1. Disconnect the 3-pin connector from the ignition coil. Refer to *IGNITION COIL ACCESS*.



1. Ignition coil connector
2. Set emergency engine stop switch to RUN.
3. Turn ignition switch to ON.
4. Read voltage as per following table.

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

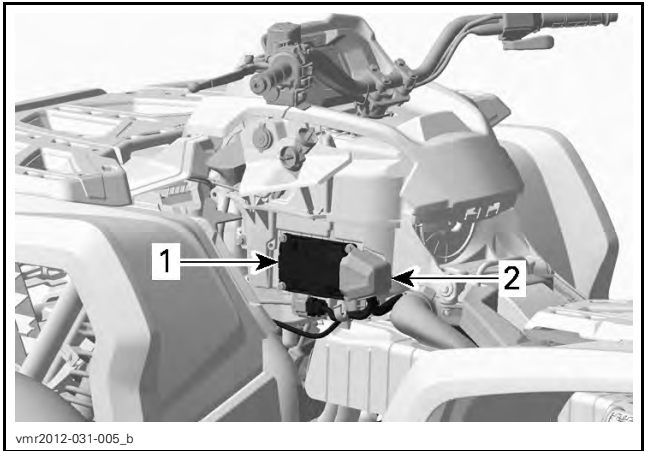
Section 06 ELECTRICAL SYSTEM
Subsection 04 (IGNITION SYSTEM (570))

IGNITION COIL INPUT VOLTAGE TEST	
CONNECTORS	VOLTAGE
Pin 2 with battery ground	Battery voltage

If battery voltage is NOT read, check continuity of ignition coil supply circuit. Refer to *WIRING DIAGRAM*.

Testing the Ignition Coil Ground Circuit Continuity

1. Disconnect the ECM connector and connect it to the ECM adapter tool. Refer to *ELECTRONIC FUEL INJECTION (EFI)* subsection.



TYPICAL
1. ECM
2. ECM connector cover

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

2. Check wiring continuity as per following table.

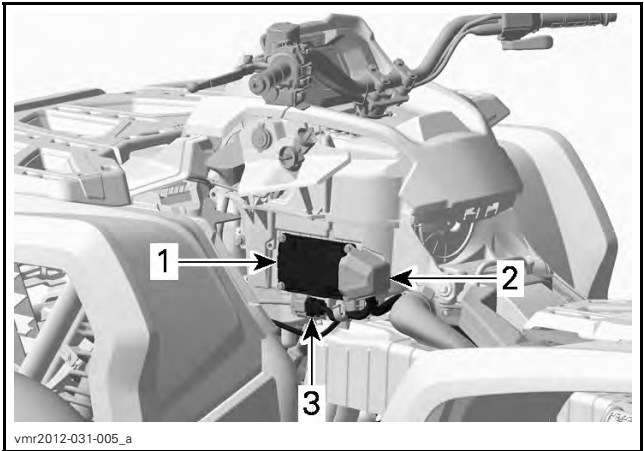
IGNITION COIL GROUND CIRCUIT CONTINUITY TEST		
COMPONENT	PIN (IGNITION COIL CONNECTOR)	PIN (ECM CONNECTOR)
Cylinder 1 (front)	1	M1
Cylinder 2 (rear)	3	M2

Testing the Ignition Coil Resistance

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

Primary Windings

1. Disconnect HIC2 connector.



TYPICAL
1. ECM
2. ECM connector cover
3. HIC2 connector

2. Disconnect ECM connector and connect it to the ECM adapter tool.

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

3. Using a multimeter set to Ω , check resistance in primary windings as follows.

IGNITION COIL RESISTANCE TEST			
PRIMARY CIRCUIT	ENGINE CONNECTOR (HIC2)	ECM CONNECTOR	RESISTANCE @ 20°C (68°F)
Cylinder 1 (front)	Pin C	M1	.3 - .6 Ω
Cylinder 2 (rear)		M2	

If any resistance is not good, measure resistance directly on coil. If second test is ok, check wiring.

Secondary Windings

Due to the integrated diode, it is not possible to take any resistance measurement of the secondary winding.

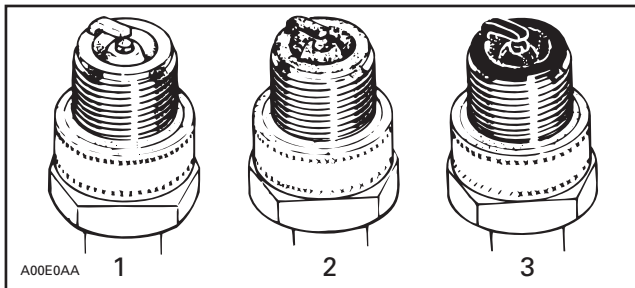
SPARK PLUG

For spark plug replacement procedure, refer to *PERIODIC MAINTENANCE PROCEDURES* subsection.

Troubleshooting Fouled Spark Plug

Fouling of the spark plug is indicated by irregular running of the engine, decreased engine speed due to misfiring, reduced performance, and increased fuel consumption. This is due to a loss of compression. Other possible causes are: prolonged idling or low-speed riding, a clogged air filter, incorrect fuel, defective ignition system, incorrect spark plug gap, lubricating oil entering the combustion chamber, or too cold spark plug. The plug face of a fouled spark plug has either a wet black deposit or a black carbon fouling. Such coatings form a conductive connection between the center electrode and ground.

Spark Plug Analysis



TYPICAL

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

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

CHARGING SYSTEM

SERVICE TOOLS – OTHER SUPPLIER

Description	Part Number	Page
EXTECH INDUCTIVE AMMETER	380941	558
NAPA ULTRA PRO BATTERY LOAD TESTER	95260	558–560

GENERAL

SYSTEM DESCRIPTION

The purpose of the charging system is to keep the battery at a full state of charge.

NOTE: For an overview of the vehicle electrical system, refer to *ENGINE MANAGEMENT SYSTEM* section.

Magneto

The magneto is the primary source of electrical energy. It transforms a magnetic field into electric current (AC).

The alternating current is regulated and transformed into direct current (DC) by the voltage regulator, and normally powers all of the vehicle's systems and accessories.

The magneto has a 3 phase delta wound stator.



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TYPICAL

Voltage Regulator

The regulator receives AC current from the magneto and transforms it into direct current (DC).

The voltage regulator output voltage is distributed as follows:

- Fuse 1 30A

- Fuse 3 30A
- Battery.

The voltage regulator limits voltage to prevent any damage to electrical components.

COMPONENT	VOLTAGE Vdc
Voltage Regulator	Minimum 12.5
	Maximum 15



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TYPICAL

Battery

The battery supplies DC power to every electrical and electronic system in the vehicle as well as all accessories. At low engine RPM operation and high current load conditions, it supplements the magneto's output as required, and helps to maintain a steady system voltage.

TROUBLESHOOTING

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

Section 06 ELECTRICAL SYSTEM

Subsection 05 (CHARGING SYSTEM)

BATTERY REGULARLY DISCHARGED OR WEAK

- 1. Loose or corroded battery cable connections.
- Tighten or repair battery cable connections.
- 2. Worn or defective battery.
- Charge and test battery.
- 3. Defective magneto stator.
- Test stator, refer to MAGNETO AND STARTER SYSTEM subsection.
- 4. Defective regulator/rectifier.
- Test system voltage.
- 5. Damaged magneto rotor or Woodruff key.
- Replace magneto rotor or Woodruff key, refer to MAGNETO AND STARTER SYSTEM subsection.

PROCEDURES

Ensure battery is fully charged.

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 is in PARK when performing charging system tests.

BATTERY LOAD TEST

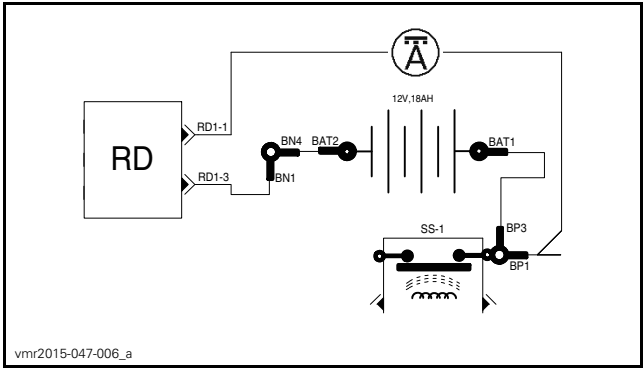
- 1. Remove seat.
- 2. Connect a battery load tester such as the NAPA ULTRA PRO BATTERY LOAD TESTER (P/N 95260).
- 3. Ensure proper test conditions.

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 perform a *CHARGING SYSTEM LOAD TEST*.

CHARGING SYSTEM LOAD TEST

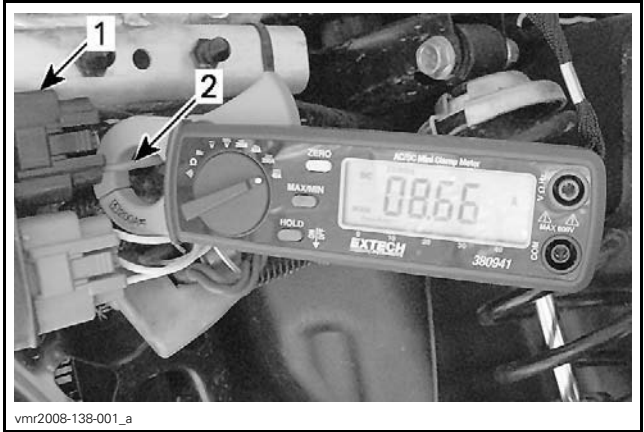


- 1. Remove seat.
- 2. Connect a battery load tester such as the NAPA ULTRA PRO BATTERY LOAD TESTER (P/N 95260).
- 3. Start vehicle and read voltage on tester.

SPECIFICATION	
Voltage	12.5 - 15 Vdc

If voltage is **above** specification, replace regulator and continue *CHARGING SYSTEM LOAD TEST*.

- 4. Connect an ammeter such as EXTECH INDUCTIVE AMMETER (P/N 380941) around RD1-1 wire.



DC CURRENT TEST WITH INDUCTIVE AMMETER

- 1. Output connector of voltage regulator
- 2. Ammeter clamped over RED wire

- 5. Ensure proper test conditions.

TEST CONDITIONS	
Battery voltage at idle‡	Above 12.6 Vdc
Engine	Increase to 4000 RPM

TEST CONDITIONS	
Load	As required to decrease battery voltage to 12 Vdc
Time	15 seconds
‡ Required for accurate testing	

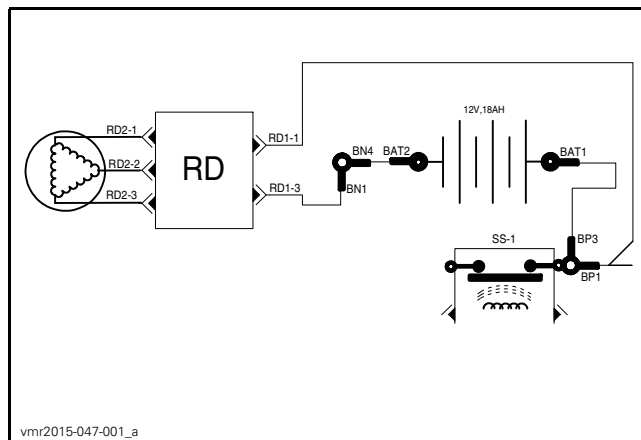
6. Read amperage on ammeter.

MODEL	SPECIFICATION
Base models (no-DPS, not CE)	35 ± 5 Amps
DPS models	41 ± 5 Amps
All CE models	41 ± 5 Amps

If amperage or voltage is not within specification, verify magneto and wires. Refer to *MAGNETO AND STARTER* subsection. Replace:

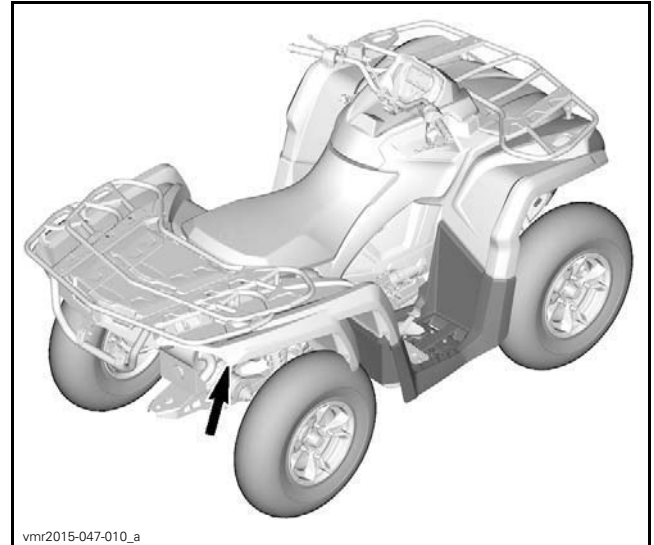
- Voltage regulator if magneto test is within specifications.
- Magneto if magneto test is not within specifications.

VOLTAGE REGULATOR (RD)



Voltage Regulator Access

The voltage regulator/rectifier is accessible on the RH rear side of the vehicle.



Voltage Regulator Continuity Test

Due to internal circuitry, there is no static test available.

Voltage Regulator Power Test

1. Check voltage at RD1-1.

TEST CONDITIONS		
RD1-1	Hot at all times	
BACKPROBE	PROBE	SPECIFICATION
RD1-1	BAT2 (-)	Battery voltage

2. Connect a battery load tester such as the NAPA ULTRA PRO BATTERY LOAD TESTER (P/N 95260).
3. Start vehicle.
4. Ensure proper test conditions.

TEST CONDITIONS	
Battery voltage at idle‡	Above 12.6 Vdc
Engine	Increase to 4000 RPM
Load	As required to decrease battery voltage to 12 Vdc
Time	15 seconds
‡ Required for accurate testing	

5. Measure voltage drop.

BACKPROBE	PROBE	SPECIFICATION
RD1-1	BAT1 (+)	Under 0.2 Vdc

If voltage drop is above specification, locate and repair damaged connector/wire.

Voltage Regulator Ground Test

1. Check ground at RD1-3.

TEST CONDITIONS		
RD1-3		Permanent ground
BACKPROBE	PROBE	SPECIFICATION
RD1-3	BAT1 (+)	Battery voltage

2. Connect a battery load tester such as the NAPA ULTRA PRO BATTERY LOAD TESTER (P/N 95260).
3. Start vehicle.
4. Ensure proper test conditions.

TEST CONDITIONS	
Battery voltage at idle‡	Above 12.6 Vdc
Engine	Increase to 4000 RPM
Load	As required to decrease battery voltage to 12 Vdc
Time	15 seconds
‡ Required for accurate testing	

5. Measure voltage drop.

BACKPROBE	PROBE	SPECIFICATION
RD1-3	BAT2 (-)	Under 0.4 Vdc

If voltage drop is above specification, locate and repair damaged connector/wire.

BATTERY

Battery Information

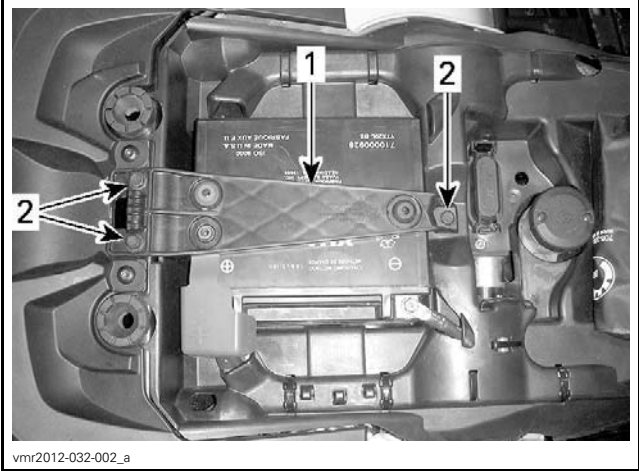
These vehicles are equipped with a VRLA battery (Valve Regulated Lead Acid). It is a maintenance-free type battery.
Refer to battery manufacturer's instructions for proper filling, activation and routine charging procedures.

Battery Removal

1. Remove seat.
2. Disconnect BLACK (-) cable first, then the RED (+) cable.

NOTICE Always respect this order for removal; disconnect BLACK (-) cable first.

3. Remove battery retaining plate.



TYPICAL
1. Battery retaining plate
2. Retaining plate screws (3)

4. Remove battery.

Battery Cleaning

Clean the battery support, cables and battery posts using a solution of baking soda and water.
Remove corrosion (if so) from battery cable terminals and battery posts using a firm wire brush. Rinse with clear water and dry well.

Battery Inspection

Visually inspect battery casing for cracks or any other damages. If casing is damaged, replace battery and thoroughly clean battery support with a water and baking soda solution.
Inspect condition of battery posts, battery support, holding strap and strap attachment points and wire terminal lugs.

Battery Storage

It is not necessary to remove the battery during vehicle storage but it is recommended for long term storage.
If the battery is left in the vehicle during storage or used infrequently, disconnect the BLACK (-) negative battery cable to eliminate battery current drain from the electrical equipment.
Recharge the battery once a month with an approved battery charger as per manufacturer's recommendations.
Clean battery, battery support and connections as required, refer to BATTERY CLEANING in this section.
For other recommendations during storage, refer to battery manufacturers instructions.

⚠ WARNING

Ensure battery is stored in a safe place, out of reach for children.

TIGHTENING TORQUE

Battery retaining plate
screws

4.5 N•m ± 0.5 N•m
(40 lbf•in ± 4 lbf•in)

New Battery Activation

Refer to the instructions provided with the battery.

Battery Charging

⚠ WARNING

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

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

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

An automatic charger is a fast and convenient way for error-proof charging.

Always follow the battery manufacturer's charging instructions.

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

Battery Voltage Below 12.8 V and Above 11.5 V

STANDARD CHARGING (RECOMMENDED)		
BATTERY TYPE	TIME	CHARGE
YTX20L-BS	4 - 9 HOURS	2 A

QUICK CHARGING		
BATTERY TYPE	TIME	CHARGE
YTX20L-BS	50 MINUTES	10 A

Battery Installation

NOTICE Always connect RED (+) cable first then BLACK (-) cable.

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

STARTING SYSTEM

SERVICE TOOLS

Description	Part Number	Page
ECM ADAPTER TOOL (ONE CONNECTOR).....	529 036 085	565
FLUKE 115 MULTIMETER	529 035 868	567

GENERAL

STARTING SYSTEM OPERATION

When the START button is pressed, 12 Vdc is applied through the start switch (MG1) to the starter solenoid coil. If the engine cranking conditions are met, the ECM completes the starter solenoid control circuit by providing a ground. The starter solenoid then closes its contacts and battery power is applied to the starter for cranking the engine.

Engine Cranking Conditions

The following conditions must be met to allow engine cranking.

- Ignition switch turned ON
- Engine stop switch to RUN
- Transmission in Park, Neutral or a brake pedal/lever is applied
- Start button is pressed and held.

TROUBLESHOOTING

Check for fault codes. Refer to: *DIAGNOSTIC AND FAULT CODES* subsection.

ENGINE WILL NOT TURN

If the starter cranks over the engine with the brakes applied, check the shifter adjustment and the gearbox position sensor and wiring. Refer to the *SHIFTER* and *GEARBOX AND 4X4 COUPLING UNIT* sections.

If the "Engine cranking conditions" are met and the starter will not crank the engine, check the following:

1. Battery and connections (refer to *CHARGING SYSTEM*)
2. Starter solenoid
3. Start button switch
4. Starter (refer to *MAGNETO AND STARTER* subsection)
5. Wiring and connections.

ENGINE TURNS

Starting system is OK.

1. Verify ignition system. Refer to *IGNITION SYSTEM* subsection.
2. Verify EFI systems. Refer to *ELECTRONIC FUEL INJECTION (EFI)* subsection.
3. Verify mechanical condition of engine. Refer to *ENGINE, CVT AND GEARBOX* section.

PROCEDURES

Ensure battery is fully charged.

Refer to applicable *WIRING HARNESS AND CONNECTORS* for harness layout and connector locations on vehicle.

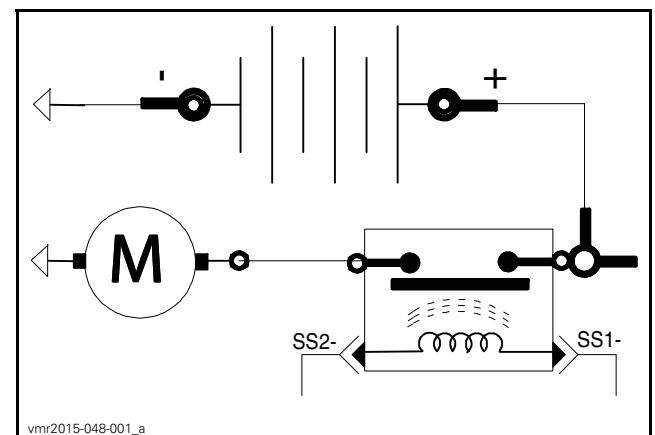
Refer to applicable *WIRING DIAGRAM* for additional information.

⚠ WARNING

Ensure vehicle is in PARK when performing starting system tests.

STARTING SYSTEM TESTS

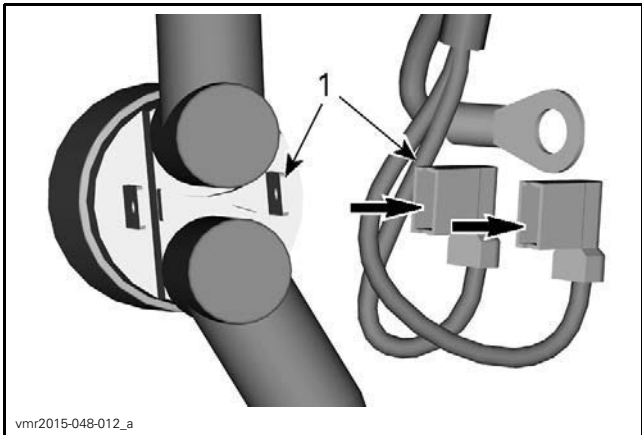
Starter Solenoid



1. Disconnect SS1 and SS2

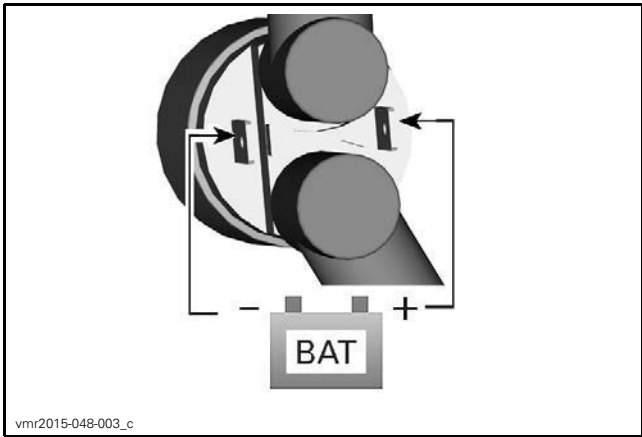
Section 06 ELECTRICAL SYSTEM

Subsection 06 (STARTING SYSTEM)



1. SS1

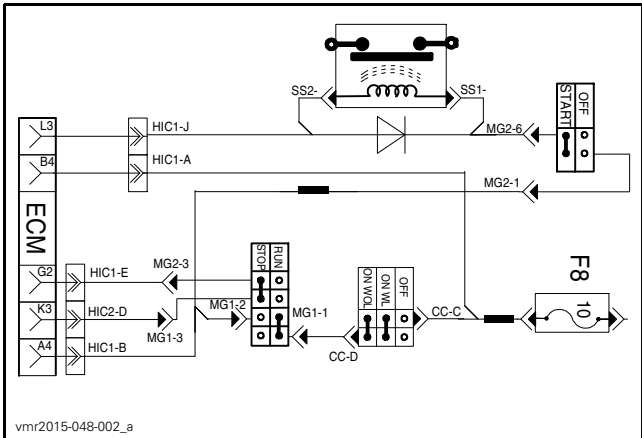
2. Activate the starter solenoid.
- 2.1 Apply 12Vdc to SS1
- 2.2 Ground SS2



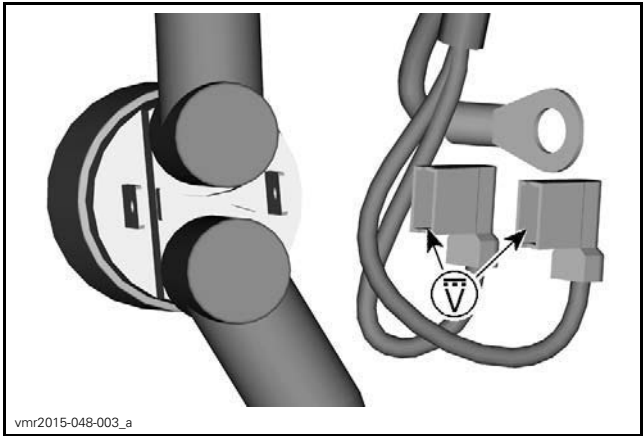
SS1 IS ON THE RIGHT

3. If starter turns, verify *STARTER SOLENOID CONTROL CIRCUIT*.
4. If starter does not turn, verify *STARTER SOLENOID CONTINUITY*.

Starter Solenoid Control Circuit



TEST CONDITION	
Engine stop switch	RUN
Ignition switch	ON
Start button	Pressed



SS1 IS ON THE RIGHT

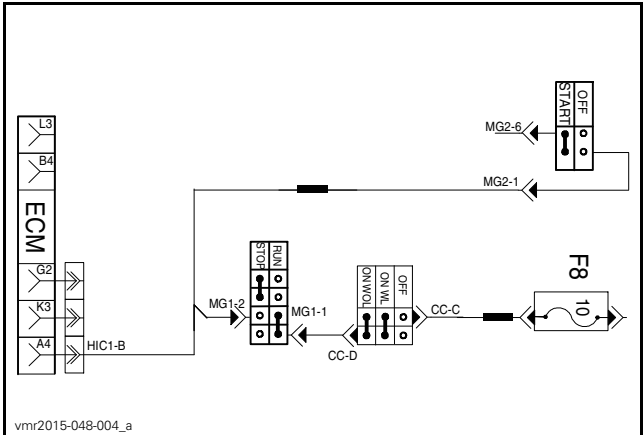
PROBE	PROBE	SPECIFICATION
SS1	SS2	Battery voltage
SS1	BAT -	Battery voltage
BAT +	SS2	Battery voltage

If voltage is as per specification replace starter solenoid.

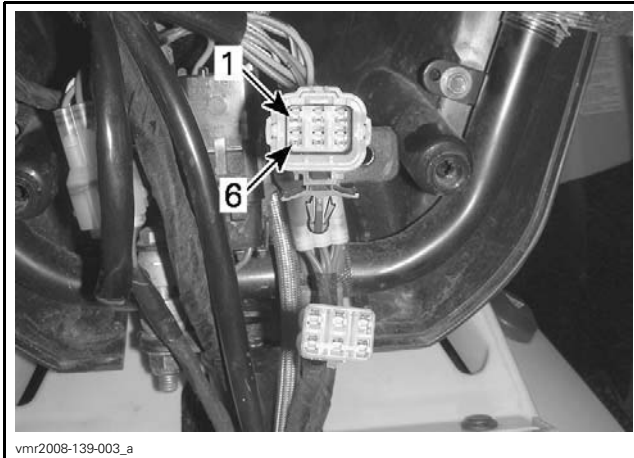
If voltage is not as per specification, verify *STARTER SOLENOID CONTROL POWER CIRCUIT* or *STARTER SOLENOID CONTROL GROUND CIRCUIT* as applicable.

Starter Solenoid Control Power Circuit

NOTE: This procedure also tests the start button.



1. Disconnect MG2 connector.



MG2 STEERING HARNESS CONNECTOR PIN-OUT

TEST CONDITION		
Engine stop switch		RUN
Ignition switch		ON
PROBE	PROBE	SPECIFICATION
MG2-1	BAT -	Battery voltage.

- If voltage is not as per specification:
 - Check fuse(s)
 - Test engine stop switch. Refer to *IGNITION SYSTEM* subsection
 - Test ignition switch Refer to *IGNITION SYSTEM* subsection.
- Test start button.

TEST CONDITION		
Start button		Pressed
PROBE	PROBE	SPECIFICATION
MG2-1	MG2-6	Close to 0Ω

If start button does not test as specified, replace the multifunction switch assembly.

If start switch tests as specified, repair wire to starter solenoid SS1 terminal.

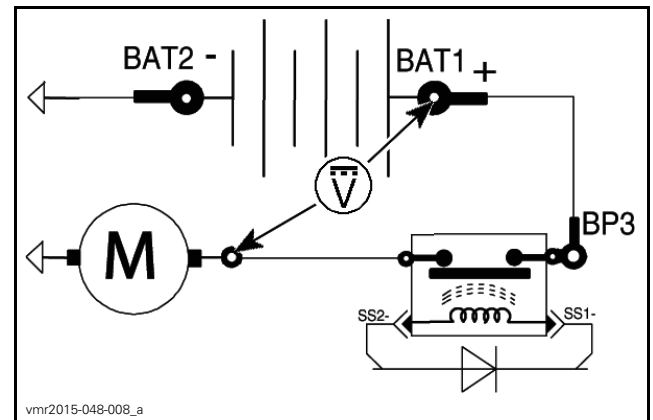
Starter Power Circuit Voltage Drop

NOTE: Engine must be in starting condition for this test. Do not perform on a «No Start» vehicle.

TEST CONDITION	
Fuse F5	Removed‡
Engine stop switch	RUN
Ignition switch	ON

TEST CONDITION	
Start button	Pressed
Engine	Cranking
‡ Will prevent engine from starting	

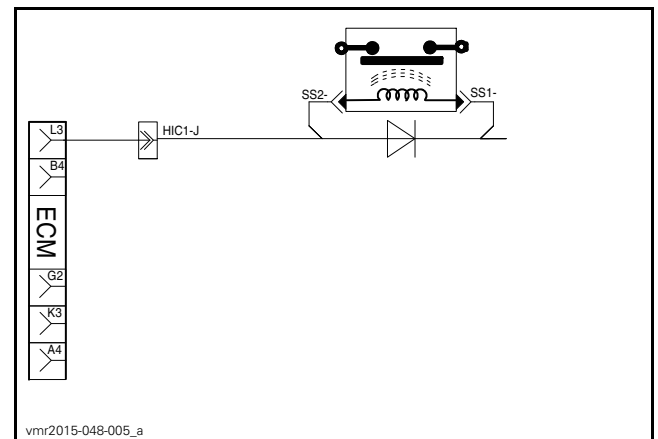
- Measure voltage drop.



PROBE	PROBE	SPECIFICATION
BAT1	Starter B+ terminal	Below 0.4 Vdc

If voltage drop is above specification, repair or replace sources of high resistance in circuit.

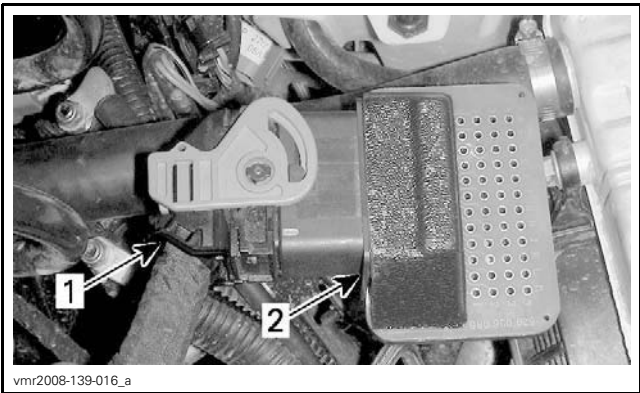
Starter Solenoid Control Ground Circuit



- Disconnect SS2.
- Install the ECM connector onto the ECM ADAPTER TOOL (ONE CONNECTOR) (P/N 529 036 085)

Section 06 ELECTRICAL SYSTEM

Subsection 06 (STARTING SYSTEM)



- 1. ECM connector
- 2. ECM adapter tool

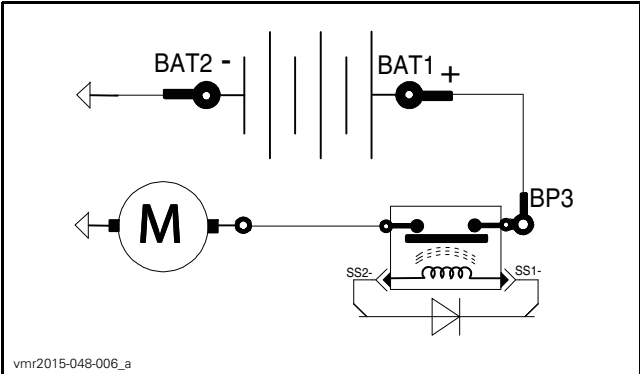
PROBE	PROBE	SPECIFICATION
SS2	ECM-L3	Close to 0Ω

If resistance is not as specified, repair or replace wiring/connections.

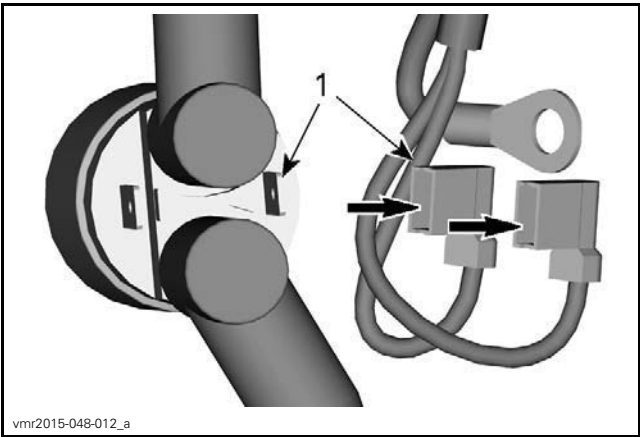
If solenoid power control circuit and ground control circuit both test good, test ECM ground circuits. Refer to *ELECTRONIC FUEL INJECTION (EFI)* section.

NOTE: Supply a ground with a jumper wire if you suspect that the ECM is not supplying a ground to the solenoid.

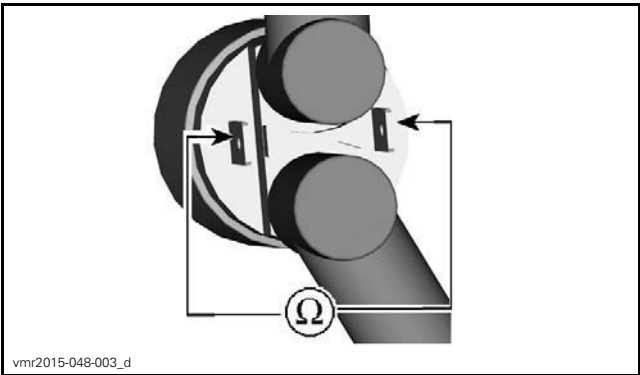
Starter Solenoid Continuity



- 1. Disconnect the black (-) negative battery cable.
- 2. Disconnect SS1 and SS2



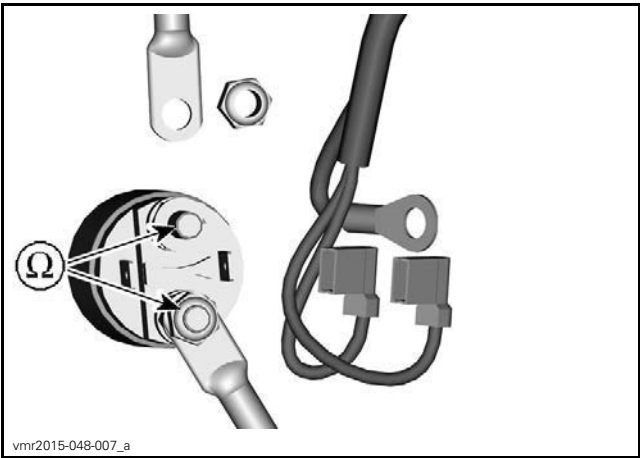
- 1. SS1



PROBE	PROBE	SPECIFICATION @ 20°C (68°F)
SS1	SS2	Close to 6Ω

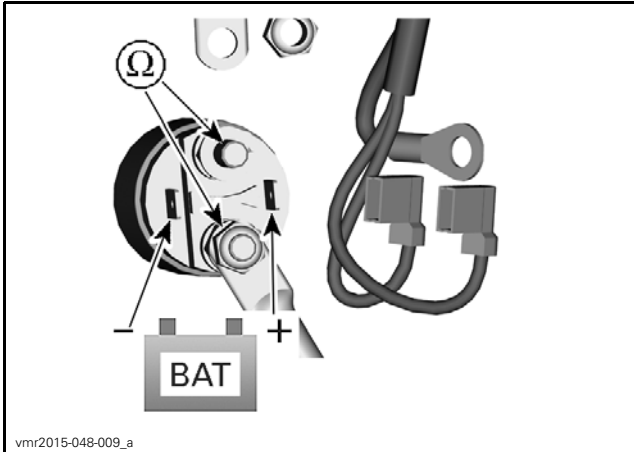
If resistance is not as per specification, replace the solenoid.

- 3. Disconnect BP3.



PROBE	PROBE	SPECIFICATION
BP3	Terminal to starter motor	O.L.

- 4. Jump starter solenoid.



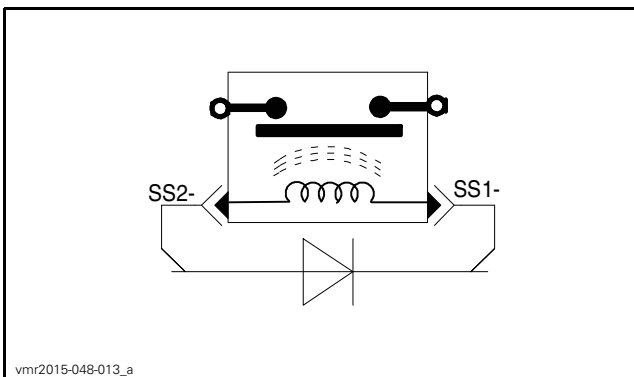
SS1 IS ON THE RIGHT

PROBE	PROBE	SPECIFICATION
BP3	Terminal to starter motor	Close to 0Ω

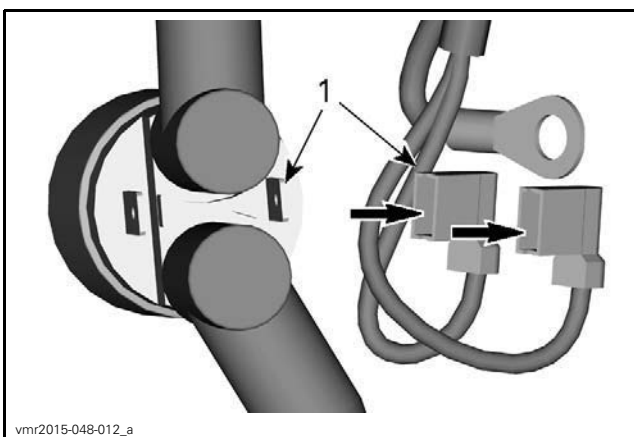
If resistance is not as per specification, replace the solenoid.

5. If starter power and ground circuits are good, refer to *MAGNETO AND STARTER* subsection for starter diagnosis and replacement.

Solenoid Diode Test



Disconnect SS1 and SS2 from starter solenoid.

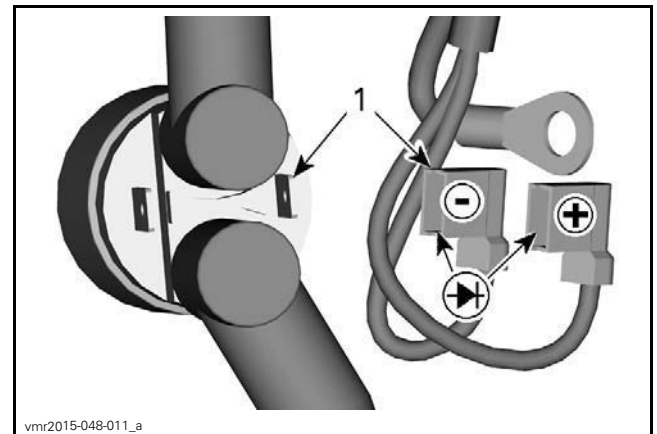


1. SS1

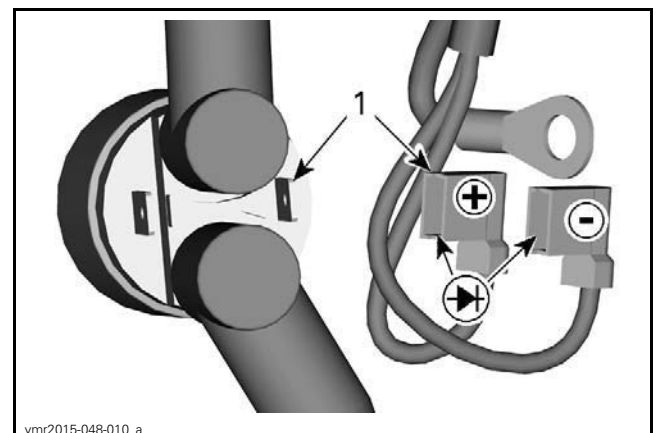
Use the FLUKE 115 MULTIMETER (P/N 529 035 868) and set it to the diode symbol as shown.



Probe wires while paying attention to the diode polarity.



FORWARD POLARITY, MUST BE AROUND 0.5 V



REVERSE POLARITY, MUST BE OPEN CIRCUIT
1. SS1

Section 06 ELECTRICAL SYSTEM

Subsection 06 (STARTING SYSTEM)

If test failed, replace diode. Refer to *WIRING HARNESS AND CONNECTORS* for diode location.

NOTE: The diode is integrated in the harness near the starter solenoid.

DIGITALLY ENCODED SECURITY SYSTEM (D.E.S.S.)

GENERAL

SYSTEM DESCRIPTION

The ignition key contains a ROM chip with a unique digital code that is the equivalent of a unique teeth pattern on a conventional key.

When the ignition key is turned ON, the ECM reads the ignition key and, if it is not recognized, no engine starting will be possible.

NOTE: When a key is not recognized by the ECM, INVALID KEY will be displayed in the multifunction speedometer.

NOTE: All ignition keys have the same teeth pattern. Therefore, they can be used and turned in the switch of any D.E.S.S.-equipped vehicle. However, unless the D.E.S.S. system recognizes (in the ECM) a valid programmed key, the engine starting will not be allowed.

NOTE: Actually, it is the memory of the ECM that is programmed to recognize the digital code of the ignition key.

Up to 10 ignition keys may be programmed in the memory of the ECM. They can also be erased individually or all at once.

Note that the D.E.S.S. circuitry is already activated on all new ECM.

TROUBLESHOOTING

DIAGNOSTIC TIPS

NOTE: It is a good practice to check for fault codes using B.U.D.S. as a first troubleshooting step.

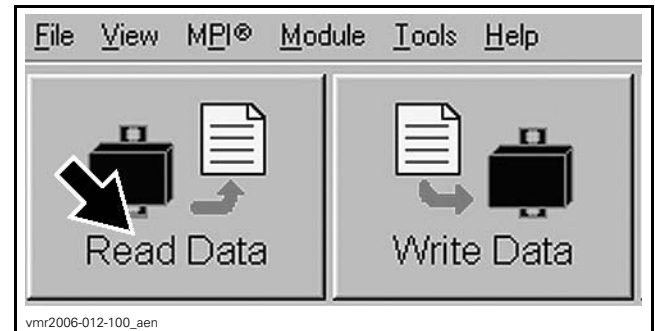
If D.E.S.S. key is not recognized by the ECM, key is defective or there is a wiring problem, CHECK ENGINE light will turn on and a message will be displayed in the multifunction speedometer.

PROCEDURES

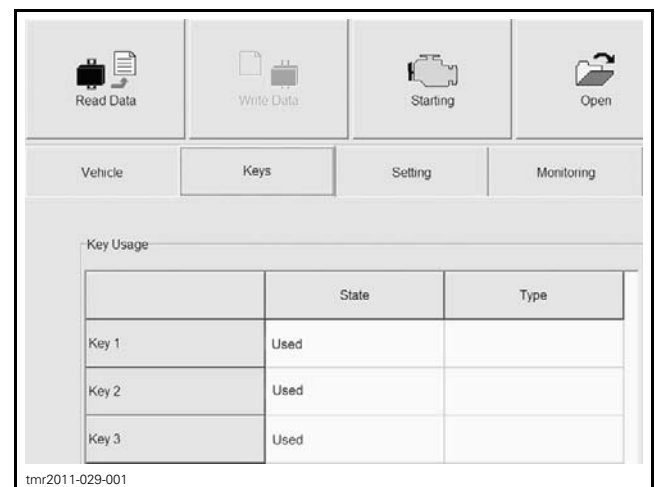
KEY PROGRAMMING

1. Connect to the latest applicable B.U.D.S. version. Refer to *COMMUNICATION TOOLS AND B.U.D.S.* subsection.

2. Turn ignition switch to ON using any of the key provided with the vehicle. DO NOT start the engine.
3. Click the **Read Data** button in B.U.D.S.

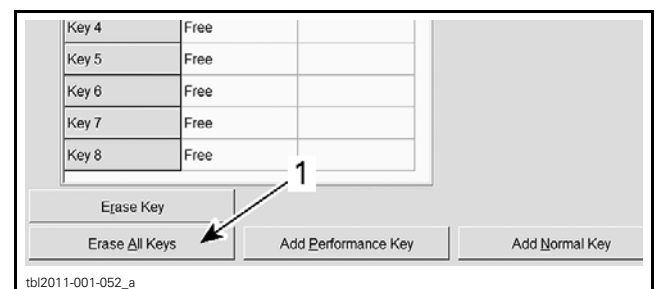


4. Click on **Keys** tab.



KEYS TAB

5. Click on **Erase All Keys** button.



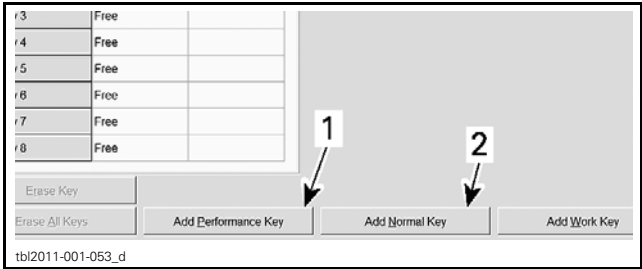
1. Click here to erase all keys

6. Click "YES" to confirm the action.
7. Check the color of the key to be programmed.

Subsection XX (DIGITALLY ENCODED SECURITY SYSTEM (D.E.S.S.))

KEY	KEY TYPE
BLACK key	Performance key
GRAY key	Normal key

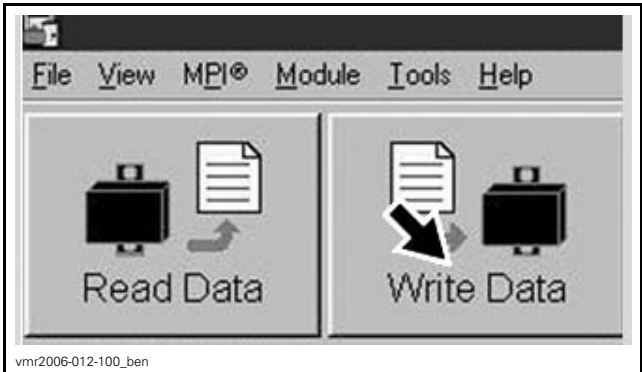
8. Click on the appropriate **Add Key** button.



- 1. Add Performance Key button
- 2. Add Normal Key button

NOTE: The **Add Work Key** button is not used for these vehicles.

- 9. Turn ignition switch to OFF.
- 10. Remove the key.
- 11. Insert the next key to be programmed.
- 12. Turn ignition key to ON position.
- 13. Click on the appropriate **Add Key** button.
- 14. Repeat to program more keys if needed.
- 15. Click on **Write Data** button to transfer new settings and information to the ECM.



WRITE DATA BUTTON

When new data is written in the ECM, a message that says "Remove key from vehicle" is displayed in the gauge. When this occurs, remove the key from ignition switch and wait until the message disappears.

- 16. Click on EXIT button to end session.
- 17. Disconnect all cables and hardware from vehicle.
- 18. Ensure to reinstall the connector into its housing.

LIGHTS, GAUGE AND ACCESSORIES

SERVICE TOOLS

Description	Part Number	Page
FLUKE 115 MULTIMETER	529 035 868	576, 578

SERVICE PRODUCTS

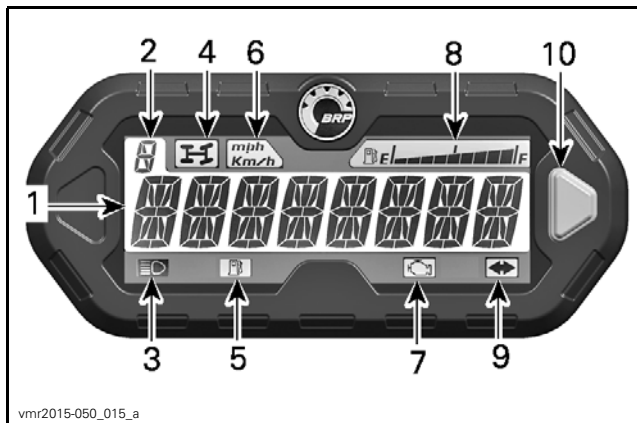
Description	Part Number	Page
DIELECTRIC GREASE	293 550 004	572

GENERAL

NOTICE It is recommended to always disconnect the battery when replacing any electric or electronic parts. Always disconnect battery exactly in the specified order, BLACK (-) cable first.

MULTIFUNCTION GAUGE

Multifunction Gauge Description



1. Main screen
2. Transmission position display
3. High beam indicator lamp
4. 4WD indicator lamp
5. Low fuel level indicator lamp
6. MPH, Km/h indicator lamp
7. Check engine indicator lamp
8. Fuel level display
9. Signal lights/hazard lights indicator lamp (CE models)
10. Selector button

1) Main Screen

The main screen is used to display numerous functions of the multifunction gauge.

Refer to *MULTIFUNCTION GAUGE MODES* for the available display modes.

2) Transmission Position Display

This display will show transmission position.

DISPLAY	FUNCTION
P	Park
R	Reverse
N	Neutral
H	High range
L	Low range

3) High Beam Indicator Lamp



When this indicator is ON, it indicates that **high beam** is selected on the headlights switch and that the ignition key is in the "ON with lights" position.

4) 4WD Indicator Lamp



When this indicator is ON, it indicates the **4WD** system is activated.

5) Low Fuel Level Indicator Lamp



When this indicator is ON, it indicates that there is approximately 5 L (1.3 U.S. gal.) of fuel left in fuel tank.

6) KM/H or MPH Indicator Lamp



The applicable lamp turns on to indicate the active speedometer unit of display.

7) Check Engine Indicator Lamp



Section 06 ELECTRICAL SYSTEM

Subsection 07 (LIGHTS, GAUGE AND ACCESSORIES)

When this indicator is ON, it indicates an engine fault code, look for a message in the main screen display.

When this indicator blinks, it indicates that **LIMP HOME** mode is activated.

8) Fuel Level Display

Bar gauge continuously indicates the level of fuel in the fuel tank while riding.

9) Turn signal/Hazard lights Indicator Lamp



When this indicator is ON, it indicates:

- A turn signal is activated, or
- The hazard lights are activated.

10) Selector Button

The selector button is used to navigate or change settings in the multifunction gauge.

Multifunction Display Modes

Speed Mode

In this mode, the display shows the speed of the vehicle either in km/h or in MPH.



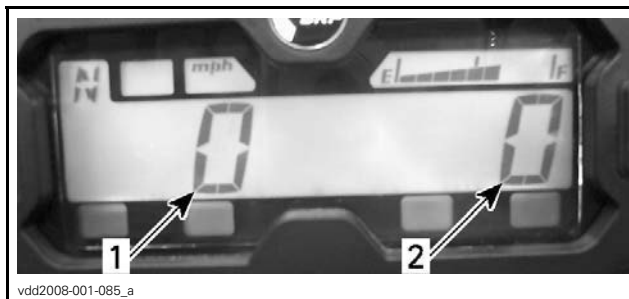
RPM Mode

In this mode, the display shows the engine RPM.



Combined Mode

In this mode, the display shows the speed of the vehicle and the engine RPM.



1. Vehicle speed
2. Engine RPM

Odometer (OD)

Odometer records the total distance travelled either in miles or kilometers.



Clock

Shows current time.



Refer to *GAUGE SETUP* to set current time.

Trip Meter (TP)

The trip meter records the travelled distance since it has been reset. Distance travelled is displayed either in kilometers or miles.



Press and HOLD the selector button for 2 seconds to reset the trip meter.

Trip Hour Meter (TH)

The trip hour meter records vehicle running time when the electrical system is activated. It can be used to establish traveling time between 2 places.



Press and HOLD the selector button for 2 seconds to reset the hour meter.

Engine Hour Meter (EH)

The engine hour meter records engine running time.



Message Display Mode

If an abnormal engine condition occurs, a message may scroll across the main screen in conjunction with a pilot lamp.

Refer to *DIAGNOSTIC SYSTEM AND FAULT CODES* subsection.

Navigating the LCD Gauge

⚠ WARNING

Never adjust or set functions on the multi-function gauge while riding the vehicle.

Default Display Mode

After vehicle startup, the default display mode is either:

- Vehicle speed
- Engine revolutions per minute (RPM)
- Both parameters simultaneously (combined mode).

To change from one display to the other, proceed as follows.

1. Turn ignition key to ON to power-up the system.
2. Wait until the "greeting message" has been displayed.
3. Press and release selector button once to display OD (odometer).
4. Press the selector button again, this time for 2 seconds.

This will change the Mode to either Speed, RPM or Combined.



5. To select another mode, repeat steps 3 and 4 until the desired mode is displayed.

Temporary Display Mode

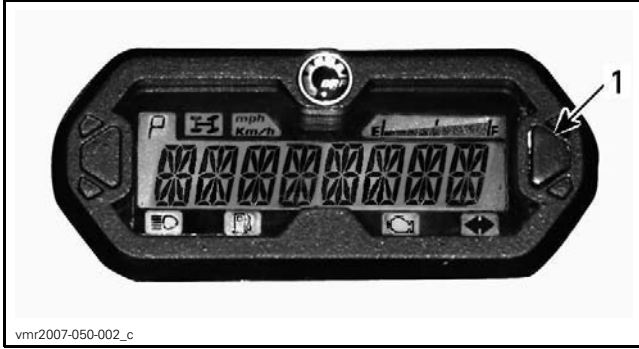
In the temporary display mode, the following functions are available:

- Odometer
- Clock
- Trip meter (resettable)
- Trip Hour meter (resettable)
- Engine hour meter.

Press and release selector button to change the default display mode to the temporary mode.

Section 06 ELECTRICAL SYSTEM

Subsection 07 (LIGHTS, GAUGE AND ACCESSORIES)



1. Selector button

The gauge will display the selected mode for 10 seconds then will return to the normal display mode.

While in a resettable mode, push and HOLD selector button for 2 seconds to reset it.

TROUBLESHOOTING

DIAGNOSTIC TIPS

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

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

Circuit Testing

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

NOTE: If the ignition switch is left ON for more than 50 minutes, the accessory relay will shut down.

Electrical Connection Inspection

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

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

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

Check for signs of moisture, corrosion or dullness. Clean pins properly and coat them with DIELECTRIC GREASE (P/N 293 550 004) or other appropriate lubricant when reassembling them, except if otherwise specified such as for the ECM connector.

Pay attention to ground wires.

For wiring harness connector locations, refer to *WIRING HARNESS AND CONNECTORS* subsection.

DIAGNOSTIC GUIDELINES (GAUGE)

MULTIFUNCTION GAUGE WILL NOT COME ON

1. Multifunction gauge not powered up.
 - Check fuse (F4), refer to *POWER DISTRIBUTION* subsection.
 - Test multifunction gauge 12 Vdc input and ground circuits as per *MULTIFUNCTION GAUGE WIRE IDENTIFICATION* in this subsection. Refer to *WIRING DIAGRAM*.
2. Defective Multifunction Gauge.
 - Replace multifunction gauge.

RELAYS/SPEEDO FUSE (F4) BURNS OUT REPEATEDLY

1. Taillight/Brake light system short circuit.
 - Check taillight/brake light bulbs and circuit

MULTIFUNCTION GAUGE COMMUNICATION ERROR

1. Multifunction gauge CAN circuit open.
 - Ensure multifunction gauge is properly connected and powered up.
 - Check for applicable fault code using B.U.D.S., refer to *MONITORING SYSTEM AND FAULT CODES* subsection.
 - Carry out a *MULTIFUNCTION GAUGE CAN RESISTOR TEST* in this subsection.
 - Carry out a continuity test of the multifunction gauge CAN wires, refer to *WIRING DIAGRAM*.

NO FUEL QUANTITY INDICATION

1. Defective fuel level sender or wiring.
 - Refer to *FUEL TANK AND FUEL PUMP* subsection.
2. Defective Multifunction Gauge.
 - Replace multifunction gauge, refer to *MULTIFUNCTION GAUGE* in this subsection.

DIAGNOSTIC GUIDELINES (LIGHTS)

BRAKE LIGHTS WILL NOT COME ON WHEN BRAKES APPLIED

1. Defective brake relay.
 - Test brake relay (R8), refer to *POWER DISTRIBUTION* subsection.
2. Defective brake light switch(es).
 - Refer to *BRAKE LIGHT SWITCHES* in the *BRAKE* subsection.
3. Defective wiring/connectors.
 - Test wiring continuity, refer to applicable *WIRING DIAGRAM*.

TURN SIGNAL LIGHTS WILL NOT COME ON WHEN SELECTED (CE MODELS)

1. Accessories fuse (F12) open circuit (turn signals inoperative only).
 - Test fuse, refer to *POWER DISTRIBUTION* subsection.
2. Clock/Hazard fuse (F8) open circuit (turn signals and hazard lights inoperative).
 - Test fuse, refer to *POWER DISTRIBUTION* subsection.
3. Defective Flasher Module.
 - Replace flasher module, refer to *FLASHER MODULE* in this subsection.
4. Defective wiring/connectors.
 - Test wiring continuity, refer to applicable *WIRING DIAGRAM*.

HAZARD LIGHTS WILL NOT COME ON WHEN SELECTED (CE MODELS ONLY)

1. Clock/Hazard fuse (F8) open circuit.
 - Check fuse, refer to *POWER DISTRIBUTION* subsection.
2. Hazard lights 12 Vdc input circuit open.
 - Check wiring and connectors as per *TURN SIGNAL/HAZARD LIGHTS WIRE IDENTIFICATION* in this subsection. Refer to *WIRING DIAGRAM*.
3. Hazard lights selector switch defective.
 - Test switch as per *TURN SIGNAL/HAZARD LIGHTS WIRE IDENTIFICATION* in this subsection. Refer to *WIRING DIAGRAM*.
4. Defective wiring/connector between hazard lights selector switch and flasher module.
 - Refer to *WIRING DIAGRAM*.
5. Flasher module ground circuit open.
 - Test wiring and connectors, refer to *WIRING DIAGRAM*.

6. Defective flasher module.
 - Replace flasher module, refer to *FLASHER MODULE* in this subsection.

HAZARD LIGHTS COME ON WITHOUT BEING SELECTED (CE MODELS ONLY)

1. Hazard lights switch or wiring short circuit.
 - Check for water in LH multifunction switch.
 - Test hazard light switch and wiring, refer to *WIRING DIAGRAM*.
2. Resistor R1 in flasher module input circuit is open.
 - Test resistor R1, refer to *WIRING DIAGRAM*.

TURN SIGNAL/HAZARD LIGHTS INDICATOR IN MULTIFUNCTION GAUGE WILL NOT COME ON WITH TURN SIGNAL OR HAZARD LIGHTS SELECTED ON, IGNITION SWITCH ON (CE MODELS ONLY)

1. Signal wire from flasher module to multifunction gauge open circuit.
 - Test circuit continuity from flasher module (3-MC2-4) to multifunction gauge (1-C1-8).
2. Defective flasher module.
 - Replace flasher module, refer to *FLASHER MODULE* in this subsection.
3. Defective multifunction gauge.
 - Replace multifunction gauge.

HAZARD LIGHTS INDICATOR NOT WORKING WITH IGNITION SWITCH OFF (CE MODELS ONLY)

1. Defective hazard LED
 - Test LED. Observe polarity.

POSITION LIGHTS WILL NOT COME ON (CE MODELS ONLY)

1. Defective light bulbs
 - Test/replace light bulbs.
2. Accessories fuse F12 open circuit.
 - Test fuse, refer to *POWER DISTRIBUTION* subsection.
3. Power or ground circuit wiring.
 - Check wiring continuity, refer to *WIRING DIAGRAM*.

Section 06 ELECTRICAL SYSTEM

Subsection 07 (LIGHTS, GAUGE AND ACCESSORIES)

HORN WILL NOT FUNCTION (CE MODELS ONLY)

1. Burnt Clock/Hazard fuse (F4)
 - Check fuse
2. Defective horn.
 - Test horn by applying 12 Vdc and ground jumper to horn.
3. Defective horn switch.
 - Test horn switch as per HORN WIRE IDENTIFICATION in this subsection. Refer to WIRING DIAGRAM.
4. Defective wiring.
 - Check wiring continuity as per HORN WIRE IDENTIFICATION in this subsection. Refer to WIRING DIAGRAM.

PROCEDURES

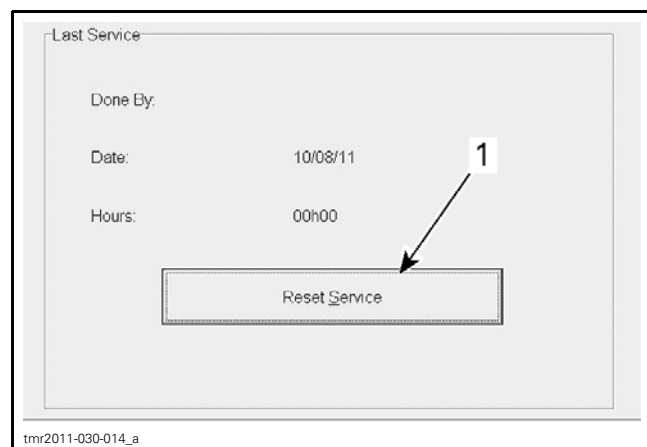
MULTIFUNCTION GAUGE

Maintenance Required Message Reset

Connect to the latest applicable B.U.D.S. software version. Refer to *COMMUNICATION TOOLS AND B.U.D.S.* subsection.

Select **Vehicle** tab.

Click on the **Reset Service** button.



TYPICAL

1. Reset Service button

Multifunction Gauge Wire Identification

FUNCTION	PIN	COLOR
12 volt input from fuse F4	17	OR/GN
12 volt input from fuse F8 (Clock)	16	BE
Ground	20	BK
CAN LO	18	WH/BK
CAN HI	19	WH/BE
Fuel level gauge supply	4	BR/PK
Fuel level gauge ground	21	VI/PK
2WD/4WD switch signal (-)	7	BK/BE
HI beam signal (+)	5	BU
Vehicle speed sensor signal (VSS)	9	PK

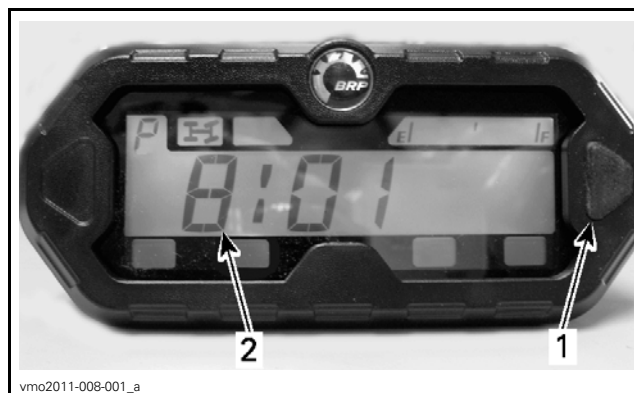
Multifunction Gauge Circuit Protection

CONDITION	CIRCUIT PROTECTION
Supplied at all times	Fuse 8
Supplied with main relay activated	Fuse 4

Clock Setting Using Gauge Selector Button

To set current time, proceed as follows:

1. Select the clock display.



1. Selector button
2. Time

2. Press and HOLD selector button.

NOTE: The display will flash.

3. Choose the 12-hour (12H) or 24-hour (24H) format by pressing button.

4. If the 12-hour format was selected, choose Am (A) or Pm (P) by pressing button.
5. Choose hour first digit by pressing button.
6. Choose hour second digit by pressing button.
7. Choose minutes first digit by pressing button.
8. Choose minutes second digit by pressing button.

NOTE: The gauge will display the current time for 10 seconds then will return to the normal display mode.

Multifunction Gauge Set-Up Using B.U.D.S.

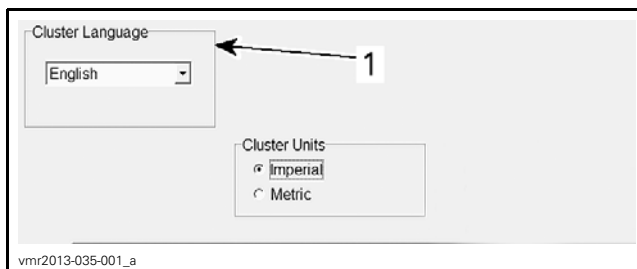
Connect to the applicable B.U.D.S. software. Refer to *COMMUNICATION TOOLS AND B.U.D.S.* subsection.

Language Selection

In B.U.D.S., select the:

- **Setting** page tab
- **Cluster** page tab.

Scroll and select the desired display language in the **Cluster Language** box.



TYPICAL

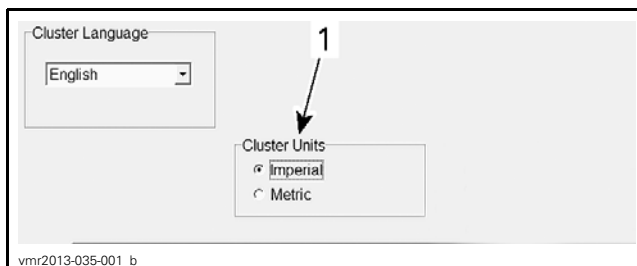
1. Cluster Language box

Units of Display Selection

In B.U.D.S., select the:

- **Setting** page tab
- **Cluster** page tab.

Select **Imperial** or **Metric** in the **Cluster Units** box.



TYPICAL

1. Cluster Units box

Clock Setting

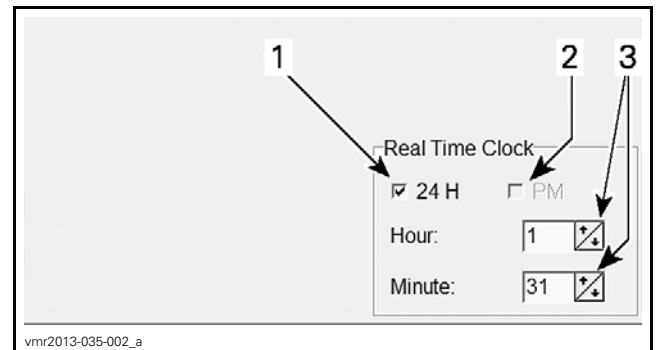
In B.U.D.S., select the:

- **Setting** page tab
- **Cluster** page tab.

To set clock to the 24-hour format, check the **24 H** box. To set it to the 12-hour format, leave the box empty.

If 12-hour format was selected, check the **PM** box if required.

Set hour and minutes using the up or down arrows.



TYPICAL

1. 24 H box
2. PM box
3. Arrows

Multifunction Gauge Test Using B.U.D.S.

Connect to the latest applicable B.U.D.S. software version. Refer to *COMMUNICATION TOOLS AND B.U.D.S.* subsection.

Wow Test

This function is used to check if the indicator lights, display and analog indicators (if applicable) are functional.

NOTE: This function does not test the signals or external circuits.

In B.U.D.S., select the:

- **Activation** page
- **Cluster** tab.

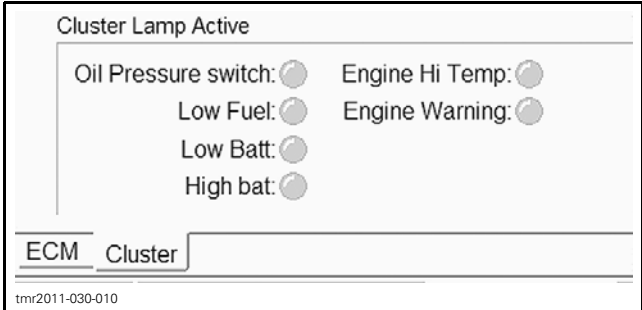
Click on the **WOW Test** button.

Indicator Lights Monitoring

In B.U.D.S., select the:

- **Monitoring** page
- **Cluster** tab.

Use the **Cluster Lamp Active** box to monitor different indicator lights outputs.



TYPICAL - CLUSTER LAMP ACTIVE BOX

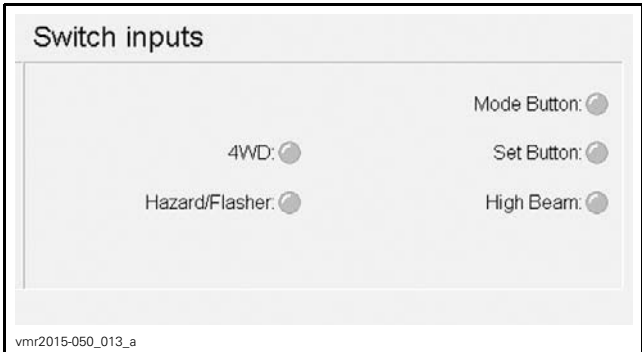
This function confirms that the signals are broadcasting and the indicator lights should be ON in the multifunction gauge.

Switch Input Monitoring

In B.U.D.S., select the:

- Monitoring page
- Cluster tab.

Use the **Switch Inputs** box to monitor different switch inputs as you activates the switches.



TYPICAL - SWITCH INPUTS BOX

This function confirms that the ECM receives the inputs.

Vehicle Parameters Monitoring

In B.U.D.S., select the:

- Monitoring page
- Cluster tab.

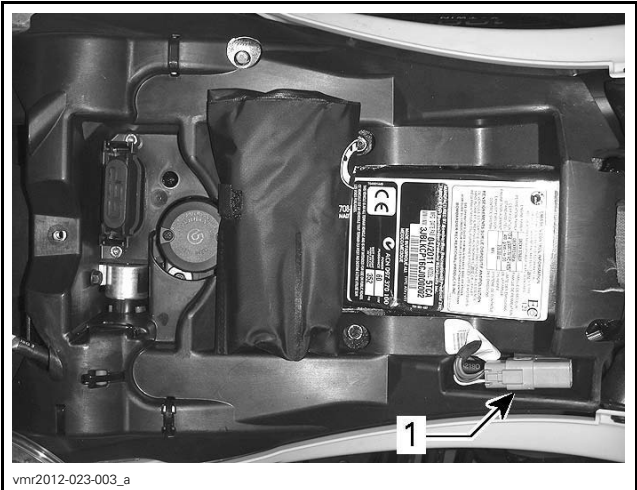
In the upper area of the B.U.D.S. cluster page, the following indications are displayed.

- Engine speed (RPM)
- Vehicle speed
- Fuel level
- Gear position.

These indications confirm that the applicable signals are transmitted and the information should be displayed in the multifunction gauge.

Multifunction Gauge CAN Resistor Test

1. Disconnect DPS1 connector (control) from the DPS module, refer to *STEERING SYSTEM* sub-section.
2. Remove seat to access diagnostic link connector (DB).
3. Remove diagnostic link connector from its holder.



1. Diagnostic link connector (DB)

4. Measure the resistance of the CAN resistors as follows.

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

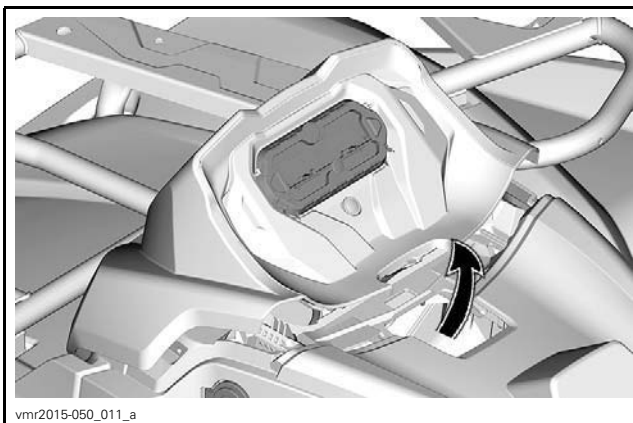
CAN RESISTOR TEST	
DIAGNOSTIC LINK CONNECTOR	RESISTANCE
Pins 1 and 2	Approximately 60 Ω

NOTE: This tests both the ECM and the Cluster CAN resistors and wires.

TEST RESULT	
READING	POSSIBLE CAUSE
Approximately 60 Ω	ECM and CLUSTER CAN wires and resistors good
Approximately 120 Ω	CAN wire to CLUSTER open CAN wire to ECM open CLUSTER CAN resistor open ECM CAN resistor open
Infinite (open circuit)	CAN wire to DB connector open circuit

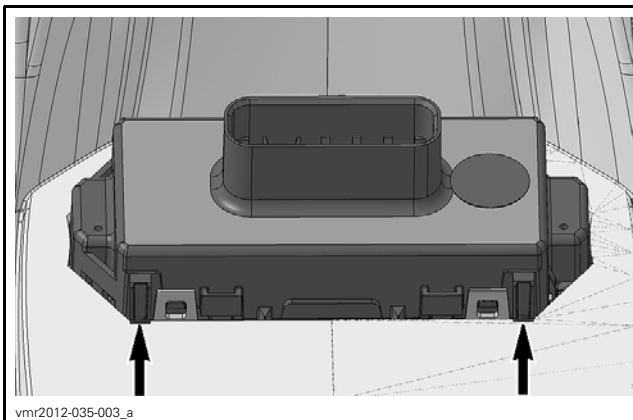
Gauge Support Removal

The gauge is clipped in place. Gently pull upwards and disconnect electrical connectors.



Multifunction Gauge Removal

1. Pull gauge support from vehicle.
2. From the back of the gauge support, release the gauge retaining tabs and remove the gauge from its support.



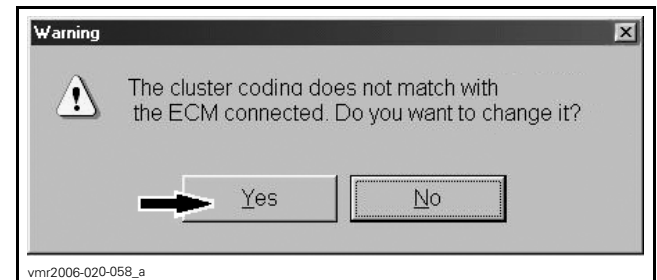
GAUGE RELEASE TABS (4)

Multifunction Gauge Installation

For the installation, reverse the removal procedure.

New Multifunction Gauge Registration (coding)

Whenever the multifunction gauge is replaced, B.U.D.S. must be used to register it in the ECM. Simply click **Yes** when the following message appears.



IMPORTANT: If a multifunction gauge from another vehicle model is installed and is not registered in the ECM through B.U.D.S., **engine starting will not be allowed until the gauge is registered with the proper coding.**

12 VOLT POWER OUTLET

12 Volt Power Outlet Removal and Installation

Refer to *BODY* subsection and remove the RH inner fender panel.

Unplug the connectors of the power outlet.

Unscrew the retaining nut.

Reverse procedure for installation.

12 Volt Power Outlet Wire Identification

FUNCTION	PIN	COLOR
12 volt input from fuse F12	2	RD/BK
Ground	1	BK

12 Volt Power Outlet Circuit Protection

CONDITION	CIRCUIT PROTECTION
Supplied when R2 and R3 are activated	Fuse 12 of fuse block 1 (from accessories relay R3)

HEADLIGHTS

Headlight Wire Identification

ACCESSORY RELAY (R3)		
FUNCTION	PIN	COLOR
12 volt input from fuse F3	E12	RD/GN
12 volt input from F4 (relay winding input)	E10	OR/GN
12 volt output to ignition switch (F12)	D10	RD/YE before F12 and RD/BK after F12
Relay winding ground (from ECM K2)	D12	OR/BK

HEADLIGHT LOW/HIGH BEAM SWITCH		
FUNCTION	PIN	COLOR
12 volt input from ignition switch	MG2-4	RD/BU
12 volt output to high beam headlights	MG2-5	BU
12 volt output to low beam headlights	MG2-2	GN

Headlights Circuit Protection

CONDITION	CIRCUIT PROTECTION
Supplied when R2 and R3 are activated	Fuse 12 of fuse block 1 (from fuse 3 of fuse block 2)

Headlight Test

1. Disconnect LOW beam and HIGH beam headlight connectors. Refer to *BULB REPLACEMENT*.
2. Set ignition switch to ON (with lights).
3. Measure the voltage on headlight connector as follows.

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

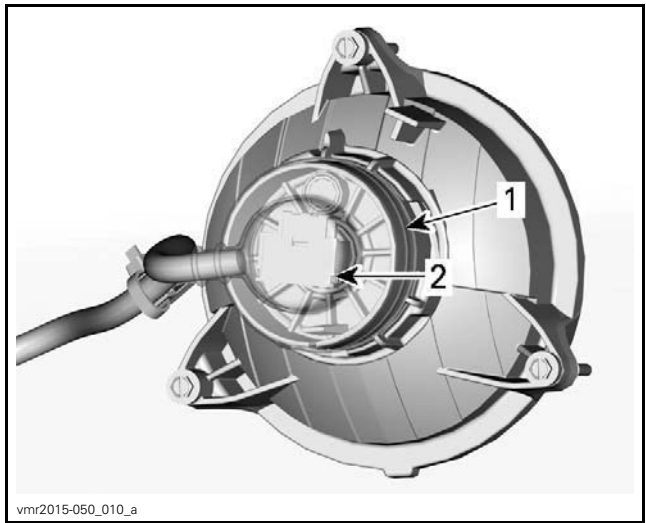
4. Measure the voltage on headlight connector as follows.

SWITCH POSITION	WIRE COLOR		VOLTAGE
LO beam	GREEN (Low beam connector)	BLACK	Battery voltage
HI beam			No voltage
Lo beam	BLUE (Hi beam connector)		Battery voltage
HI beam			

Headlight Bulb Replacement

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.

1. Remove cover.
2. Unplug connector.
3. Remove bulb.



1. Cover
2. Connector

4. Properly reinstall removed parts in the reverse order of their removal.
5. Validate headlight operation.

Headlamp Beam Aiming

NOTE: Load vehicle as per normal use.

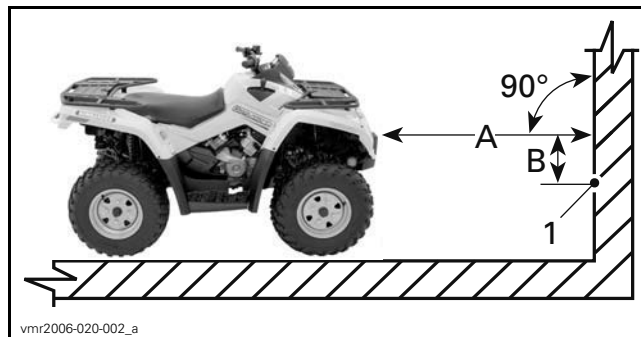
1. Position vehicle on a level surface 5 m (16 ft) in front of a test surface (wall or screen) as in first illustration.
2. Measure the distance from the center of each headlight to the ground (high beam and low beam).

3. Trace a line on the test surface parallel to the ground at each measured height (one for high beam and one for low beam).

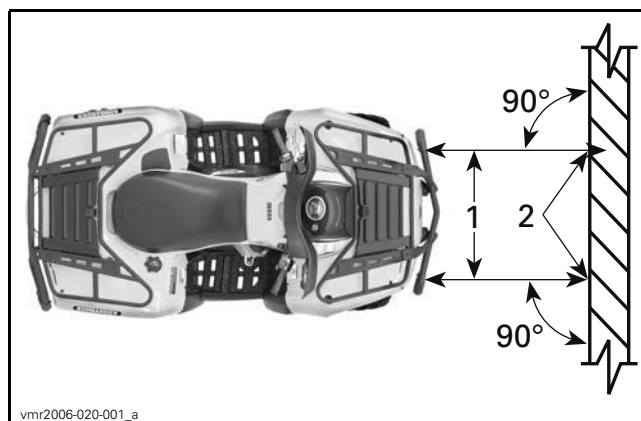
Low beam aiming is correct when the crest of the low beam is **below** the applicable horizontal center line traced on the test surface as per specification.

High beam aiming is correct when the center of the high beam (focus point) is **below** the applicable horizontal center line traced on the test surface as per specification.

SPECIFICATION	
Low beam crest (top of low beam)	25 mm to 125 mm (1 in to 5 in) below applicable line
High beam center (focus point)	



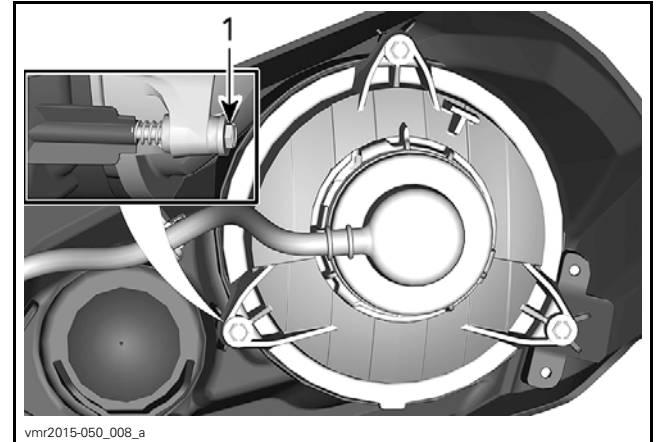
TYPICAL
1. Light beam center
A. 5 m (17 ft)
B. Beam aiming specification



TYPICAL
1. Headlight center lines
2. Light beam center

Beam Aiming Adjustment

Turn adjustment knobs to adjust beam height and side orientation to specification.



LOW BEAM
1. Adjustment knobs

TAILLIGHTS/BRAKE LIGHTS

Brake Light Switch

For brake light switch location and testing, refer to *BRAKES* subsection.

Brake Light Wire Identification

BRAKE LIGHT RELAY (R8)		
FUNCTION	PIN	COLOR
12 volt input from fuse F4 (brake light power)	C8	OR/GN
12 volt input from F4 (relay winding input)	D8	OR/GN
12 volt output to brake light	D9	WH/OR
Relay winding ground (from brake light switch(es))	C9	RD/OR

Brake Light Circuit Protection

CONDITION	CIRCUIT PROTECTION
Supplied when: Main relay R2 activated Brake relay R8 activated	Fuse 4 of fuse block 1 (from main relay R2)

Taillight Wire Identification

FUNCTION	PIN	COLOR
Supplied when main relay R2 activated	2	OR/GN
Ground from BN1	3	BLACK

Section 06 ELECTRICAL SYSTEM

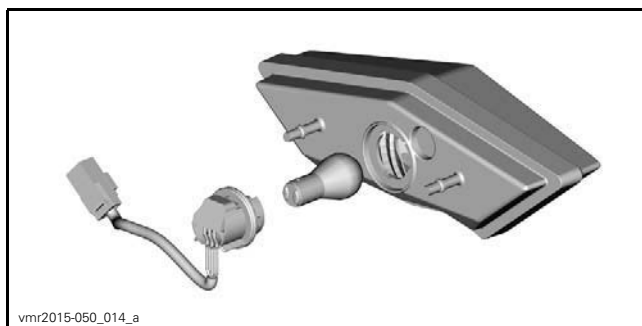
Subsection 07 (LIGHTS, GAUGE AND ACCESSORIES)

Taillight Circuit Protection

CONDITION	CIRCUIT PROTECTION
Supplied when main relay R2 activated	Fuse 4 of fuse block 1 (from main relay R2)

Taillight/Brake Light Bulb Replacement

1. Unplug connector from bulb.
2. Rotate light bulb counterclockwise to remove it from taillight.



3. Remove bulb socket from taillight.

Installation is the reverse of the removal procedure.

TURN SIGNALS/HAZARD (CE MODELS ONLY)

Turn Signal/Hazard Lights Wire Identification

FLASHER MODULE		
FUNCTION	PIN	COLOR
12 volt input from fuse F8	MC2-1	BE
12 volt input from R3	MC1-5	RD/BK
RH turn 12 volt input from turn signal switch	MC1-1	BE/BR
LH turn 12 volt input from turn signal switch	MC1-2	BE/GY
Output to RH turn signal lights	MC2-2	BR
Output to LH turn signal lights	MC2-3	GY

FLASHER MODULE		
FUNCTION	PIN	COLOR
Output to multifunction gauge (turn signal indicator)	MC2-4	OR
Ground	MC1-4	BK
Hazard 12 volt input from hazard switch	MC1-6	BE/RD

TURN SIGNAL SWITCH (IN MULTIFUNCTION SWITCH)		
FUNCTION	PIN	COLOR
12 volt input from fuse F8	MG3-3	BE
RH turn 12 volt output to flasher module	MG3-1	BE/BR
LH turn 12 volt output to flasher module	MG3-2	BE/GY

HAZARD SWITCH		
FUNCTION	PIN	COLOR
12 volt input from fuse F8	MG3-3	BE
12 volt output to flasher module	MG3-5	BE/RD
12 volt output to hazard pilot lamp		

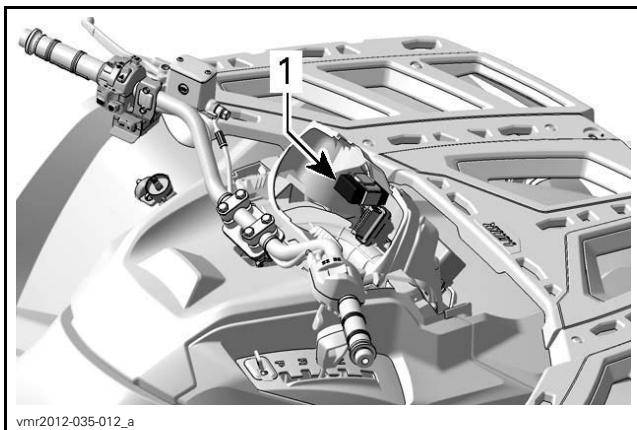
Turn Signal/Hazard Circuit Protection

TURN SIGNAL CIRCUIT	
CONDITION	CIRCUIT PROTECTION
Supplied when R2 and R3 are activated	Fuse 12 of fuse block 1 (from accessory relay R3)
Battery power (continuous)	Fuse 8 of fuse block 1

HAZARD CIRCUIT	
CONDITION	CIRCUIT PROTECTION
Battery power (continuous)	Fuse 8 of fuse block 1

Flasher Module Access

Remove multifunction gauge.



1. Flasher module location

HORN (CE MODELS ONLY)

Horn Wire Identification

HORN SWITCH (IN MULTIFUNCTION SWITCH)		
FUNCTION	PIN	COLOR
12 volt input from fuse F8	MG3-3	BE
12 volt output to horn	MG3-4	BE/BK

HORN		
FUNCTION	PIN	COLOR
12 volt input from horn switch	2	BE/BK
Ground	1	BLACK

Horn Circuit Protection

CONDITION	CIRCUIT PROTECTION
Battery power (continuous)	Fuse 8 of fuse block 1

FRONT DRIVE (450)

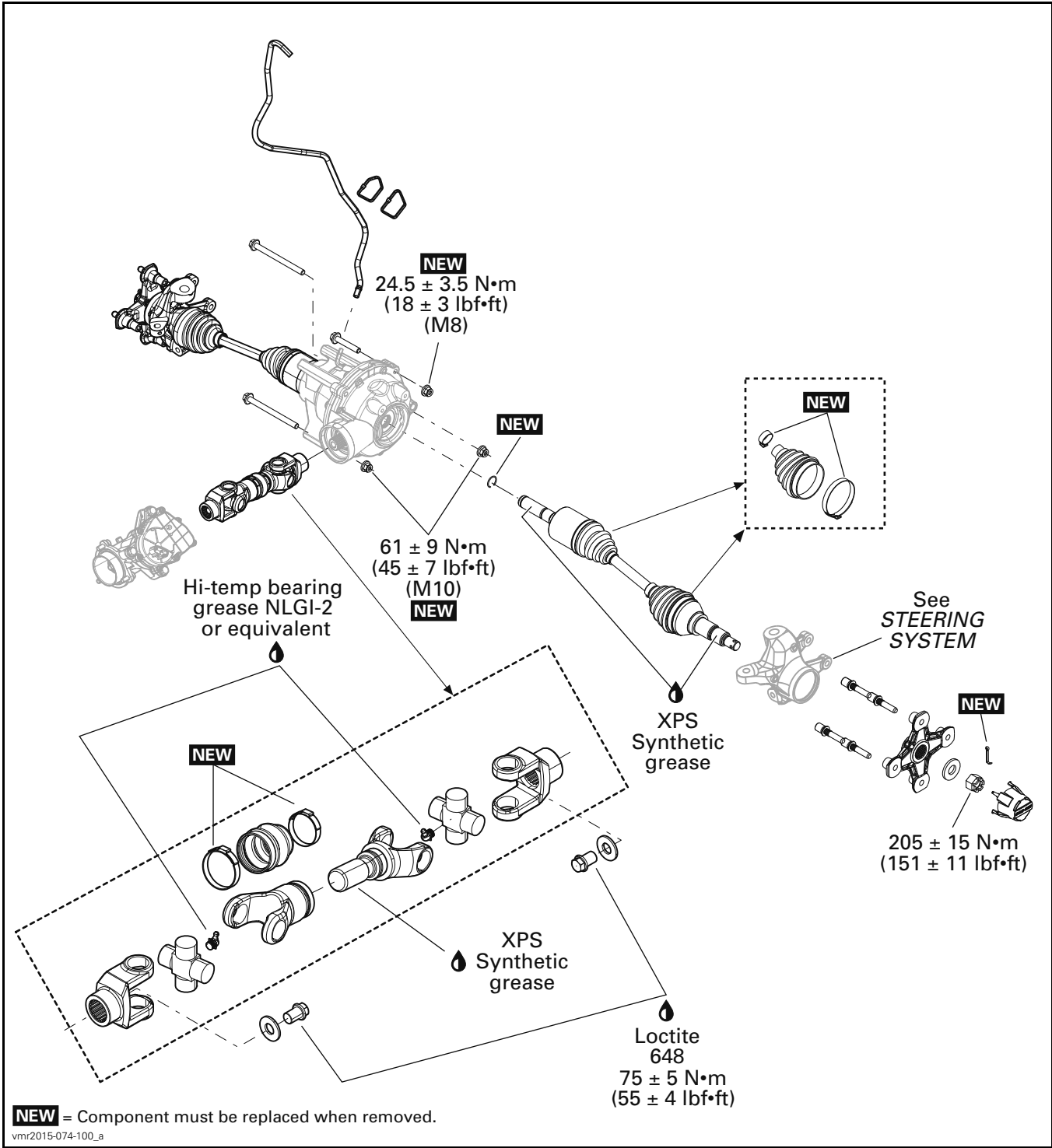
SERVICE TOOLS

Description	Part Number	Page
BACKLASH MEASUREMENT TOOL.....	529 035 665	589
CV BOOT CLAMP PLIER	529 036 120	587
CV JOINT EXTRACTOR.....	529 036 005	587
SPANNER SOCKET	529 035 649	591

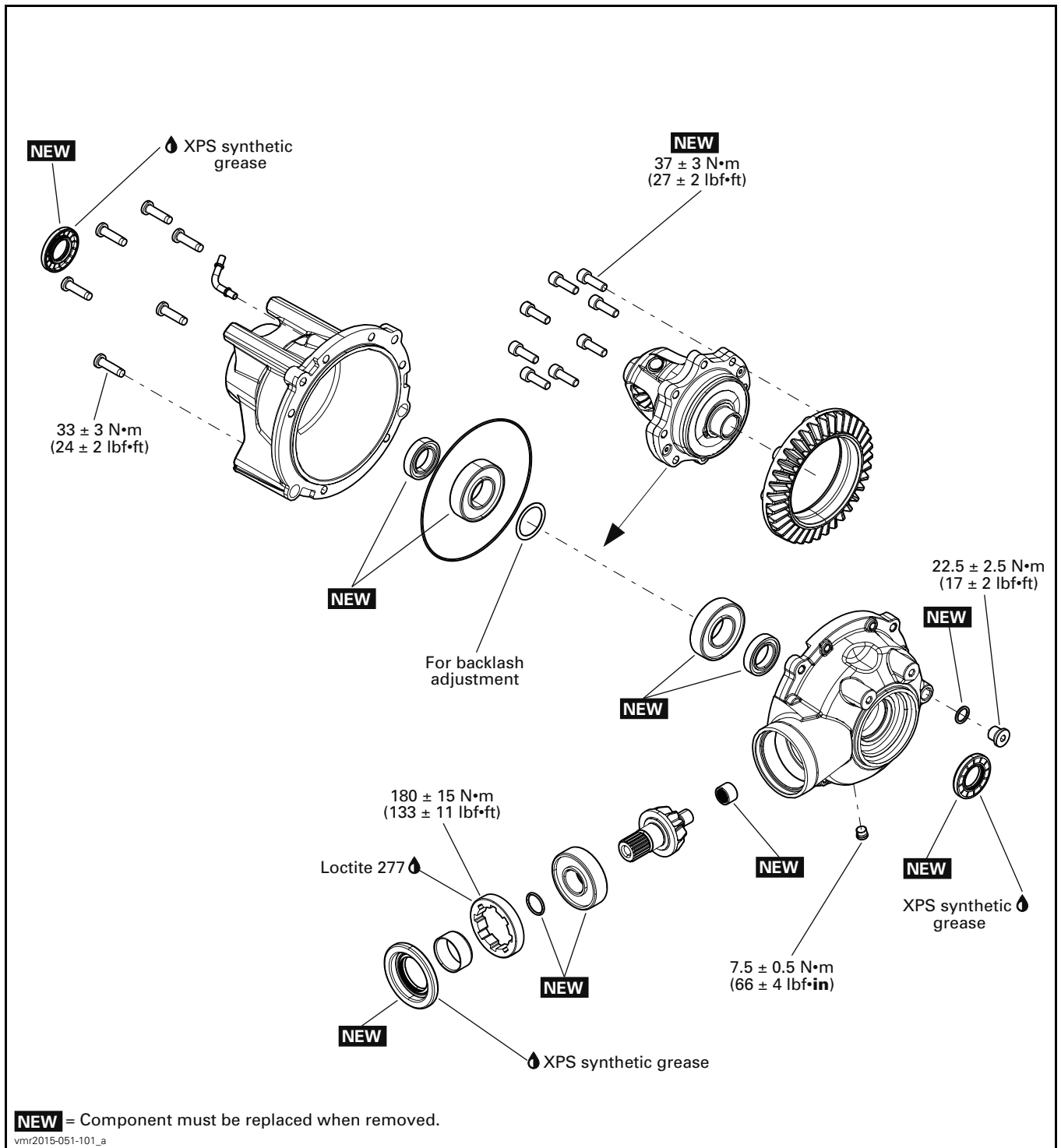
SERVICE PRODUCTS

Description	Part Number	Page
LOCTITE 277	293 800 073	593
LOCTITE 648 (GREEN)	413 711 400	594
XPS SYNTHETIC GREASE.....	293 550 010	587, 593–594

FRONT DRIVE SHAFTS AND FRONT PROPELLER SHAFT



FRONT DIFFERENTIAL



GENERAL

The procedure explained below is the same for the RH and LH sides unless otherwise instructed.

SYSTEM DESCRIPTION

The Visco-Lok® system constantly monitors front wheel speed and, if it detects one wheel spinning faster than its mate, it progressively sends more power to the wheel with the better traction.

The Visco-Lok system is comprised of two principal components, a shear pump and the controlled multi-plate clutch.

A unique feature of the shear pump is that it is self-contained and independent. It does not require an external source of hydraulic fluid. The self-contained viscous shear pump generates a pressure proportional to wheel speed differential - meaning the difference in rotational speed between the two wheels. This pressure engages the friction clutch via a piston to transmit the torque.

In the event of a failure, the Visco-Lok carrier/ring gear and pinion gear will have to be replaced.

NOTE: The Visco-Lok shear pump is not serviceable. If the pump is disassembled, the viscous fluid contained inside will be lost and it cannot be replaced.

PROCEDURES

WHEEL HUB

Wheel Hub Removal

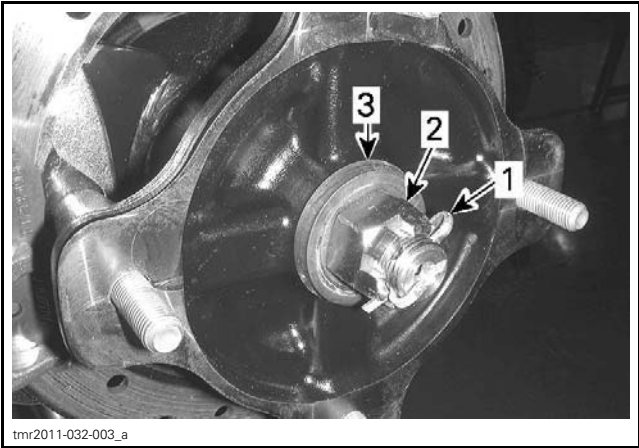
Lift and support vehicle.

Select the 4WD position and place the transmission lever on "P".

Remove caliper from knuckle. Refer to *BRAKES* subsection.

Remove the following parts:

- Wheel cap
- Cotter pin
- Castellated nut
- Belleville washer.



TYPICAL
1. Cotter pin
2. Castellated nut
3. Belleville washer

Remove wheel hub.

Wheel Hub Inspection

Check wheel hub for cracks or other damages.

Check inner splines for wear or other damages.

If any damage is detected on wheel hub, replace it with a new one.

Wheel Hub Installation

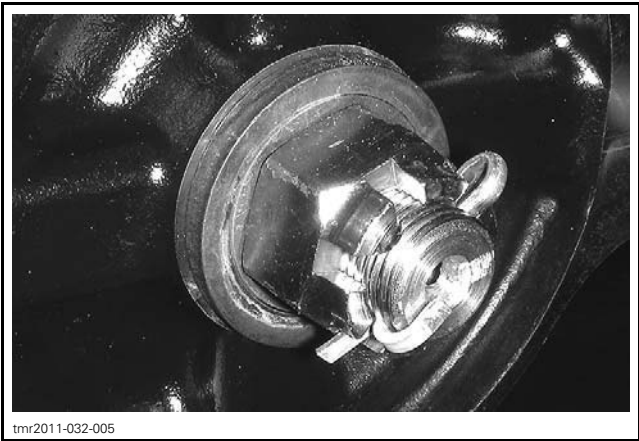
The installation is the reverse of the removal procedure. However, pay attention to the following. Install Belleville washer with its convex side outwards.

Tighten castellated nut to specification.

TIGHTENING TORQUE	
Castellated nut	205 N•m ± 15 N•m (151 lbf•ft ± 11 lbf•ft)

NOTE: Tighten further castellated nut if required to align grooves with drive shaft hole.

Install a **NEW** cotter pin.



FRONT DRIVE SHAFT

Front Drive Shaft Removal

Lift and support vehicle.

Remove inner fender panel(s). Refer to *BODY* subsection.

Remove the *KNUCKLE*. Refer to *STEERING SYSTEM* subsection.

Remove shock absorber lower bolt.

Lift and attach the following parts to make room.

- Shock absorber
- Upper suspension arm.

Strongly pull drive shaft out of differential.



PULL DRIVE SHAFT

Discard the stop ring at the end of the shaft.

Front Drive Shaft Inspection

Inspect the condition of boots. If there is any damage or evidence of leaking lubricant, replace them. Refer to *DRIVE SHAFT BOOT* in this subsection.

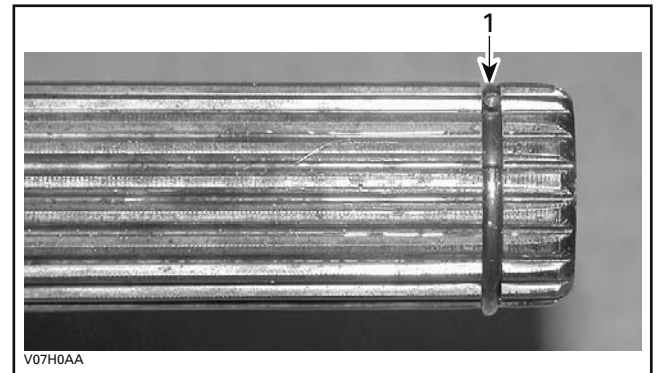
Check splines for excessive wear. Replace if necessary.

NOTE: If the splines on plunging joint are worn, a check of differential inner splines should be done.

Front Drive Shaft Installation

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

Install a **NEW** stop ring.



TYPICAL
1. Stop ring

Apply XPS SYNTHETIC GREASE (P/N 293 550 010) on the splines.

Ensure that wear ring is close to the differential.

DRIVE SHAFT BOOT

Drive Shaft Boot Removal

Remove *FRONT DRIVE SHAFT*. See procedure in this subsection.

Remove drive shaft boot clamps.

REQUIRED TOOL
CV BOOT CLAMP PLIER (P/N 529 036 120)



Dislodge the large end of the boot.

Separate the joint from the shaft. Two procedures can be done.

Without the Special Tool

Clamp joint housing in a vise.

Align shaft with joint.

Pull hard on shaft to remove from joint.

Remove boot from drive shaft.

Remove and discard the circlip. A new one is included in the boot kit.

With the Special Tool

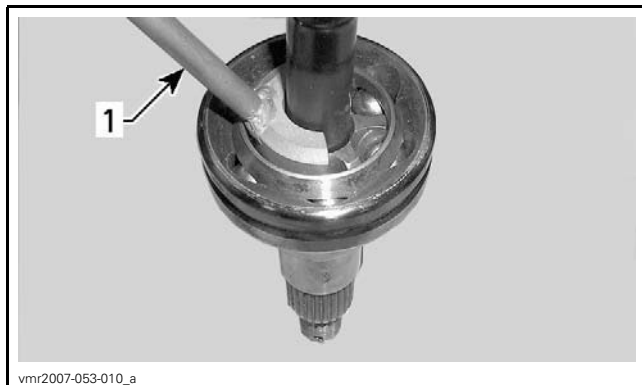
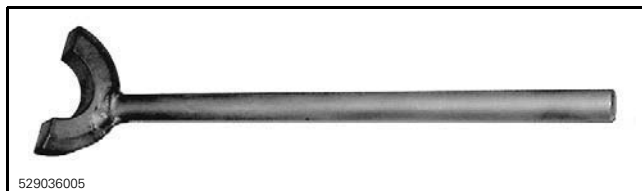
Place drive shaft in vice with the joint downward.

Install the tool on bearing.

REQUIRED TOOL
CV JOINT EXTRACTOR (P/N 529 036 005)

Section 07 DRIVE SYSTEM

Subsection 01 (FRONT DRIVE (450))



TYPICAL — CV JOINT SHOWN

1. Joint extractor tool

With an hammer, hit on the tool to separate joint from shaft.

When joint and shaft are separated, remove boot from drive shaft.

Remove and discard the circlip. A new one is included in the boot kit.

Drive Shaft Boot Installation

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

Install the **NEW** circlip.

Pack bearing area with grease (included with the new boot kit).

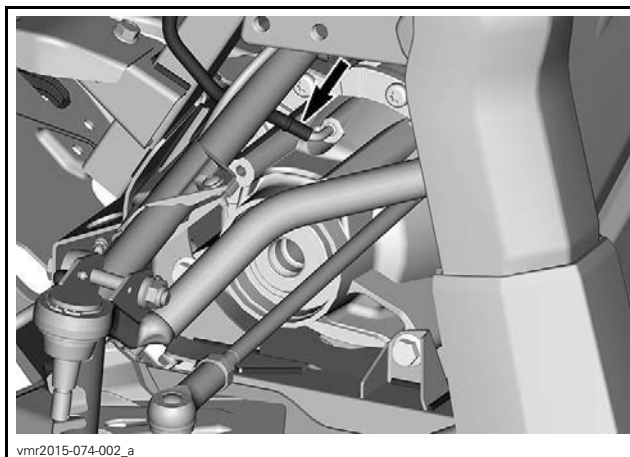
NOTE: Do not use or add other grease.

Install **NEW** drive shaft boot clamps.

FRONT DIFFERENTIAL

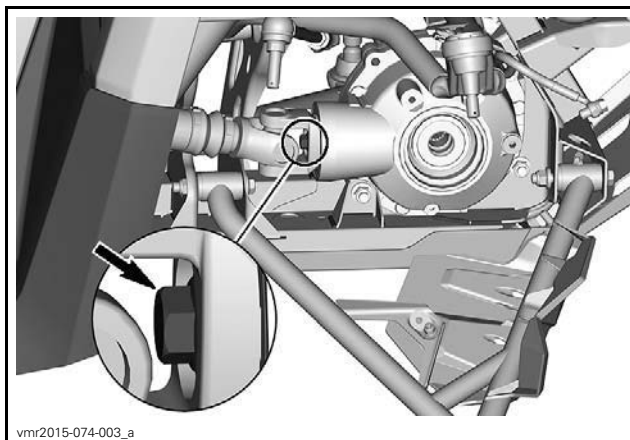
Front Differential Removal

1. Drain front differential. Refer to *PERIODIC MAINTENANCE PROCEDURES* subsection.
2. Remove both front drive shafts. Refer to *FRONT DRIVE SHAFT* in this subsection.
3. Detach vent hose from front differential.



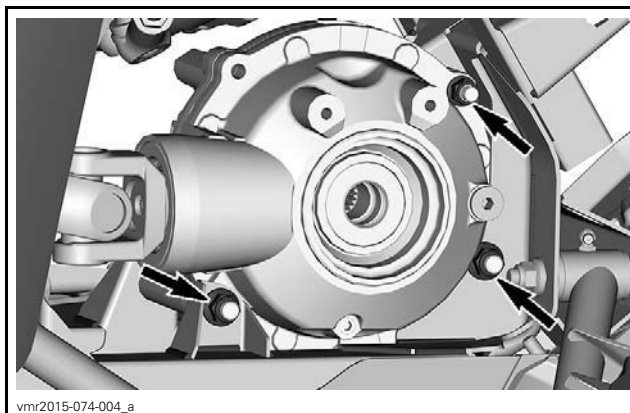
FROM LH SIDE

4. Remove screw securing the propeller shaft to the front differential.

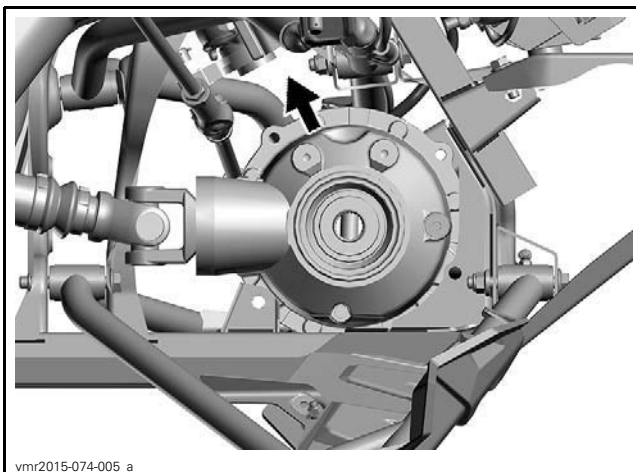


NOTE: Heat screw to break the threadlocker bond prior to removal.

5. Remove screws securing front differential to frame.



6. Move differential upward and rearward, and pull it out of the frame from the RH side.



NOTICE Be careful not to knock or to bend vent hose fitting while removing front differential.

Front Differential Inspection (Assembled)

Manually turn the pinion gear; it should turn smoothly. Repair if necessary.

Check if oil seals are brittle, hard or damaged. Replace if necessary.

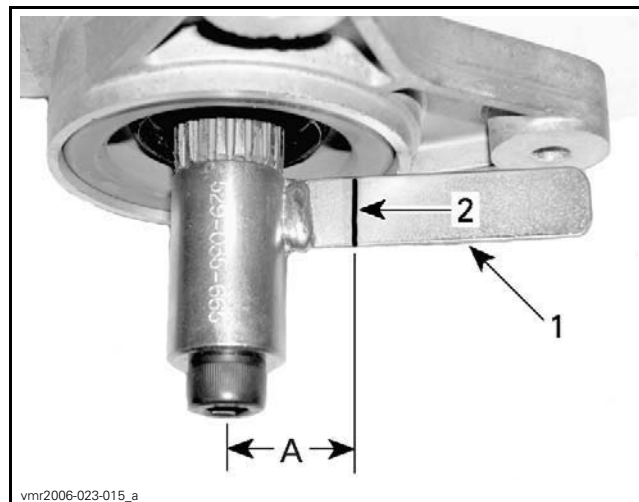
Backlash Inspection

When measuring backlash, the differential cover should be upside down to pull the ring gear out of mesh.

Using a dial indicator and the BACKLASH MEASUREMENT TOOL (P/N 529 035 665), measure the backlash.

Place the backlash measurement tool at the end of pinion gear.

From center of tool bolt, measure 25.4 mm (1 in) and scribe a mark on the tab.



1. Tab of backlash measurement tool
 2. Mark on tab
- A. 25.4 mm (1 in)

Position the dial indicator tip against the tab at a 90° angle and right on the previously scribed mark.

Gently, move the tool tab back and forth. Note the backlash result.



Rotate pinion gear 1/2 turn and recheck backlash. Note the result.

Rotate pinion gear 1 turn and recheck backlash.

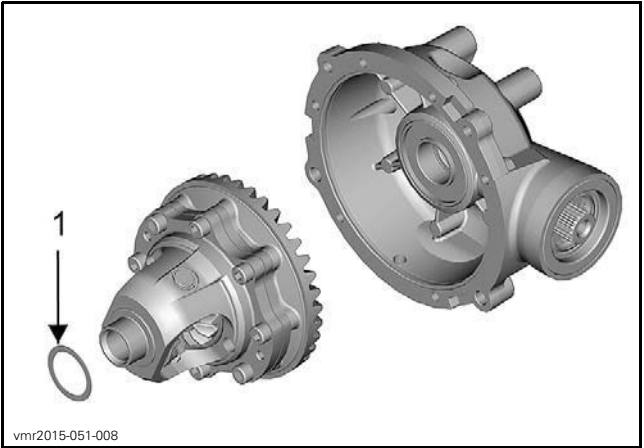
BACKLASH SPECIFICATION
0.1 mm (.004 in) to 0.25 mm (.01 in)

If backlash is out of specification, split final drive housing and adjust shim thickness as per following guideline.

Section 07 DRIVE SYSTEM

Subsection 01 (FRONT DRIVE (450))

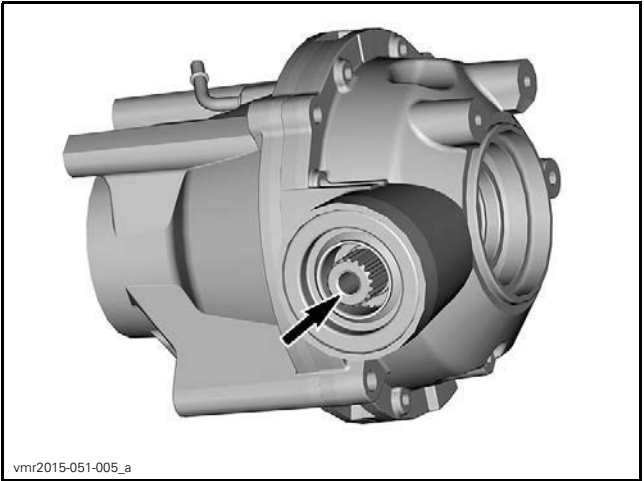
BACKLASH ADJUSTMENT GUIDELINE	
BACKLASH MEASUREMENT	WHAT TO DO
Below 0.1 mm (.004 in)	Remove shim(s) and recheck backlash
Above 0.25 mm (.01 in)	Add shim(s) and recheck backlash



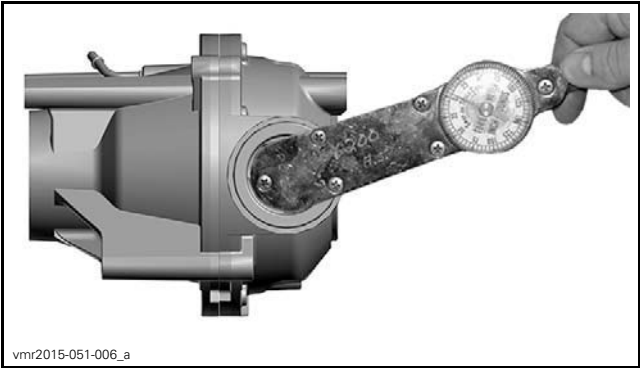
1. Backlash shim

Preload Inspection

Screw the propeller shaft screw in pinion gear.



Using a needle torque wrench, measure the preload.



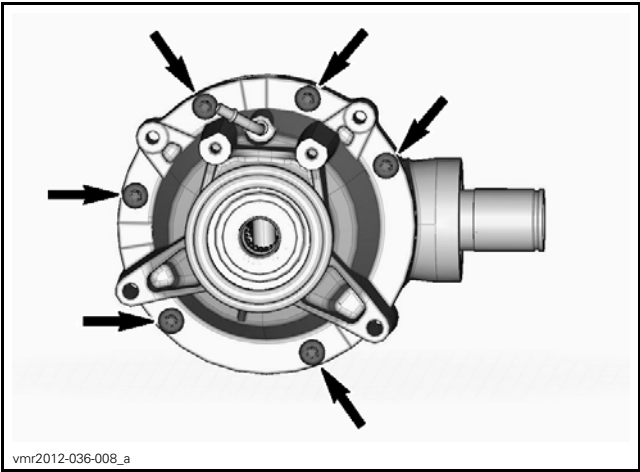
PRELOAD SPECIFICATION
Maximum 0.50 N•m (4 lbf•in)

If preload is out of specification, split front differential housing and check all bearings conditions.

Front Differential Disassembly

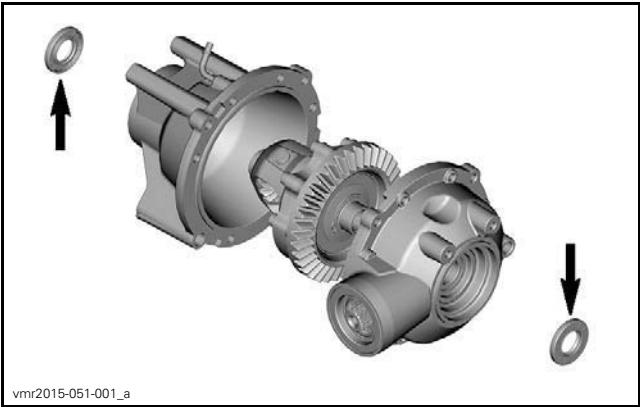
Differential Housing

Remove front differential housing screws.



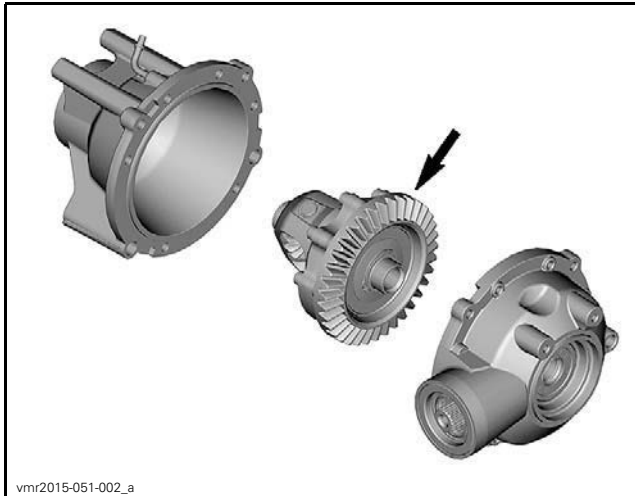
Separate half housings.

Remove oil seals.



Visco-Lok Carrier/Ring Gear

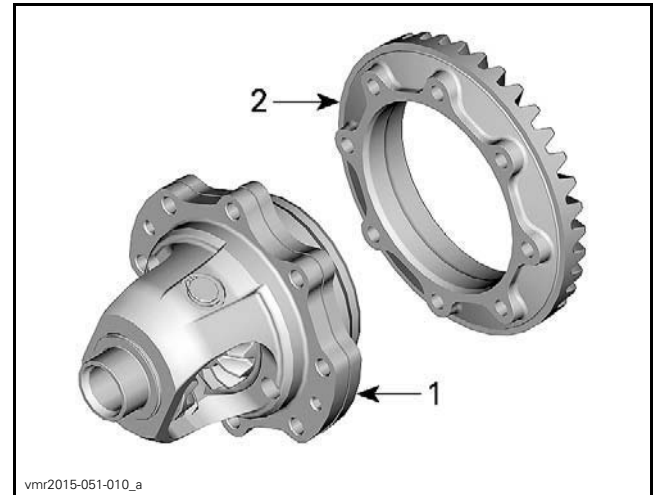
Remove Visco-Lok carrier/ring gear out of half housing.



Remove screws securing ring gear to Visco-Lok unit.



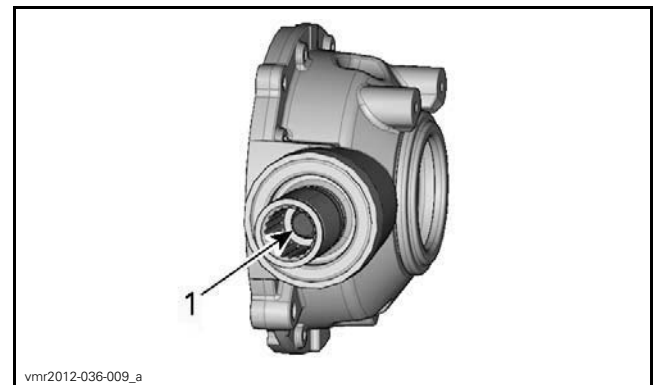
Separate ring gear from Visco-Lok unit.



1. Visco-Lok unit
2. Ring gear

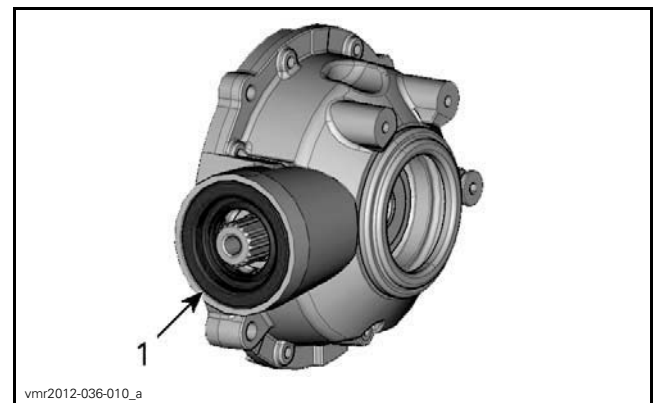
Pinion Gear

Remove screw retaining front propeller shaft adapter.



1. Retaining screw

Remove and discard oil seal.



1. Oil seal

Unscrew the pinion nut.

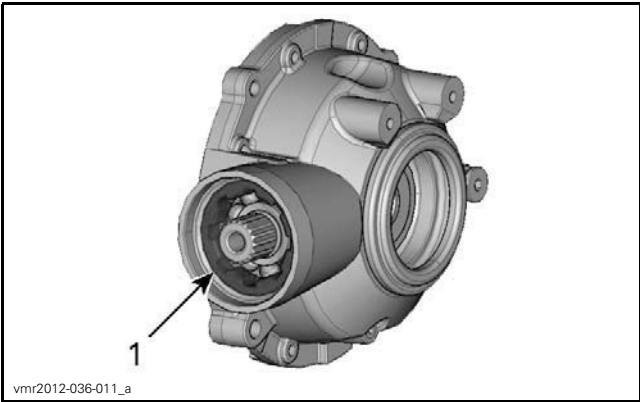
REQUIRED TOOL
SPANNER SOCKET (P/N 529 035 649)

Section 07 DRIVE SYSTEM

Subsection 01 (FRONT DRIVE (450))



529035649

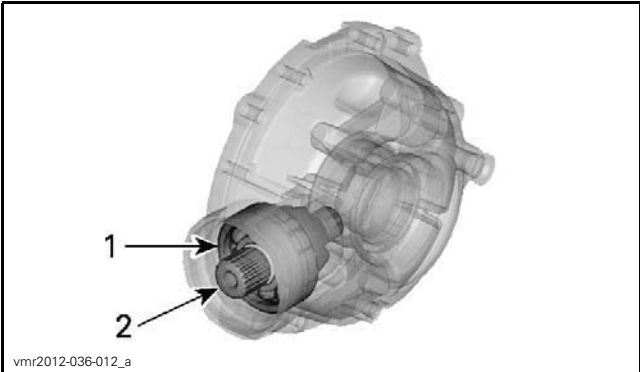


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1. Pinion nut

Remove bearing and pinion gear together.

RECOMMENDED TOOLS	QTY
Pipe: 78 mm (3-1/16 in) diameter x 127 mm (5 in) in length	1
Threaded rod: M10 x 1.25, 178 mm (7 in) length	1
M10 x 1.25 nut	3
Flat bar	1

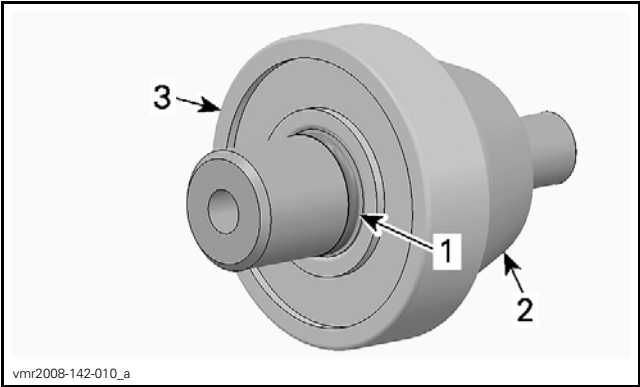


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1. Bearing
2. Pinion gear

Remove and discard O-ring.

Remove bearing from pinion gear.



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1. O-ring
2. Pinion gear
3. Bearing

Remove and discard the needle bearing.

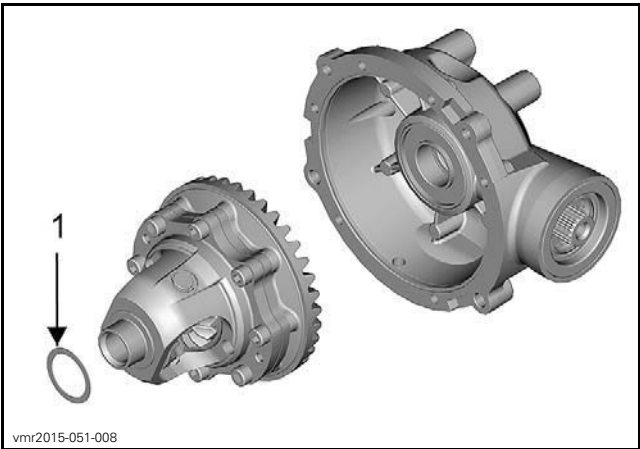
Front Differential Assembly

Adjustment is required when any of the following part is changed.

- Pinion gear
- Ring gear
- Viscolok unit
- Housing.

As a preliminary setup, install shim according to the following table.

RECOMMENDED SHIM THICKNESS	
BACKLASH	0.5 mm (.02 in) (as a preliminary adjustment)



vmr2015-051-008

1. Backlash shim

Prior to finalizing assembly, proceed in this order:

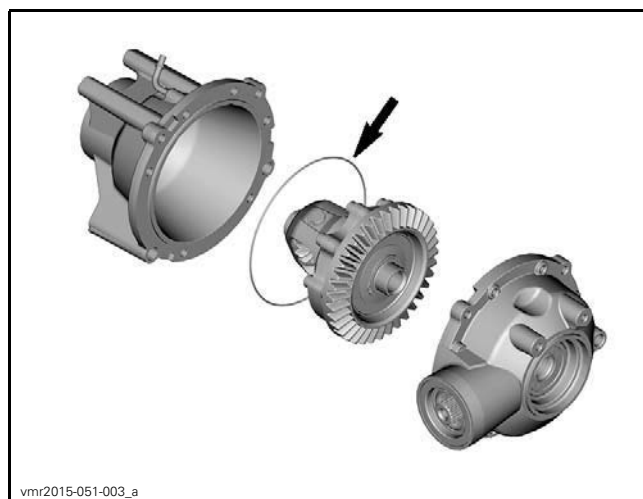
- Temporarily assemble final drive using recommended torques.
- Do not apply thread locker product.
- Do not install a new pinion nut.
- Check backlash.
- Check preload.

Visco-Lok Carrier/Ring Gear

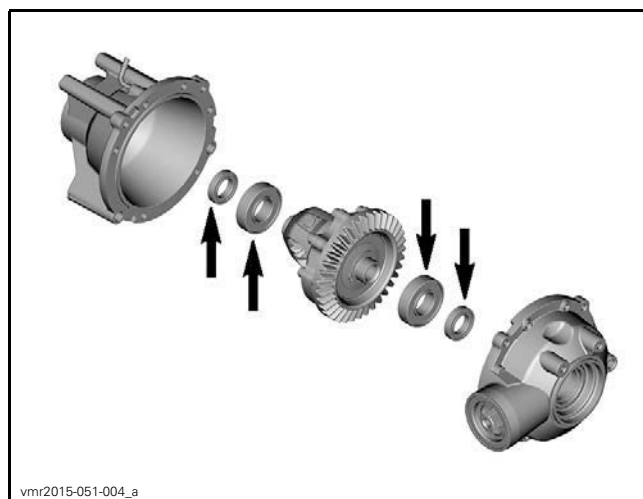
The installation is the reverse of the removal procedure. However, pay attention to the following. Tighten Visco-Lok / ring gear screws to specification.

TIGHTENING TORQUE	
Visco-Lok / ring gear screws	37 N•m ± 3 N•m (27 lbf•ft ± 2 lbf•ft)

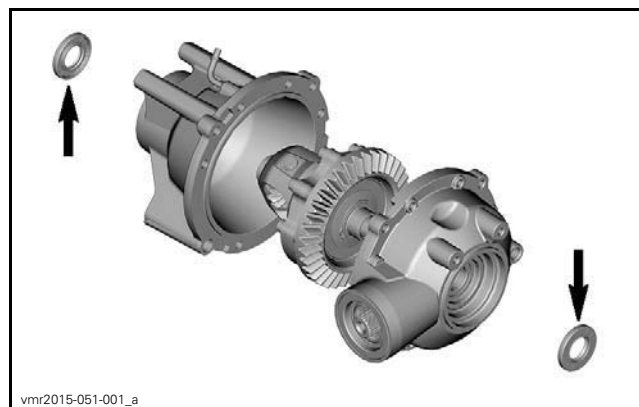
Check condition of seal. Replace if damaged.



Check bearings. Replace with **NEW** bearings if necessary.



Apply XPS SYNTHETIC GREASE (P/N 293 550 010) on **NEW** oil seals and install.



Tighten differential housing screws to specification.

TIGHTENING TORQUE	
Differential housing screws	23.5 N•m ± 3.5 N•m (17 lbf•ft ± 3 lbf•ft)

Pinion Gear

Install a **NEW** ball bearing.

Install a **NEW** O-ring.

Install a **NEW** needle bearing.

Apply LOCTITE 277 (P/N 293 800 073) to pinion nut.

Install and tighten the pinion nut to specification.

TIGHTENING TORQUE	
Pinion nut	180 N•m ± 15 N•m (133 lbf•ft ± 11 lbf•ft) + LOCTITE 277 (P/N 293 800 073)

Apply XPS SYNTHETIC GREASE (P/N 293 550 010) on **NEW** oil seal and install.

Tighten front propeller shaft adapter retaining screw to specification.

TIGHTENING TORQUE	
Front propeller shaft adapter retaining screw	75 N•m ± 5 N•m (55 lbf•ft ± 4 lbf•ft)

Front Differential Installation

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

TIGHTENING TORQUE	
M8 nut securing front differential to frame	24.5 N•m ± 3.5 N•m (18 lbf•ft ± 3 lbf•ft)
M10 nuts securing front differential to frame	61 N•m ± 9 N•m (45 lbf•ft ± 7 lbf•ft)

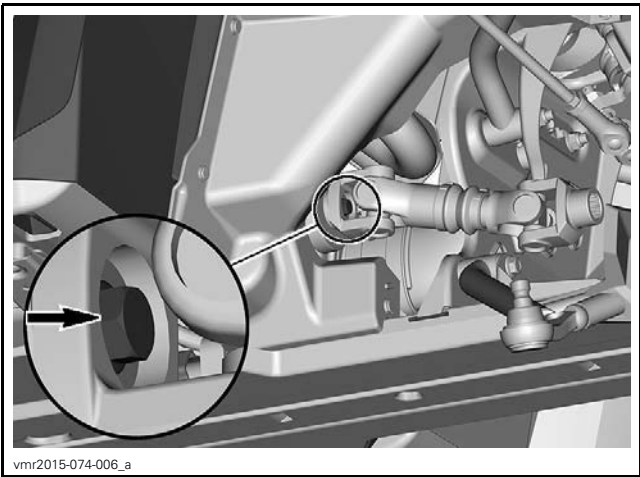
Section 07 DRIVE SYSTEM
Subsection 01 (FRONT DRIVE (450))

Refill front differential with recommended oil. Refer to *PERIODIC MAINTENANCE PROCEDURES* subsection.

FRONT PROPELLER SHAFT

Front Propeller Shaft Removal

- 1. Lift and support vehicle.
- 2. Remove front wheel. Refer to *WHEELS AND TIRES* subsection.
- 3. Remove inner fender panel(s). Refer to *BODY* subsection.
- 4. Remove front differential. Refer to *FRONT DIFFERENTIAL REMOVAL* in this subsection.
- 5. Remove screw securing front propeller shaft to coupling unit.



NOTE: Heat screw to break the threadlocker bond prior to removal.

- 6. Remove front propeller shaft by pulling it forward.

Front Propeller Shaft Inspection

Inspect if propeller shaft is not bent or twisted.
Check propeller shaft splines for wear or damage.
Check if propeller shaft bellows is pierced or brittle.

Front Propeller Shaft Installation

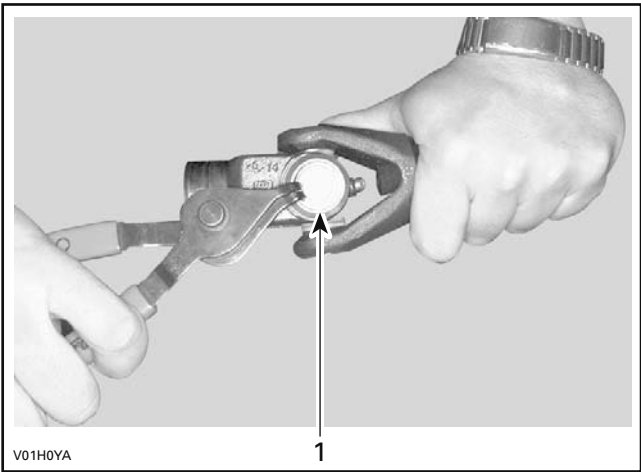
The installation is the reverse of removal procedure. However, pay attention to the following:
Apply XPS SYNTHETIC GREASE (P/N 293 550 010) on splines.

TIGHTENING TORQUE	
Propeller shaft screws	75 N•m ± 5 N•m (55 lbf•ft ± 4 lbf•ft)
	+ LOCTITE 648 (GREEN) (P/N 413 711 400)

PROPELLER SHAFT U-JOINTS

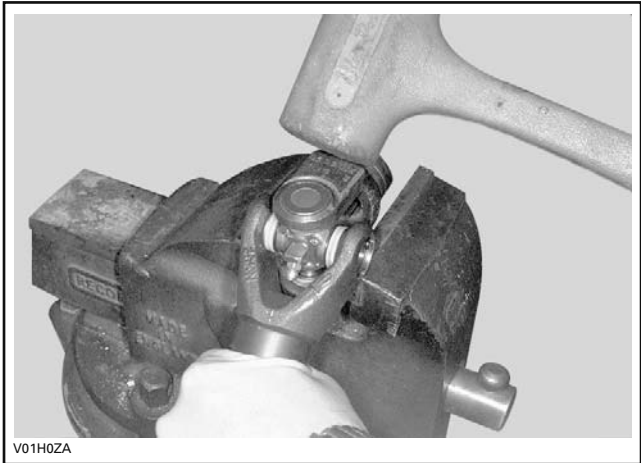
Propeller Shaft U-Joint Removal

Remove internal snap ring from bearing caps.



1. Snap ring

Support inner yoke in vice and drive other yoke down with a soft hammer.



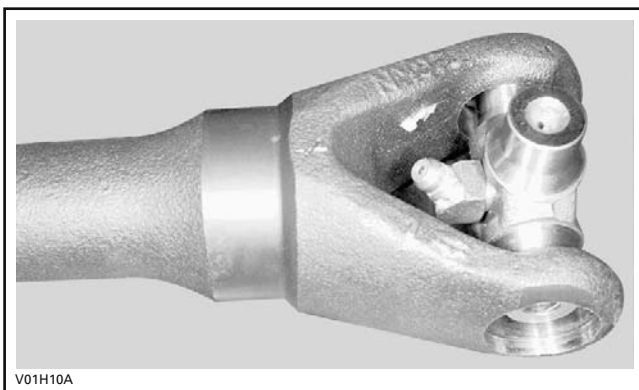
Support U-joint in vice and drive inner yoke down to remove remaining bearing caps.

Remove U-joint cross.

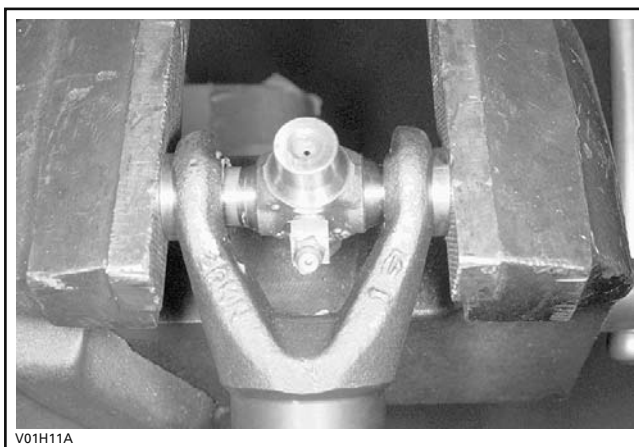
Propeller Shaft U-Joint Installation

Install new U-joint in inner yoke.

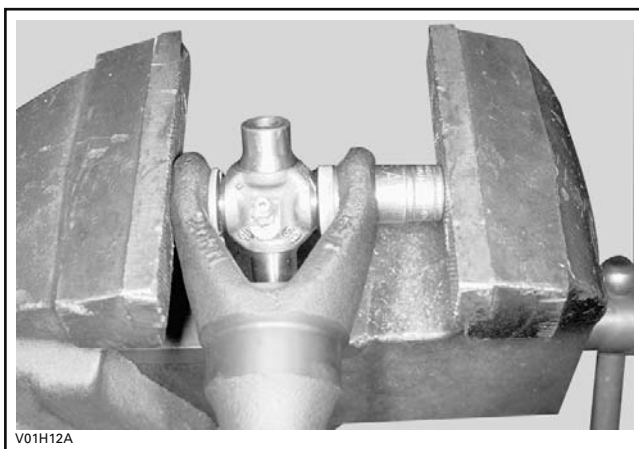
NOTE: Position propeller shaft U-joint as shown for proper grease fitting location.



Install bearing caps. Use a vise to push bearing caps.



Using a suitable pusher, fully seat bearing cap on one side.



Install snap ring.

Complete installation for the other bearing caps.

Grease U-joint. Refer to *PERIODIC MAINTENANCE PROCEDURES* subsection.

REAR DRIVE

SERVICE TOOLS

Description	Part Number	Page
BACKLASH MEASUREMENT TOOL.....	529 035 665	620
CV BOOT CLAMP PLIER	529 036 120	616
CV JOINT EXTRACTOR.....	529 036 005	617
SPANNER SOCKET	529 035 649	623

SERVICE PRODUCTS

Description	Part Number	Page
LOCTITE 277	293 800 073	625
LOCTITE 648 (GREEN)	413 711 400	619
XPS SYNTHETIC GREASE.....	293 550 010	615, 618

Subsection 03 (REAR DRIVE)

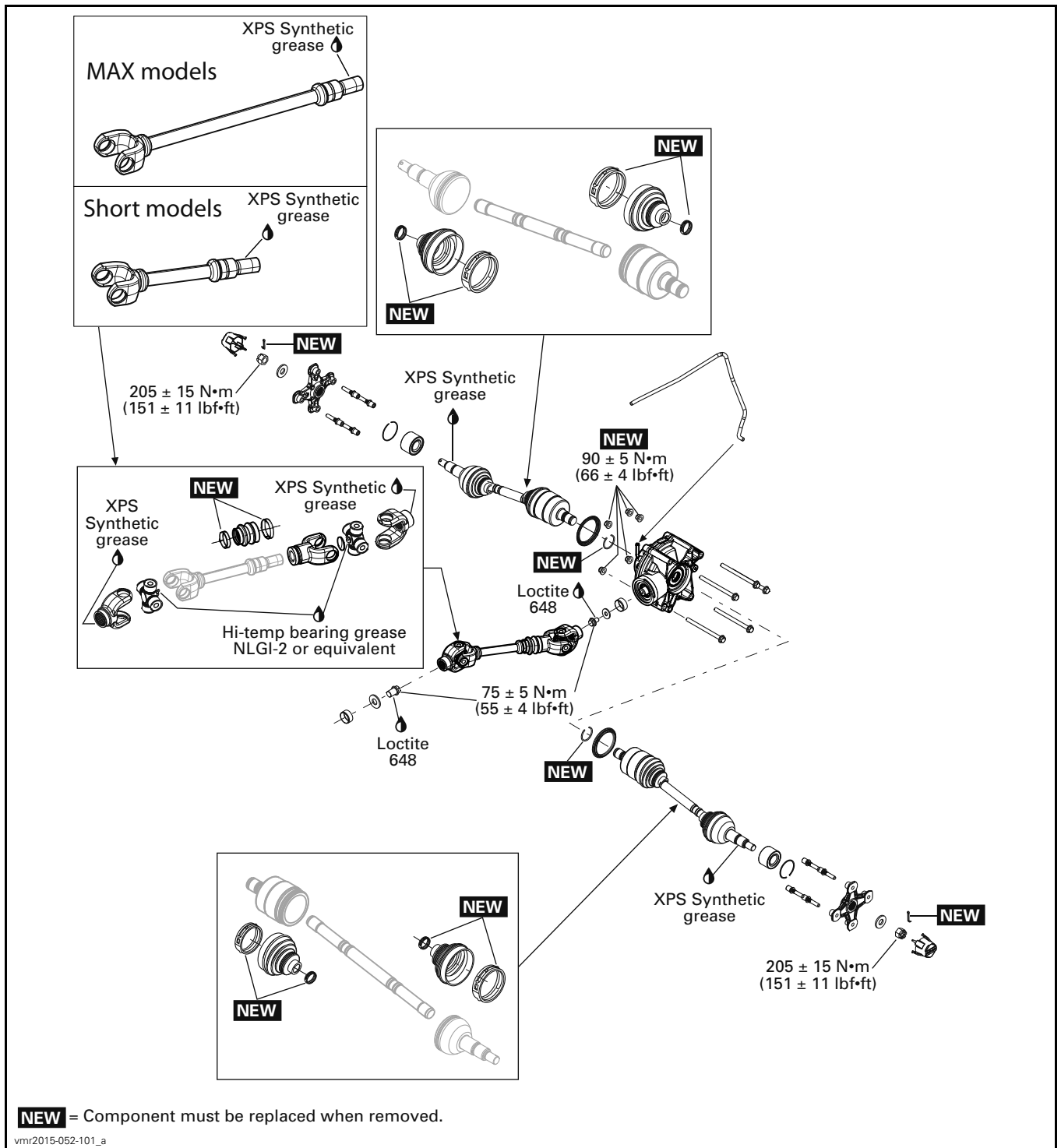
The diagram illustrates the assembly process for a drive shaft. Key components and steps include:

- MAX models** and **Short models**: Initial shaft configurations.
- XPS Synthetic grease**: Applied to various joints.
- NEW**: Components that must be replaced when removed.
- Torque Specifications**:
 - $205 \pm 15 \text{ N}\cdot\text{m}$ ($151 \pm 11 \text{ lbf}\cdot\text{ft}$)
 - $90 \pm 5 \text{ N}\cdot\text{m}$ ($66 \pm 4 \text{ lbf}\cdot\text{ft}$)
 - $75 \pm 5 \text{ N}\cdot\text{m}$ ($55 \pm 4 \text{ lbf}\cdot\text{ft}$)
- Loctite 648**: Applied to specific fasteners.
- Hi-temp bearing grease NLGI-2 or equivalent**: Used for bearing lubrication.

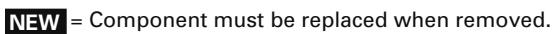
NEW = Component must be replaced when removed.

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MODELS WITH 450 ENGINE



Subsection 03 (REAR DRIVE)



614

PROCEDURES

WHEEL HUB

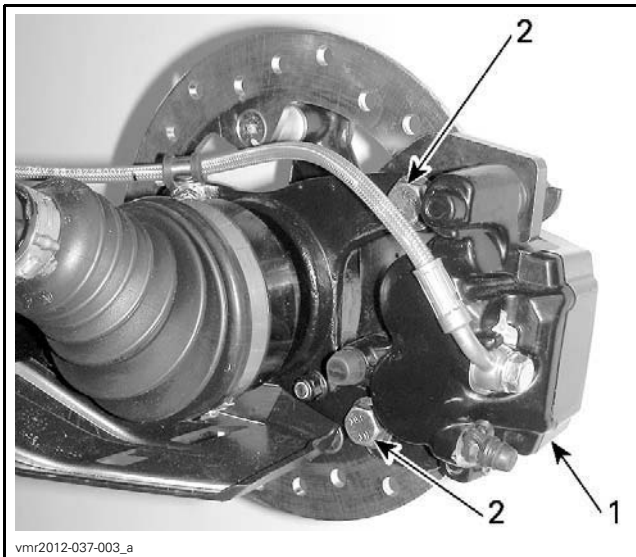
Wheel Hub Removal

Lift and support vehicle.

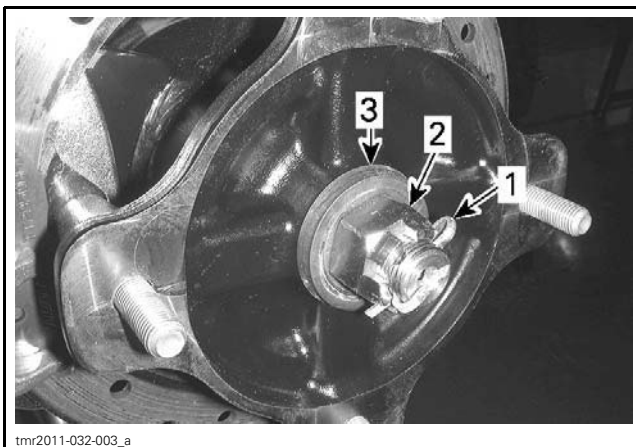
Remove the wheel.

Remove the following parts:

- Caliper mounting bolts (if applicable), refer to *BRAKES* subsection
- Hub cap
- Cotter pin
- Wheel hub nut
- Belleville washer.



1. Caliper
2. Remove bolts



TYPICAL

1. Cotter pin
2. Wheel hub nut
3. Belleville washer

Remove wheel hub.

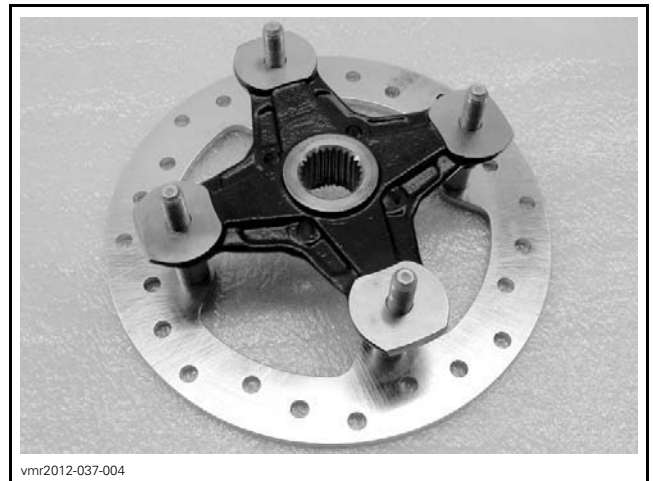
Wheel Hub Inspection

Remove disk from RH wheel hub as necessary.

Check wheel hub for cracks or other damages.

Check inner splines for wear or other damages.

If any damage is detected on wheel hub, replace it with a new one.

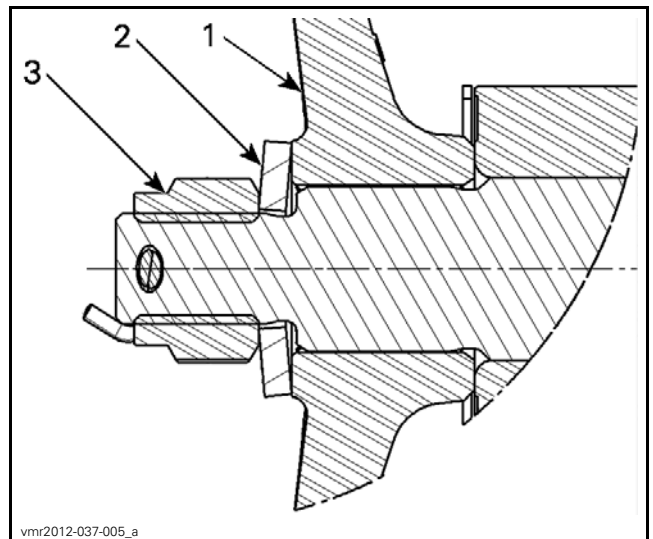


Wheel Hub Installation

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

Apply XPS SYNTHETIC GREASE (P/N 293 550 010) on drive shaft splines.

Install Belleville washer with its convex side outward.



1. Wheel hub
2. Washer — Convex side here
3. Nut

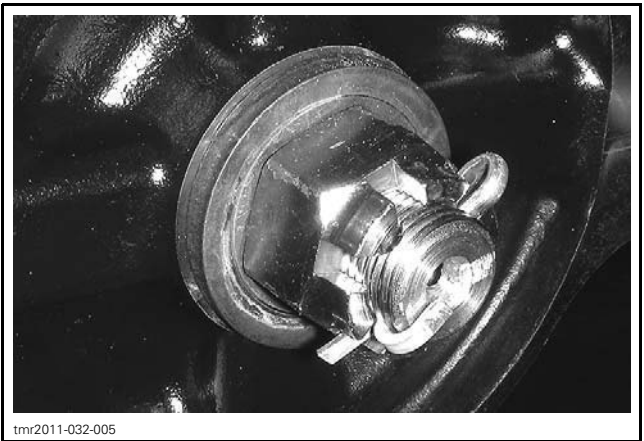
Section 07 DRIVE SYSTEM

Subsection 03 (REAR DRIVE)

TIGHTENING TORQUE	
Wheel hub nut	205 N•m ± 15 N•m (151 lbf•ft ± 11 lbf•ft)

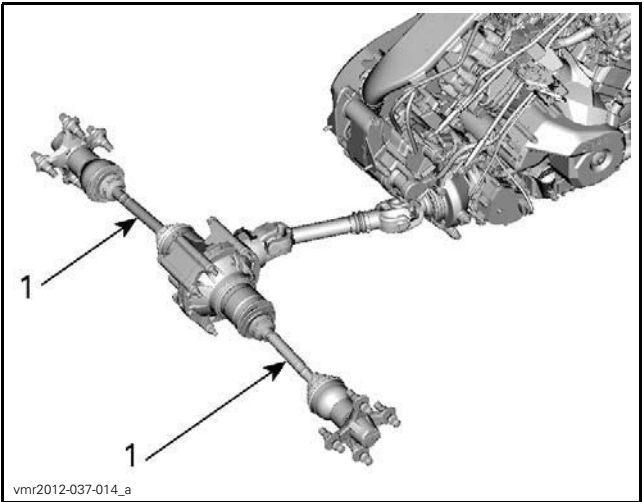
NOTE: If required, tighten castellated nut further to align grooves with drive shaft hole.

Install a **NEW** cotter pin.



DRIVE SHAFT

Drive Shaft Removal



TYPICAL
1. Drive shafts

Lift and support vehicle.

Remove the wheel hub. See procedure in this subsection.

Remove trailing arm. Refer to *REAR SUSPENSION*.

Strongly pull drive shaft out of final drive.

Drive Shaft Inspection

Inspect the condition of boots. If there is any damage or evidence of leaking lubricant, replace them. Refer to *DRIVE SHAFT BOOT*.

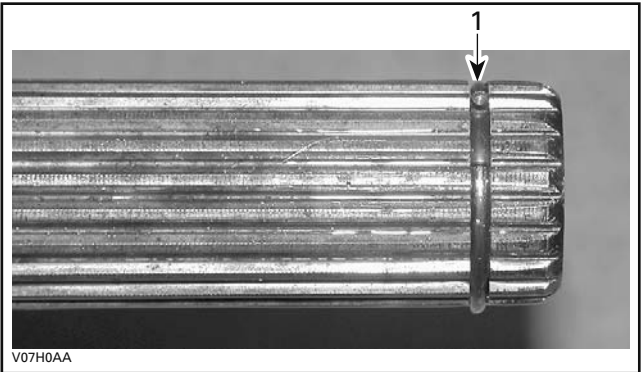
Check shaft splines. Replace drive shaft if necessary.

Check dust shield on drive shaft end. Replace if necessary.

Drive Shaft Installation

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

Install a **NEW** stop ring.



TYPICAL
1. NEW stop ring

After drive shaft insertion in rear final drive, validate if properly locked.

DRIVE SHAFT BOOT

Drive Shaft Boot Removal

Remove the drive shaft from vehicle. See procedure in this subsection.

Remove drive shaft boot clamps using the following tool:

TOOL	
CV BOOT CLAMP PLIER (P/N 529 036 120)	

Dislodge the large boot end.

Separate the joint from the shaft. Two procedures can be done.

Without the Special Tool

Clamp joint housing in a vise.

Align shaft with joint.

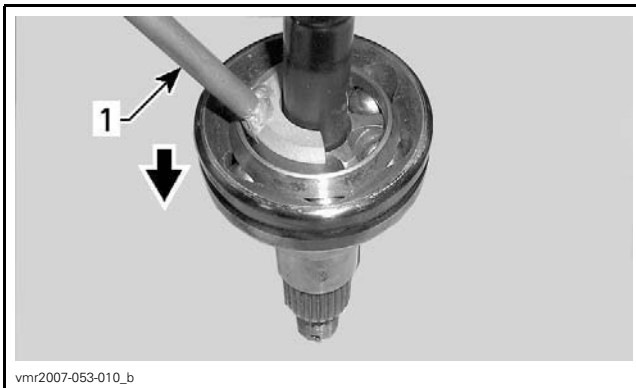
Pull hard on shaft to remove from joint.

Remove boot from drive shaft.

Remove and discard the circlip. A new one is included in the boot kit.

With the Special Tool

Place drive shaft in vice with the joint downward. Install the CV JOINT EXTRACTOR (P/N 529 036 005) on bearing.



TYPICAL — CV JOINT SHOWN
1. Joint extractor tool

With an hammer, hit on the tool to separate joint from shaft.

When joint and shaft are separated, remove boot from drive shaft.

Remove and discard the circlip. A new one is included in the boot kit.

Remove drive shaft boot.

Drive Shaft Boot Installation

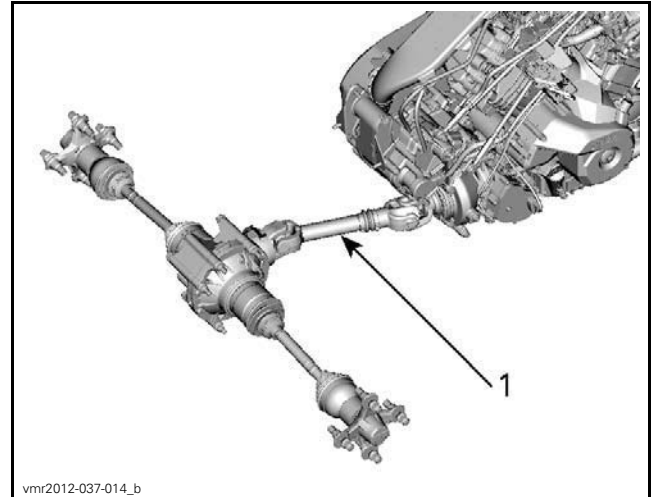
The installation is the reverse of the removal procedure. However, pay attention to the following:

Pack bearing area with grease (included with the new boot kit).

NOTE: Do not use any other grease.

PROPELLER SHAFT

Propeller Shaft Removal



TYPICAL
1. Propeller shaft

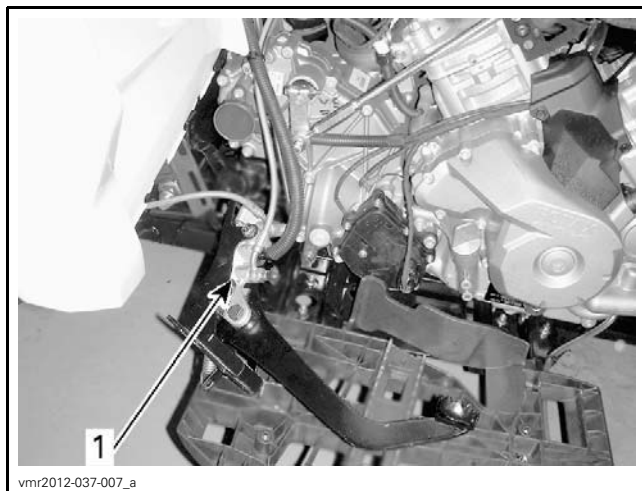
1. Lift and support rear end of vehicle.
2. Remove wheels. Refer to *WHEELS AND TIRES* subsection.
3. Drain oil from rear final drive. Refer to *PERIODIC MAINTENANCE PROCEDURES*.
4. Detach brake master cylinder from frame. Refer to *BRAKES* subsection.



1. Remove retaining screws

Section 07 DRIVE SYSTEM

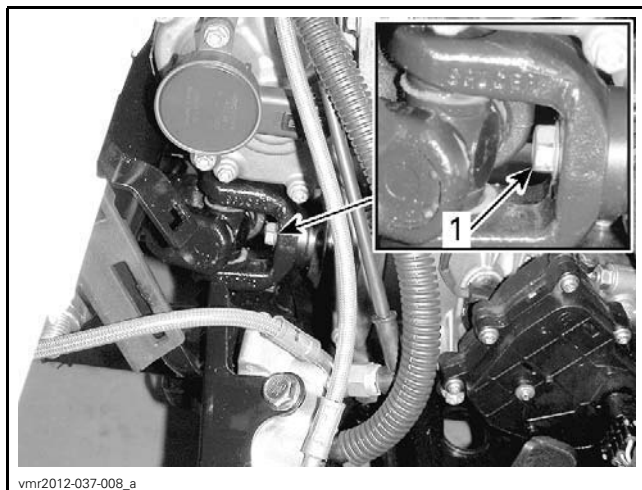
Subsection 03 (REAR DRIVE)



1. Master cylinder moved apart

5. From RH side of vehicle, remove propeller shaft screw from gearbox output shaft.

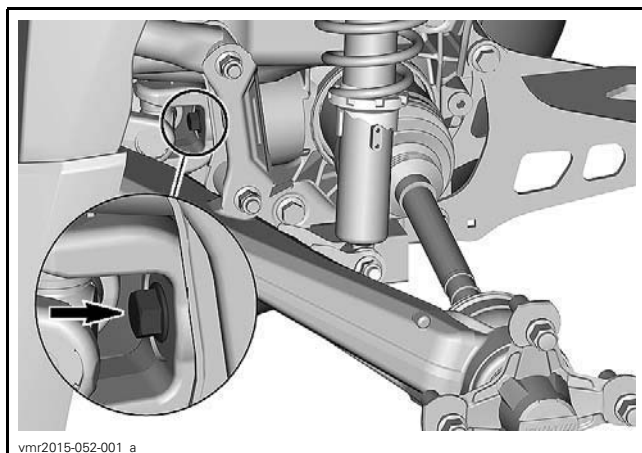
NOTE: Heat screw to break the threadlocker bond prior to removal.



TYPICAL — RH SIDE OF VEHICLE

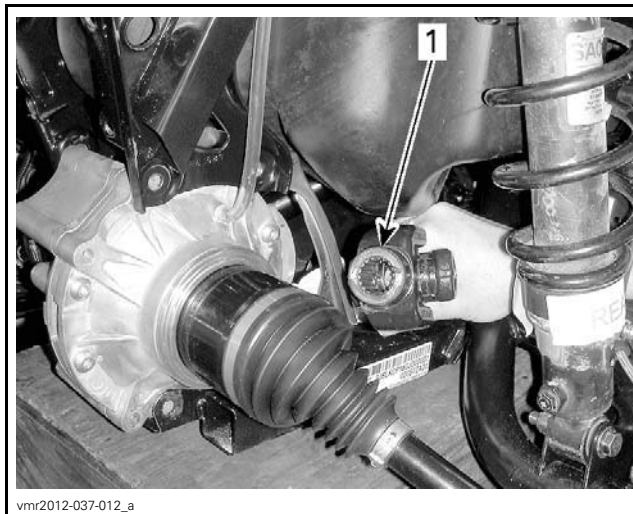
1. Remove screw

6. From LH side of vehicle, remove propeller shaft screw from rear final drive yoke.



LH SIDE OF VEHICLE

7. Remove rear final drive retaining bolts. Refer to *REAR FINAL DRIVE* in this subsection.
8. Remove bolts from rear retaining plate. Refer to *REAR FINAL DRIVE* in this subsection.
9. Move the rear final drive rearward to allow dislodging the propeller shaft.
10. Dislodge the propeller shaft from the gearbox.
11. Remove the propeller shaft.



1. Pull out propeller shaft

Propeller Shaft Inspection

Inspect if propeller shaft is not bent or twisted.

Check propeller shaft splines for wear or damage.

Check if propeller shaft bellow is cracked, pierced or brittle.

Propeller Shaft Installation

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

Apply XPS SYNTHETIC GREASE (P/N 293 550 010) to splines.

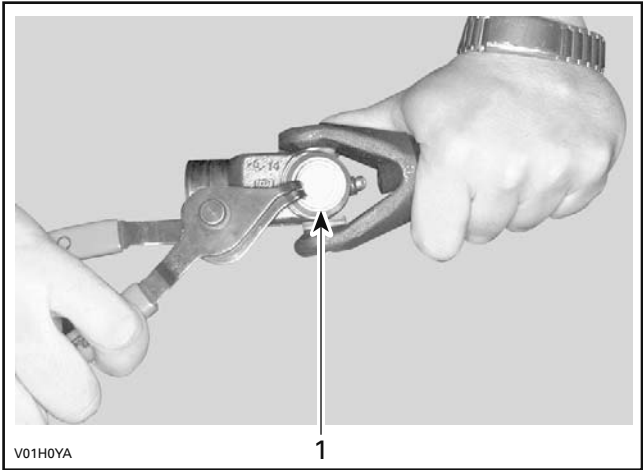
PARTS	TORQUE
Propeller shaft screw (rear final drive side)	75 N•m ± 5 N•m (55 lbf•ft ± 4 lbf•ft) + LOCTITE 648 (GREEN) (P/N 413 711 400)
Propeller shaft screw (gearbox side)	75 N•m ± 5 N•m (55 lbf•ft ± 4 lbf•ft) + LOCTITE 648 (GREEN) (P/N 413 711 400)

Refill rear final drive. Refer to *PERIODIC MAINTENANCE PROCEDURES* subsection.

PROPELLER SHAFT U-JOINTS

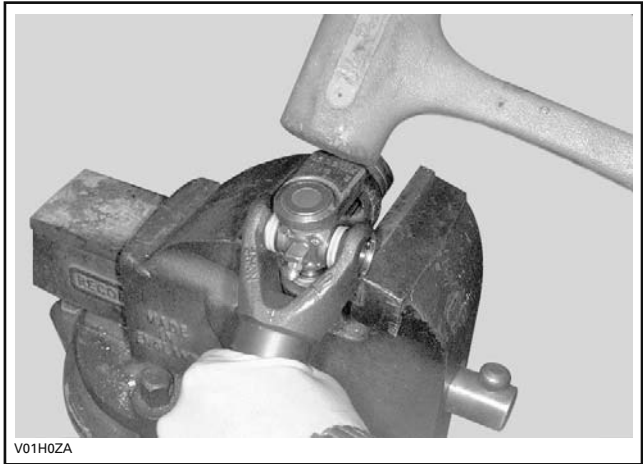
Propeller Shaft U-Joint Removal

Remove internal snap ring from bearing caps.



1. Snap ring

Support inner yoke in vice and drive other yoke down with a soft hammer.



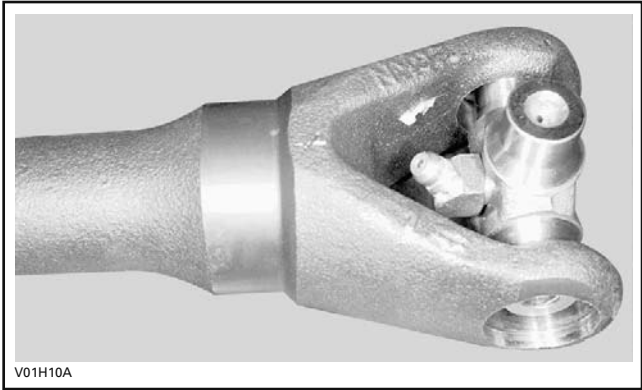
Support U-joint in vice and drive inner yoke down to remove remaining bearing caps.

Remove U-joint cross.

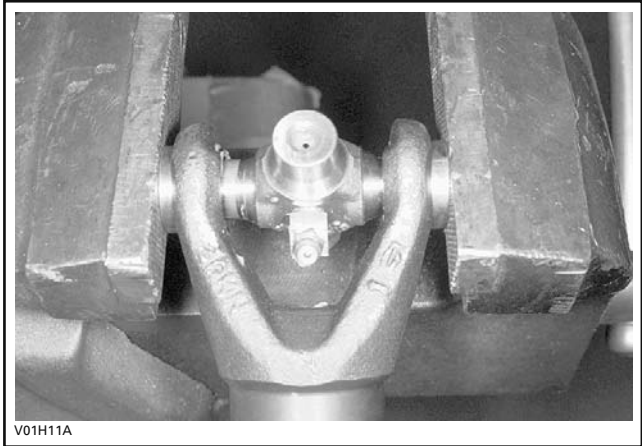
Propeller Shaft U-Joint Installation

Install a **NEW** U-joint in inner yoke.

NOTE: Position propeller shaft U-joint as shown for proper grease fitting location.



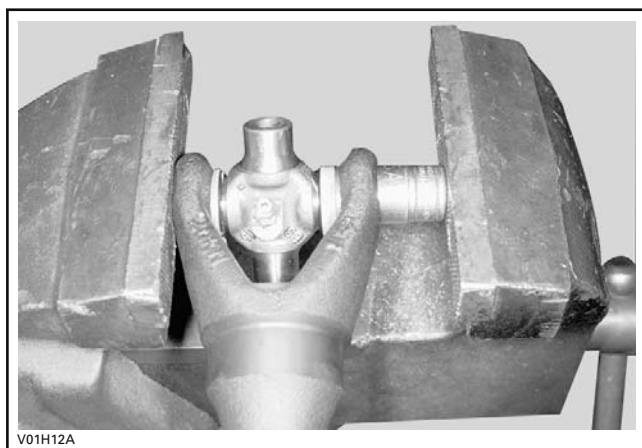
Install bearing caps. Use a vise to push bearing caps.



Using a suitable pusher, fully seat bearing cap on one side.

Section 07 DRIVE SYSTEM

Subsection 03 (REAR DRIVE)



Install snap ring.

Complete installation for the other bearing caps.

Grease U-joint. Refer to *PERIODIC MAINTENANCE PROCEDURES* subsection.

REAR FINAL DRIVE

Rear Final Drive Removal

Drain oil. Refer to *PERIODIC MAINTENANCE PROCEDURES* subsection.

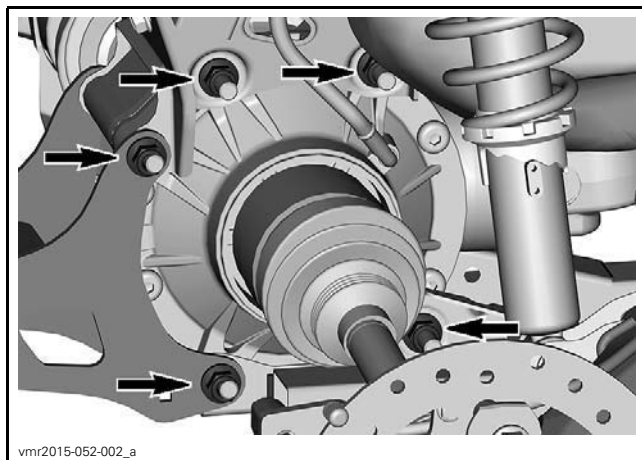
Lift and support vehicle.

Support rear bottom end of frame.

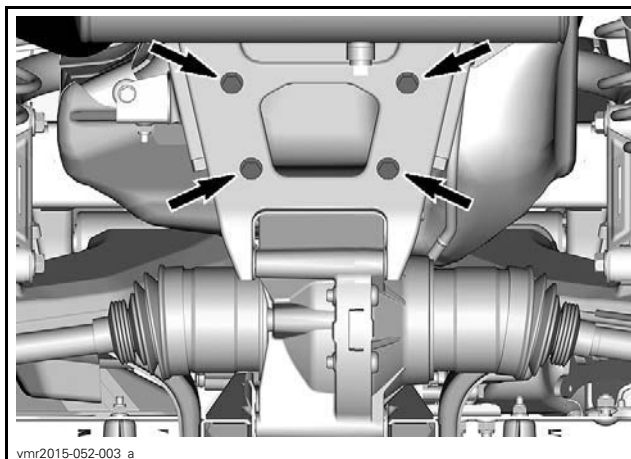
Remove drive shafts. See procedure in this subsection.

Remove rear propeller shaft screw from the rear final drive yoke. Refer to *PROPELLER SHAFT* in this subsection.

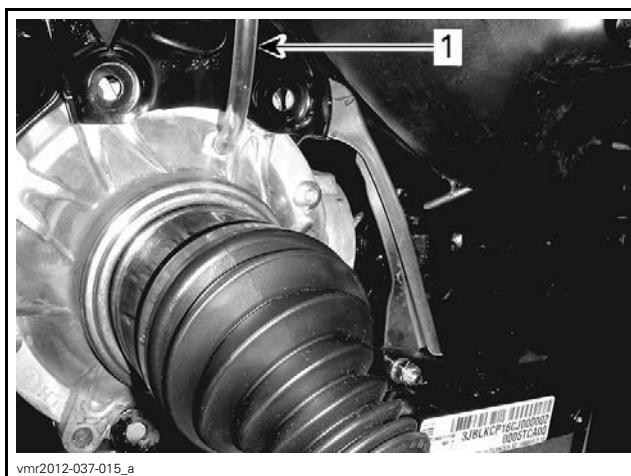
Remove rear final drive screws (5x).



Remove bolts from rear retaining plate.



Unplug the vent hose from final drive.



1. Pull out

Remove the final drive.

Rear Final Drive Inspection (Assembled)

Manually turn rear final drive gear; it should turn smoothly. Repair if necessary.

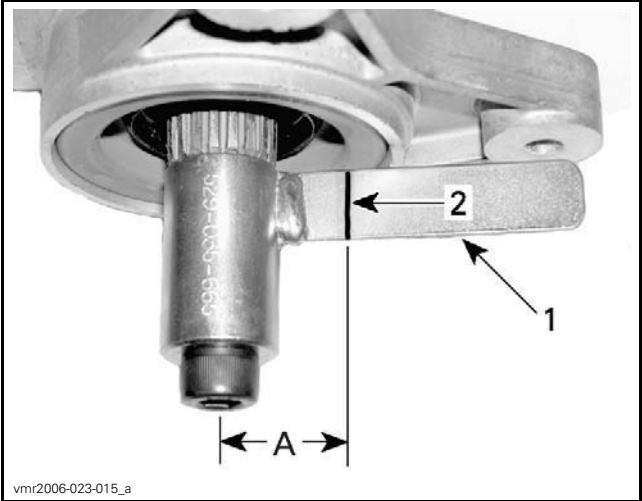
Check if oil seals are brittle, hard or damaged. Replace if necessary.

Backlash Inspection

Using a dial indicator and the BACKLASH MEASUREMENT TOOL (P/N 529 035 665), measure the backlash.

Place the backlash measurement tool at the end of pinion gear.

From center of tool bolt, measure 25.4 mm (1 in) and scribe a mark on the tab.



- 1. Tab of backlash measurement tool
- 2. Mark on tab
- A. 25.4 mm (1 in)

Position the dial indicator tip against the tab at a 90° angle and right on the previously scribed mark. Gently, move the tool tab back and forth. Note the backlash result.

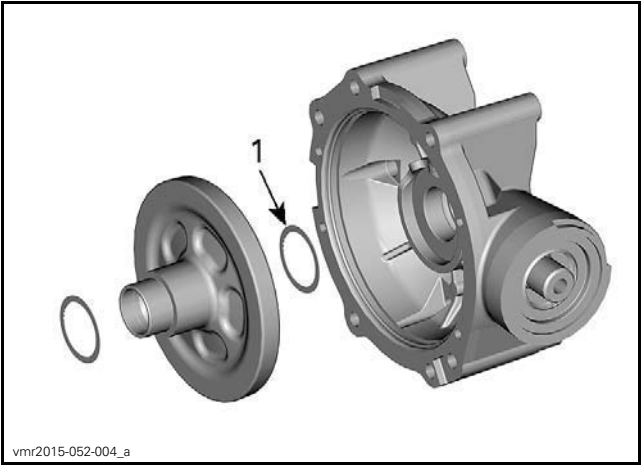


Rotate pinion gear 1/2 turn and recheck backlash. Note the result.
Rotate pinion gear 1 turn and recheck backlash.

BACKLASH SPECIFICATION
0.1 mm (.004 in) to 0.35 mm (.014 in)

If backlash is out of specification, split final drive housing and adjust shim thickness as per following guideline.

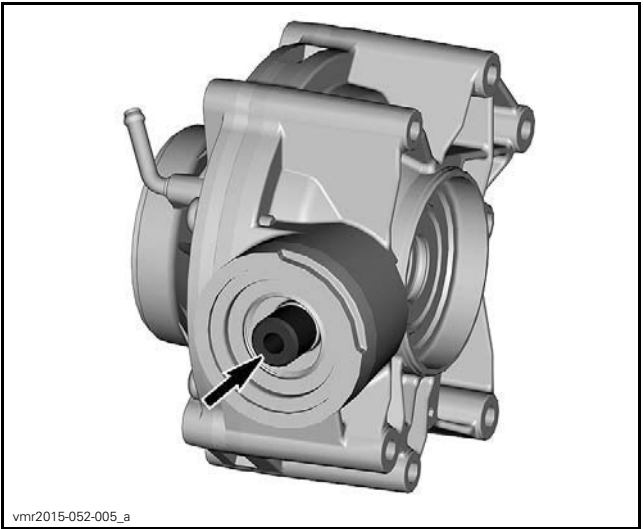
BACKLASH ADJUSTMENT GUIDELINE	
BACKLASH MEASUREMENT	WHAT TO DO
Below 0.1 mm (.004 in)	Add shim(s) and recheck backlash
Above 0.35 mm (.014 in)	Remove shim(s) and recheck backlash



- 1. Backlash shim

Preload Inspection

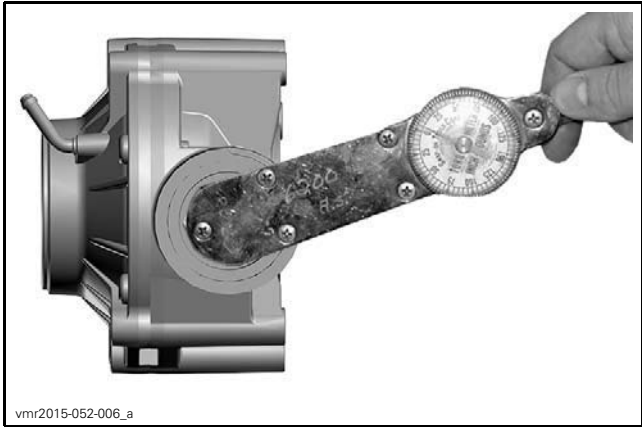
Screw the propeller shaft screw in pinion gear.



Using a needle torque wrench, measure the preload.

Section 07 DRIVE SYSTEM

Subsection 03 (REAR DRIVE)



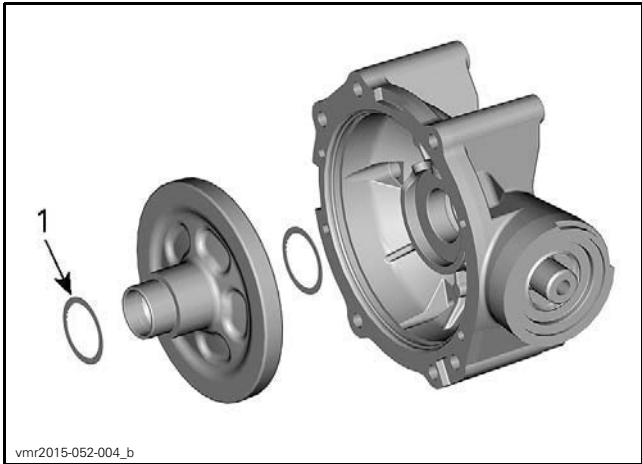
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PRELOAD SPECIFICATION

0.06 N•m (.5 lbf•in) to 0.50 N•m (4 lbf•in)

If preload is out of specification, split final drive housings and adjust shim thickness as per following guideline.

PRELOAD GUIDELINE	
PRELOAD MEASUREMENT	WHAT TO DO
Below 0.06 N•m (.5 lbf•in)	Add shim(s) and recheck preload
Above 0.50 N•m (4 lbf•in)	Remove shim(s) and recheck preload



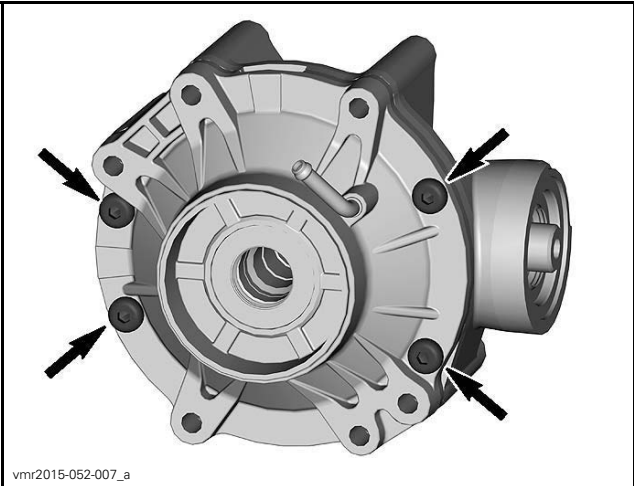
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1. Preload shim

Rear Final Drive Disassembly

Ring Gear

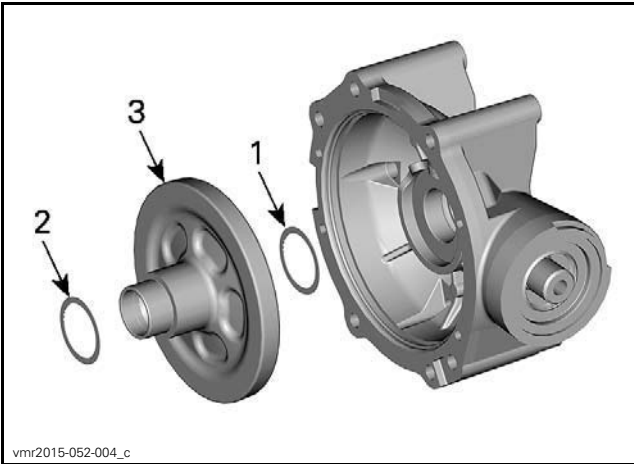
Remove the final drive housing screws.



vmr2015-052-007_a

Split final drive housings.

NOTE: Be careful to keep track of shims on ring gear.



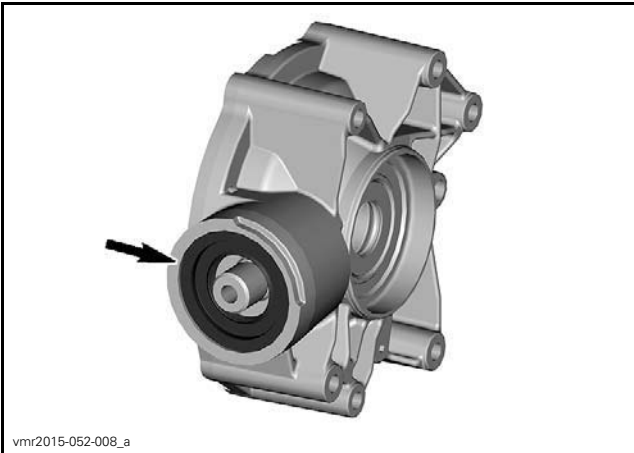
vmr2015-052-004_c

- 1. Backlash shim
- 2. Preload shim
- 3. Ring gear

Extract ring gear out of half housing.

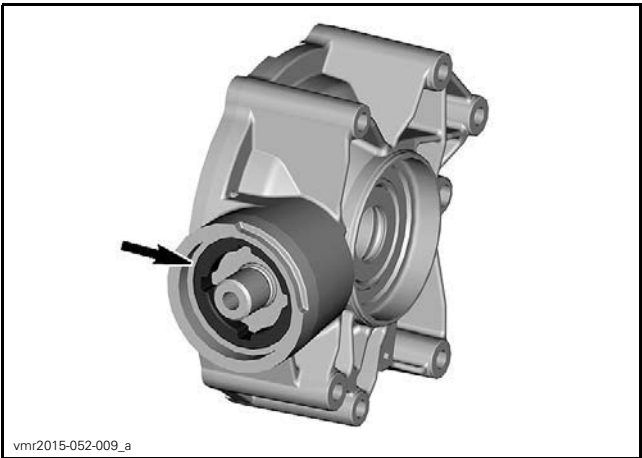
Pinion Gear

Remove and discard oil seal.



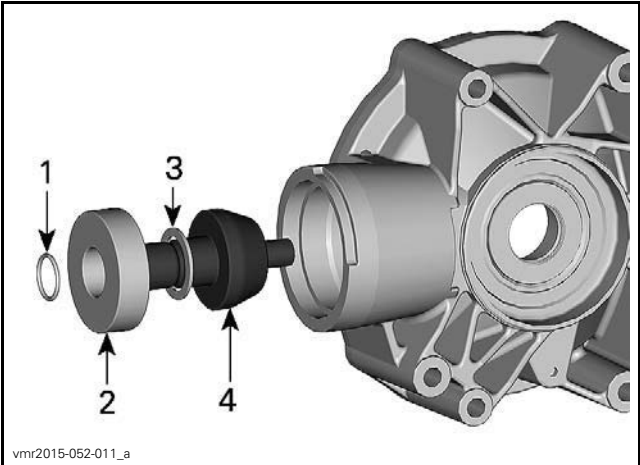
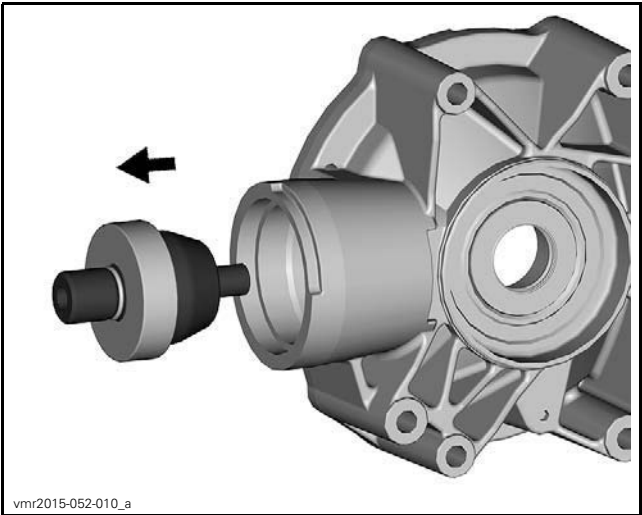
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Unscrew the pinion nut. Use the SPANNER SOCKET (P/N 529 035 649).



NOTE: The pinion nut is left hand threaded. Unscrew by turning clockwise.

Remove the bearing along with the pinion gear. Be careful to keep track of shims. Discard bearing.

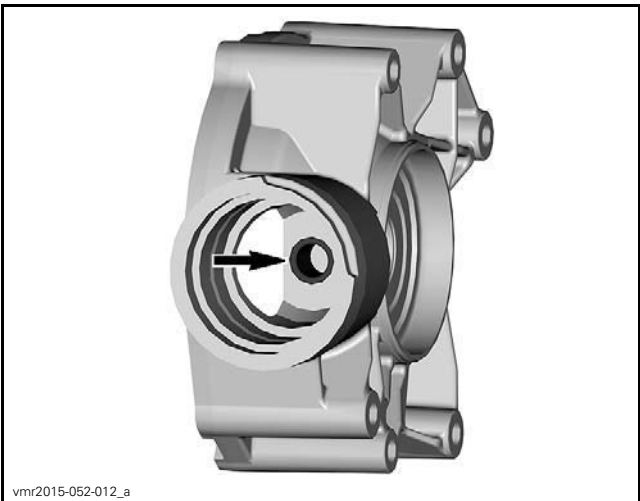


1. O-ring
2. Ball bearing
3. Pinion gear shim
4. Pinion gear

The pinion gear and bearing can be easily removed using the following suggested tool:

PART	QTY
Pipe: 83 mm (3-1/4 in) diameter x 127 mm (5 in)	1
Threaded rod: M10 x 1.25 x 178 mm (7 in)	1
M10 x 1.25 nut	3
Flat bar	1

Remove and discard the needle bearing.



Rear Final Drive Assembly

Adjustment is required when any of the following part is changed.

- Pinion gear
- Ring gear
- Housing.

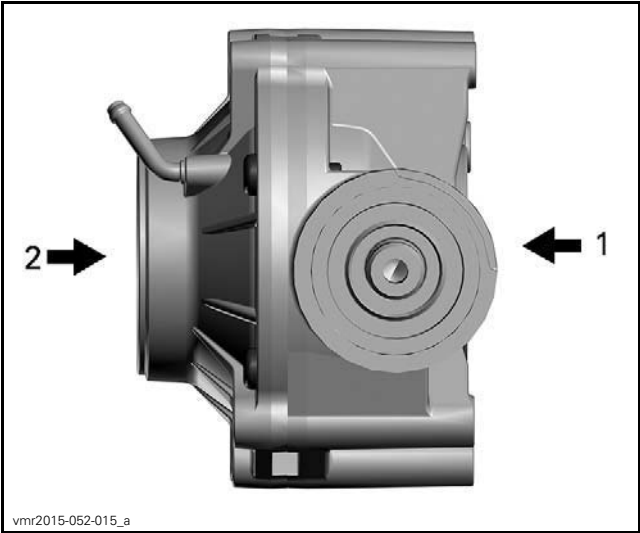
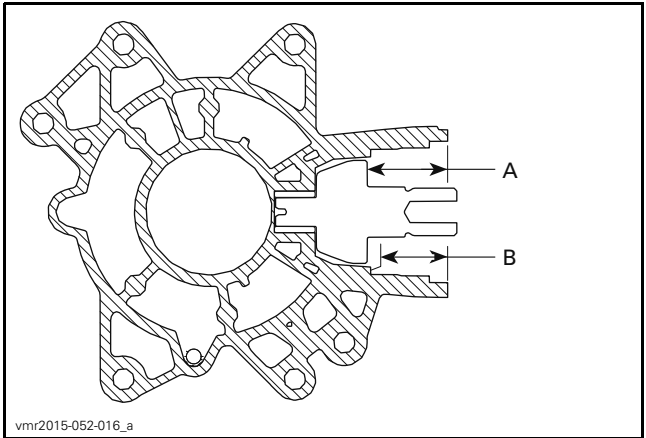
As a preliminary setup, install shims according to the following table.

Section 07 DRIVE SYSTEM
Subsection 03 (REAR DRIVE)

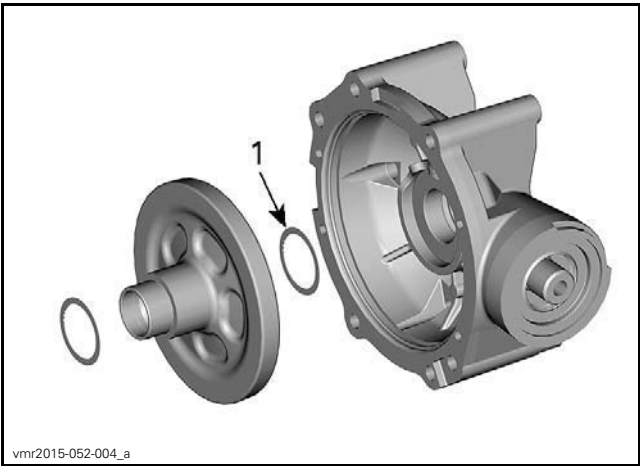
RECOMMENDED SHIM THICKNESS	
PINION GEAR	See procedure for pinion gear shim thickness
BACKLASH	0.5 mm (.02 in)
PRELOAD	(as a preliminary adjustment)

Procedure for pinion gear shim thickness:

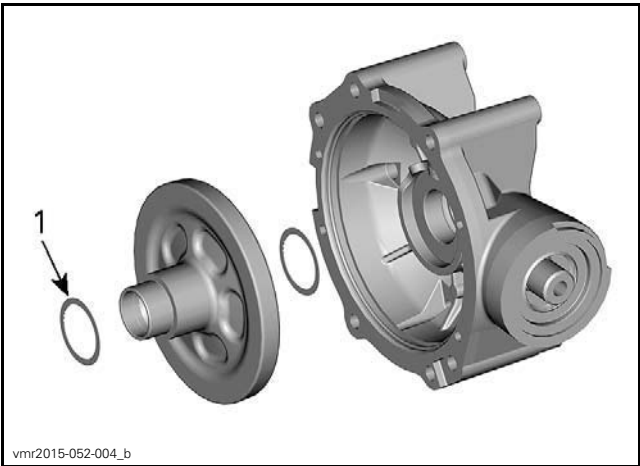
1. Remove the old pinion gear and install the new one without the ball bearing. The new pinion will be located at the "zero" location.
2. Measure the distance "A" between outside surface of the gear case and the shim surface of pinion.
3. Measure the distance "B" between outside surface of the gear case and the bearing shoulder of the gear case.
4. The shim thicknesss will be "A-B-0.53 mm (.021 in)".
5. Select the good combination of shim to match the thickness calculated on step 4.



1. Backlash side
2. Preload side



1. Backlash shim



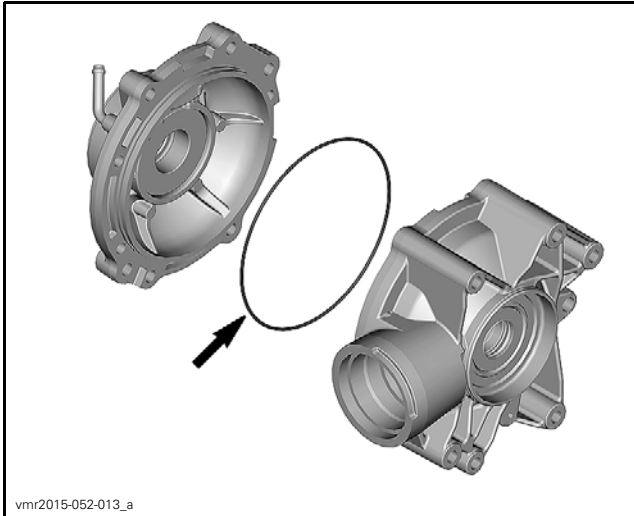
1. Preload shim

- Prior to finalizing assembly, proceed in this order:
- Temporarily assemble final drive using recommended torques.
 - Do not apply thread locker product.
 - Do not install a new pinion nut.

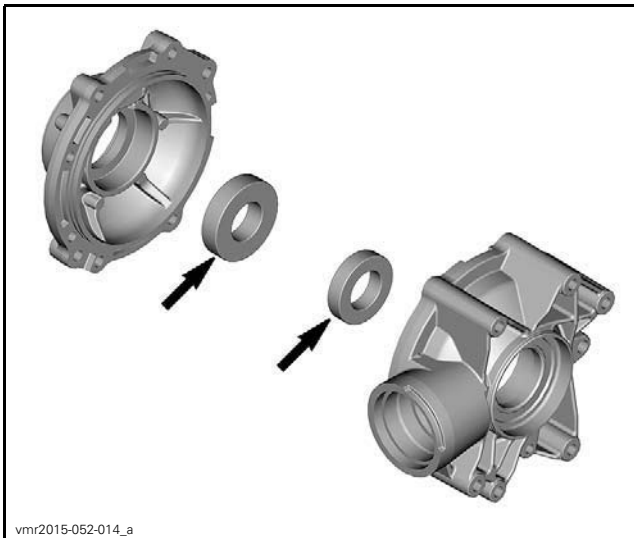
- Check backlash.
- Check preload.

Ring Gear

The installation is the reverse of the removal procedure. However, pay attention to the following:
 Check condition of seal. Replace if damaged.



Install **NEW** bearings.



Tighten final drive housing screws as per specification.

TIGHTENING TORQUE	
Final drive housing screws	32 N•m ± 3 N•m (24 lbf•ft ± 2 lbf•ft)

Pinion Gear

The installation is the reverse of the removal procedure. However, pay attention to the following:
 Install a **NEW** needle bearing.

Install the shim(s) then a **NEW** ball bearing.
 install a **NEW** O-ring.

Apply LOCTITE 277 (P/N 293 800 073) to pinion nut.
 Install and tighten the pinion nut as per specification.

TIGHTENING TORQUE	
Pinion nut (LH THREADS)	180 N•m ± 15 N•m (133 lbf•ft ± 11 lbf•ft) + LOCTITE 277 (P/N 293 800 073)

Lubricate and install a **NEW** oil seal.

Rear Final Drive Installation

The installation is the reverse of the removal procedure. However, pay attention to the following:
 Install the lowest rear final drive retaining screws first.

Install all screws and nuts prior to tighten.

Tighten nuts to specification.

TIGHTENING TORQUE	
Final drive retaining nuts	90 N•m ± 5 N•m (66 lbf•ft ± 4 lbf•ft)

Refill the final drive with recommended oil. Refer to *PERIODIC MAINTENANCE PROCEDURES* subsection.

WHEELS AND TIRES

SERVICE PRODUCTS

Description	Part Number	Page
LOCTITE 767 (ANTISEIZE LUBRICANT)	293 800 070	627

PROCEDURES

TIRES

⚠ WARNING

Do not rotate tires. The front and rear tires have a different size. Respect direction of rotation when applicable.

Tire Pressure

⚠ WARNING

Tire pressure greatly affects vehicle handling and stability. Insufficient pressure may cause tire to deflate and rotate on wheel. Excessive pressure may burst the tire. Always follow recommended pressure.

Check pressure when tires are **cold** before using the vehicle. Tire pressure changes with temperature and altitude. Recheck pressure if one of these conditions has changed.

TIRE PRESSURE	FRONT	REAR
MIN.	41.4 kPa (6 PSI)	41.4 kPa (6 PSI)
MAX. Use when total load is greater than 131.5 kg (290 lb)	48.3 kPa (7 PSI)	68.9 kPa (10 PSI)

Tire Inspection

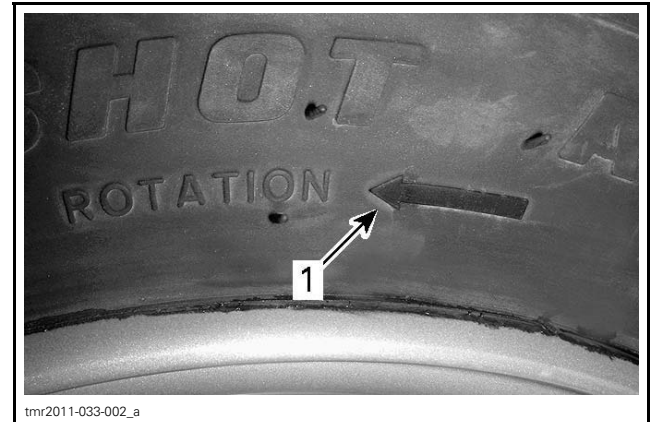
Check tire for presence of slits, bulges, wear or other damage. Replace if necessary.

Tire Replacement

Use an automotive tire changer to replace tires.

⚠ WARNING

- Replace tires only with the same type and size as original tires.
- For unidirectional tread pattern, ensure that the tires are installed in the correct direction of rotation.



TYPICAL

1. Direction of rotation

WHEELS

Wheel Removal

Loosen nuts just enough to be able to unscrew them once the vehicle will be off the ground.

Lift and support the vehicle.

Remove nuts, then remove wheel.

Wheel Inspection

Inspect wheel for wear or damage especially at the mounting holes.

Wheel Installation

At installation, it is recommended to apply LOC-TITE 767 (ANTISEIZE LUBRICANT) (P/N 293 800 070) on threads.

Check if tires are unidirectional.

Section08 CHASSIS

Subsection01 (WHEELS AND TIRES)



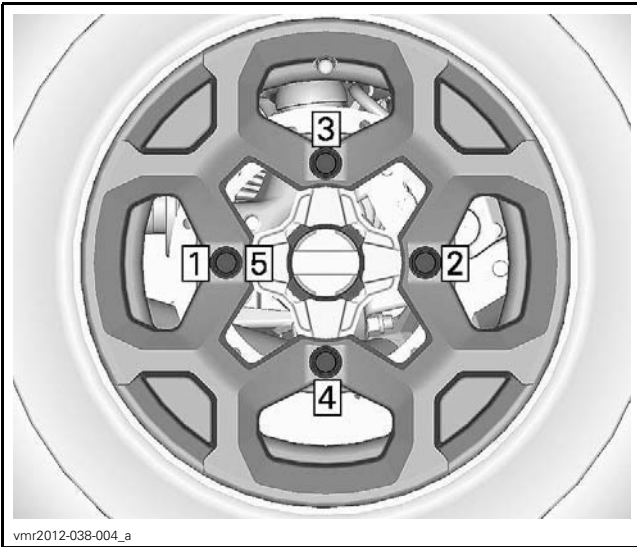
TYPICAL
1. Direction of rotation

Install wheel with the tire in the right direction of rotation.

Install lug nuts with the taper towards the wheel.

Tighten wheel lug nuts to the specified torque using the illustrated sequence.

WHEEL LUG NUTS	
TORQUE	100 N•m ± 10 N•m (74 lbf•ft ± 7 lbf•ft)



TYPICAL - TIGHTENING SEQUENCE

NOTICE Always use the recommended wheel nuts for the type of wheel. Using a different nut could cause damages to the rim or studs.

STEERING SYSTEM

SERVICE TOOLS

Description	Part Number	Page
STEERING ALIGNMENT TOOL.....	529 036 059	632

SERVICE TOOLS – OTHER SUPPLIER

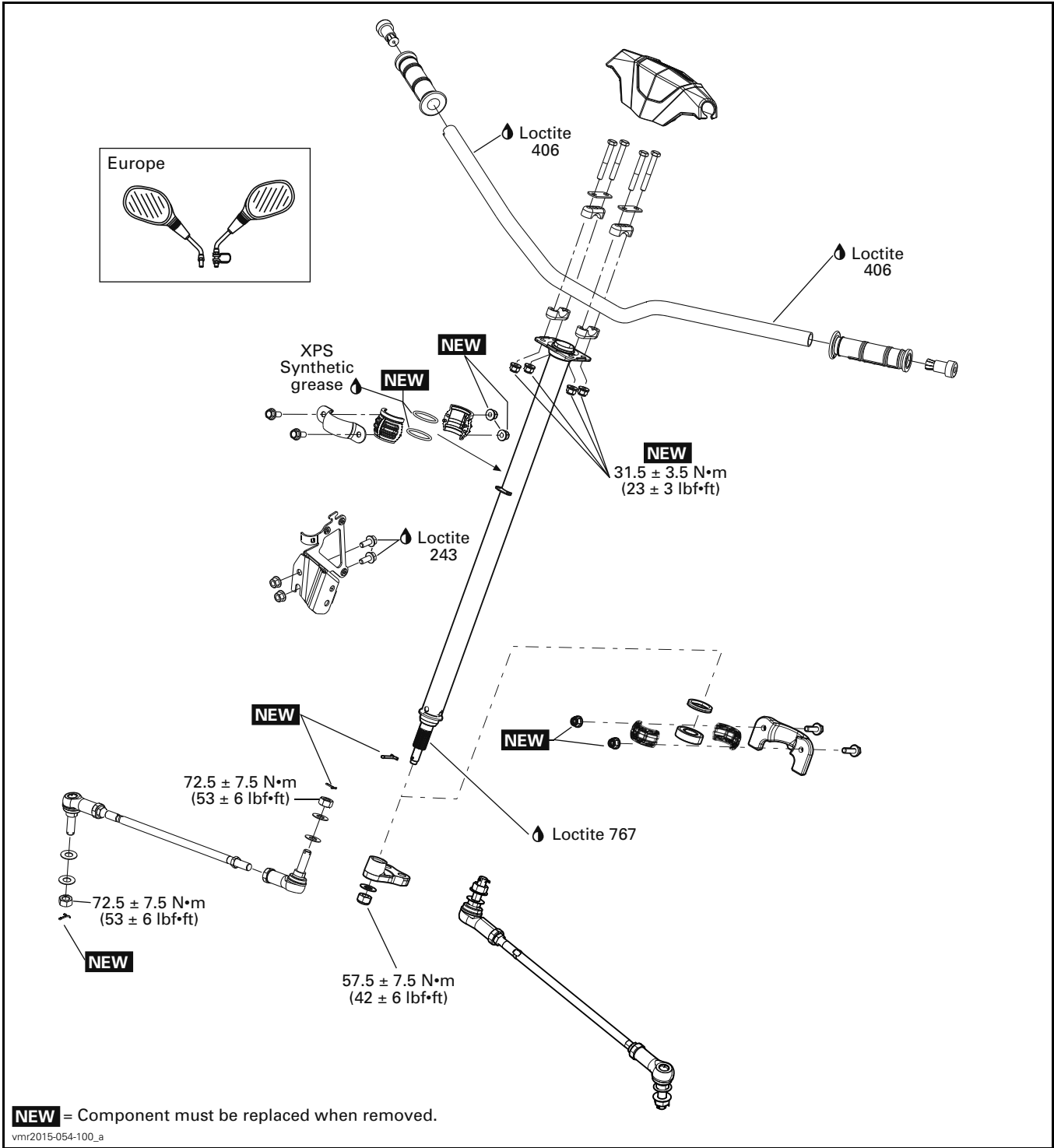
Description	Part Number	Page
SMOOTHFLOW™ TAPERED TIP.....	16 ga	633
	#511 rtt-b	

SERVICE PRODUCTS

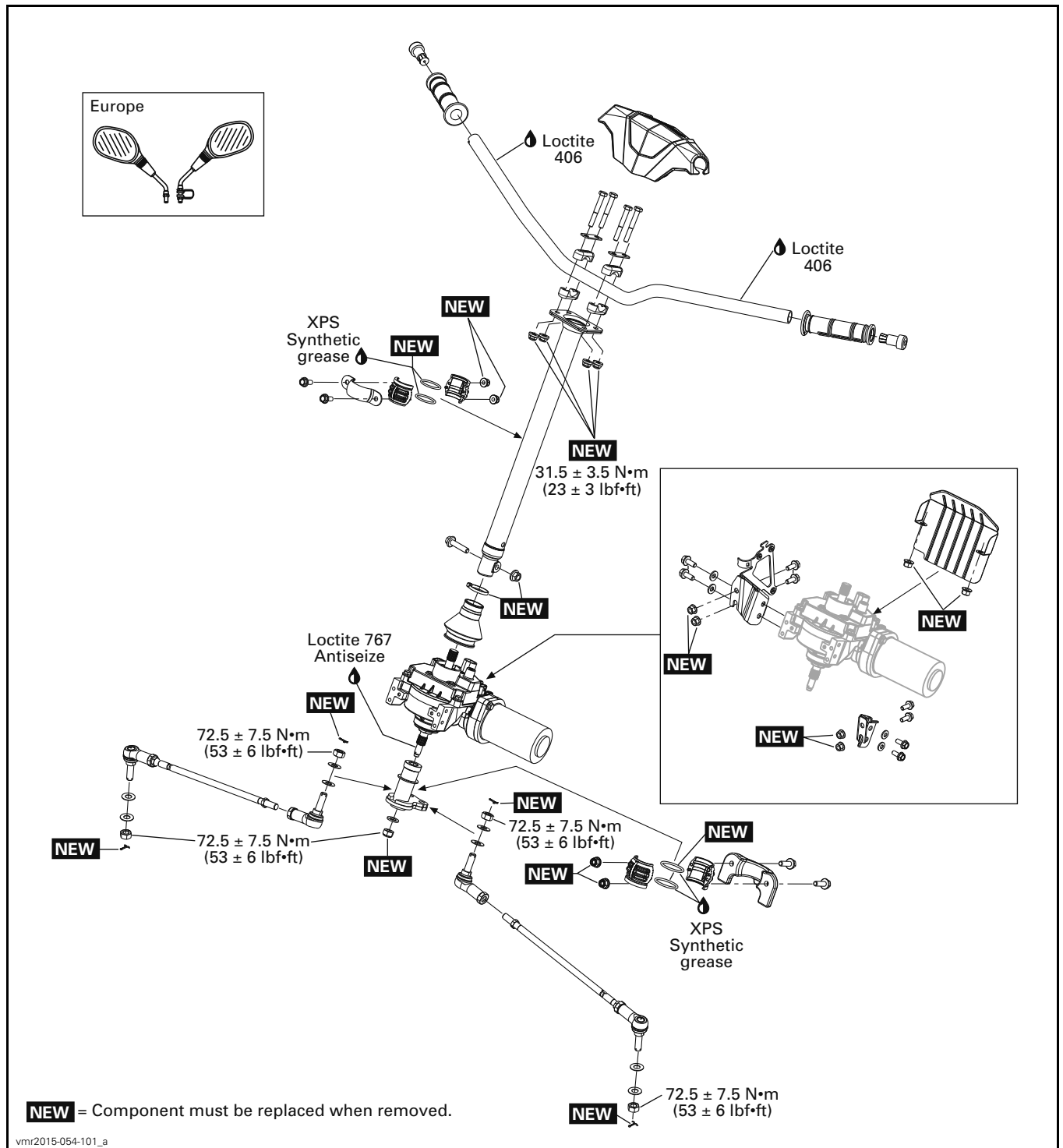
Description	Part Number	Page
LOCTITE 406 (GLUE).....	293 800 100	633
LOCTITE 767 (ANTISEIZE LUBRICANT)	293 800 070	639, 642
PULLEY FLANGE CLEANER	413 711 809	633
XPS SYNTHETIC GREASE.....	293 550 010	639

Section 08 CHASSIS
Subsection 02 (STEERING SYSTEM)

Without DPS



With DPS



GENERAL

The procedures described below are the same for the RH and LH sides, unless otherwise instructed.

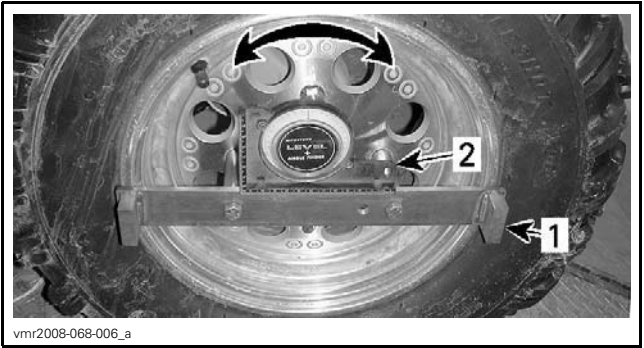
ADJUSTMENT

STEERING ALIGNMENT

1. Place vehicle on a level surface.
2. Check pressure in each tire. Adjust to recommended pressure.
3. Lift and secure vehicle off the ground so that the suspension is fully extended.
4. Position and secure handlebar in the straight ahead position.
5. Remove two wheel nuts on the LH rear wheel and install the steering alignment tool.

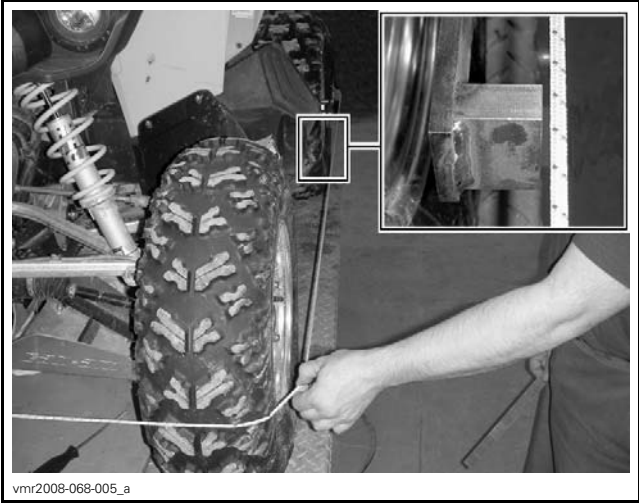
REQUIRED TOOL	
STEERING ALIGNMENT TOOL (P/N 529 036 059)	

6. Place a rope around all four tires using an elastic, link both ends together.
- NOTE:** The rope must be placed at the center of the wheels.
7. Rotate the rear wheel to position the alignment tool level with the rope. Ensure rope passes over the spacer blocks on the alignment tool.



1. Steering adjustment tool
2. Angle gauge or level

8. At the LH front of wheel, near the front of the rim, pull on the rope so that it does not touch the first spacer block on the alignment tool.



9. Slowly move rope back until it just makes contact with both spacers.
- NOTE:** Ensure rope remains in this position as you carry out the following steps.



10. Measure the distance between the rope and the rim, at the front and at the rear of the wheel rim.





TYPICAL — REAR OF WHEEL

11. Calculate the difference between the front and rear measurements and compare with following specification.

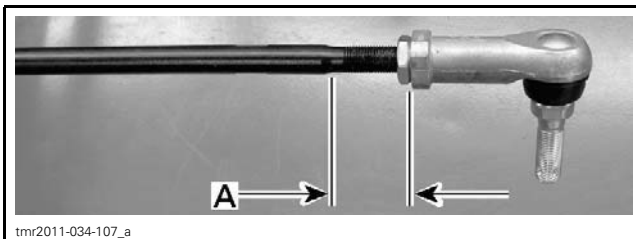
SPECIFICATION
0 mm to 3 mm (0 in to .118 in) toe-in

12. If the wheel toe measurement is out of specification, carry out the following:
 - 12.1 Loosen tie-rod end lock nuts.
 - 12.2 Adjust tie-rod length.

NOTE: For a toe-in adjustment, the distance must be longer at the front of the wheel. Lengthen tie-rod to increase toe-in, and vise-versa.

⚠ WARNING

The maximum unengaged tie-rod length must not exceed 32 mm (1-1/4 in) Tie rod unengaged length must be the same at both ends of the tie-rod.



A. Maximum unengaged length

- 12.3 Tighten tie-rod end lock nuts to specification.

TIGHTENING TORQUE	
Tie-rod end locking nut	34 N•m ± 2 N•m (25 lbf•ft ± 1 lbf•ft)

13. Repeat procedure for other front wheel.

PROCEDURES

HANDLEBAR GRIP

Handlebar Grip Removal

1. Loosen the screw at the end of handlebar grip.
2. Remove the handlebar grip cap.
3. Cut and remove the handlebar grip.

Handlebar Grip Installation

1. Remove all rubber residues of the old grip before installing the new.
2. Clean the handlebar with PULLEY FLANGE CLEANER (P/N 413 711 809) or alcohol to remove any greasy matter on it.
3. Install handlebar grip by blowing compressed air between handle grip and handlebar.
4. Install a SMOOTHFLOW™ TAPERED TIP (P/N 16 GA #511 RTT-B) from EFD Inc on a bottle of LOCTITE 406 (GLUE) (P/N 293 800 100).
5. Lift a part of the grip using a small screwdriver and inject glue (about 4 spots per side).

NOTE: The glue dries quickly. Do not apply it before installing grip.

6. Apply pressure on the grip for approximately 30 seconds to set the glue.
7. Install the handlebar grip cap and torque screw 0.4 N•m (3.5 lbf•in).

HANDLEBAR COVER

Handlebar Cover Removal

Pull on plastic handlebar cover to remove it from the handlebar.

Handlebar Cover Inspection

Check covers for cracks or other damages. Replace if necessary.

Handlebar Cover Installation

The installation is the reverse of the removal procedure.

HANDLEBAR

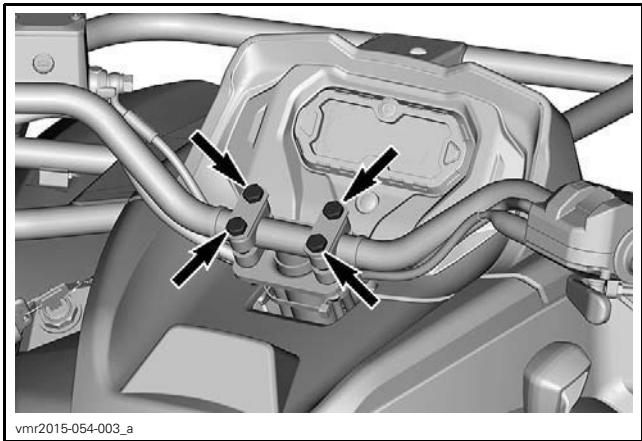
Handlebar Removal

1. Remove handlebar cover.

NOTE: Remove handlebar grips, throttle handle, brake handle and multifunction switch only if the handlebar is defective and requires replacement.

2. Remove handlebar mounting screws.

Section 08 CHASSIS
Subsection 02 (STEERING SYSTEM)



Handlebar Inspection

Inspect the handlebar for damage, cracks or bending. Replace if any of these problems is detected.

Handlebar Installation

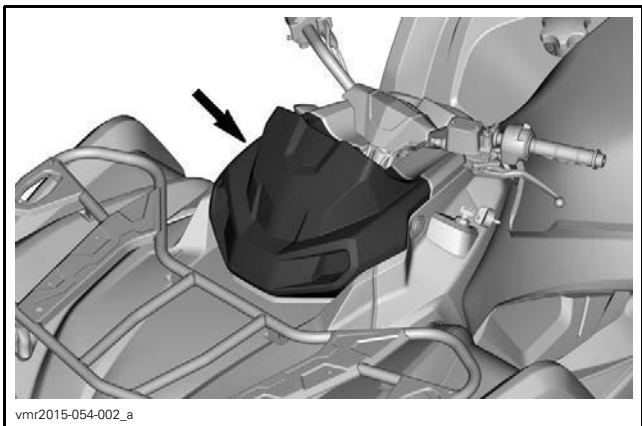
The installation is the reverse of the removal procedure.

NOTE: Ensure handlebar "U" clamps are tightened equally (equal distance on each side of clamps).

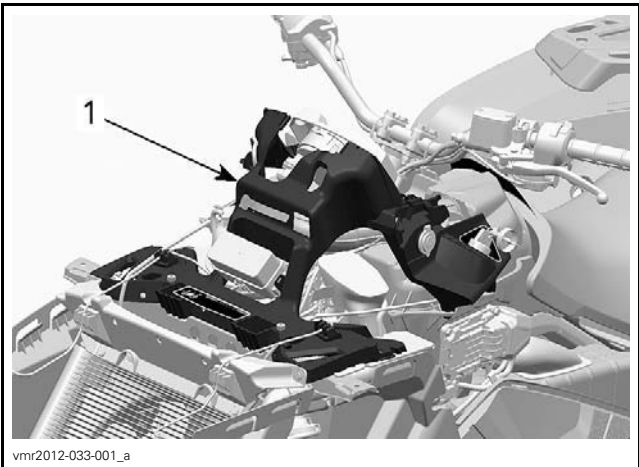
STEERING CONNECTORS

Steering Connector Access

1. Remove gauge support, refer to *LIGHTS, GAUGE AND ACCESSORIES* subsection.

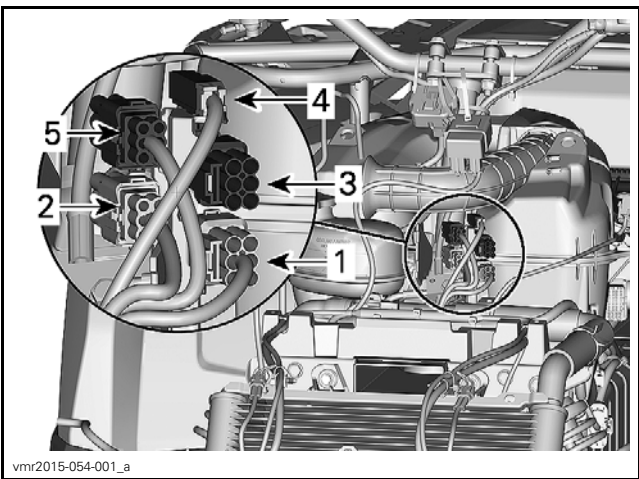


2. Remove front body module, refer to body subsection.
3. Remove dash board support.



1. Dash board support

Steering Connector Identification



STEERING CONNECTOR IDENTIFICATION

1. MG1 (LH multifunction switch)
2. MG2 (LH multifunction switch)
3. MG3 (LH multifunction switch)
4. DC3 (DC power connector)
5. HIC1 (Engine interconnect)

MULTIFUNCTION SWITCH

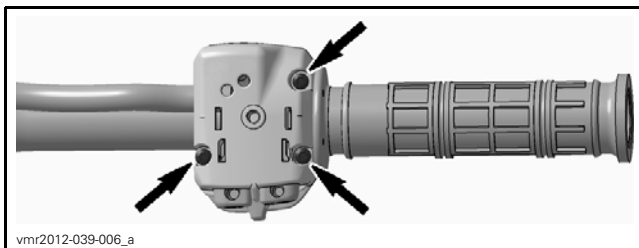
Multifunction Switch Removal (From Vehicle)

Remove gauge support. Refer to *LIGHTS, GAUGE AND ACCESSORIES* subsection.

Carry out steps in *MULTIFUNCTION SWITCH REMOVAL (AT HANDLEBAR)*.

Multifunction Switch Removal (At Handlebar)

1. Remove multifunction switch screws.



TYPICAL - MULTIFUNCTION SWITCH

2. Separate multifunction switch from handlebar.
3. Disconnect multifunction switch steering connectors, refer to *STEERING CONNECTOR IDENTIFICATION* in this subsection:
 - MG1
 - MG2
 - MG3.
4. Take note of the positions of the locking ties securing the steering harness, then cut them and remove the multifunction switch steering harness from the vehicle.

Multifunction Switch Installation

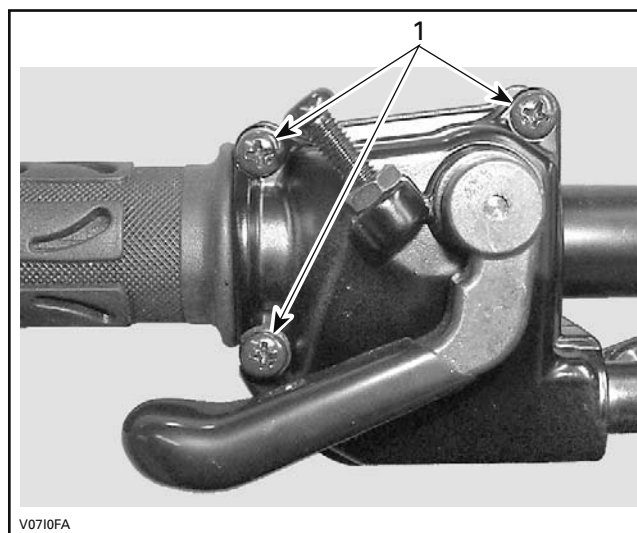
For installation, reverse the removal procedure.

NOTICE Be sure to route and secure the multifunction switch steering harness as noted prior to removal.

THROTTLE LEVER

Throttle Lever Removal

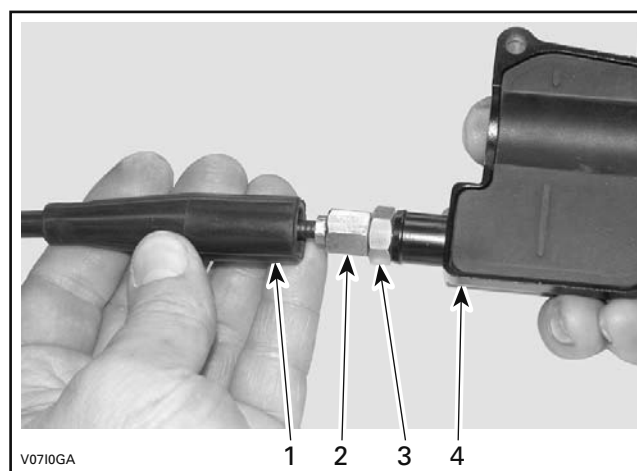
1. Disconnect the HIC1 connector (2/4WD switch), refer to *STEERING CONNECTORS* in this subsection.
2. Remove throttle lever housing retaining screws.



TYPICAL - THROTTLE LEVER HOUSING

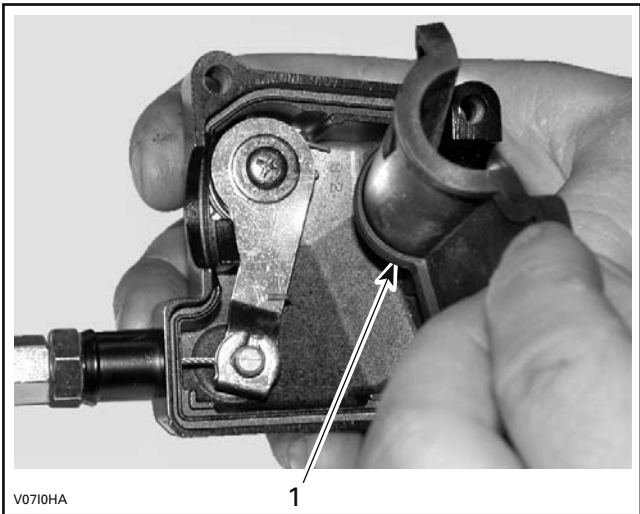
1. Remove retaining screws

3. Separate throttle lever housing from handlebar.
4. Slide rubber protector back to expose throttle cable adjuster.



1. Cable protector
2. Throttle cable adjuster
3. Lock nut
4. Throttle lever housing

5. Loosen lock nut and screw in the throttle cable adjuster.
6. Remove inner housing protector.



1. Inner housing protector

7. Slide cable in clip slot and remove the end of the cable from clip.



8. Remove throttle cable from housing.

Throttle Lever Installation

The installation is the reverse of the removal procedure.

Adjust throttle cable. Refer to *THROTTLE CABLE ADJUSTMENT*.

BRAKE LEVER

Brake Lever Removal (From Vehicle)

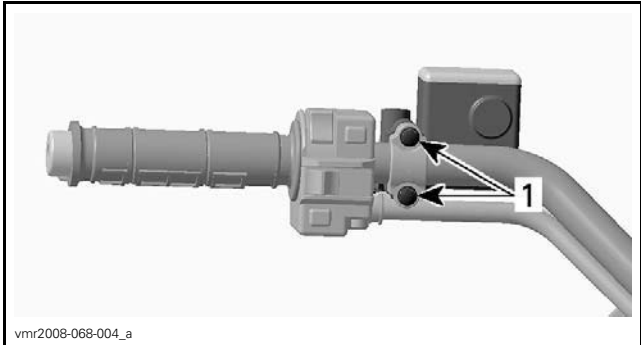
1. Carry out steps in *BRAKE LEVER REMOVAL (FROM HANDLEBAR)*.

NOTICE Avoid spilling brake fluid on plastic, rubber or painted parts.

2. Disconnect brake hose, refer to *BRAKES* subsection.

Brake Lever Removal (At Handlebar)

1. Remove brake lever retaining screws.



TYPICAL

1. Remove these retaining screws

2. Separate brake lever from handlebar.

Brake Lever Installation

The installation is the reverse of the removal procedure. However, pay attention to the following: Tighten brake lever mounting screw to specification.

TIGHTENING TORQUE	
Brake lever mounting screw	9 N•m ± 1 N•m (80 lbf•in ± 9 lbf•in)

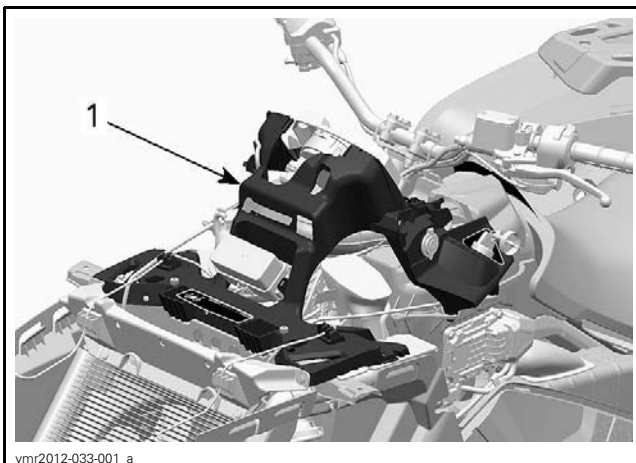
 **WARNING**

If brake hose was disconnected, bleed brake system. Refer to *BRAKES* subsection.

STEERING COLUMN

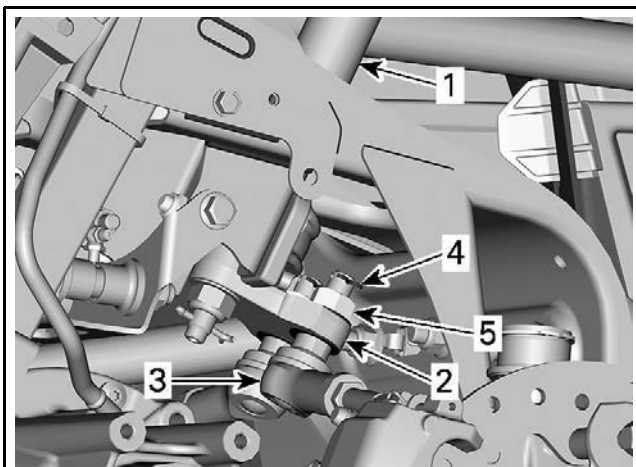
Steering Column Removal (Without a DPS)

1. Remove gauge support, refer to *LIGHTS, GAUGE AND ACCESSORIES* subsection.
2. Refer to *BODY* subsection to remove the following:
 - Front body module
 - Inner fender panels
3. Remove dash board support.



1. Dash board support

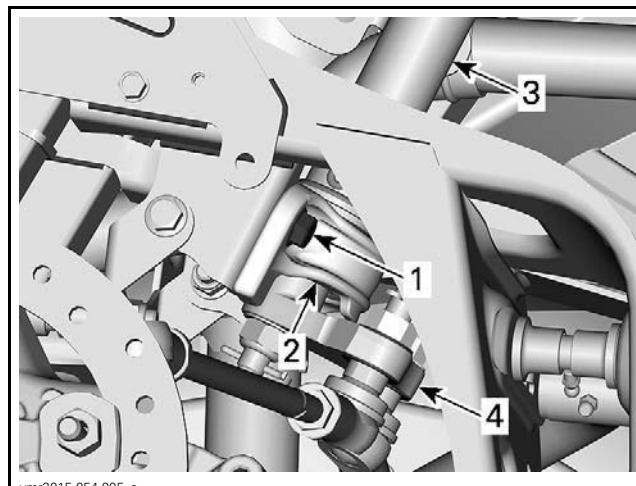
4. Remove the air intake silencer. Refer to *AIR INTAKE SYSTEM* subsection.
5. Remove handlebar, refer to *HANDLEBAR REMOVAL* in this subsection. Also remove locking ties and separate wiring harnesses and hoses from the steering column.
6. Disconnect the tie-rods from the pitman arm at the bottom of the steering column. Refer to *TIE-ROD* in this subsection.



- vmr2015-054-004_a
1. Steering column
 2. Pitman arm
 3. Tie-rod end
 4. Cotter pin
 5. Tie-rod retaining nut

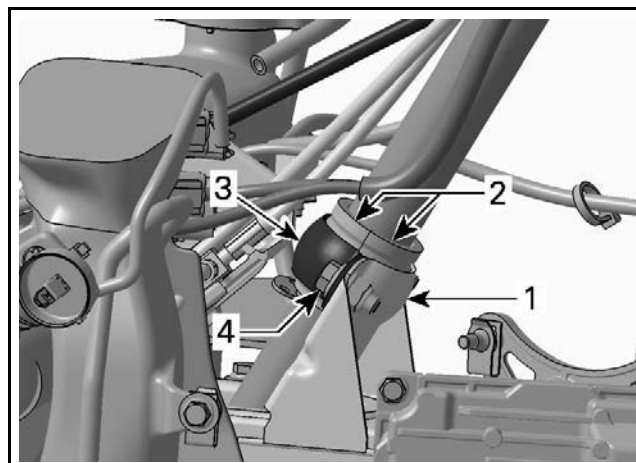
NOTE: When removing tie-rods from pitman arm, take note of positions of flat washers for installation.

7. Remove lower half bushing retaining screws and pull retainer off of half bushings.



- vmr2015-054-005_a
1. Lower retainer mounting screws (2)
 2. Lower half bushing retainer
 3. Steering column
 4. Pitman arm

8. Remove upper half bushing retaining screws and pull retainer off of half bushings.



- vmr2012-039-010_a
1. Upper steering column support
 2. Half bushings
 3. Half bushing retainer
 4. Retainer mounting screws (2)

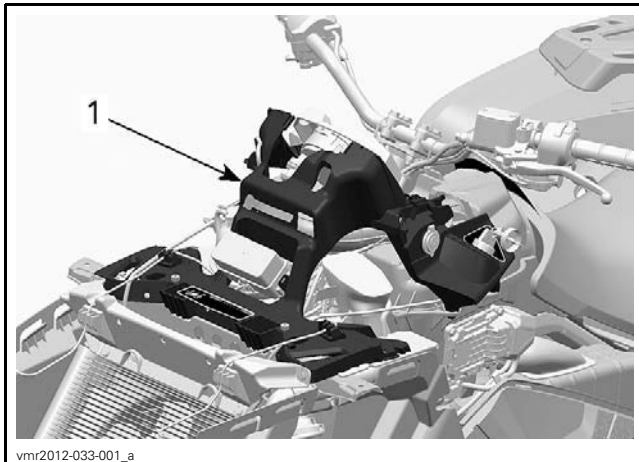
9. Pull steering column from vehicle.

Steering Column Removal (With a DPS)

1. Remove gauge support, refer to *LIGHTS, GAUGE AND ACCESSORIES* subsection.
2. Refer to *BODY* subsection and remove the following:
 - Front body module
 - Inner fender panels
3. Remove dash board support.

Section 08 CHASSIS

Subsection 02 (STEERING SYSTEM)

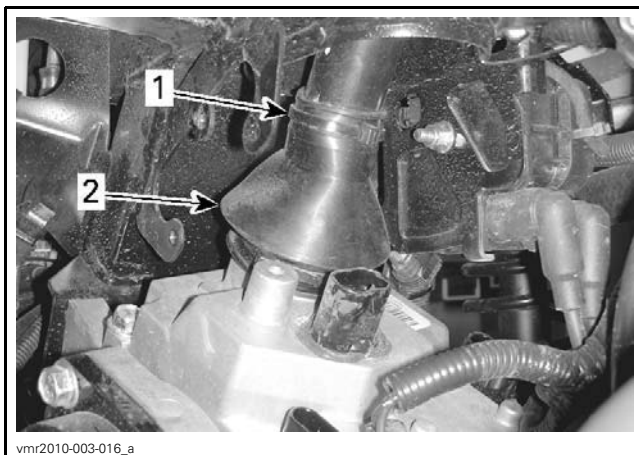


1. Dash board support

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

5. Remove handlebar, refer to *HANDLEBAR REMOVAL* in this subsection. Also remove locking ties and separate wiring harnesses and hoses from the steering column.

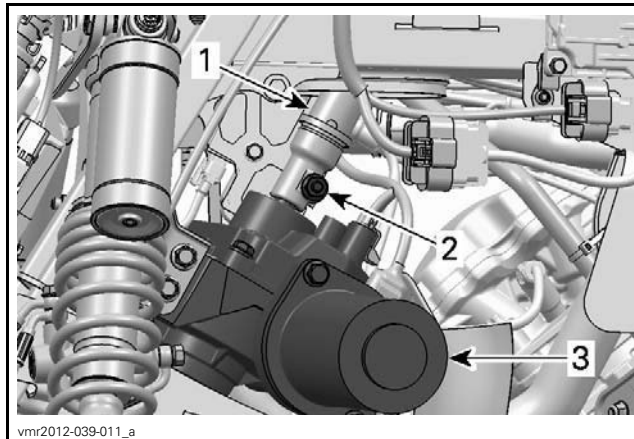
6. Cut the locking tie securing the bellows at the bottom of steering column near the DPS unit, and pull the bellows upwards sufficiently to access the steering column pinch screw.



TYPICAL

1. Cut this locking tie
2. Steering column bellows

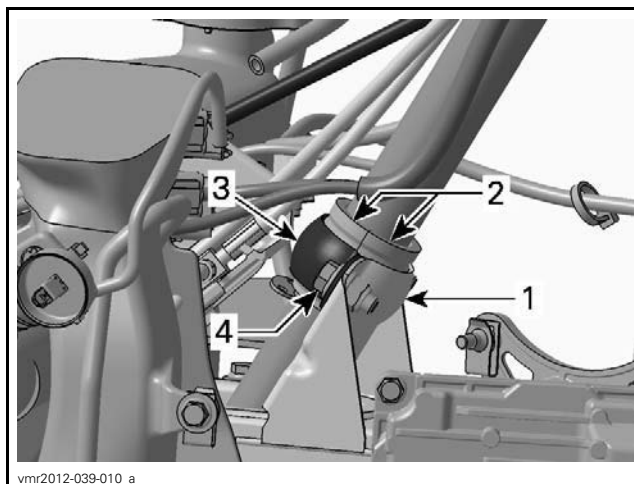
7. Remove steering column lower pinch screw and nut. Discard the nut.



SOME PARTS REMOVED FOR CLARITY

1. Steering column
2. Steering column lower pinch screw and nut
3. DPS unit

8. Remove upper half bushing retaining screws and pull retainer off of half bushings.



1. Upper steering column support
2. Half bushings
3. Half bushing retainer
4. Retainer mounting screws (2)

9. Pull steering column from vehicle.

Steering Column Inspection

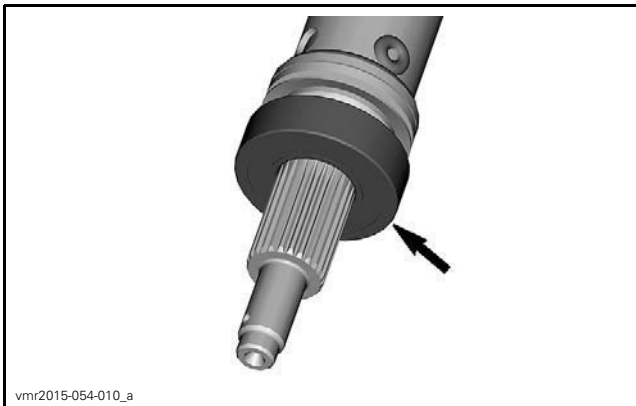
1. Inspect steering column for wear, cracks or bending. Replace if any of these problems is detected.
2. Check steering column O-rings and seal for brittleness, hardness, wear or other damage. Replace if necessary.
3. Clean and check steering column half bushings. If they show signs of wear or cracking, replace them.

Models Without a DPS

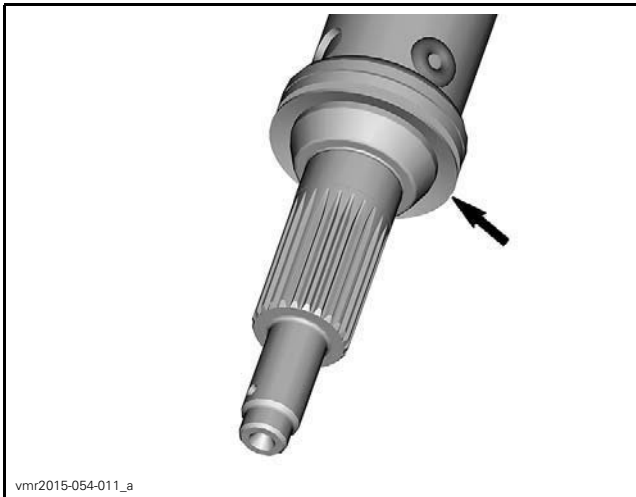
4. Check if steering column lower ball bearing turns freely and smoothly. Replace if necessary.

Steering Column Lower Ball Bearing and Seal Replacement (Without a DPS)

1. Remove the pitman arm. Refer to *PITMAN ARM* in this subsection.
2. Remove ball bearing.



3. Remove seal.



4. Install a **NEW** seal.
5. Install a **NEW** ball bearing.

Steering Column Installation

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

PRODUCT	
O-rings, half bushings and DPS input shaft splines	XPS SYNTHETIC GREASE (P/N 293 550 010)
DPS output shaft splines	LOCTITE 767 (ANTISEIZE LUBRICANT) (P/N 293 800 070)

Install **NEW** cotter pins (as applicable per model). Both ends of cotter pins must be folded.

Install **NEW** elastic nuts where used.

Torque all fasteners as specified in the applicable exploded view.

Carry out a *STEERING ALIGNMENT* procedure as detailed in this subsection.

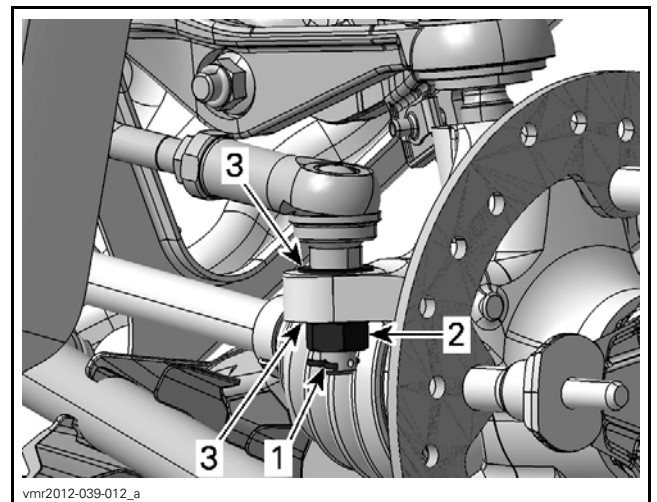
Carry out a *TORQUE OFFSET RESET* procedure as detailed in this subsection.

TIE-ROD

NOTE: Use the same procedure for RH and LH side.

Tie-Rod Removal

1. Place vehicle on jack stands and remove the applicable wheel.
2. Remove tie-rod end from steering knuckle by removing:
 - Cotter pin (discard)
 - Retaining nut
 - Hardened washers.



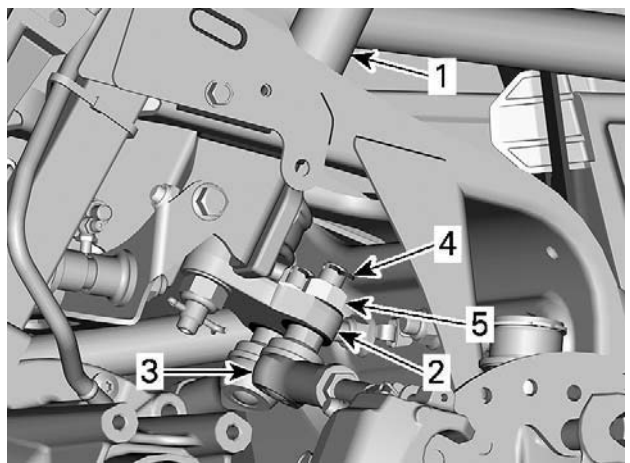
TIE ROD AT STEERING KNUCKLE

1. Cotter pin
2. Retaining nut
3. Hardened washers

3. If completely removing tie-rod from vehicle, repeat previous step at pitman arm.

Section 08 CHASSIS

Subsection 02 (STEERING SYSTEM)



vmr2015-054-004_a

TIE ROD AT PITMAN ARM

- 1. Steering column
- 2. Pitman arm
- 3. Tie-rod end
- 4. Cotter pin
- 5. Tie-rod end retaining nut

Tie-Rod Inspection

Inspect tie-rod for straightness, cracks and other damages. Replace as required.

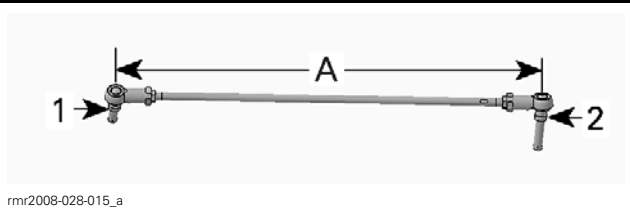
Inspect tie-rod ends for wear or excessive play. If excessive, replace the tie-rod end.

Tie-Rod Installation

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

When installing a new tie-rod or tie-rod end, adjust tie-rod to nominal length.

TIE-ROD NOMINAL LENGTH	
Dimension "A" - center to center	416.4 mm (16-3/8 in)



rnr2008-028-015_a

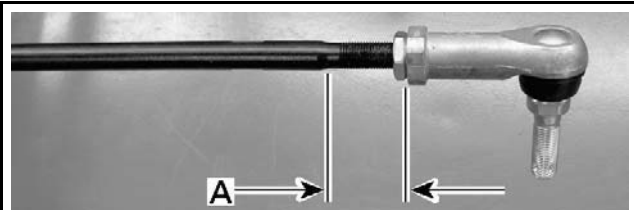
NOMINAL LENGTH

- 1. Pitman arm side
 - 2. Knuckle side
- A. 416.4 mm (16-3/8 in)

TIE-ROD MAXIMUM UNENGAGED LENGTH	
Dimension "A" - Shoulder to tie rod end face	32 mm (1-1/4 in)

⚠ WARNING

Maximum tie-rod unengaged length must not exceed specification. Both tie-rod ends must be engaged equally.



tmr2011-034-107_a

MAXIMUM TIE-ROD UNENGAGED LENGTH

A. 32 mm (1-1/4 in)

Install **NEW** cotter pins. Both ends of cotter pins must be folded.

Check the steering alignment, refer to *STEERING ALIGNMENT* in this subsection.

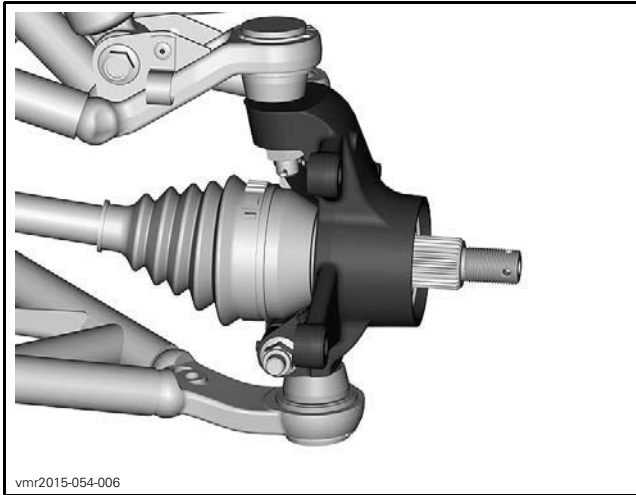
Apply specified torques.

TIGHTENING TORQUE	
Tie-rod lock nut	34 N•m ± 2 N•m (25 lbf•ft ± 1 lbf•ft)
Tie rod end retaining nut	72 N•m ± 7 N•m (53 lbf•ft ± 5 lbf•ft)

KNUCKLE

Knuckle Removal

- 1. Safely lift and support the front of vehicle.
- 2. Remove front wheel.
- 3. Detach tie-rod end from knuckle, refer to *TIE-ROD END* in this subsection.
- 4. Remove brake caliper, refer to *BRAKES* subsection.
- 5. Remove wheel hub, refer to *FRONT DRIVE* subsection.



6. Detach upper suspension arm from knuckle, refer to *FRONT SUSPENSION*.
7. Detach lower suspension arm from knuckle, refer to *FRONT SUSPENSION*.
8. Remove knuckle from vehicle.

Knuckle Inspection

Check knuckle for cracks or other damages. Replace if necessary.

Check if wheel bearing turns freely and smoothly. See *WHEEL BEARING* in this subsection.

Knuckle Installation

The installation is the reverse of the removal procedure.

Refer to applicable subsection.

WHEEL BEARINGS

Wheel Bearing Inspection (Maintenance)

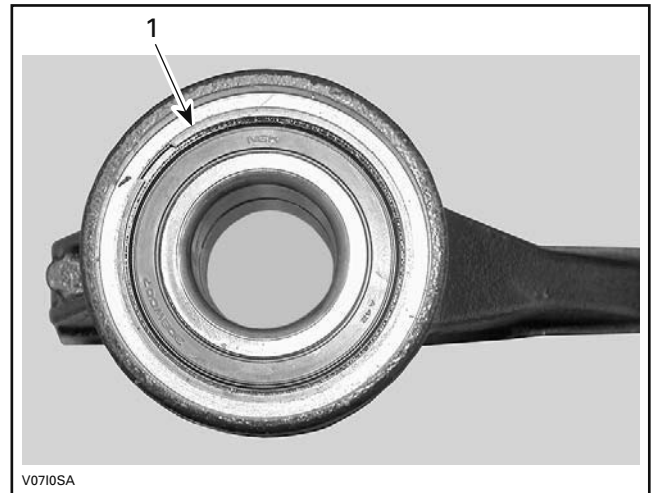
Refer to *PERIODIC MAINTENANCE PROCEDURES* subsection.

Wheel Bearing Inspection (During Component Removal)

Whenever the drive axle or knuckle is removed, check if wheel bearing turns freely and smoothly. Replace if necessary.

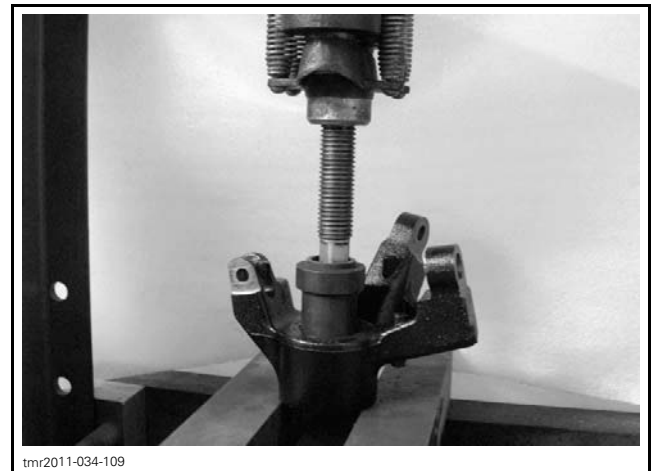
Wheel Bearing Removal

1. Remove knuckle from vehicle, refer to *KNUCKLE REMOVAL* in this subsection.
2. Remove the circlip.



TYPICAL
1. Circlip

3. Install knuckle on a press.
4. Remove bearing from knuckle using an appropriate bearing remover.



TYPICAL

NOTE: It may be necessary to heat the knuckle to remove bearing.

⚠ WARNING

Clean all grease from outside and inside of knuckle before heating it.

Wheel Bearing Installation

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

To ease wheel bearing installation:

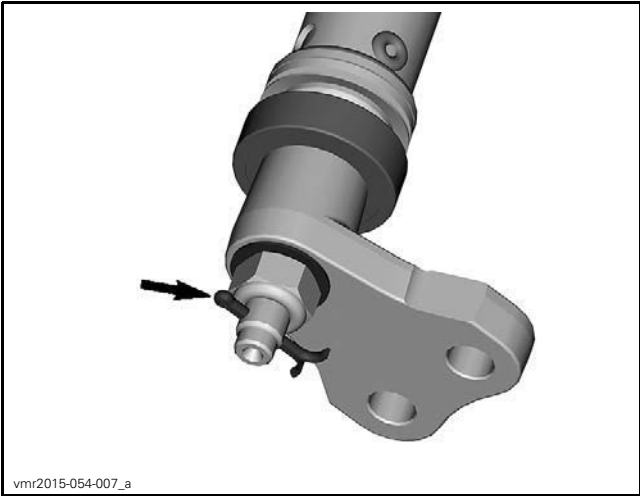
- Place bearing in a freezer for 10 minutes.
- Place knuckle in oven to 100°C (212°F) for 30 minutes maximum.

When knuckle is cooled down, install **NEW** circlip.

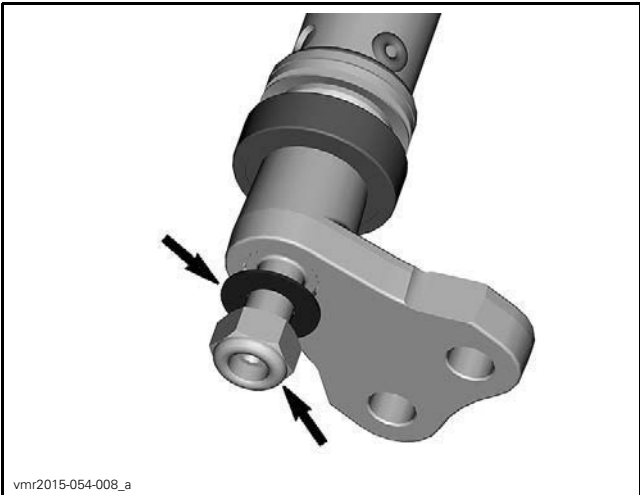
PITMAN ARM (WITHOUT A DPS)

Pitman Arm Removal

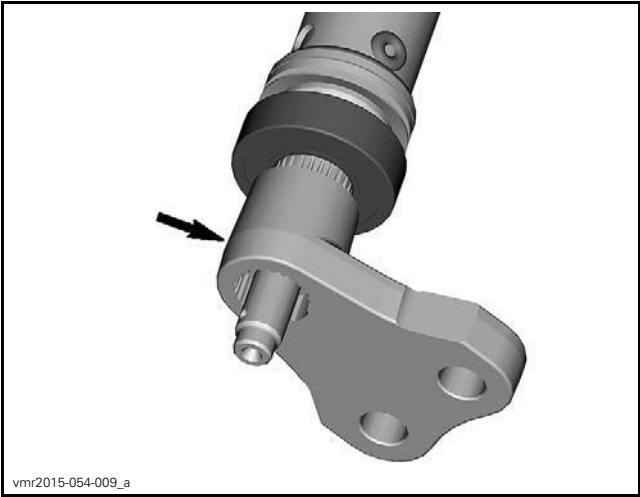
- 1. Remove tie rod ends from pitman arm. Refer to *TIE ROD* in this subsection.
- 2. Remove and discard cotter pin.



- 3. Remove pitman arm retaining nut and washer.



- 4. Remove pitman arm.



Pitman Arm Inspection

Inspect pitman arm for cracks or other damages. Replace if necessary.

Check pitman arm splines for excessive wear. Replace if necessary.

Pitman Arm Installation

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

PRODUCT	
Steering column splines	LOCTITE 767 (ANTISEIZE LUBRICANT) (P/N 293 800 070)

Tighten the pitman arm retaining nut to specification.

TIGHTENING TORQUE	
Pitman arm retaining nut	57.5 N•m ± 7.5 N•m (42 lbf•ft ± 6 lbf•ft)

Install a **NEW** cotter pin. Both ends of cotter pins must be folded.

PITMAN ARM (WITH A DPS)

Refer to *DYNAMIC POWER STEERING (DPS)* subsection.

DYNAMIC POWER STEERING (DPS)

SERVICE TOOLS

Description	Part Number	Page
FLUKE 115 MULTIMETER	529 035 868	652
PITMAN ARM JIG	529 036 225	663, 665
PITMAN ARM PULLER	529 036 227	664
POSITIONING ADAPTOR.....	529 036 230	664

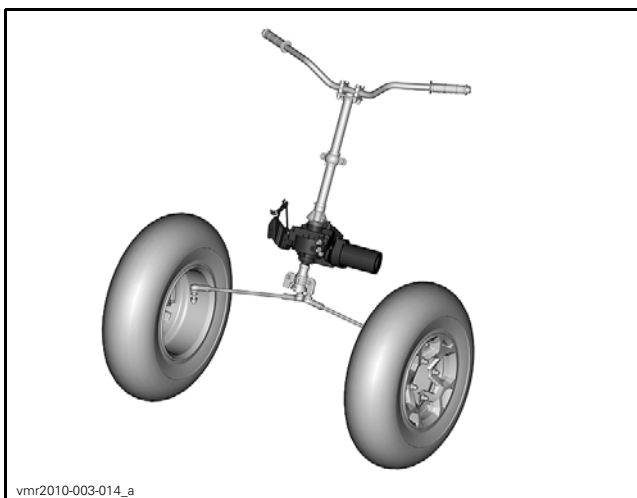
SERVICE PRODUCTS

Description	Part Number	Page
LOCTITE 767 (ANTISEIZE LUBRICANT)	293 800 070	665
XPS SYNTHETIC GREASE.....	293 550 010	659

GENERAL

SYSTEM DESCRIPTION (FEATURES)

The Dynamic Power Steering (DPS) provides a computer controlled, variable power assist, achieved by an electric motor to optimize the amount of steering input required by the rider.



1. Dynamic power steering unit (DPS)

The DPS system uses the following parameters to determine how much steering assist it provides:

- Engine RPM
- Battery/electrical system voltage
- Vehicle speed
- DPS shaft torque sensor input.

The amount of steering assist provided is dependent on the handlebar effort (steering torque), electrical power available, and vehicle speed.

The greater the handlebar effort (torque), the greater the assist will be.

The slower the vehicle speed, the greater the assist will be.

If the electrical system is activated but the engine is **not** running, there is **no** power assist provided.

When the handlebar is in the straight ahead position, there is no steering assist.

Steering torque may also come from the wheels due to rough terrain. Steering kickback is reduced while providing feedback to the driver.

The greater the power steering assist, the greater the load on the electrical system.

When the electrical system is under high load (battery not at full charge, operating the vehicle for prolonged periods of time at slow speed and low RPM which, requires higher power steering assist), the battery power reserve will gradually decrease. This further increases the load on the charging system and the electrical system voltage will drop. As system voltage drops, so does power steering assist.

NOTE: It is important to maintain the battery at a full state of charge to ensure proper DPS operation. The magneto output is 650 watts to minimize battery drain and system voltage drop.

DPS Assist Mode

The DPS system provides three rider selectable modes of operation.

DPS MAX provides maximum steering assist for technical low speed riding in rough or muddy terrain, or for touring.

Section08 CHASSIS

Subsection03 (DYNAMIC POWER STEERING (DPS))

DPS MED provides normal (medium) steering assist for general all purpose riding.

DPS MIN provides less steering assist for increased feedback and aggressive trail riding.

A fourth mode of operation is available as an accessory to adjust the steering assist level for operation with an approved BRP track kit.

Derating Explanation

Derating is an internal protection system integrated in the DPS electronic module.

This system protects the electronic components when DPS works too hard and the internal temperature reaches a critical level.

It also protects electronics when current ripples in the system are too high. These current ripples can be caused by:

- Loose battery connections
- Low battery voltage
- Bad grounds
- Defective stator or bad stator output wires connection
- Failed regulator
- High electrical loads.

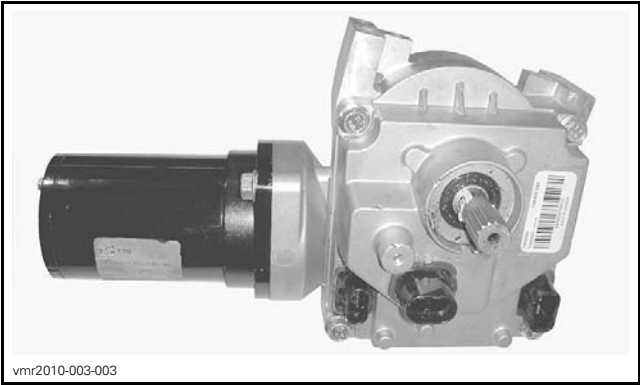
The internal protection system decreases the assistance level available to protect its electronic board. The normal assistance level will return when riding conditions are back to normal and the internal temperature decrease and/or when the ripples in the electric circuit decreases.

NOTE: This reaction is a normal protective behavior of the unit and it does not necessarily raise a fault in the cluster.

DPS SYSTEM DESCRIPTION
(COMPONENTS)

DPS Unit

The DPS unit is a self contained unit that includes the steering gear, the DPS module, the DPS motor, and the torque sensor.



TYPICAL - DPS UNIT

The DPS module provides DC power to the motor. The amount and duration of that DC power is determined by the inputs to the DPS module. The direction in which the motor turns is changed by reversing the polarity of the circuit current.

The DPS motor does not "spin", but rather turns in very small increments based on the amount, duration, and direction of DC power delivered by the DPS module.

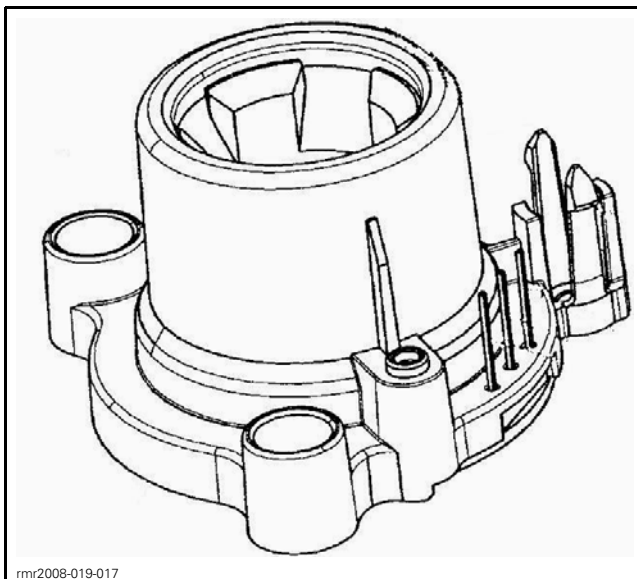
DPS Unit Protection

To protect the DPS electronic components, the steering assist behavior will change as follows.

CONDITION	DPS BEHAVIOR
When motor internal temperature reaches a certain temperature (DPS continuously estimates it)	Steering assist will gradually decrease
DPS internal board temperature is above 85°C (185°F)	
DPS internal board temperature is above 100°C (212°F)	Steering assist is stopped

When the DPS unit temperature is back within normal operating range, normal steering assist will resume.

Steering Torque Sensor



The steering column is connected to the shaft on the DPS unit. A small area of the DPS shaft is magnetized. Inside the DPS unit, a torque sensor surrounds the magnetized area of the DPS shaft.

When the handlebar is turned, torque is applied to the shaft which tends to twist the shaft slightly, deforming the magnetic field in the shaft. The sensor detects the torque by measuring the deviation of the magnetic field.

The torque sensor is very sensitive and can detect very small changes in the magnetic field. The harder the handlebar is turned, the greater the magnetic deviation, the greater the power steering assist.

ADJUSTMENT

TORQUE OFFSET RESET

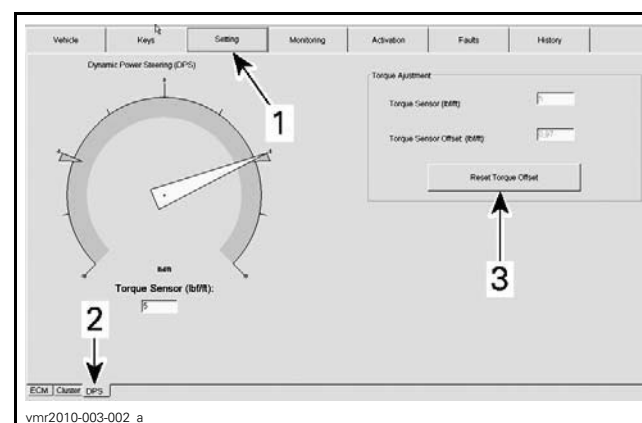
When replacing the following parts or adjusting steering alignment, the sensor torque offset must be reset to zero for proper system operation.

PART ADJUSTED OR REPLACED	WHAT TO DO
– DPS unit – Steering column half bushings – Steering column – Tie rod – Tie rod end – Knuckle – Wheel bearing – Ball joint – Front suspension arm (lower/upper) – Pitman arm – Steering alignment	Reset Torque Offset in Setting, DPS

1. Ensure proper *STEERING ALIGNMENT*, see procedure in this subsection.
2. Connect vehicle to the latest applicable B.U.D.S. software version.
3. In B.U.D.S., select **Read Data**.
4. Choose the **Setting** page tab.
5. At the bottom LH corner of the **Setting** page, choose the **DPS** tab.

NOTICE Ensure handlebar is free and centered within ± 10 degrees of center position. There **MUST NOT** be any effort applied to the steering column.

6. Press **Reset Torque Offset** button.

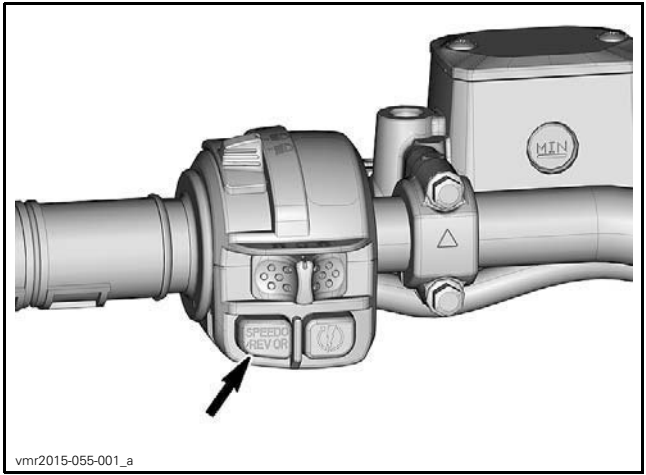


DPS TORQUE OFFSET RESET

1. Setting page tab
2. DPS tab
3. Reset Torque Offset button

DPS ASSIST MODE

1. To **view** the active DPS ASSIST mode, momentarily press and release the OVERRIDE/DPS button on the LH multifunction switch assembly.



The active DPS mode will be displayed in the lower portion of multifunction gauge.



1. DPS mode display

2. To **change** DPS ASSIST mode, press and hold the OVERRIDE/DPS button for approximately 2 seconds to go to the next setting.

The DPS system will toggle to the following available mode. The newly activated DPS mode will be briefly displayed in the multifunction gauge.

3. Repeat previous step to toggle through the available mode.

NOTE: The DPS mode of operation cannot be changed if the vehicle is in reverse. The DPS/Override switch must be released between each DPS mode selection.

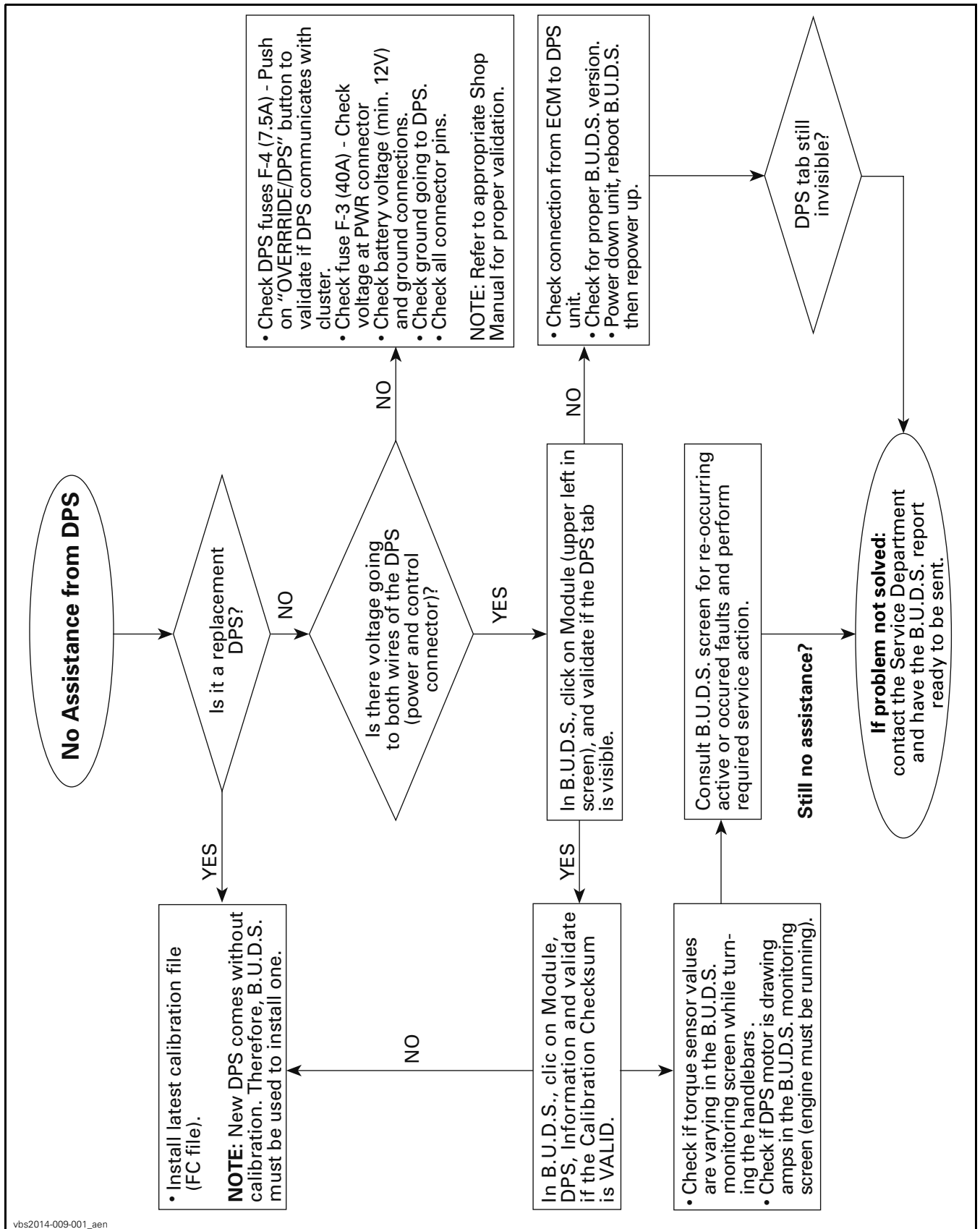
TROUBLESHOOTING

TROUBLESHOOTING FLOW CHARTS

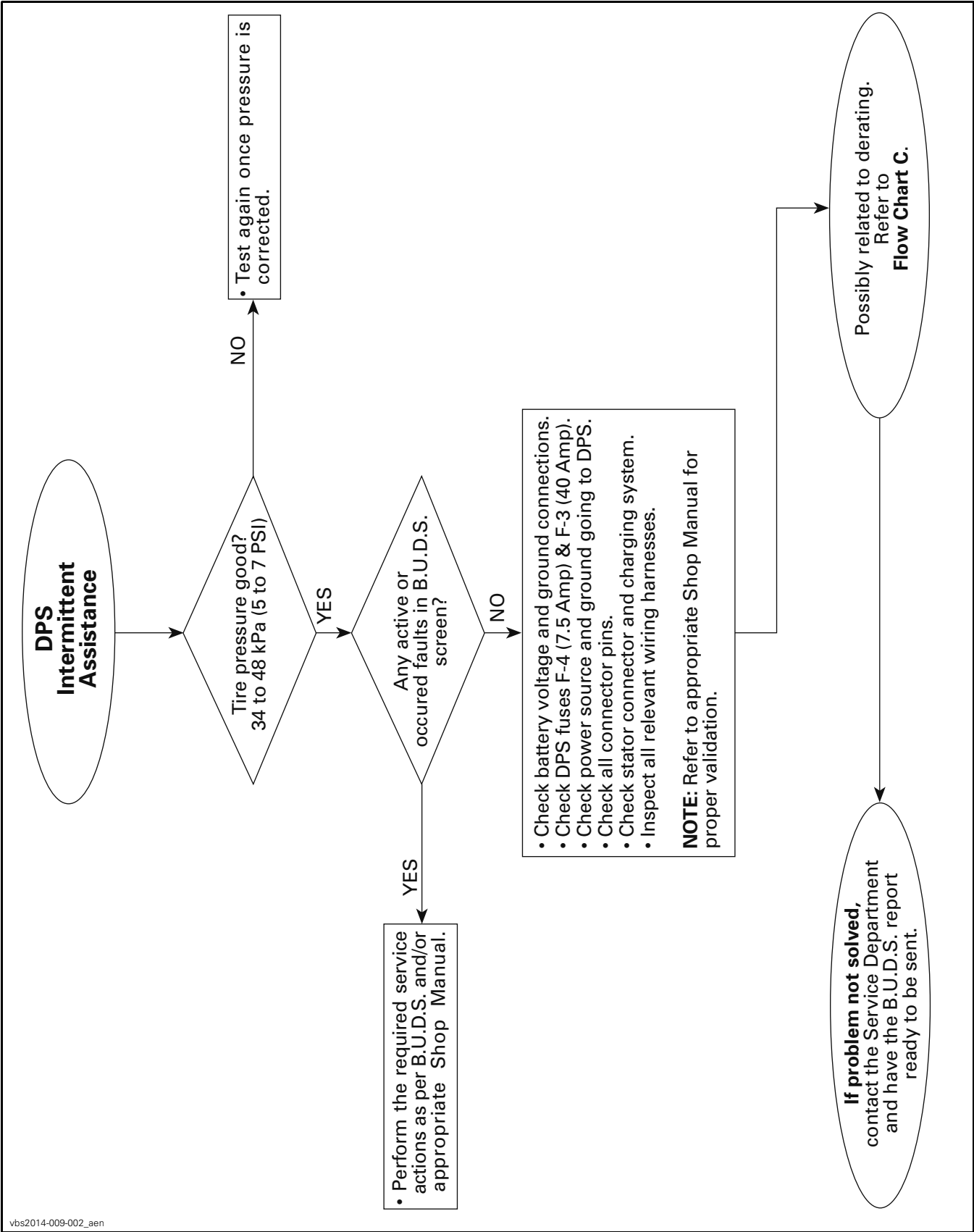
Use the troubleshooting flow charts to diagnose a problem. If a problem cannot be solved, contact a service representative for support before replacing a DPS.

- Here is the list of provided flow charts:
- Flow chart A: No Assistance From DPS
 - Flow chart B: DPS Intermittent Assistance
 - Flow chart C: Derating or Limited Assistance
 - Flow chart D: Free Play Felt in Steering System
 - Flow chart E: Steering Turn Easier on One Side than the Other.

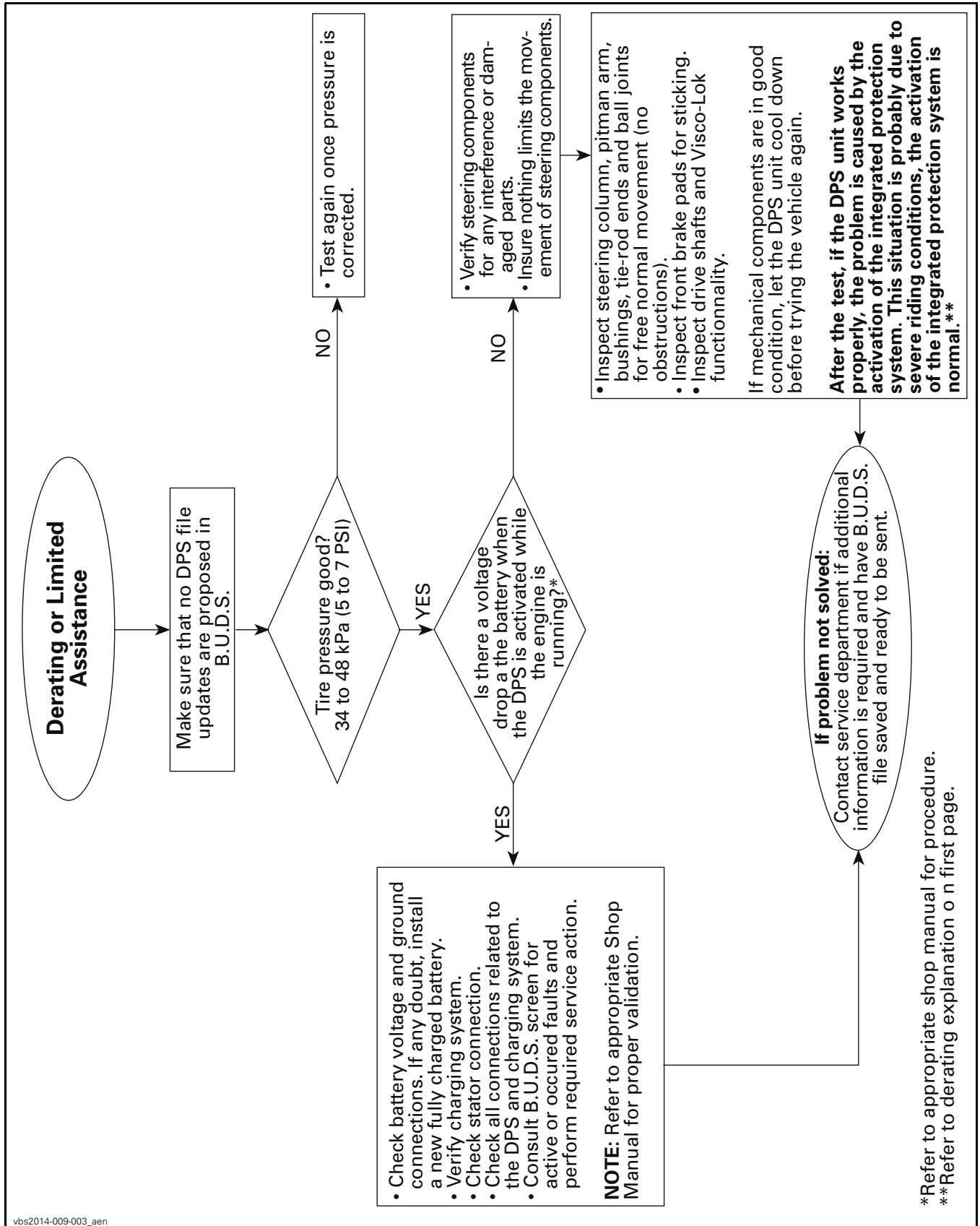
Flow Chart A



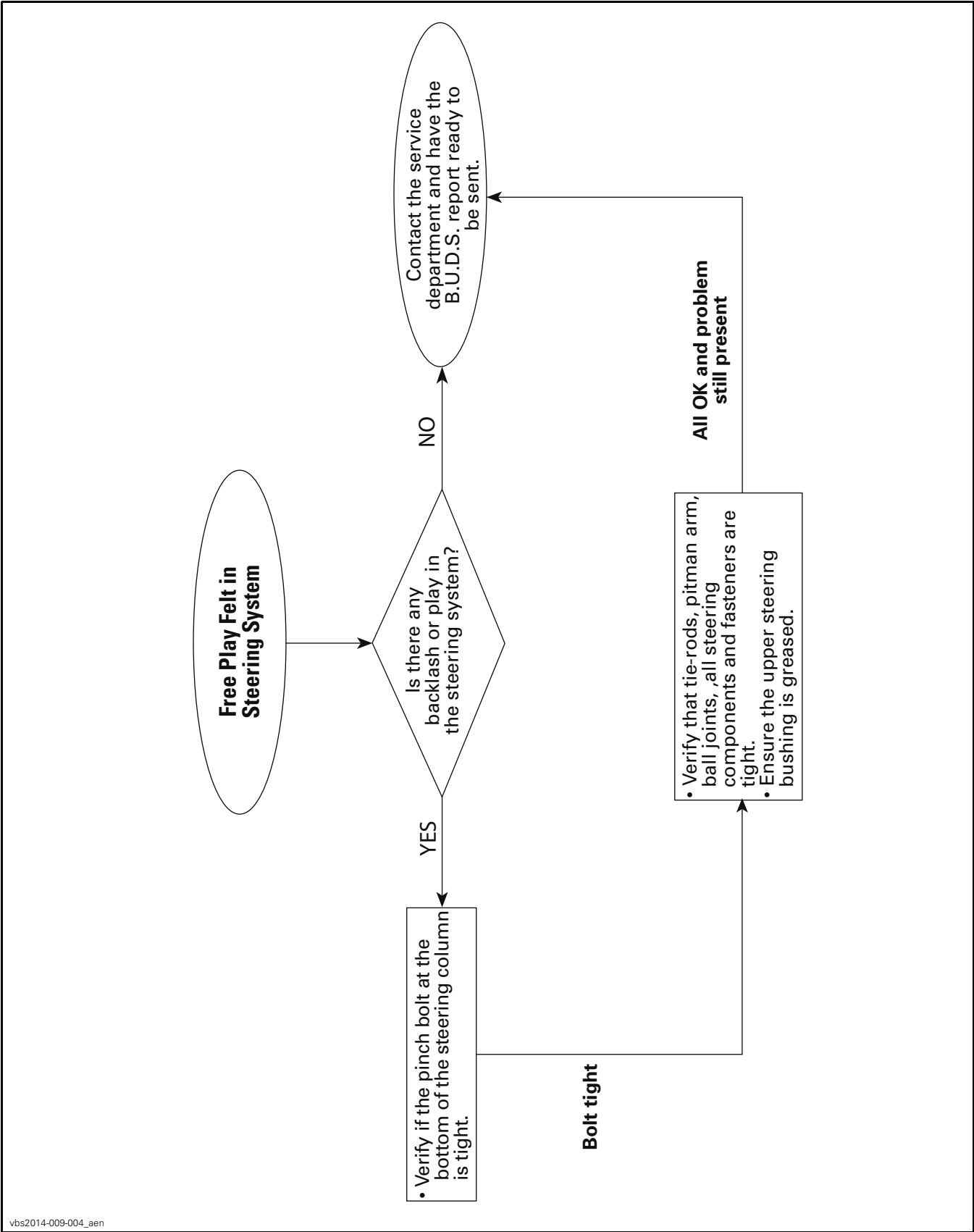
Flow Chart B



Flow Chart C



Flow Chart D



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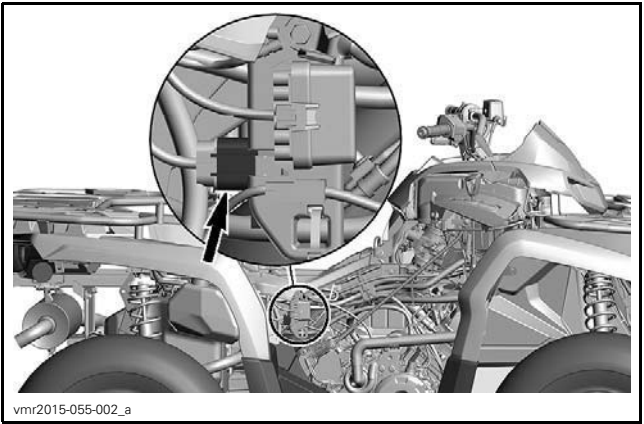
graph TD
    Start([Steering Turns  
Easier on One than  
the Other Side]) --> Step1[• Check tire pressure and  
steering alignment.]
    Step1 --> Step2[• Connect to B.U.D.S. and go to  
the DPS monitoring screen.]
    Step2 --> Dec1{Is torque offset value  
more than 3 N•m when the  
handlebars are free, untouched  
and are positioned straight  
ahead?}
    Dec1 -- YES --> Step3[• Re-set the torque sensor.]
    Dec1 -- NO --> Step4[• Check for faults and perform  
required actions.  
• Ensure the latest calibration file  
is installed.]
    Step3 --> Dec2{Can't reset the torque  
sensor or a re-occurring  
torque sensor fault?}
    Dec2 -- YES --> Step5[• Make sure nothing touches  
the steering column.  
• Verify steering column align-  
ment as per appropriate Shop  
Manual.]
    Dec2 -- NO --> Dec3{Any of the previous  
issues still  
exist?}
    Step4 --> Dec3
    Step5 --> Dec3
    Dec3 -- YES --> End([Contact the service  
department and have the  
B.U.D.S. report ready to  
be sent.])
    Dec3 -- NO --> Step1
    
```

PROCEDURES

DPS UNIT

DPS Unit Fuse Test

A 40 A DPS fuse located in a fuse holder, on the RH side of the frame, under the battery support, provides power for the DPS motor.



1. Test DPS fuse (PF3-F2) using a multimeter.

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

2. Replace fuse as required.

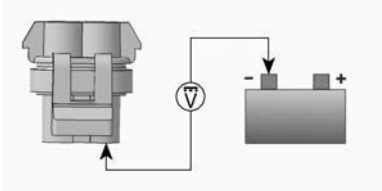
DPS Unit Input Voltage Test (Power Side)

1. Disconnect the DPS PWR (power) connector.



TYPICAL
1. DPS PWR connector (motor power)

2. Test for 12 Vdc DPS motor power at DPS2-A and DPS2-B as per following table.

MULTIMETER PROBE POSITIONS		VOLTAGE
DPS2 power connector pin A	Battery ground	Battery voltage
DPS2 power connector pin B		
		

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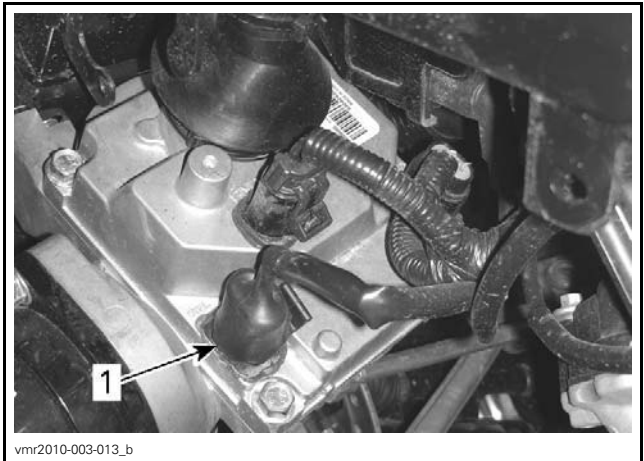
If NO voltage is measured, test the 40 A DPS fuse in the rear fuse holder (PF3-F2). If good, check wires and connector pins. Replace or repair defective parts and reset fault codes.

If battery voltage is measured, carry out the following *DPS UNIT INPUT VOLTAGE TEST (CONTROL SIDE)*.

NOTE: This test may also be carried out by connecting a 12 Vdc test light between each DPS PWR connector pins (A and B), and the battery (-) negative terminal. The test light must come on bright.

DPS Unit Input Voltage Test (Control Side)

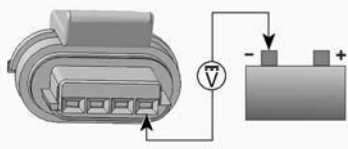
1. Disconnect DPS CTRL (control) connector.



TYPICAL
1. DPS CTRL (control) connector

2. Set the ignition switch to ON.
3. Set the engine RUN/STOP switch to RUN.

4. Test for 12 Vdc power to the DPS module at DPS1-A as per following table.

MULTIMETER PROBE POSITIONS	VOLTAGE
DPS control connector (pin A) and battery ground	Battery voltage
	

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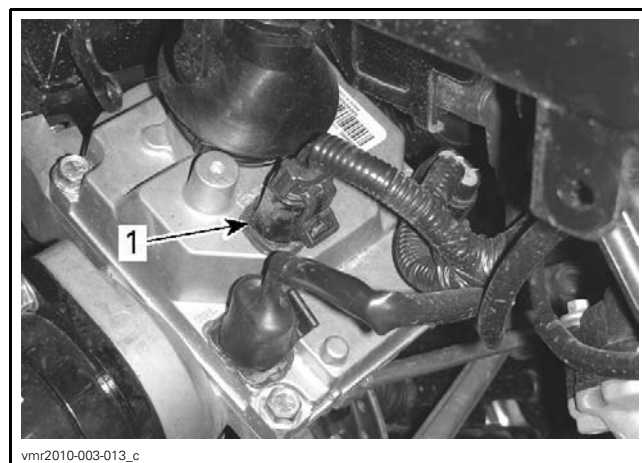
If NO voltage is measured, check wires and connector pins from DPS unit to the Relays/Speedo fuse in front fuse box (PF1-F4). Replace or repair defective parts and reset fault codes.

If battery voltage is measured, carry out the following *DPS UNIT GROUND CIRCUIT TEST*.

NOTE: This test may also be carried out by connecting a 12 Vdc test light between the DPS control connector (pin A), and the battery (-) negative terminal. The test light must come on bright.

DPS Unit Ground Circuit Test

1. Disconnect the DPS ground connector (GDN).



TYPICAL

1. DPS ground connector (GDN)

2. Test for continuity between DPS3-A and DPS3-B to battery ground.

MULTIMETER PROBE POSITIONS		READING
DPS GDN connector pin A	Battery ground	Continuity (close to 0 Ω)
DPS GDN connector pin B		

If there is NO continuity or a high resistance is measured, check wires and connector pins from DPS unit to chassis ground post. Replace or repair defective parts and reset fault codes.

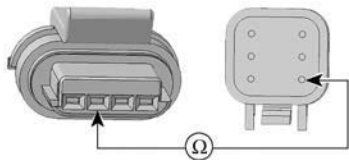
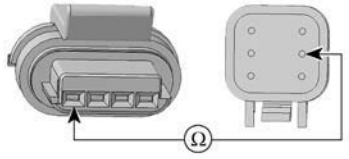
If there is good continuity, carry out the following *DPS UNIT COMMUNICATION LINK (CAN) CONTINUITY TEST*.

NOTE: This test may also be carried out by connecting a 12 Vdc test light between each GDN connector pin and the battery (+) positive terminal. The test light must come on bright.

DPS Unit Communication Link (CAN) Continuity Test

NOTE: DPS unit must receive an RPM signal to provide power steering assist.

1. Disconnect the DPS control connector and the diagnostic connector.
2. Test continuity of CAN Bus Wires at DPS1-C and DPS1-D.

MULTIMETER PROBE POSITIONS	RESISTANCE @ 20°C (68°F)
DPS control connector (pin C) and diagnostic connector (pin 1)	Below 1 Ω
	
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DPS control connector (pin D) and diagnostic connector (pin 2)	
	
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Section 08 CHASSIS
Subsection 03 (DYNAMIC POWER STEERING (DPS))

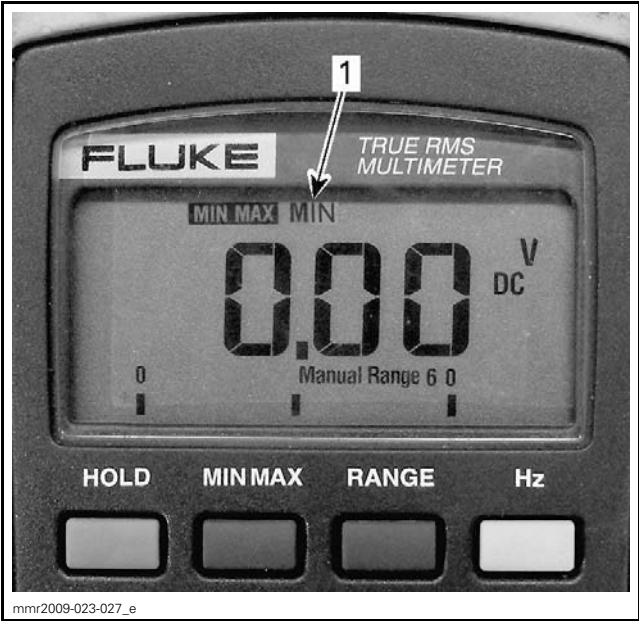
If resistance measured is out of specification, check wires and connector pins. Carry out repairs as required and reset fault codes using B.U.D.S software.

If resistance measured is good, replace the DPS unit and reset fault codes using B.U.D.S software.

DPS System Load Test

If the charging system cannot sustain normal voltage when the DPS is operating, DPS ASSIST may be greatly reduced or nonexistent. Carry out the following steps.

- 1. Measure the battery voltage.
- NOTE:** If battery voltage is low, recharge battery.
- 2. Ensure the vehicle transmission is set to PARK.
 - 3. Start the engine.
 - 4. Note the voltage on the multimeter with the engine running (charging system voltage).
 - 5. Press the **RANGE** button repeatedly to select **Manual Range 6 0**.



1. MIN function selected

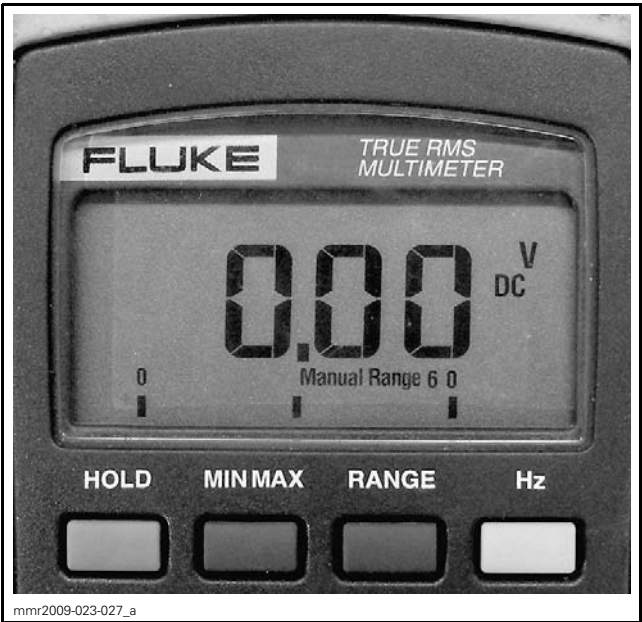
- 7. Turn the handlebar **momentarily** against the steering frame stops to each side.

NOTE: Do not hold steering against frame stops for an extended period of time.

- 8. Read the MIN charging system voltage recorded while the handlebar was turned against each stop.

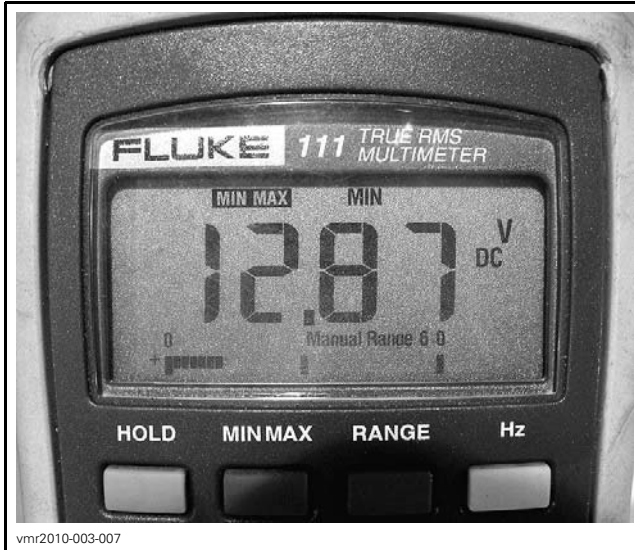
DPS SYSTEM LOAD TEST			
PROBE POSITIONS		STEERING POSITION	VOLTAGE READING
Battery (-) terminal	DPS fuse holder pin B	LH stop	At least 12 Vdc
		RH stop	

NOTE: Turning the handlebar momentarily against the frame stops generates maximum DPS load (maximum current draw on electrical system). Electrical system must sustain at least 12 Vdc for proper DPS operation.



VDC SELECTED TO MANUAL RANGE 6 0

- 6. Press the **MIN MAX** button on the multimeter to engage the MIN function.



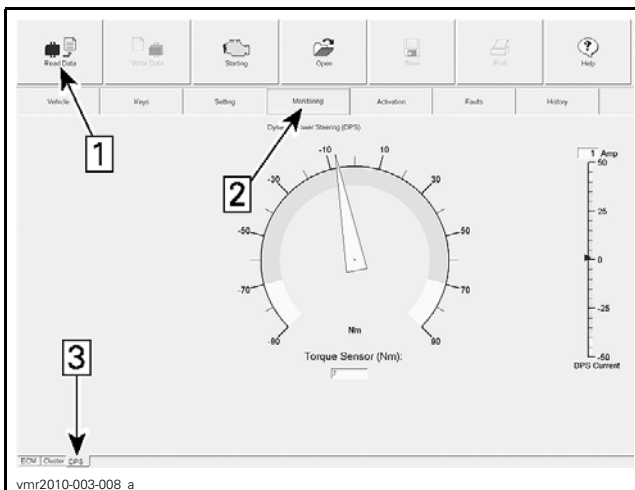
If the electrical system cannot sustain at least 12 Vdc, check the following:

- Battery
- Battery connections
- DPS unit power and ground connections
- Charging system
- Frame and engine ground studs.

If the previously listed items, carry out the following **DPS UNIT CURRENT TEST**.

DPS Unit Current Test

1. Connect vehicle to the latest applicable B.U.D.S. software version.
2. Click on the **Read Data** button.
3. Choose the **Monitoring** page tab.
4. At the bottom of the **Monitoring** page, choose the **DPS** tab.

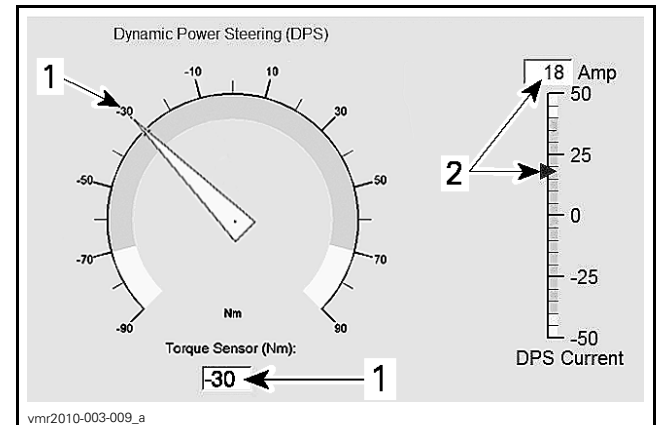


Step 1: Press Data button
Step 2: Select Monitoring page tab
Step 3: Select DPS tab

5. With the vehicle engine running in PARK, turn the handlebar side to side, momentarily against each stop and observe the indications on the B.U.D.S. **DPS Monitoring** page.

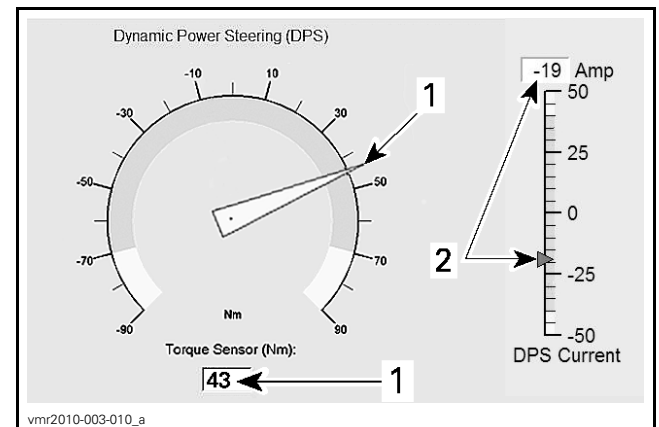
The **DPS Torque Sensor Nm** increase with torque applied to handlebar.

The **DPS Current** ammeter should increase proportionately to the torque applied, and decrease with the torque as steering assist is provided.



TYPICAL - LH TURN

1. Torque sensor indication (negative)
2. DPS current indication (positive)



TYPICAL - RH TURN

1. Torque sensor indication (positive)
2. DPS current indication (negative)

NOTE: Increase and decrease in torque and current readings is very brief as steering assist is quickly provided. Current draw should remain within green scale but may momentarily peak to 60 amps, then drop off close to 0 amps as torque applied is nulled out by steering assist. A residual torque of 2 N•m (18 lbf•in) with a corresponding current draw is acceptable.

If current draw tends to remain high, carry out the following:

- Steering alignment check.

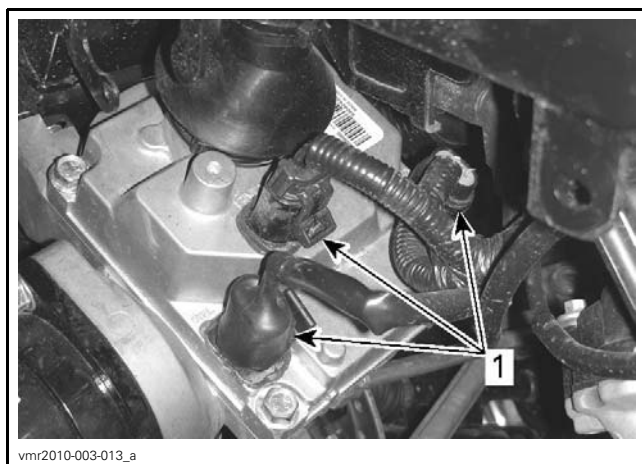
Section 08 CHASSIS

Subsection 03 (DYNAMIC POWER STEERING (DPS))

- Steering column shim adjustment at half bushings as described in the *DPS UNIT INSTALLATION* procedure detailed in this section.
- *TORQUE OFFSET RESET* procedure detailed in this section.
- Replace DPS unit.

DPS Unit Removal

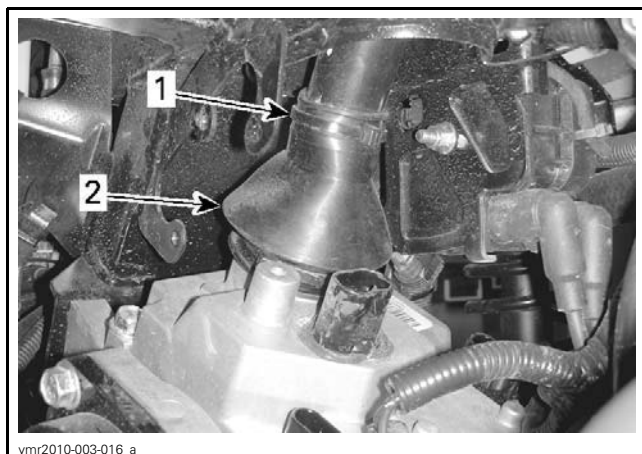
1. Remove the front body module, refer to *BODY* subsection.
2. Remove both inner fender panels
3. Remove the CVT air inlet duct assembly, refer to *AIR INTAKE SYSTEM* subsection.
4. Disconnect the 3 electrical connectors from the DPS unit.



TYPICAL

1. DPS connectors (3x)

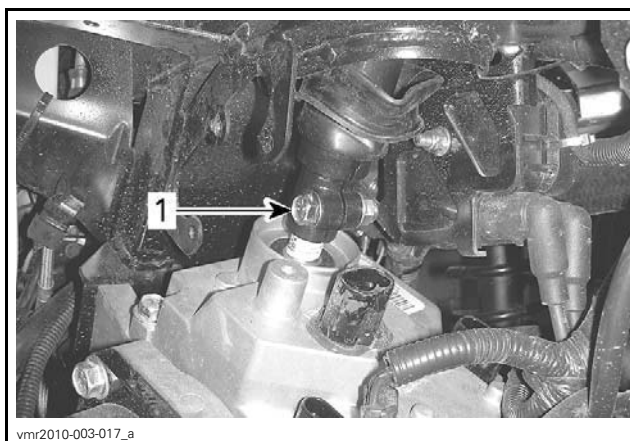
5. Cut the locking tie securing the bellows at the bottom of steering column near the DPS unit, and pull the bellows upwards sufficiently to access the steering column pinch bolt.



TYPICAL

1. Cut this locking tie
2. Steering column bellows

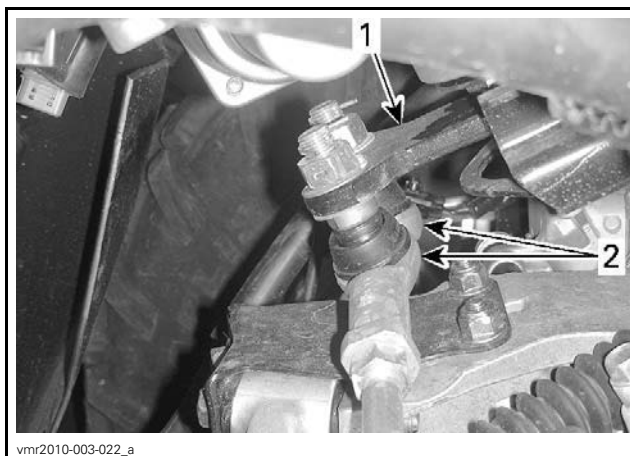
6. Remove the steering column pinch bolt and retaining nut. Discard the retaining nut.



TYPICAL

1. Steering column pinch bolt

7. Remove the hardware that secures both tie-rod ends to the pitman arm (steering lever). Discard cotter pins.



TYPICAL

1. Pitman arm
2. Tie rod ends

8. Turn the steering to each side and disengage each tie-rod end from the pitman arm.

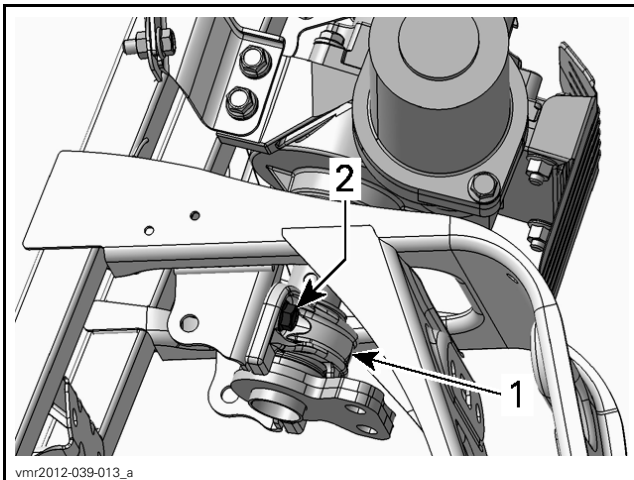


TYPICAL - TIE ROD ENDS (HARDWARE REMOVED)

9. Pull up on the steering column to partly disengage it from the DPS unit.

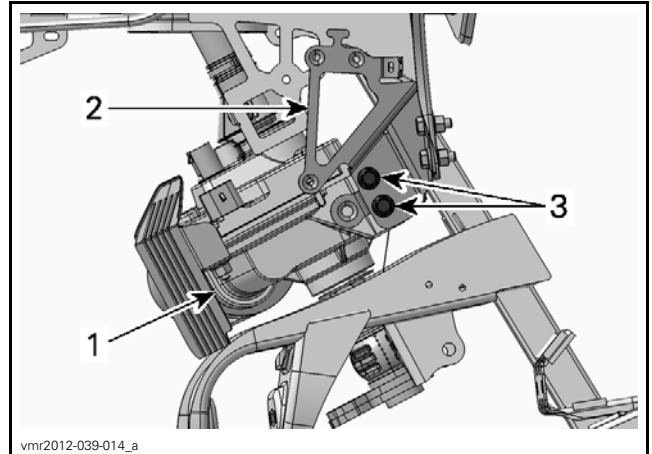
NOTE: A mechanical stop on the steering column will prevent you from fully disengaging the steering column.

10. Remove the lower half bushing retainer that secures the steering shaft to the frame.



1. Lower half bushing retainer
2. Bolts to remove (2)

11. Remove the 2 hexagonal flanged screws securing the DPS unit to the RH support bracket.



DPS REMOVAL - RH SIDE

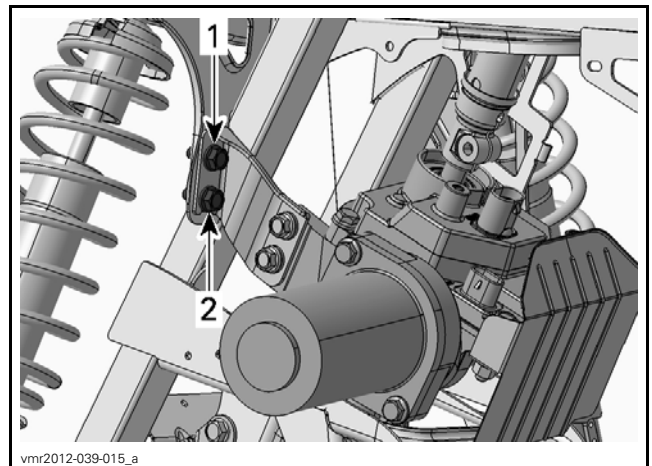
1. DPS
2. RH DPS support bracket
3. Remove these screws (2)

NOTE: Discard the conical spring washers on the DPS retaining screws.

12. On the LH side of the DPS unit, remove the DPS support bracket from the frame in the following manner:

12.1 Remove the top retaining screw.

12.2 Loosen the lower retaining screw sufficiently for the bracket to become loose on the frame.

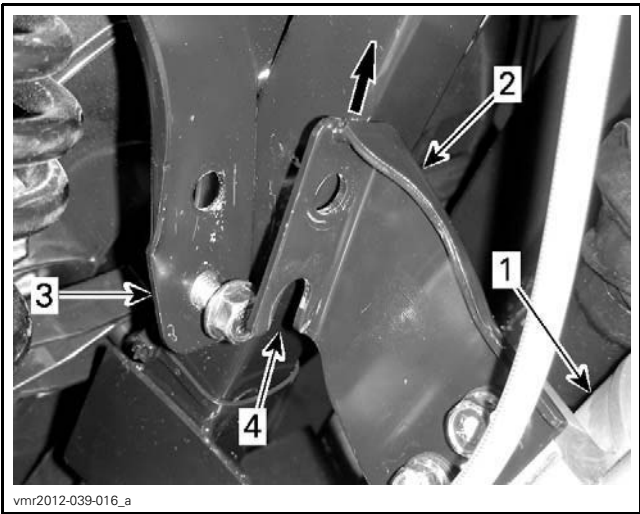


DPS REMOVAL - LEFT SIDE

- Step 1: Remove DPS retaining screws (2 each side)
- Step 2: Discard conical washers under screw head

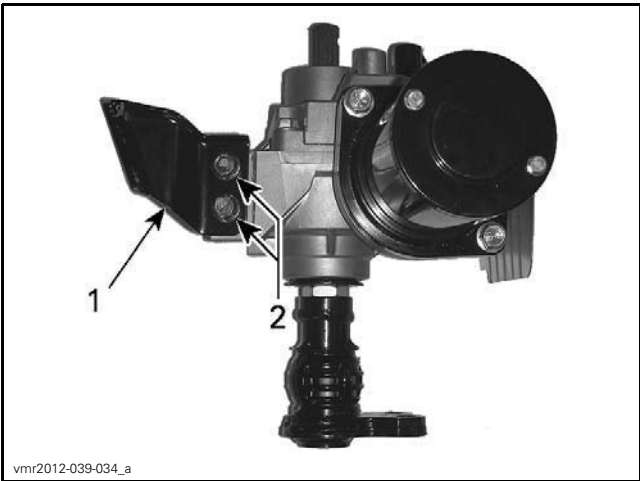
13. Pull up on DPS unit to remove the DPS unit and support bracket from the frame.

Section08 CHASSIS
Subsection03 (DYNAMIC POWER STEERING (DPS))



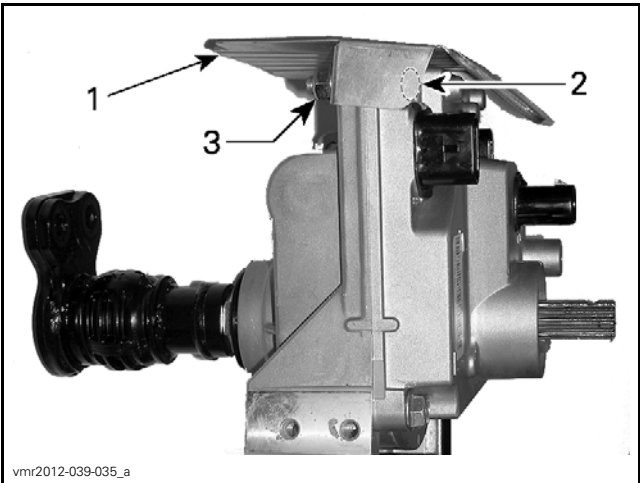
TYPICAL - LH DPS SUPPORT BRACKET
1. DPS unit
2. DPS support bracket
3. Vehicle frame
4. Slotted hole in DPS support bracket

- 14. If replacing DPS unit, remove the following from the DPS unit:
- LH DPS support bracket
- DPS heat shield.



1. LH DPS support bracket
2. Retaining screws

NOTE: When removing the DPS heat shield, hold the DPS housing screws steady using a wrench to as you remove the 2 heat shield retaining nuts.



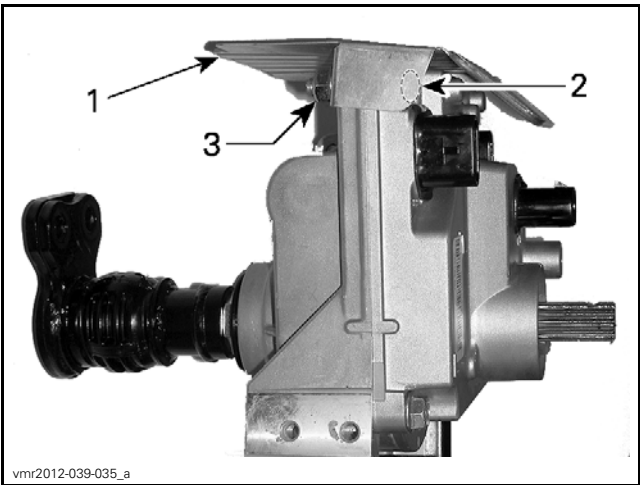
1. DPS heat shield
2. Retaining screws to hold steady (2 not visible)
3. Retaining nuts to remove

DPS Unit Installation

IMPORTANT: The following hardware must all be replaced with new ones:

- Hexagonal forming screws with threadlocker
- Conical spring washers
- Elastic nuts.

- 1. If the DPS unit is being replaced, install heat shield from old DPS unit onto new DPS unit.



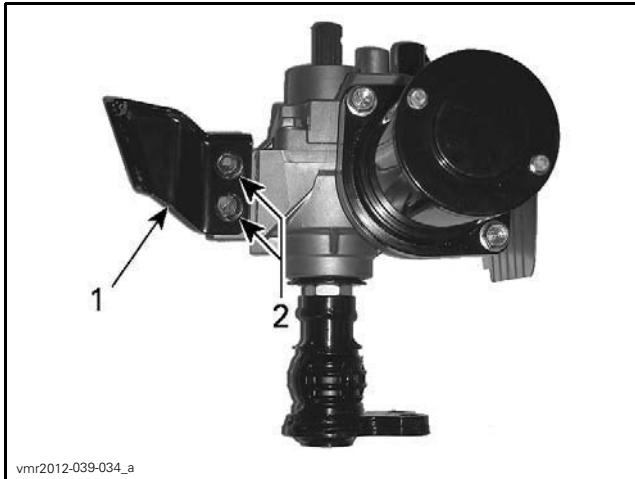
1. DPS heat shield
2. Retaining screws to hold steady (2 not visible)
3. Retaining nuts to remove (2)

NOTE: Important: Hold DPS housing screws steady using a wrench as you apply specified torque to heat shield retaining nuts.

Table with 2 columns: Component, Torque. Row 1: Retaining nuts, DPS heat shield, 24.5 N•m ± 3.5 N•m (18 lbf•ft ± 3 lbf•ft)

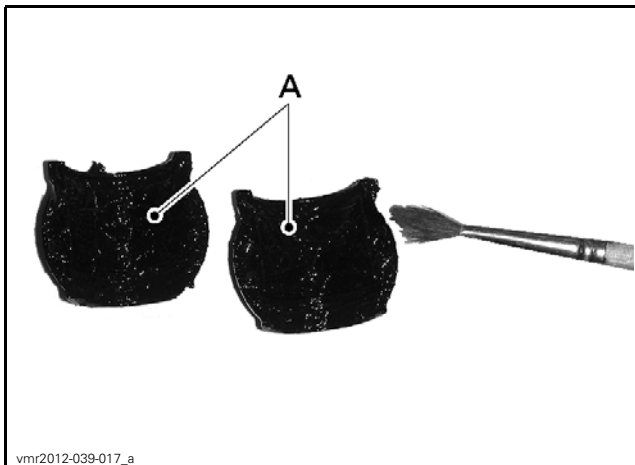
- 2. Install LH DPS support bracket loosely using NEW fasteners.

NOTE: Important: Install the retaining screws to the DPS support bracket loosely at this time. This is required to ensure proper DPS alignment at a later step when all steering and DPS fasteners are tightened to specified torque.

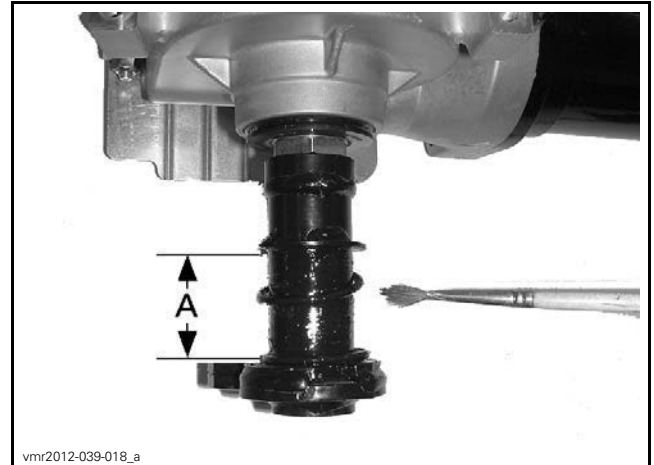


1. LH DPS support bracket
2. Retaining screws

3. Ensure "O" rings on steering shaft are in good condition.
4. Apply XPS SYNTHETIC GREASE (P/N 293 550 010) to:
 - The inside of both steering shaft half bushings
 - The steering shaft and "O" rings.

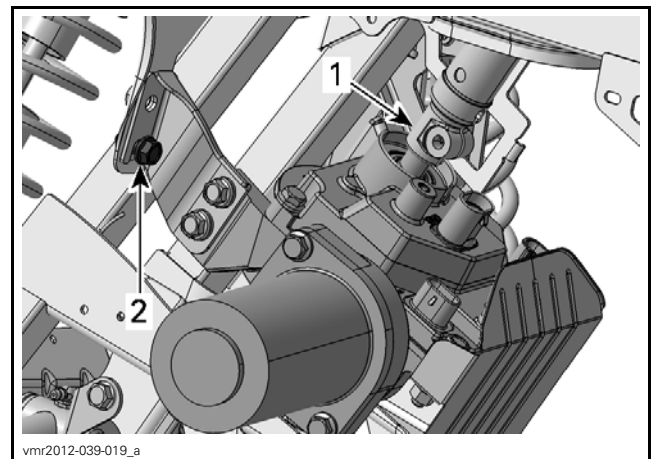


- A. XPS synthetic grease (P/N 293 550 010) here



- A. XPS synthetic grease (P/N 293 550 010) here

5. Insert the steering column onto the DPS input shaft
6. Position the LH DPS support bracket onto the hexagonal forming screw that was left on the frame DPS mount.



1. Steering column onto the DPS input shaft here
2. LH DPS support bracket onto the hexagonal forming screw here

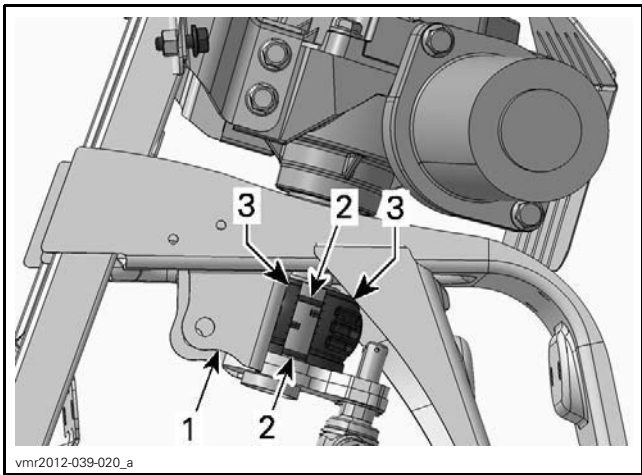
NOTE: The DPS shaft splines have a key which **must be aligned** with the keyway in the steering column.

Section 08 CHASSIS
Subsection 03 (DYNAMIC POWER STEERING (DPS))



vmr2010-003-031
TYPICAL - STEERING COLUMN INDEXED TO DPS SHAFT SPLINES

7. Ensure the following are properly positioned on the lower steering shaft and lower steering shaft mount.
- O-rings
 - Steering shaft half bushings.

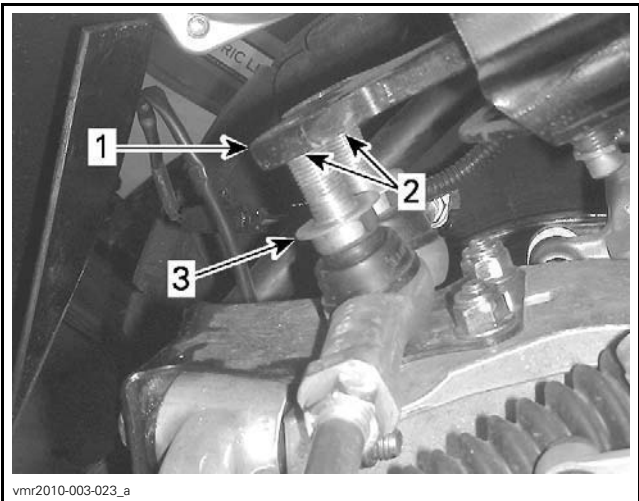


vmr2012-039-020_a
1. Lower steering shaft mount
2. O-rings
3. Steering shaft half bushings

8. Install the 3 remaining hexagonal forming screws that secure the DPS unit **loosely** using **NEW** fasteners.

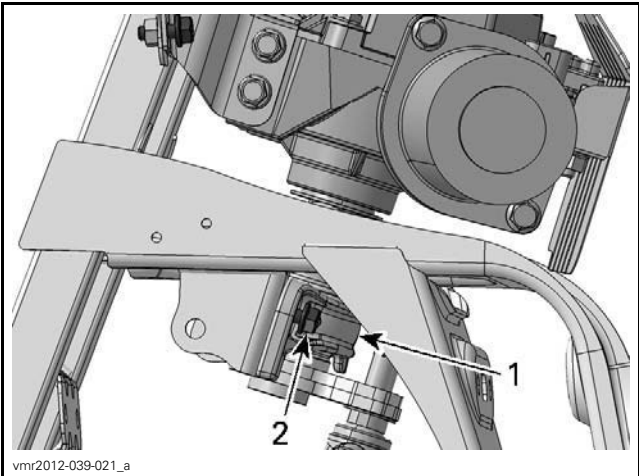
NOTE: Ensure the support bracket retaining screws have a **NEW** conical spring washer between the screw head and the DPS frame support.

Ensure both tie rod ends have a hardened steel washer on them, then insert the tie-rod ends onto the pitman arm.



vmr2010-003-023_a
TYPICAL
1. Pitman arm
2. Tie rod ends inserted in pitman arm
3. Hardened steel washer on tie rod end

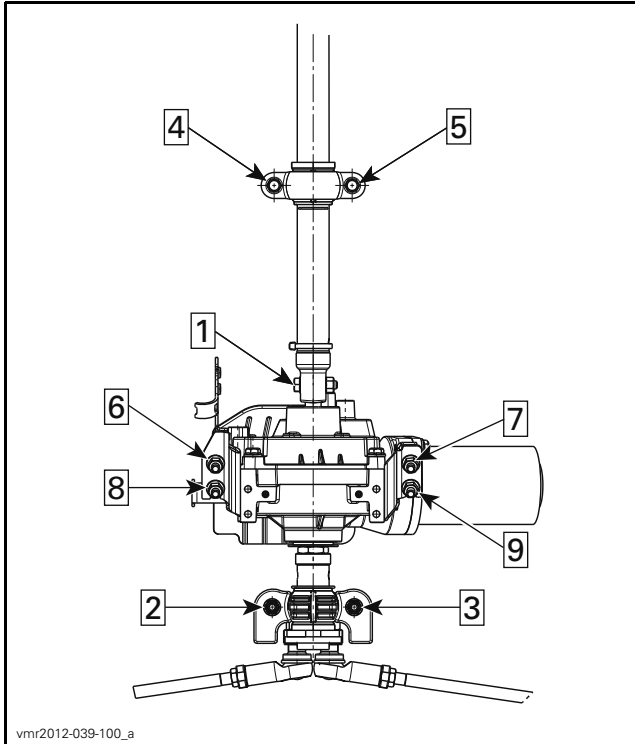
9. Install the lower half bushing retainer **loosely** using **NEW** fasteners.



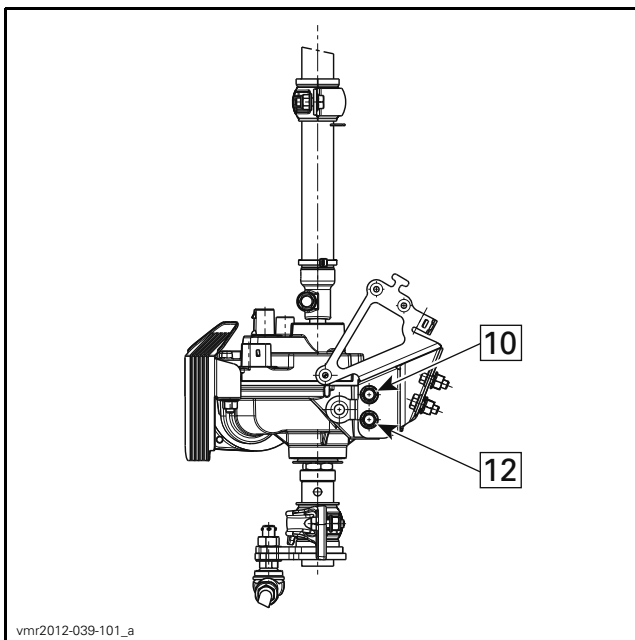
vmr2012-039-021_a
1. Lower half bushing retainer
2. Hexagonal forming screws installed loosely

10. Install steering column pinch bolt and a **NEW** elastic nut **loosely**.
11. Tighten the steering and DPS fasteners to specified torque using the torque sequence specified in the following 3 illustrations.

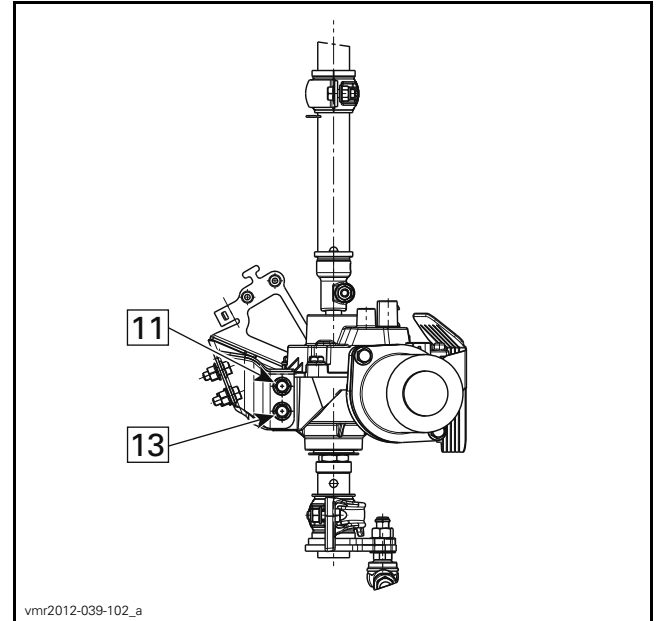
TIGHTENING TORQUE	
DPS retaining screws	24.5 N•m ± 3.5 N•m (18 lbf•ft ± 3 lbf•ft)
DPS bracket retaining screws	
Steering column retainer	
Steering column pinch bolt	



DPS AND STEERING TORQUE SEQUENCE (1 OF 3)



DPS AND STEERING TORQUE SEQUENCE (2 OF 3)



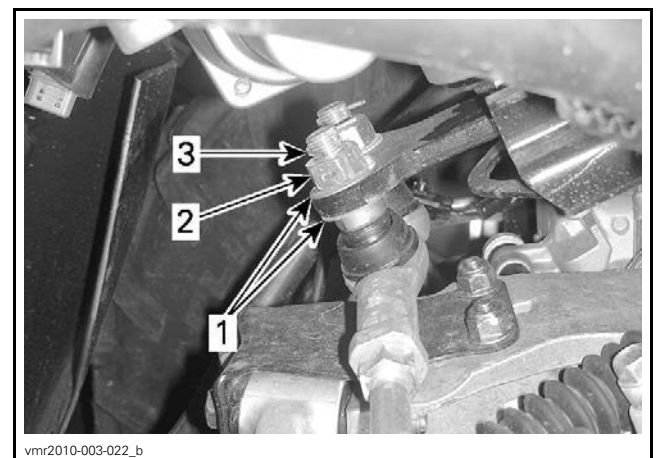
DPS AND STEERING TORQUE SEQUENCE (3 OF 3)

12. Install the second hardened steel washer and nut on each tie-rod end. Tighten retaining nuts as specified.

TIGHTENING TORQUE

Tie-rod end to pitman arm	72.5 N•m ± 7.5 N•m (53 lbf•ft ± 6 lbf•ft)
---------------------------	--

13. Install **NEW** cotter pins on the tie-rod ends.



TYPICAL

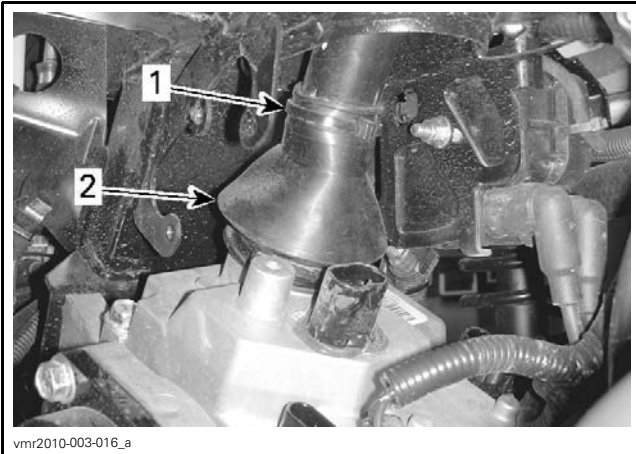
1. Hardened steel washers (one each side of pitman arm)
2. Tie rod end retaining nut (torque applied)
3. NEW cotter pin installed

14. Pull bellows down over steering column pinch bolt and edge of DPS unit housing extension. Secure bellows using the appropriate locking tie.

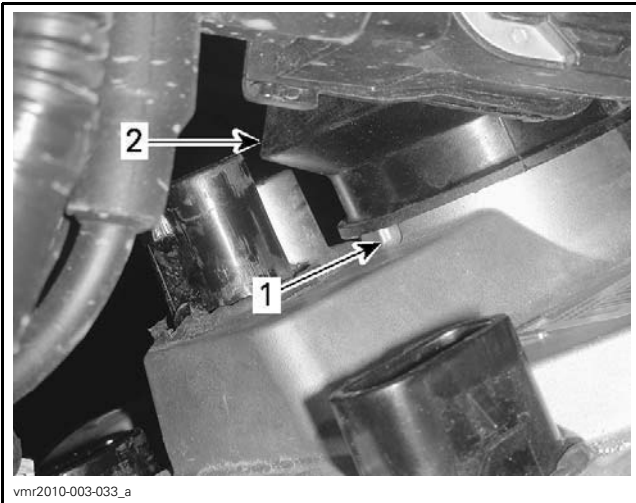
Section 08 CHASSIS

Subsection 03 (DYNAMIC POWER STEERING (DPS))

NOTE: Ensure the locking tie is on the tube part of the steering column, **not** on the forged end. Bellows should cover end of ring flange on DPS unit but **not** cover the drainage hole at the bottom of the ring flange. **Do not** install a locking tie on the DPS end of the bellows. Lower portion of bellows **MUST** remain floating over the DPS housing.

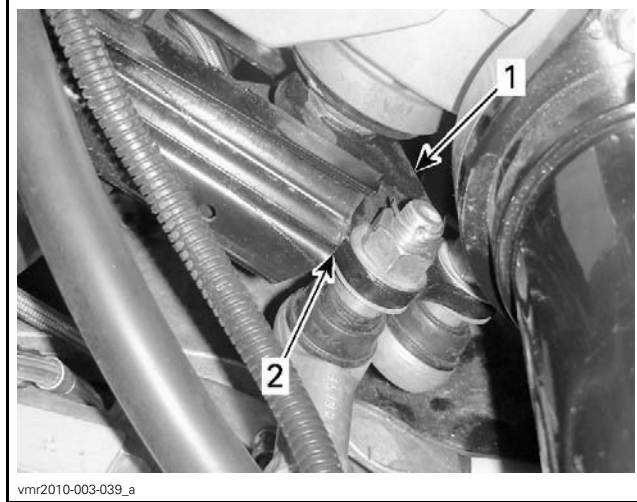


TYPICAL
1. Locking tie location
2. Steering column bellows



TYPICAL
1. Drainage hole in DPS ring flange
2. Steering column bellows

15. Turn handlebar fully to each side and check for proper contact between pitman arm and pitman arm frame stops (both sides).



TYPICAL - LH ILLUSTRATED
1. Pitman arm
2. Contact point with frame stop

NOTE: Contact between pitman arm and pitman arm stops must be checked with vehicle weight on wheels.

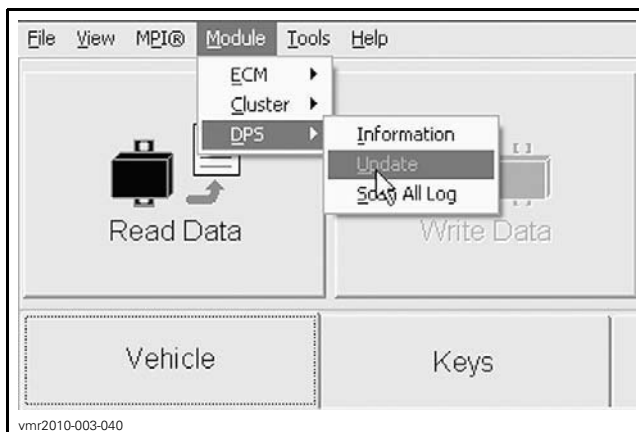
16. Reconnect DPS electrical connectors.
17. Perform a *STEERING ALIGNMENT* as described in the applicable Shop Manual subsection.
18. If installing a replacement DPS unit, refer to *DPS REPLACEMENT* in this subsection.
19. Perform the torque offset reset. Refer to *TORQUE OFFSET RESET* in this subsection.
20. Install all other removed parts in the reverse order of removal.
21. Carry out a test ride of the ATV to ensure proper operation of the DPS unit.

DPS Unit Replacement

New DPS units **do not** come with the required software programmed into the unit. A DPS unit fault will be generated when the vehicle is powered up. The check engine light will come on and a DPS FAULT message will appear in the multi-function gauge.

When DPS unit installation is complete, carry out the following steps.

1. Connect the ATV to the latest applicable B.U.D.S. software version.
2. Select the **Read Data** button.
3. In the **Module** menu, choose the **DPS** sub-menu and install the latest DPS software **Update** file as applicable to the type ATV (Outlander or Renegade).



vmr2010-003-040
DPS SOFTWARE UPDATE

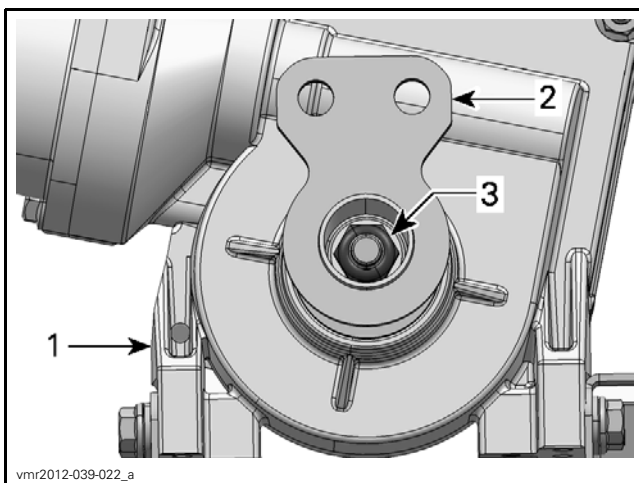
4. Once the correct DPS software file is installed, go to the **Faults** page and clear the fault codes.
5. Carry out the *TORQUE OFFSET RESET* procedure as described in this subsection.
6. Test drive the ATV to ensure proper DPS operation.

PITMAN ARM

NOTE: On models without a DPS, the pitman arm is replaced with the steering column. Refer to STEERING COLUMN in this subsection.

Pitman Arm Removal

1. Remove DPS unit from vehicle, refer to *DPS REMOVAL* in this subsection.
2. Remove Pitman arm retaining nut and washer.



1. DPS
2. Pitman arm
3. Pitman arm nut and washer

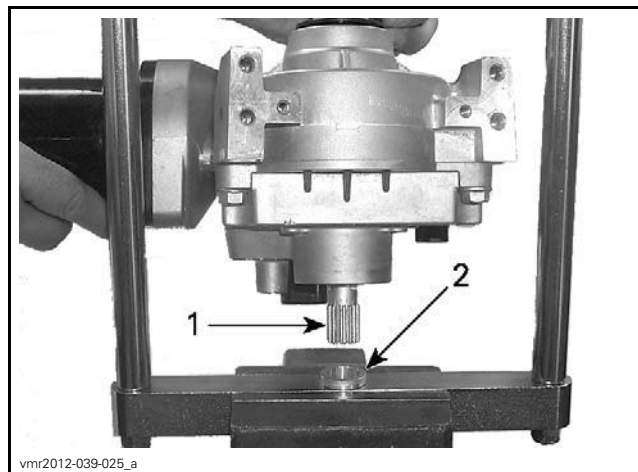
3. Install the pitman arm jig in a vise with the positioning screw upward.

REQUIRED TOOLS

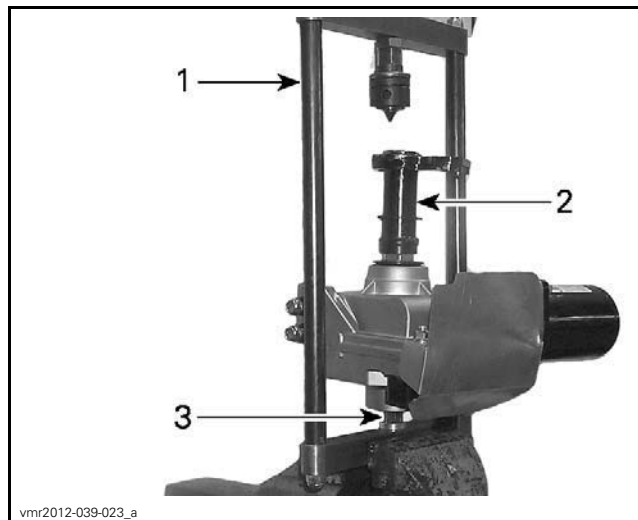
PITMAN ARM JIG
(P/N 529 036 225)



4. Insert the DPS input shaft in the Pitman arm jig receptacle with the Pitman arm facing up.



1. DPS input shaft
2. Shaft receptacle in Pitman arm jig



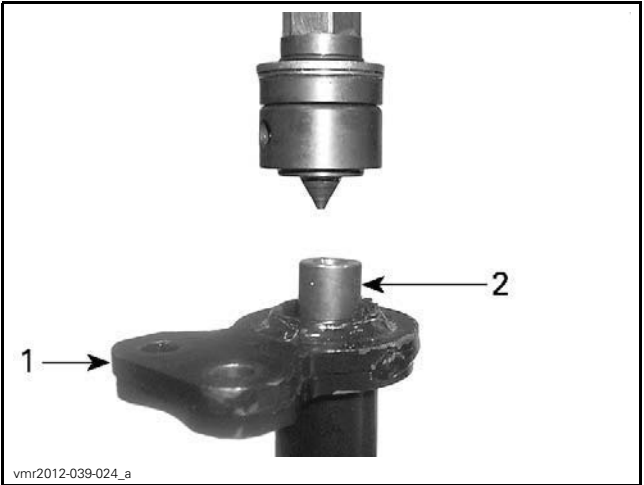
1. Pitman arm jig in vise
2. Pitman arm up
3. DPS input shaft inserted in jig

5. Insert the positioning adapter in the Pitman arm so its point rests in the DPS output shaft.

NOTE: A countersunk hole is machined in tip of the DPS output shaft to accept and center the positioning adapter point.

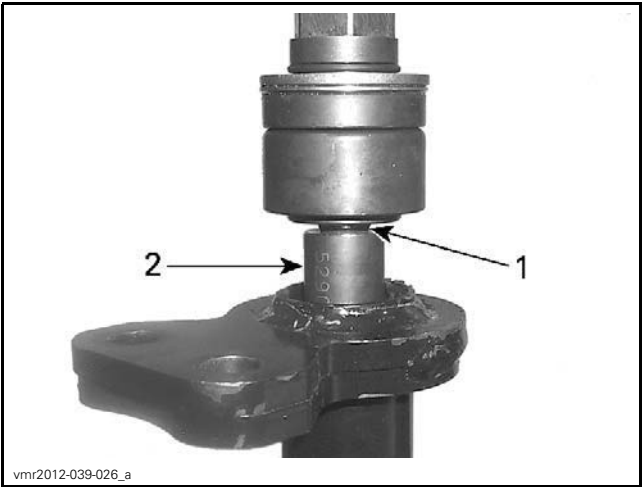
Section 08 CHASSIS
Subsection 03 (DYNAMIC POWER STEERING (DPS))

REQUIRED TOOL	
POSITIONING ADAPTOR (P/N 529 036 230)	



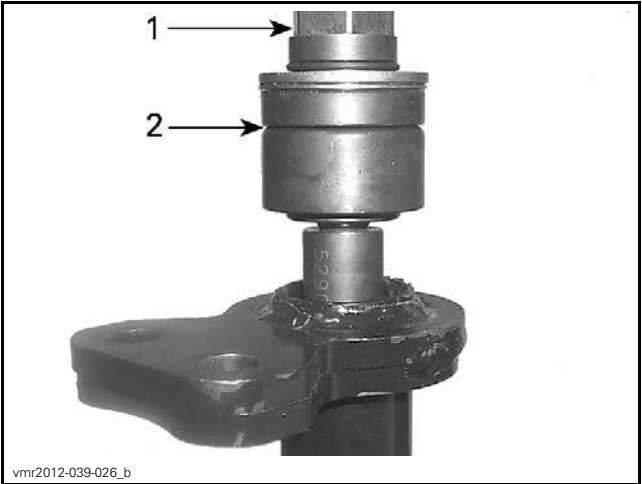
1. Pitman arm
2. Positioning adaptor

6. Turn the jig positioning screw until the screw tip rests snugly in the positioning adaptor.



1. Jig screw tip
2. Positioning adaptor

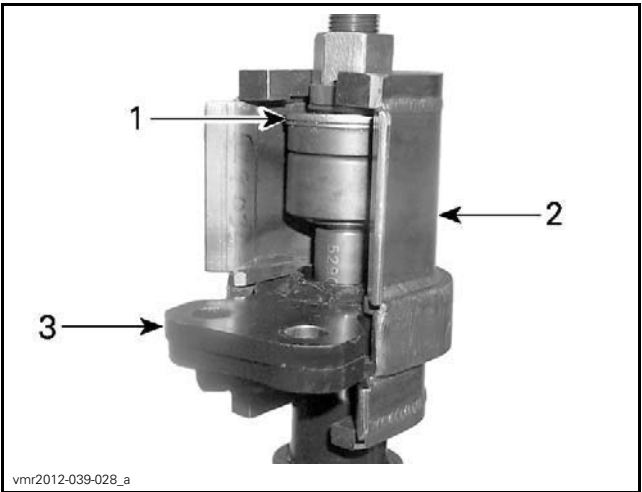
7. Turn the extractor nut down until there is no space between the extractor and the positioning tip.



1. Extractor nut
2. No space here

8. Install the universal Pitman arm puller over the Pitman arm and the extractor thrust bearing.

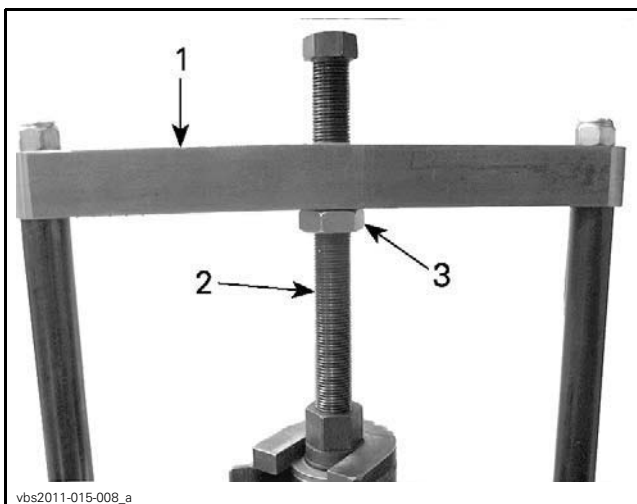
REQUIRED TOOL	
PITMAN ARM PULLER (P/N 529 036 227)	



1. Extractor thrust bearing
2. Pitman arm puller
3. Pitman arm

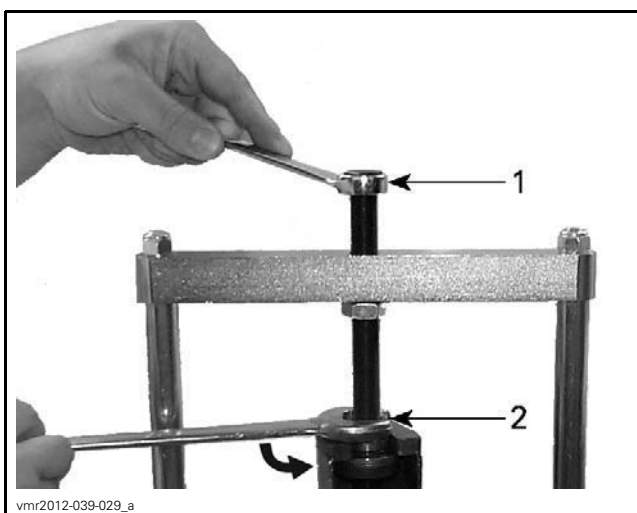
9. Lock the positioning screw by screwing the lock nut tightly against jig upper bar.

NOTE: Be sure to hold the position screw steady to prevent its tip from backing off the positioning adaptor.



1. Jig upper bar
2. Positioning screw
3. Lock nut

10. As you hold the positioning screw steady, turn the extractor nut up to pull the Pitman arm off the DPS output shaft.



1. Positioning screw (held steady)
2. Extractor nut (turned up)

11. Remove Pitman arm puller.
12. Unscrew positioning screw.
13. Remove Pitman arm from the DPS shaft.

Pitman Arm Installation

1. Install Pitman arm jig in a vise with positioning screw upward.

REQUIRED TOOL	
PITMAN ARM JIG (P/N 529 036 225)	

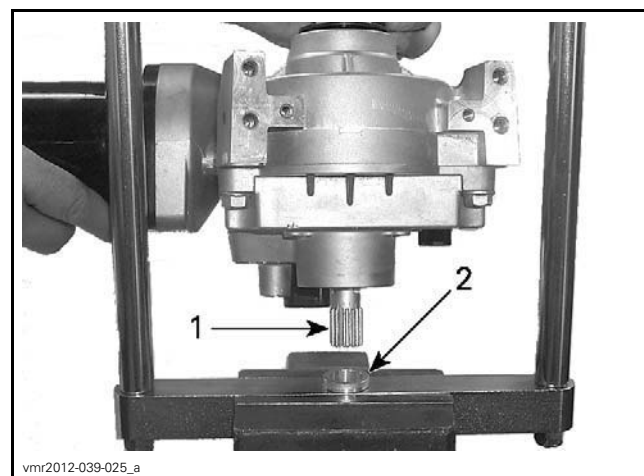
2. Apply antizeize lubricant on DPS output shaft splines; completely cover all the splines with a light coat.

PRODUCT	
DPS output shaft splines	LOCTITE 767 (ANTISEIZE LUBRICANT) (P/N 293 800 070)

3. Place Pitman arm on DPS shaft as per following illustration.

NOTE: Be sure to correctly align the Pitman arm shaft key with the keyway (ground off splines) on the DPS output shaft.

4. Insert the DPS input shaft in the Pitman arm jig receptacle with the Pitman arm facing up.



1. DPS input shaft
2. Shaft receptacle in Pitman arm jig

Section 08 CHASSIS

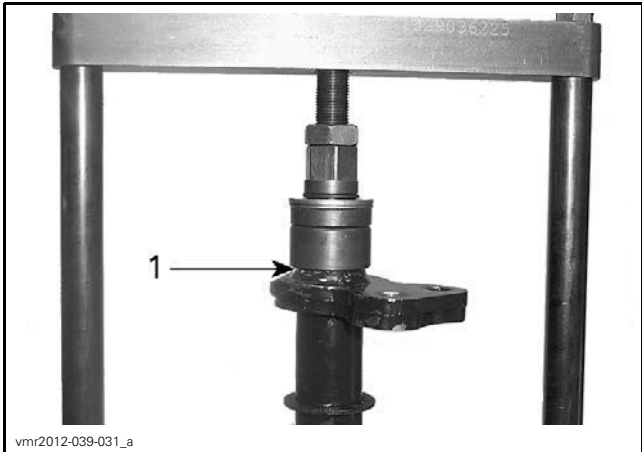
Subsection 03 (DYNAMIC POWER STEERING (DPS))



1. Spline keyway alignment here

5. Turn the jig positioning screw until the alignment point makes proper contact with the Pitman arm.

NOTE: Ensure positioning screw is centered in Pitman arm tube.

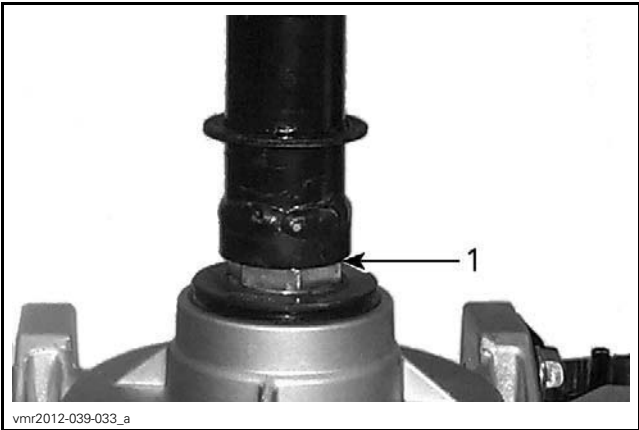
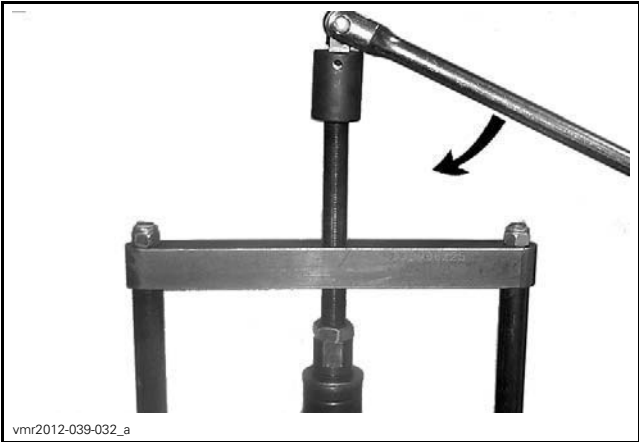


1. Ensure proper contact here

6. Turn the positioning screw to push the Pitman arm on the DPS output shaft until it bottoms out on the DPS output shaft nut.

NOTE: Ensure specified torque is applied.

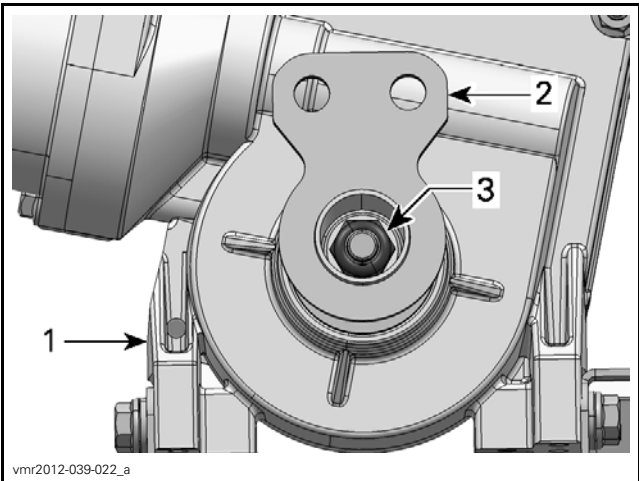
TIGHTENING TORQUE	
Positioning screw torque	50 N•m (37 lbf•ft)



1. Ensure proper contact here

7. Unscrew positioning screw and remove pusher adapter and pull out DPS unit.

8. Install Pitman arm retaining washer and nut. Tighten nut as specified.



- 1. DPS
- 2. Pitman arm
- 3. Pitman arm nut and washer

TIGHTENING TORQUE	
Pitman arm retaining nut	72.5 N•m ± 7.5 N•m (53 lbf•ft ± 6 lbf•ft)

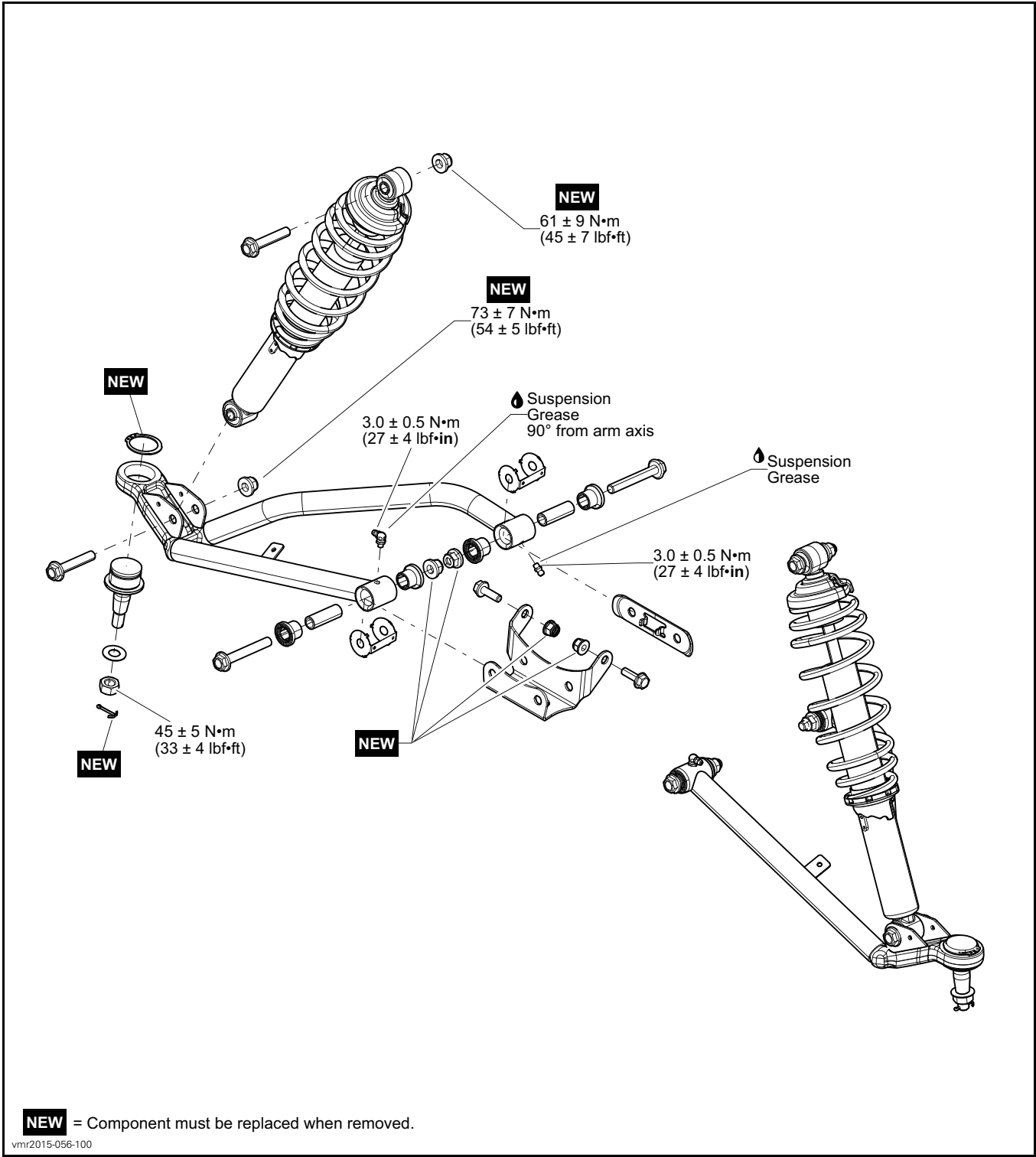
9. Carry out a steering alignment as described in this subsection.

FRONT SUSPENSION

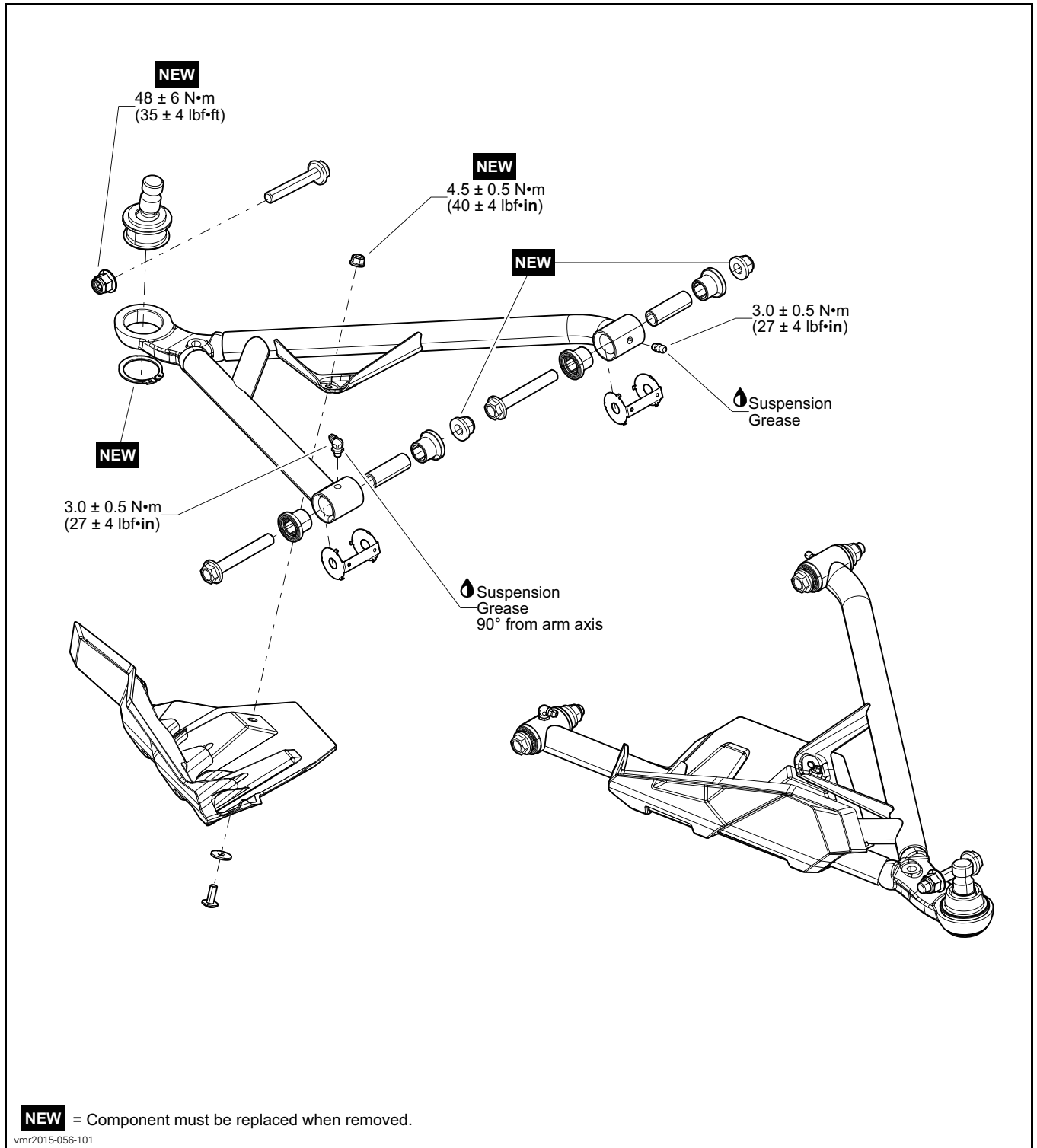
SERVICE TOOLS

Description	Part Number	Page
BALL JOINT REMOVAL TOOL.....	529 036 310	675

UPPER SUSPENSION ARMS AND COMPONENTS



LOWER SUSPENSION ARMS AND COMPONENTS



GENERAL

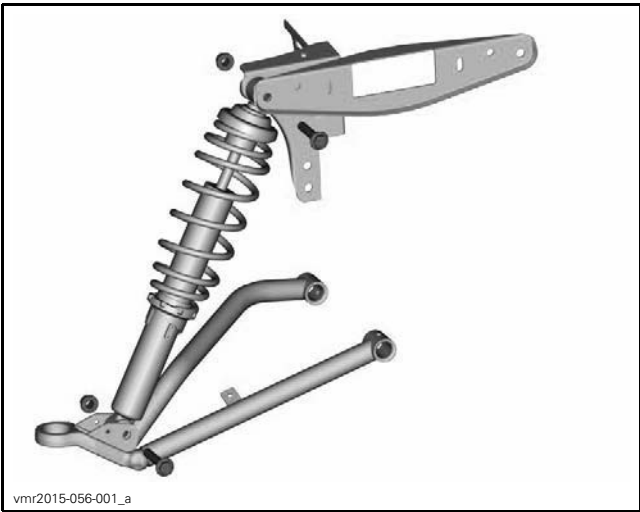
The procedure explained below is the same for the RH and LH sides unless otherwise noted.

PROCEDURES

SHOCK ABSORBER

Shock Absorber Removal

- 1. Safely lift and support the vehicle off the ground.
- 2. Remove screws and nuts retaining shock absorber.

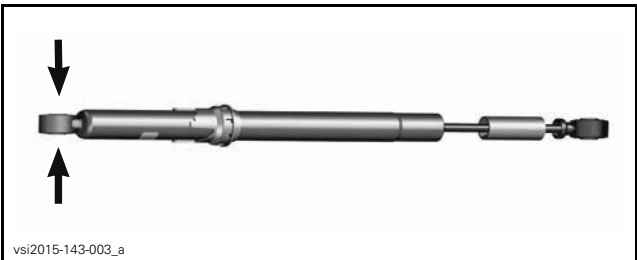


- 3. Remove shock absorber.

Shock Absorber Inspection

Remove spring from shock absorber. Refer to *SPRINGS* in this subsection.

Secure the end of shock body in a vise with its rod upward.



TYPICAL

NOTICE Do not clamp directly on shock body.

Extend and compress the piston several times over its entire stroke. Check that it moves smoothly and with uniform resistance with its rod upward.

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 stroke.

Replace if any faults are present.

Shock Absorber Installation

The installation is the reverse of the removal procedure. However, pay attention to the following. Install shock absorber screws from front towards rear of vehicle.

Tighten shock absorber nuts to specification.

TIGHTENING TORQUE	
Upper shock absorber nut	61 N•m ± 9 N•m (45 lbf•ft ± 7 lbf•ft)
Lower shock absorber nut	73 N•m ± 7 N•m (54 lbf•ft ± 5 lbf•ft)

SHOCK ABSORBER BUSHINGS

Refer to *SHOCK ABSORBER BUSHINGS* in *REAR SUSPENSION* subsection for complete procedures.

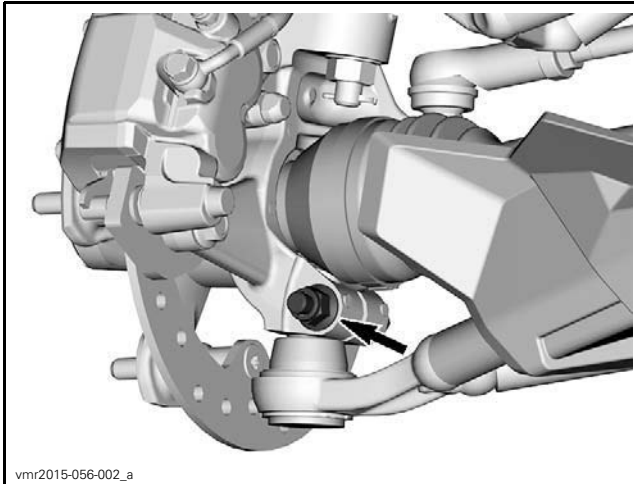
SPRINGS

Refer to *SPRINGS* in *REAR SUSPENSION* subsection for complete procedures.

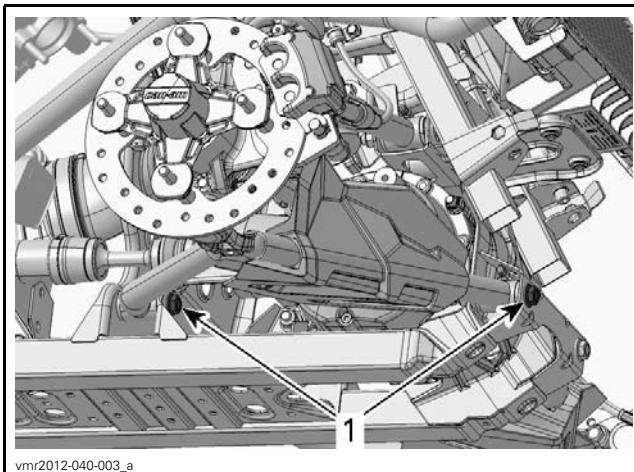
LOWER SUSPENSION ARM

Lower Suspension Arm Removal

- 1. Safely lift and support the vehicle off the ground.
- 2. Remove wheel, refer to *WHEELS AND TIRES* subsection.
- 3. Remove screw and nut securing lower ball joint to knuckle.

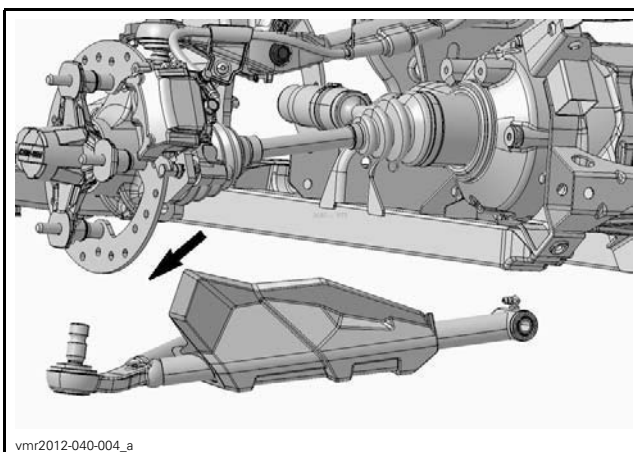


4. Remove screws and nuts securing suspension arm to frame.



1. Suspension arm screws

5. Remove suspension arm.



MOVE OUTWARDS

Lower Suspension Arm Installation

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

Lubricate suspension arm. Refer to *PERIODIC MAINTENANCE PROCEDURES* subsection.

Tighten ball joint nut to specification.

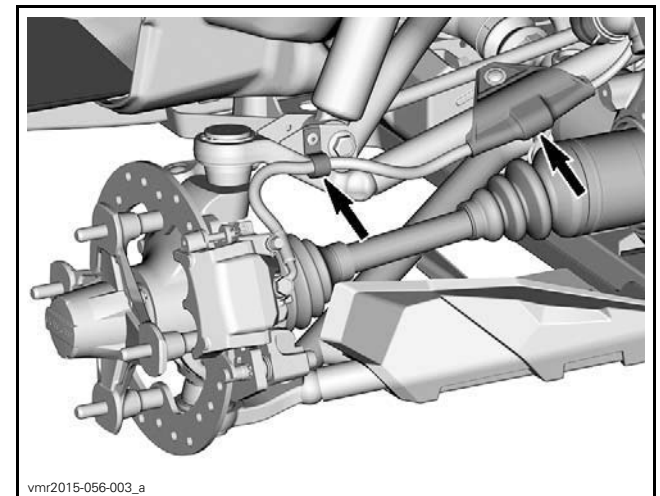
TIGHTENING TORQUE	
Nut securing ball joint to knuckle	48 N•m ± 6 N•m (35 lbf•ft ± 4 lbf•ft)

Perform steering alignment procedure. Refer to *STEERING ALIGNMENT* subsection.

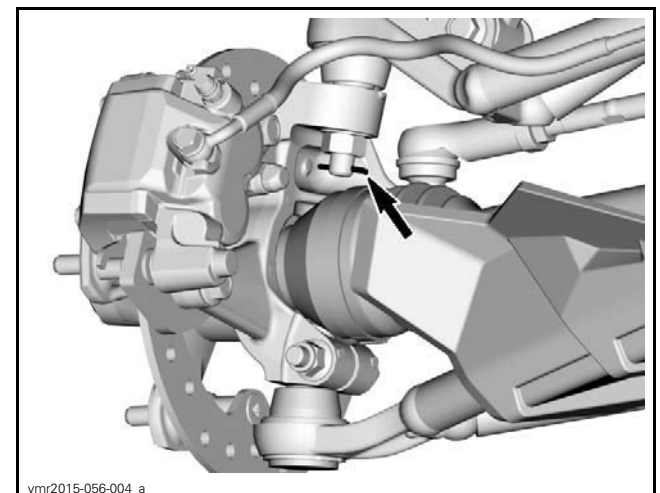
UPPER SUSPENSION ARM

Upper Suspension Arm Removal

1. Safely lift and support the vehicle off the ground.
2. Remove wheel, refer to *WHEELS AND TIRES* subsection.
3. Remove fasteners retaining brake hose to vehicle.



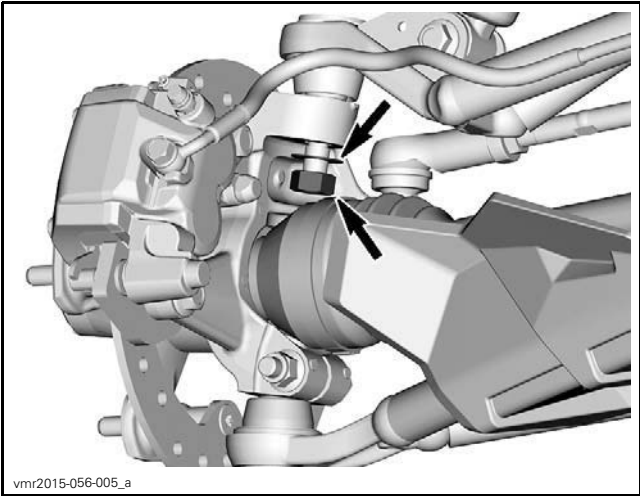
4. Remove and discard cotter pin retaining ball joint.



Section 08 CHASSIS

Subsection 04 (FRONT SUSPENSION)

5. Remove ball joint nut and washer.



6. Carefully move brake hose aside.

7. Using a plastic hammer, carefully hit on the knuckle side to separate ball joint from knuckle.

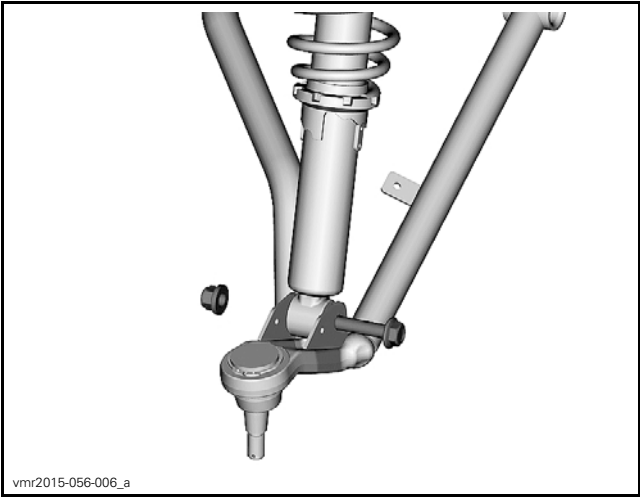
NOTE: A ball joint remover can be used if the ball joint is jammed into knuckle.

NOTICE Never hit on suspension arm to avoid damaging it permanently.

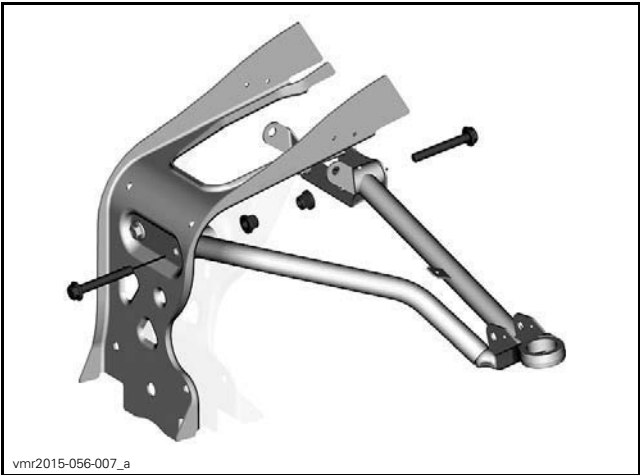


TYPICAL - CAREFULLY HIT ON KNUCKLE SIDE

8. Remove screw and nut securing suspension arm to shock absorber.



9. Remove screws and nuts securing suspension arm to frame.



10. Remove suspension arm.

Upper Suspension Arm Installation

The installation is the reverse of the removal procedure. However, pay attention to the following. Lubricate suspension arm. Refer to *PERIODIC MAINTENANCE PROCEDURES* subsection.

Install a **NEW** cotter pin to secure ball joint nut. Both end of cotter pin must be folded.

Tighten shock absorber nut to specification.

TIGHTENING TORQUE	
Lower shock absorber nut	73 N•m ± 7 N•m (54 lbf•ft ± 5 lbf•ft)

Tighten ball joint nut to specification.

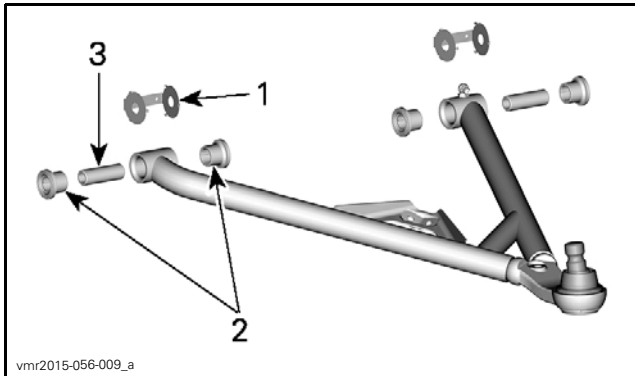
TIGHTENING TORQUE	
Ball joint nut	45 N•m ± 5 N•m (33 lbf•ft ± 4 lbf•ft)

Perform steering alignment procedure. Refer to *STEERING ALIGNMENT* subsection.

SUSPENSION ARM BUSHINGS

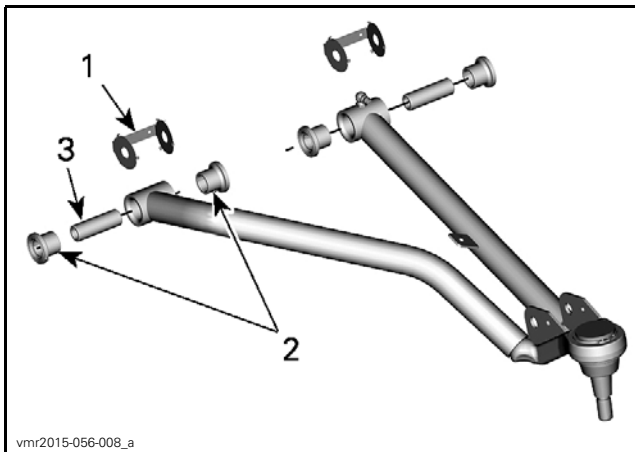
Suspension Arm Bushings Removal

1. Remove wear plates, bushings and sleeves from suspension arm.



LOWER SUSPENSION ARM

1. Wear plates
2. Bushings
3. Sleeves



UPPER SUSPENSION ARM

1. Wear plates
2. Bushings
3. Sleeves

Suspension Arm Bushings Installation

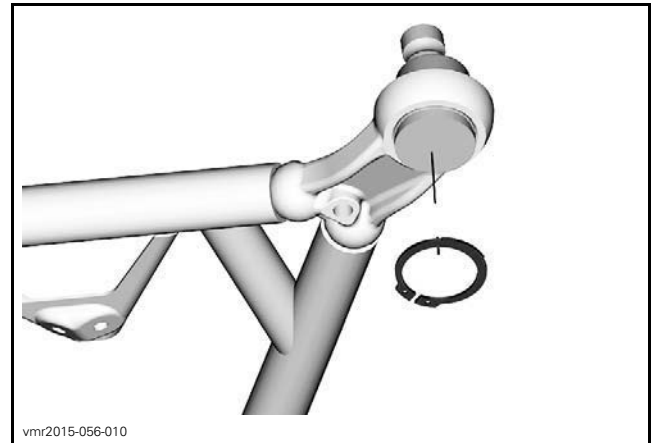
The installation is the reverse of the removal procedure. However, pay attention to the following. Lubricate suspension arm. Refer to *PERIODIC MAINTENANCE PROCEDURES* subsection.

BALL JOINTS

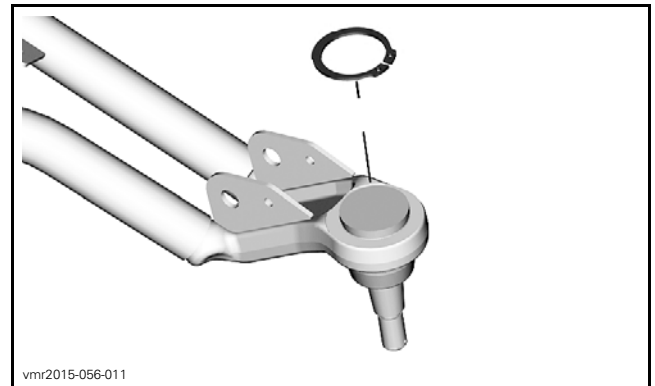
Ball Joint Removal

1. Remove suspension arm from vehicle. Refer to *SUSPENSION ARM REMOVAL* in this subsection.

2. Remove circlip from ball joint.



LOWER BALL JOINT



UPPER BALL JOINT

3. Install suspension arm on a press.

NOTICE Pressing on the center or on the lip of the ball joint will damage it.

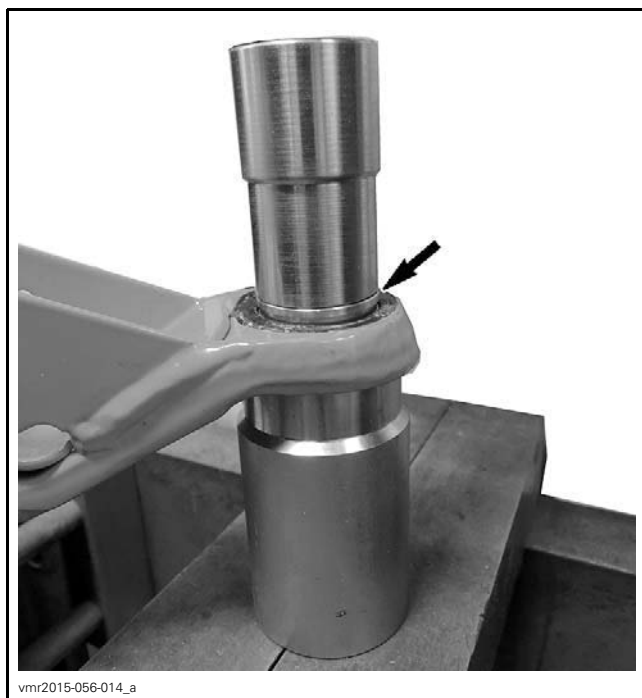


DO NOT PRESS THERE

NOTE: The BALL JOINT REMOVAL TOOL (P/N 529 036 310) is design to apply force only on the outside edge of the ball joint.

Section 08 CHASSIS

Subsection 04 (FRONT SUSPENSION)



CONTACT BETWEEN TOOL AND BALL JOINT ON THE OUTSIDE EDGE ONLY

4. Remove ball joint from suspension arm.

NOTICE Make sure that suspension arm is properly supported on the press during ball joint removal.

Ball Joint Installation

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

Install a **NEW** circlip to secure ball joint.

REAR SUSPENSION

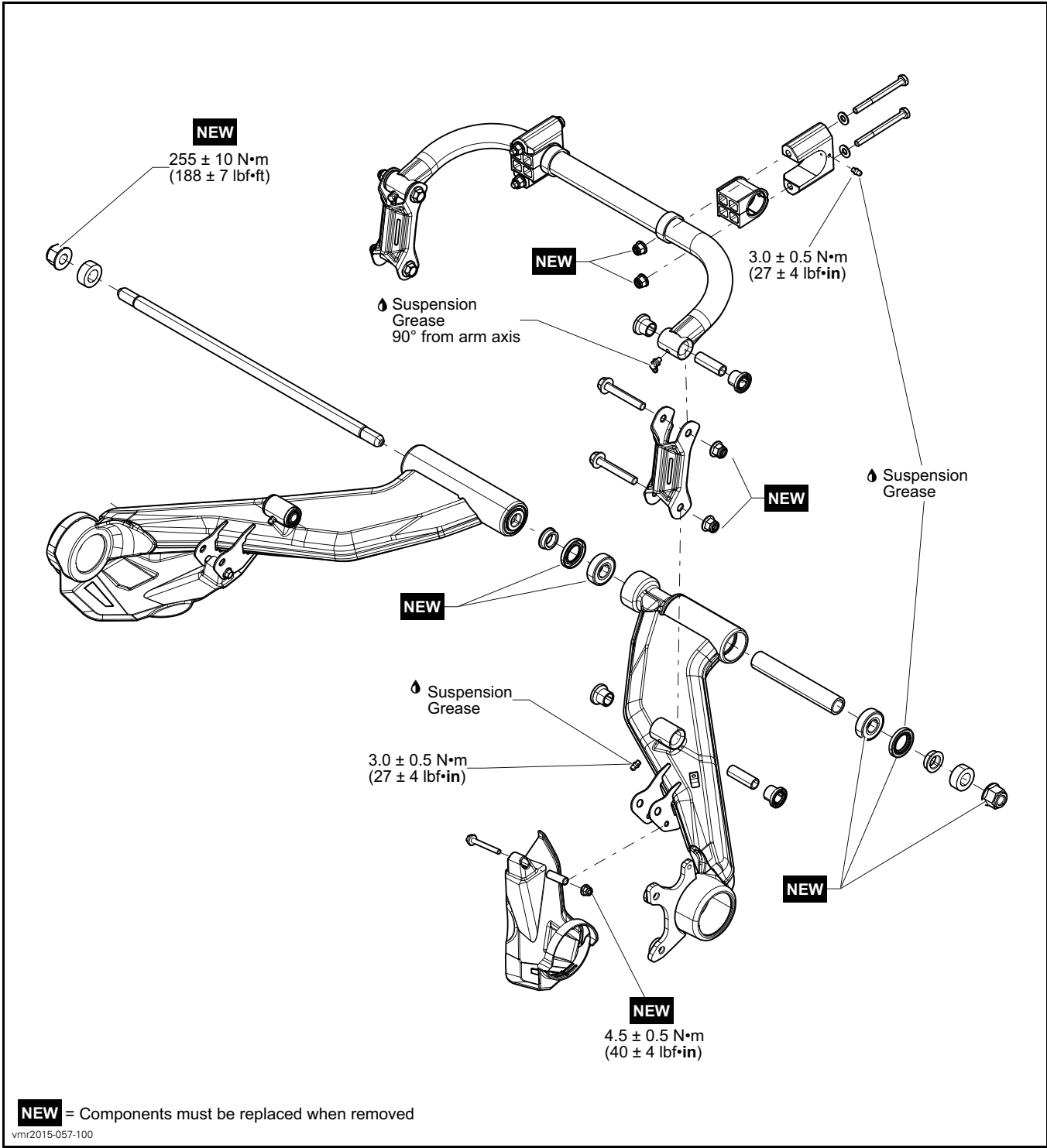
SERVICE TOOLS

Description	Part Number	Page
SPRING COMPRESSOR	529 036 184	681

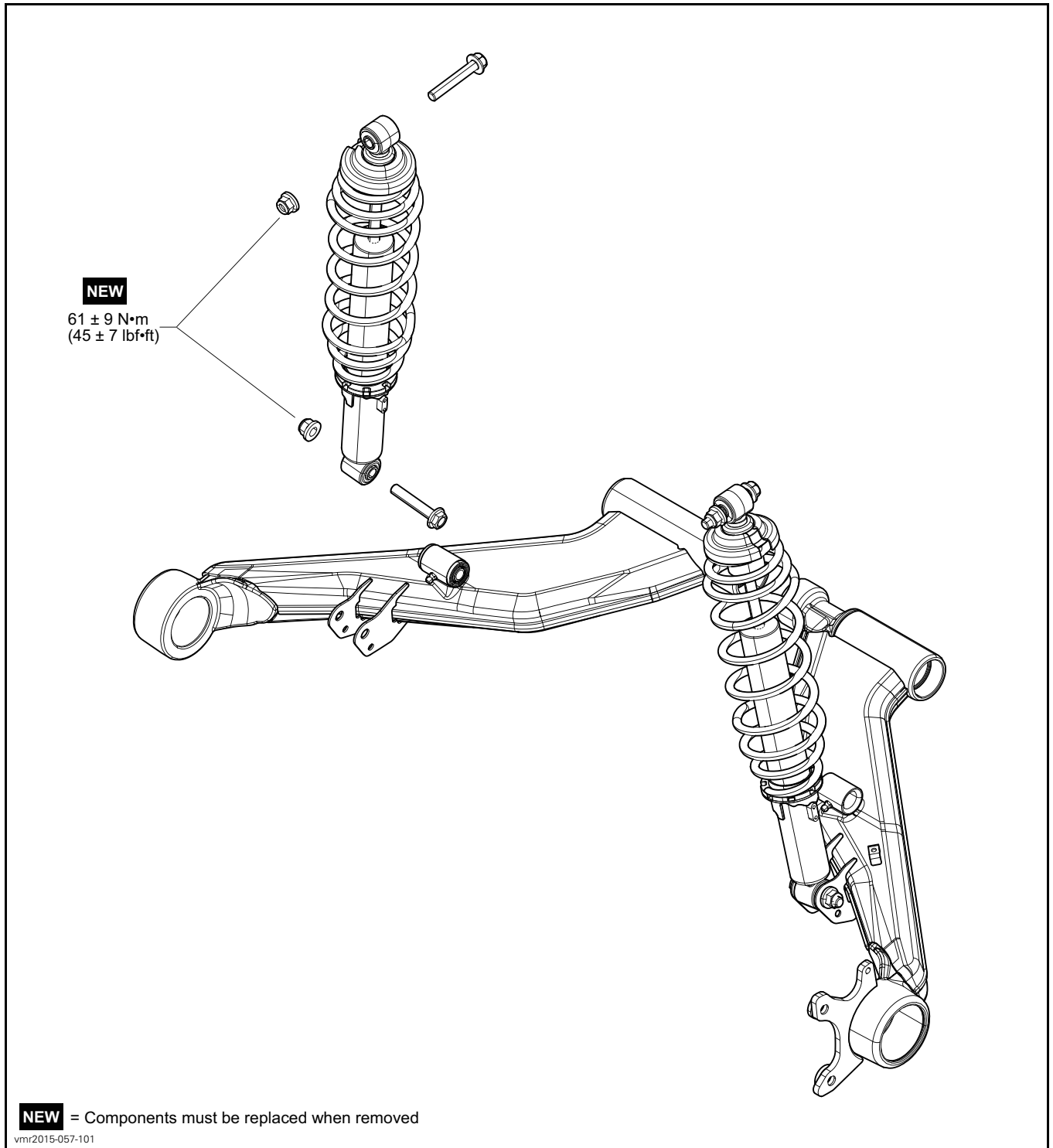
SERVICE PRODUCTS

Description	Part Number	Page
SUSPENSION GREASE	293 550 033	684

TRAILING ARMS AND SWAY BAR



SHOCK ABSORBERS



GENERAL

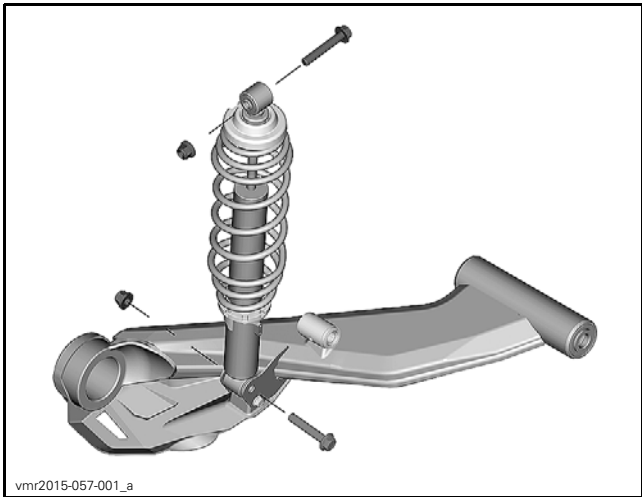
The procedure described below is the same for the RH and LH sides, unless otherwise instructed.

PROCEDURES

SHOCK ABSORBERS

Shock Absorber Removal

- 1. Safely lift and support the vehicle off the ground.
- 2. Remove screws and nuts retaining shock absorber.

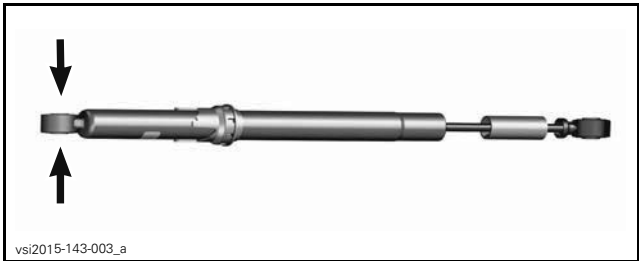


- 3. Remove shock absorber.

Shock Absorber Inspection

Remove spring from shock absorber. Refer to *SPRINGS* in this subsection.

Secure the end of shock body in a vise with its rod upward.



TYPICAL

NOTICE Do not clamp directly on shock body.

Extend and compress the piston several times over its entire stroke. Check that it moves smoothly and with uniform resistance with its rod upward.

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 stroke.

Replace if any faults are present.

Shock Absorber Installation

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

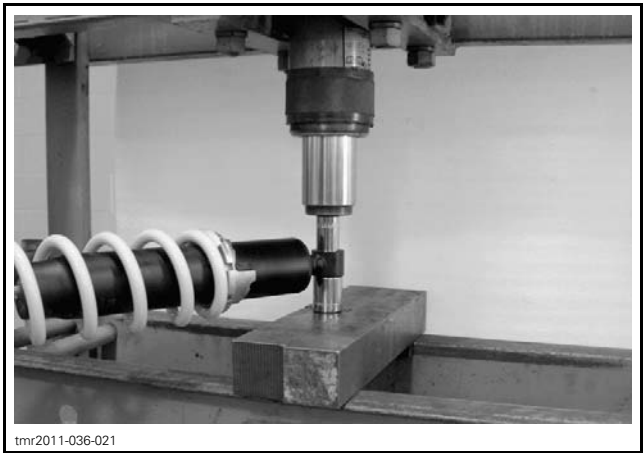
Tighten shock absorber nuts to specification.

TIGHTENING TORQUE	
Shock absorber nut	61 N•m ± 9 N•m (45 lbf•ft ± 7 lbf•ft)

SHOCK ABSORBER BUSHINGS

Shock Absorber Bushing Replacement

- 1. Remove shock absorber from vehicle. Refer to *SHOCK ABSORBERS* in this subsection.
- 2. Install shock absorber on a press.
- 3. Use an appropriate socket to push bushing.



TYPICAL

- 4. Remove bushing from shock absorber.



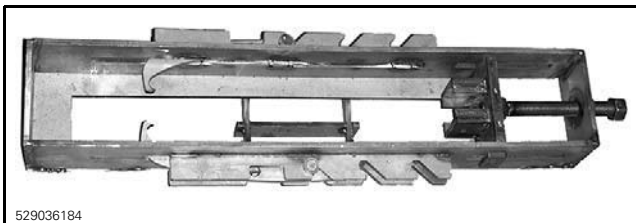
TYPICAL

5. Install a **NEW** bushing as the reverse of removal.
6. Install shock absorber on vehicle.

SPRINGS

Spring Removal

1. Remove shock absorber from vehicle. Refer to *SHOCK ABSORBERS* in this subsection.
2. Place the SPRING COMPRESSOR (P/N 529 036 184) in a vise.



3. Position the shock absorber in the tool.
4. Install the spring compressor pins.
5. Tighten spring remover screw until the spring is sufficiently compressed to remove spring cap.
6. Remove spring cap from shock absorber.
7. Release spring remover screw.
8. Remove spring from shock absorber.

Spring Inspection

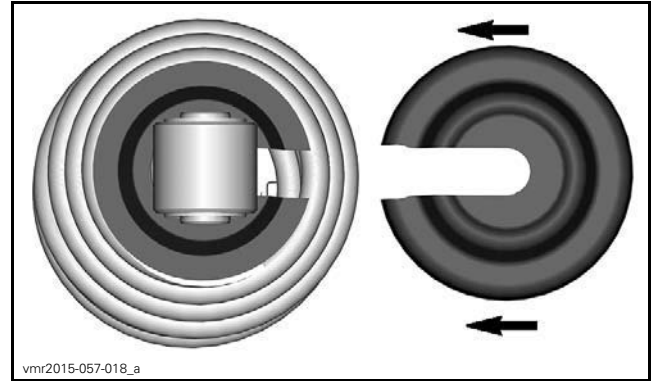
Inspect the spring for damage.

Replace if necessary.

Spring Installation

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

On applicable models, install spring cap opening at 180° from spring stopper opening.

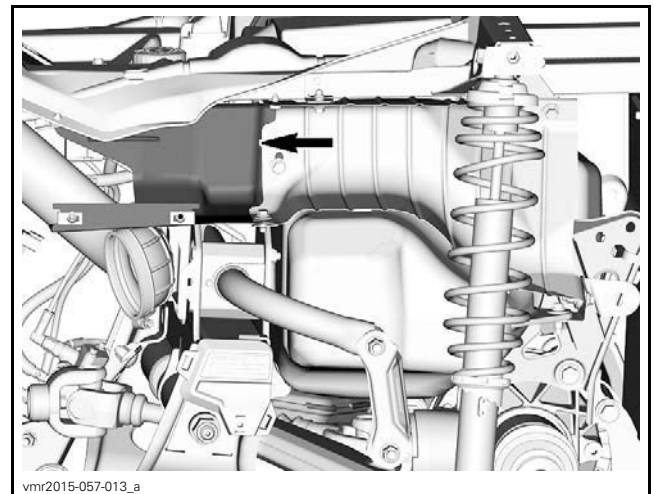


CAP OPENING AT 180°

SWAY BAR

Sway Bar Removal

1. Safely lift and support the vehicle off the ground.
2. Remove rear wheels, refer to *WHEELS AND TIRES* subsection.
3. Refer to *EXHAUST SYSTEM* and remove:
 - Muffler
 - Exhaust pipe.
4. Remove the following inner heat shield.

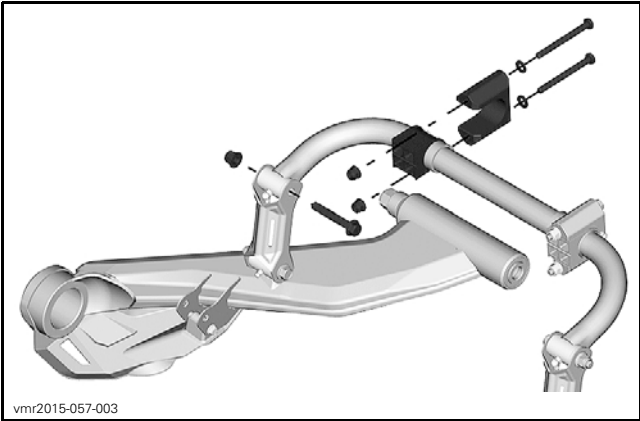


SOME PARTS REMOVED FOR CLARITY

5. Remove fasteners and sway bar bushing holders.

Section 08 CHASSIS

Subsection 05 (REAR SUSPENSION)



6. Remove sway bar.

Sway Bar Inspection

Check sway bar for cracks, bending or other damages.

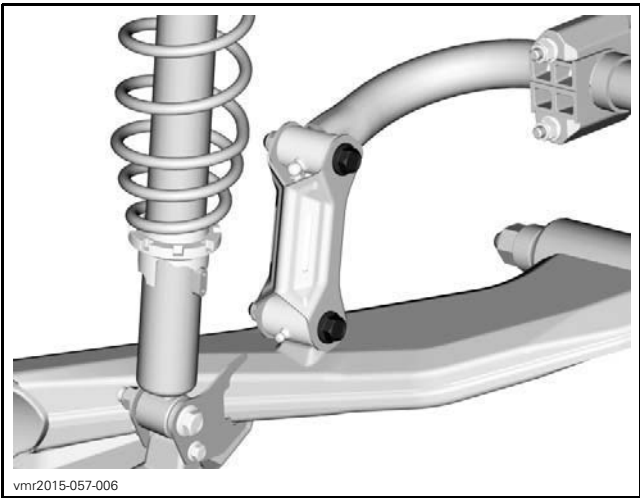
Replace if necessary.

Sway Bar Installation

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

Install all retaining screws of sway bar loosely first.

Position link arm screws with their heads towards inside.



Tighten sway bar retaining screws to specification.

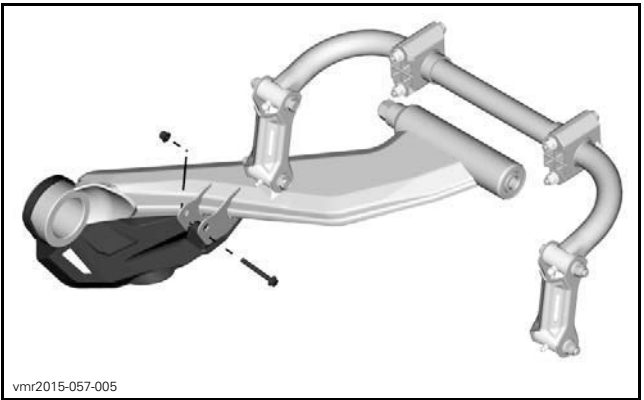
TIGHTENING TORQUE	
Screws securing sway bar to frame	24.5 N•m ± 3.5 N•m (18 lbf•ft ± 3 lbf•ft)
Screws securing sway bar to link arm	61 N•m ± 9 N•m (45 lbf•ft ± 7 lbf•ft)

Lubricate sway bar. Refer to *PERIODIC MAINTENANCE PROCEDURES* subsection.

TRAILING ARM

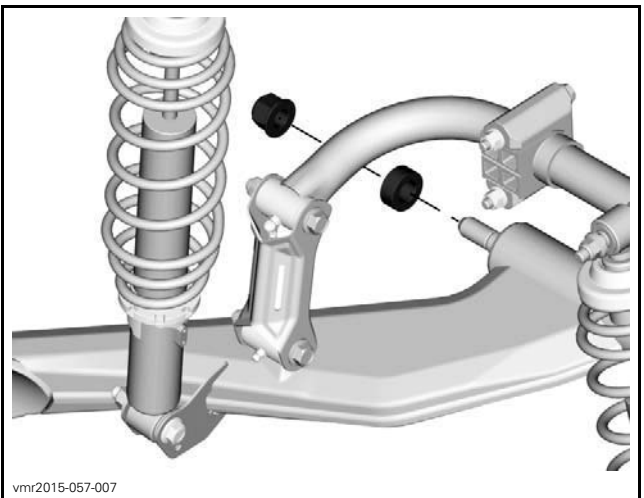
Trailing Arm Removal

1. Safely lift and support the vehicle off the ground.
2. Remove wheel hub, refer to *REAR DRIVE* subsection.
3. Remove protective plate from trailing arm.

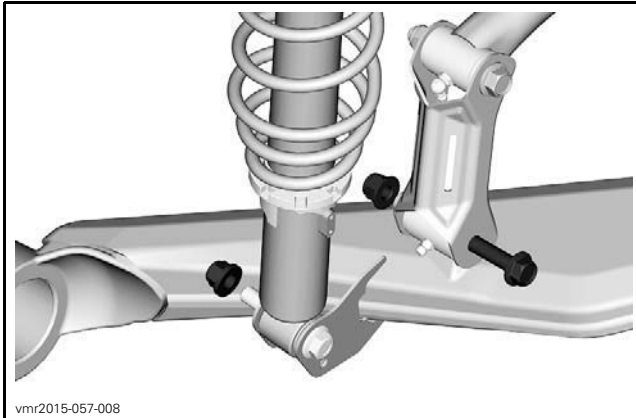


NOTE: If applicable, remove fasteners retaining brake hose to vehicle.

4. Remove nut and washer securing trailing arm pivot shaft.

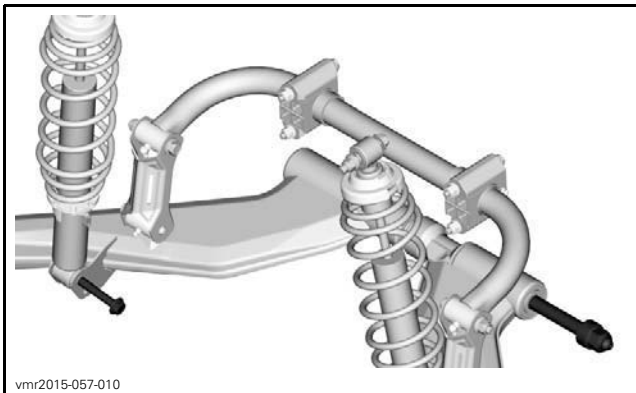


5. Detach trailing arm from link arm and remove lower nut retaining shock absorber.



6. Firmly hold trailing arm then remove:
- Shock absorber lower screw
 - Trailing arm pivot shaft (pull from opposite side).

NOTE: If only one trailing arm is removed, pull pivot shaft just enough to clear trailing arm.

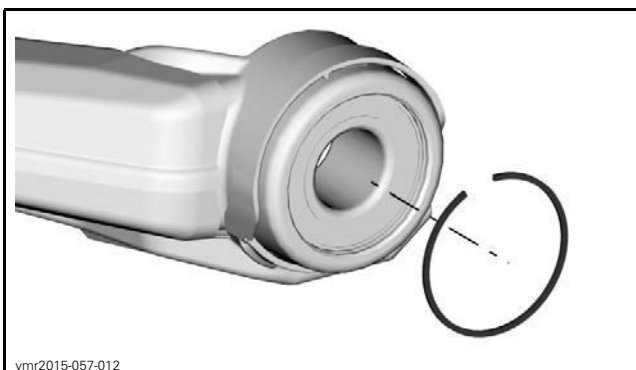


7. Remove trailing arm from vehicle.

Trailing Arm Disassembly

Drive Shaft Bearing Removal

1. Remove circlip securing bearing into trailing arm.

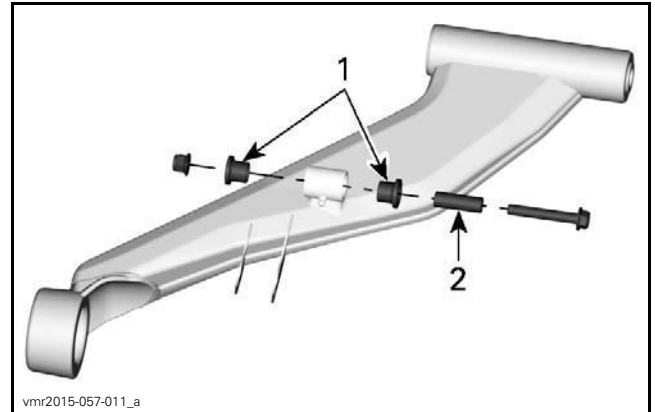


2. Install trailing arm on a press.
3. Use an appropriate bearing remover.

4. Remove drive shaft bearing from trailing arm.

Link Arm Inner Bushing Removal

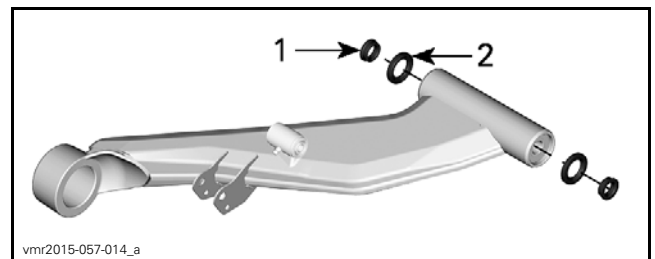
Remove both bushings and sleeve from trailing arm.



1. Bushings
2. Sleeve

Trailing Arm Pivot Bearing Removal

1. Remove both spacers and seals from trailing arm pivot.

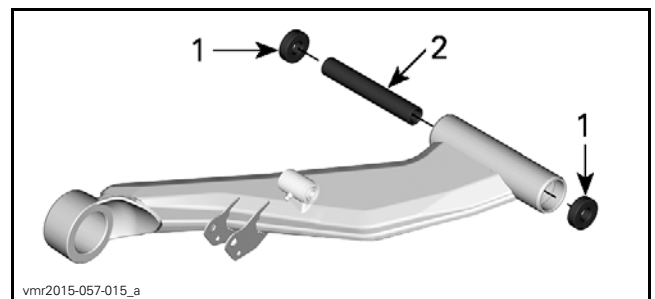


1. Spacer
2. Seal

2. Remove bearing with an appropriate bearing remover.

NOTE: Remove one bearing at a time.

3. Remove inner spacer from trailing arm.



1. Pivot bearings
2. Inner spacer

Section 08 CHASSIS

Subsection 05 (REAR SUSPENSION)

Trailing Arm Inspection

Check trailing arms for:

- Cracks
- Bending.

Check seals condition.

Check inner race of each pivot bearing with your finger. Bearings should turn smoothly and quietly.

Replace all damaged parts.

Trailing Arm Assembly and Installation

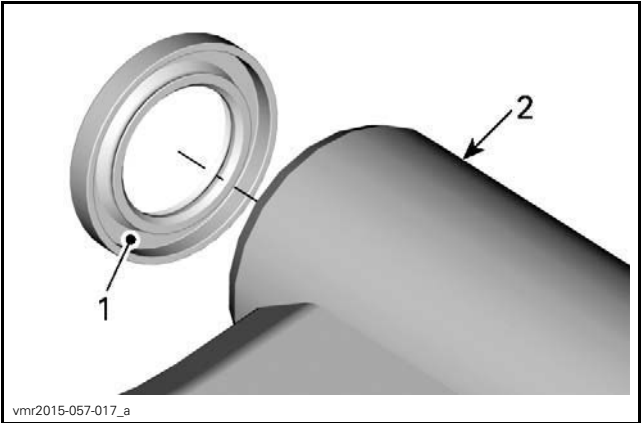
The installation is the reverse of the removal procedure. However, pay attention to the following.

Install the following **NEW** parts:

- Trailing arm pivot nuts
- Pivot bearings
- Pivot seals
- Circlip.

Use an appropriate shaft to center trailing arm inner spacer during pivot bearings installation.

Install pivot bearings and inner spacer as per the following sequence.



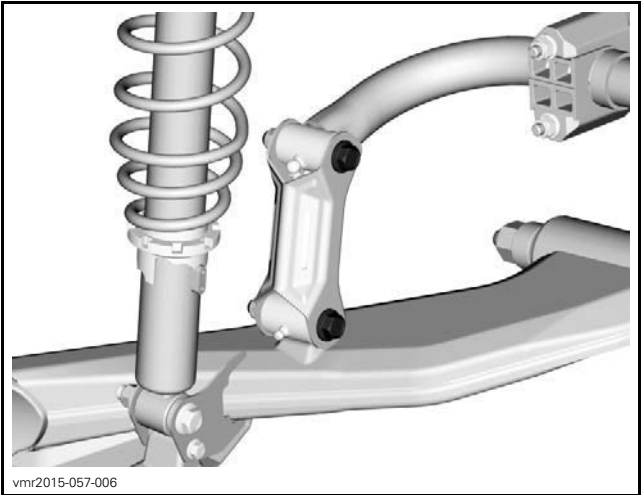
1. Seal cavity
2. Trailing arm

Center trailing arm pivot shaft.

Tighten trailing arm pivot nuts as per the following sequence.

TIGHTENING SEQUENCE		
Trailing arm pivot nuts	RH side nut	Tighten nut until it reaches end of threads
	LH side nut	255 N•m ± 10 N•m (188 lbf•ft ± 7 lbf•ft)

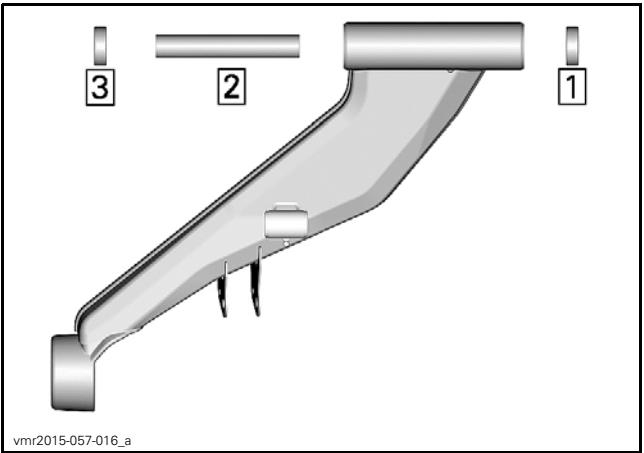
Position link arm bolts with their heads towards inside.



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Tighten trailing arm fasteners to specification.

TIGHTENING TORQUE	
Bolts securing trailing arm to link arm	61 N•m ± 9 N•m (45 lbf•ft ± 7 lbf•ft)
Shock absorber nuts	61 N•m ± 9 N•m (45 lbf•ft ± 7 lbf•ft)
Protective plate retaining nuts	4.5 N•m ± 0.5 N•m (40 lbf•in ± 4 lbf•in)



TYPICAL - LH TRAILING ARM
Step 1: Insert bearing on RH side
Step 2: Center inner spacer with RH side bearing using a shaft
Step 3: Insert bearing on LH side

Lubricate trailing arm pivot seals.

LUBRICATION	
Pivot seals	SUSPENSION GREASE (P/N 293 550 033)

Install trailing arm pivot seal with its cavity facing inwards.

BRAKES

SERVICE TOOLS

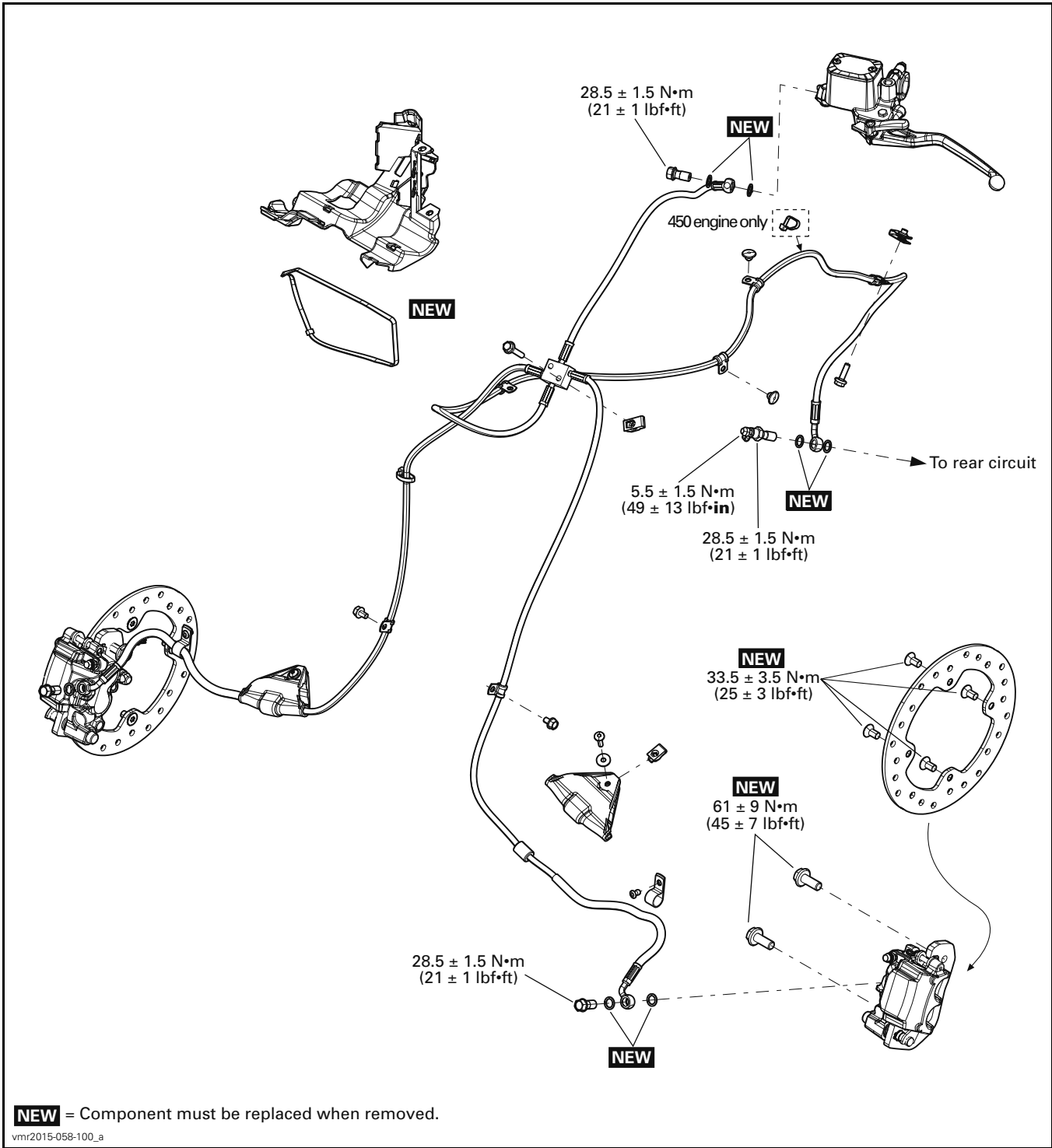
Description	Part Number	Page
ECM ADAPTER TOOL.....	529 036 166	692

SERVICE PRODUCTS

Description	Part Number	Page
XPS BRAKES AND PARTS CLEANER (USA)	219 701 705	695
XPS BRAKES AND PARTS CLEANER	219 701 776	695
XPS SYNTHETIC GREASE.....	293 550 010	693

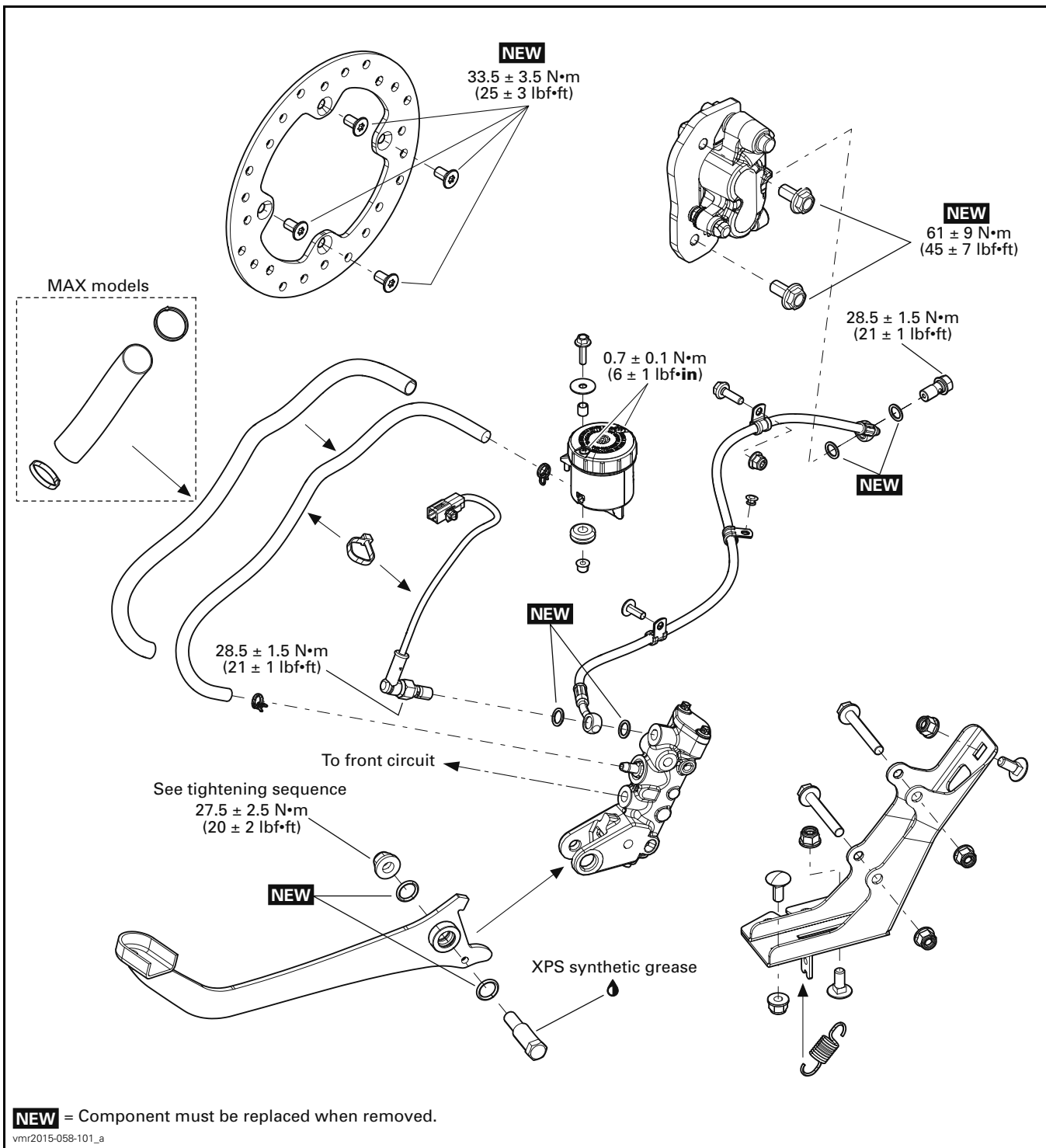
OUTLANDER L (FRONT CIRCUIT)

All Except CE Models



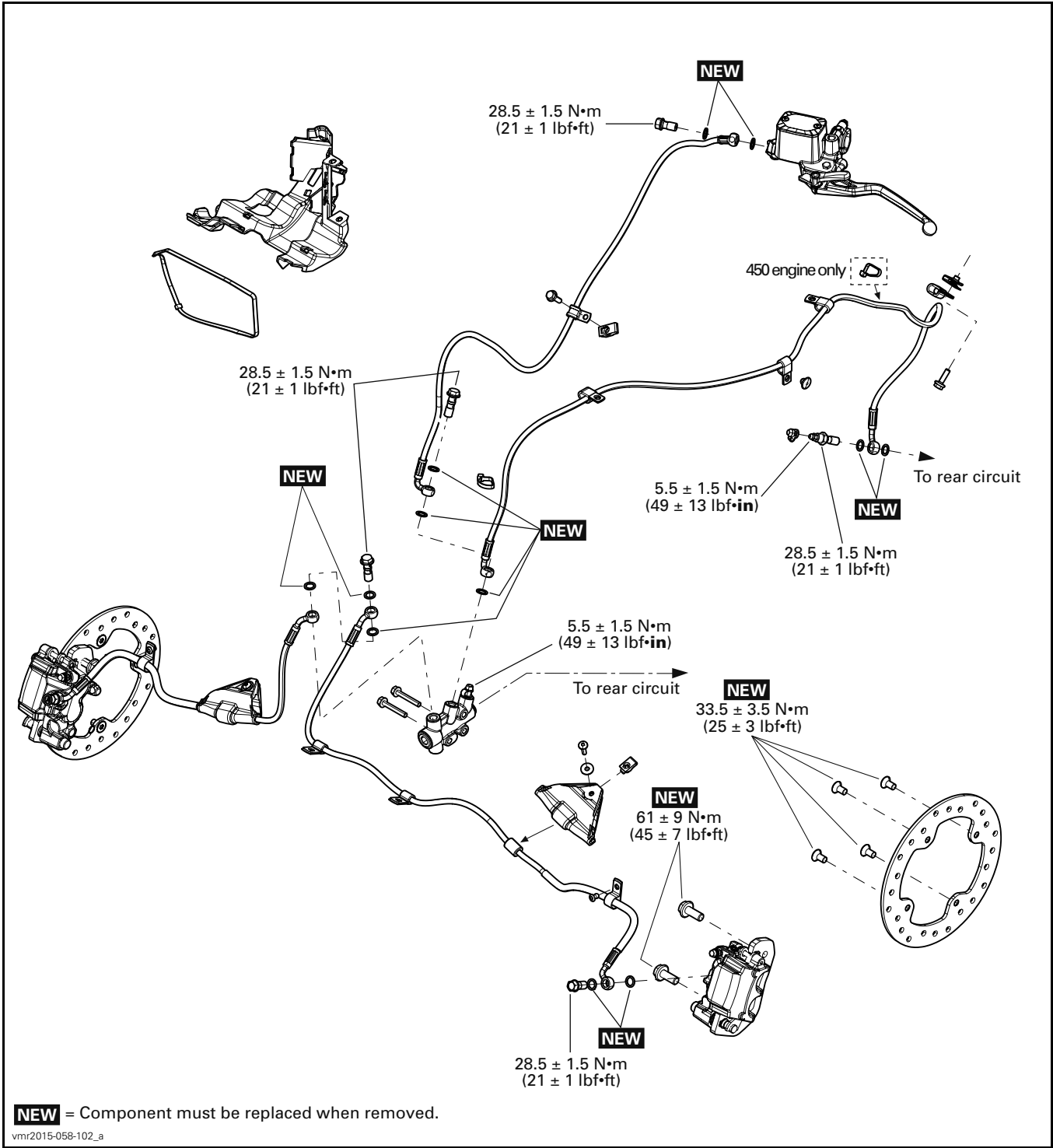
OUTLANDER L (REAR CIRCUIT)

All Except CE Models



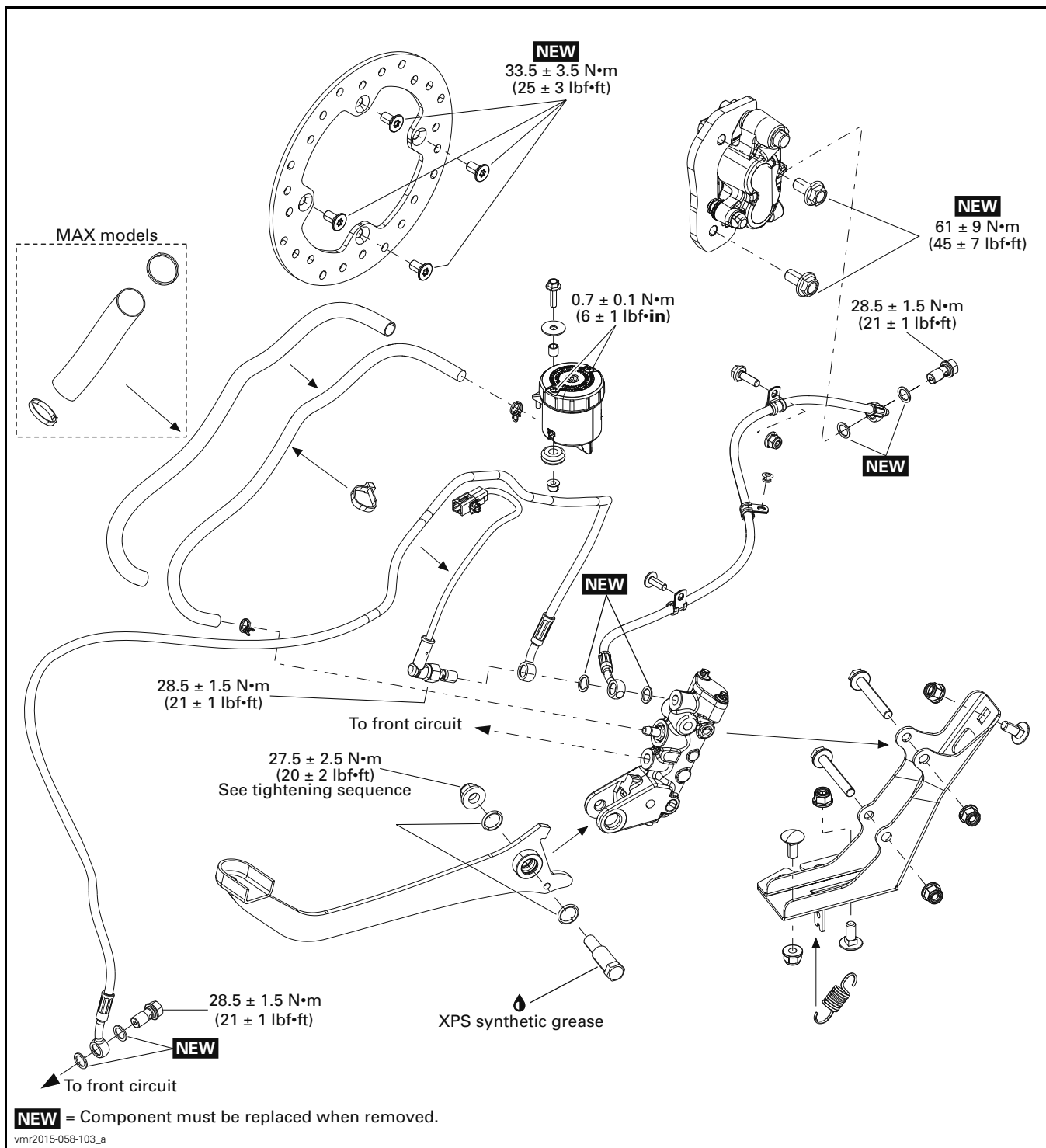
OUTLANDER L (FRONT CIRCUIT)

CE Models



OUTLANDER L (REAR CIRCUIT)

CE Models



CALIPERS AND BRAKE LEVERS

All Models

FRONT

Diagram showing the front view of a brake caliper assembly. Components include a brake pad, a piston, and a bracket. Torque specifications are provided for the piston pin ($8.5 \pm 1.5 \text{ N}\cdot\text{m}$ / $75 \pm 13 \text{ lbf}\cdot\text{in}$) and the bracket pin ($8.5 \pm 1.5 \text{ N}\cdot\text{m}$ / $75 \pm 13 \text{ lbf}\cdot\text{in}$). A note indicates the application of brake caliper synthetic grease to the piston and bracket.

REAR

Diagram showing the rear view of a brake caliper assembly. Components include a brake pad, a piston, and a bracket. Torque specifications are provided for the piston pin ($8.5 \pm 1.5 \text{ N}\cdot\text{m}$ / $75 \pm 13 \text{ lbf}\cdot\text{in}$) and the bracket pin ($8.5 \pm 1.5 \text{ N}\cdot\text{m}$ / $75 \pm 13 \text{ lbf}\cdot\text{in}$). A note indicates the application of brake caliper synthetic grease to the piston and bracket.

LH SIDE

Diagram showing the LH side view of a brake lever assembly. Components include a cover, gasket, and lever. Torque specifications are provided for the cover pin ($1.3 \pm 0.1 \text{ N}\cdot\text{m}$ / $12 \pm 1 \text{ lbf}\cdot\text{in}$) and the lever pin ($8.5 \pm 1.5 \text{ N}\cdot\text{m}$ / $75 \pm 13 \text{ lbf}\cdot\text{in}$). A note indicates the application of XPS synthetic grease to the lever pin.

RH SIDE

Diagram showing the RH side view of a brake lever assembly. Components include a cover, gasket, and lever. Torque specifications are provided for the cover pin ($1.3 \pm 0.1 \text{ N}\cdot\text{m}$ / $12 \pm 1 \text{ lbf}\cdot\text{in}$) and the lever pin ($8.5 \pm 1.5 \text{ N}\cdot\text{m}$ / $75 \pm 13 \text{ lbf}\cdot\text{in}$). A note indicates the application of XPS synthetic grease to the lever pin. A dashed box indicates that this side view is only applicable to certain models.

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GENERAL

WARNING

Always check brake system operation after removing or servicing a brake component.

NOTICE Avoid spilling brake fluid on plastic, rubber or painted parts. Protect these parts with a rag when servicing brake system.

NOTE: Sealing washers must be discarded and replaced with new ones every time a Banjo bolt is unscrewed.

NOTE: Always clean the area around a brake component before servicing.

SYSTEM DESCRIPTION

A disc brake system with twin-piston sliding calipers is used.

Disc Brake Configurations

OUTLANDER L		
MODELS	NUMBER OF DISC BRAKES	
	FRONT	REAR
All models	2	1

Brake Controls and Circuit Configurations

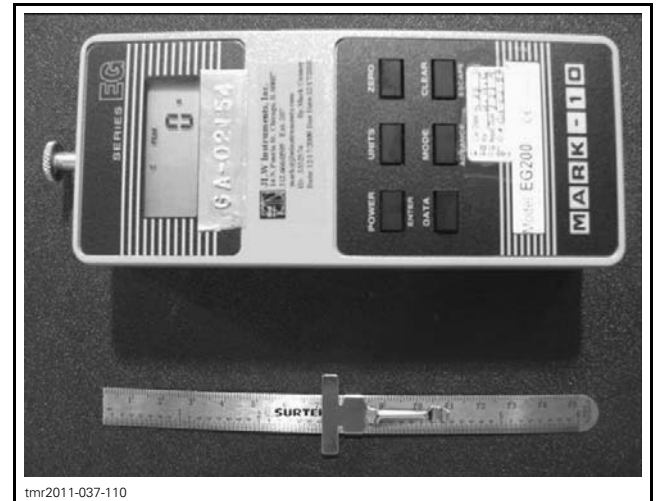
OUTLANDER L		
MODELS	LH BRAKE LEVER	BRAKE PEDAL
All except CE models	Controls front and rear brakes	Controls rear brakes
CE models	Controls front and rear brakes	Controls front and rear brakes

INSPECTION

BRAKE SYSTEM PRESSURE VALIDATION

Required Tools

Use an appropriate compression force gauge such as *MARK-10 EG-200* and a ruler.

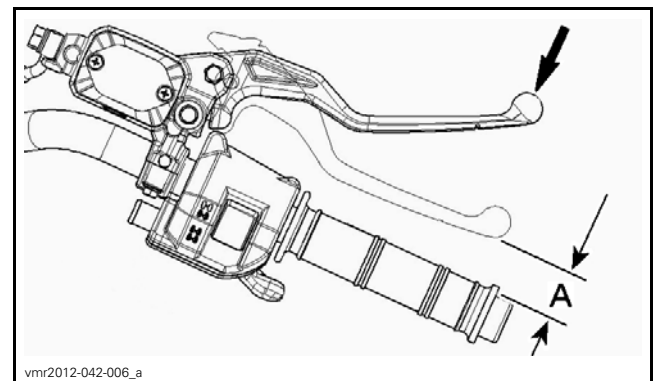


TYPICAL

Brake Lever Verification

NOTE: Do not pump up the brakes repeatedly before doing the validation.

1. Position force gauge perpendicularly on brake lever edge.
2. Position a ruler perpendicularly to handlebar grip.
3. Push brake lever at distance **A** from handlebar grip using force gauge.



A. Distance from handlebar (refer to table)

4. Read load recorded by the force gauge.
5. Load reading must be as per the following table.

BRAKE LEVER VERIFICATION		
LEVER	DISTANCE A	MINIMUM LOAD
LH side lever	25 mm (1 in)	150 N (34 lbf)
RH side lever (if applicable)	25 mm (1 in)	130 N (29 lbf)

Section 08 CHASSIS

Subsection 06 (BRAKES)

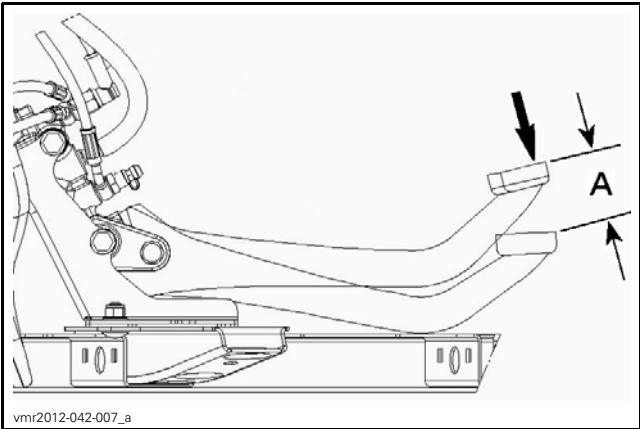
6. If load reading is not in accordance with the specification:
- 6.1 Perform a brake system inspection and cleaning.
 - 6.2 Bleed brake system.

NOTE: Refer to *PERIODIC MAINTENANCE PROCEDURES* subsection.

Brake Pedal Verification

NOTE: Do not pump up the brakes repeatedly before doing the validation.

- 1. Position force gauge perpendicularly on brake pedal edge.
- 2. Position a ruler perpendicularly to brake pedal.
- 3. Push brake pedal from distance **A** using force gauge.



A. Distance to push (refer to table)

- 4. Read load recorded by the force gauge.
- 5. Load reading must be as per the following table.

BRAKE PEDAL VERIFICATION		
MODELS	DISTANCE A	MINIMUM LOAD
All Outlander L except CE	35 mm (1-3/8 in)	180 N (40 lbf)
Outlander L CE	55 mm (2-5/32 in)	180 N (40 lbf)

6. If load reading is not in accordance with the specification:
- 6.1 Perform a brake system inspection and cleaning.
 - 6.2 Bleed brake system.

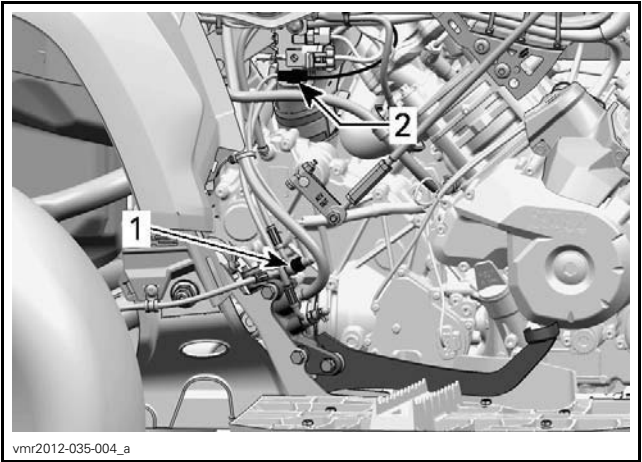
NOTE: Refer to *PERIODIC MAINTENANCE PROCEDURES* subsection.

PROCEDURES

BRAKE LIGHT SWITCHES

Brake Light Switch Location

The brake light switch is located on the brake pedal master cylinder.



BRAKE PEDAL MASTER CYLINDER

- 1. Brake light switch
- 2. Brake light switch connector

Brake Light Switch Resistance Test

- 1. Disconnect brake light switch connector.
- 2. Check switch operation as follows.

BRAKE LIGHT SWITCH POSITION	PIN		RESISTANCE
Firmly pushed	1	2	Close to 0 Ω
Released			Infinite (OL)

If switch is defective, replace with a new one.

If the switch tests good, verify wire continuity between harness connector and ECM connector. Refer to *BRAKE SYSTEMS WIRING DIAGRAM*.

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



Brake Light Switch Replacement

1. Disconnect brake light switch connector.
2. Drain brake line.
3. Remove brake light switch.

NOTE: Use shop rags to catch any spilled brake fluid.

4. Install **NEW** sealing washers.
5. Install brake light switch.

TIGHTENING TORQUE	
Brake light switch	28.5 N•m ± 1.5 N•m (21 lbf•ft ± 1 lbf•ft)

6. Connect brake light switch connector.
7. Refill and bleed brake system, refer to *PERIODIC MAINTENANCE PROCEDURES* subsection.

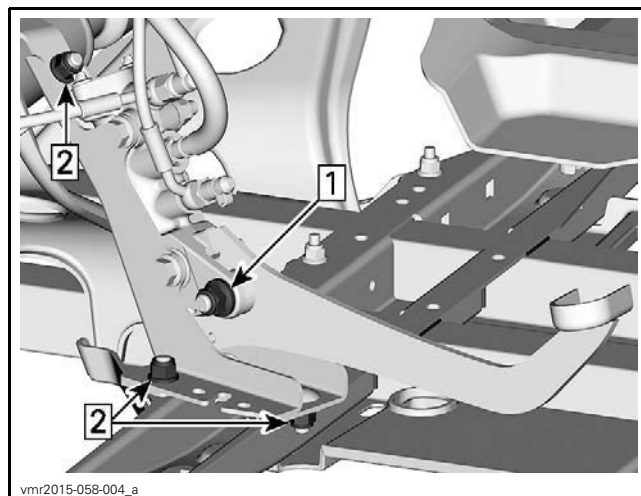
BRAKE PEDAL

Brake Pedal Removal

1. Drain brake system, refer to *PERIODIC MAINTENANCE PROCEDURES* subsection.
2. Remove RH footrest panel. Refer to *BODY* subsection.

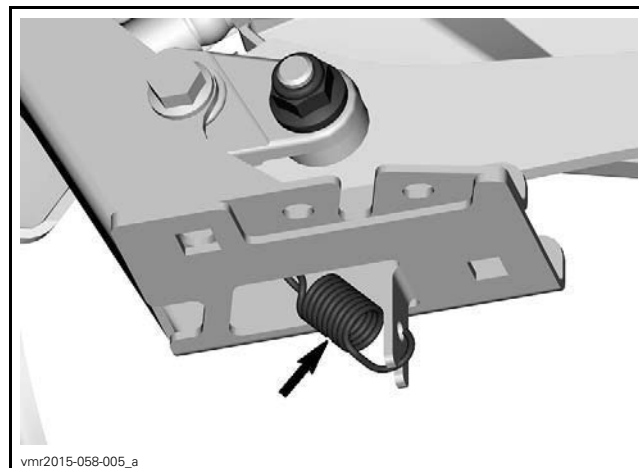
NOTE: Loosen brake pedal bolt before removing support from frame.

3. Remove master cylinder support from frame.

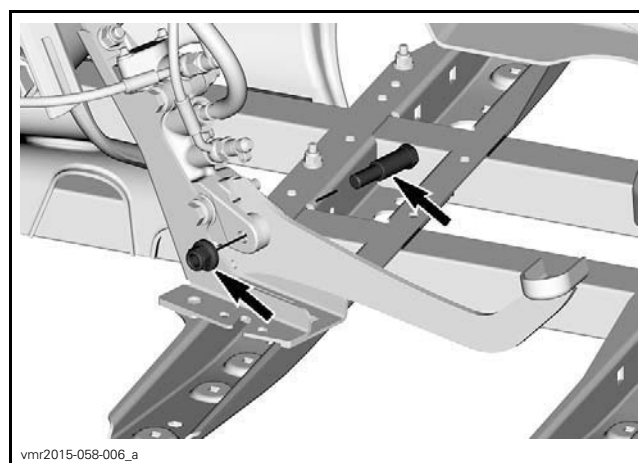


Step 1: Loosen brake pedal pivot
Step 2: Remove nuts

4. Remove brake pedal spring.



5. Remove brake pedal.



Brake Pedal Installation

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

Install **NEW** brake pedal O-ring.

Lubricate brake pedal pivot.

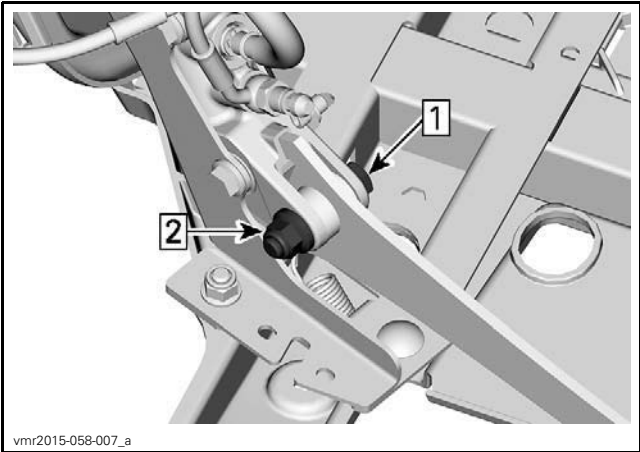
LUBRICATION	
Brake pedal pivot	XPS SYNTHETIC GREASE (P/N 293 550 010)

Tighten brake pedal nut as per the following sequence.

TIGHTENING SEQUENCE		
STEP 1	Brake pedal bolt (pivot)	10 N•m ± 2 N•m (89 lbf•in ± 18 lbf•in)
STEP 2	Brake pedal nut	27.5 N•m ± 2.5 N•m (20 lbf•ft ± 2 lbf•ft)

Section 08 CHASSIS

Subsection 06 (BRAKES)



TIGHTENING SEQUENCE

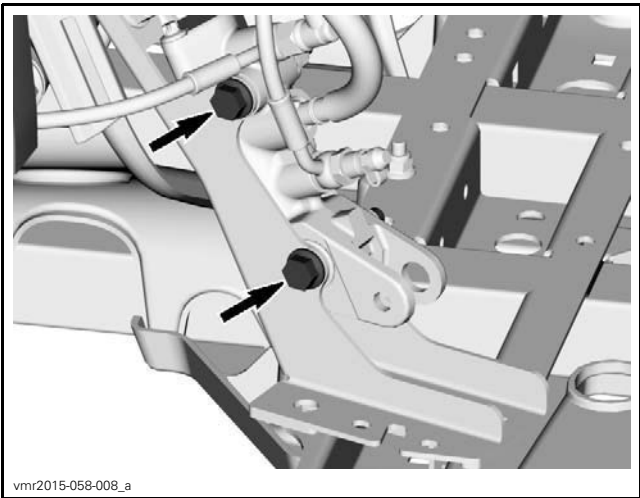
Step 1: Tighten bolt

Step 2: Hold bolt then tighten nut

MASTER CYLINDER

Master Cylinder Removal

- 1. Remove BRAKE PEDAL. See procedure in this subsection.
- 2. Remove master cylinder from support.



- 3. Remove hoses and bleeder from master cylinder.

Master Cylinder Inspection

- Check boot for crack.
- Check rod for wear and scratch.
- Check master cylinder housing for leak or damage.

Master Cylinder Installation

The installation is the reverse of the removal procedure. However, pay attention to the following. Tighten brake hoses and bleeder to specification.

TIGHTENING TORQUE	
Brake hose screw (banjo fitting)	28.5 N•m ± 1.5 N•m (21 lbf•ft ± 1 lbf•ft)
Bleeder	8.5 N•m ± 1.5 N•m (75 lbf•in ± 13 lbf•in)

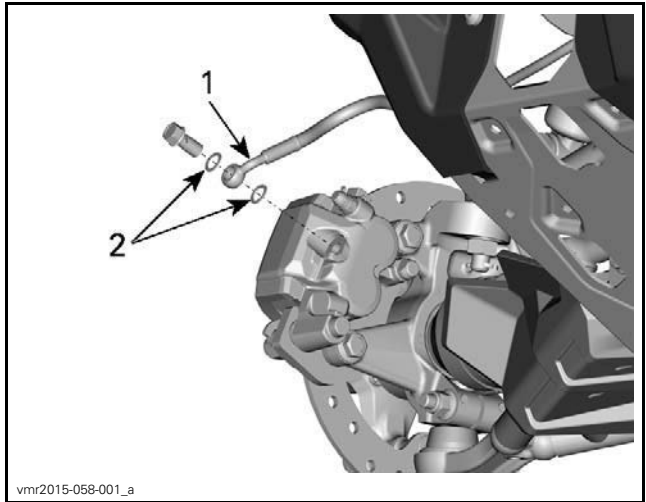
Install NEW sealing washers.

Refill and bleed brake system, refer to PERIODIC MAINTENANCE PROCEDURES subsection.

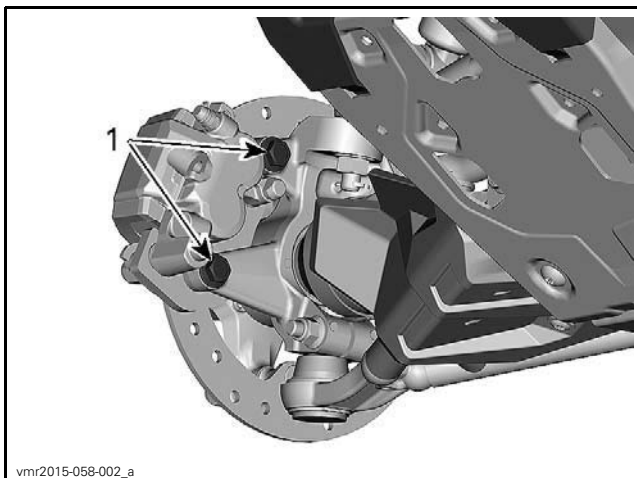
CALIPER

Caliper Removal

- 1. Safely lift and support the vehicle.
- 2. Remove wheel, refer to WHEELS AND TIRES subsection.
- 3. If caliper is removed from vehicle for replacement:
 - 3.1 Drain brake system, refer to PERIODIC MAINTENANCE PROCEDURES subsection.
 - 3.2 Unscrew brake hose from caliper.



- 1. Brake hose
 - 2. Sealing washers
- 4. Remove fasteners retaining brake hose.
 - 5. Remove screws securing caliper support.



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1. Caliper screws

6. Place caliper assembly onto a support.

NOTICE Do not let caliper hang by the hose and do not stretch or twist hose.

Caliper Installation

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

If caliper was removed for replacement:

- Refill and bleed brake system, refer to *PERIODIC MAINTENANCE PROCEDURES* subsection.
- Install **NEW** sealing washers.

Install **NEW** caliper retaining screws.

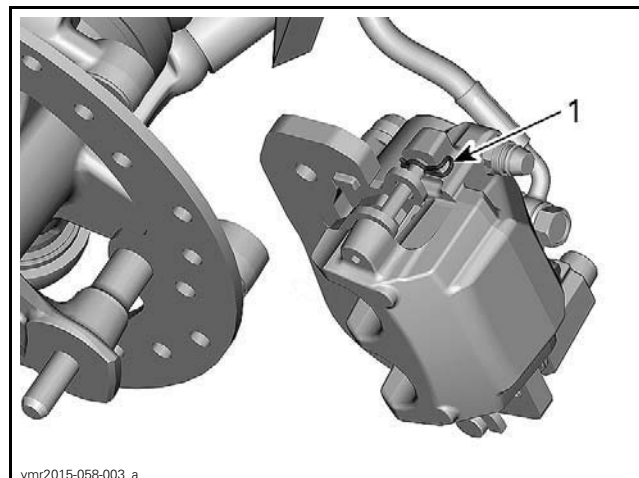
Tighten caliper retaining screws to specification.

TIGHTENING TORQUE	
Caliper retaining screws	61 N•m ± 9 N•m (45 lbf•ft ± 7 lbf•ft)

BRAKE PADS

Brake Pads Replacement

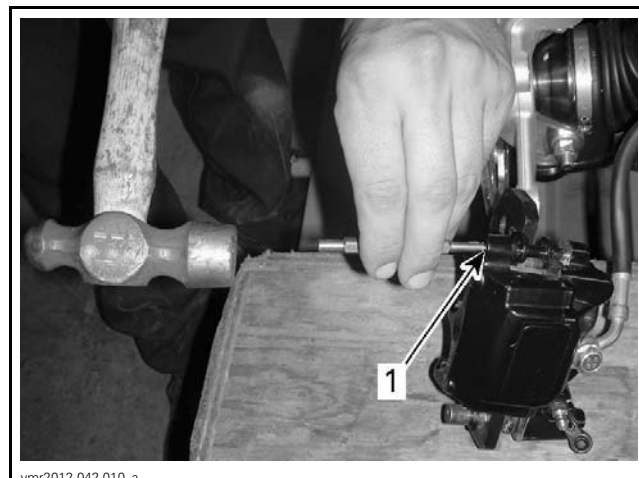
1. Remove caliper, refer to *CALIPER REMOVAL* in this subsection.
2. Remove pin retainer securing brake pad pin.



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1. Pin retainer

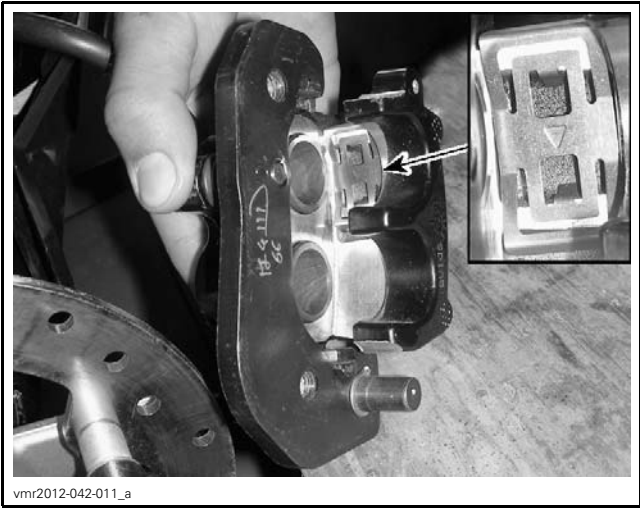
3. Remove brake pad pin from caliper.



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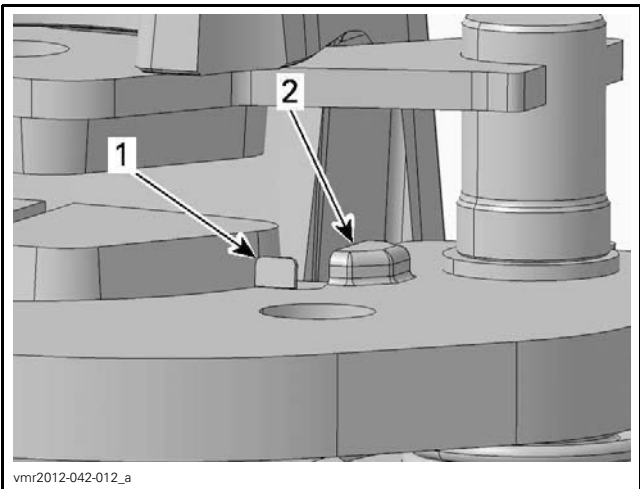
1. Brake pad pin

4. Carefully remove brake pads.
 5. Clean pistons end using XPS BRAKES AND PARTS CLEANER (P/N 219 701 776) or XPS BRAKES AND PARTS CLEANER (USA) (P/N 219 701 705).
 6. Push caliper pistons inward.
- NOTE:** To avoid damaging pistons, use an old pad to push it into the caliper using a C-clamp.
7. Ensure brake pad spring is properly positioned onto caliper and not damaged.



BRAKE PAD SPRING

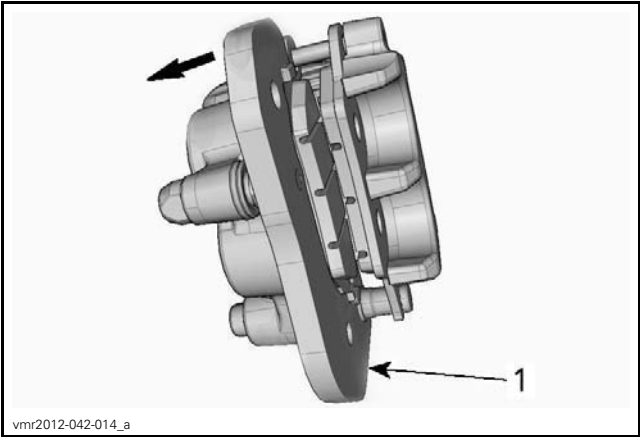
8. Ensure pad stopper is properly aligned with caliper support protrusion.



1. Pad stopper
2. Caliper support protrusion

NOTICE Prior to installing brake pads, pad stopper must be properly positioned and not damaged.

- 9. Install **NEW** brake pads.
- 10. Clean and install brake pad pin on caliper.
- 11. Install pin retainer to secure brake pad pin.
- 12. Slide caliper support completely into caliper.



1. Caliper support

13. Install caliper, refer to *CALIPER INSTALLATION* in this subsection.

BRAKE DISC

Brake Disc Inspection

- 1. Check disc surfaces for scratches or grooves on both sides.
- 2. Measure thickness of the disc.

DISC MINIMUM THICKNESS	
FRONT	4.0 mm (.157 in)
REAR	4.0 mm (.157 in)

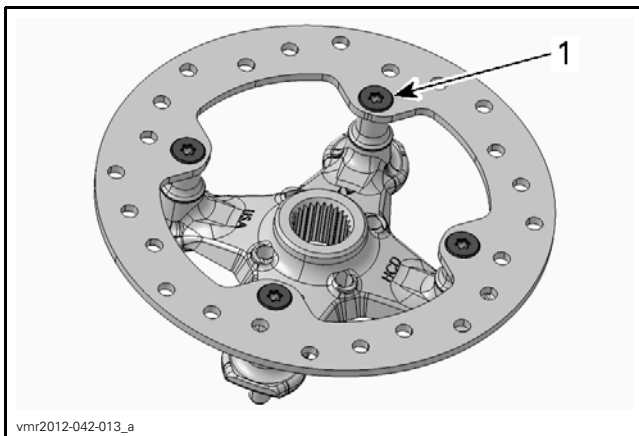
NOTICE Brake discs must never be machined.

- 3. Check warpage of the disc.

MAXIMUM DISC WARPAGE	
FRONT	0.2 mm (.01 in)
REAR	

Brake Disc Replacement

- 1. Remove caliper, refer to *CALIPER REMOVAL* in this subsection.
- 2. Remove wheel hub, refer to *FRONT DRIVE* or *REAR DRIVE* subsection.
- 3. Remove screws securing brake disc to wheel hub.



1. Brake disc screw

4. Replace brake disc.
5. Install **NEW** brake disc screws.
6. Tighten brake disc screws to specification.

TIGHTENING TORQUE	
Brake disc screws	33.5 N•m ± 3.5 N•m (25 lbf•ft ± 3 lbf•ft)

7. Install wheel hub then caliper.
8. Install **NEW** cotter pin to secure wheel hub nut.

BODY (450)

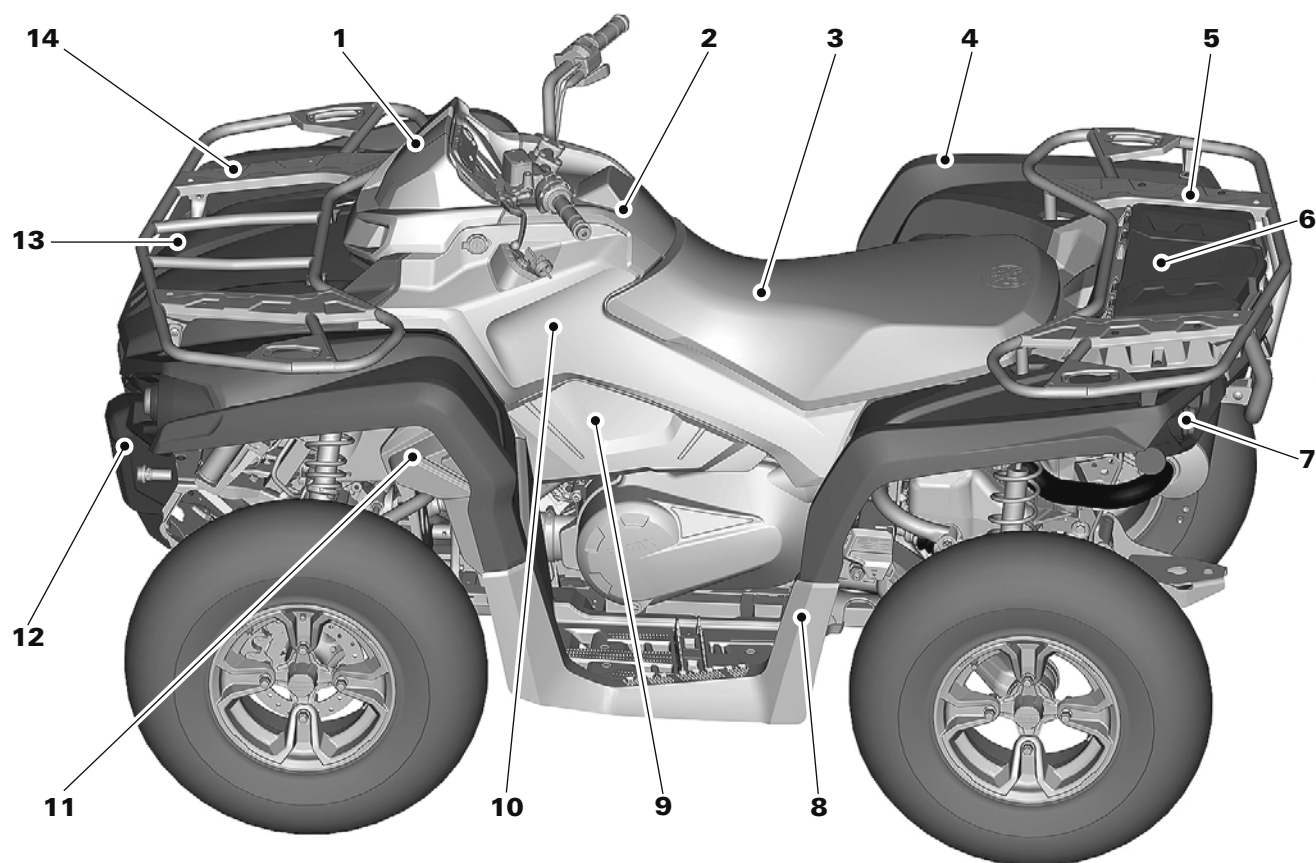
SERVICE TOOLS

Description	Part Number	Page
OETIKER PLIERS.....	295 000 070	709

Section 08 CHASSIS

Subsection 07 (BODY (450))

BODY PARTS NOMENCLATURE (SHORT MODEL)

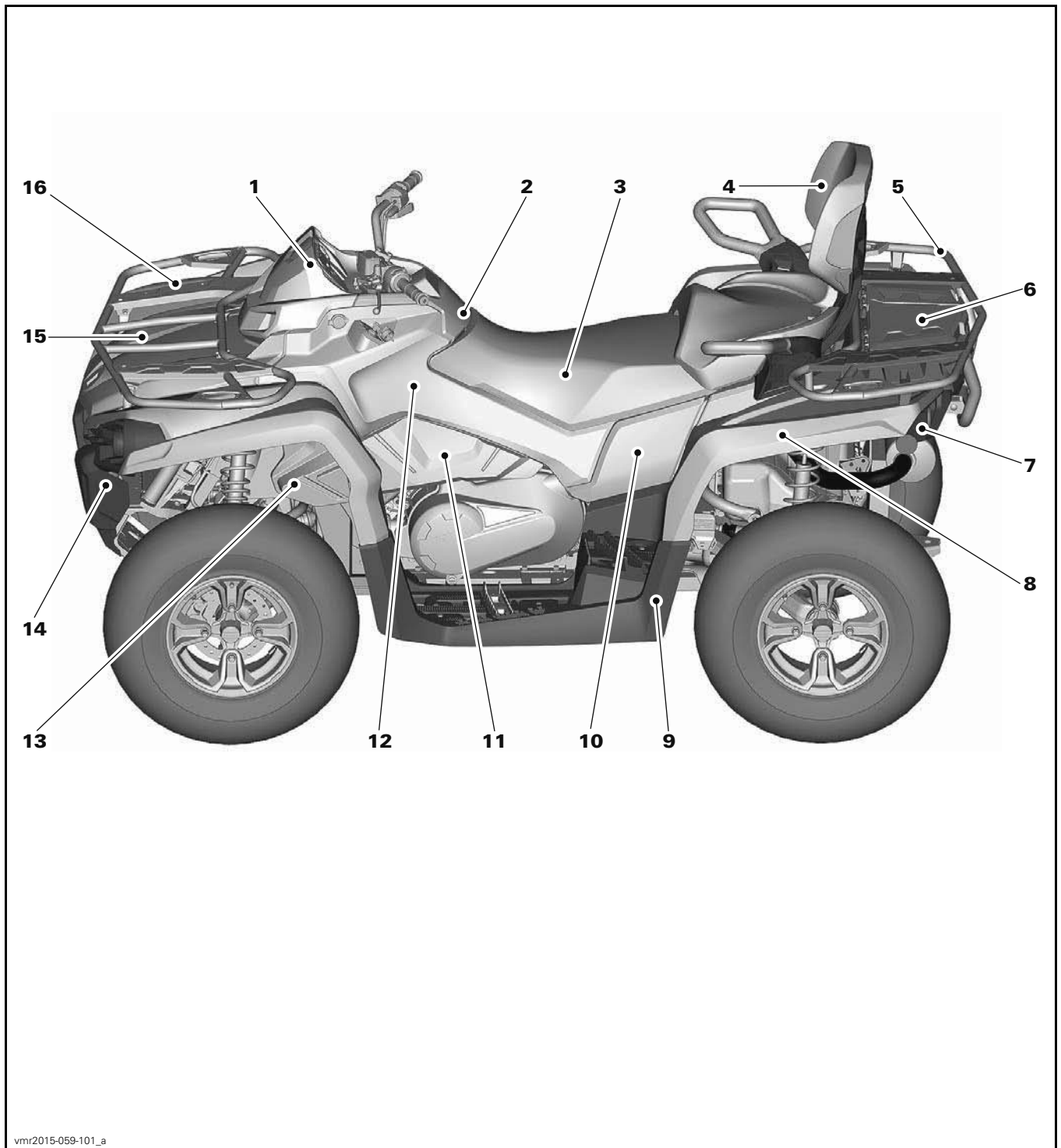


vmr2015-059-100_a

- 1. Gauge support
- 2. Console
- 3. Seat
- 4. Rear fender
- 5. Rear rack
- 6. Rear storage compartment
- 7. Rear fascia

- 8. Footrest panel
- 9. Side panel extension
- 10. Side panel
- 11. Inner fender panel
- 12. Front fascia
- 13. Front fender
- 14. Front rack

BODY PARTS NOMENCLATURE (MAX MODEL)



vmr2015-059-101_a

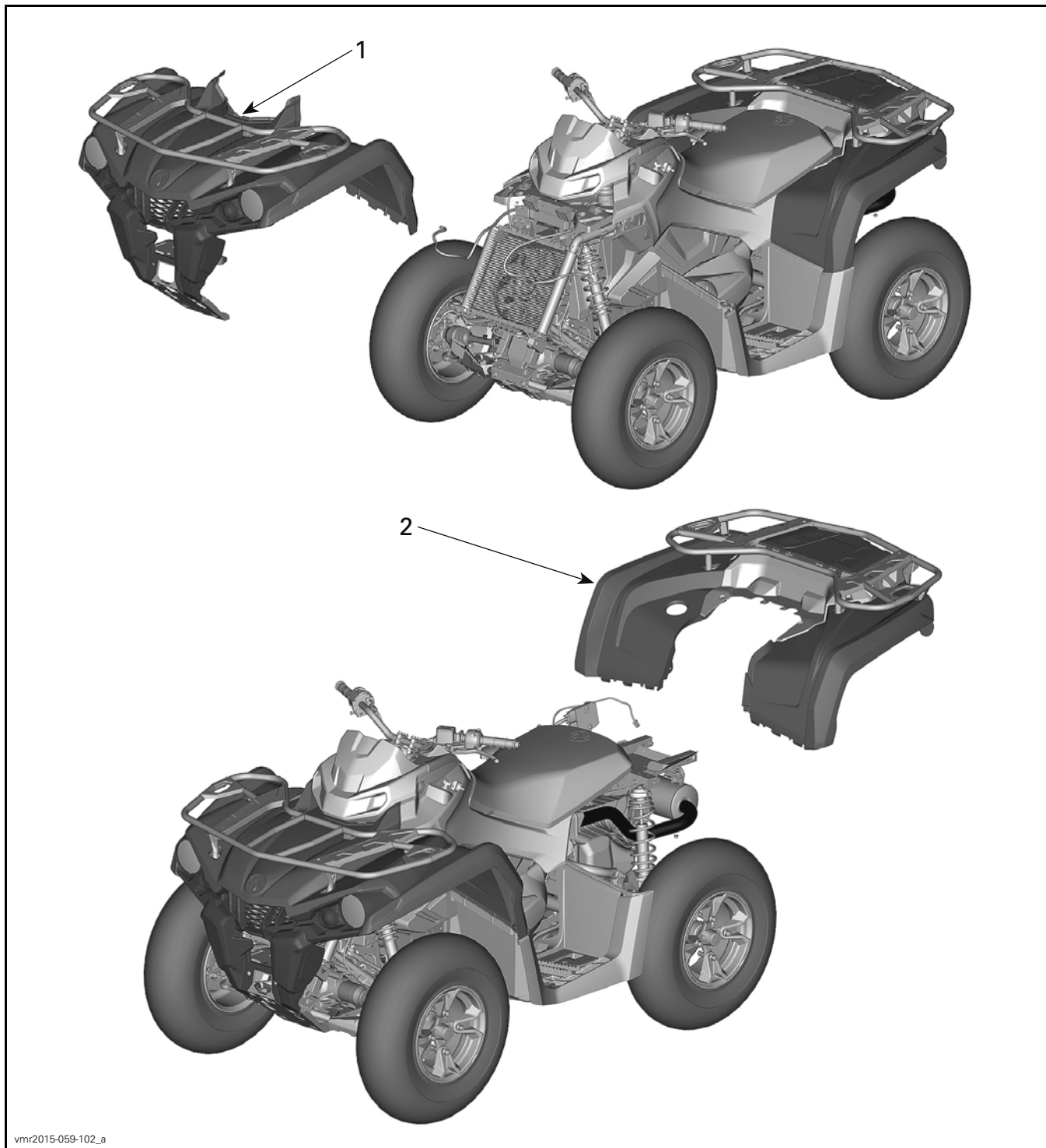
- 1. Gauge support
- 2. Console
- 3. Seat
- 4. Passenger seat
- 5. Rear rack
- 6. Rear storage compartment
- 7. Rear fascia
- 8. Rear Fender

- 9. Footrest panel
- 10. Rear side panel extension
- 11. Side panel extension
- 12. Side panel
- 13. Inner fender panels
- 14. Front fascia
- 15. Front fender
- 16. Front rack

Section 08 CHASSIS

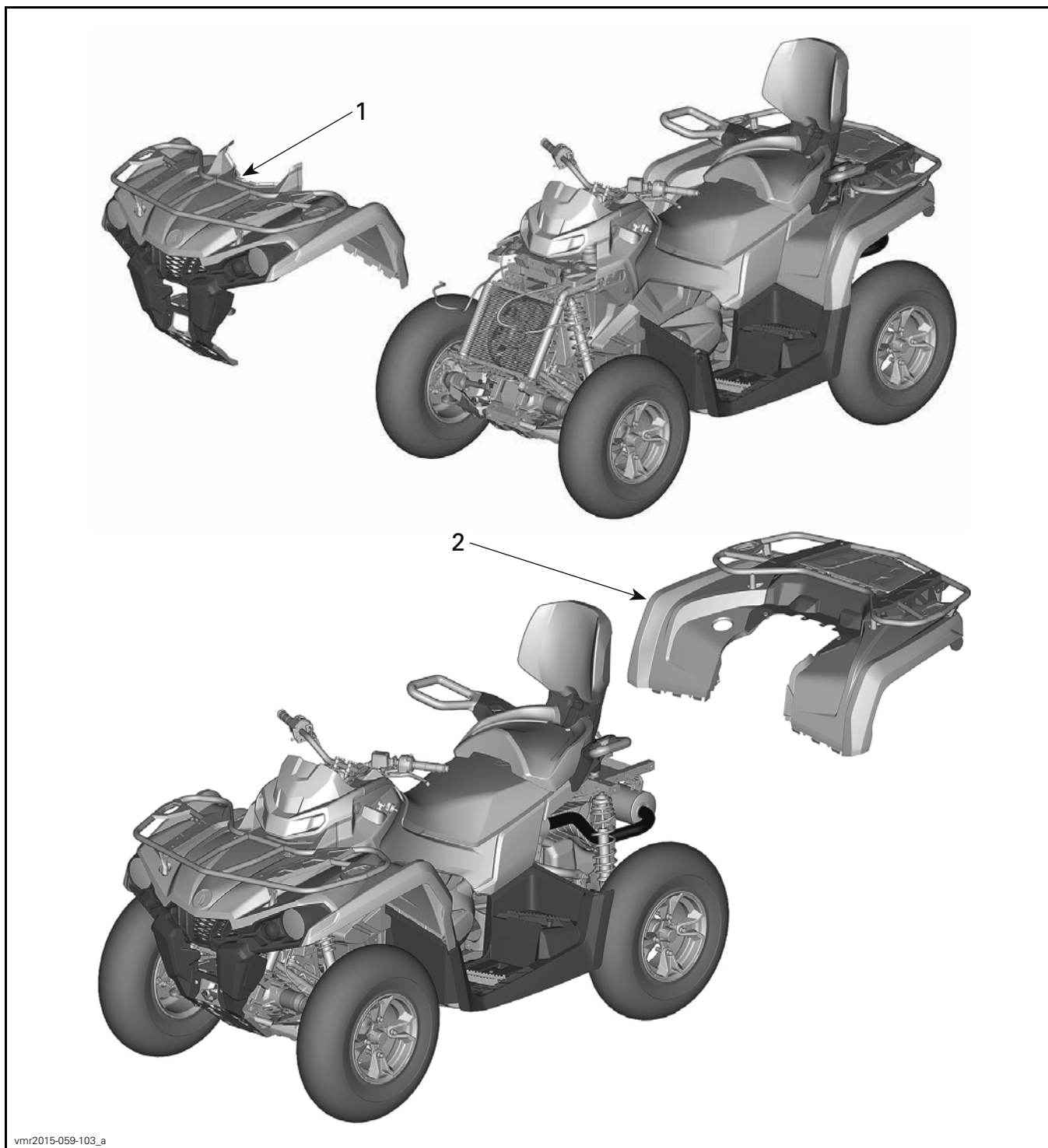
Subsection 07 (BODY (450))

FRONT AND REAR BODY MODULES (SHORT MODEL)



- 1. Front body module
- 2. Rear body module

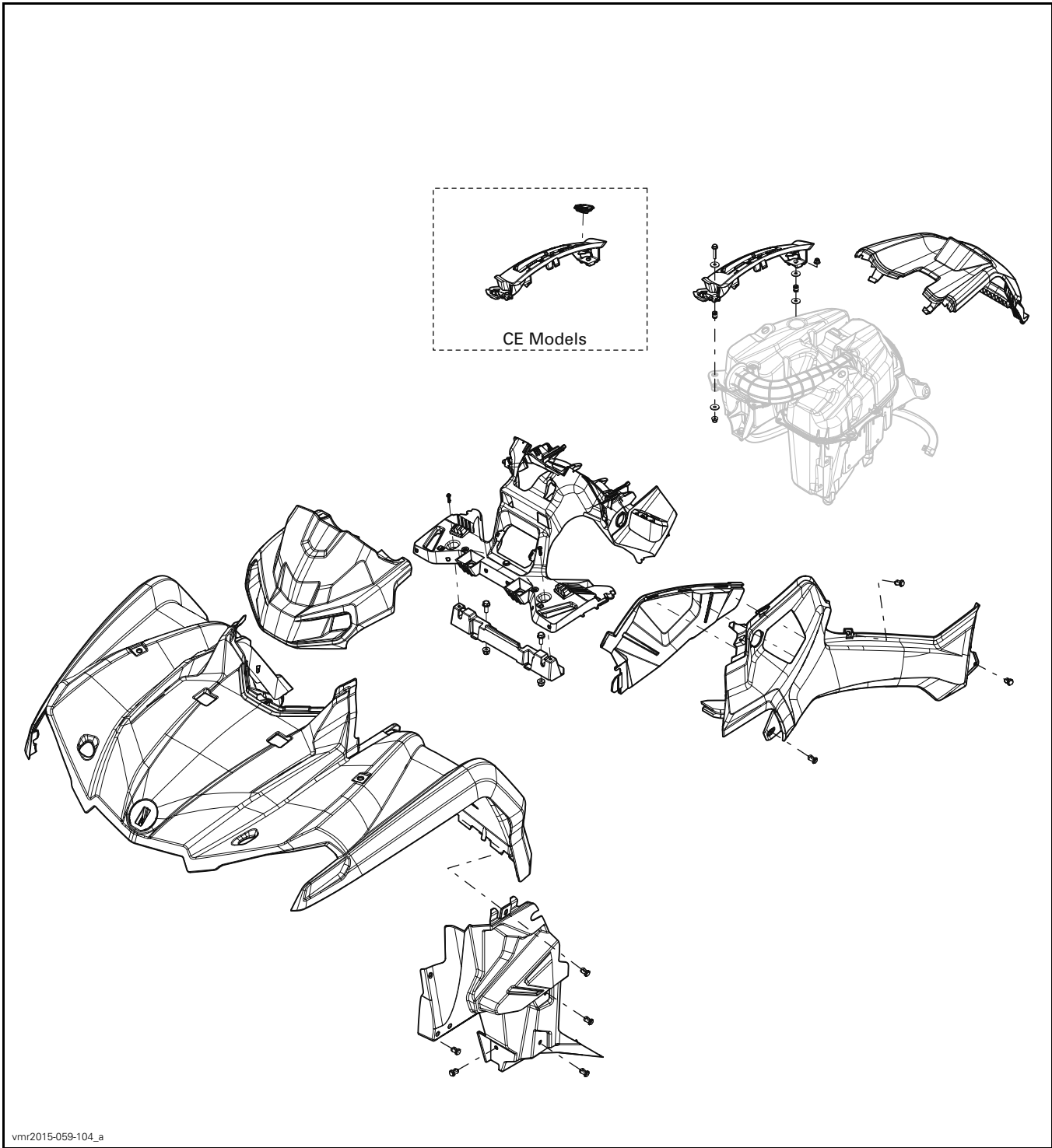
FRONT AND REAR BODY MODULES (MAX MODEL)



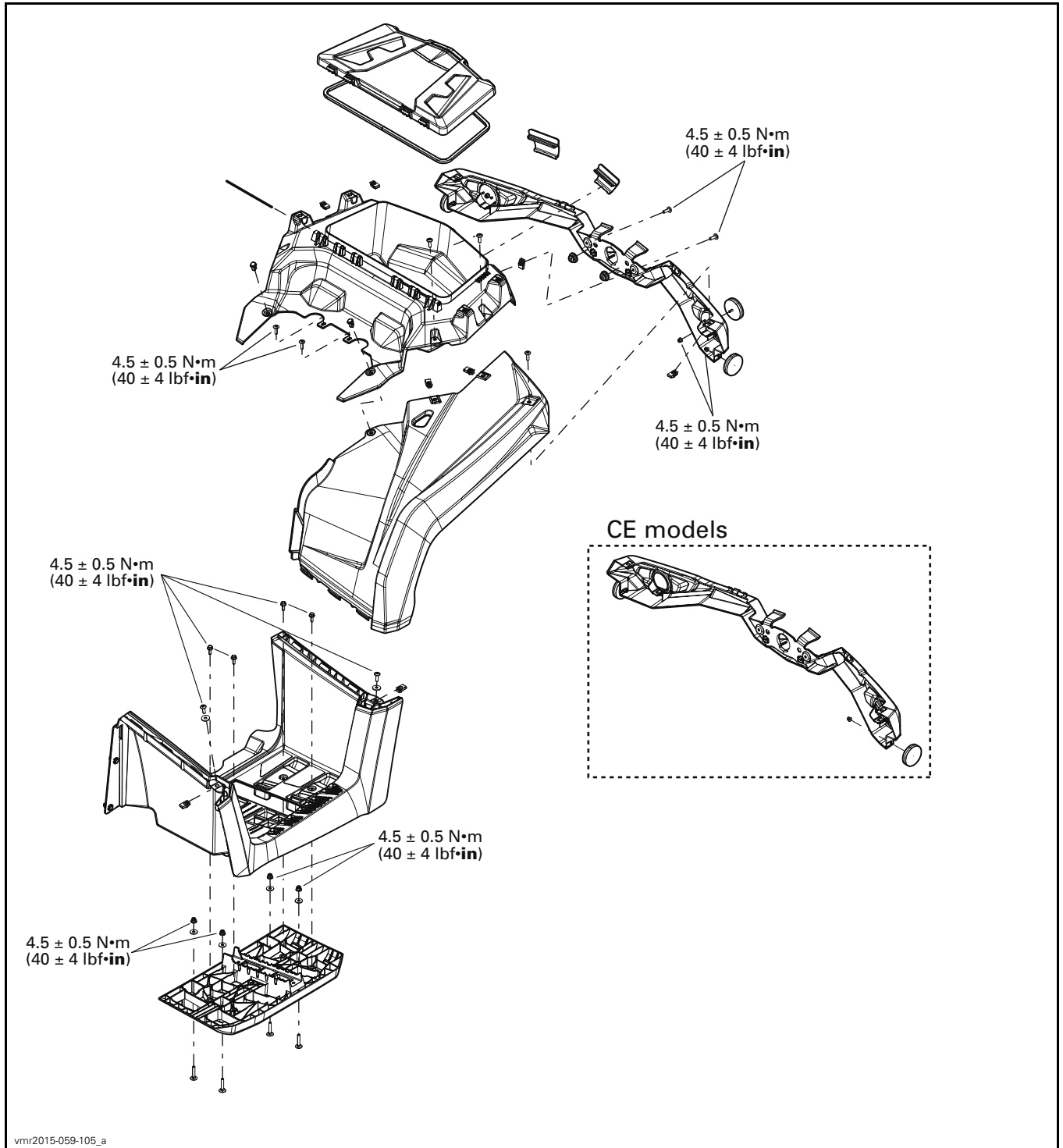
1. Front body module
2. Rear body module

BODY PARTS (SHORT MODEL)

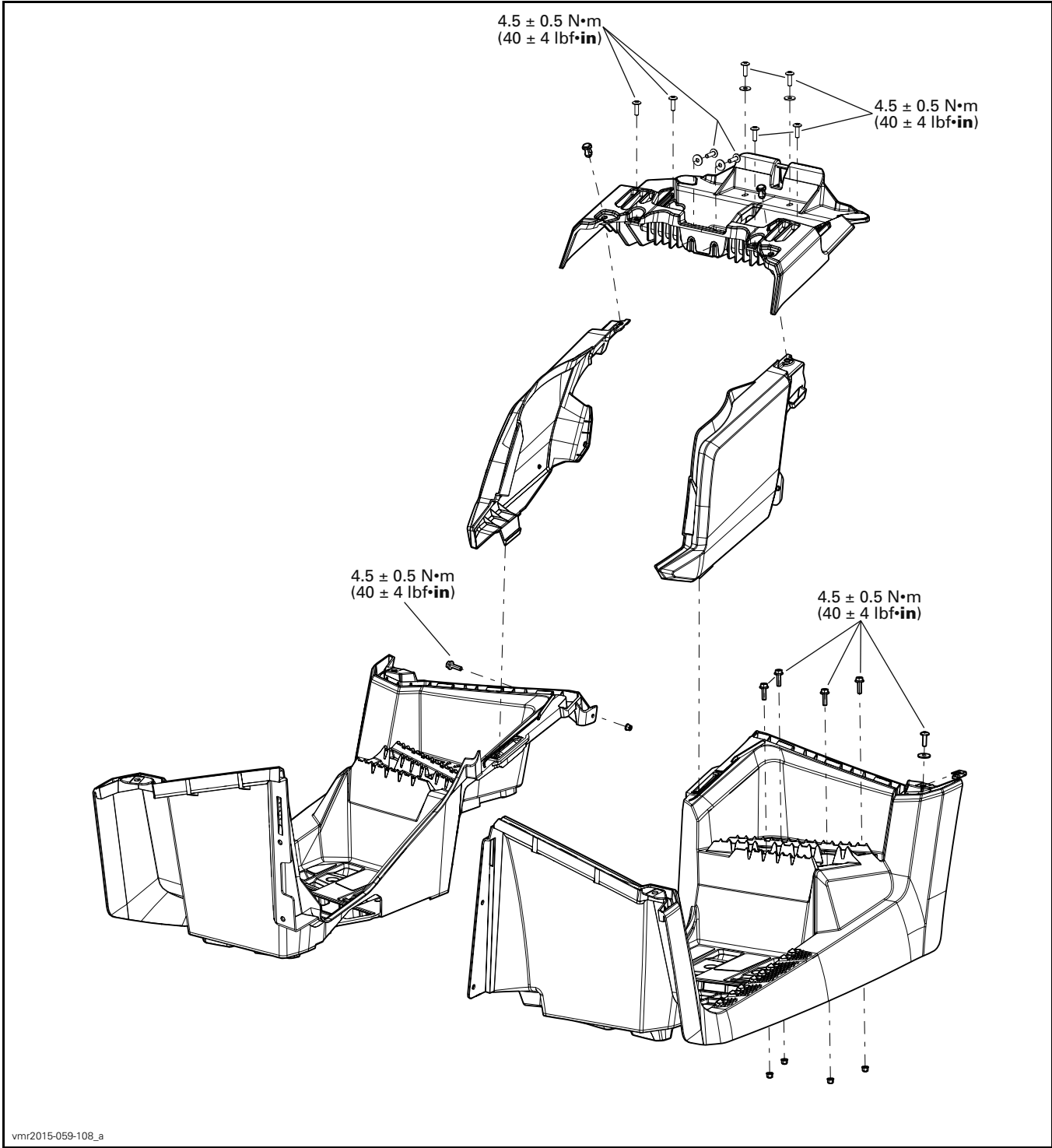
Please note that unless indicated, the procedure is the same for both sides.



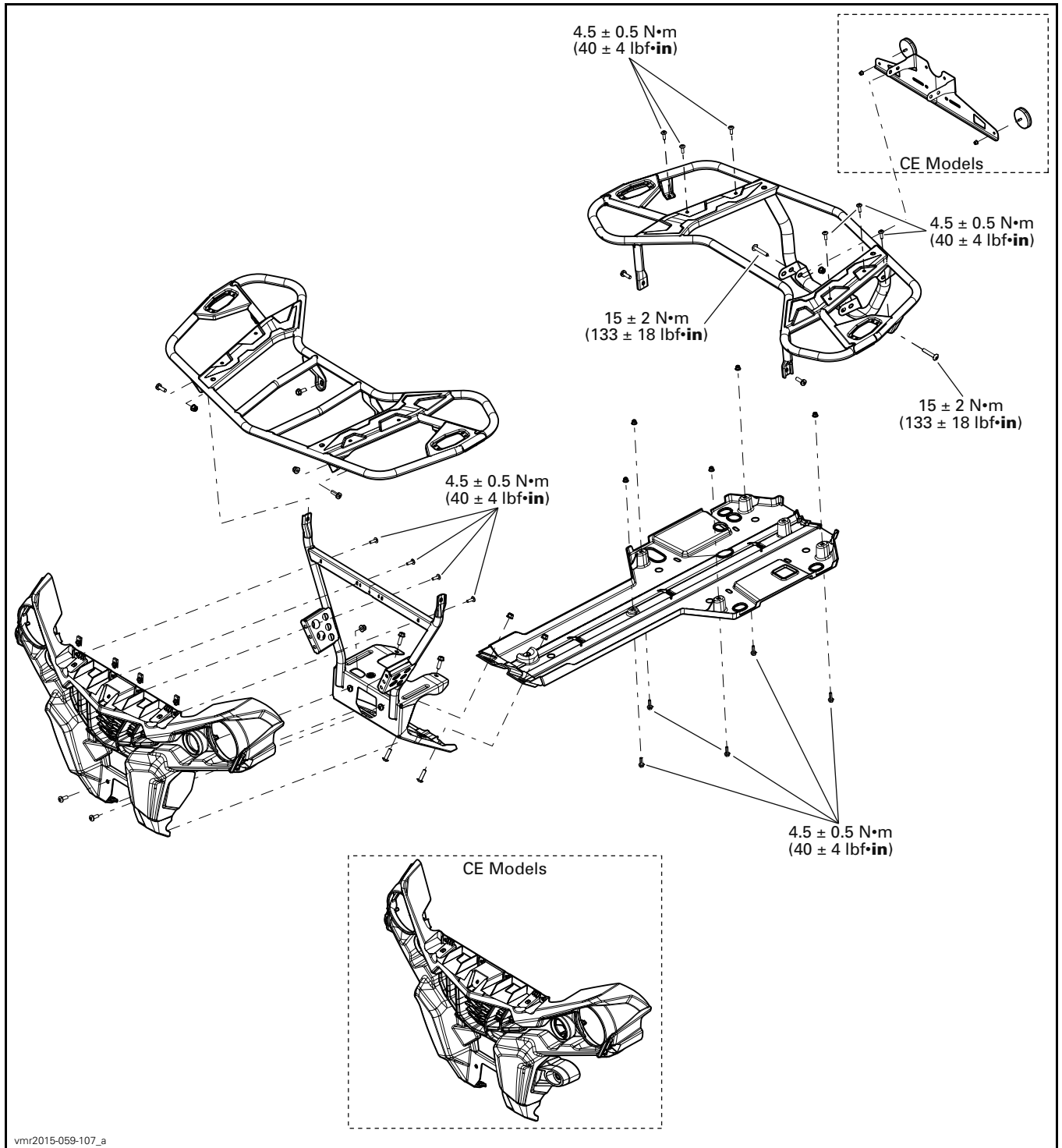
BODY PARTS (SHORT MODEL)



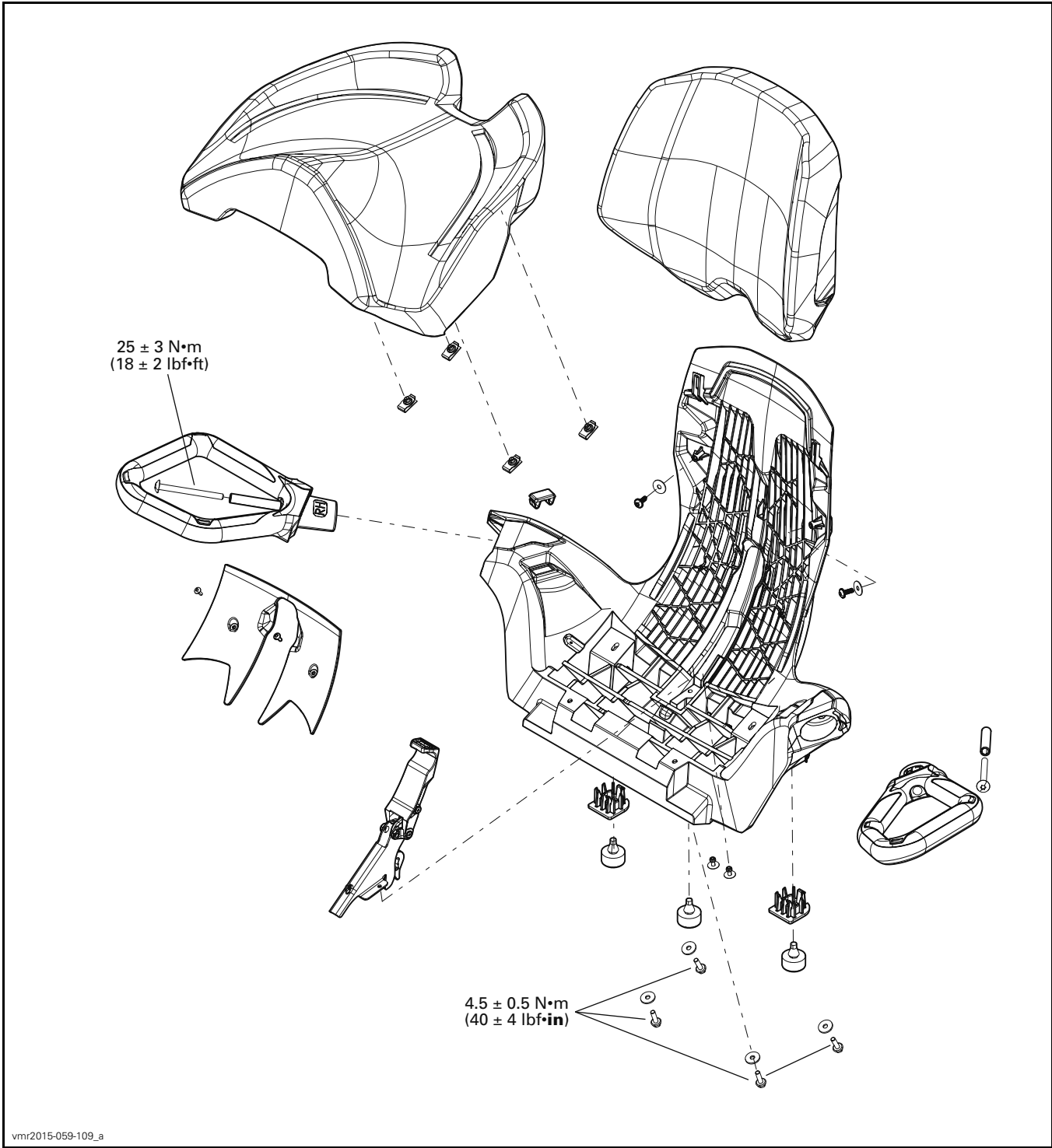
BODY PARTS (MAX MODEL)



RACKS AND BODY PARTS



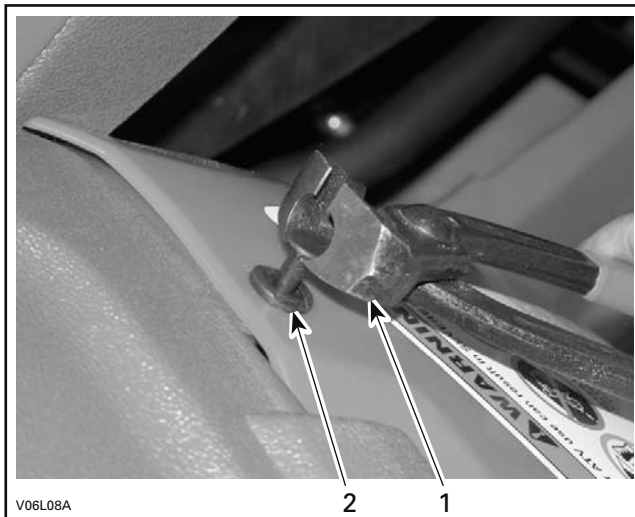
PASSENGER SEAT



PROCEDURES

PLASTIC RIVET

Plastic rivets are used in the riveting of the various body parts. Plastic rivets can be reused many times. Use the OETIKER PLIERS (P/N 295 000 070) to remove them.



TYPICAL
1. Pliers
2. Plastic rivet

DECALS

Decal Removal

Using a heat gun warm up one end of decal for a few seconds until decal can roll off when rubbing with your finger.

Pull decal slowly and when necessary apply more heat to ease removal on the area that has to be peeled off.

If decal tears while pulling off, it has to be heated for a few seconds longer. If decal tends to stretch while pulling off, stop heating and wait a few seconds to let it cool, then peel it off.

Decal Installation

Using isopropyl alcohol, clean the surface and dry thoroughly.

Apply liquid soap to new decal and carefully position it. Using a sponge or a squeegee, remove the air bubbles and surplus water working from the center toward the edges. Allow to air dry.

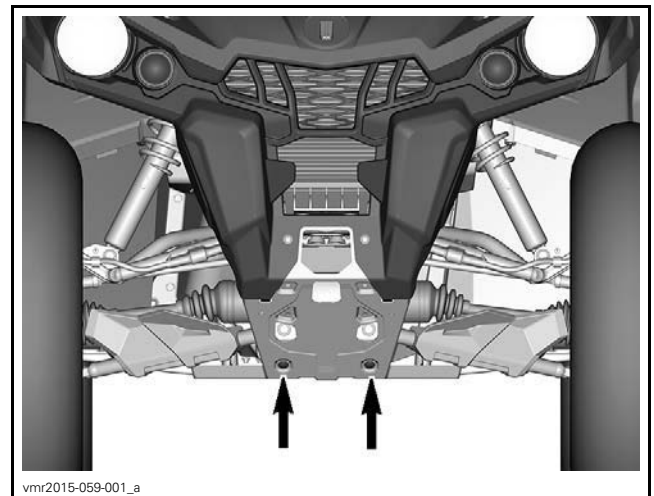
NOTICE Do not apply isopropyl alcohol or solvent directly on decals. Use these products in a well ventilated area.

FRONT BODY MODULE

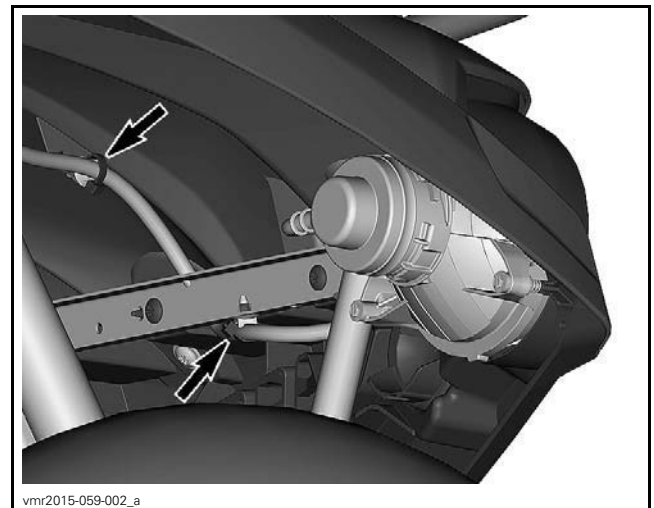
Front Body Module Removal

NOTE: Unless indicated, RH side shown on illustrations.

1. Disconnect battery negative (-) cable.
2. Remove the following panels, see procedure in this subsection:
 - *SIDE PANELS*
 - *INNER FENDER PANELS.*
3. Remove front skid plate retaining screws.



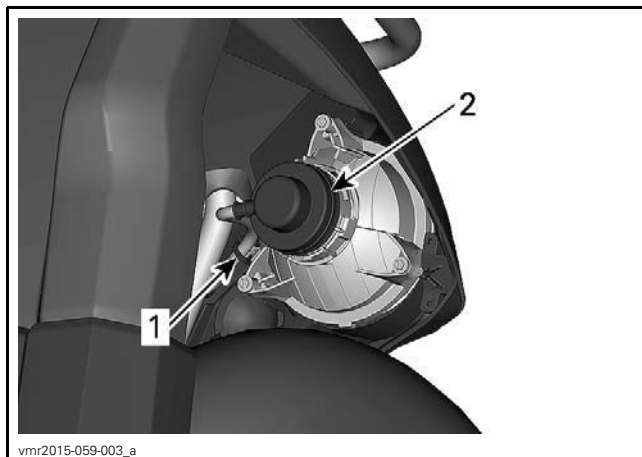
4. Remove locking ties securing headlights harness to subframe.



5. Disconnect headlights connectors.

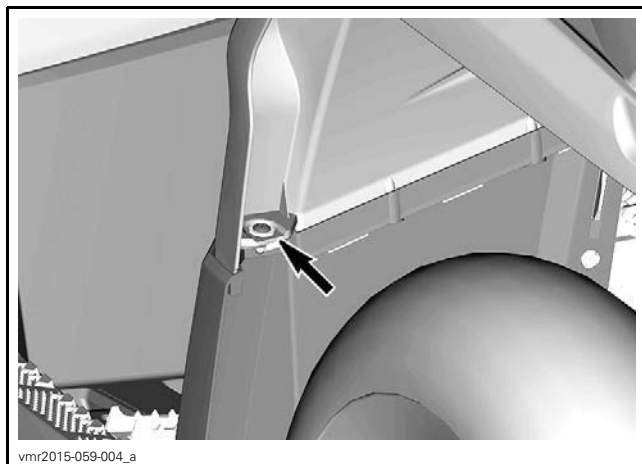
Section 08 CHASSIS

Subsection 07 (BODY (450))

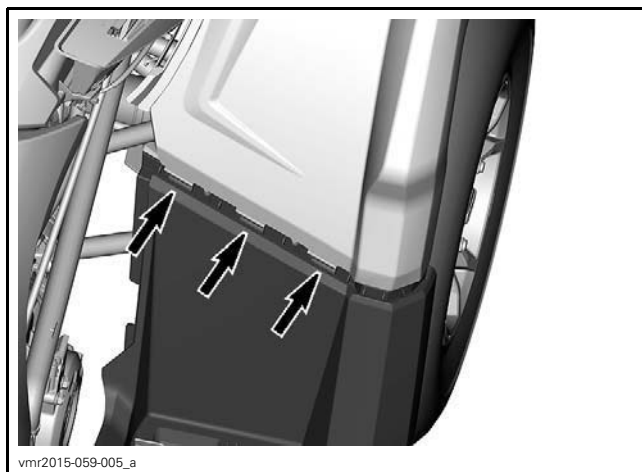


1. Locking tie
2. Headlight connectors

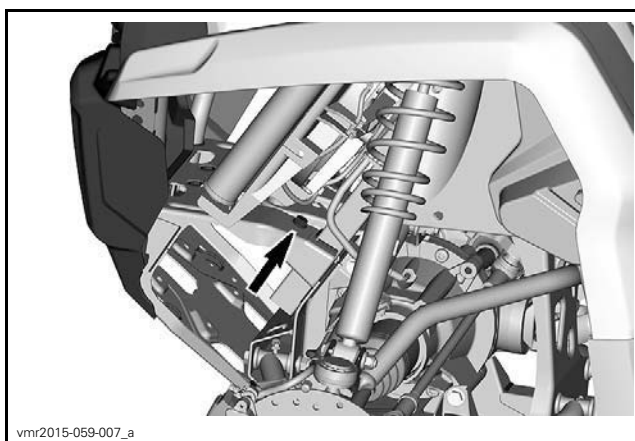
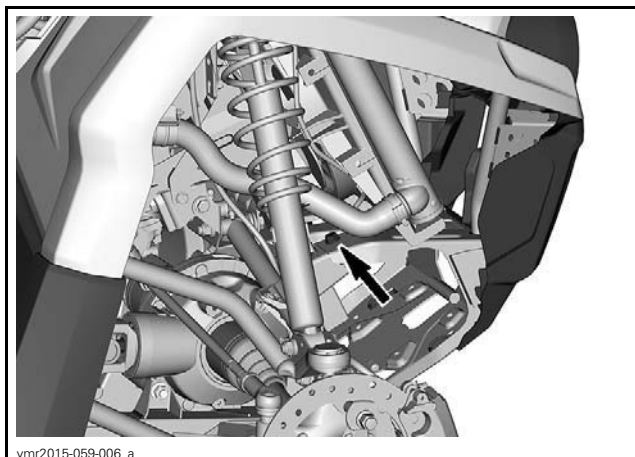
6. Remove screw securing front fender to footrest panel (on both sides).



7. Detach front fender from footrest panel by releasing retaining tabs (on both sides).

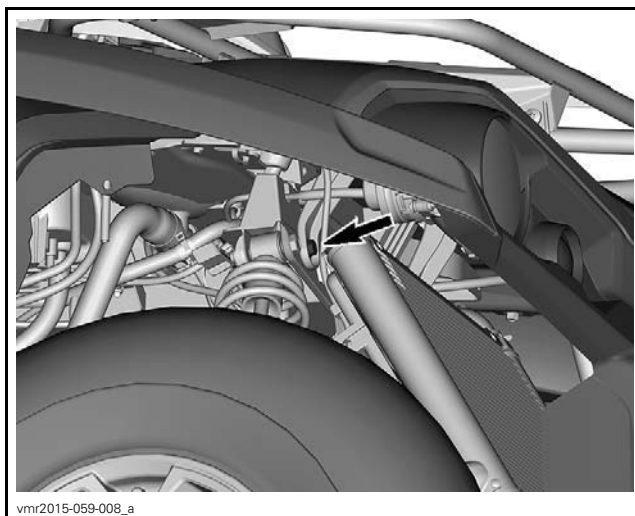


8. Remove screws securing front body module to frame.



LH SIDE

9. Remove screws securing front rack to frame.



10. With the assistance of a person, pull front body module forward.

11. Install front body module on a stable and clean support.

Front Body Module Installation

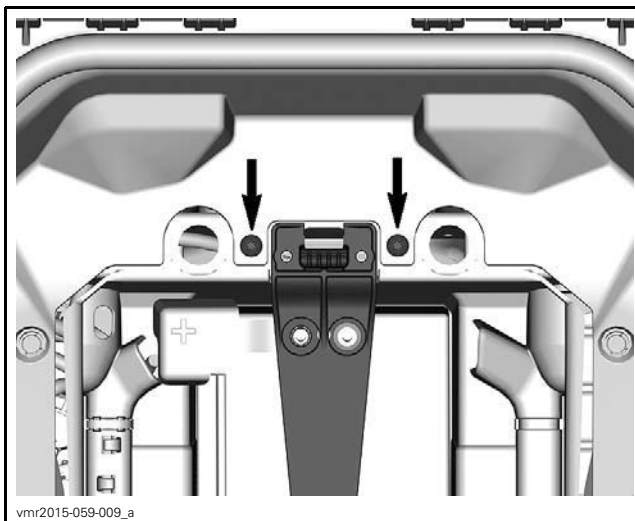
The installation is the reverse of the removal procedure. However, pay attention to the following. Tighten front fender screws to specification.

TIGHTENING TORQUE	
Screws securing footrest panels to front fender	4.5 N•m ± 0.5 N•m (40 lbf•in ± 4 lbf•in)

REAR BODY MODULE

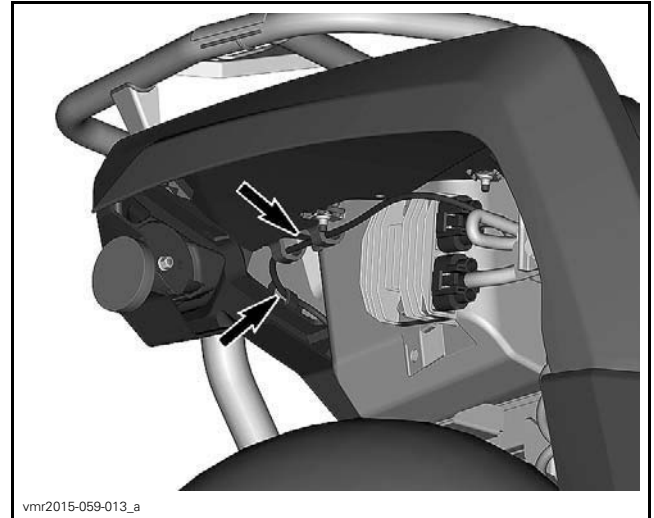
Rear Body Module Removal

1. Remove seat.
2. Remove the following panels, see procedure in this subsection:
 - *PASSENGER SEAT HOLDER (MAX MODELS)*
 - *SIDE PANELS.*
3. On **Short Models**, remove rear storage compartment retaining screws.

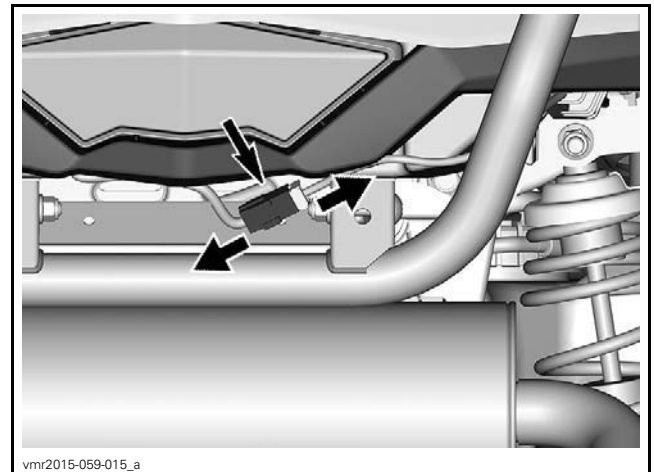


TOP VIEW

4. Release taillight harness from the rear fender tabs.

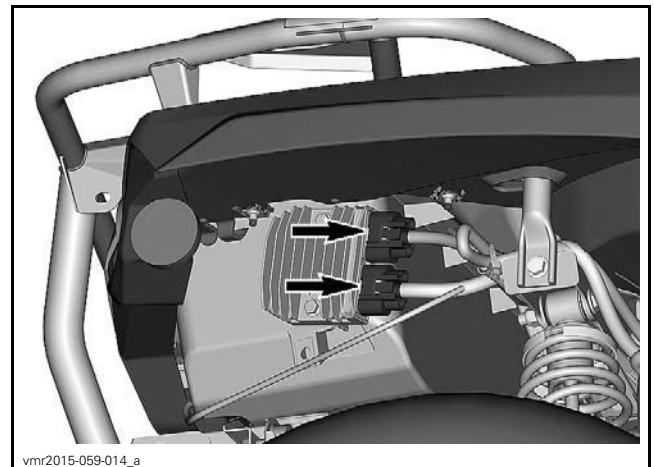


5. Disconnect taillight connector.

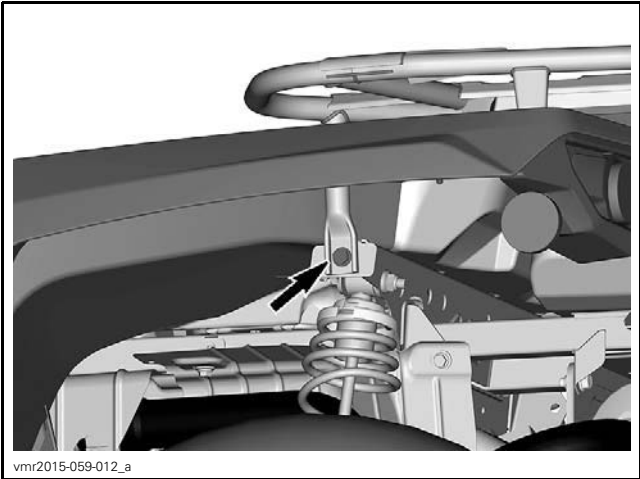


REAR VIEW

6. Disconnect connectors from voltage regulator rectifier.

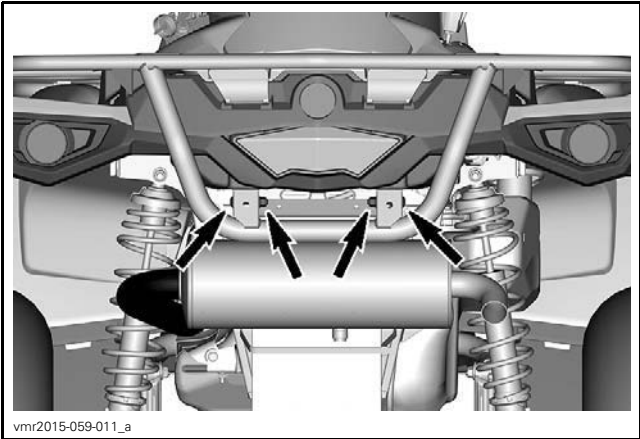


7. Remove rear rack upper retaining screws.



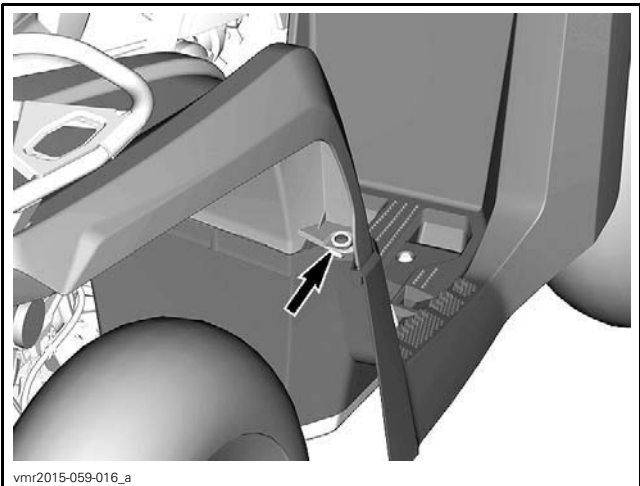
LH SIDE SHOWN

8. Remove rear rack lower retaining screws and nuts.



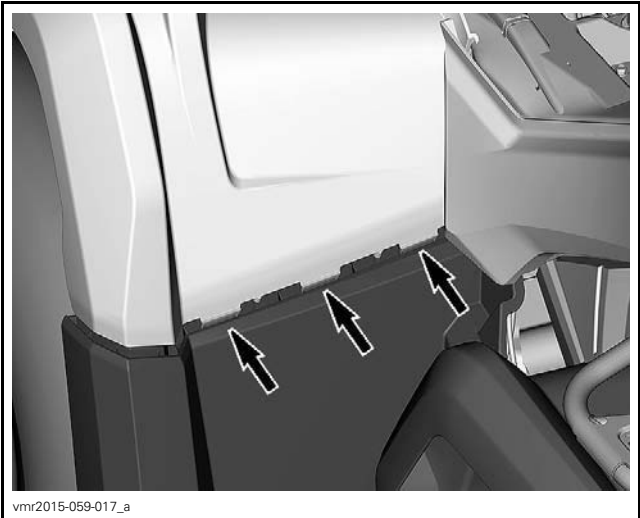
REAR VIEW

9. Remove screw securing rear fender to footrest panel (on both sides).



SHORT MODEL SHOWN

10. Detach rear fender from footrest panel by releasing retaining tabs (on both sides).



SHORT MODEL SHOWN

11. Remove fuel tank cap.
12. Place a **clean** rag into fuel tank filler tube.
13. With the assistance of a person, pull rear body module rearward.
14. Install rear body module on a stable and clean support.
15. Remove rag and reinstall fuel tank cap.

 **WARNING**

Fuel vapors are flammable and explosive under certain conditions. Unless otherwise noted, the fuel tank cap must always be installed on vehicle.

Rear Body Module Installation

The installation is the reverse of the removal procedure. However, pay attention to the following. Tighten rear body module retaining screws to specification.

TIGHTENING TORQUE	
Rear rack lower screws	15 N•m ± 2 N•m (133 lbf•in ± 18 lbf•in)

Tighten rear fender screws to specification.

TIGHTENING TORQUE	
Screws securing footrest panels to rear fenders	4.5 N•m ± 0.5 N•m (40 lbf•in ± 4 lbf•in)

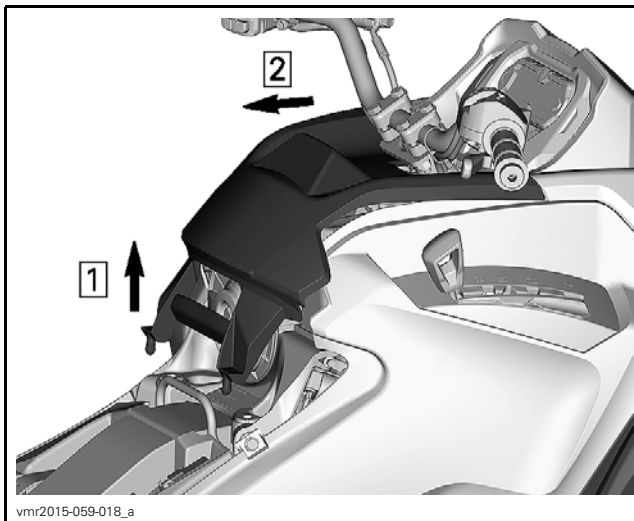
Tighten rear storage compartment to specification.

TIGHTENING TORQUE	
Rear storage compartment screws	4.5 N•m ± 0.5 N•m (40 lbf•in ± 4 lbf•in)

CONSOLE

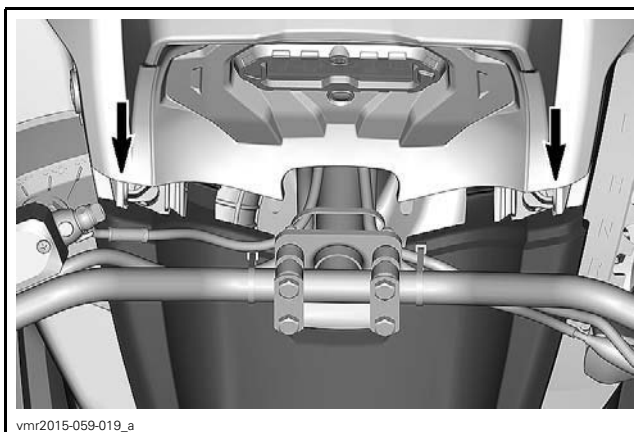
Console Removal

1. Remove seat.
2. Lift rear portion of console upwards.
3. Pull console rearwards.



Console Installation

The installation is the reverse of the removal procedure. However, pay attention to the following. Align console front tabs with slots, then push console forward.



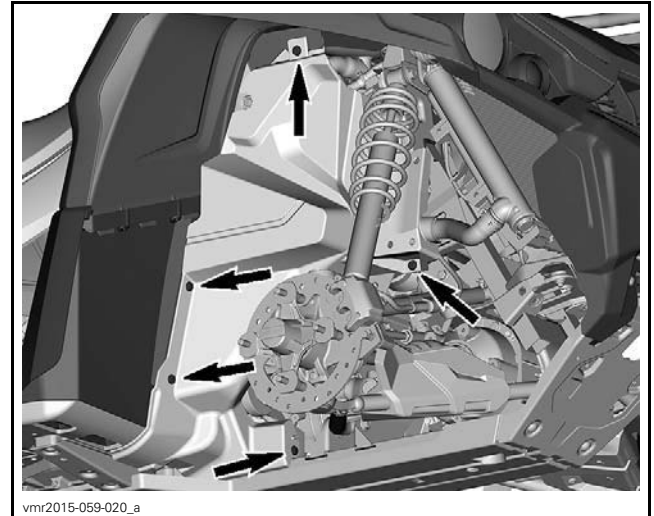
GAUGE SUPPORT

Refer to *LIGHTS, GAUGE AND ACCESSORIES* subsection.

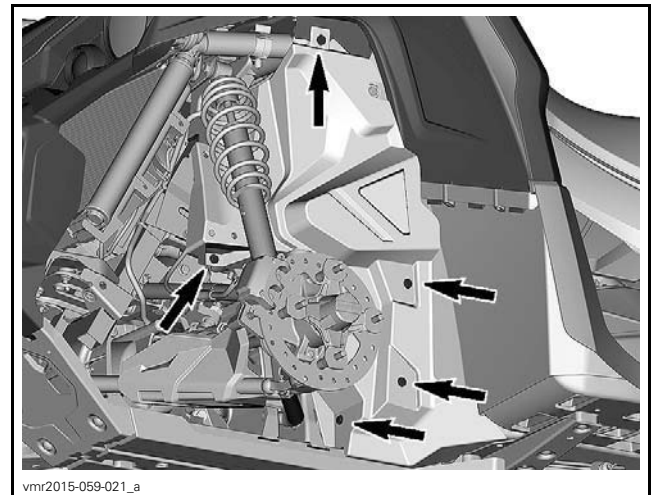
INNER FENDER PANELS

Inner Fender Removal and Installation

Remove plastic rivets from inner fender panels.



WHEEL REMOVED FOR CLARITY



LH SIDE SHOWN, WHEEL REMOVED FOR CLARITY

The installation is the reverse of the removal procedure.

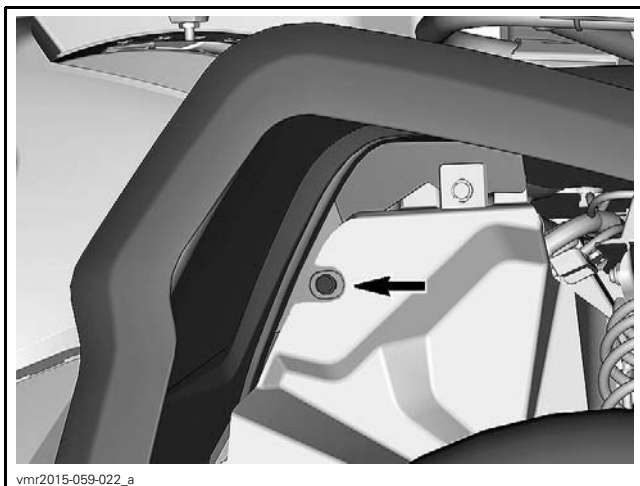
SIDE PANELS

Side Panel Removal

1. Remove following panels, see procedures in this subsection:
 - *CONSOLE*
 - *PASSENGER SEAT HOLDER* (MAX models).
2. Remove *GAUGE SUPPORT*. Refer to *LIGHTS, GAUGE AND ACCESSORIES* subsection.
3. Remove plastic rivet securing side panel to inner fender panel.

Section 08 CHASSIS

Subsection 07 (BODY (450))



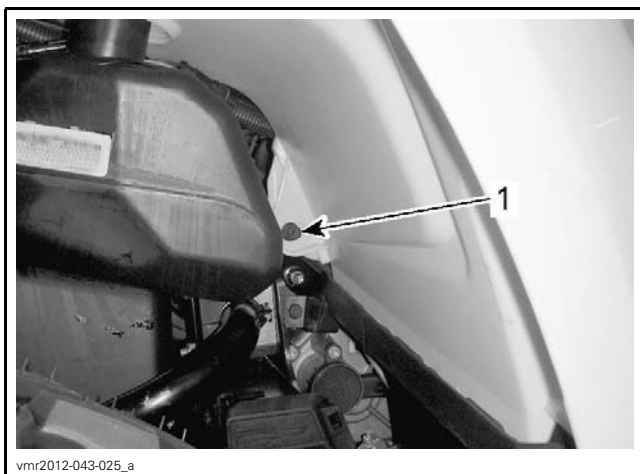
4. Remove plastic rivet securing side panel to air filter housing.



1. Plastic rivet securing side panel

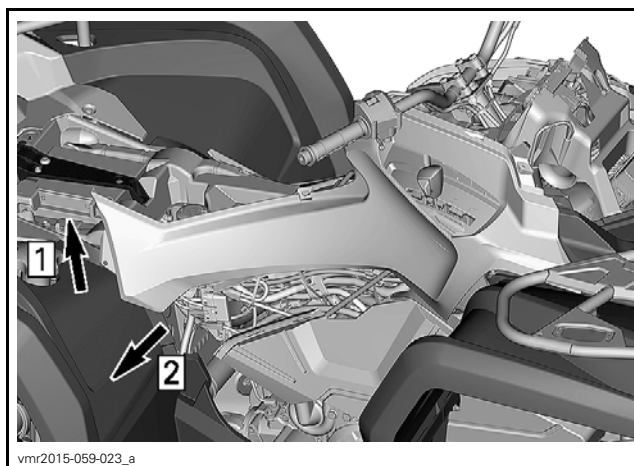
Short Models

5. Remove plastic rivet securing side panel to rear fender.



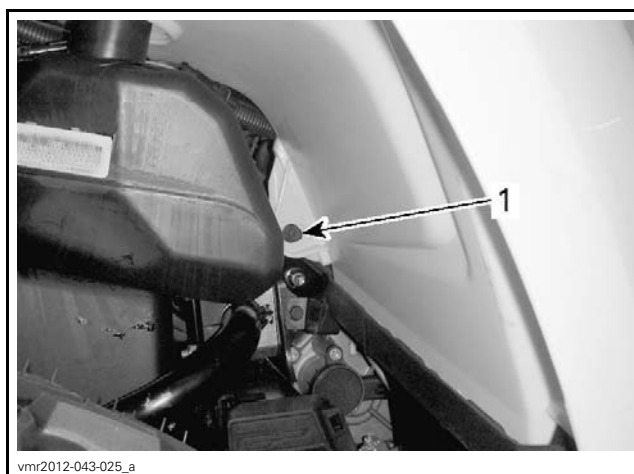
1. Plastic rivet securing side panel

6. Lift rear portion of side panel assembly then pull it towards outside.



MAX Models

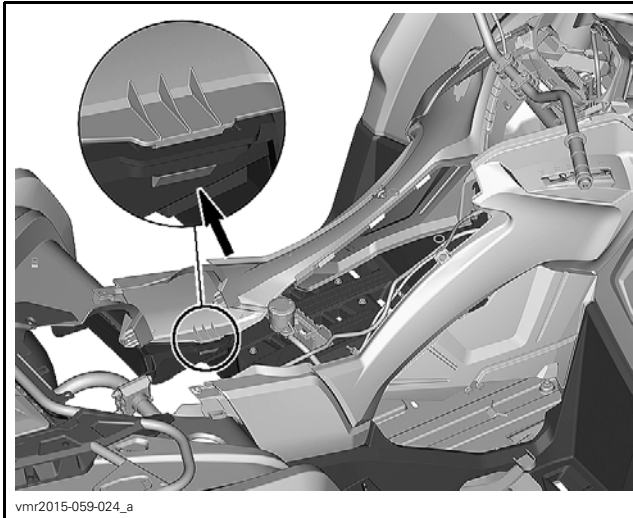
7. Remove plastic rivet securing rear side panel extension to rear fender.



1. Plastic rivet securing side panel

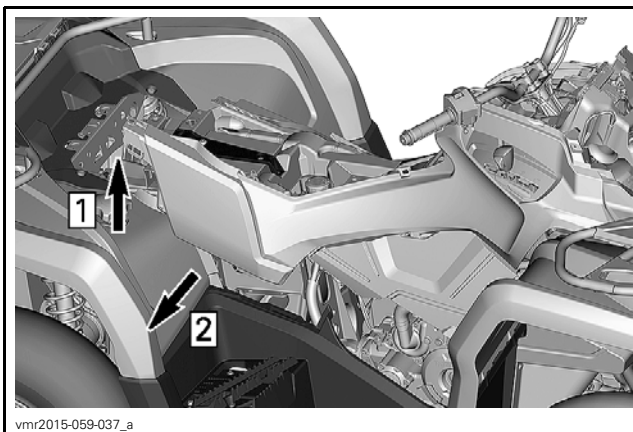
8. Remove passenger seat holder. See procedure in this subsection.

9. Detach rear side panel extension from footrest panel by releasing retaining tab.



FRAME AND ENGINE REMOVED FOR CLARITY

10. Lift rear portion of side panel assembly then pull it towards outside.



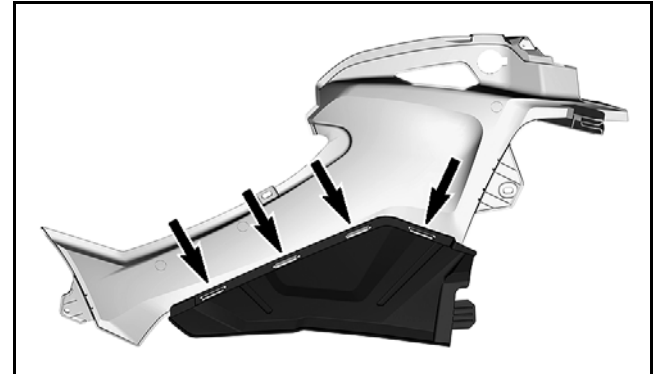
Side Panel Installation

The installation is the reverse of the removal procedure. However, pay attention to the following. Align side panel front tab with slot, then push side panel forward.

PANEL EXTENSIONS

Panel Extension Removal

1. Remove seat.
2. Remove *GAUGE SUPPORT*. Refer to *LIGHTS, GAUGE AND ACCESSORIES* subsection.
3. Remove following panels, see procedures in this subsection:
 - *CONSOLE*
 - *PASSENGER SEAT HOLDER* (MAX models)
 - *SIDE PANEL*.
4. Undo tabs securing panel extension to side panel.



BACK OF PANEL SHOWN

5. Remove panel extension.

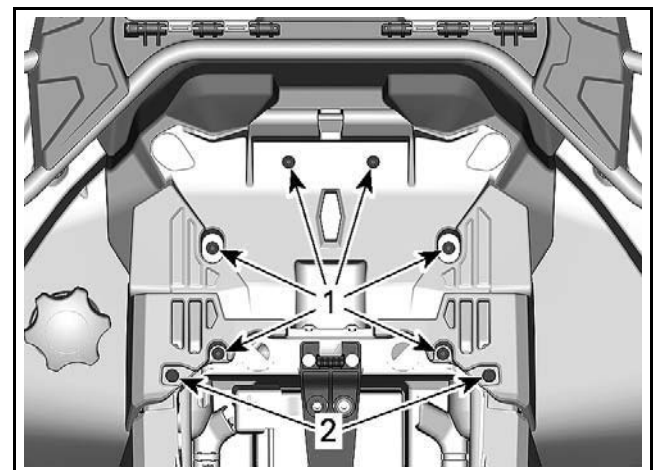
Panel Extension Installation

Installation is the reverse of removal.

PASSENGER SEAT HOLDER (MAX MODELS)

Passenger Seat Holder Removal

1. Remove driver and passenger seats.
2. Remove retaining screws securing passenger seat holder and rear storage compartment to frame.
3. Remove plastic rivets securing passenger seat holder to rear side panel extensions.



1. Screws
2. Plastic rivets

Passenger Seat Holder Installation

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

Tighten passenger seat holder retaining screws to specification.

Section 08 CHASSIS
Subsection 07 (BODY (450))

TIGHTENING TORQUE	
Passenger seat holder retaining screws	4.5 N•m ± 0.5 N•m (40 lbf•in ± 4 lbf•in)

REAR SIDE PANEL EXTENSIONS (MAX MODEL)

Rear Side Panel Extension Removal

1. Remove driver and passenger seats.
2. Remove the following panels, see procedures in this subsection:
 - *PASSENGER SEAT HOLDER*
 - *SIDE PANEL*.
3. Unclip retaining tab securing rear side panel extension to side panel.

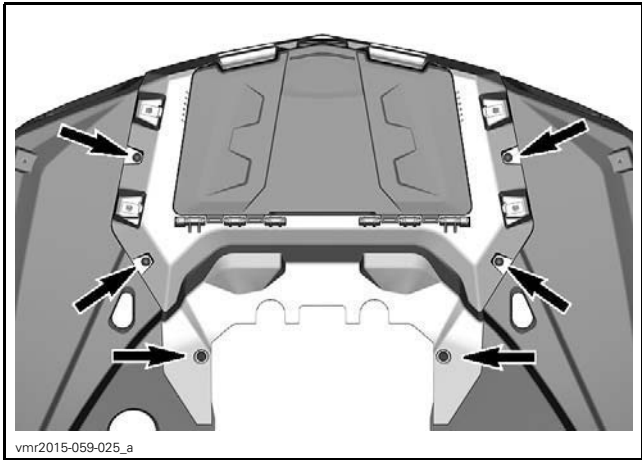
Rear Side Panel Extension Installation

Installation is the reverse of removal.

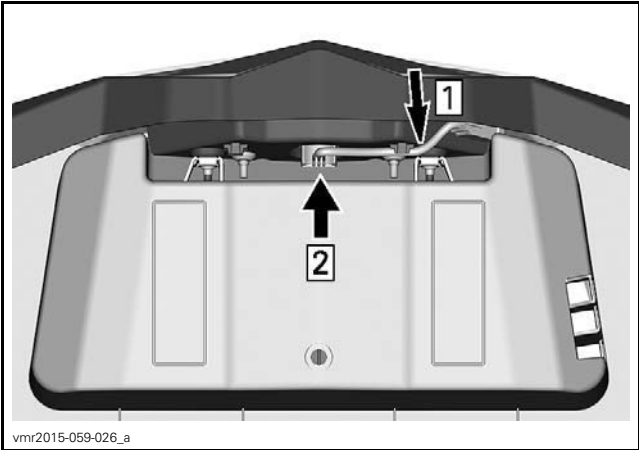
REAR STORAGE COMPARTMENT

Rear Storage Compartment Removal

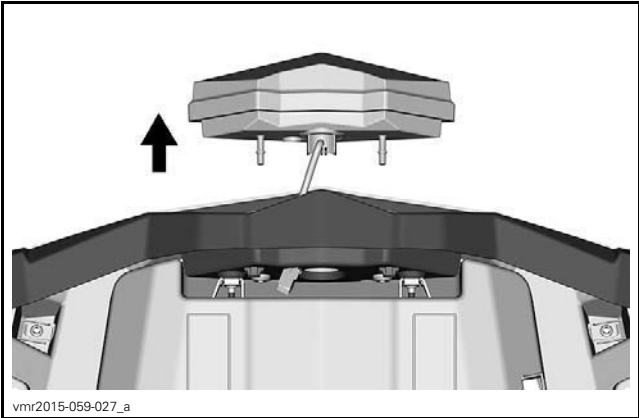
1. Remove seat.
2. Remove rear body module. Refer to *REAR BODY MODULE*.
3. Remove rear rack. Refer to *REAR RACK REMOVAL*.
4. Remove retaining screws and plastic rivets securing rear storage compartment to rear fenders.



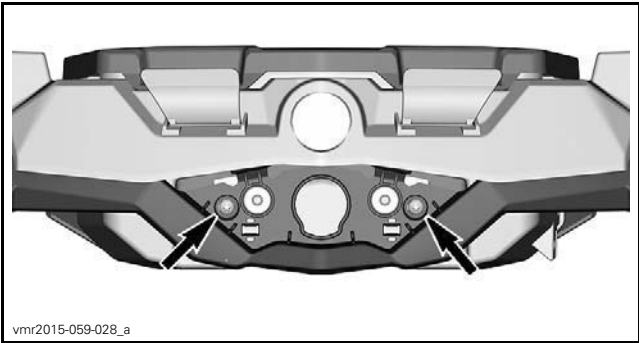
5. Remove taillight from rear fascia.



BOTTOM UP VIEW OF THE STORAGE COMPARTMENT
Step 1: Gently pull on taillight harness from rear fascia clip
Step 2: Push on the taillight from behind the fascia towards the rear



6. Remove retaining screws securing rear fascia to rear storage compartment.



Rear Storage Compartment Installation

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

Tighten rear storage compartment retaining screws to specification.

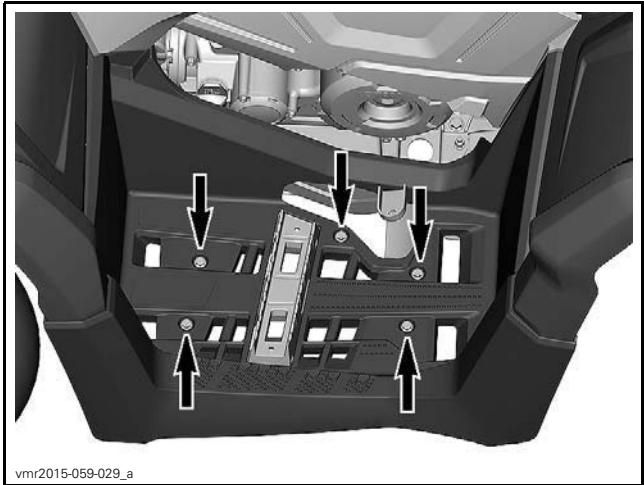
TIGHTENING TORQUE	
Rear storage compartment retaining screws	4.5 N•m ± 0.5 N•m (40 lbf•in ± 4 lbf•in)

FOOTREST PANELS

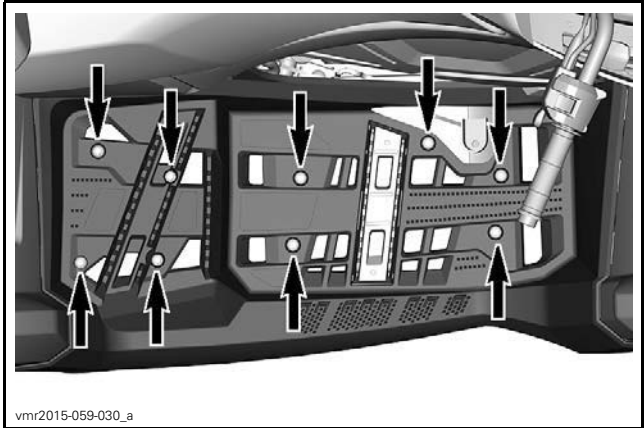
Footrest Panel Removal

Short Models

1. Remove footrest panel retaining screws.

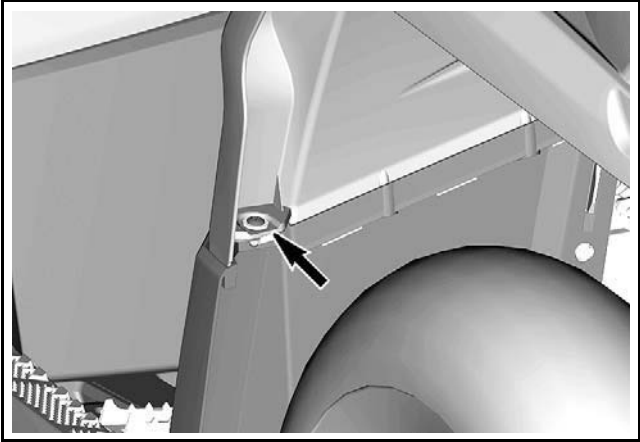


SHORT MODELS

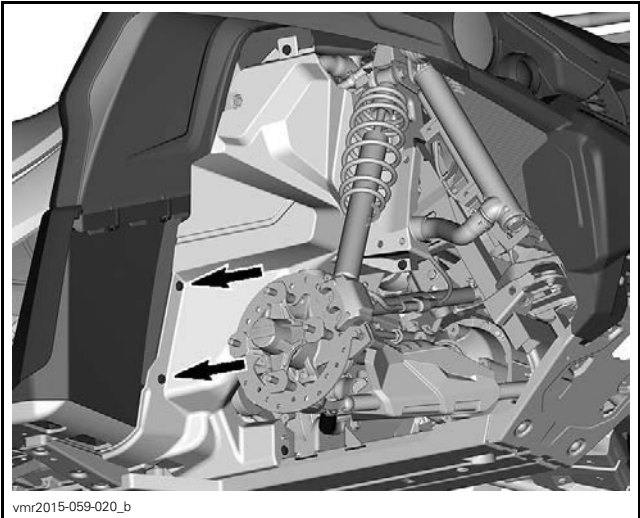


MAX MODELS

2. Remove screw securing front fender to footrest panel.

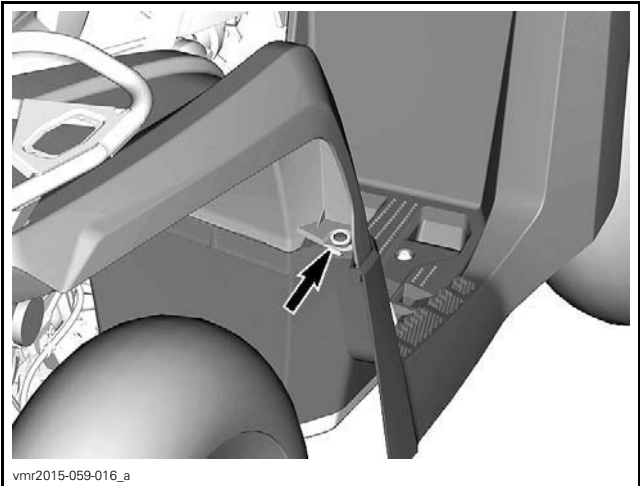


3. Remove both plastic rivet securing inner fender panel to footrest panel.



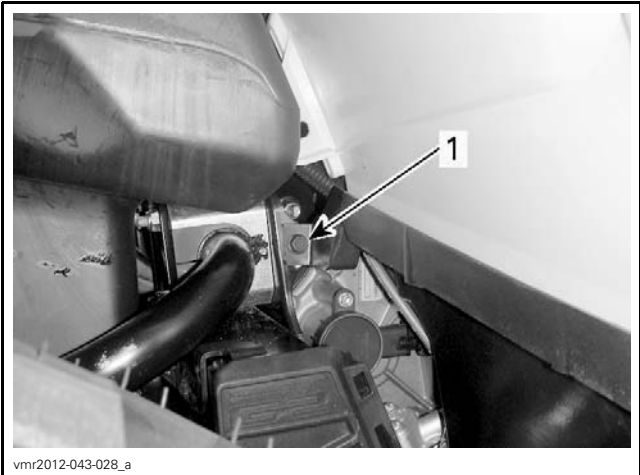
WHEEL REMOVED FOR CLARITY

4. Remove screw securing rear fender to footrest panel.



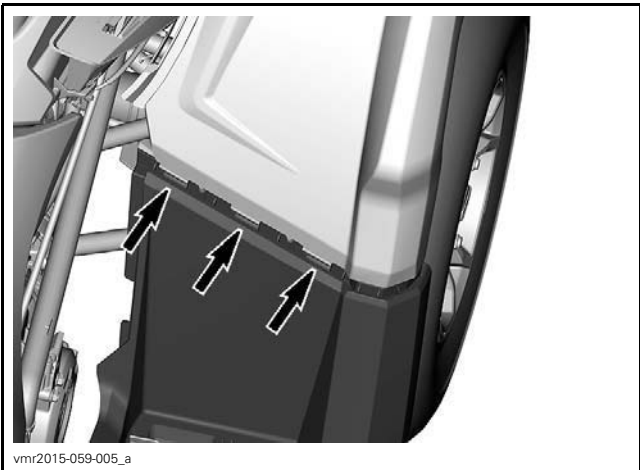
SHORT MODEL SHOWN

5. Remove screw securing footrest panel to frame.

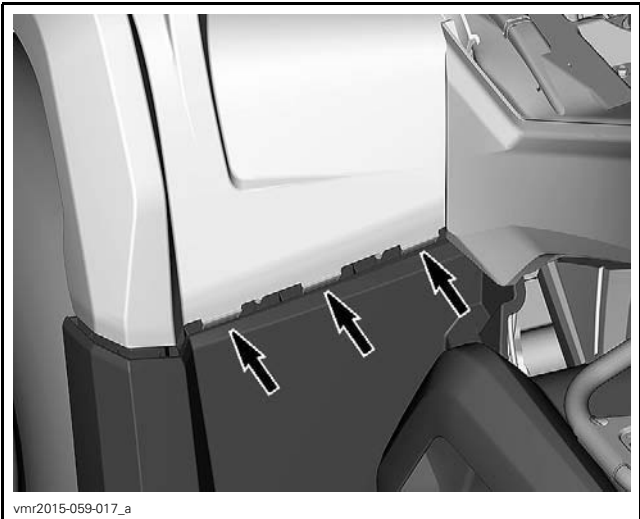


1. Screw securing footrest panel

6. Detach front fender from footrest panel by releasing retaining tabs.



7. Detach rear fender from footrest panel by releasing retaining tabs.



SHORT MODEL SHOWN

8. Remove footrest panel from vehicle.

Footrest Panel Installation

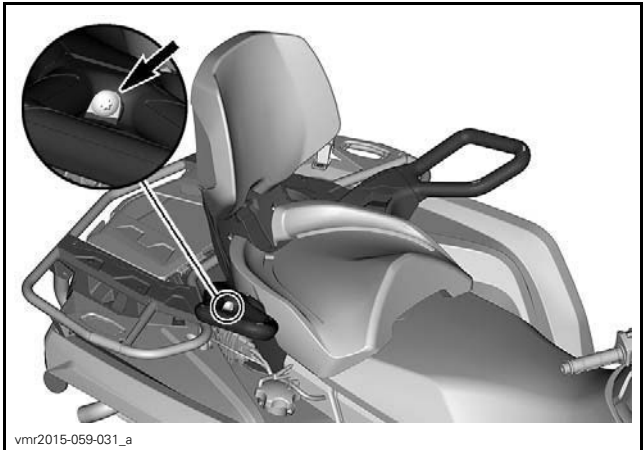
The installation is the reverse of the removal procedure. However, pay attention to the following. Tighten footrest panel screws to specification.

TIGHTENING TORQUE	
Footrest panel retaining screws	4.5 N•m ± 0.5 N•m (40 lbf•in ± 4 lbf•in)

PASSENGER GRIPS

Passenger Grips Removal

1. Remove retaining screw securing passenger grips and remove passenger grips.



Passenger Grips Installation

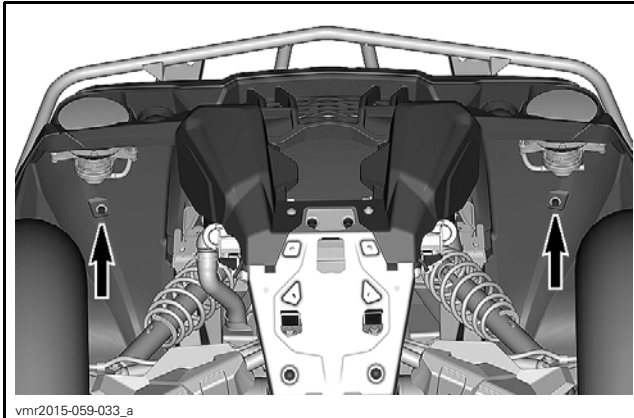
Installation is the reverse of removal. However pay attention to the following: Tighten passenger grips retaining screw to specification.

TIGHTENING TORQUE	
Passenger grips retaining screw	25 N•m ± 3 N•m (18 lbf•ft ± 2 lbf•ft)

RACK (FRONT AND REAR)

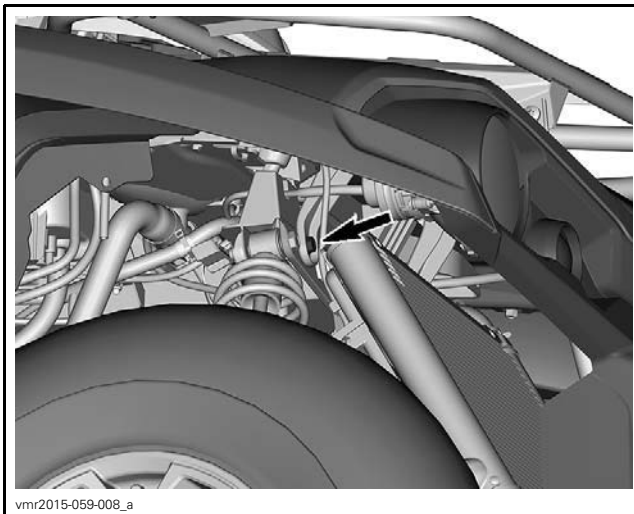
Front Rack Removal

1. Remove screws securing front fenders to rack.

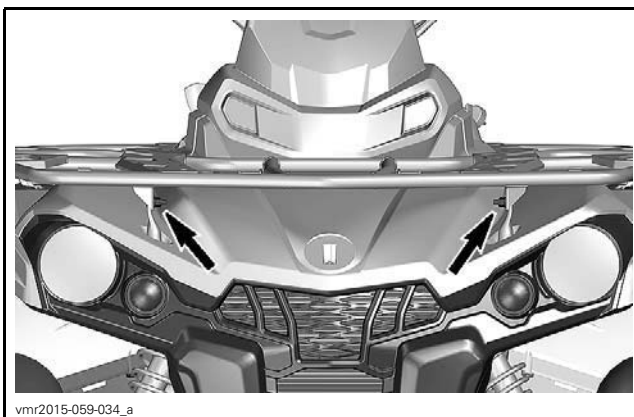


BOTTOM UP VIEW

2. Remove screws securing rack to frame.



3. Remove screws securing rack to subframe.



4. Remove rack from vehicle.

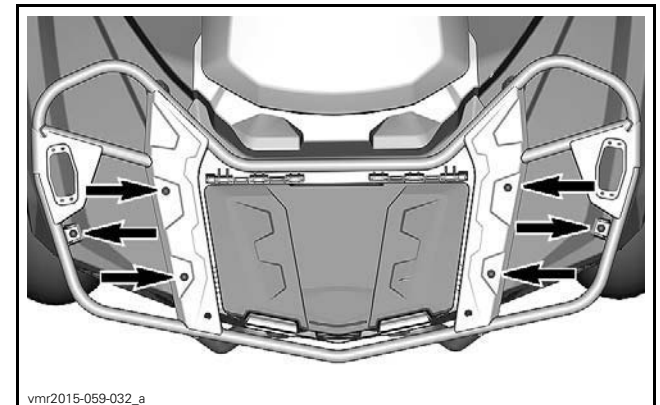
Front Rack Installation

The installation is the reverse of the removal procedure. However, pay attention to the following. Tighten front rack retaining screws to specification.

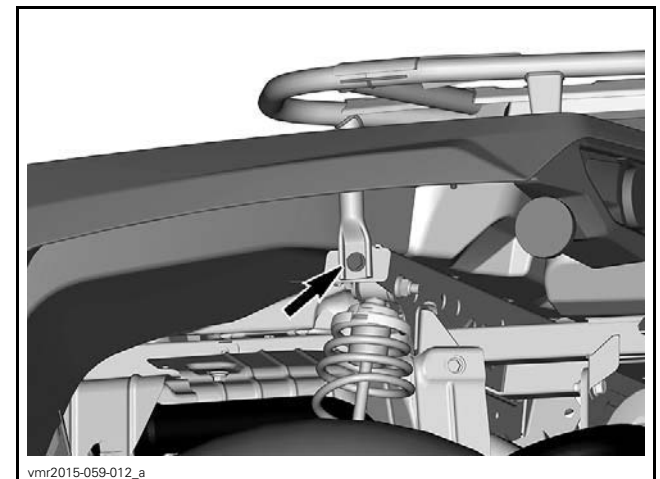
TIGHTENING TORQUE	
Screws securing fender to front rack	$4.5 \text{ N}\cdot\text{m} \pm 0.5 \text{ N}\cdot\text{m}$ ($40 \text{ lbf}\cdot\text{in} \pm 4 \text{ lbf}\cdot\text{in}$)

Rear Rack Removal

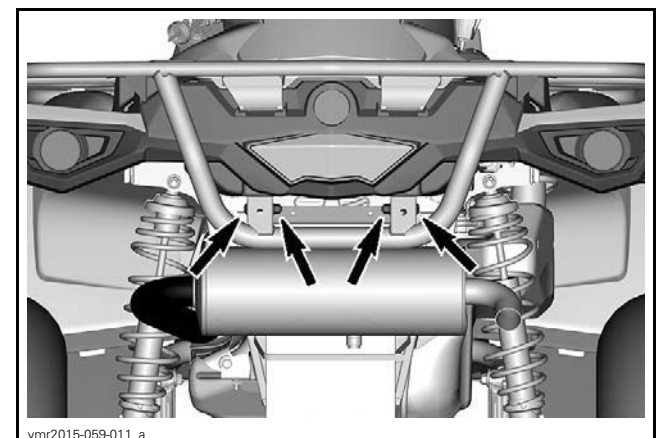
1. Remove screws securing rear fenders and storage compartment to rack.



2. Remove upper screws securing rack to frame.



3. Remove lower screws securing rack to frame.



Section 08 CHASSIS

Subsection 07 (BODY (450))

4. Remove rack from vehicle.

Rear Rack Installation

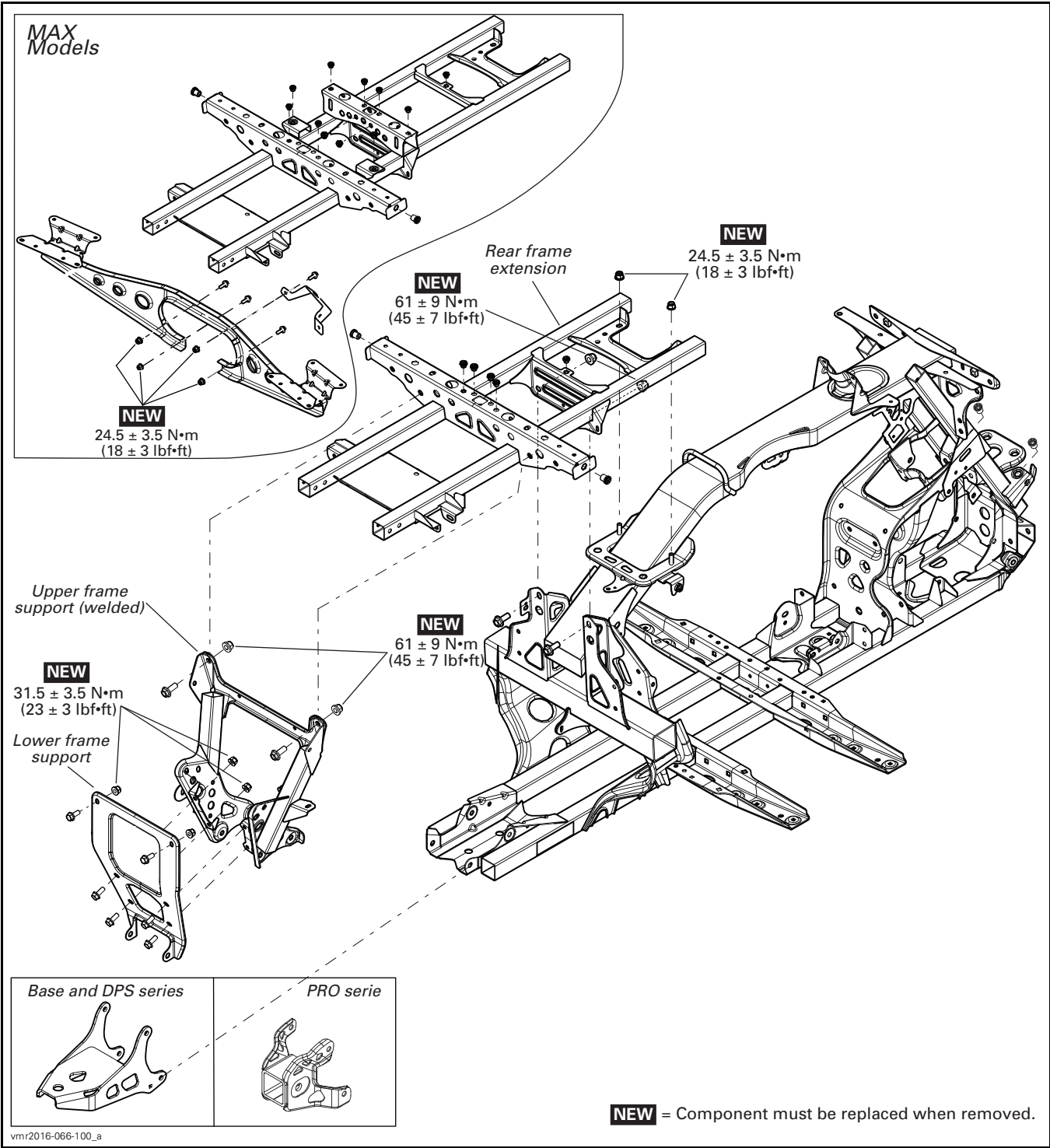
The installation is the reverse of the removal procedure. However, pay attention to the following:
Tighten rear rack retaining screws to specification.

TIGHTENING TORQUE	
Screws securing rear fenders and storage compartment to rack	4.5 N•m ± 0.5 N•m (40 lbf•in ± 4 lbf•in)
Lower screws securing rear rack to frame	15 N•m ± 2 N•m (133 lbf•in ± 18 lbf•in)

FRAME

SERVICE TOOLS – OTHER SUPPLIER

Description	Part Number	Page
BLIND THREADED INSERT INSTALLER.....	model 9600	290



PROCEDURES

FRAME

Frame Inspection

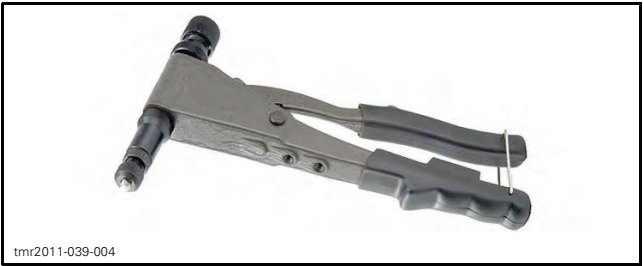
Check frame for bending, cracks, weld damages or any other damage. Replace frame as necessary.

Frame Welding

No welding should be done on frame except if mentioned or required on an approved BRP Bulletin.

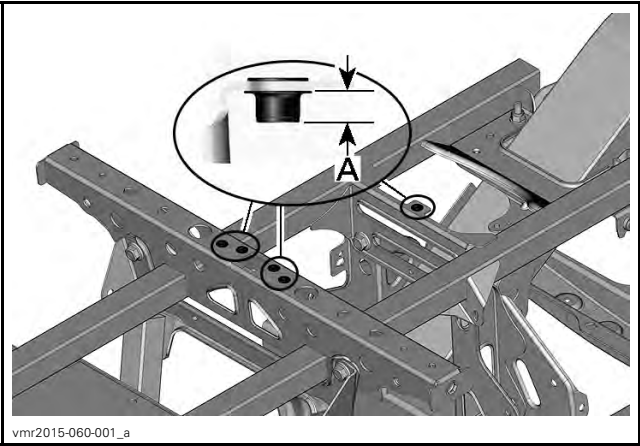
Frame Insert Replacement

To install a new blind threaded insert, use the following tool: BLIND THREADED INSERT INSTALLER (P/N MODEL 9600) from Textron. See their web site at: www.textronfasteningsystems.com.



After insert installation, ensure insert can hold the torque applied to the screw it retains and measure the compressed length of the frame insert. Otherwise, install a new insert.

INSERT	COMPRESSED LENGTH
Insert for M6 bolt	9 mm ± 0.5 mm (.354 in ± .02 in)
Insert for M8 bolt	11.5 mm ± 0.5 mm (.453 in ± .02 in)



INSERT FOR M6 BOLT SHOWN
A. 9 mm ± 0.5 mm (.354 in ± .02 in)

Frame Replacement

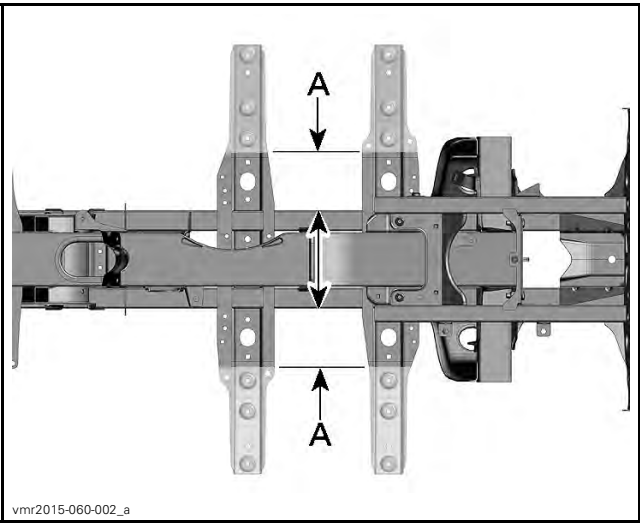
Blind threaded inserts are not installed on replacement frames. Make sure to order enough inserts when replacing frame. Refer to *ELECTRONIC PARTS CATALOG*.

Footrest Bracket Replacement

A footrest bracket replacement kit (P/N 703 500 852) is available through regular channel. Order a replacement kit for each bracket to be replaced.

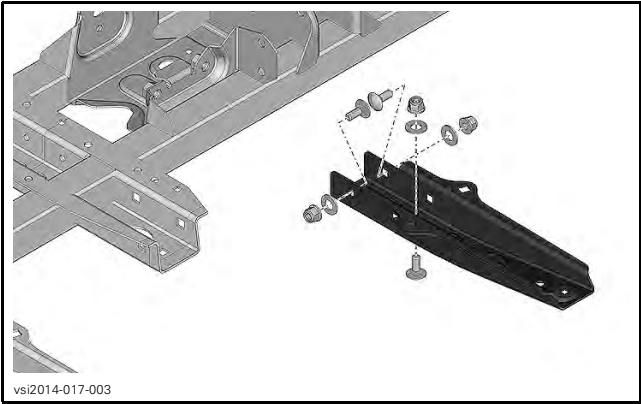
Replacing footrest bracket request to cut the original welded one. Cut the damaged bracket at 111 mm (4-3/8 in) from the square tube.

NOTICE Do not cut shorter than dimension specified.



A. 111 mm (4-3/8 in)

Install the new footrest bracket and tighten nuts to specification.



REPLACEMENT KIT

TIGHTENING TORQUE	
Footrest bracket nuts	24.5 N•m ± 3.5 N•m (18 lbf•ft ± 3 lbf•ft)

OUTLANDER L 570

ENGINE			
Engine type			ROTAX® 570, 4-stroke, 2 cylinders (V-twin), liquid cooled
Valve train			4 valves/cylinder (mechanical adjustment), single over head camshaft (SOHC) with timing chain
Bore			84 mm (3.31 in)
Stroke			51.4 mm (2.02 in)
Displacement			570 cm³ (34.8 in³)
Compression ratio			10.6:1
Maximum HP RPM			8000 rpm
Exhaust system			Spark arrestor approved by USDA Forest Service
Air filter			Synthetic paper filter with foam
Intake valve opening			3° BTDC
Intake valve closing			34 ABDC
Exhaust valve opening			39° BBDC
Exhaust valve closing			2° BTDC
Valve clearance		Intake	0.06 mm to 0.14 mm (.0024 in to .0055 in)
		Exhaust	0.11 mm to 0.19 mm (.0043 in to .0075 in)
Valve stem diameter	Intake	New	4.966 mm to 4.980 mm (.1955 in to .1961 in)
		Service limit	4.930 mm (.1941 in)
	Exhaust	New	4.956 mm to 4.970 mm (.1951 in to .1957 in)
		Service limit	4.930 mm (.1941 in)
Valve out of round	Intake and exhaust	New	0.005 mm (.0002 in)
		Service limit	0.06 mm (.0024 in)
Valve guide diameter		New	4.998 mm to 5.018 mm (.1968 in to .1976 in)
		Service limit	5.050 mm (.1988 in)
Valve spring free length		New	40.81 mm (1.607 in)
		Service limit	39.00 mm (1.535 in)
Valve seat contact width	Intake	New	1.05 mm to 1.35 mm (.041 in to .053 in)
		Service limit	1.8 mm (.071 in)
	Exhaust	New	1.25 mm to 1.55 mm (.049 in to .061 in)
		Service limit	2 mm (.079 in)
Rocker arm bore diameter		New	12.036 mm to 12.050 mm (.4739 in to .4744 in)
		Service limit	12.060 mm (.4748 in)

ENGINE			
Rocker arm shaft diameter		New	12.000 mm to 12.018 mm (.4724 in to .4731 in)
		Service limit	11.990 mm (.472 in)
Piston diameter		New	83.950 mm to 83.966 mm (3.3051 in to 3.3057 in)
		Service limit	83.850 mm (3.3012 in)
Piston/cylinder clearance		New	0.057 mm to 0.087 mm (.0022 in to .0034 in)
		Service limit	0.130 mm (.0051 in)
Piston ring type		1 st	Upper compression ring, rectangular
		2 nd	Lower compression ring, tapered face
		3 rd	Oil scraper ring
Ring end gap	Rectangular	New	0.10 mm to 0.30 mm (.004 in to .012 in)
		Service limit	0.40 mm (.016 in)
	Tapered face	New	0.35 mm to 0.55 mm (.014 in to .022 in)
		Service limit	0.85 mm (.033 in)
	Oil scraper ring	New	0.20 mm to 0.70 mm (.008 in to .028 in)
		Service limit	1.00 mm (.039 in)
Ring/piston groove clearance	Rectangular	New	0.025 mm to 0.070 mm (.001 in to .0028 in)
		Service limit	0.100 mm (.0039 in)
	Tapered face	New	0.020 mm to 0.060 mm (.0008 in to .0024 in)
		Service limit	0.150 mm (.0059 in)
	Oil scraper ring	New	0.010 mm to 0.180 mm (.0004 in to .0071 in)
		Service limit	0.250 mm (.0098 in)
Cylinder bore		New	84.023 mm to 84.037 mm (3.308 in to 3.3085 in)
Cylinder taper		Maximum new	0.038 mm (.0015 in)
		Service limit	0.090 mm (.0035 in)
Cylinder out of round		Maximum new	0.015 mm (.0006 in)
		Service limit	0.020 mm (.0008 in)
Camshaft main bearing journal	Timing chain side	New	34.959 mm to 34.975 mm (1.3763 in to 1.377 in)
		Service limit	34.950 mm (1.376 in)
	Spark plug side	New	21.959 mm to 21.980 mm (.8645 in to .8654 in)
		Service limit	21.950 mm (.8642 in)
Camshaft main bearing journal bore	Timing chain side	New	35.000 mm to 35.025 mm (1.378 in to 1.3789 in)
		Service limit	35.040 mm (1.3795 in)
	Spark plug side	New	22.000 mm to 22.021 mm (.8661 in to .867 in)
		Wear limit	22.040 mm (.8677 in)

ENGINE			
Camshaft lobe	Intake valve	New	31.830 mm to 32.030 mm (1.2531 in to 1.261 in)
		Service limit	31.810 mm (1.2524 in)
	Exhaust valve	New	31.730 mm to 31.930 mm (1.2492 in to 1.2571 in)
		Service limit	31.710 mm (1.2484 in)
Crankshaft main bearing journal diameter (MAG/PTO side)		New	42.016 mm to 42.040 mm (1.6542 in to 1.6551 in)
		Service limit	42.000 mm (1.6535 in)
Crankshaft radial play (MAG/PTO side)		Service limit	0.07 mm (.0028 in)
Crankshaft bearing journal diameter (in PTO cover)		New	34.004 mm to 34.020 mm (1.3387 in to 1.3394 in)
		Service limit	33.998 mm (1.3385 in)
Crankshaft radial play (PTO cover bearing)		Service limit	0.10 mm (.0039 in)
Crankshaft axial play		New	0.200 mm to 0.500 mm (.0079 in to .0197 in)
		Service limit	0.600 mm (.0236 in)
Crankshaft pin diameter		New	40.001 mm to 40.025 mm (1.5748 in to 1.5758 in)
		Service limit	39.990 mm (1.5744 in)
Crankshaft deflection	MAG/PTO side	New	0.050 mm (.002 in)
Crankcase plain bearing	MAG/PTO side	Service limit	42.100 mm (1.6575 in)
PTO cover plain bearing		Service limit	34.120 mm (1.3433 in)
Connecting rod big end diameter		Service limit	40.100 mm (1.5787 in)
Connecting rod big end radial play		Service limit	0.09 mm (.0035 in)
Connecting rod big end axial play		New	0.200 mm to 0.500 mm (.008 in to .02 in)
		Service limit	0.600 mm (.024 in)
Connecting rod small end diameter		New	20.010 mm to 20.020 mm (.7878 in to .7882 in)
		Service limit	20.060 mm (.7898 in)
Piston pin diameter		New	19.996 mm to 20.000 mm (.7872 in to .7874 in)
		Service limit	19.980 mm (.7866 in)
Connecting rod/piston pin clearance (radial play)		Service limit	0.080 mm (.0031 in)
LUBRICATION SYSTEM			
Type			Wet sump. Replaceable cartridge oil filter
Oil filter			Replaceable cartridge

LUBRICATION SYSTEM			
Engine oil pressure		Minimum	300 kPa (44 PSI) at 6000 RPM
Engine oil	Capacity (oil change with filter)		2.0 L (2.1 qt (U.S. liq.))
	Recommended		For the summer season, use XPS 4-stroke synth. blend oil (summer) (P/N 293 600 121). For the winter season, use XPS 4-stroke synthetic oil (All climate)(P/N 293 600 112). If not available, use a 5W40 motor oil that meets the requirements for API service classification SG, SH or SJ

COOLING SYSTEM			
Coolant	Type	Finland, Norway and Sweden	Use Long life antifreeze (P/N 619 590 204)
		All other countries	Use long life antifreeze (P/N 219 702 685)
		Alternative, or if not available	Coolant specifically designed for aluminum engines Ethyl glycol/distilled water mix (50%/50%).
	Capacity		3.4 L (.9 U.S. gal.)
Thermostat		Starts to open	65°C (149°F)
		Fully open	75°C (167°F)
Radiator cap opening pressure			110 kPa (16 PSI)

TRANSMISSION		
Type		CVT (Continuously Variable Transmission)
Engagement RPM		1750 ± 100 RPM
Drive belt width	Service limit	30.00 mm (1.181 in)
Governor cup roller outer diameter	New	13.80 mm to 14.00 mm (.543 in to .551 in)
	Service limit	13.20 mm (.52 in)
Governor cup roller inner diameter	New	8.025 mm to 8.175 mm (.316 in to .322 in)
	Service limit	9.00 mm (.354 in)
Centrifugal lever pivot bolt diameter	New	6.078 mm to 6.100 mm (.239 in to .24 in)
	Service limit	6.000 mm (.236 in)
Centrifugal lever bore diameter	New	6.035 mm to 6.078 mm (.2376 in to .2393 in)
	Service limit	6.200 mm (.244 in)
Drive pulley sliding half centrifugal lever pivot bolt bore diameter	New	6.113 mm to 6.171 mm (.241 in to .243 in)
	Service limit	6.300 mm (.248 in)
Drive pulley sliding half large bushing	New	55.000 mm to 55.040 mm (2.165 in to 2.167 in)
	Service limit	55.200 mm (2.173 in)
Drive pulley sliding half small bushing	New	32.000 mm to 32.040 mm (1.26 in to 1.261 in)
	Service limit	32.200 mm (1.268 in)

TRANSMISSION		
Drive pulley spring free length		Service limit 85 mm (3.35 in)
Drive pulley spring free squareness		Service limit 4 mm (.157 in)
Spring sleeve length	New	9.2 mm to 9.4 mm (.362 in to .37 in)
	Service limit	9.0 mm (.354 in)
Driven pulley sliding half bushing	New	30.060 mm to 30.100 mm (1.183 in to 1.185 in)
	Service limit	30.200 mm (1.189 in)
Driven pulley sliding fixed bushing	New	30.060 mm to 30.100 mm (1.183 in to 1.185 in)
	Service limit	30.200 mm (1.189 in)
Torque gear on driven pulley		Service limit 7.500 mm (.295 in)
Driven pulley spring free length		Service limit 125 mm (4.92 in)
Driven pulley spring free squareness		Service limit 3.8 mm (.15 in)
Cam width in top surface		Service limit 4.50 mm (.177 in)
GEARBOX		
Type		Dual range (HI-LO) with park, neutral and reverse
Gear ratios	Angle drive sub-transmission	32/13 = 2.462
	High	38/28 = 1.357
	Low	46/20 = 2.300
	Reverse	31/14 = 2.214
Overall gear ratio	High	3.341
	Low	5.662
	Reverse	5,451
Gearbox oil	Capacity	400 ml (13.5 U.S. oz)
	Recommended	XPS synthetic gear oil (75W 140) (P/N 293 600 140) or a 75W140 API GL-5 synthetic gear oil
Output shaft backlash	New	0.10 mm to 0.20 mm (.004 in to .008 in)
	Service limit	0.25 mm (.01 in)
Coupling sleeve groove width	New	5.25 mm to 5.35 mm (.207 in to .211 in)
	Service limit	5.50 mm (.217 in)
Coupling fork claw thickness	New	4.95 mm to 5.05 mm (.195 in to .199 in)
	Service limit	4.80 mm (.189 in)
Shift fork claw thickness (high gear shift fork)	New	4.80 mm to 4.90 mm (.189 in to .193 in)
	Service limit	4.70 mm (.185 in)
Shift fork claw thickness (low and reverse gear shift fork)	New	5.10 mm to 5.20 mm (.201 in to .205 in)
	Service limit	5.0 mm (.197 in)

GEARBOX			
Shift fork pin diameter		New	6.92 mm to 6.97 mm (.272 in to .274 in)
		Service limit	6.85 mm (.27 in)
Width of shift fork engagement groove (low and reverse gear)		New	5.30 mm to 5.40 mm (.209 in to .213 in)
		Service limit	5.50 mm (.217 in)
Width of shift fork engagement groove (high gear)		New	5.00 mm to 5.10 mm (.197 in to .201 in)
		Service limit	5.20 mm (.205 in)
Diameter free pinions		New	29.000 mm to 29.013 mm (1.1417 in to 1.1422 in)
		Service limit	29.015 mm (1.1423 in)
Intermediate gear shaft		New	24.979 mm to 25.000 mm (.9834 in to .9843 in)
		Service limit	24.977 mm (.983 in)
Countershaft	MAG side	New	N.A.
		Service limit	17.990 mm (.7083 in)
	CVT side	New	N.A.
		Service limit	24.970 mm (.9831 in)
	Free pinion bearing	New	N.A.
		Service limit	24.970 mm (.9831 in)
Bevel gear shaft	Free pinion bearing	Service limit	24.984 mm (.9836 in)

ELECTRICAL SYSTEM		
Magneto generator output	Without DPS	400 W @ 6000 RPM
	With DPS	500 W @ 6000 RPM
	CE version	500 W @ 6000 RPM
Stator resistance (20°C (68°F))		0.15 to 0.30 Ω
Ignition system type		IDI (Inductive Discharge Ignition)
Ignition timing		Not adjustable
Spark plug	Quantity	2
	Make and type	NGK DCPR8E
	Gap	0.7 mm to 0.8 mm (.028 in to .031 in)
Engine RPM limiter setting	Forward	8000 rpm
	Reverse	15 km/h (9 MPH) without Override)
Battery	Type	Maintenance free
	Voltage	12 Vdc
	Nominal rating	18 A•h
	Power starter output	0.7 KW
Headlights	High	HS1 35 W
	Low	HS1 35 W

ELECTRICAL SYSTEM			
Taillights			P21/5W
Turn signal lights (CE models only)			R10W
Position light (CE models only)			W5W
Licence plate light (CE models only)			R10W
Fuses (PF1)	-Speedo -Relay	F4	10 A
	-Ignition coils -Fuel injectors -Fuel pump	F5	10 A
	-Key switch -Starter solenoid	F8	10 A
	Colling fan	F9	20 A
	DC out / lights / Acc.	F12	20 A
Relays (PF1)	Cooling fan	R1	20 A
	Main	R2	20 A
	Accessories	R3	20 A
	Fuel pump	R4	30 A
	Brake lights	R8	30 A
Fuses (PF2)	Main	F1	30 A
	Spare	F2	30 A
	ACC	F3	30 A
Fuse (PF3)	DPS	N/A	40 A

FUEL SYSTEM			
Fuel delivery		Type	Electronic Fuel Injection (EFI), 46 mm throttle body, 1 injector per cylinder
Fuel pump		Type	Electrical (in fuel tank)
		Operating pressure	350 kPa ± 10 kPa (51 PSI ± 1 PSI)
Idle speed			1250 rpm ± 50 (not adjustable)
Fuel	Type		Regular unleaded gasoline
	Minimum octane rating	Inside North America	87 (R+M)/2 or higher
		Outside North America	92 RON or higher
Fuel tank capacity			20.5 L (5.4 U.S. gal.)
Fuel remaining when low fuel light turns ON			± 5 L (1.3 U.S. gal.)

DRIVE SYSTEM			
Drive system type			Selectable 2WD/4WD
Front differential oil/ rear final drive oil	Capacity	Front	500 ml (17 U.S. oz)
		Rear	250 ml (8.5 U.S. oz)
	Type	Front	XPS synthetic gear oil (75W 90) (P/N 293 600 043) OR synthetic oil 75W 90 API GL5)
		Rear	XPS synthetic gear oil (75W 140) (P/N 293 600 140) or a 75W140 API GL-5 synthetic gear oil
Front drive		Base	Straight gear Visco-Lok
		All models except Base	Straight gear Visco-lok QE
Front drive ratio			3.6:1
Rear drive			Bevel Straight gear / final drive
Rear drive ratio			3.6:1
CV joint grease			Castrol CV joint grease (P/N 293 550 062)
Propeller shaft grease			Propeller shaft grease(P/N 293 550 063)

STEERING		
Turning radius	1-UP	212 cm (83 in)
	2-UP	239 cm (94 in)
Total toe (vehicle on ground)		2.5 mm $\pm$ 12.7 mm (.1 in $\pm$.5 in)
Camber angle (vehicle on ground)		0°

FRONT SUSPENSION		
Suspension type		Double A-arm with dive-control geometry
Suspension travel		226 mm (8.9 in)
Shock absorber	Quantity	2
	Type	Oil
Spring free length		325.6 mm (12.82 in)
Preload adjustment type		5 positions cam

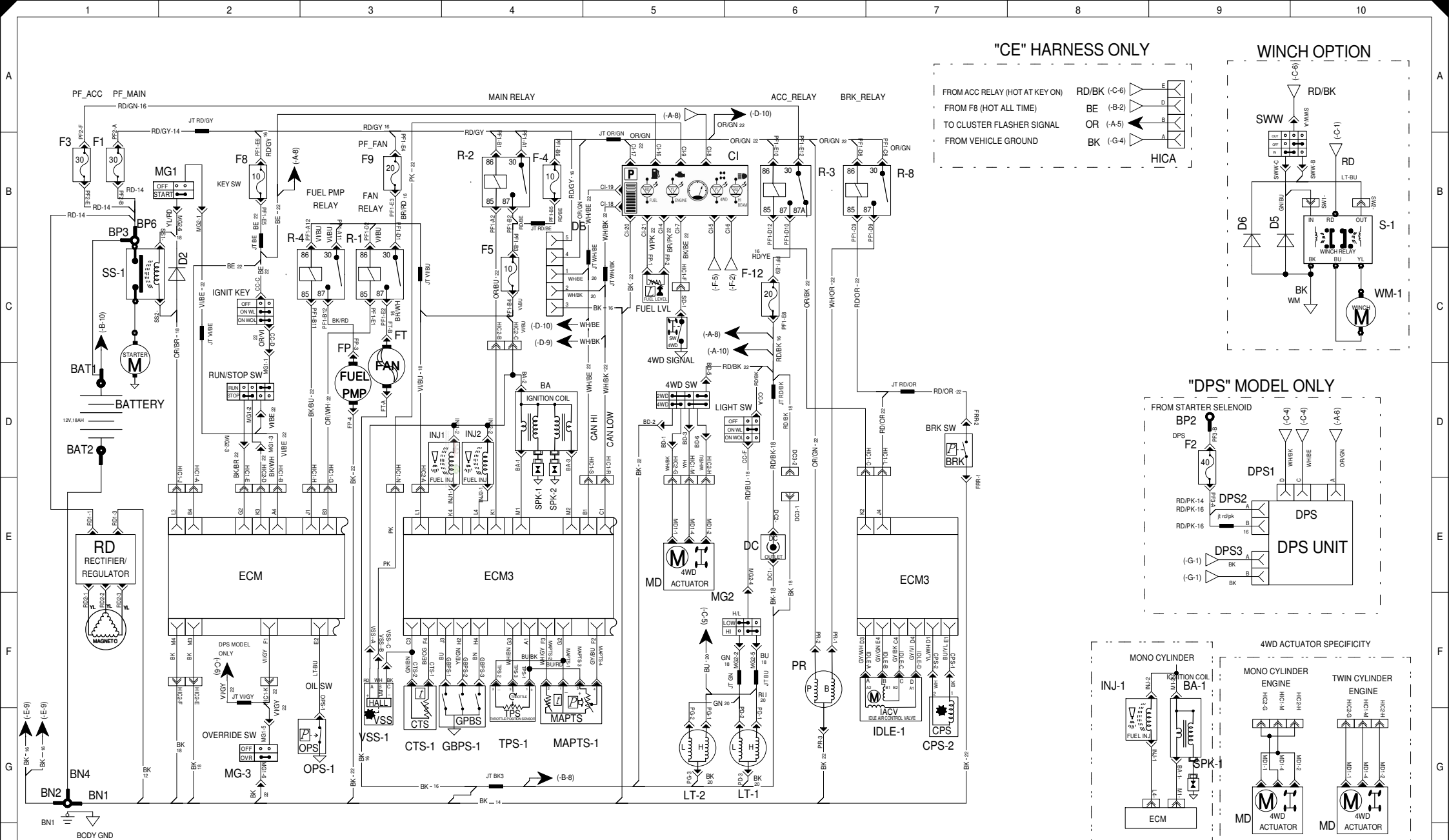
REAR SUSPENSION		
Suspension type		Trailing arm Independant (TTI) with external stabilizer bar
Suspension travel		224 mm (8.82 in)
Shock absorber	Qty	2
	Type	Oil
Spring free length	1 UP	315.6 mm (12.43 in)
	2 UP	325.6 mm (12.82 in)
Preload adjustment type		5 positions cam

BRAKES					
Front brakes			Type		Dual 214 mm cross drilled disc brakes with hydraulic twin-piston calipers
Rear brake			Type		Single 214 mm cross drilled disc brake with hydraulic twin-piston caliper
Brake fluid			Capacity		260 ml (8.8 U.S. oz)
			Type		DOT 4
Caliper					Floating twin pistons (2 x 26 mm)
Brake pad material					Organic
Minimum brake pad thickness					1 mm (.039 in)
Minimum brake disc thickness					4.0 mm (.157 in)
Maximum brake disc warpage					0.2 mm (.008 in)
TIRES					
Pressure	Front	1-UP	UP TO 164 kg (360 lb)	41.4 kPa (6 PSI)	
			FROM 164 kg (360 lb) TO 235 kg (517 lb)	48.2 kPa (7 PSI)	
		2-UP	UP TO 132 kg (290 lb)	41.4 kPa (6 PSI)	
			FROM 132 kg (290 lb) TO 272 kg (600 lb)	48.2 kPa (7 PSI)	
	Rear	1-UP	UP TO 164 kg (360 lb)	41.4 kPa (6 PSI)	
			FROM 164 kg (360 lb) TO 235 kg (517 lb)	68.9 kPa (10 PSI)	
		2-UP	UP TO 132 kg (290 lb)	41.4 kPa (6 PSI)	
			FROM 132 kg (290 lb) TO 272 kg (600 lb)	68.9 kPa (10 PSI)	
Minimum tire thread depth				3 mm (.118 in)	
Tire size		Standard	Front	635 x 203 x 305 mm (25 x 8 x 12 in)	
			Rear	635 x 279 x 305 mm (25 x 11 x 12 in)	
		Pro	Front	660 x 203 x 305 mm (26 x 8 x 12 in)	
			Rear	660 x 254 x 305 mm (26 x 10 x 12 in)	

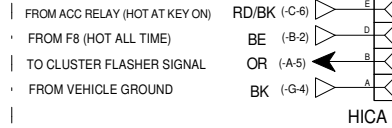
WHEELS		
Type	Base	Steel
	All except base model	Cast Aluminum
Rim size	Front	305 x 152 mm (12 x 6 in)
	Rear	305 x 191 mm (12 x 7.5 in)
Wheel nut torque		100 N•m (74 lbf•ft)

DIMENSIONS		
Overall length	1-UP	211 cm (83 in)
	2-UP	231 cm (91 in)
Overall width		117 cm (46 in)
Overall height	1-UP	124 cm (49 in)
	2-UP	133 cm (52.5 in)
Wheelbase	1-UP	129.5 cm (51 in)
	2-UP	149.9 cm (59 in)
Wheel track	Front	97.4 cm (38 in)
	Rear	92.3 cm (36 in)
Ground clearance		26.7 cm (10.5 in)

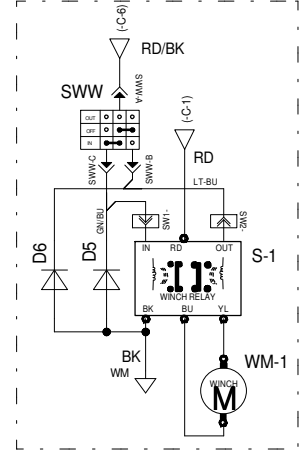
LOADING CAPACITY AND WEIGHT		
Dry weight	1-UP	319 kg (703 lb)
	2-UP	336 kg (740 lb)
Front rack capacity		54 kg (120 lb)
Rear rack capacity		109 kg (240 lb)
Rear storage compartment loading capacity		10 kg (22 lb)
Total vehicle load allowed (including driver, all other loads and added accessories)	1-UP	235 kg (517 lb)
	2-UP	272 kg (600 lb)
Towing capacity		590 kg (1,300 lb)
Tongue capacity		23 kg (50 lb)



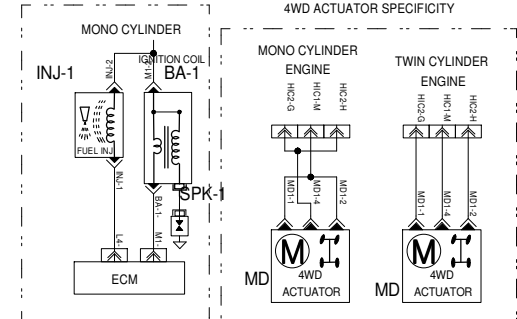
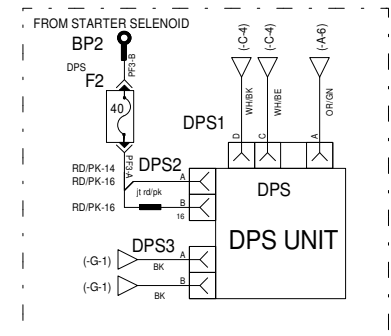
"CE" HARNESS ONLY



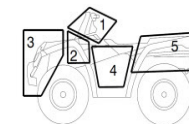
WINCH OPTION



"DPS" MODEL ONLY



MODEL			All rights reserved. No parts of this document may be reproduced in any form without the prior written permission of Bombardier Recreational Products Inc. (BRP).	TITLE		710003560			
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ZONE #	ZONE DESCRIPTION
1	STEERING AREA
2	MODULE AREA
3	FRONT OF VEHICLE
4	ENGINE AREA
5	REAR OF VEHICLE

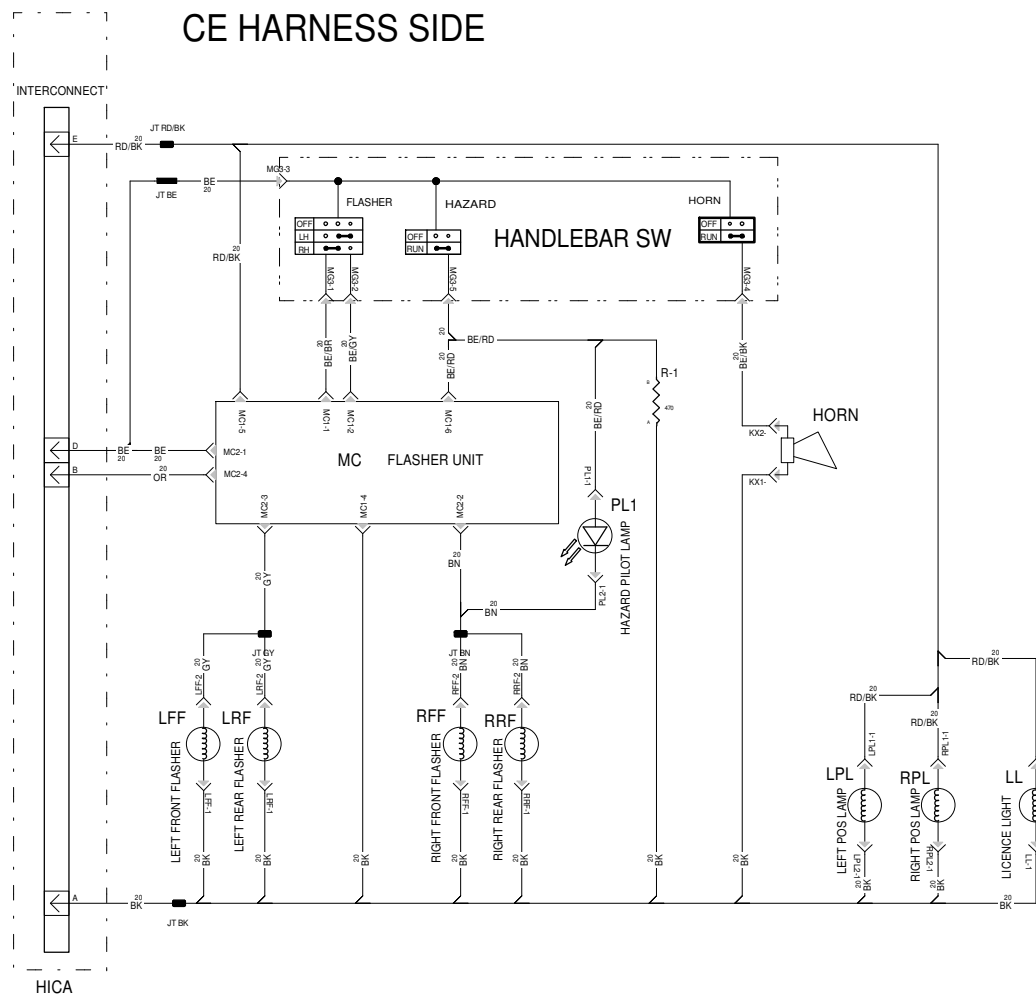
MAIN HARNESS SIDE

CE HARNESS SIDE

FROM ACC RELAY/HOT AT KEY ON

FROM MAIN/HOT ALL TIME
TO CLUSTER, FLASHER SIGNAL

TO MAIN VEHICLE GROUND



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MY			DRAWN BY		DESIGN BY		REV	A	REV DATE	2013-10-03
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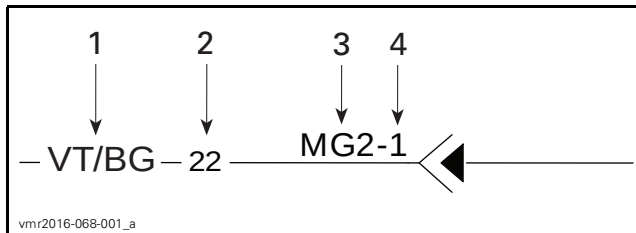
WIRING DIAGRAM INFORMATION

GENERAL

WIRING DIAGRAM INFORMATION

NOTE: The wiring diagrams are in the manual back cover pocket.

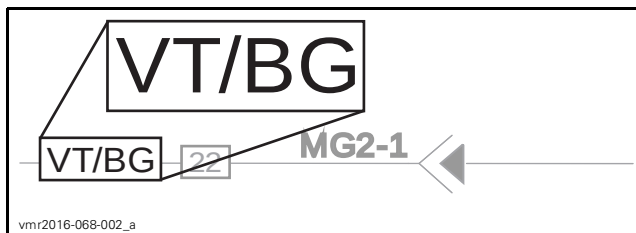
The wiring diagrams use the following codes.



1. Wire colors
2. Wire gauge
3. Connector identification
4. Terminal location in connector

Wire Colors

It identifies the color of a wire. When a 2-color scheme is used, the first color is the main color while the second color is the tracer color.



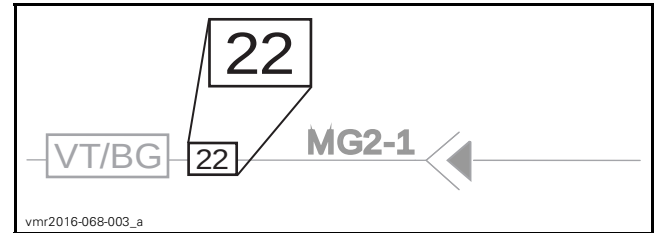
Example: VT/BG is a VIOLET wire with a BEIGE stripe.

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.

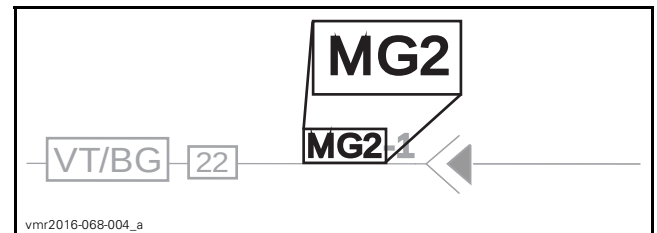
Wire Gauge

The number after wire color indicates the gauge of a wire.



Connector Identification

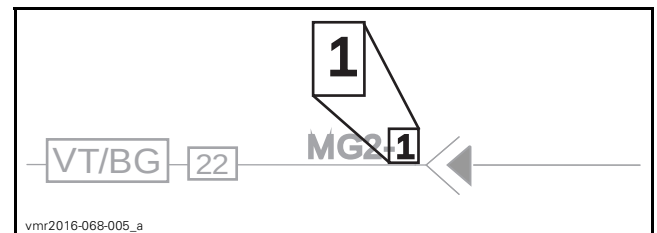
Indicates the connector individually. If there are many connectors in the same area, this helps to identify which wire is in which connector.



Terminal Location in Connector

This is the terminal position in the connector. The number or letter given refers to the physical identification stamped on the connector.

NOTE: If no letter or number is indicated on the connector, they are indicated where there is a specific test using this connector.



PROCEDURES

This section gives the procedures in order to quickly repair electrical harness splices.

1. Make sure to perform the usual tests described in *ELECTRICAL SYSTEM* sections before investigating the harness splices.
2. If an electrical issue can not be found with the usual tests, locate the main harness splice that is involved in the faulty circuit and repair it as per the *SPLICES REPAIR PROCEDURE*.
3. To repair a splice, we recommend the use of a tin solder meeting the followings requirements or an equivalent.

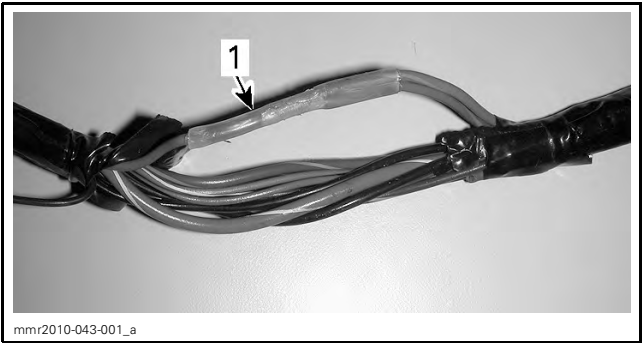
Section 10 WIRING DIAGRAM
Subsection 01 (WIRING DIAGRAM INFORMATION)

TIN SOLDER REQUIREMENTS
SN 60
PB 40
DIA 0.062
FLUX RA 2%

SPLICES REPAIR PROCEDURE

CASE 1: Wire Detached from Splice

- 1. Locate splice. Refer to splices location diagrams.
- 2. Remove wires from protector tube.
- 3. Locate the shrink tube protecting the defective splice.



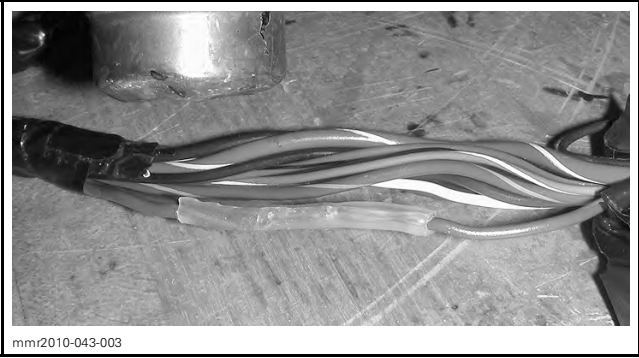
1. Shrink tube

- 4. Remove the shrink tube.
 - 4.1 Using a blade, cut the shrink tube.

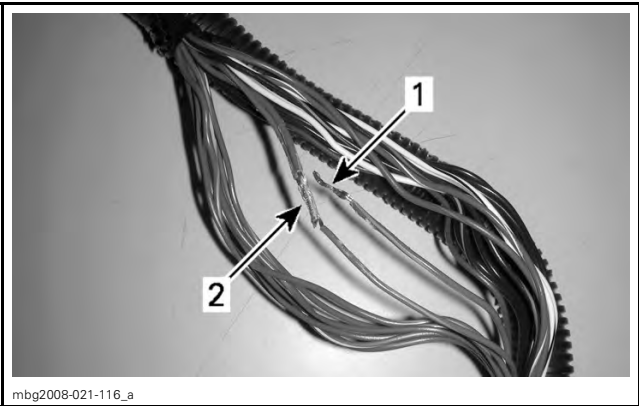


NOTICE Be careful with the blade to avoid cutting wires insulation.

- 4.2 Slightly heat the shrink tube using a heat gun.

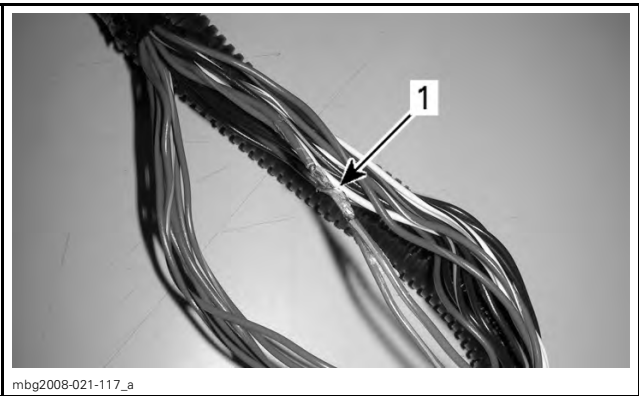


- 4.3 Remove the shrink tube with long nose pliers.
- 5. Locate detached wire from splice.



1. Detached wire
2. Splice

- 6. Twist detached wire around splice.

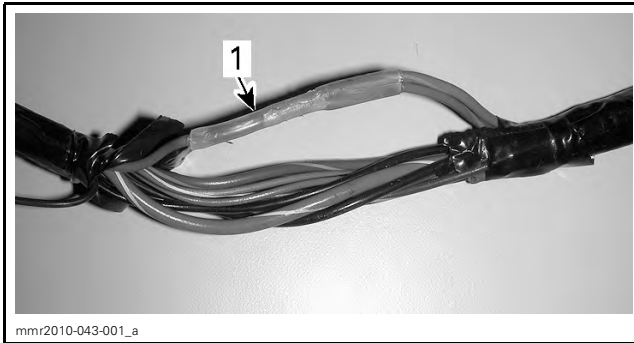


1. Twisted wire

- 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

1. Locate splice. Refer to splices location diagrams.
2. Remove wires from protector tube.
3. Locate the shrink tube protecting the defective splice.



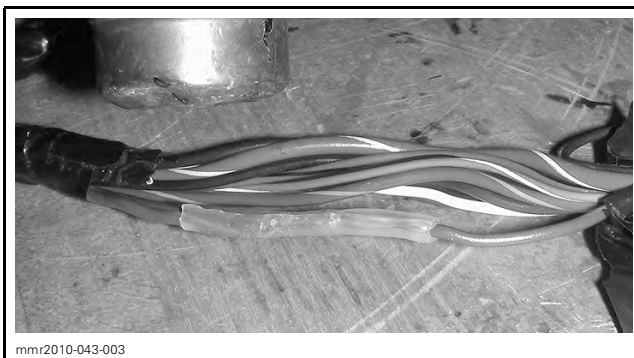
1. *Shrink tube*

4. Remove the shrink tube.
 - 4.1 Using a blade, cut the shrink tube.

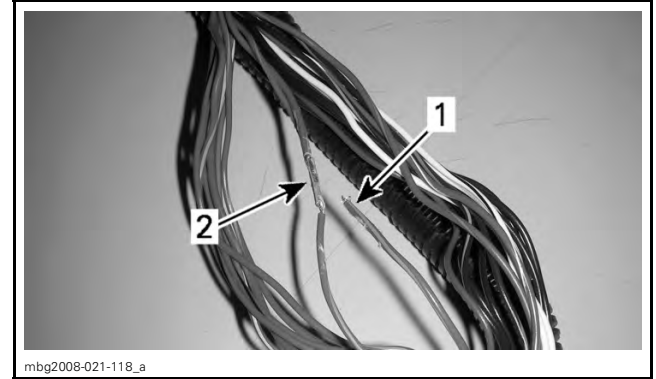


NOTICE Be careful with the blade to avoid cutting wires insulation.

- 4.2 Slightly heat the shrink tube using a heat gun.

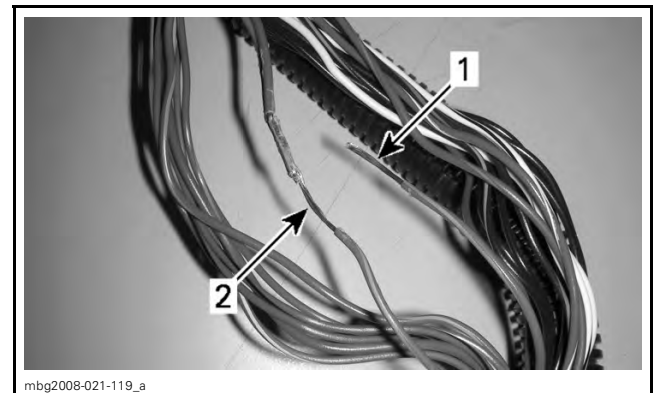


- 4.3 Remove the shrink tube with long nose pliers.
5. Locate broken wire from splice.



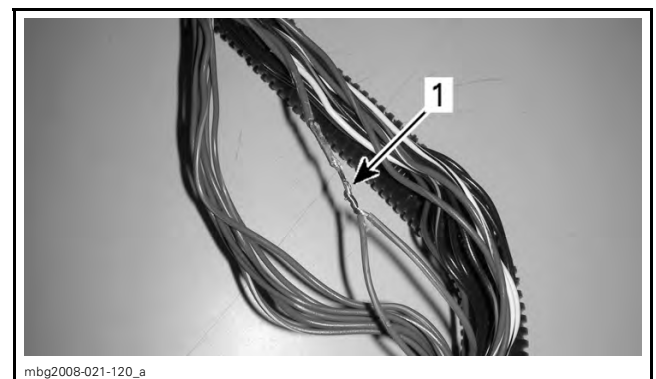
1. *Broken wire*
2. *Splice*

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).