can-am™

BRP

2008
2009

Shop Manual

OUTLANDER

400™ EFI Series

219 100 311

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2008/2009
Shop Manual

Outlander™ 400 EFI

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SAFETY NOTICE

This manual has been prepared as a guide to correctly service and repair 2008/2009 Outlander™ 400 EFI Series ATVs as describe in the model list in the *INTRODUCTION*.

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

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

This shop manual uses technical terms which may be slightly different from the ones used in the *PARTS CATALOG*.

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

The content depicts parts and/or procedures applicable to the particular product at time of writing. Service and Warranty Bulletins may be published to update the content of this manual. Make sure to read and understand these. It does not include dealer modifications, whether authorized or not by BRP, after manufacturing the product.

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 for which it was designed.

⚠ WARNING

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

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

⚠ WARNING

Identifies an instruction which, if not followed, could cause serious personal injury including possibility of death.

CAUTION: Denotes an instruction which, if not followed, could severely damage vehicle components.

NOTE: Indicates supplementary information needed 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 use common shop safety practice.

BRP disclaims liability for all damages and/or injuries resulting from the improper use of the contents. We strongly recommend that any services be carried out and/or verified by a highly skilled professional mechanic. It is understood that certain modifications may render use of the vehicle illegal under existing federal, provincial and state regulations.

INTRODUCTION

GENERAL INFORMATIONS

This shop manual covers the following BRP made 2008/2009 Outlander™ 400 EFI Series.

MODEL YEAR	MODEL	COLOR	ENGINE	MODEL NUMBER
2008	Outlander 400 EFI	Green, Red	400 EFI	5A8A, 5A8C, 5A8E, 5A8F, 5A8H, 5A8J
	Outlander 400 EFI XT	Green, Red, Yellow	400 EFI	5B8A, 5B8B, 5B8C, 5B8E, 5B8F
	Outlander Max 400 EFI	Green, Red	400 EFI	5C8B, 5C8C, 5C8D, 5C8F, 5C8G
	Outlander Max 400 EFI XT	Green, Red, Yellow	400 EFI	5D8A, 5D8B, 5D8C, 5D8E, 5D8F
2009	Outlander 400 EFI	Red, Yellow	400 EFI	5A9A, 5A9B, 5A9C, 5A9D
	Outlander 400 EFI XT	Black, Red, Yellow	400 EFI	5B9A, 5B9B, 5B9C,5B9F
	Outlander Max 400 EFI	Red	400 EFI	5C9A, 5C9B, 5C9C
	Outlander Max 400 EFI XT	Black, Red, Yellow	400 EFI	5D9A, 5D9B, 5D9C, 5D9D, 5D9F

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.

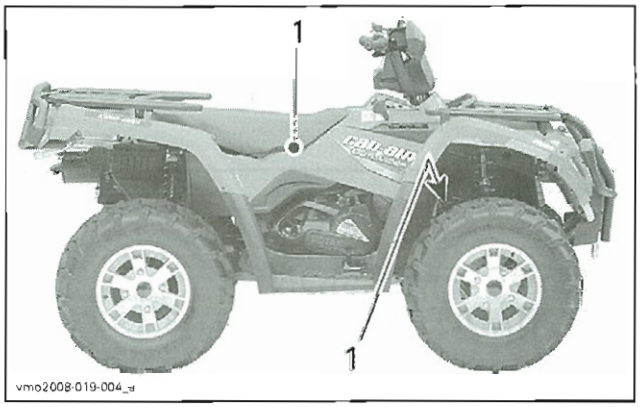
BRP reserves the right at any time to discontinue or change specifications, designs, features, models or equipment without incurring obligation.

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

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

HOW TO IDENTIFY YOUR VEHICLE

Vehicle Description Decal



TYPICAL
1. *Vehicle description decal*

Vehicle Model Number

The Vehicle Model Number is scribed on vehicle description decal.

1. *Model number*

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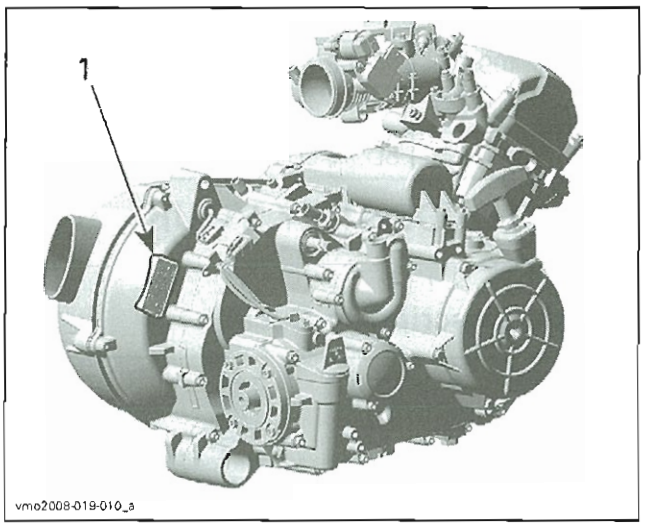
Vehicle Serial Number

The Vehicle Identification Number (V.I.N.) is scribed on vehicle description decal. See above. It is also engraved on frame near vehicle description decal.

1. Vehicle serial number

Engine Serial Number



1. Engine serial 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 performing service on ATVs that carry an emissions control information label, adjustments must be kept within published factory specifications.

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

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

Exceptions include manufacturer's prescribed changes, such as altitude adjustments for example.

Owner Responsibility

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

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

EPA Emission Regulations

Some ATVs manufactured by BRP are certified to the EPA as conforming to the requirements of the regulations for the control of air pollution from new ATV engines. This certification is contingent on certain adjustments being set to factory standards. For this reason, the factory procedure for servicing the product must be strictly followed and, whenever practicable, returned to the original intent of the design.

The responsibilities listed above are general and in no way a complete listing of the rules and regulations pertaining to the EPA requirements on exhaust emissions for ATVs products. For more detailed information on this subject, you may contact the following locations:

FOR ALL COURIER SERVICES:
U.S. Environmental Protection Agency
Office of Transportation and Air Quality
1310 L Street NW
Washington D.C. 20005

REGULAR US POSTAL MAIL:
1200 Pennsylvania Ave. NW
Mail Code 6403J
Washington D.C. 20460

INTERNET: http://www.epa.gov/otaq/

E-MAIL: otaqpublicweb@epa.gov

TIGHTENING TORQUE

Tighten fasteners to torque mentioned in exploded views and/or text, When they are not specified, refer to following table.

⚠ WARNING

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

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

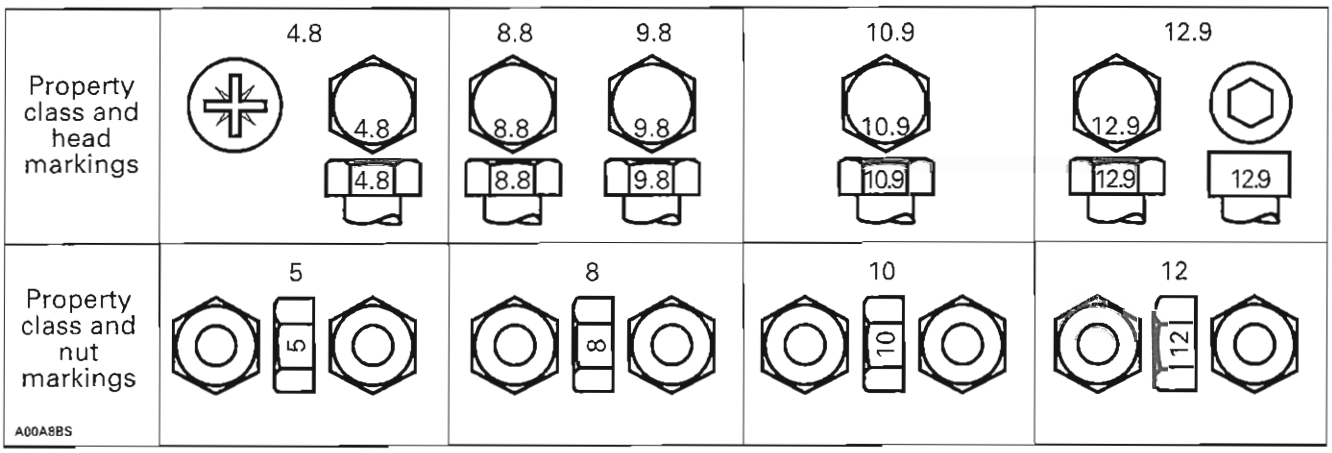
- Manually screw all screws, bolts and/or nuts.
- Apply the half of the recommended torque value.

CAUTION: Be sure to use proper tightening torque for the proper strength grade.

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

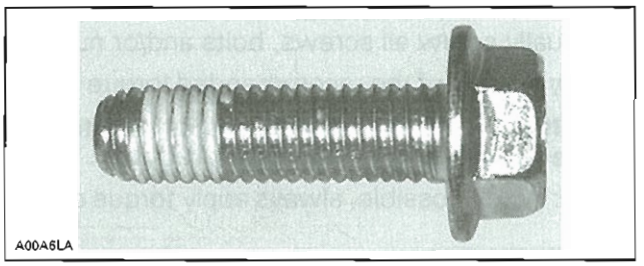
- Torque at the recommended torque value.

NOTE: Always torque screws, bolts and/or nuts in a crisscross sequence.



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 – 4 N•m (31 – 35 lbf•**in**)	4 – 5 N•m (35 – 44 lbf•**in**)
M5	3 – 3.5 N•m (27 – 31 lbf•**in**)	4.5 – 5.5 N•m (40 – 47 lbf•**in**)	7 – 8.5 N•m (62 – 75 lbf•**in**)	8 – 10 N•m (71 – 89 lbf•**in**)
M6	6.5 – 8.5 N•m (58 – 75 lbf•**in**)	8 – 12 N•m (71 – 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 (23 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 (53 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)

SELF-LOCKING FASTENERS PROCEDURE



TYPICAL — SELF-LOCKING FASTENER

The following describes the most common application procedures when working with self-locking fasteners.

Use a metal brush or a tap to clean the hole properly then use a solvent, let act during 30 minutes and wipe off. The solvent utilization is to ensure the adhesive works properly.

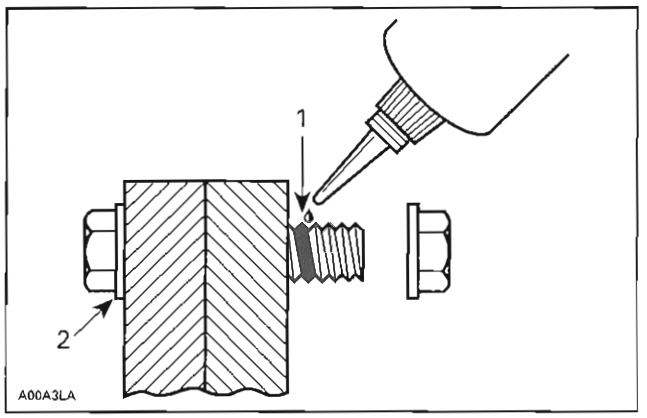
LOCTITE® APPLICATION PROCEDURE

The following describes the most common application procedures when working with Loctite products.

NOTE: Always use proper strength Loctite product as recommended in this shop manual.

Threadlocker

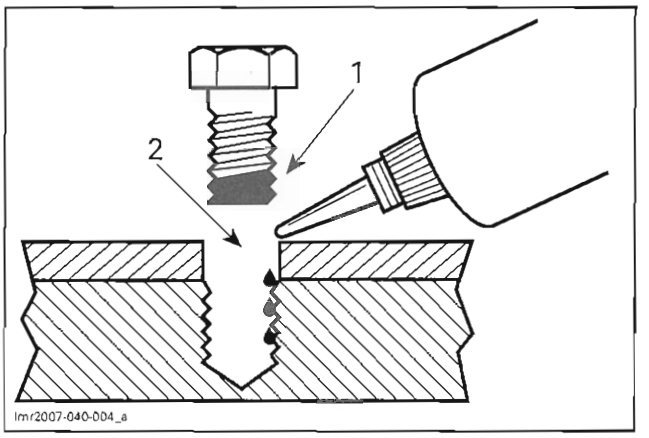
Uncovered Holes (bolts and nuts)



1. *Apply here*
2. *Do not apply*

- Clean threads (bolt and nut) with solvent.
- Apply Loctite Primer N (P/N 293 800 041) on threads and allow to dry.
- Choose proper strength Loctite threadlocker.
- Fit bolt in the hole.
- Apply a few drops of threadlocker at proposed tightened nut engagement area.
- Position nut and tighten as required.

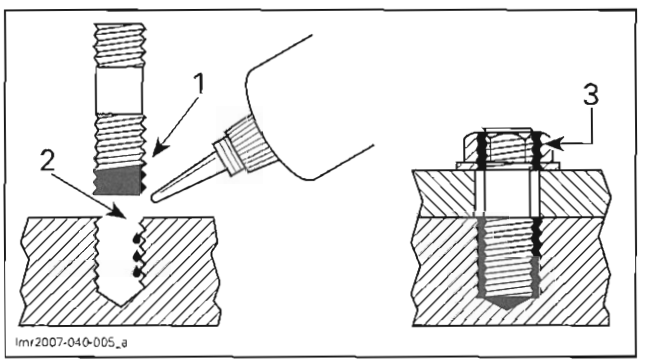
Blind Holes



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

- Clean threads (bolt and hole) with solvent.
- Apply Loctite Primer N (P/N 293 800 041) on threads (bolt and nut) and allow to dry for 30 seconds.
- Choose proper strength Loctite threadlocker.
- Apply several drops along the threaded hole and at the bottom of the hole.
- Apply several drops on bolt threads.
- Tighten as required.

Stud in Blind Holes



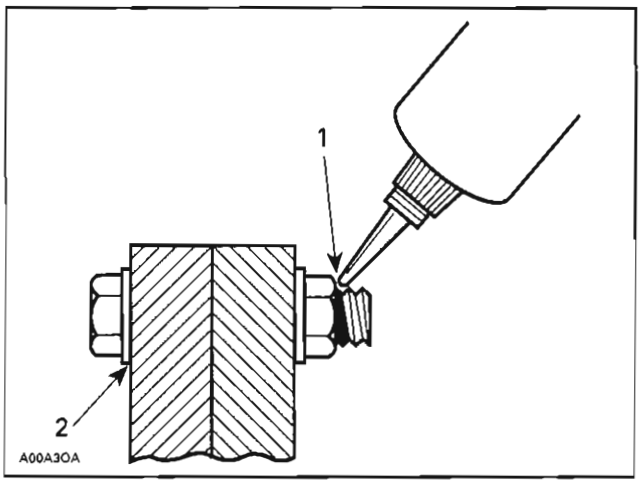
1. *On threads*
2. *On threads and in the hole*
3. *Onto nut threads*

- Clean threads (stud and hole) with solvent.
- Apply Loctite Primer N (P/N 293 800 041) on threads and allow to dry.
- Put 2 or 3 drops of proper strength Loctite threadlocker on female threads and in hole.

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

- Apply several drops of proper strength Loctite on stud threads.
- Install stud.
- Install cover, etc.
- Apply drops of proper strength Loctite on uncovered threads.
- Tighten nuts as required.

Pre-Assembled Parts

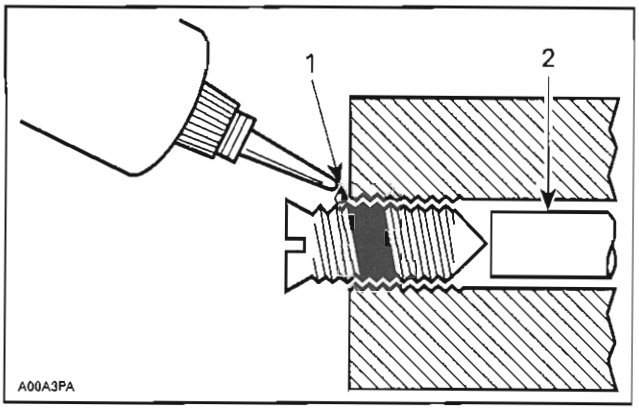


1. Apply here
2. Do not apply

- Clean bolts and nuts with solvent.
- Assemble components.
- Tighten nuts.
- Apply drops of proper strength Loctite on bolt/nut contact surfaces.
- 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.

Adjusting Screw

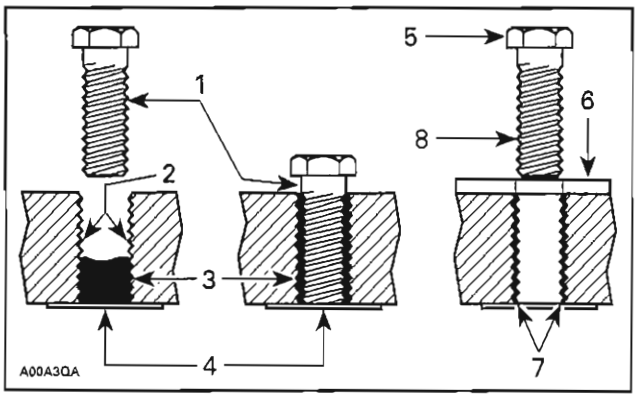


1. Apply here
2. Plunger

- Adjust screw to proper setting.
- Apply drops of proper strength Loctite threadlocker on screw/body contact surfaces.
- Avoid touching metal with tip of flask.

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

Stripped Thread Repair



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

Standard Thread Repair

– Follow instructions on Loctite FORM-A-THREAD 81668 package.
– If a plate is used to align bolt:

a. Apply release agent on mating surfaces.
b. Put waxed paper or similar film on the surfaces.

– Twist bolt when inserting it to improve thread conformation.

NOTE: NOT intended for engine stud repairs.

Repair of Small Holes/Fine Threads

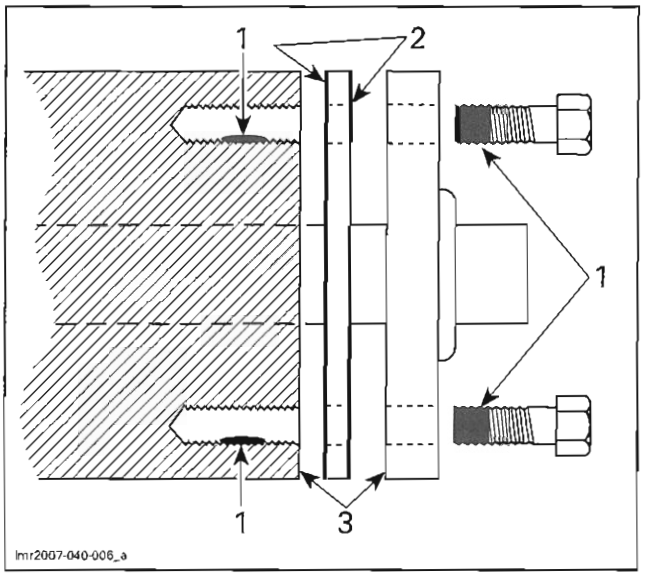
Option 1: Enlarge damaged hole, then follow *STANDARD THREAD REPAIR* procedure.

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

Permanent Stud Installation (light duty)

- Use a stud or thread on desired length.
- DO NOT apply release agent on stud.
- Do a *STANDARD THREAD REPAIR*.
- Allow to cure for 30 minutes.
- Assemble.

Gasket Compound



1. Proper strength Loctite
2. Loctite Primer N (P/N 293 800 041) and Loctite 518 (P/N 293 800 038) on both sides of gasket
3. Loctite Primer N only

- Remove old gasket and other contaminants with Loctite Chisel (gasket remover (P/N 413 708 500). Use a mechanical mean if necessary.

NOTE: Avoid grinding.

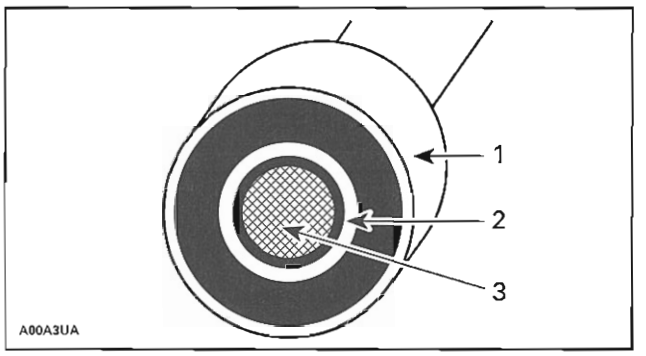
- Clean both mating surfaces with solvent.
- Spray Loctite Primer N on both mating surfaces and on both sides of gasket. Allow to dry 1 or 2 minutes.
- Apply Loctite 518 (P/N 293 800 038) on both sides of gasket, using a clean applicator.
- Place gasket on mating surfaces and assemble immediately.

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

- If holes are sunken, apply proper strength Loctite on bolt threads.
- Tighten as usual.

Mounting on Shaft

Mounting with a Press



1. Bearing
2. Proper strength Loctite
3. Shaft

- Clean shaft external part and element internal part.
- Apply a strip of proper strength Loctite on shaft circumference at insert or engagement point.

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

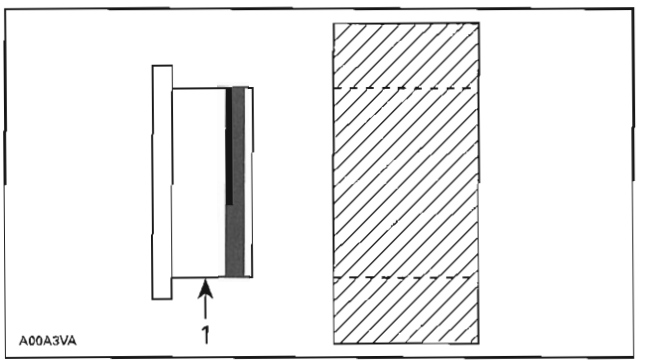
- DO NOT use antiseize Loctite or any similar product.
- No curing period is required.

Mounting in Tandem

- Apply retaining compound on internal element bore.
- Continue to assemble as shown above.

Case-In Components

Metallic Gaskets



1. Proper strength Loctite

- Clean inner housing diameter and outer gasket diameter.

- Spray housing and gasket with Loctite Primer N (P/N 293 800 041).
- 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.

- Install according to standard procedure.
- Wipe off surplus.
- Allow it to cure for 30 minutes.

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.

MANUAL INFORMATION

The manual is divided into many major sections as you can see in the main table of contents at the beginning of the manual.

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

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

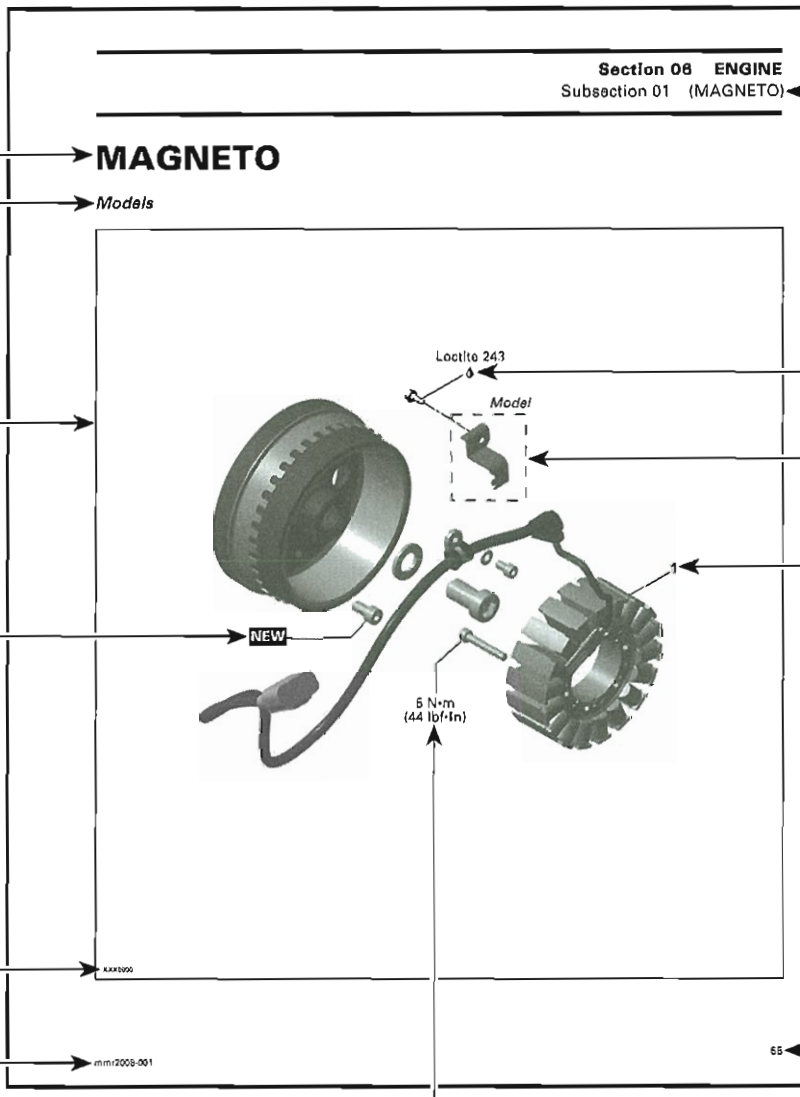
CAUTION: Most components of those vehicles are built with parts dimensioned in the metric system. Most fasteners are metric and must not be replaced by customary fasteners or vice-versa. Mismatched or incorrect fasteners could cause damage to the vehicle or possible personal injury.

As many of the procedures in this manual are interrelated, we suggest, that before undertaking any task, you read and thoroughly understand the entire section or subsection in which the procedure is contained.

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

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

TYPICAL PAGE



Page heading indicates section and subsection.

Subsection title

Indicates applicable models.

Drop represents a service product to be applied.

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

Dotted box contains parts applicable to a specific model.

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

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

Illustration number for publishing process.

Document number for publishing process.

Page number

Specific torque applicable to this installation.

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

Typical_isa_2008_en

TYPICAL PAGE

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

GENERAL

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

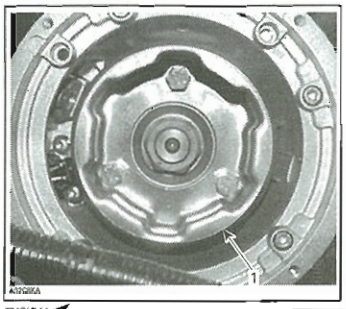
During assembly/installation, use the torque values and service products as in the exploded views.

Reference to a specific section or subsection.

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.



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

TYPICAL
1 Starting pulley

Call-outs pertaining to above illustration.

PROCEDURES

Indicates component procedures apply to.

MAGNETO FLYWHEEL

Magneto Flywheel Cleaning

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

CAUTION: Clean magneto flywheel using only a clean cloth.

Indicates specific procedure to be carried out.

Magneto Flywheel Removal

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

Remove acoustic panel.

Remove rewind starter.

Remove starting pulley no. 2.

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

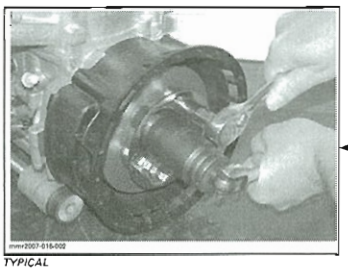


Illustration always follows text to which it applies.

TYPICAL

Models

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

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

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

typical_txt_2008_en

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MAINTENANCE CHART

MAINTENANCE CHART

The schedule should be adjusted according to operating conditions and use. The initial maintenance is very important and must not be neglected.

NOTE: The chart gives an equivalence between number of hours and months/year. Perform the maintenance operation to whatever time comes first.

IMPORTANT: ATV rental operations or intensive use of ATV, will require greater frequency of inspection and maintenance.

A: ADJUST C: CLEAN I: INSPECT L: LUBRICATE R: REPLACE	INITIAL INSPECTION 10 H OR 30 DAYS OR 300 km (185 mi)	25 H OR 750 km (470 mi)	50 H OR 1500 km (930 mi)	100 H OR 1 YEAR OR 3000 km (1865 mi)	200 H OR 2 YEARS OR 6000 km (3730 mi)	
PART/TASK						REFER TO
ENGINE						
Engine oil and filter	R			R		*LUBRICATION SYSTEM*
Valves	I, A			I, A		*CYLINDER HEAD/CYLINDER*
Engine seals	I			I		*ENGINE*
Engine mounting fasteners	I			I		*ENGINE REMOVAL/INSTALLATION*
Air filter		C (1)		R		*AIR INTAKE SYSTEM*
Exhaust system	I			I		*EXHAUST SYSTEM*
Spark arrester				C		
Coolant	I			I (2)	R	*COOLING SYSTEM*
Radiator cap/cooling system pressure test	I				I	
Radiator	I, C (1)		I, C (1)			
Rewind starter rope				I		*REWIND STARTER*
ENGINE MANAGEMENT SYSTEM						
EMS sensors	I			I		*ENGINE MANAGEMENT*
EMS fault codes	I			I		
FUEL SYSTEM						
Throttle body	I			I,L		*ELECTRONIC FUEL INJECTION*
Throttle cable	I, A, L		I, A, L			*STEERING SYSTEM*
Fuel lines, connections and fuel tank pressure test	I			I		*FUEL TANK AND FUEL PUMP*
In-line fuel filter (2008 models only)				R		
Fuel pump pressure test					I	

A: ADJUST C: CLEAN I: INSPECT L: LUBRICATE R: REPLACE	INITIAL INSPECTION 10 H OR 30 DAYS OR 300 km (185 mi)	25 H OR 750 km (470 mi)	50 H OR 1500 km (930 mi)	100 H OR 1 YEAR OR 3000 km (1865 mi)	200 H OR 2 YEARS OR 6000 km (3730 mi)	
PART/TASK						REFER TO
ELECTRICAL SYSTEM						
Spark plug						*IGNITION SYSTEM*
Battery connections	I		I			*CHARGING SYSTEM*
ECM connectors (visual inspection without disconnecting)				I		*ELECTRONIC FUEL INJECTION*
Electrical connections and fastening (ignition system, starting system, fuel injectors etc.)	I			I		*IGNITION SYSTEM*, *STARTING SYSTEM* and *ELECTRONIC FUEL INJECTION*
Ignition switch, engine start button and engine stop switch	I			I		*IGNITION SYSTEM* and *STARTING SYSTEM*
Lighting system (HI/LO intensity, brake lamp, headlamp aiming, etc.)	I			I		*LIGHTS, GAUGE AND ACCESSORIES*
CONTINUOUSLY VARIABLE TRANSMISSION (CVT)						
Drive belt				I		*CONTINUOUSLY VARIABLE TRANSMISSION (CVT)*
Drive and driven pulleys				I, C		
One-way bearing inside CVT				I, L		
CVT air inlet/outlet duct	I		I, C			
DRIVE TRAIN						
Front and rear differentials seals and vents	I		I			*FRONT DRIVE* and *REAR DRIVE*
Front and rear differentials oil	I		I		R	
Drive shaft boots and protectors	I	I				
Drive shaft joints			I			
Rear propeller shaft joints (1)	I	L	I			*REAR DRIVE*
4 x 4 coupling unit	I			I		*4 X 4 COUPLING UNIT*
WHEELS/TIRES						
Wheel bearings				I		*STEERING SYSTEM*
Wheel nuts/studs	I		I			*WHEELS/TIRES*
STEERING SYSTEM						
Handlebar fastener				I		*STEERING SYSTEM*
Steering system mechanism (column, bearing, etc.)	I			I (2)		
Tie rod ends			I			
Front wheel alignment	I			I, A		

A: ADJUST
C: CLEAN
I: INSPECT
L: LUBRICATE
R: REPLACE

PART/TASK	INITIAL INSPECTION 10 H OR 30 DAYS OR 300 km (185 mi)	25 H OR 750 km (470 mi)	50 H OR 1500 km (930 mi)	100 H OR 1 YEAR OR 3000 km (1865 mi)	200 H OR 2 YEARS OR 6000 km (3730 mi)	REFER TO
SUSPENSION						
Trailing arms				I		*REAR SUSPENSION*
Trailing arm bearings					I	
Shock absorbers			I			*FRONT SUSPENSION* and *REAR SUSPENSION*
A-arms			I, L			*FRONT SUSPENSION*
Ball joints		I				
BRAKES						
Brake fluid	I	I			R	*BRAKES*
Brake system (discs, hoses, etc.)				I		
Brake pads		I (1)				
BODY/FRAME						
Frame fastener			I			*BODY/FRAME*
Frame				I		

(1) More often under severe use such as dusty area, sand, snow, wet or muddy conditions.

(2) Every 100 hours, check coolant strength.

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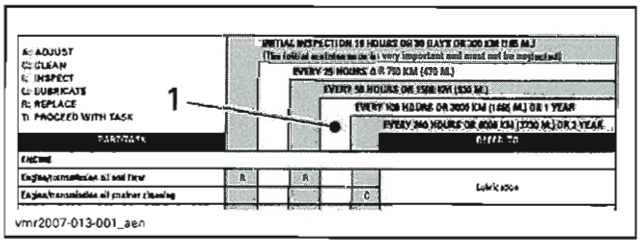
PRESEASON PREPARATION

Prior to use vehicle, proper vehicle preparation is required after performing the storage procedure.

Any worn, broken or damaged parts found during the storage procedure should have been replaced. If not, proceed with the replacement.

Using the maintenance chart, performed items in the column indicated: 100 h or 1 year or 3000 km (1865 mi).



1. Use this column

Furthermore, proceed with the following:

Vehicles Prepared as per Storage Procedure

- Remove rags from: CVT inlet and outlet hoses, engine air intake and muffler.
- Test drive vehicle to confirm proper operation.

Vehicles Not Prepared as per Storage Procedure

- Replace engine oil and filter.
- Drain fuel tank and fill with fresh fuel.
- Test drive vehicle to confirm proper operation.

STORAGE PROCEDURE

SERVICE PRODUCTS

Description	Part Number	Page
BRP heavy duty cleaner	293 110 001	8
XP-S Lube	293 600 016	8
BRP fuel stabilizer	413 408 600	7
Vinyl & Plastic Cleaner	413 711 200	8
storage oil	413 711 600	7
storage oil (US)	413 711 900	7

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

FUEL SYSTEM

Fuel System Protection

With the new fuel additives, it is critical to use the BRP fuel stabilizer (P/N 413 408 600) or an equivalent to prevent fuel deterioration and fuel system gumming. Follow the manufacturer's instructions for proper use.

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

Pour fuel stabilizer in fuel tank. Fill up fuel tank.

Do not drain fuel system.

ENGINE

Engine Oil and Filter Replacement

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

Engine Internal Lubrication

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

⚠ WARNING

This procedure must only be performed in a well-ventilated area. Do not run engine during storage period.

Proceed as follows:

- 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. Refer to *LUBRICATION SYSTEM* section.
- Remove spark plug and spray storage oil (P/N 413 711 600) into cylinder.

NOTE: For US citizens, use storage oil (US) (P/N 413 711 900) only.

CAUTION: Do not inject storage oil into throttle body bore to avoid blocking idle bypass valve.

- Press start button, 1 or 2 seconds maximum, to lubricate cylinder.
- Reinstall the spark plug.

COOLING SYSTEM

Coolant Inspection

Test coolant density using an antifreeze hydrometer.

NOTE: Follow manufacturer's instructions for proper use.

A 50/50 mixture of antifreeze and distilled water will provide the optimum cooling, corrosion protection and antifreeze protection.

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

Change coolant if necessary. Refer to *COOLING SYSTEM* section.

CVT TRANSMISSION

Pulley Inspection, Cleaning and Protection

Remove drive belt from pulleys.

Inspect and clean pulleys then spray XP-S Lube (P/N 293 600 016) on pulley faces.

Do not reinstall drive belt. Close CVT cover.

ELECTRICAL SYSTEM

Battery Removal and Storage

Remove the battery. Store it in dry and cool place out of the sun, refer to *BATTERY* in *CHARGING SYSTEM* section.

VEHICLE

Vehicle Cleaning

To facilitate the inspection and ensure adequate lubrication of components, it is recommended to clean the entire vehicle.

Wash and dry the vehicle.

CAUTION: Never use a high pressure washer to clean the vehicle. USE LOW PRESSURE ONLY (like a garden hose). The high pressure can cause electrical or mechanical damages.

Remove any dirt or rust.

To clean the vinyl or plastic parts, use only flannel clothes with Vinyl & Plastic Cleaner (P/N 413 711 200).

CAUTION: 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 clean the entire vehicle, including metallic parts use 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 XP-S Lube (P/N 293 600 016).

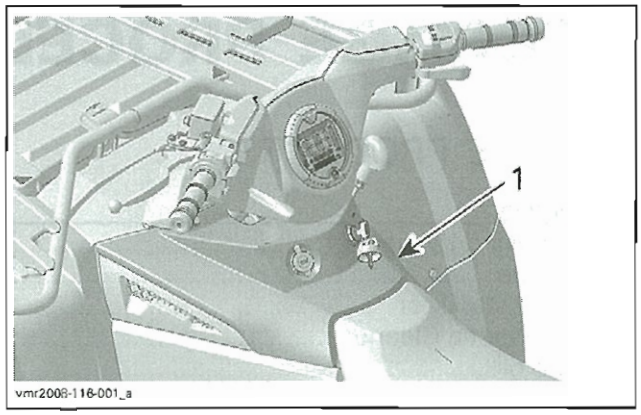
Vehicle Protection

To prevent the intrusion of small animals or other debris, block the following locations with clean rags:

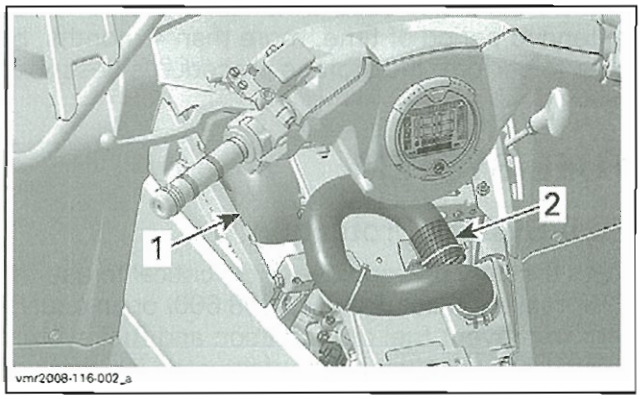
- CVT air inlet duct
- CVT air outlet duct
- Air intake inlet
- Muffler.

CAUTION: Do not forget, these rags must be removed during preseason preparation before starting the vehicle.

To reach the CVT air inlet duct and the air intake inlet, lift the console. Refer to *BODY*.

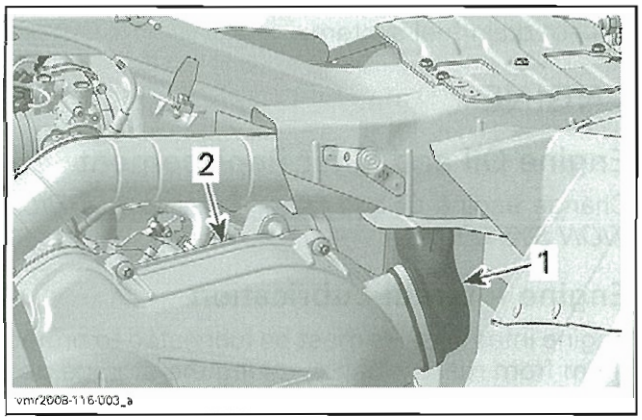


1. Console



1. CVT inlet hose
2. Air intake inlet

The CVT outlet hose is located at the rear of engine, against vertical frame beam. The removal of the left side panel is necessary to reach the hose.



1. CVT outlet hose
2. CVT cover

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

CAUTION: 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.

SPECIAL PROCEDURES

SERVICE PRODUCTS

Description	Part Number	Page
XP-S Lube	293 600 016	9–10

NOTE: These procedures give a guideline of things to do if one of these abnormal situations occur with the vehicle.

TURN OVER

When vehicle is turned over or stays tilted on the side, put the vehicle back on its wheels, then wait 3 to 5 minutes before starting the engine.

Inspect air filter housing drain tube for oil accumulation, if any oil is found, clean air filter and air filter housing. Refer to *AIR INTAKE SYSTEM* section.

Check oil level and refill if necessary.

Check engine coolant level and refill if necessary.

Start engine and let it run at idle, around 1 minute, then stop engine. Check oil level immediately.

CAUTION: Stop engine immediately if the LOW OIL message and check engine indicator light stay ON.

If the engine oil level is good, check the following:
- Oil filter for contamination. Replace oil filter and oil.

If the problem is still not resolved, check the following:
- Oil pressure switch for damages. Replace it if necessary.
- Oil strainer cleanliness and damages. Clean or replace oil strainer.
- Oil pressure regulator valve stays open in the crankcase due to contamination (metallic particles). Clean or replace the valve.
- Valve piston stuck in the oil pump housing. Repair valve piston.
- Oil pump cleanliness and operation. Clean or replace oil pump if necessary.

ATV IMMERSION

ATV Submerged for a Long Time (Over One Hour)

Disassemble engine and transmission to clean the internal parts and check if there is no rust or corrosion on any internal parts. Refer to the specific *ENGINE* section.

Drain air filter housing then clean and dry air filter.

Remove muffler and empty it. Let muffler dry then reinstall it on the vehicle.

Flush fuel tank and refill with new gas.

Lubricate throttle body. Refer to *FUEL SYSTEM*.

Look for water in:
- Brake system (replace brake fluid)
- Differentials (drain oil and check internal parts for rust or corrosion then refill).

Lubricate all cables. Check if the cables operate properly.

Spray all metal parts with XP-S Lube (P/N 293 600 016).

Test ride to confirm all is working well (electrical and mechanical components).

ATV Submerged for a Short Time (Less than One Hour)

Check if engine oil is contaminated (oil will be milky). If so, perform the following instructions.

- Drain engine oil.
- Drain air filter housing then clean and dry air filter.
- Look for water in fuel tank, in doubt, flush fuel tank and refill with new gas.
- Drain the CVT housing. Refer to *CONTINUOUSLY VARIABLE TRANSMISSION (CVT)*.
- Remove the CVT cover then clean and check all parts of CVT.
- Lubricate all cables. Check if the cables operate properly.
- Remove spark plug then crank engine slowly several times.
- Add a small quantity of engine oil in cylinder (approximately 2 teaspoonfuls). Do not reinstall spark plug at this moment.
- Refill engine at the proper level with the recommended oil. Crank engine several times.
- Check condition of spark plug. If spark plug appears good reinstall it, if not install a new one.

- 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 white appearance in engine oil.

Spray all metal parts with XP-S Lube (P/N 293 600 016).

Test drive to confirm all is working well (electrical and mechanical components).

TECHNICAL GUIDELINES

The following charts are provided to help in diagnosing the probable source of troubles. It should be used as a guideline.

ENGINE

Cooling System

Symptom: HIGH ENGINE OPERATING TEMPERATURE

1. **Check mud/dust in radiator fins.**
   - *Radiator fin obstructed, hard air cooling. Clean radiator fins.*
2. **Check coolant level.**
   - *Coolant less than recommended level. Refill.*
3. **Check radiator cap.**
   - *Defective radiator cap relief valve. Replace.*
4. **Check vent holes in coolant expansion tank cap.**
   - *Inner cap vent hole of coolant expansion tank is clogged. Replace.*
   - *Cap vent hole of coolant expansion tank is clogged. Replace.*
5. **Check cooling fan fuse and relay.**
   - *Faulty fan switch and/or faulty fuse. Replace defective part(s).*
6. **Check cooling fan and connection.**
   - *Fan motor faulty. Replace.*
   - *Wire harness is brittle or hard (no connection). Replace.*
7. **Check radiator condition for leakage.**
   - *Radiator swelled, cracked or deformed. Replace radiator.*
8. **Check condition of hoses and clamps fixation.**
   - *Hoses are brittle and/or hard. Replace.*
   - *Hose clamps are loose. Retighten clamps.*

9. **Check for air bubbles in cooling system.**
   - *Air in cooling system. Refill and bleed cooling system (refer to COOLING SYSTEM).*
10. **Check engine temperature sensor for electrical/mechanical failure.**
    - *Engine is not overheating. Temperature sensor defective. Replace.*
11. **Check thermostat.**
    - *Thermostat defective. Replace.*
12. **Check coolant bleeding screw on thermostat housing.**
    - *Screw is loosed/missing and/or gasket ring is missing/broken. Retighten/add screw and replace gasket ring.*
13. **Check gasket(s) of water pump cover.**
    - *Leakage in water pump cover area. Retighten screws and/or replace gasket.*
14. **Check leak indicator hole (water pump housing area MAG side) if coolant leaks.**
    - *Coolant leaking from leak indicator hole means a damaged rotary seal inside magneto cover. Replace both rotary seal and oil seal (refer to COOLING SYSTEM and MAGNETO/STARTER).*
15. **Check condition of water pump impeller.**
    - *Impeller wings broken and/or impeller thread is damaged. Replace.*

Symptom: HIGH ENGINE OPERATING TEMPERATURE (cont'd)

16. Check cylinder head and/or cylinder base gasket.

- *Worn out gasket(s) is (are) causing water leakage. Replace gasket(s) and refill with coolant and oil (refer to COOLING SYSTEM and LUBRICATION SYSTEM).*

17. Check intermediate gear(s) behind magneto cover.

- *Worn out and/or broken gear(s) is (are) causing less coolant supply. Replace worn out and/or broken gear(s) (refer to LUBRICATION SYSTEM and MAGNETO/STARTER).*

18. Check if water pump shaft is seized.

- *Water pump shaft does not turn. Replace defective part(s).*

Lubrication System

Symptom: LOW OR NO OIL PRESSURE/HIGH OIL CONSUMPTION

1. Check oil level and look for leakage on crankcase and/or defective seals.

- *Crankcase is leaking due to damage. Rebuild engine with new crankcase and gasket parts. Use recommended oil (refer to TECHNICAL SPECIFICATIONS).*
- *Crankcase is leaking due to loose screws. Retighten screws with recommended torque.*
- *Sealing rings, O-rings and/or gaskets are brittle and/or hard or damaged. Replace damaged parts.*
- *Piston rings worn out (blue-colored engine exhaust emission). Replace piston rings (refer to CYLINDER HEAD/CYLINDER).*
- *Piston rings are broken (low compression and blue-colored engine exhaust emission). Replace piston rings (refer to CYLINDER HEAD/CYLINDER).*
- *Valve stem seal damaged and/or sealing lip is hard and/or brittle. Replace all valve stem seals.*

2. Check oil drain plug underneath engine.

- *Plug is loosen and/or gasket ring is missing. Retighten the plug and/or place gasket ring.*

3. Check leak indicator hole for oil leaks (crankcase MAG, beside water pump housing area).

- *Oil leaking from leak indicator hole means a damaged oil seal of water pump shaft inside magneto cover. Replace both rotary seal and oil seal (refer to COOLING SYSTEM and MAGNETO/STARTER).*

4. Check oil filter for contamination.

- *Oil filter clogged. Replace oil filter and oil at the same time. Use recommended oil (refer to TECHNICAL SPECIFICATIONS).*

5. Check oil pressure switch operation.

- *Oil pressure switch damaged. Replace oil pressure switch.*

6. Check oil strainer underneath engine.

- *Screw(s) is (are) loosed and/or gasket is damaged, brittle or hard. Retighten screw and/or replace gasket.*
- *Oil strainer is clogged due to contamination. Clean or replace strainer and diagnose causes. Replace possible damaged parts. Use recommended oil (refer to TECHNICAL SPECIFICATIONS).*

7. Check oil orifice(s) on the oil pump suction side.

- *Oil orifice(s) is (are) clogged. Clean from contamination. Replace oil and oil filter if necessary (refer to MAINTENANCE or LUBRICATION SYSTEM).*

8. Check oil pressure regulator valve (spring) operation.

- *Valve spring damaged (valve always open). Replace spring.*
- *Valve piston in oil pump housing stays open due to contamination (metallic particles). Clean and/or repair valve piston and oil pump housing.*

Symptom: LOW OR NO OIL PRESSURE/HIGH OIL CONSUMPTION (cont'd)

9. **Check oil pump operation.**
   - *Oil pump rotor is out of wear limit. Replace oil pump shaft (refer to LUBRICATION SYSTEM).*
   - *Oil pump seized due to oil leakage and/or air inclusion. Replace oil pump (refer to LUBRICATION SYSTEM).*
   - *Gears driving oil pump are broken or damaged. Replace gears.*
   - *Incorrect oil being used. Use recommended oil (refer to TECHNICAL SPECIFICATIONS).*
10. **Check plain bearings in crankcase for severe wear.**
   - *Plain bearings out of specification (increased clearance). Replace all plain bearings at the same time (refer to CRANKCASE/CRANKSHAFT).*

Symptom: OIL CONTAMINATION (WHITE APPEARANCE)

1. **Check leak indicator hole (crankcase MAG, beside water pump housing area) if water and oil leaks.**
   - *Leakage of oil/water mixture from leak indicator hole means damaged oil seal and rotary seal of water pump shaft inside magneto cover. Replace both, rotary seal and oil seal and refill with recommended oil and/or coolant (refer to COOLING SYSTEM and MAGNETO/STARTER).*
2. **Check cylinder head and/or cylinder base gasket.**
   - *Gasket damaged or leaking. Retighten cylinder head with recommended torque and/or replace gasket.*
3. **Check tightening torque of cylinder head screws.**
   - *Screws not properly tightened. Retighten screws to recommended torque and replace oil.*
4. **Check oil for particles (may indicate possible damages inside the engine).**
   - *Oil contamination due to metal or plastic particles. Replace possibly damaged parts including oil and oil filter. Use recommended oil (refer to TECHNICAL SPECIFICATIONS).*

Cylinder and Head

Symptom: UNUSUAL ENGINE NOISE AND/OR VIBRATION AT IDLE SPEED

1. **Check valve adjustment.**
   - *Intake and/or exhaust valves not adjusted correctly. Adjust valves.*
2. **Check operation of decompressor located on camshaft.**
   - *Decompressor shaft sticks and/or torsion spring is damaged. Replace spring and/or decompressor mechanism.*
   - *Loose camshaft gear. Retighten camshaft gear (refer to CYLINDER HEAD/CYLINDER).*
3. **Check chain tensioner operation.**
   - *Faulty chain tensioner. Replace spring and/or mechanism.*

Symptom: UNUSUAL ENGINE NOISE AND/OR VIBRATION WHILE OPERATING

1. **Check items of *UNUSUAL ENGINE NOISE AND/OR VIBRATION AT IDLE SPEED*.**
2. **Check noise coming from cylinder head area.**
   - *Chain guide worn out. Replace chain guide.*
   - *Stretched chain and/or worn out sprocket. Replace chain and sprocket at the same time.*
   - *Sprocket screw got loose. Retighten screw with recommended torque.*
   - *Rocker arm(s) is (are) worn out (valve adjustment). Replace rocker arm(s) and/or shaft(s) and readjust valve clearance.*
   - *Thrust washer(s) on rocker arm shaft is (are) missing. Fit thrust washer(s) (refer to CYLINDER HEAD/CYLINDER).*

Crankshaft and Balancer Shaft

Symptom: UNUSUAL ENGINE NOISE AND/OR VIBRATIONS

1. **Check if mark on balancer shaft is aligned with crankshaft position mark.**
   - *Mark on balancer shaft and crankshaft are not aligned. Readjust position of balancer shaft and crankshaft (refer to CRANKCASE/CRANKSHAFT).*
2. **Check for possible plain bearing failure.**
   - *Connecting rod big end clearance is out of specification. Replace damaged and/or worn out part(s).*
   - *Oil pressure is out of specified values. Replace damaged parts (refer to LUBRICATION SYSTEM).*
   - *Connecting rod small end bearing is damaged and/or out of specification. Replace damaged and/or worn out part(s).*
   - *Crankshaft plain bearing MAG/PTO side is damaged and/or out of specification. Replace crankshaft and plain bearing MAG/PTO at the same time (refer to CRANKCASE/CRANKSHAFT).*
3. **Check ball bearing(s) on balancer shaft end(s).**
   - *Ball bearing(s) do(es) not move freely. Replace bearing(s).*

Gearbox

Symptom: UNUSUAL ENGINE NOISE AND/OR VIBRATIONS

1. **Check oil level in engine.**
   - *Oil leakage from engine. Replace damaged gasket(s) and/or oil seal(s), torque screws and refill with recommended oil up to specified level (refer to TECHNICAL SPECIFICATIONS).*
2. **Check magnetic drain plug.**
   - *Magnetic drain plug shows particles. Check engine for internal damage.*
3. **Check bearings in the gearbox for free movement.**
   - *Bearing(s) do(es) not move freely. Replace bearing(s).*
4. **Check for knocking noise.**
   - *Tooth of gears are damaged and/or worn. Replace respective gears.*

Symptom: GEAR INDICATION FAILS

1. **Check wire harness connector pins (gear indicator) and/or multifunction gauge.**
   - *Connector pins are corroded and/or damaged. Clean connector and/or replace wire harness if damaged.*
   - *Multifunction gauge failed and/or damaged. Repair and/or replace damaged part(s).*
2. **Check gearbox position switch(es) condition on PTO side (behind CVT driven pulley).**
   - *Gearbox position switch(es) pin(s) is (are) worn and/or damaged. Replace gearbox position switch(es).*
   - *Contact(s) is (are) corroded and/or contact screw for wire harness got loose. Clean contact surface and retighten contact screw(s) with recommended torque.*
   - *Wire harness has broken cables. Replace wire harness.*

Symptom: GEAR(S) IS (ARE) HARD TO SHIFT

1. **Check engine idle speed.**
   - *Check throttle cable and its adjustment.*
   - *Check idle air control valve and connectors.*

Symptom: GEAR(S) IS (ARE) HARD TO SHIFT (cont'd)

2. **Check transmission lever and connecting rod.**
   - *Ball joint and/or ball joint nut is (are) loose. Retighten or replace the ball joint. Check shifter adjustment.*
3. **Check spring on shifter plate.**
   - *Broken spring. Replace the spring.*
4. **Check for any mud intrusions.**
   - *CVT parts dirty. Clean all CVT parts.*
5. **Check CVT one way clutch on drive pulley.**
   - *CVT one way clutch was not lubricated correctly. Lubricate CVT one way clutch (refer to CONTINUOUSLY VARIABLE TRANSMISSION (CVT)).*
   - *CVT one way clutch is worn out or damaged. Replace defective part(s) (refer to CONTINUOUSLY VARIABLE TRANSMISSION (CVT)).*
6. **Check shift shaft spline and/or shift forks for wear and/or damages.**
   - *Shift shaft is worn out and/or shows damaged splines. Replace shift shaft.*
   - *Shift drum track(s) and/or splines is (are) worn out or damaged. Replace shift drum and damaged part(s).*
   - *Shift fork(s) is (are) worn out and/or engagement pins are damaged. Replace shift fork(s).*
   - *Shift fork(s) is (are) worn out and/or fork(s) is (are) damaged. Replace shift fork(s).*
   - *Shift gear(s) is (are) worn out. Replace shift gear(s).*
   - *Gearbox position switch(es) pin(s) is (are) worn out (no roundings on top of pin). Replace gearbox position switch(es).*

Rewind Starter

Symptom: REWIND STARTER ROPE DOES NOT REWIND

1. **Check rewind spring.**
   - *Broken spring. Replace spring (refer to REWIND STARTER).*

Symptom: REWIND STARTER PAWL DOES NOT ENGAGE

1. **Check stop spring.**
   - *Broken stop spring. Replace.*
2. **Check pawl and pawl lock.**
   - *Pawl and pawl lock are stuck together because of heat. Replace.*
3. **Check pawl and rope sheaves.**
   - *Pawl and rope sheaves are stuck together because of heat. Replace.*

CVT TRANSMISSION

Symptom: THE ATV ACCELERATES SLOWLY, ESPECIALLY WHEN IT IS STOPPED

1. **Check drive belt condition.**
   - *Belt is too narrow (drive belt engagement is higher in drive pulley). Replace belt if width is less than specified (refer to CONTINUOUSLY VARIABLE TRANSMISSION (CVT) and/or TECHNICAL SPECIFICATIONS).*

Symptom: THE ATV ACCELERATES SLOWLY, ESPECIALLY WHEN IT IS STOPPED (cont'd)

2. **Check roller(s) on governor cup and/or lever condition on drive pulley sliding sheave.**
   - *Roller(s) is (are) worn and/or damaged (refer to CONTINUOUSLY VARIABLE TRANSMISSION (CVT)). Replace governor cup assembly.*
   - *Lever(s) on drive pulley sliding sheave is (are) worn and/or damaged (refer to CONTINUOUSLY VARIABLE TRANSMISSION (CVT)). Replace all levers at the same time (lever kit).*
3. **Check drive pulley sliding sheave for free axial movement.**
   - *Sliding sheave is stuck (refer to CONTINUOUSLY VARIABLE TRANSMISSION (CVT)). Replace damaged part(s).*
4. **Check condition of drive/driven pulley spring.**
   - *Drive pulley spring tension is too smooth and/or damaged (refer to CONTINUOUSLY VARIABLE TRANSMISSION (CVT)). Replace spring.*
   - *Driven pulley spring tension is too stiff (refer to CONTINUOUSLY VARIABLE TRANSMISSION (CVT)). Replace spring.*
5. **Check condition of fixed and sliding sheaves (drive and driven pulley).**
   - *Check surface of fixed and sliding sheaves (drive and driven pulley) for grooves or other damages; refer to CONTINUOUSLY VARIABLE TRANSMISSION (CVT)).*
6. **Check if cam of driven pulley is worn.**
   - *Replace if out of specifications; (refer to CONTINUOUSLY VARIABLE TRANSMISSION (CVT)).*

Symptom: ENGINE MAXIMUM RPM IS TOO HIGH AND TOP SPEED IS NOT REACHED

1. **Check drive/driven pulley area for contamination and/or water intrusion.**
   - *CVT area is contaminated with water, dirt or oil. Clean CVT system and replace damaged part(s).*
2. **Check items 1 to 4 of *THE ATV ACCELERATES SLOWLY, ESPECIALLY WHEN IT IS STOPPED*.**

Symptom: DRIVE PULLEY NOISE AT IDLE SPEED

1. **Check slider shoes (drive pulley).**
   - *Worn slider shoes (increased clearance between governor cup and drive pulley sliding sheave). Replace all slider shoes at the same time (slider shoes kit).*
2. **Check driven pulley sliding mechanism (between driven pulley outer and inner sheave).**
   - *Mechanism is stuck and/or damaged. Replace driven pulley assembly.*
3. **Check roller(s) and/or levers for wear (located on sliding sheave of drive pulley).**
   - *Roller(s) on governor cup is (are) worn out and/or damaged (refer to CONTINUOUSLY VARIABLE TRANSMISSION (CVT)). Replace governor cup assembly.*
   - *Lever(s) on drive pulley sliding sheave is (are) worn out and/or damaged (refer to CONTINUOUSLY VARIABLE TRANSMISSION (CVT)). Replace all levers at the same time (lever kit).*
4. **Check drive pulley screw torque.**
   - *Loose screw. Retighten screw with recommended torque.*
5. **Check one-way clutch condition on drive pulley sliding sheave.**
   - *Bearing(s) do(es) not move freely. Replace damaged part(s) and lubricate inside of one-way clutch (refer to CONTINUOUSLY VARIABLE TRANSMISSION (CVT)).*
   - *Spring sleeve(s) inside one-way clutch is (are) worn out. Replace both sleeves and springs and lubricate inside of one-way clutch (refer to CONTINUOUSLY VARIABLE TRANSMISSION (CVT)).*
   - *Spring(s) inside one-way clutch is (are) worn out. Replace both pins and springs and lubricate inside of one-way clutch (refer to CONTINUOUSLY VARIABLE TRANSMISSION (CVT)).*

Symptom: DRIVE PULLEY NOISE WHEN ACCELERATING/DECELERATING

1. **Check items 1 to 5 of *DRIVE PULLEY NOISE AT IDLE SPEED*.**

Symptom: DRIVE PULLEY NOISE WHEN ACCELERATING/DECELERATING (cont'd)

2. **Check if belt runs in dry conditions.**
   - *Drive pulley area is wet/contaminated due to water/dirt intrusion. Clean driven pulley area and/or drain water out of CVT cover.*
3. **Check drive/driven pulley screw torque.**
   - *Loose screw on drive and/or driven pulley. Retighten screw with recommended torque.*
4. **Check cam and driven pulley fixed sheave for wear.**
   - *Cam and/or drive pulley fixed sheave out of wear limit and/or damaged. Replace damaged part(s).*
5. **Check torque gear in driven pulley sliding sheave for wear.**
   - *Torque gear out of wear limit and/or damaged. Replace torque gear (refer to CONTINUOUSLY VARIABLE TRANSMISSION (CVT)).*
6. **Check for foreign particles in CVT area (stones, dirt, etc.).**
   - *Small particles damaged belt and/or pulley surface(s). Clean system and replace damaged parts (refer to CONTINUOUSLY VARIABLE TRANSMISSION (CVT)).*

Symptom: VIBRATIONS ORIGINATING FROM DRIVE PULLEY

1. **Check torque of drive pulley screw.**
   - *Moving sliding sheave. Retighten screw.*
2. **Check fixed sheave bushings.**
   - *Excessive gap between bushings and fixed sheave shaft, thus restraining sliding sheave movements. Replace fixed sheave assembly.*
3. **Check starter ring gear condition.**
   - *Starter ring gear loosened. Retighten ring gear and/or mount it in original position (balanced system).*
4. **Check if slider shoes are present and/or placed in correct position.**
   - *Slider shoe(s) is (are) missing and/or damaged. Replace all slider shoes at the same time (slider shoes kit).*

Symptom: VIBRATIONS ORIGINATING FROM DRIVEN PULLEY

1. **Check fixed and sliding sheave bushings on driven pulley.**
   - *Excessive gap between bushings and CVT shaft, thus restraining sliding sheave movements. Replace fixed and/or sliding sheave of driven pulley, polish CVT shaft area with fine emery cloth and wipe clean with a cloth.*

Symptom: PULLEYS DO NOT DOWNSHIFT OR UPSHIFT PROPERLY

1. **Check drive pulley bushings (cleanliness, wear, etc.).**
   - *Bushings stick to fixed sheave pulley shaft. Clean or replace.*
   - *Spring seat sticks to sliding sheave pulley bushing. Clean system and/or replace sliding sheave pulley.*
   - *One-way clutch does not operate properly. Clean system and/or replace damaged part(s).*
2. **Check driven pulley spring tension.**
   - *Driven pulley spring tension is too weak and/or broken. Replace.*
   - *Driven pulley cam is worn or damaged. Replace.*

Symptom: BELT GLAZED EXCESSIVELY OR HAVING BAKED APPEARANCE

1. **Check if CVT air intake and/or outlet is clogged.**
   - *CVT area heats up due to contamination. Clean air intake and/or outlet from contamination.*
   - *Fins of drive pulley fixed sheave (underneath ring gear) are clogged. Clean from contamination.*

Symptom: BELT GLAZED EXCESSIVELY OR HAVING BAKED APPEARANCE (cont'd)

2. **Check if pulley sheaves are clean.**
   - *Oil on pulley surfaces. Clean pulley sheaves and replace belt.*
   - *Water intrusion in CVT area. Find root cause and repair. Drain water and replace belt.*

Symptom: BELT WORN EXCESSIVELY ON TOP WIDTH

1. **Check drive belt width.**
   - *Considerable wear. Replace belt if narrower than specified (refer to CONTINUOUSLY VARIABLE TRANSMISSION (CVT) or TECHNICAL SPECIFICATIONS).*
2. **Check drive belt identification number.**
   - *Improper belt angle (wrong type of belt). Replace belt with an appropriate drive belt.*
3. **Check for localized belt wear caused by belt slippage.**
   - *Localized wear. Replace belt.*

Symptom: BELT DISINTEGRATION

1. **Check if drive belt lifetime is exceeded.**
   - *Clean CVT system and rebuild with a new drive belt.*
2. **Check drive belt identification number.**
   - *Excessive belt speed. Using unspecified type of belt. Replace belt with proper type of belt (refer to TECHNICAL SPECIFICATIONS).*
3. **Check if pulley sheaves are clean.**
   - *Oil on pulley surfaces. Clean pulley surfaces with fine emery cloth and wipe clean using Pulley Flange Cleaner (P/N 413 711 809) and a cloth.*
   - *Drive/driven pulley sheaves are damaged by stones inside CVT area. Clean pulley surfaces with fine emery cloth, wipe clean with a cloth or replace drive/driven pulley sheaves and belt.*

Symptom: FLEX CRACKS BETWEEN COGS

1. **Check drive belt condition.**
   - *Considerable use, belt wearing out. Replace.*
   - *Brittle belt condition through aging. Replace belt.*

ELECTRICAL SYSTEM

Ignition System

Symptom: NO SPARK OR POOR SPARK

1. **Check spark plug cap contact and/or cable.**
   - *Spark plug cap loose. Replug cap.*
   - *Spark plug cable melted and/or damaged. Replace spark plug cable.*
2. **Check spark plug condition and/or gap.**
   - *Fouled spark plug or wrong spark plug gap. Readjust gap and clean spark plug or replace.*
3. **Check ignition coil.**
   - *Check ignition coil input voltage and continuity of the appropriate circuit of the wiring harness. Repair the connectors or replace the wiring harness between ECM connector and the ignition coil, refer to IGNITION SYSTEM.*
   - *Perform ignition coil resistance test. Replace ignition coil. Refer to IGNITION SYSTEM.*
4. **Check crankshaft position sensor.**
   - *Test sensor operation. Replace if faulty. Refer to ELECTRONIC FUEL INJECTION.*

Starting System

Symptom: STARTER DOES NOT TURN

1. **Check that multifunction gauge and taillight turn on when ignition switch is turned on and engine stop switch is set to RUN.**
   - *Check main fuse and ECM fuse. Replace if faulty.*
   - *Repair or replace faulty switch(es) or repair wiring harness.*
2. **Transmission not set to Park or Neutral.**
   - *Set transmission to PARK or NEUTRAL.*
3. **Poor contact of battery terminal(s) or ground cable connections.**
   - *Clean and tighten terminal(s).*
4. **Weak or faulty battery.**
   - *Recharge or replace battery.*
5. **Poor contact or open circuit of start switch or starting solenoid.**
   - *Check and replace defective part.*
6. **Gear selection indicator switch(es) is (are) defective.**
   - *Check switch(es) and wiring connection. Refer to CRANKCASE/CRANKSHAFT.*
7. **Diode (D4) failure.**
   - *Check diode condition of starter solenoid circuit. Refer to STARTING SYSTEM.*
8. **Starter, starter drive or starter bushings defective or worn out.**
   - *Check or replace the faulty component. Refer to CRANKCASE/CRANKSHAFT and STARTING SYSTEM.*
9. **Engine mechanical problem (ensure that other electric components are good).**
   - *Check and replace defective part.*

Symptom: STARTER TURNS BUT DOES NOT CRANK THE ENGINE

1. **Check gear condition on electric starter.**
   - *Worn and/or damaged starter gear. Replace electric starter and/or starter drive.*
2. **Check condition of starter pinion gear.**
   - *Worn and/or damaged starter pinion and/or ring gear. Replace starter drive and/or drive pulley fixed sheave.*
3. **Check splines on starter drive.**
   - *Poor movement of pinion gear on splines. Clean and/or replace starter drive.*

Symptom: STARTER KEEPS RUNNING

1. **Check splines on starter drive.**
   - *Poor movement of pinion gear on splines. Clean and/or replace starter drive.*

CHARGING SYSTEM

Symptom: BATTERY NOT CHARGING OR CHARGING VOLTAGE INADEQUATE

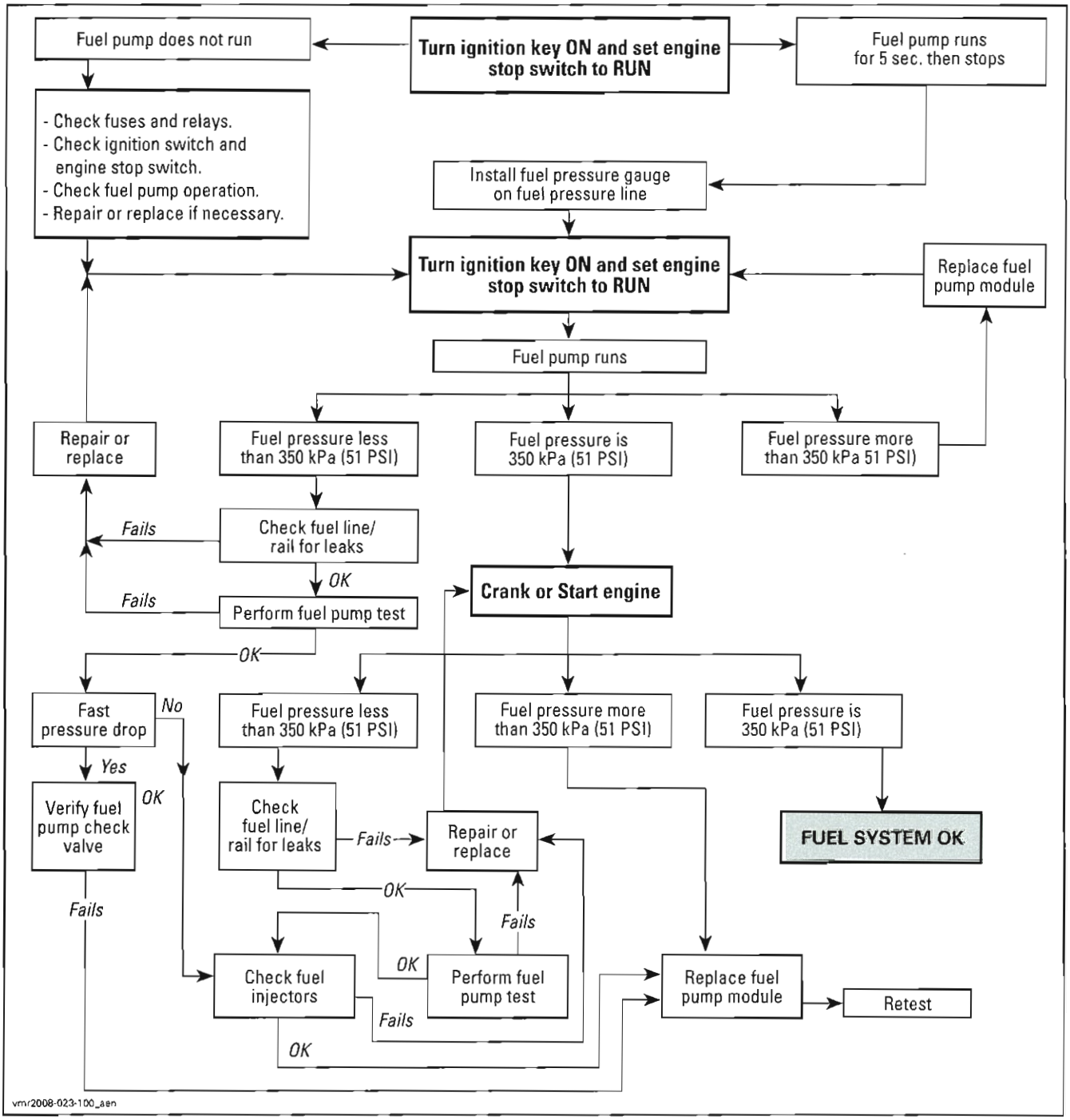
1. **Check battery.**
   - *Battery is discharged. Recharge battery.*
   - *Battery does not remain charged. Check battery and charging system. Refer to CHARGING SYSTEM.*

Symptom: BATTERY NOT CHARGING OR CHARGING VOLTAGE INADEQUATE (cont'd)

2. **Check voltage regulator/rectifier.**
   - *Refer to CHARGING SYSTEM.*
3. **Check wiring harness for cracks or other damages.**
   - *Harness shows electrical failure and/or other damages. Replace/repair wiring harness.*
4. **Check magneto for damage and/or electrical failure.**
   - *Radial position of rotor wrong due to a broken Woodruff key. Replace Woodruff key.*
   - *Connector on magneto is damaged and/or has electrical failure. Repair and clean contacts of connector.*
   - *Coating on stator winding is damaged. Replace stator.*
   - *Resistance value is out of specification (refer to CHARGING SYSTEM). Replace stator.*
   - *Weak magneto magnets. Replace magneto.*

DIAGNOSTIC FLOW CHART

FUEL SYSTEM



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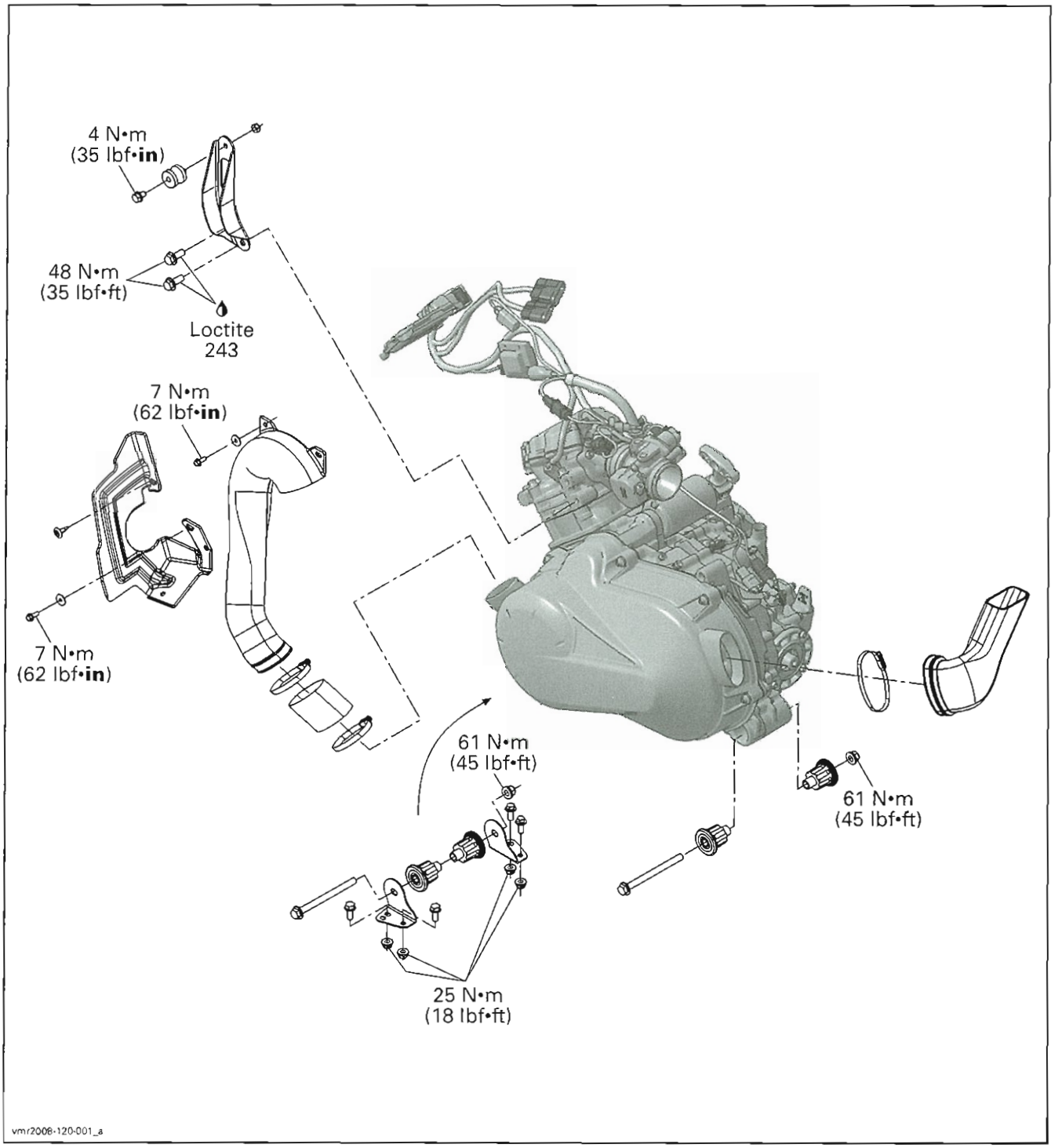
ENGINE REMOVAL/INSTALLATION

SERVICE TOOLS

SERVICE PRODUCTS



GENERAL

⚠ WARNING

To avoid potential burns, let engine and exhaust system cool down before performing any servicing.

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

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

⚠ WARNING

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

Hoses or cables removed or disconnected must be installed and routed at the same place.

CAUTION: Locking ties removed during a procedure must be replaced and installed at the same location.

PROCEDURES

ENGINE

Engine Removal

Place the vehicle on a workstation that will have access to an engine-lifting hoist.

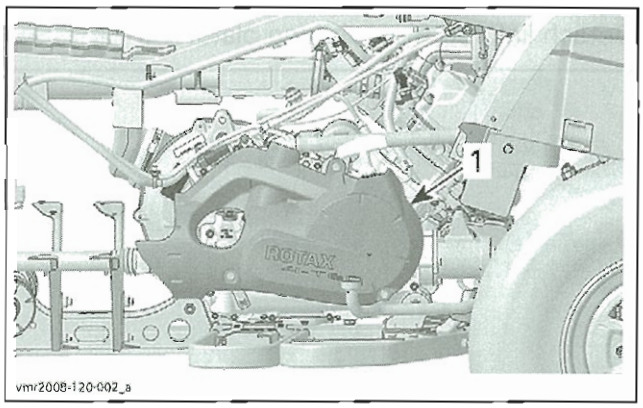
Place the transmission lever on "P" position.

Disconnect BLACK (-) cable from battery, then RED (+) cable.

Using procedures described in *BODY* section, remove the following parts:
- Seat(s)
- LH and RH side panels
- LH and RH footrests.

Remove the air filter housing. Refer to *AIR INTAKE SILENCER* section.

Remove the engine cover.

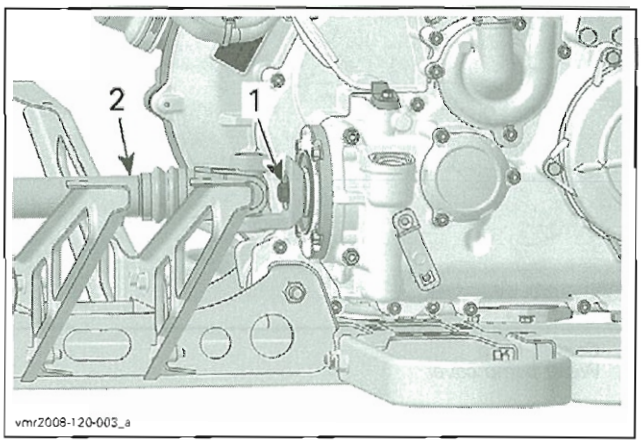


1. Engine cover

Drain engine oil. Refer to *LUBRICATION SYSTEM* section for procedure.

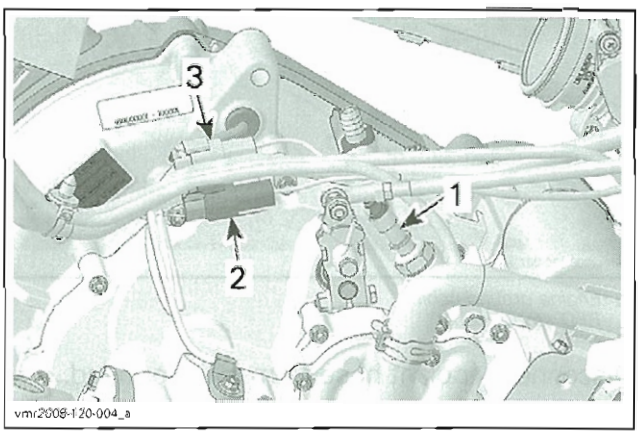
Drain cooling system. Refer to *COOLING SYSTEM* section.

Remove the rear propeller screw.



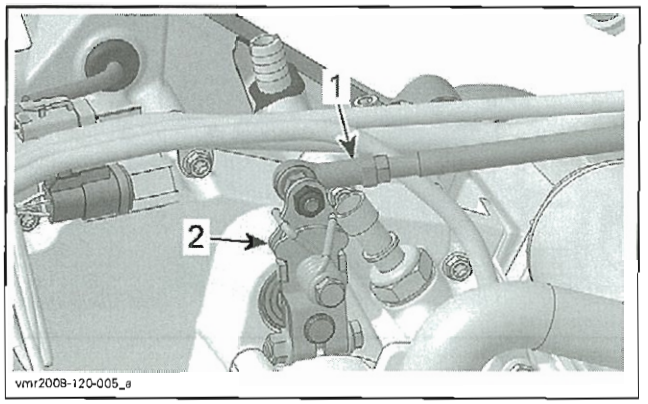
1. Rear propeller shaft screw
2. Rear propeller shaft

Unplug the vehicle speed sensor (VSS), oil pressure sensor (OPS) and the indicator switches connectors.



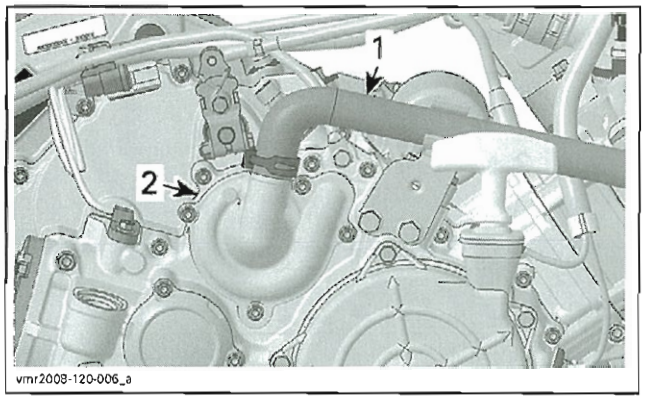
1. OPS connector
2. VSS connector
3. Indicator switches connector

Detach link rod from shifting plate.



1. Link rod
2. Shifting plate

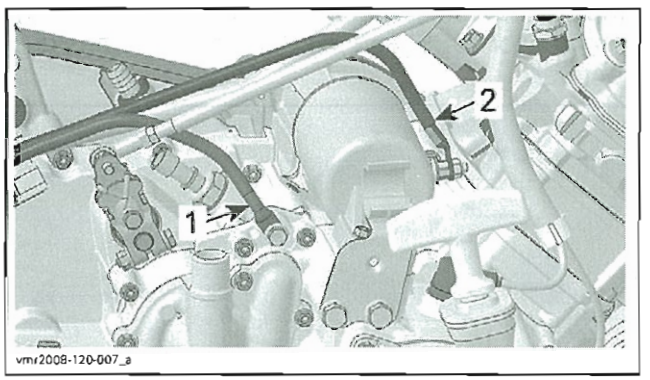
Disconnect coolant hose from water pump cover.



1. Coolant hose
2. Water pump cover

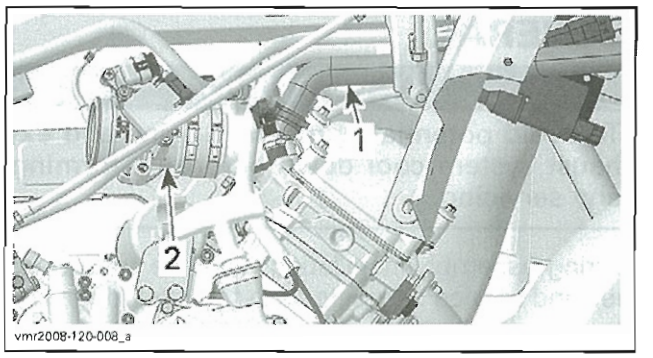
Unscrew the engine ground cable from the engine.

Remove the starter cable from the starter.



1. Engine ground cable
2. RED starter cable

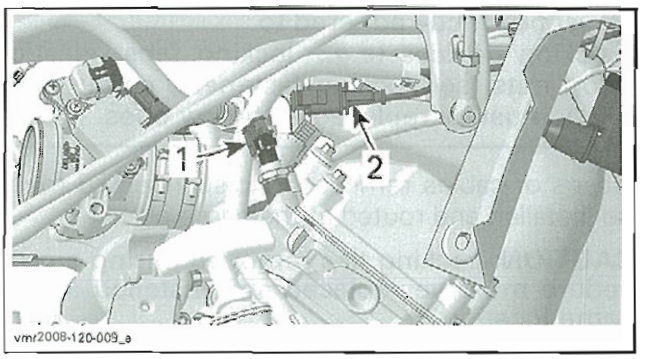
Disconnect coolant hose from cylinder head.



1. Coolant hose
2. Throttle body

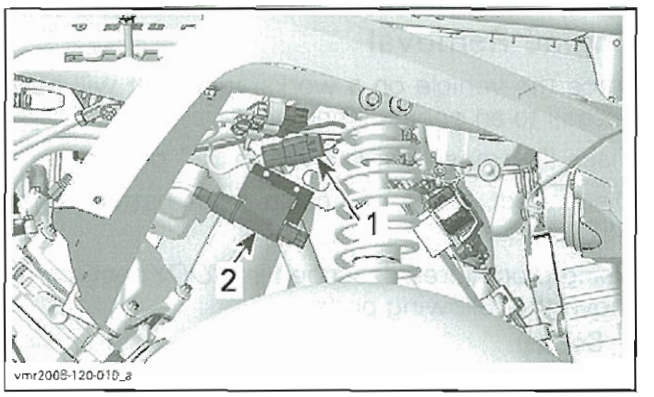
Unplug the cooling temperature sensor (CTS).

Unplug the crankshaft position sensor (CPS) connector.



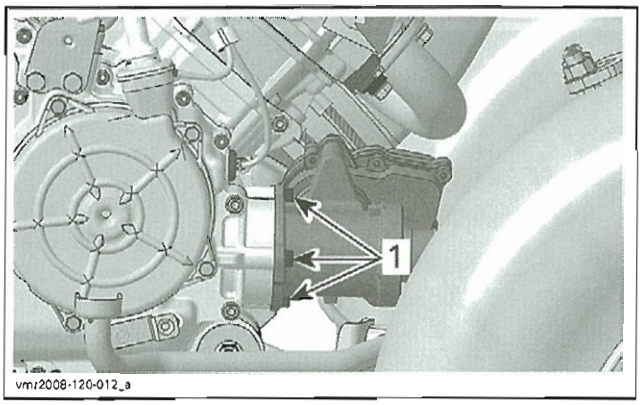
1. CTS connector
2. CPS connector

Unplug the magneto connector.



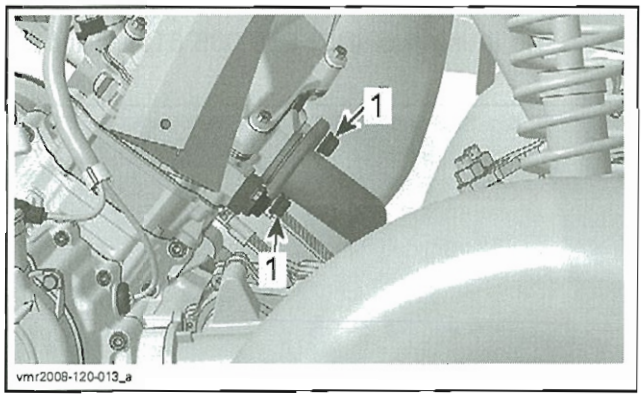
1. Magneto connector
2. Ignition coil

Remove screws securing the coupling unit to engine.



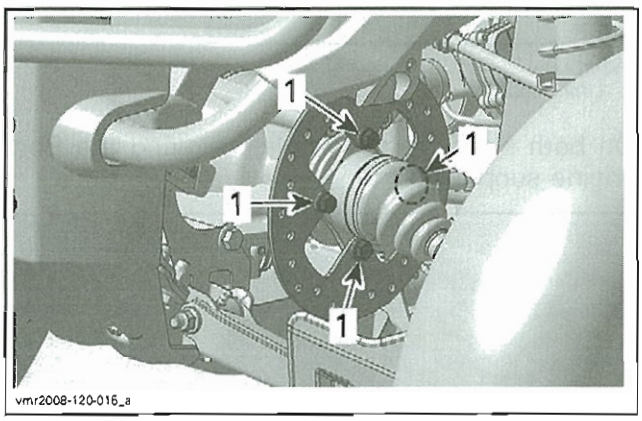
1. Coupling unit screws

Unscrew exhaust pipe nuts.



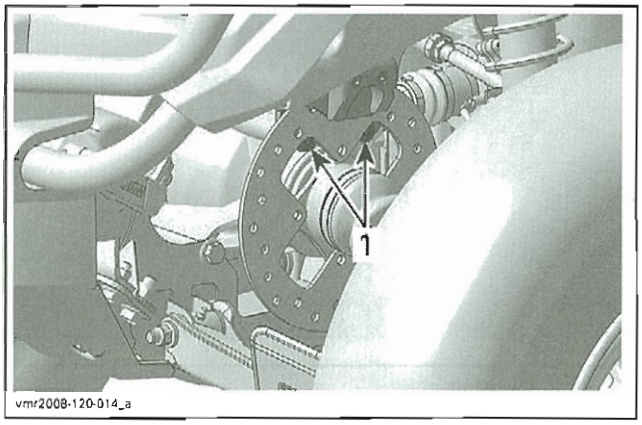
1. Exhaust pipe nuts

Apply parking brake and remove the four (4) screws retaining the brake disc to LH drive shaft.



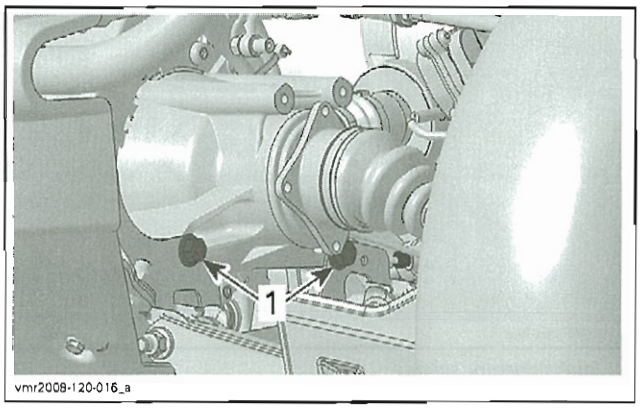
1. Brake disc screws

Release parking brake and remove screws securing the front LH caliper.



1. Caliper screws

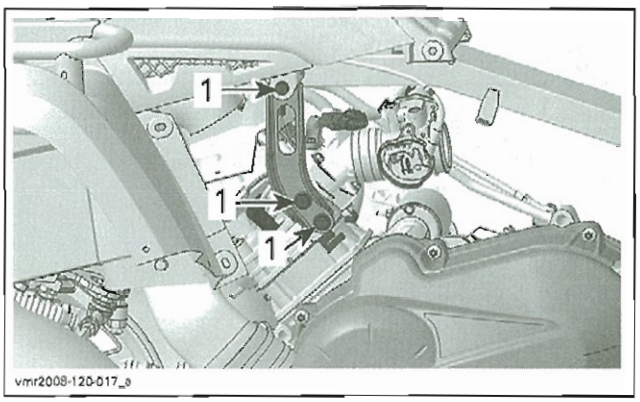
Remove differential bolts.



1. Differential bolts

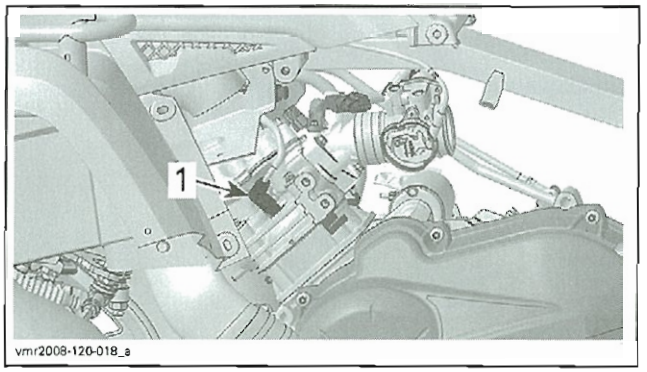
Remove exhaust pipe. Refer to *EXHAUST SYSTEM* section.

Remove the upper engine support.



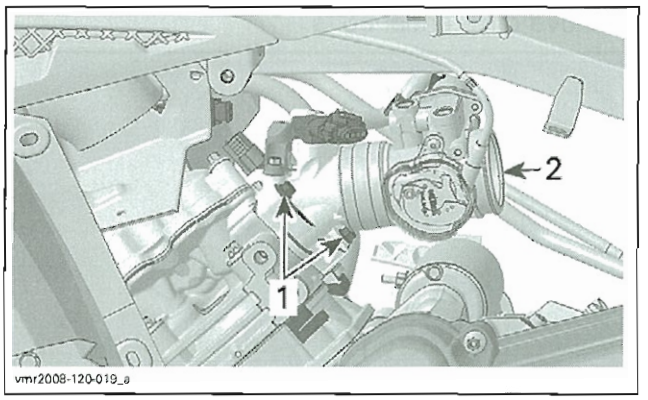
1. Engine support bolts

Remove the spark plug cable.



1. Spark plug cable

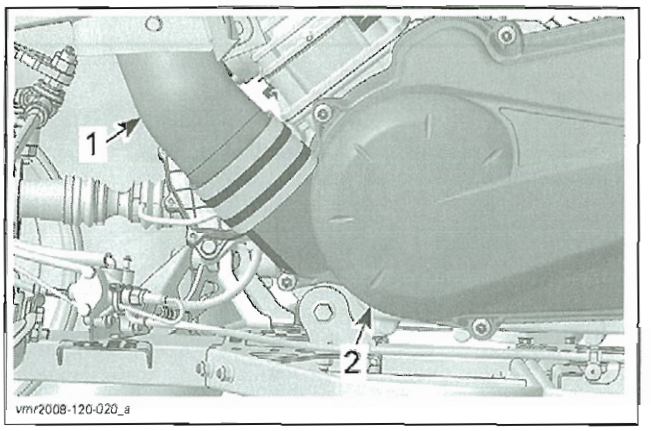
Remove the intake adaptor from cylinder head.



1. Intake adaptor screws
2. Throttle body

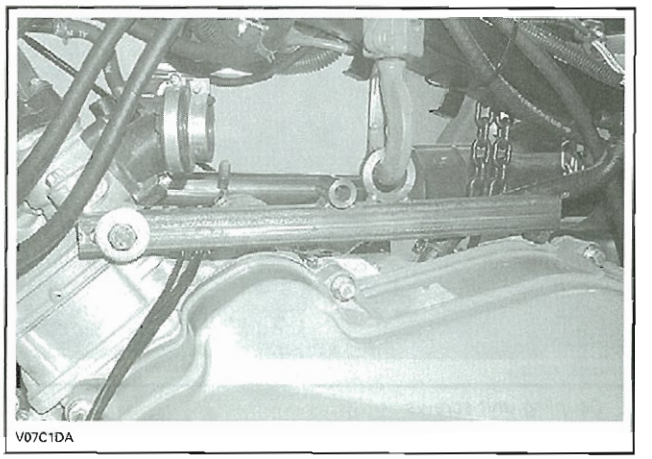
Temporarily, attach throttle body, all cables, wires and hoses on the frame.

Detach the CVT air inlet duct.



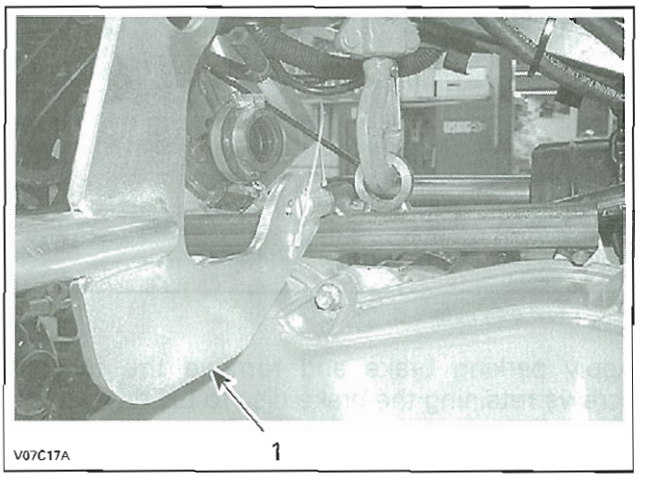
1. CVT air inlet duct
2. CVT cover

Install the engine lifting tool (P/N 529 035 898) in lifting location.



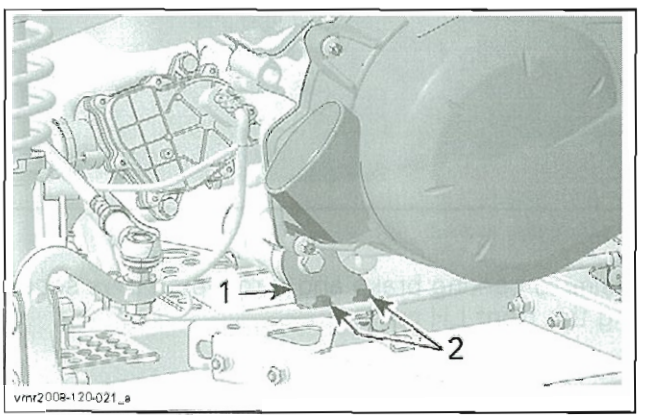
TYPICAL

Install the lifting tool (P/N 529 035 619) to tilt engine.



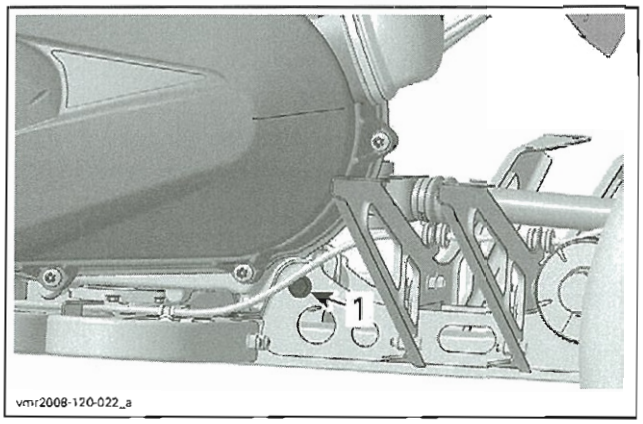
TYPICAL
1. Lifting tool

On both sides, remove bolts securing the front engine support to frame.



1. Front LH engine support
2. Engine support bolts

Remove the rear engine mounting bolt.



1. Rear engine mounting bolt

Lift engine approximately 25.4 to 38 mm (1 to 1-1/2 in).

Move engine and front differential forward to disconnect the rear propeller shaft from engine.

Lift engine a little more to clear rear mounting bracket from frame.

Turn the rear of engine toward left side to disengage the front propeller shaft from the coupling unit.

Take the engine out of the frame.

Engine Installation

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

Lift engine and move it into the frame (cylinder head first).

Insert the front engine output shaft end into the coupling unit.

Move the rear side of engine into the frame and install the rear propeller shaft.

Lower engine into place.

Install front engine support bolts. Do not torque yet.

Install rear engine mounting bolt.

When installing the upper engine support, apply Loctite 243 (blue) (P/N 293 800 060) on threads of lower bolts M10.

Tighten all bolts.

Install all other removed parts.

Fill engine with recommended engine oil and coolant. Refer to *LUBRICATION SYSTEM* and *COOLING SYSTEM* sections.

Start vehicle and check for leaks.

Stop engine and check if coolant and oil levels are correct.

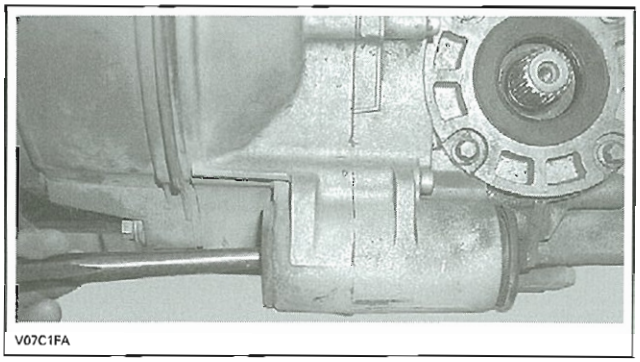
Test drive vehicle to confirm proper operation.

ENGINE MOUNT

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

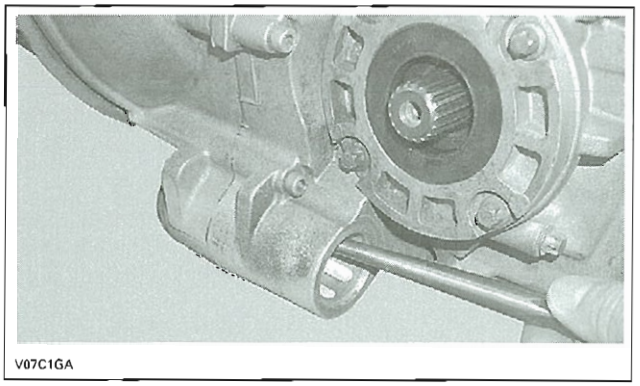
Engine Mount Removal

Insert a punch in hole of engine mount bushing and push the other bushing out of the housing.



TYPICAL

Use punch to remove the other bushing.



TYPICAL

Engine Mount Installation

The installation is the reverse of the removal procedure.

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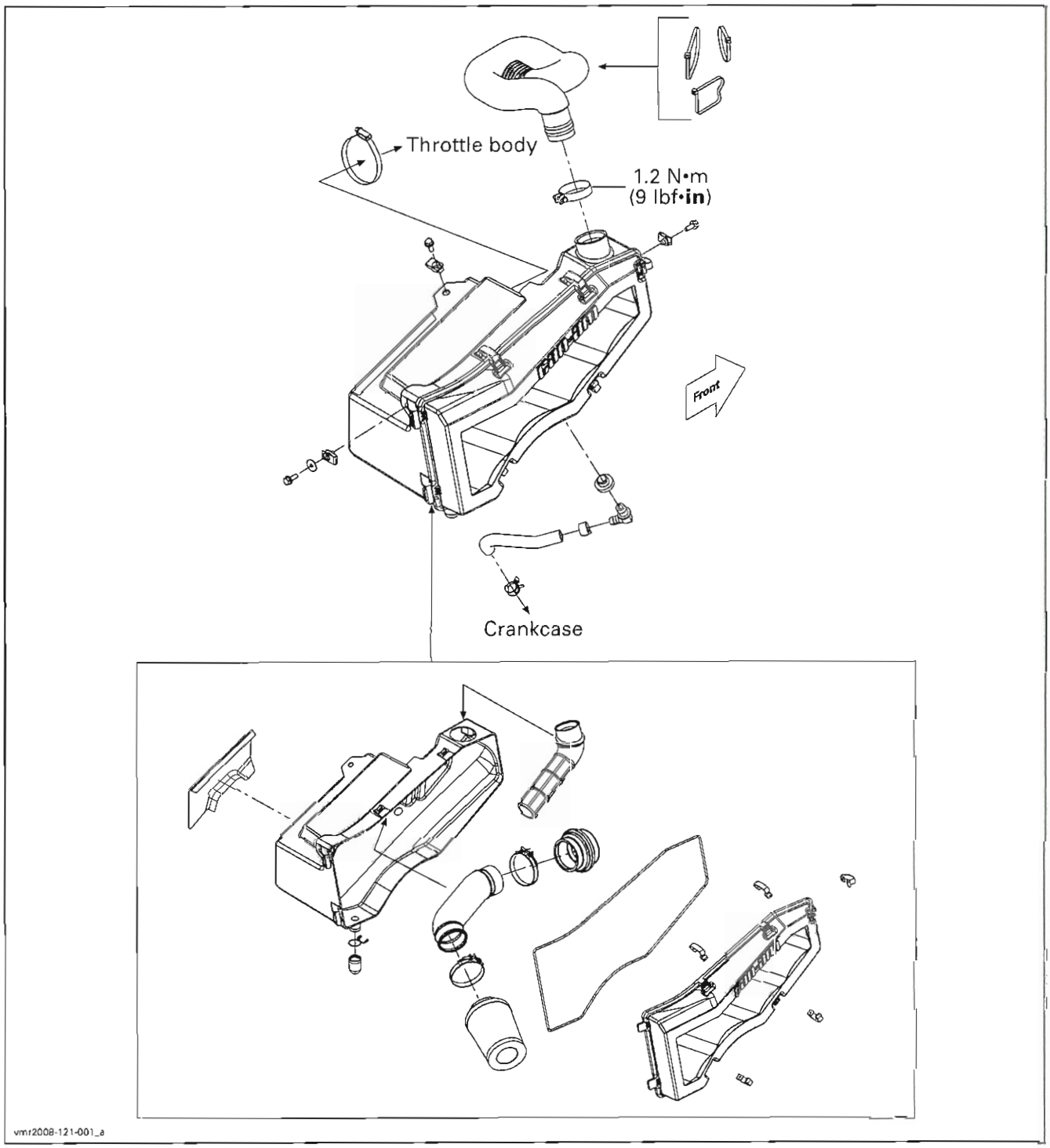
AIR INTAKE SYSTEM

SERVICE PRODUCTS

Description	Part Number	Page
air filter cleaning solution	219 700 341	32



GENERAL

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

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

⚠ WARNING

Torque wrench tightening specifications must strictly be adhered to.
Locking devices (e.g.: locking tabs, elastic stop nuts, self-locking fasteners, etc.) must be installed or replaced with new ones where specified. If the efficiency of a locking device is impaired, it must be renewed.

PROCEDURES

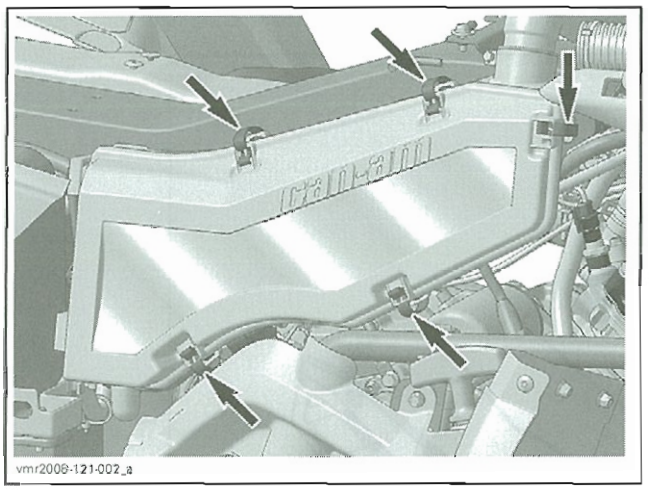
AIR FILTER

Air Filter Removal

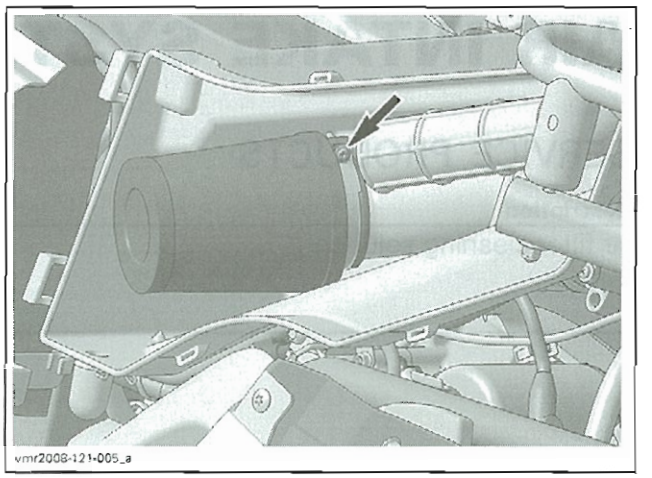
CAUTION: Never remove or modify any component in the air filter housing. The engine is calibrated to operate specifically with these components. Otherwise, engine performance degradation or damage can occur.

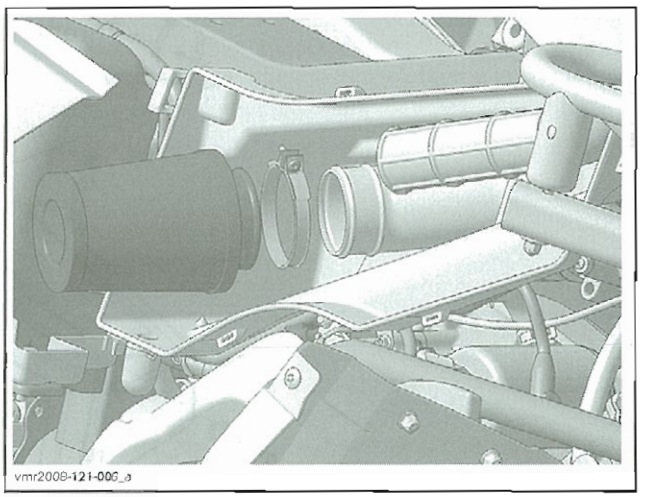
Remove seat and RH side panel. Refer to *BODY.*

Release clamps and remove air filter housing cover.



Loosen clamp and remove air filter.





If liquid or deposits are found, clean the foam prefilter. Replace filter element if damaged.

CAUTION: Do not start engine if liquid or deposit are found. If there is oil in the air filter housing, check engine oil level. Oil level may be too high.

Air Filter Cleaning

Foam Prefilter

Pour air filter cleaning solution (P/N 219 700 341) or an equivalent into a bucket. Put the foam filter in to soak.

While filter soaks, clean inside of air filter housing.

Rinse foam prefilter with warm water and let it dry completely.

Air Filter

Blow low pressure compressed air on filter element to clean it.

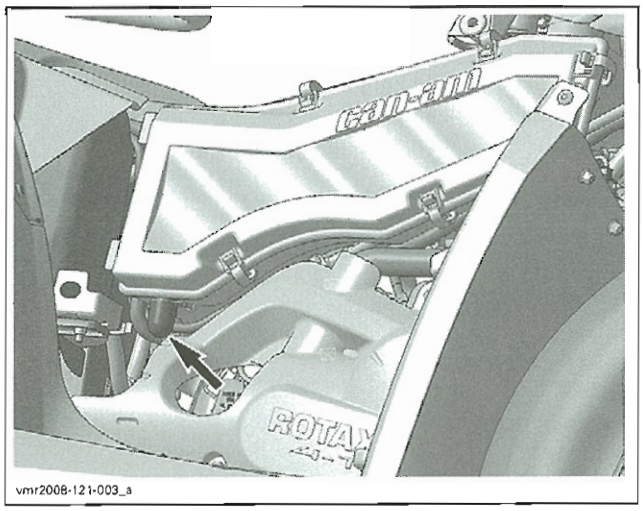
Air Filter Installation

Properly reinstall removed parts in the reverse order of their removal.

AIR FILTER HOUSING

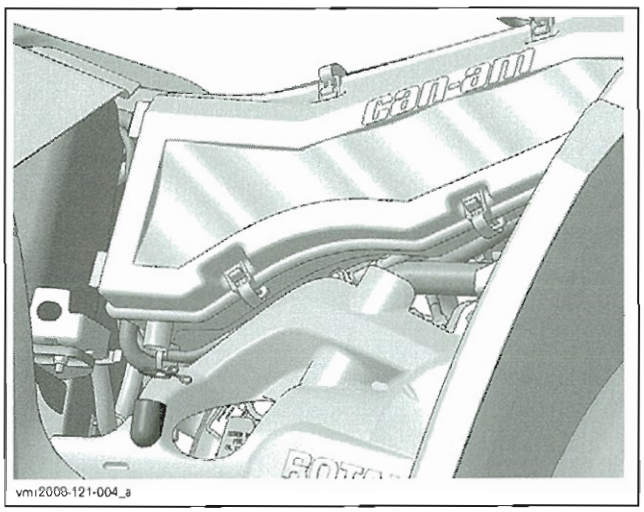
Air Filter Housing Draining

Periodically inspect air filter housing drain tube for liquid or deposits.



NOTE: If vehicle is used in muddy area, inspect more frequently than specified in maintenance chart.

If liquid or deposits are found, squeeze and remove the drain tube clamp. Pull drain tube out and empty it.



CAUTION: Do not start engine if liquid or deposit are found in the drain tube. If there is oil in the air filter housing, check engine oil level. Oil level may be too high.

Inspect air filter.

Air Filter Housing Removal

Remove seat and console. Refer to *BODY*.

On RH side of vehicle, perform the following:

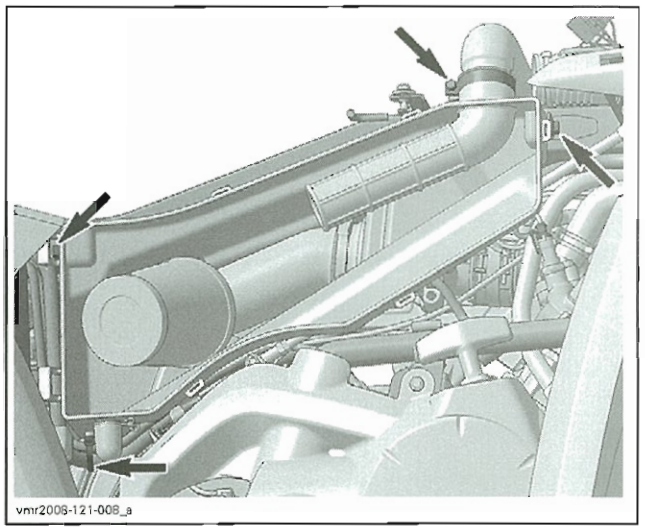
Remove the RH side panel.

Remove air filter housing cover.

Detach inlet tube.

Remove retaining screws of air filter housing.

Cut locking tie.



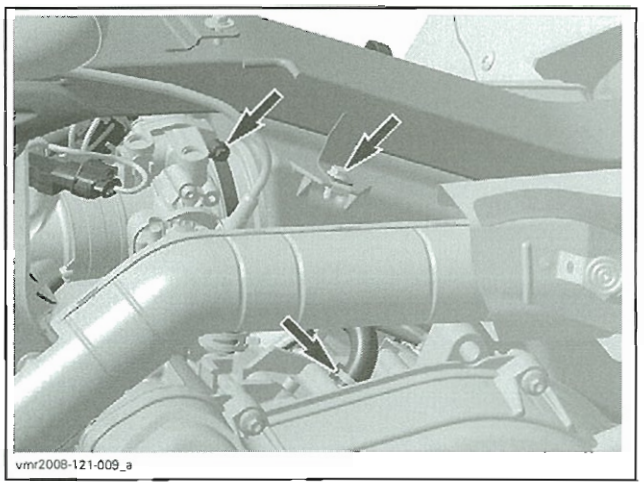
On LH side of vehicle, do the following:

Remove the LH side panel.

Detach throttle body.

Detach crankcase vent hose.

Remove retaining screws of air filter housing.



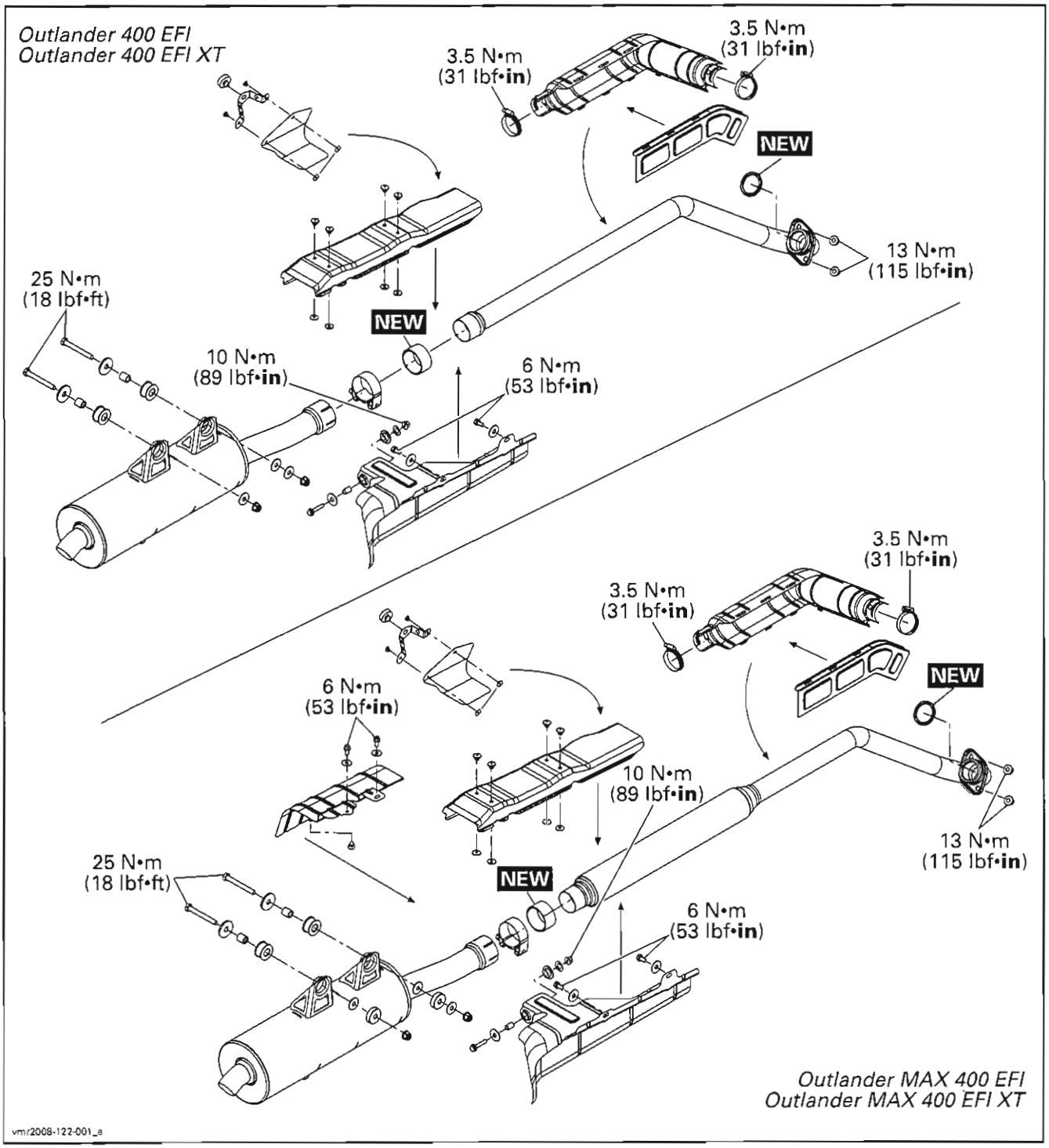
Pull out air filter housing.

Air Filter Housing Installation

For installation, reverse the removal procedure.

CAUTION: Pay attention to fuel hoses and fittings on fuel tank.

EXHAUST SYSTEM



GENERAL

⚠ WARNING

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

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

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

⚠ WARNING

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

Always inspect exhaust system parts for the following defects or damages:
- Cracks
- Tearing
- Bending
- Dents
- Corrosion
- Leaks
- Any other damage or defect which could affect system performance.

Replace if required.

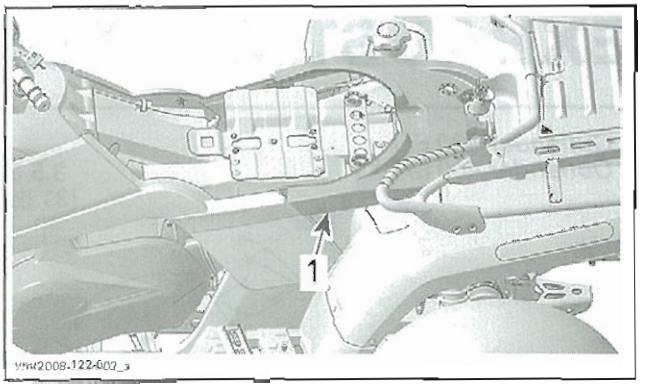
PROCEDURES

MUFFLER

Muffler Removal

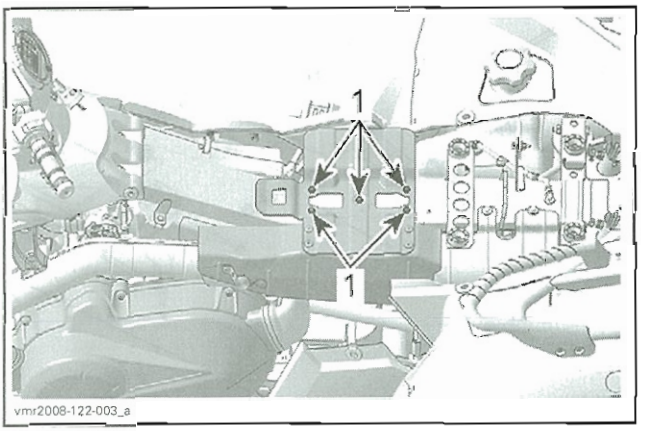
Refer to *BODY* section to remove the following components:
- Seat(s)
- LH side panel.

On MAX Series, remove the storage tray.



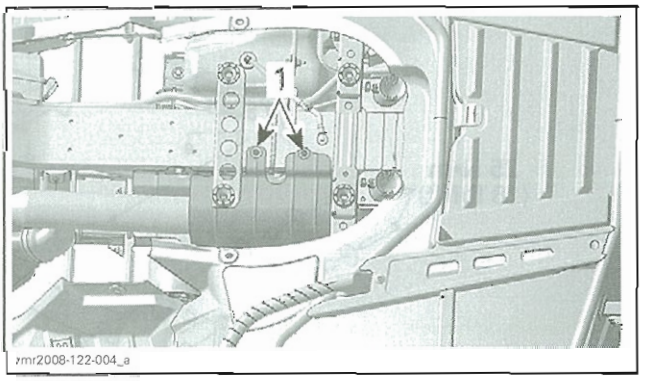
MAX SERIES ONLY
1. Storage tray

Remove seat support with the heat shield.



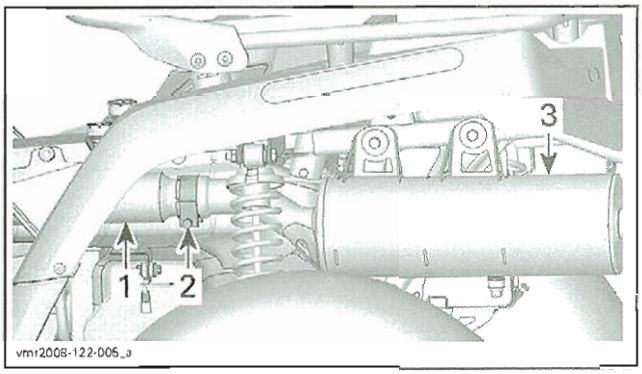
1. Seat support screws

On MAX Series, remove the rear heat shield.



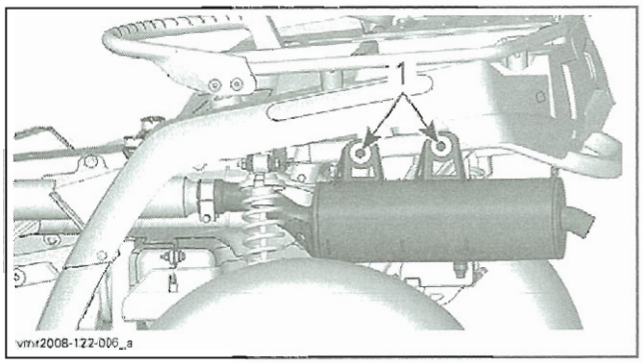
MAX SERIES ONLY
1. Heat shield screws

Unscrew muffler clamp at exhaust pipe.



1. *Exhaust pipe*
2. *Muffler clamp*
3. *Muffler*

While supporting muffler, unscrew muffler bolts.



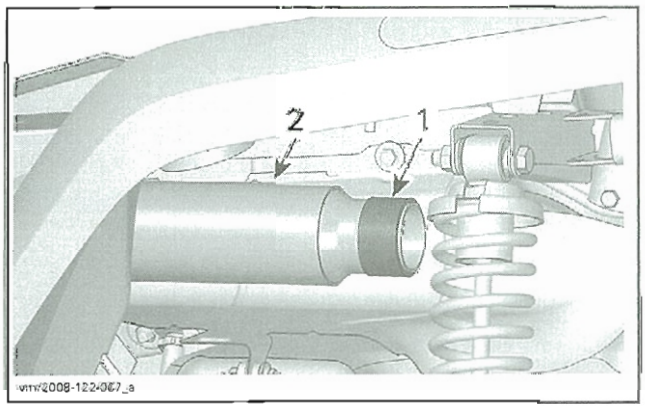
1. *Muffler bolts*

Carefully remove muffler from exhaust pipe.

Discard old muffler gasket.

Muffler Installation

Install a NEW muffler gasket.



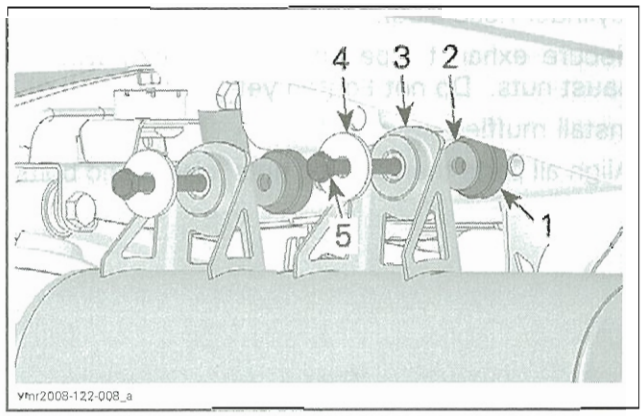
1. *Muffler gasket*
2. *Exhaust pipe*

Insert muffler clamp over exhaust pipe.

Insert muffler on exhaust pipe.

NOTE: Make sure exhaust pipe joint is positioned correctly to prevent leakage.

Install muffler bolt. Use the following illustration to position parts properly.



1. *Spacer (MAX Series only)*
2. *Flat washer M8*
3. *Muffler*
4. *Large washer*
5. *Muffler bolt*

Torque muffler clamp to 25 N•m (18 lbf•ft).

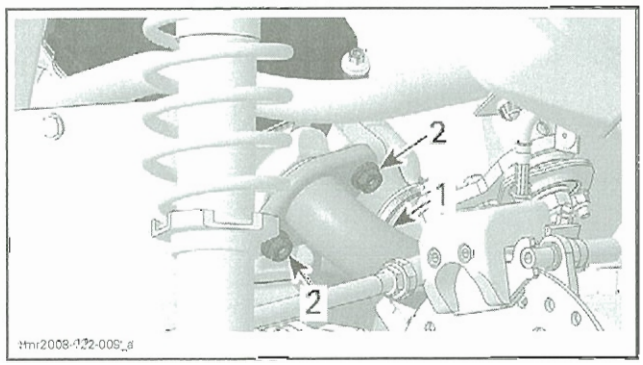
EXHAUST PIPE

Exhaust Pipe Removal

Remove the *MUFFLER*, see procedure above in this section.

Remove the RH inner fender. Refer to *BODY* section.

Unscrew exhaust pipe nuts.



1. *Exhaust pipe*
2. *Exhaust pipe nuts*

Push the exhaust pipe forward then remove it.

Remove the exhaust gasket from engine exhaust port.

Exhaust Pipe Inspection

Check exhaust pipe for:

- Cracks
- Bending
- Other damages.

Replace as required.

Exhaust Pipe Installation

Install a NEW exhaust gasket on exhaust pipe end (cylinder head side).

Secure exhaust pipe on cylinder head with exhaust nuts. Do not tighten yet.

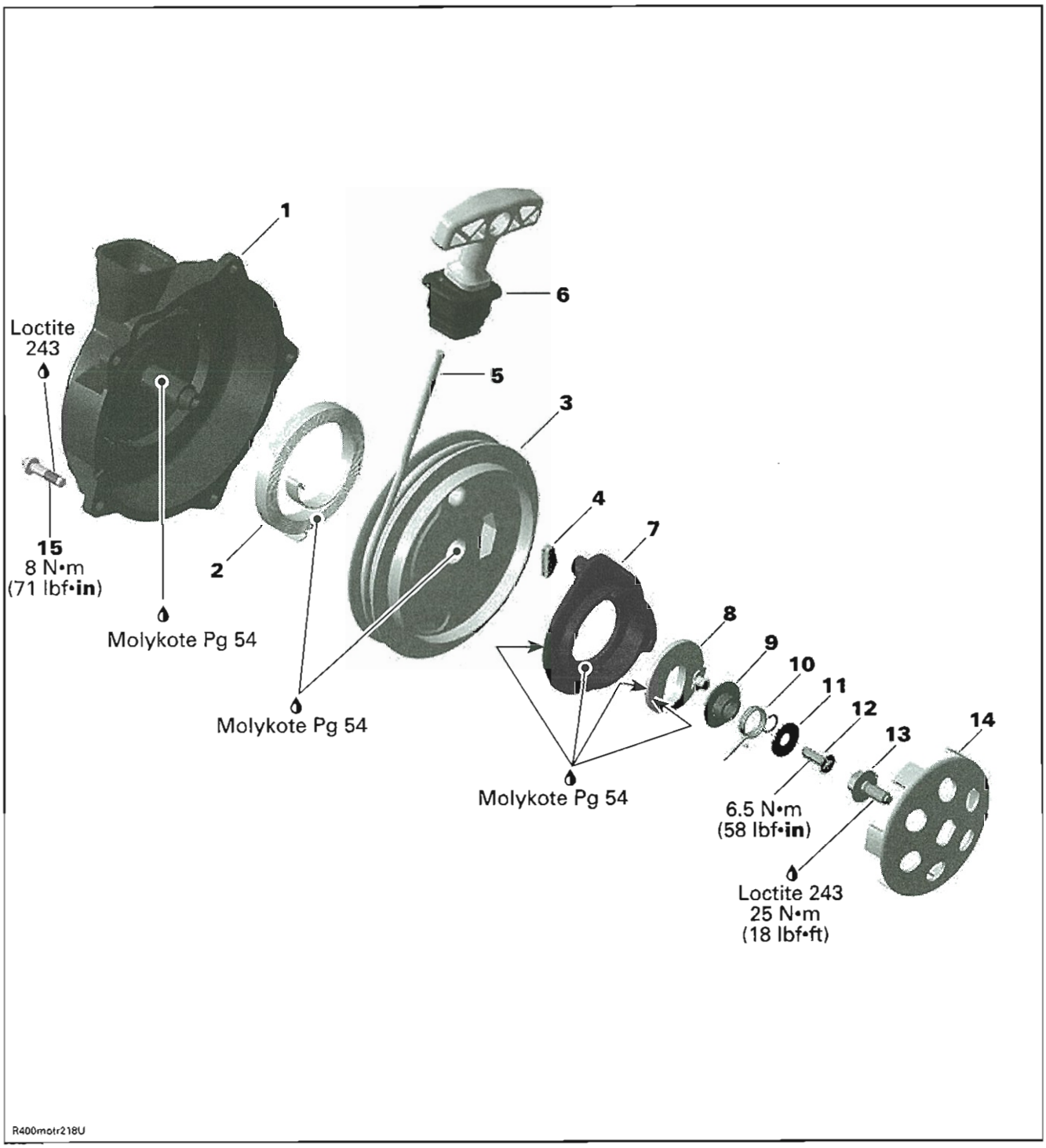
Install muffler.

Align all parts then tighten nuts, clamp and bolts.

REWIND STARTER

SERVICE PRODUCTS

Description	Part Number	Page
Loctite 243 (blue)	293 800 060	43–44
Molykote PG 54	420 899 763	41



GENERAL

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

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

⚠ WARNING

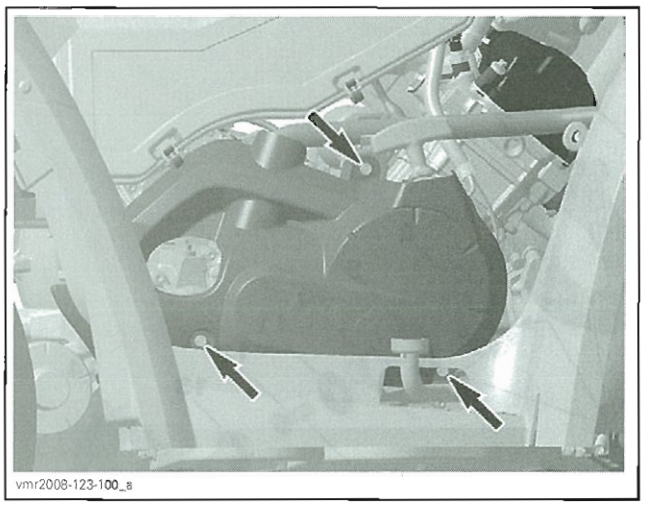
Torque wrench tightening specifications must strictly be adhered to.
Locking devices (e.g.: locking tabs, elastic stop nuts, self-locking fasteners, etc.) must be installed or replaced with new ones where specified. If the efficiency of a locking device is impaired, it must be renewed.

PROCEDURES

REWIND STARTER

Rewind Starter Removal

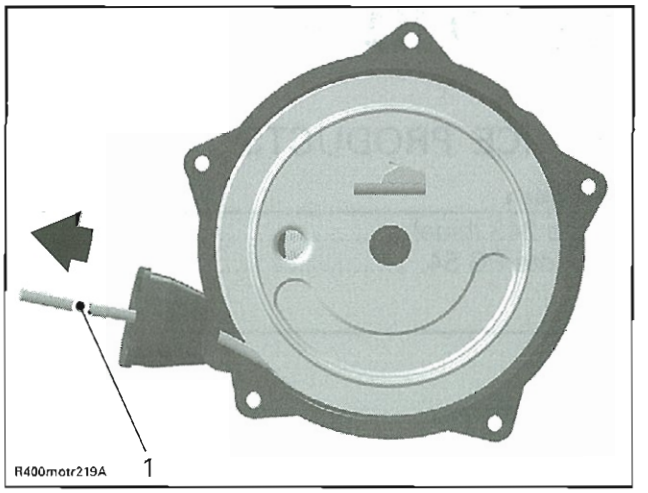
Remove engine cover.



Remove rewind starter mounting bolts no. 15 and pull rewind starter.

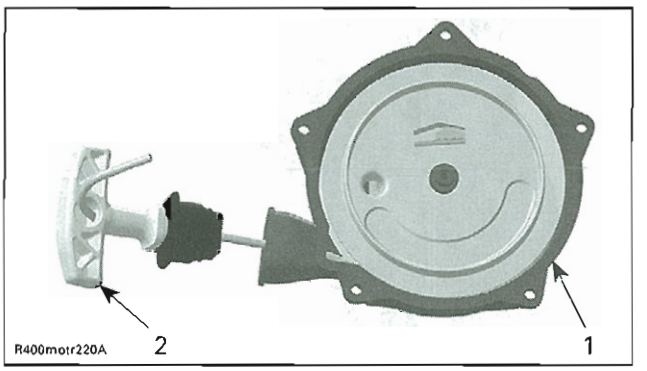
To release tension from torsion spring no. 2:

First pull grip no. 6 and tie a knot more than 20 cm (8 in) below it.



1. Rope

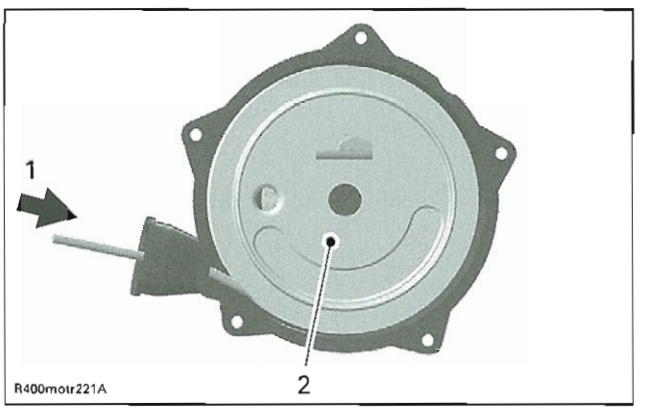
Untie knot holding rewind starter grip and remove grip.



1. Starter housing
2. Rewind starter grip

Finally untie the other knot and slowly release rope into starter housing to release spring tension.

CAUTION: Hold rope sheave to slow down the spring tension effect while releasing the rope into starter housing.



1. Direction to release spring tension
2. Rope sheave

Rewind Starter Disassembly

⚠ WARNING

Spring tension has to be released prior to withdraw the rewind starter sheave.

To remove rope no. 5 from rewind starter mechanism:

First remove flat washer no. 11 and screw no. 12, locking spring no. 10, locking spring washer no. 9, pawl lock no. 8 and pawl no. 7.

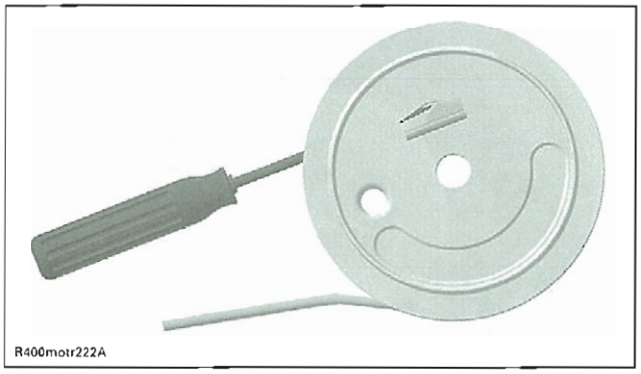
NOTE: Use two flat screwdrivers to withdraw locking spring washer no. 9.

Remove sheave no. 3 from starter housing no. 1.

Disengage key no. 4 and pull out rope no. 5.

⚠ WARNING

Torsion spring is tightly wound inside the guide. Handle with care and always wear safety goggles and hand gloves.



TYPICAL — GENTLY TAP ON KEY

⚠ WARNING

Never remove spring out of starter housing except if spring is damaged. Torsion spring is spring loaded, so handle with care and always wear safety goggles and hand gloves.

Rewind Starter Assembly

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

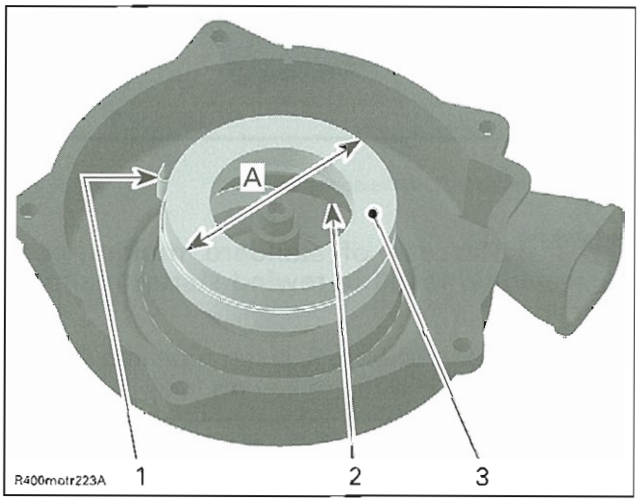
⚠ WARNING

Always install new spring into starter housing. Torsion spring is spring loaded, so handle with care during installation. Always wear safety goggles and hand gloves.

At assembly, position spring no. 2 outer end into spring guide notch. Use appropriate ring to push spring into starter housing as illustrated.

⚠ WARNING

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



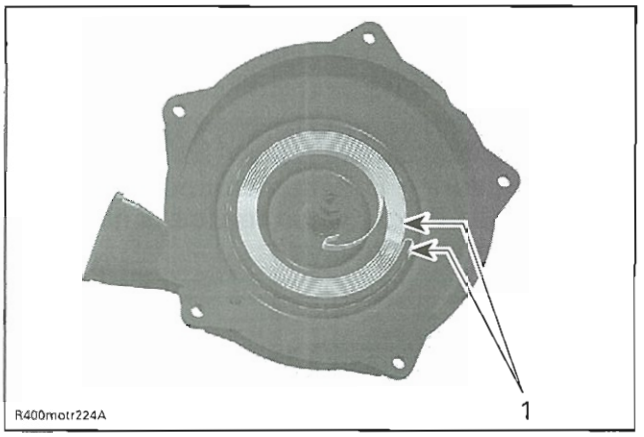
TYPICAL
1. *Outer end into guide notch*
2. *Apply Molykote PG 54 inside spring guide*
3. *Ring for spring installation*

A. 82 + .2 mm (3.23 + .008 in)

NOTE: Due to dust accumulation, rewind starter must be periodically cleaned, inspected and relubricated.

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

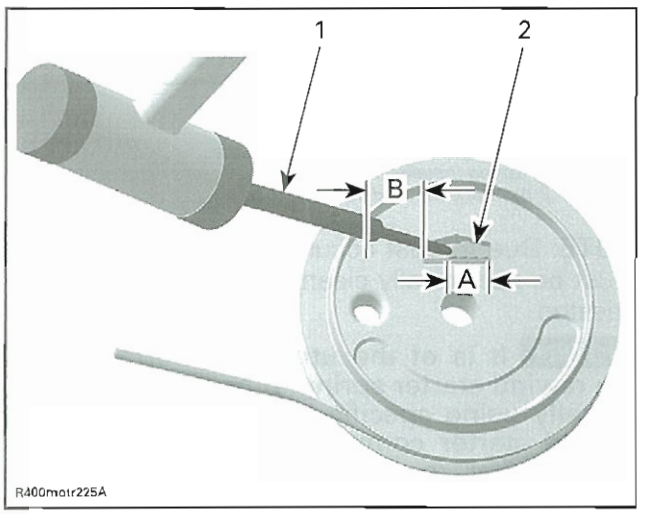
Lubricate spring assembly with Molykote PG 54 (P/N 420 899 763) and position into starter housing as illustrated.



TYPICAL
1. Apply Molykote PG 54 in spring area

NOTICE The use of standard multipurpose grease could result in rewind starter malfunction.

To install a new rope no. 5, insert rope into sheave orifice and lock it with the key no. 4 as illustrated.



TYPICAL
1. Punch
2. Key
A. Maximum 14 mm (.55 in)
B. Rope overstand 20 to 25 mm (.787 to .984 in)

To Adjust Rope Tension:

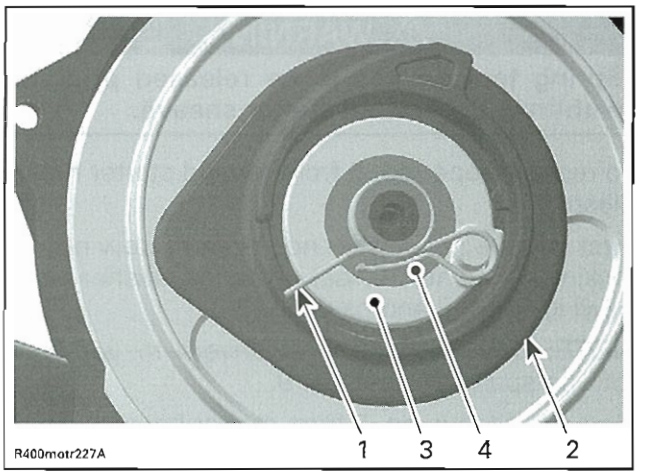
Wind rope on sheave and place rope sheave into starter housing making sure that the sheave hub notch engages in the rewind spring hook.

⚠ WARNING

To prevent spring from flying out of the guide, it is mandatory to secure rope sheave in place. Always handle with care and use safety goggles and hand gloves.

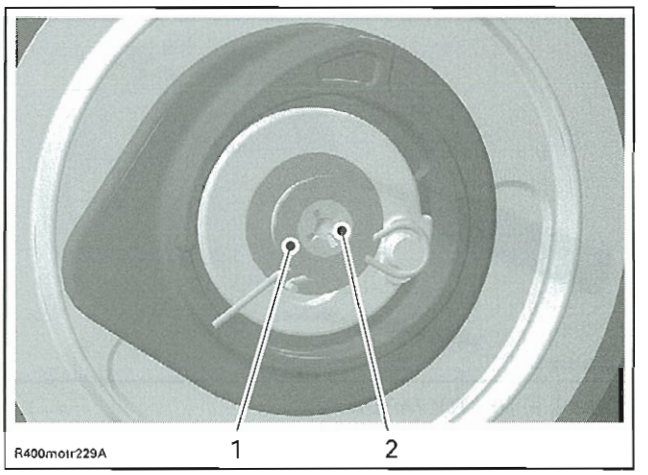
Position pawl no. 7, pawl lock no. 8 and locking spring washer no. 9.

Install locking spring no. 10.



TYPICAL
1. Locking spring
2. Pawl
3. Pawl lock
4. Locking spring washer

Install washer no. 11 and torque screw no. 12.

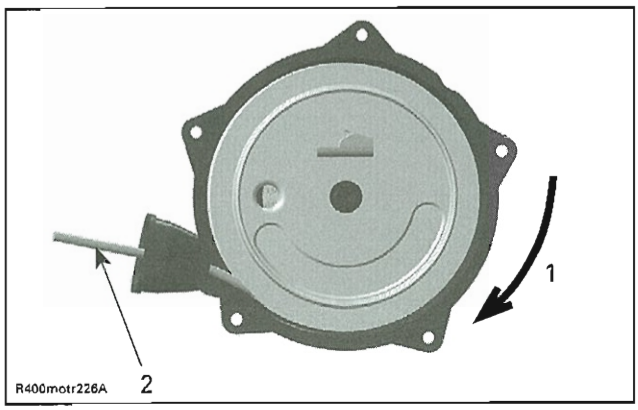


1. Washer
2. Screw

Rotate rope sheave clockwise until rope end is accessible through starter housing orifice.

Pull rope out of the starter housing and temporarily hold it.

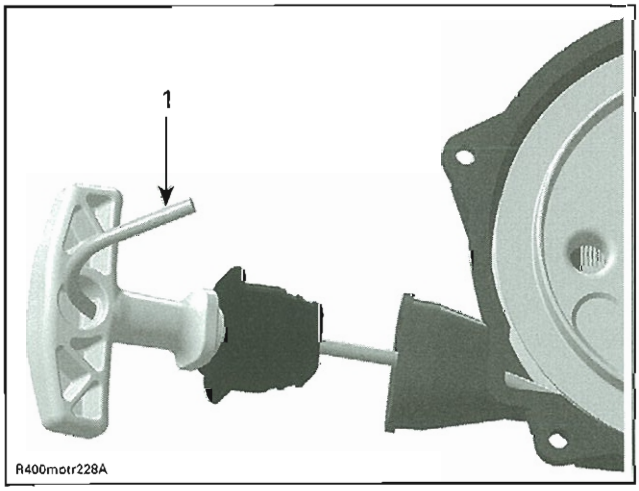
NOTE: It is recommended to use a hose clamp to fix rope in place. A knot can get too tight.



TYPICAL
1. *Turn clockwise*
2. *Position to fix rope in place*

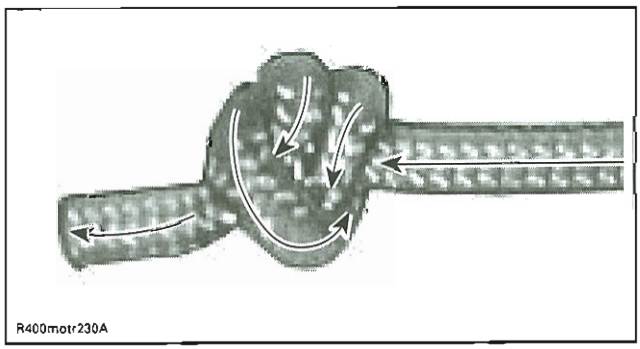
Thread starter rope no. 5 through rope guide when applicable.

Prior to installing starter grip on new rope, it is first necessary to fuse the rope end with a lit match.



TYPICAL
1. *Fuse end of starter rope*

Pass rope through starter grip, tie a knot in the rope end.



TYPICAL

Insert rope end down and pull the starter grip over the knot.

Rewind Starter Installation

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

Prior to reinstalling rewind starter on engine, clean threads from Loctite deposits.

NOTE: Before torquing mounting bolts no. 15, apply Loctite 243 (blue) (P/N 293 800 060) on threads.

STARTING PULLEY

Starting Pulley Removal

Remove rewind starter.

Remove screw no. 13 and starting pulley no. 14 from crankshaft MAG side.

Starting Pulley Installation

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

CAUTION: Take care to have the starting pulley well mounted on crankshaft end.

Apply Loctite 243 (blue) (P/N 293 800 060) on threads and torque the screw to 25 N•m (18 lbf•ft).

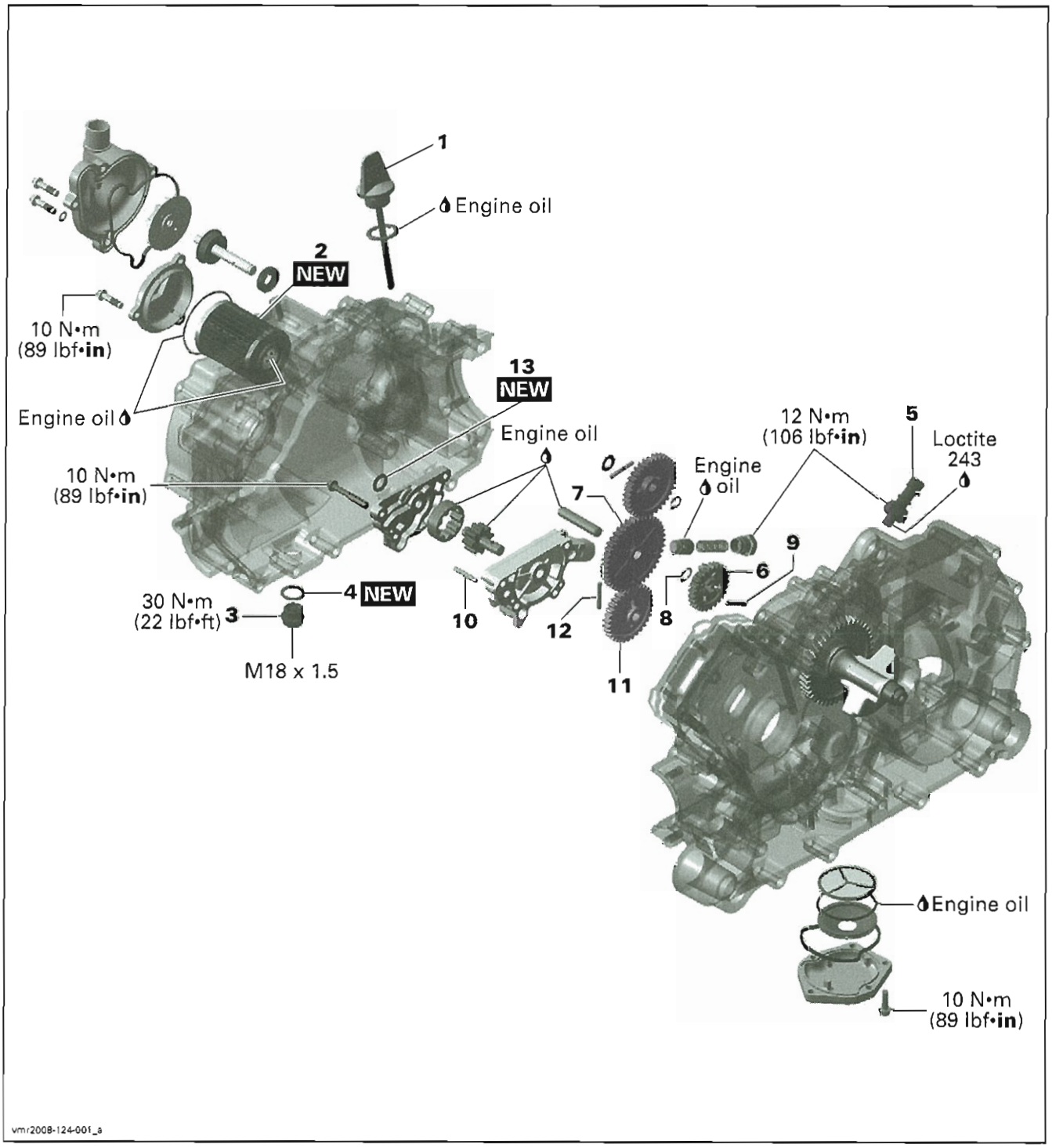
LUBRICATION SYSTEM

SERVICE TOOLS

Description	Part Number	Page
adapter hose	529 035 652	50
pressure gauge	529 035 709	50

SERVICE PRODUCTS

Description	Part Number	Page
XP-S 5W30 4-stroke oil	219 700 706	47
XP-S 5W40 synthetic oil	293 600 039	47
Loctite 243 (blue)	293 800 060	51



GENERAL

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

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

⚠ WARNING

Torque wrench tightening specifications must be strictly adhered to.
Locking devices (e.g.: locking tabs, elastic stop nuts, self-locking fasteners, cotter pin, etc.) must be installed or replaced with new ones where specified. If the efficiency of a locking device is impaired, it must be renewed.

MAINTENANCE

ENGINE OIL

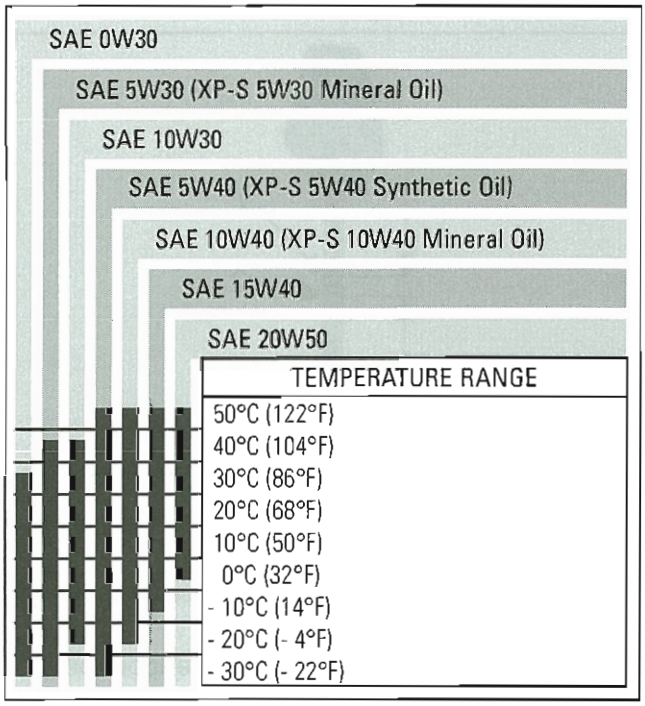
Recommended Oil

Use 4-stroke SAE 5W30 engine oil that meets or exceeds the requirements for API service classification SM, SL or SJ. Always check the API service label certification on the oil container it must contain at least one of the above standards.

The XP-S 5W30 4-stroke oil (P/N 219 700 706) is recommended.

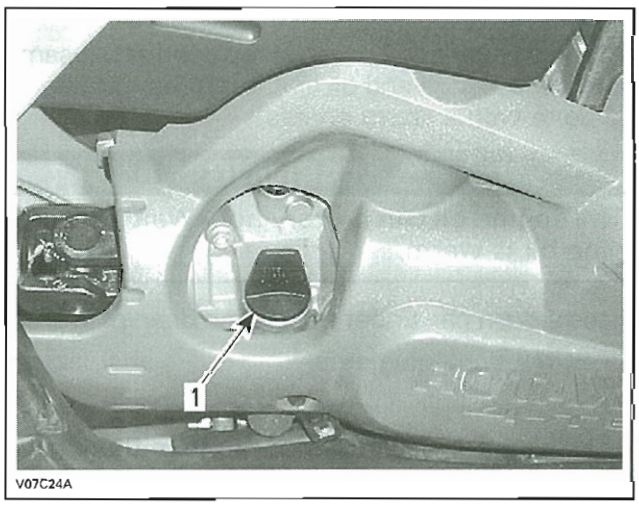
For improved overall performance and all season application, use XP-S 5W40 synthetic oil (P/N 293 600 039).

Engine Oil Viscosity Chart



Oil Level Verification

CAUTION: Check level frequently and refill if necessary. Do not overfill. Operating the engine/transmission with an improper level may severely damage engine/transmission. Wipe off any spillage.

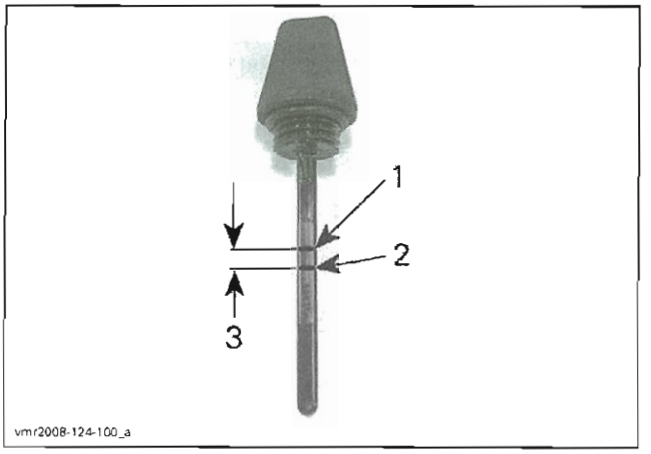


RH SIDE OF ENGINE
1. Dipstick

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

1. Unscrew dipstick no. 1 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
3. Operating range

To add oil, remove the dipstick. Place a funnel into the dipstick tube to avoid spillage.

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 overfill.

Properly tighten dipstick.

Engine Oil Replacement

Prior to change the oil, ensure vehicle is on a level surface.

Oil and oil filter no. 2 must be replaced at the same time. Oil change and oil filter replacement should be done with a warm engine.

⚠ WARNING

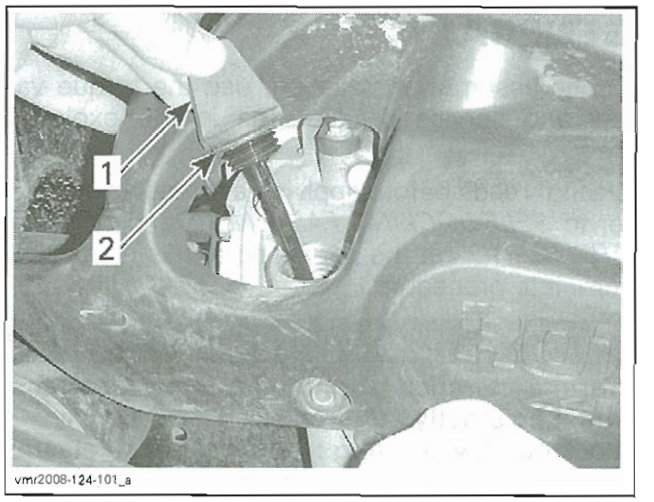
The engine oil can be very hot. Wait until engine oil is warm.

Place a drain pan under the engine drain plug area.

Clean the drain plug area.

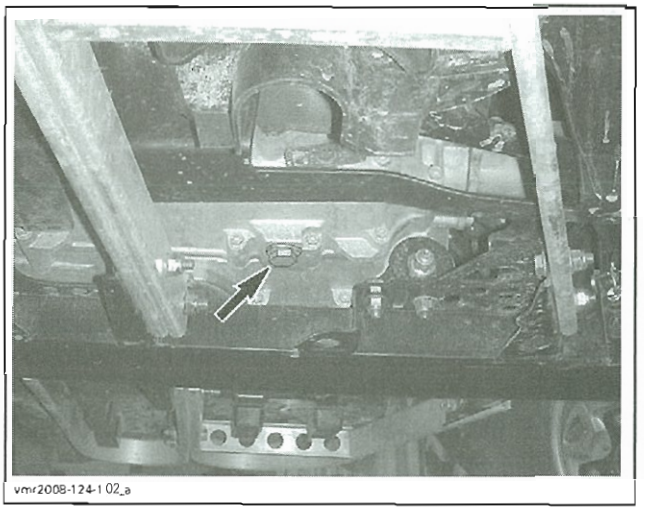
Remove dipstick.

CAUTION: Pay attention not to lose the O-ring on dipstick.



1. Dipstick
2. O-ring

Unscrew drain plug no. 3.



SEEN FROM RH SIDE, UNDERNEATH VEHICLE

Allow oil to drain completely from crankcase.

Clean the magnetic drain plug from metal shavings and residue. Presence of debris gives an indication of failure inside the engine.

Install a new gasket ring no. 4 on drain plug.

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

Torque drain plug to 30 N•m (22 lbf•ft).

Replace the oil filter.

Refill engine with recommended engine oil. Oil change capacity with filter is 3 L (3.17 qt).

After filling, check the oil level with the dipstick. Refer to *OIL LEVEL CHECK* above.

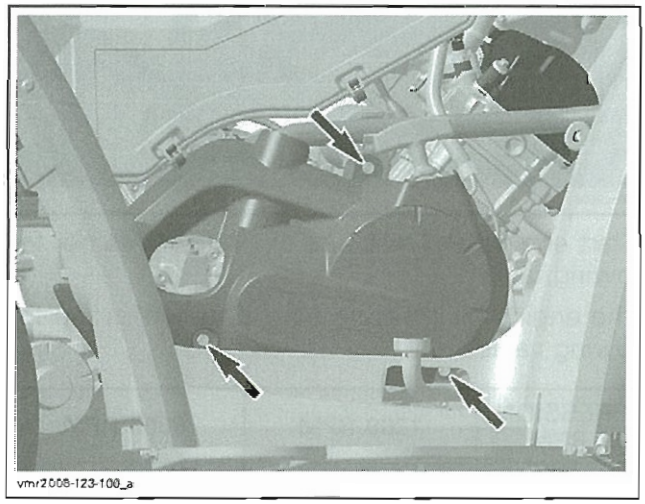
NOTE: Run engine to ensure oil filter and drain plug areas are not leaking.

Dispose oil and filter as per your local environmental regulations.

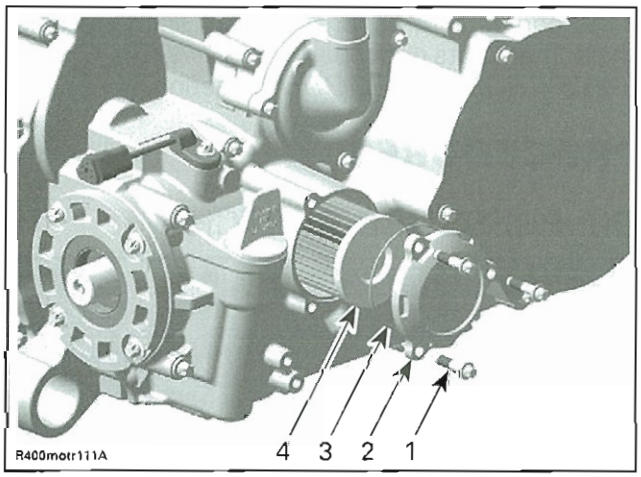
OIL FILTER

Oil Filter Removal

Remove:
- Engine cover



- Oil filter screws
- Oil filter cover with O-ring
- Oil filter.

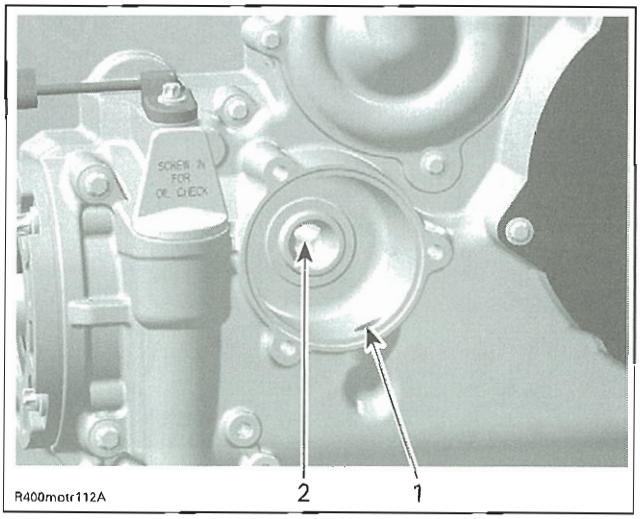


1. *Oil filter screws*
2. *Oil filter cover*
3. *O-ring*
4. *Oil filter*

Oil Filter Inspection

Check oil filter cover O-ring, change it if necessary.

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



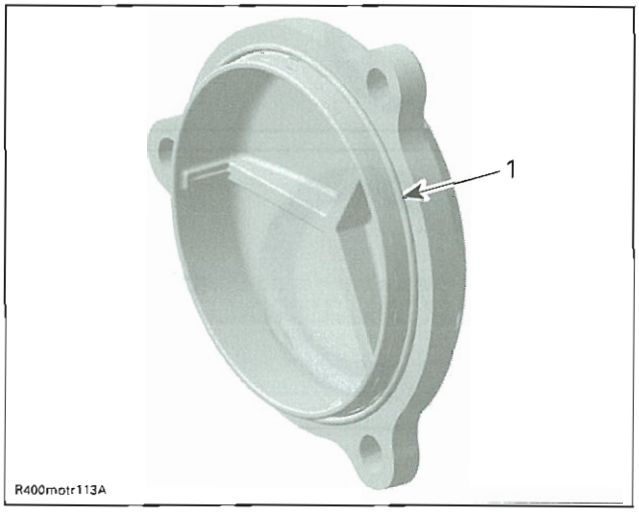
1. *Inlet bore from the oil pump to the oil filter*
2. *Outlet bore to the engine oil providing system*

Oil Filter Installation

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

Apply oil on rubber seal of oil filter to ensure proper installation.

Install O-ring on oil filter cover.



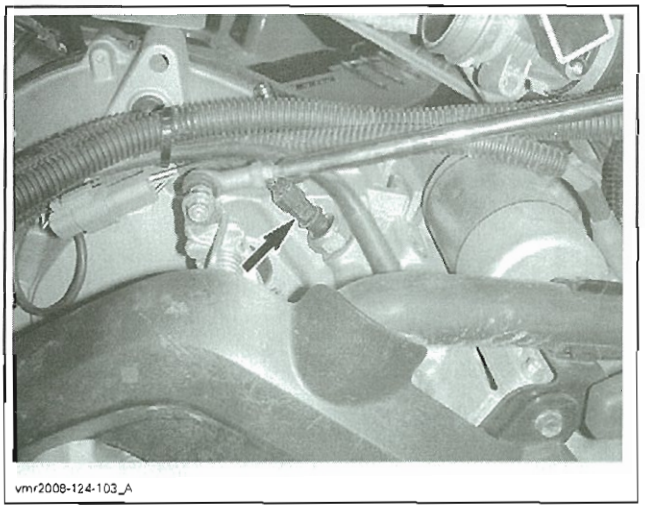
1. *O-ring in place*

INSPECTION

ENGINE OIL PRESSURE TEST

NOTE: The engine oil pressure test should be done with a warm engine and the recommended oil.

Remove the oil pressure switch no. 5.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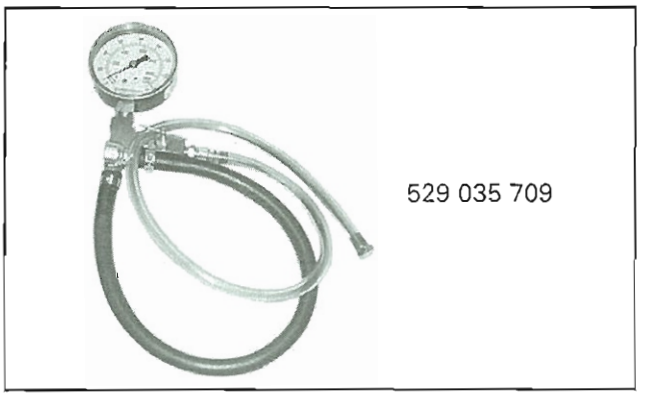
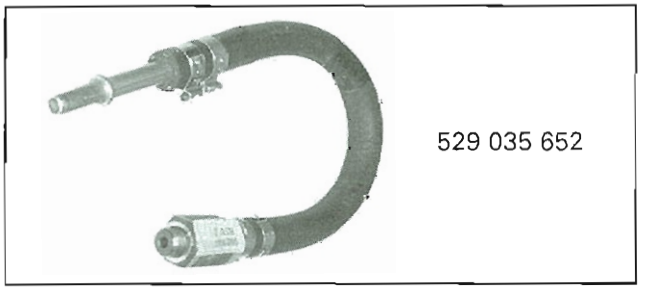
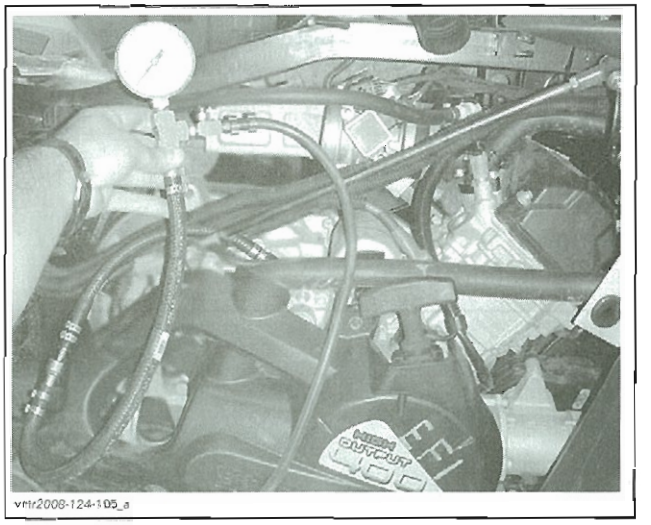
Install the pressure gauge (P/N 529 035 709) and the adapter hose (P/N 529 035 652) to the switch hole.


529 035 709


529 035 652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Start engine and measure oil pressure as per following table.

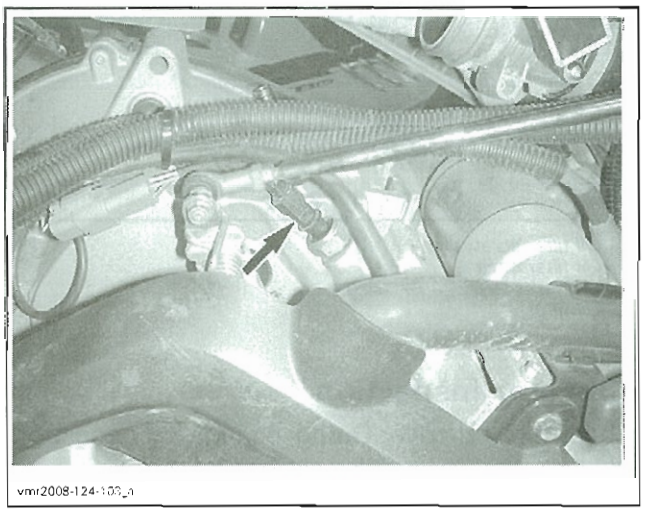
The engine oil pressure should be within the following values.

PRESSION/ RPM	1300 RPM	6000 RPM
Minimal	70 kPa (10 PSI)	350 kPa (51 PSI)
Nominal	350 kPa (51 PSI)	500 kPa (73 PSI)
Maximal	550 kPa (80 PSI)	700 kPa (102 PSI)

If the engine oil pressure is out of specifications, check the points described in *TECHNICAL GUIDELINES (TROUBLESHOOTING)* section.

PROCEDURES

OIL PRESSURE SWITCH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Oil Pressure Switch Activation

Oil pressure switch is normally closed and it opens when engine runs and pressure reaches 30 and 60 kPa (4.4 and 8.7 PSI). So, when engine runs, switch is open and if pressure goes to low, the switches closes.

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

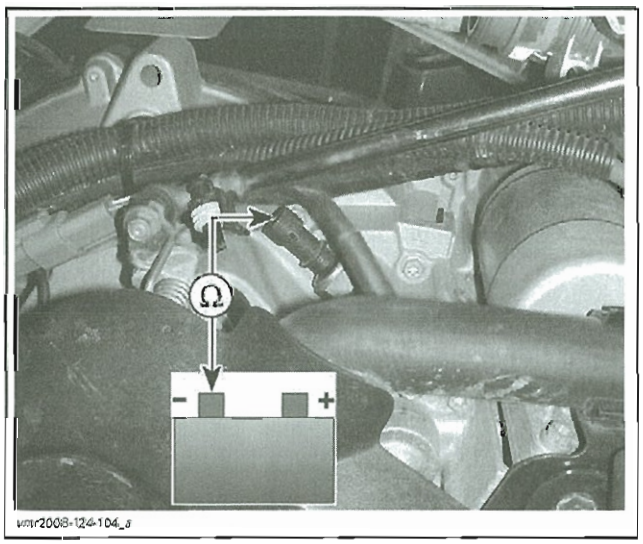
If the engine oil pressure is good, check the resistance of the oil pressure switch while engine is off and while engine is running.

Oil Pressure Switch Resistance Test

Disconnect the connector from the oil pressure switch.

Use a multimeter and select Ω to check the resistance as shown.

OPS CONNECTOR		ENGINE NOT RUNNING	ENGINE RUNNING
PIN		RESISTANCE Ω	
1	Engine ground	Close to 0 Ω (normally closed switch)	Infinitely high when pressure reaches 30 - 60 kPa (4.4 - 8.7 PSI)

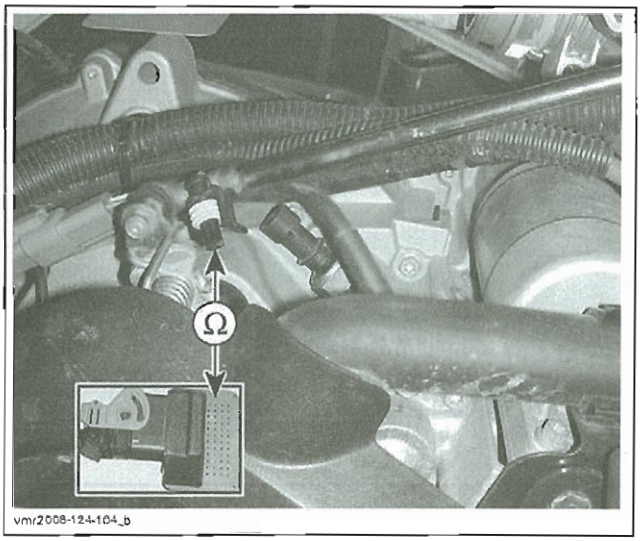


If resistance values are incorrect, replace the oil pressure switch.

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

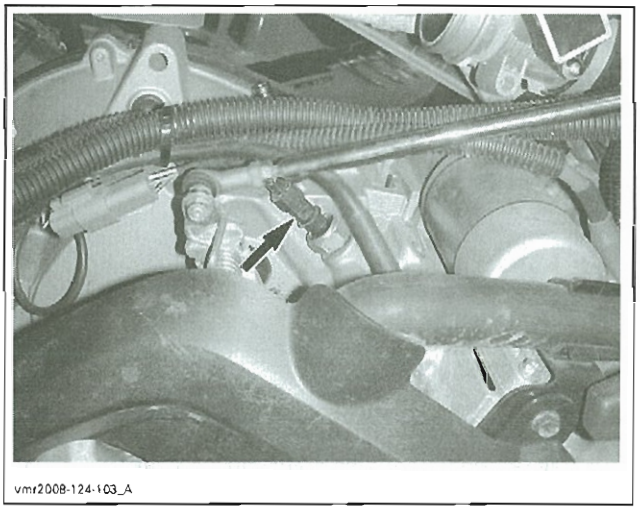
Disconnect the ECM connector and check continuity of circuit between switch and ECM.

OPS CIRCUIT		MEASUREMENT
OPS PIN	ECM PIN	RESISTANCE Ω @ 20°C (68°F)
1	E2	Close to 0 Ω



Oil Pressure Switch Removal

Unplug and unscrew the oil pressure switch no. 5.



Oil Pressure Switch Installation

Apply Loctite 243 (blue) (P/N 293 800 060) and torque switch to 12 N•m (106 lbf•**in**).

Plug switch connector.

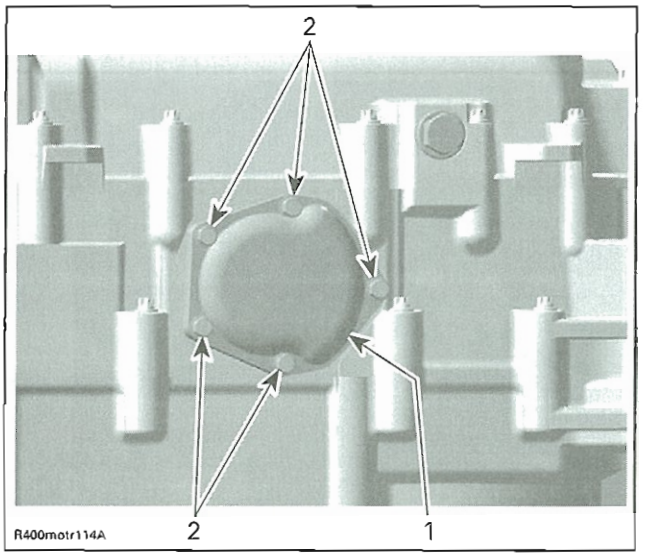
OIL STRAINER

Oil Strainer Removal

Engine must be lifted or removed to access the oil strainer. Refer to the *ENGINE REMOVAL/INSTALLATION*.

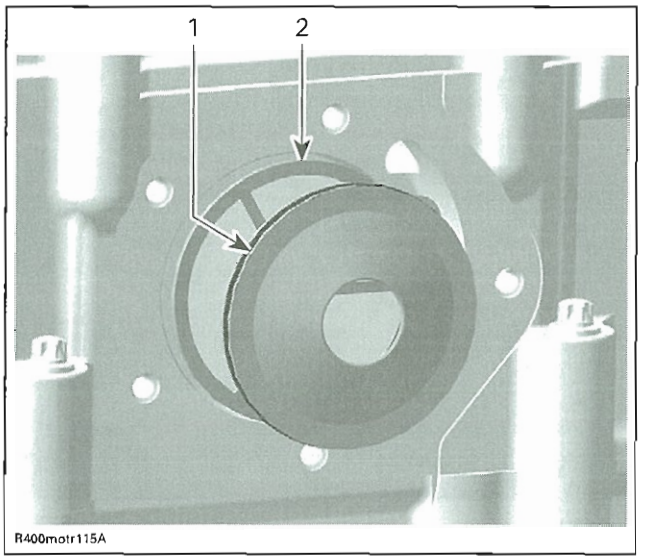
Drain engine oil, refer to *OIL CHANGE* in this section.

Remove screws retaining oil strainer cover.



1. *Oil strainer cover*
2. *5 screws*

Remove oil collector with O-ring and oil strainer.



1. *Oil collector with O-ring*
2. *Oil strainer*

Oil Strainer Cleaning and Inspection

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

⚠ WARNING

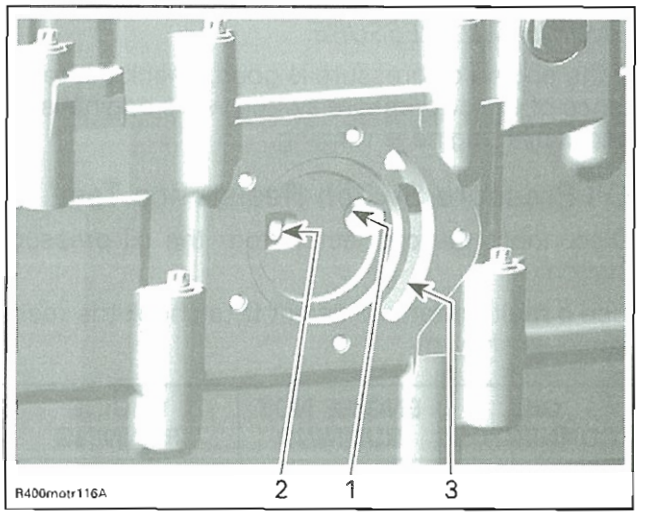
Always wear eye protector. Chemicals can cause a rash break out in and an injury to your eyes.

Inspect O-ring on the oil collector and rubber ring on the oil strainer cover.

If O-ring and/or rubber ring is (are) brittle, cracked or hard, replace the defective part(s).

Clean both contact surfaces of oil strainer cover.

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

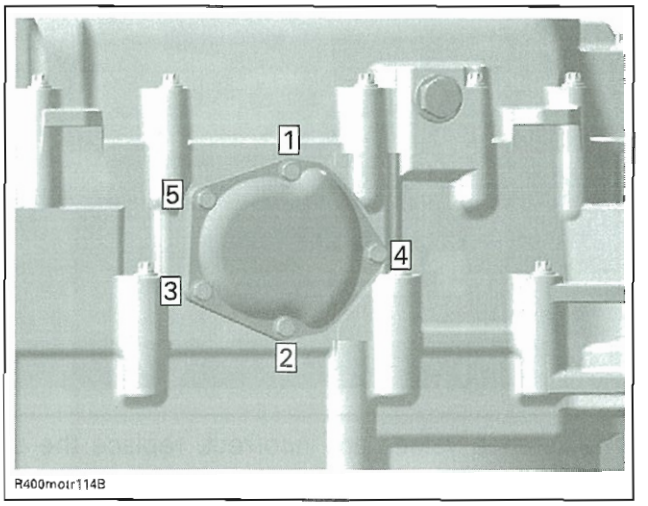


1. *Oil inlet to the oil pump*
2. *Oil return from the oil pressure regulator system*
3. *Oil return from the engine oil circulation*

Oil Strainer Installation

For installation, reverse the removal procedure.

Torque oil strainer cover screws as per following sequence.



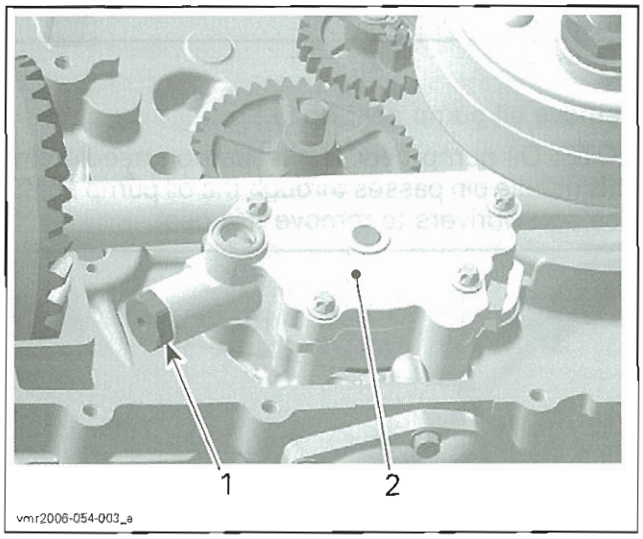
Reinstall engine in vehicle. Refill engine at the proper level with the recommended oil.

Start engine and let idle for a few minutes. Ensure oil filter and magnetic drain plug areas are not leaking.

Stop engine. Wait a while to allow oil to flow down to crankcase then check oil level. Refill as necessary.

ENGINE OIL PRESSURE REGULATOR

The oil pressure regulator is located in the oil pump housing (engine MAG side, behind magneto cover).



1. *Oil pressure regulator plug*
2. *Oil pump housing*

NOTE: The oil pressure regulator system works when the oil pressure exceeds 500 kPa (73 PSI).

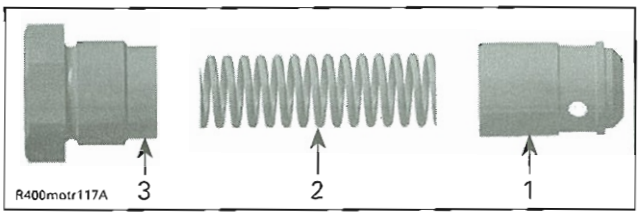
Oil Pressure Regulator Removal

Remove:

- Engine from vehicle (refer to *ENGINE REMOVAL/INSTALLATION*)
- Water pump cover (refer to *COOLING SYSTEM*)
- Magneto cover (refer to *MAGNETO/STARTER*)
- Oil pressure regulator plug, compression spring and valve piston.

⚠ WARNING

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



1. *Valve piston*
2. *Compression spring*
3. *Oil pressure regulator plug*

Oil Pressure Regulator Inspection

Inspect valve piston for scoring or other damages.

Check compression spring for free length.

COMPRESSION SPRING FREE LENGTH	
NEW NOMINAL	64 mm (2.519 in)
SERVICE LIMIT	62 mm (2.441 in)

Replace both parts if important wear or damage are present.

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

Oil Pressure Regulator Installation

For installation, reverse the removal procedure.

OIL PUMP

The oil pump is located on the engine MAG side (refer to *ENGINE OIL PRESSURE REGULATOR*).

Oil Pump Removal

Remove:

- Engine from vehicle (refer to *ENGINE REMOVAL/INSTALLATION*)
- Water pump cover (refer to *COOLING SYSTEM*)
- Magneto cover (refer to *MAGNETO/STARTER*).

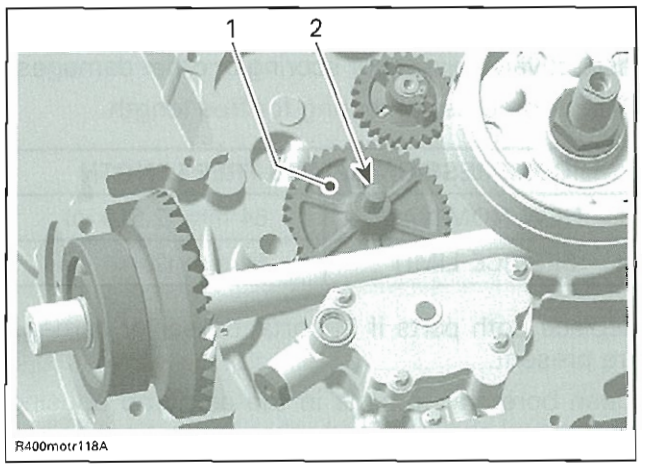
NOTE: The following steps to remove the drive gear no. 6 and the intermediate gear no. 7 are not necessary to replace only the oil pump.

Remove retaining ring no. 8 then drive gear no. 6 and needle pin no. 9.

CAUTION: Never use the retaining ring a second time. Always replace by a new one.

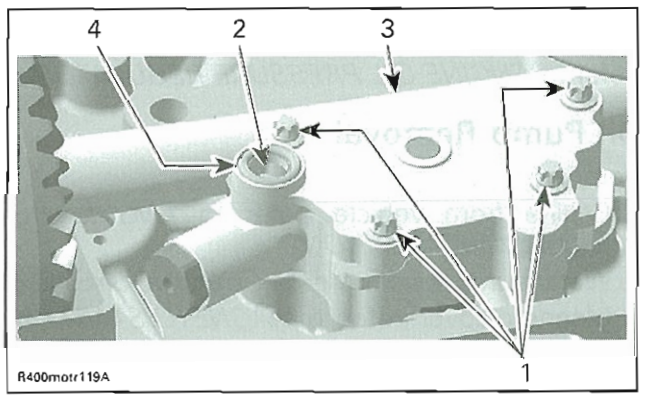
NOTE: Drive gear is snapped on a needle pin. This needle pin passes through the balancing shaft.

Remove pin and intermediate gear.



1. *Intermediate gear*
2. *Pin*

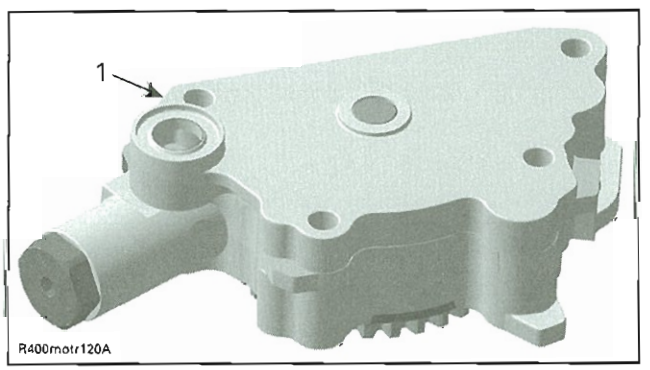
Remove oil pump cover screws and oil pump cover.



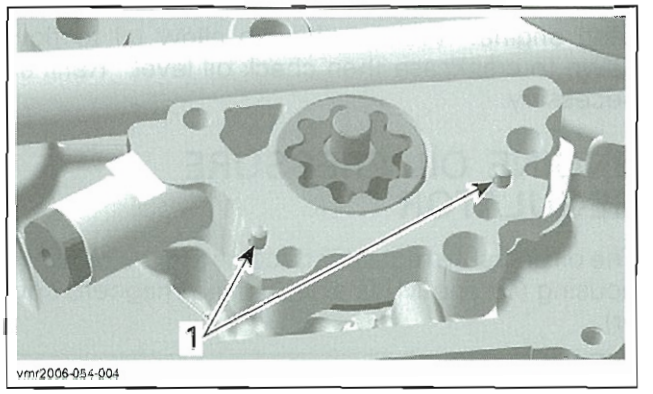
1. *4 oil pump cover screws*
2. *Oil from the pump to the oil filter in the magneto cover*
3. *Oil pump cover*
4. *Oil seal to crankcase MAG side*

NOTE: To remove oil pump system, lift the dowel pins no. 10 a bit. The oil pump housing with oil pump shaft assembly will be easier to remove.

CAUTION: Pay attention not to drop the dowel pins inside the engine.



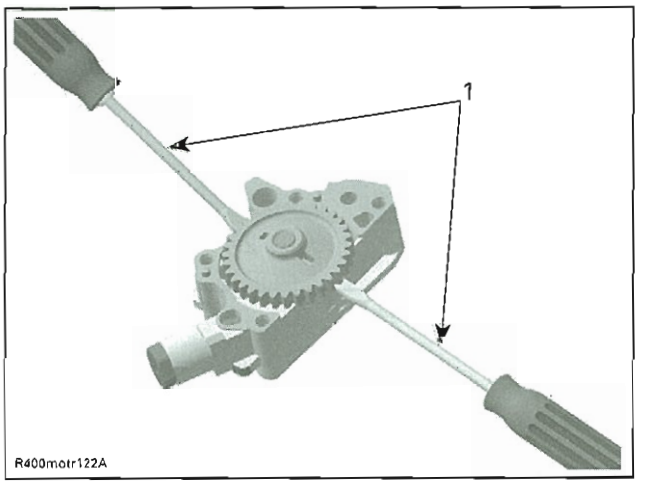
1. *Oil pump system*



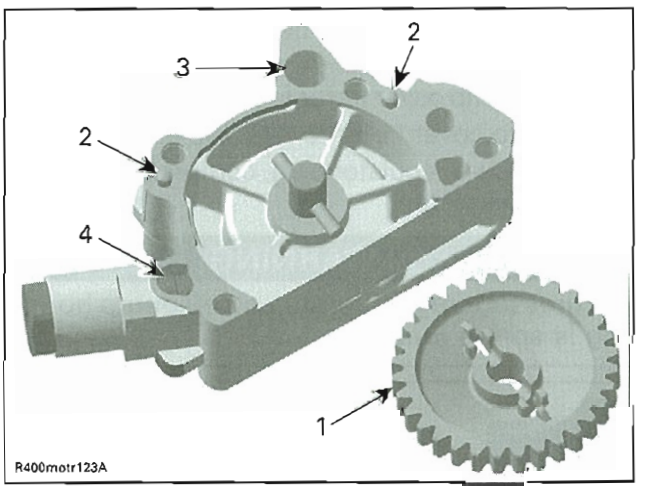
1. *Dowel pins*

Remove oil pump gear no. 11.

NOTE: Oil pump gear is snapped on needle pin. This needle pin passes through the oil pump shaft. Use screwdrivers to remove this gear.

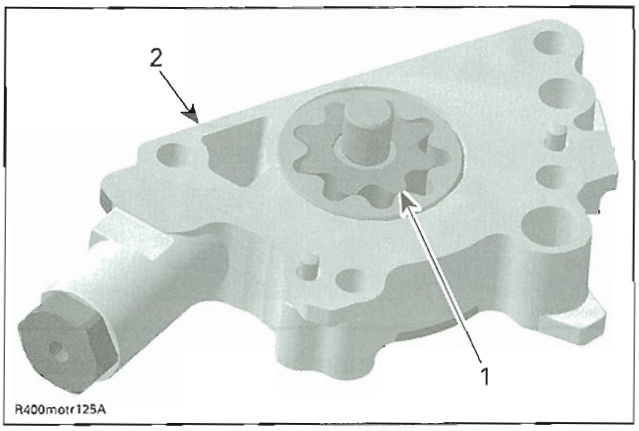


1. *Flat screwdrivers*

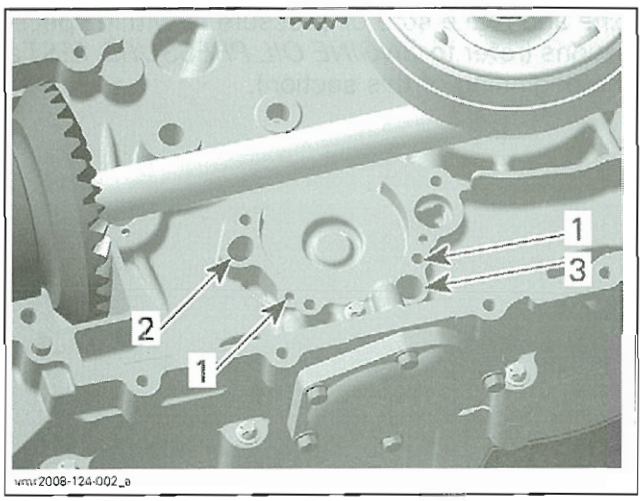


1. *Oil pump gear*
2. *Dowel pins*
3. *Suction side of the oil pump*
4. *Outlet from the engine oil pressure regulator valve*

Remove needle pin no. 12, oil pump shaft assembly and oil pump housing.



1. *Oil pump shaft assembly*
2. *Oil pump housing*



1. *Bore for dowel pin support*
2. *Oil return from the oil pressure regulator system*
3. *Oil inlet to the oil pump (leads to strainer on engine bottom)*

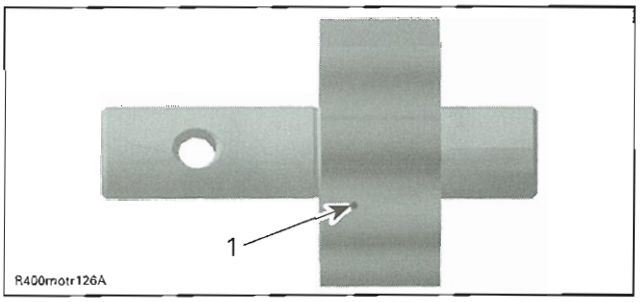
Oil Pump Inspection

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

Replace O-ring no. 13 if brittle or hard. This O-ring is located on the oil pump housing.

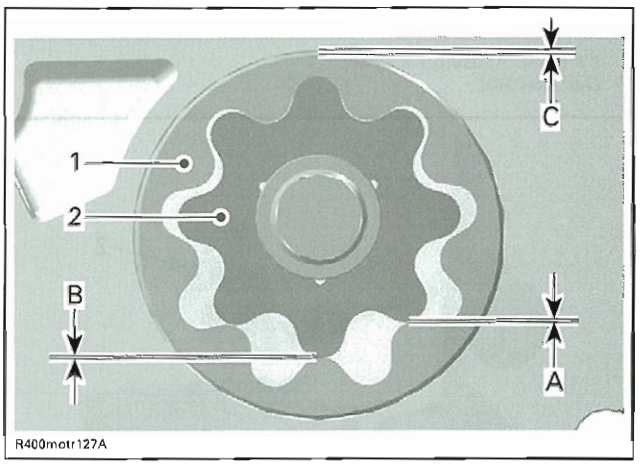
Check inner rotor for corroded pin holes or other damages. If so, replace oil pump shaft assembly.

Check the inside of oil pump housing and its cover for scoring or other damages. If so, change the complete oil pump assembly.



1. *Pittings on the teeth*

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



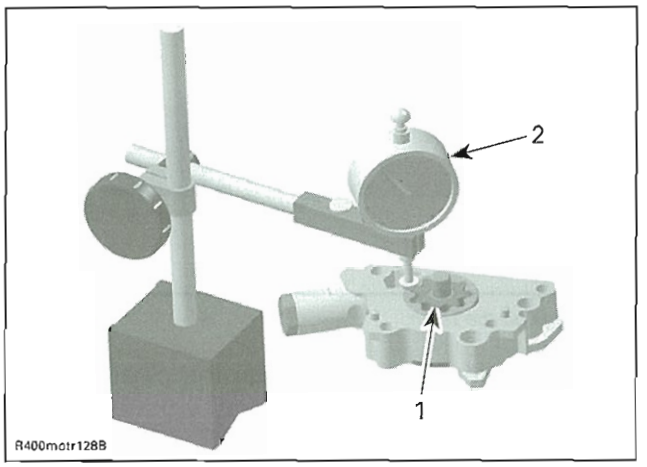
1. *Outer rotor*
2. *Inner rotor*

OUTER AND INNER ROTOR CLEARANCE	
SERVICE LIMIT	
A	0.25 mm (.009 in)
B	
C	

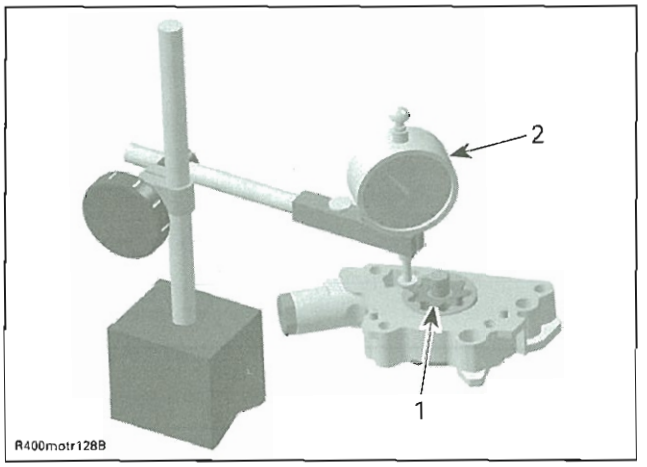
If clearance between inner and outer rotor exceeds the tolerance, replace oil pump shaft assembly. Ensure to also check oil pump housing and cover. If damaged, replace the complete oil pump assembly.

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

Using a dial indicator, measure side wear as shown.



1. Oil pump housing surface
2. Dial indicator



1. Oil pump outer rotor surface
2. Dial indicator

Difference between pump housing and outer rotor should not exceed 0.1 mm (.004 in). If so, replace the complete oil pump assembly.

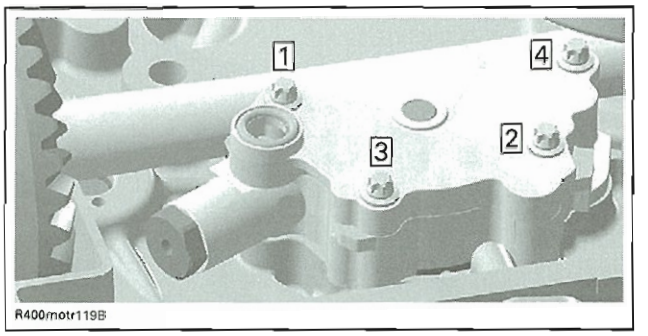
NOTE: When the axial clearance of the oil pump shaft assembly increases, the oil pressure decreases.

Oil Pump Installation

For installation, reverse the removal procedure.

CAUTION: Never apply any sealing compound on split surfaces of oil pump.

Tightening oil pump housing screws as per following sequence.



NOTE: After tightening the oil pump housing screws check for smooth operation of the oil pump assembly.

Install the O-ring no. 13 on oil pump cover.

After engine is completely reassembled, start engine and make sure oil pressure is within specifications (refer to *ENGINE OIL PRESSURE TEST* at the beginning of this section).

COOLING SYSTEM

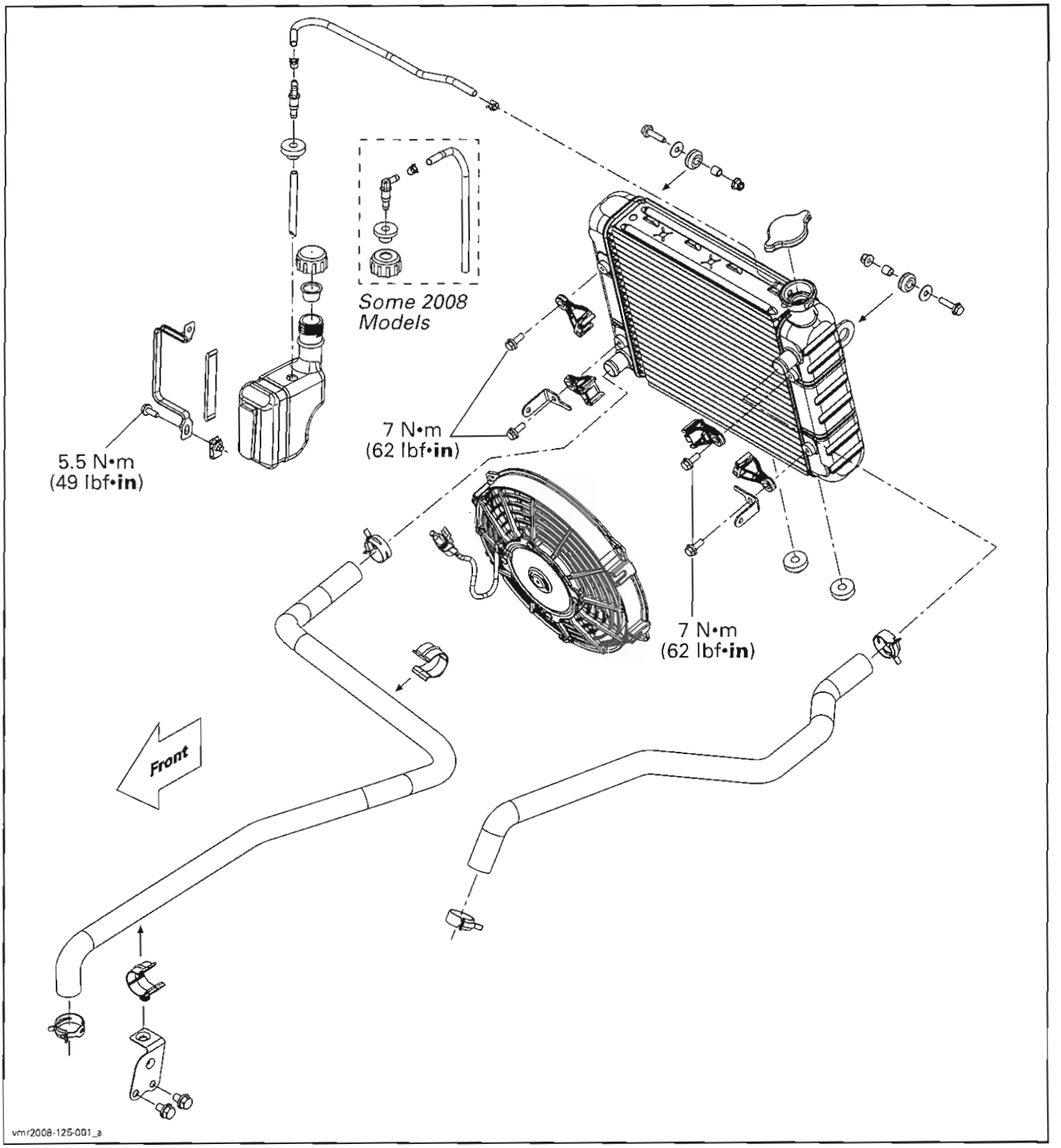
SERVICE TOOLS

Description	Part Number	Page
small hose pincher	295 000 076	64
pressure/vacuum pump	529 021 800	64
large hose pincher	529 032 500	62
oil seal pusher	529 035 757	75
water pump ceramic seal installer	529 035 766	75
Fluke 115 multimeter	529 035 868	69
test cap	529 035 991	64
ECM adapter tool	529 036 085	70

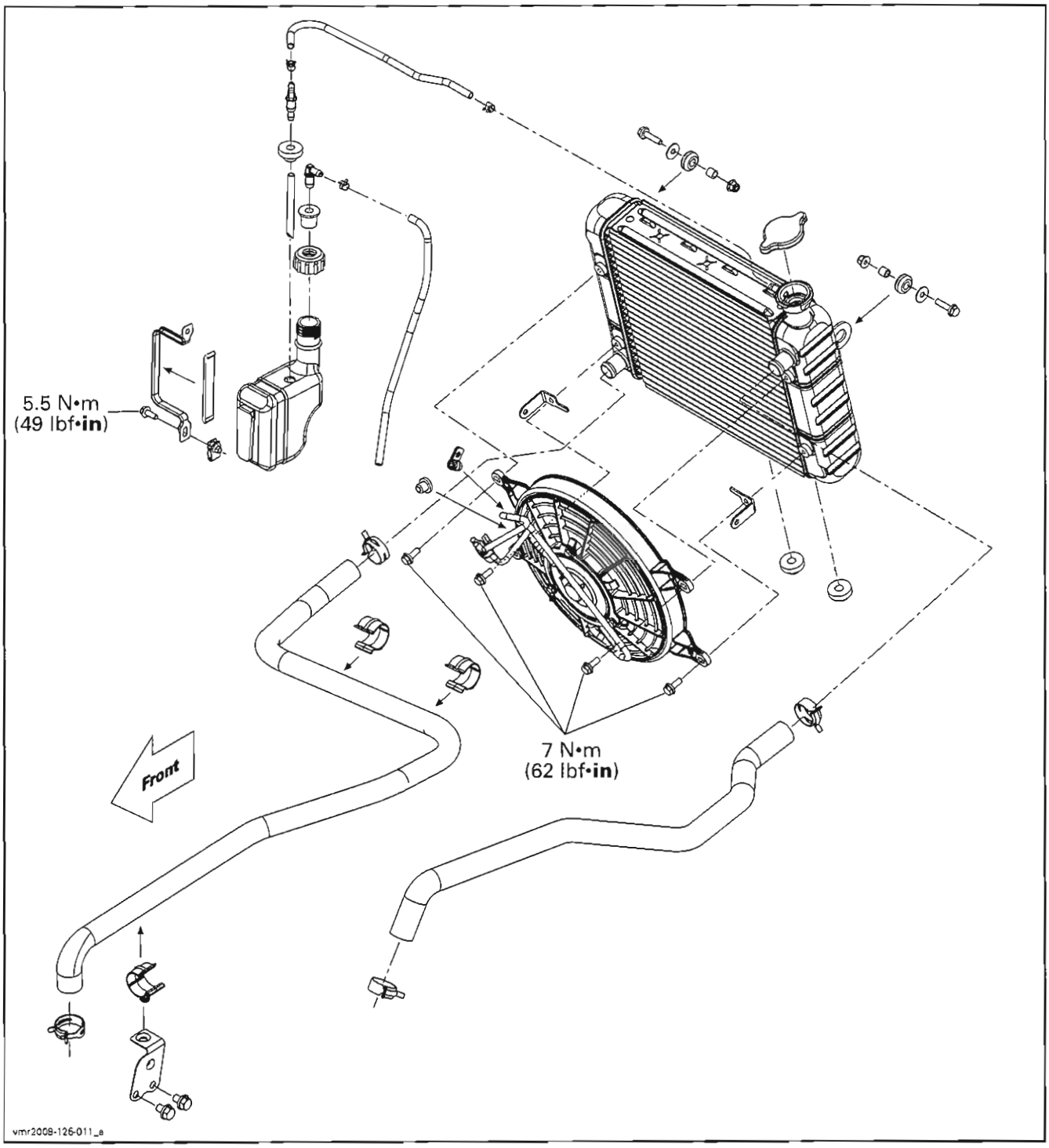
SERVICE PRODUCTS

Description	Part Number	Page
BRP premixed coolant	219 700 362	62
Super Lube grease	293 550 030	75
Loctite 243	293 800 060	65

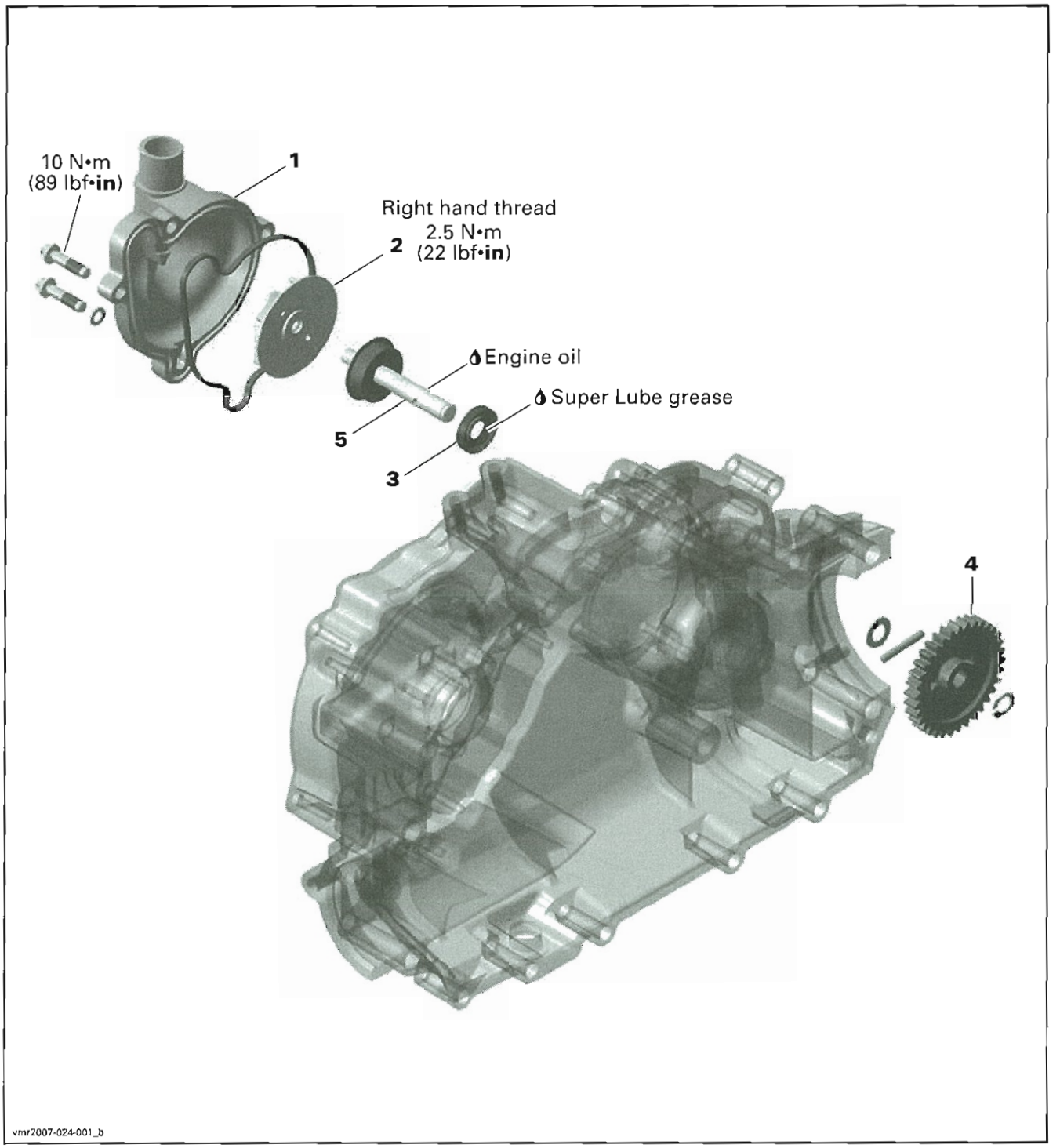
RADIATOR (2008)



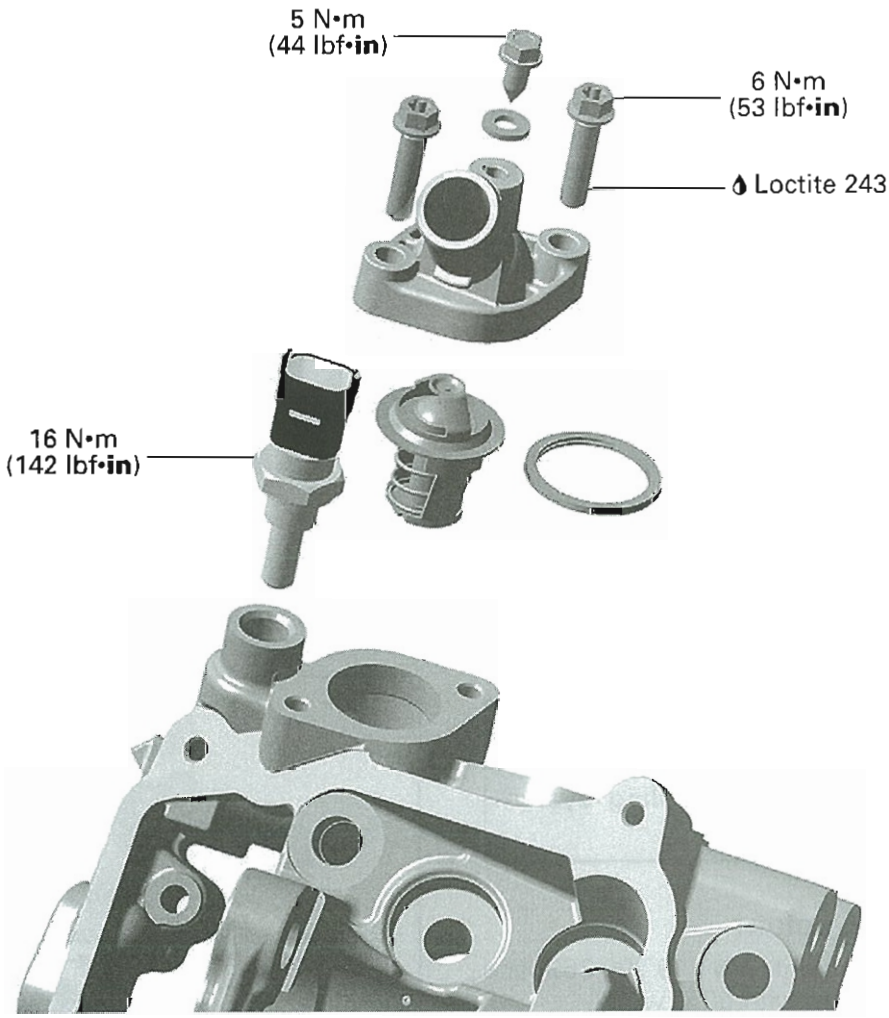
RADIATOR (2009)



WATER PUMP



THERMOSTAT



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GENERAL

⚠ WARNING

Never start engine without coolant. Engine parts and ceramic seal on water pump shaft can be damaged.

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

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

⚠ WARNING

Torque wrench tightening specifications must be strictly adhered to.
Locking devices (e.g.: locking tabs, elastic stop nuts, self-locking fasteners, etc.) must be installed or replaced with new ones where specified. If the efficiency of a locking device is impaired, it must be renewed.

MAINTENANCE

ENGINE COOLANT

⚠ WARNING

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

Recommended Coolant

Use BRP premixed coolant (P/N 219 700 362) or a blend of 50% antifreeze with 50% water.

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

CAUTION: To prevent rust formation or freezing conditions, always replenish the system with an ethylene glycol antifreeze containing corrosion inhibitors specifically recommended for aluminum engines such as the BRP premixed coolant.

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.

Draining the Cooling System

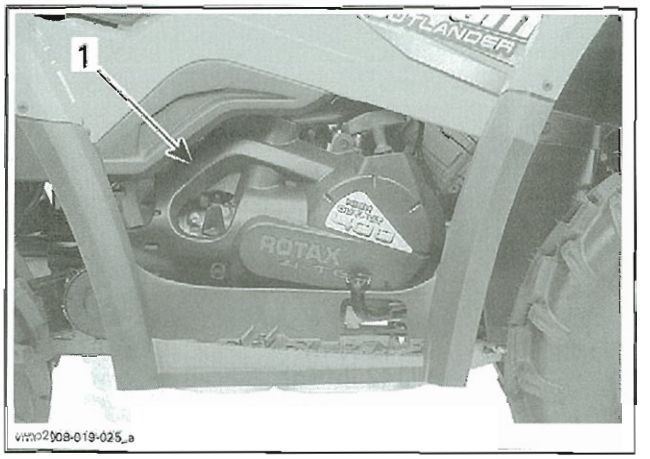
⚠ WARNING

Never drain or refill cooling system when engine is hot.

Remove the service compartment cover.

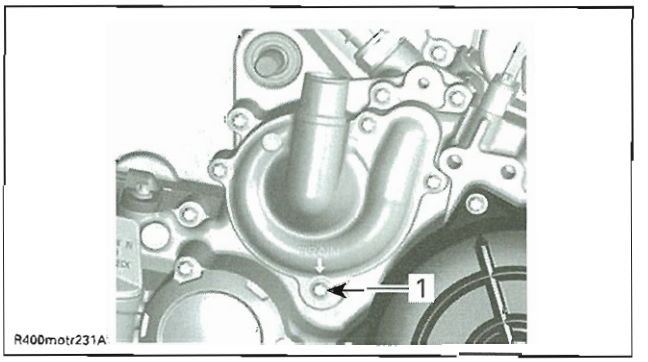
Remove radiator cap.

Remove RH engine cover.



1. RH engine cover

Partially unscrew cooling system drain plug located below coolant pump housing.



1. Cooling system drain plug

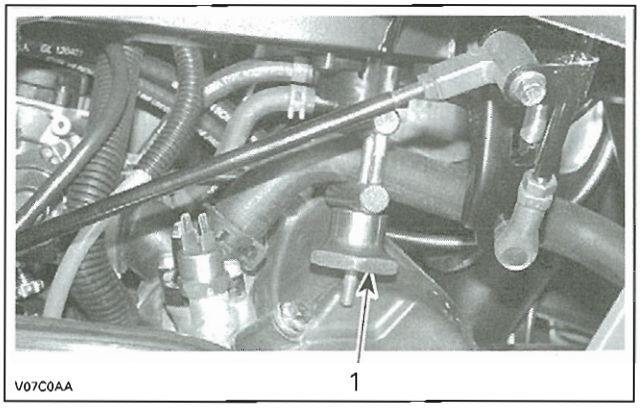
When cooling system is drained completely, remove drain plug completely and install a new gasket ring.

Reinstall drain plug and torque it to 10 N•m (89 lbf•**in**).

Refilling and Bleeding the Cooling System

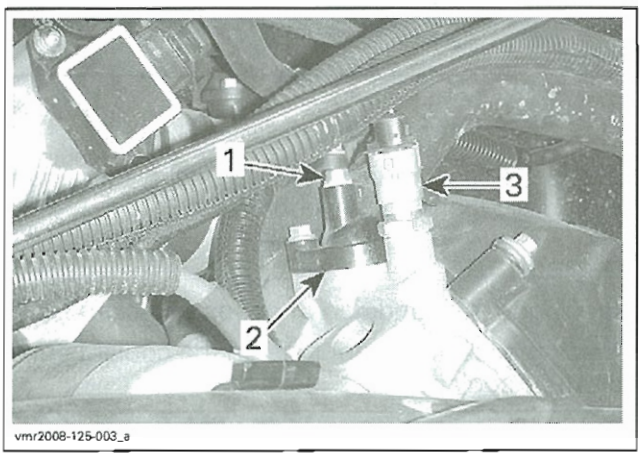
Remove the RH side body panel.

Pinch the radiator coolant return hose between radiator and thermostat housing with a large hose pincher (P/N 529 032 500) as per following illustration.



1. Hose pincher

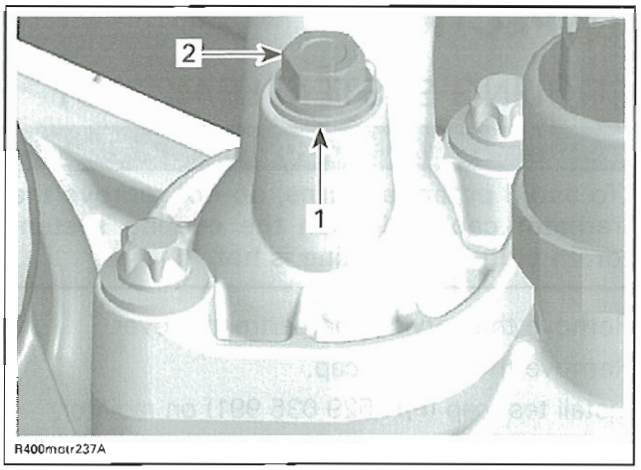
Remove cooling system bleeder screw from top of thermostat housing.



1. Bleeder screw
2. Thermostat housing
3. Coolant temperature sensor

With vehicle on a flat and level surface, and the engine cold, refill the radiator.

When coolant starts to escape from the thermostat housing bleeder port, install the bleeder screw with its gasket ring and torque to 5 N•m (44 lbf•**in**).

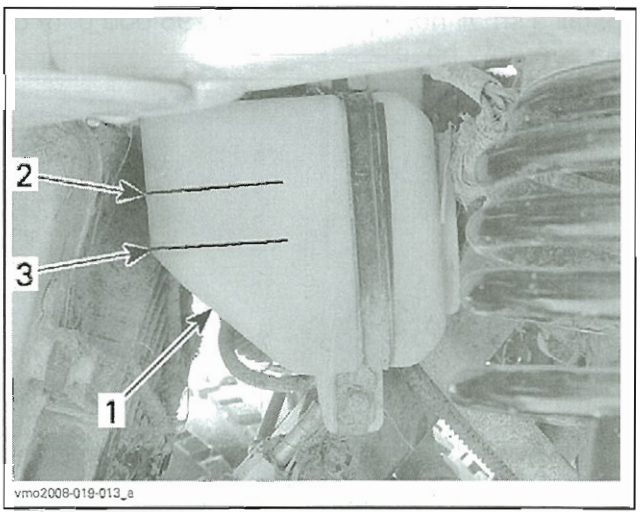


TYPICAL
1. Gasket ring
2. Bleeder screw

Remove hose pincher from radiator coolant return hose.

Top up radiator coolant and install radiator cap.

Refill coolant tank up to the MIN. level mark and install the coolant tank cap.



TYPICAL
1. Coolant tank
2. MAX. fill level mark
3. MIN. fill level mark

Run engine until thermostat opens then stop engine.

When engine has completely cooled down, recheck coolant level in radiator and coolant tank, top up if necessary. The level in the coolant tank should be between MIN. and MAX. marks.

NOTE: Coolant concentration (freezing point) should be checked with an appropriate tester, or replaced as specified in the *MAINTENANCE CHART* section.

INSPECTION

COOLING SYSTEM LEAK TEST

⚠ WARNING

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

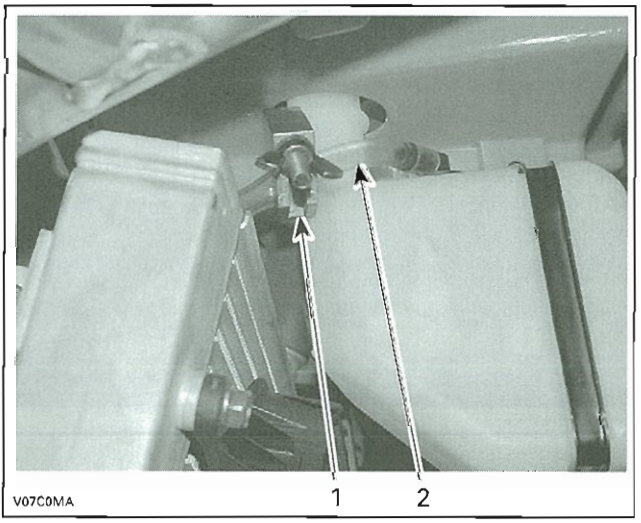
Remove the service compartment cover.

Remove the radiator cap.

Install test cap (P/N 529 035 991) on radiator.

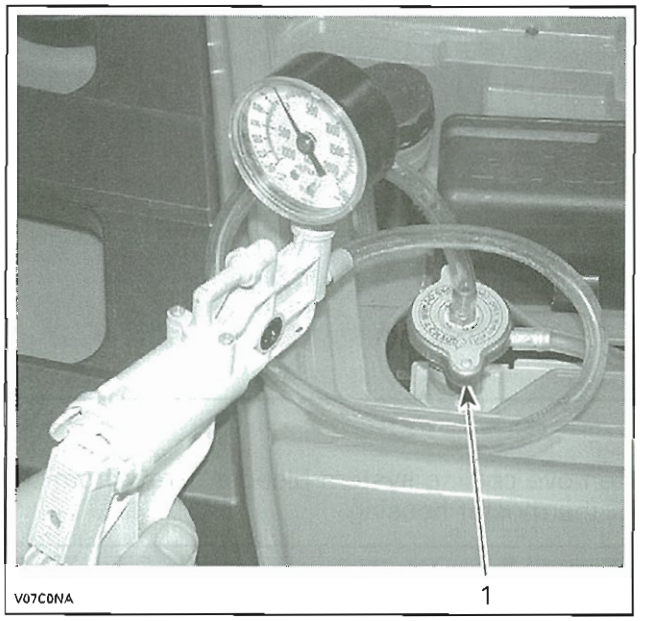
529 035 991

Install a small hose pincher (P/N 295 000 076) on the overflow hose.



TYPICAL
1. *Hose pincher*
2. *Radiator overflow hose*

Using pressure/vacuum pump (P/N 529 021 800), pressurize system to 103 kPa (15 PSI).



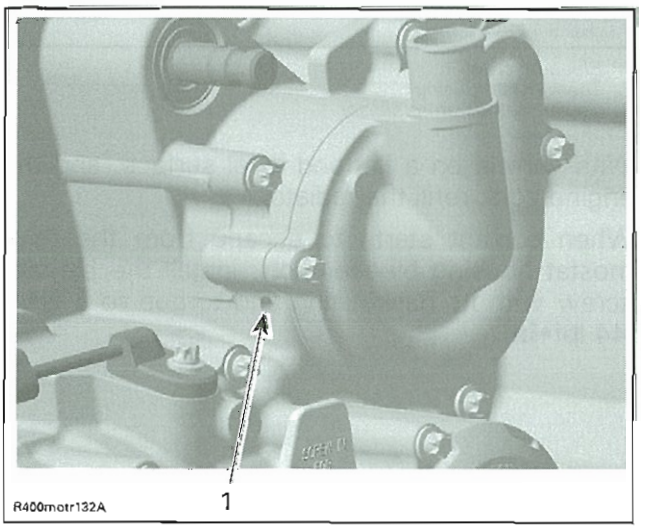
TYPICAL
1. *Special radiator cap*

Check all hoses, radiator and engine cylinder/base for coolant leaks or air bubbles.

Inspection

Check general condition of hoses and clamps.

Check the leak indicator hole on the coolant pump for oil or coolant.



1. *Leak indicator hole*

NOTE: Flowing coolant indicates a damaged or worn rotary seal. Oil indicates a defective oil seal, located behind the rotary seal. If either seal is leaking, the water pump has be removed and both seals must be replaced. Refer to *WATER PUMP SHAFT AND SEALS* in this section.

PROCEDURES

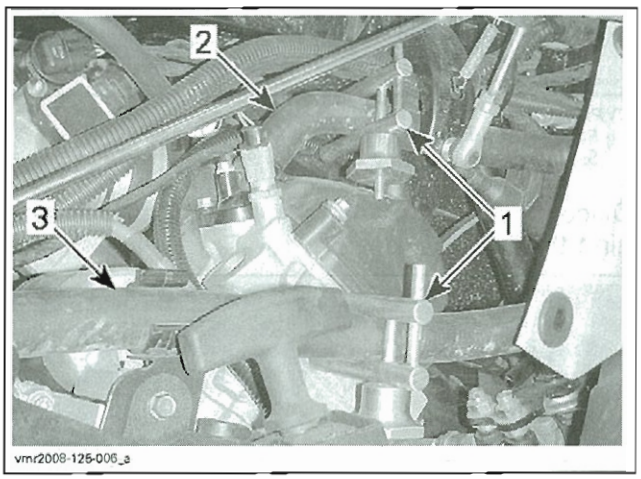
THERMOSTAT

The thermostat is a single action type, located on the RH rear side of the cylinder head.

Thermostat Removal

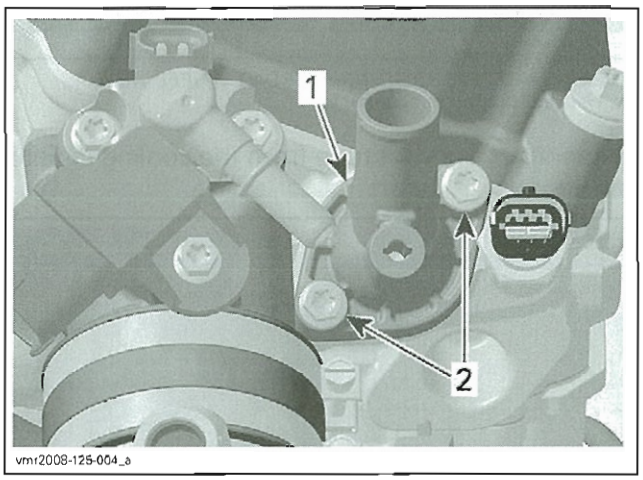
Remove the RH side body panel.

Install a hose pincher on both radiator hoses.



1. *Hose pinchers*
2. *Coolant return hose from thermostat*
3. *Radiator coolant outlet hose*

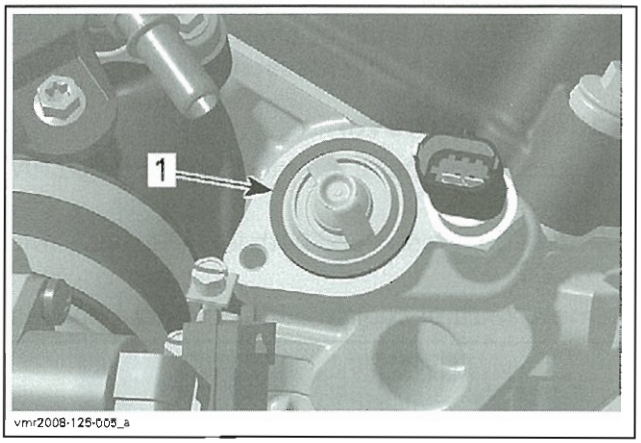
Remove thermostat housing screws and pull thermostat housing off cylinder head.



1. *Thermostat housing*
2. *Screws*

Remove thermostat and gasket from cylinder head.

NOTE: Note location of gasket for installation.



1. *Thermostat with gasket*

Thermostat Test

To test thermostat, suspend it submerged in a pot of water and heat the water until the thermostat opens. Measure the water temperature.

NOTE: The thermostat should open when the water temperature reaches 65°C (149°F).

Thermostat Installation

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

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

Apply Loctite 243 (P/N 293 800 060) to the thermostat housing mounting screws.

Torque mounting screws to 6 N•m (53 lbf•**in**).

Check coolant level in radiator and coolant tank. Top up if necessary.

Bleed the cooling system. Refer to *ENGINE COOLANT* in this section.

RADIATOR CAP

Using a pressure cap tester, test to see at what pressure the radiator cap opens. If cap pressure valve does not open at or near 110 kPa (16 PSI), install a new cap (do not exceed this pressure).

NOTE: If cap opens at a low pressure, cooling system efficiency will be reduced.

CAUTION: An over pressure condition in the cooling system can cause coolant leaks and component damage.

RADIATOR

Radiator Inspection

Check radiating fins for clogging or damage.

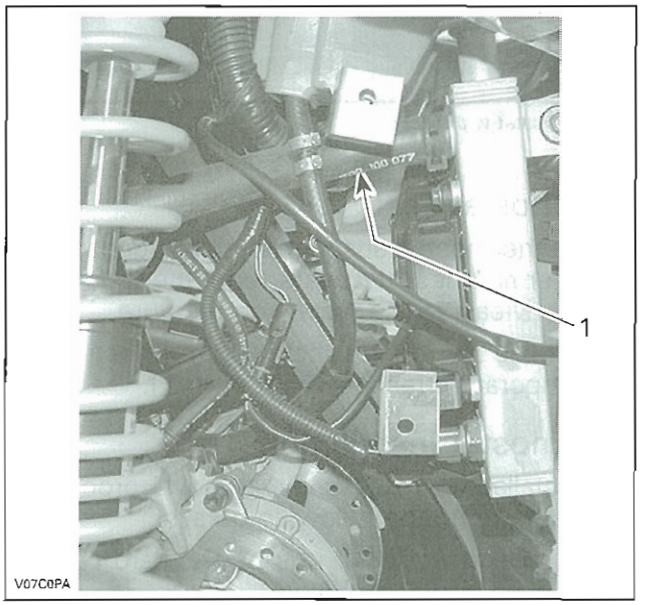
Remove insects, mud or other obstructions with compressed air or low pressure water.

Radiator Removal

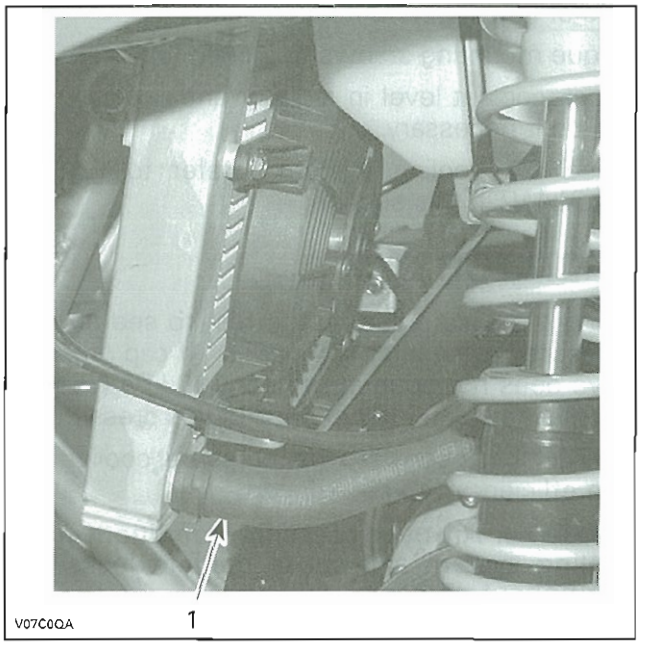
Drain cooling system, refer to *ENGINE COOLANT* in this section.

Remove front fascia and both inner fenders, refer to *BODY*.

Remove radiator coolant outlet and return hoses.

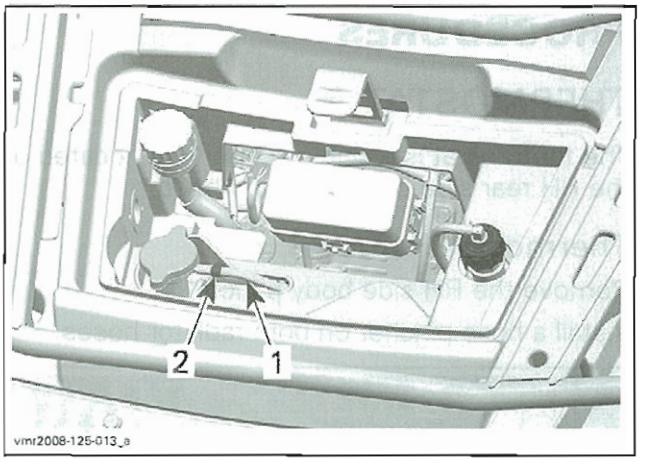


1. Radiator coolant return hose



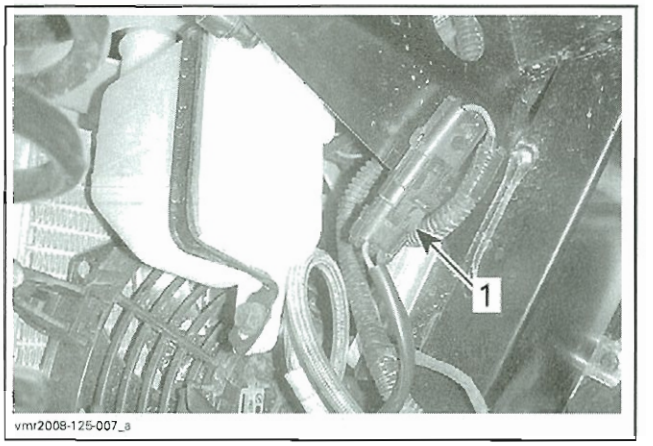
TYPICAL
1. Radiator coolant outlet hose

Remove overflow hose at radiator filler neck.



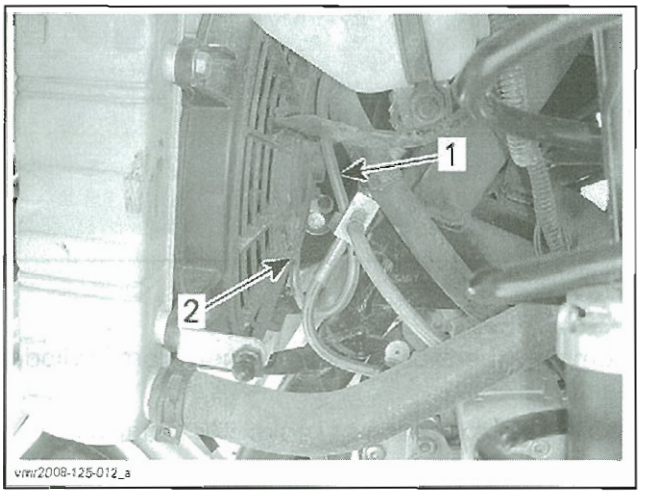
TYPICAL
1. Radiator overflow hose
2. Spring clamp

Disconnect radiator fan connector located just behind the coolant tank.



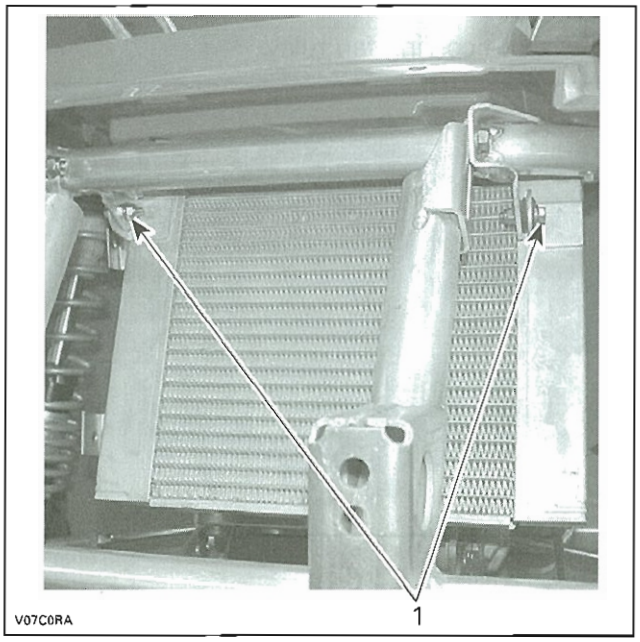
TYPICAL — VIEW THROUGH LH FRONT WHEEL WELL
1. Radiator cooling fan connector

Disconnect the vent tube from the cooling radiator fan motor.



1. Radiator fan vent tube
2. Disconnect tube from fan motor

Remove radiator mounting screws.



1. Radiator mounting screws

Remove radiator from vehicle.

Radiator Installation

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

Install rubber bushings between bottom of radiator and radiator support.

Torque all mounting screws as specified in exploded view.

Fill radiator with coolant. Refer to *ENGINE COOLANT* procedure in this section.

Check for any coolant leakage from radiator and hoses.

COOLANT TANK

The coolant expands as its temperature rises (up to 100 - 110°C (212 - 230°F)) causing pressure rise in the system. If the system working pressure limit is reached 110 kPa (16 PSI), the pressure relief valve in the radiator cap is lifted from its seat and allows coolant to flow through a hose into the coolant tank.

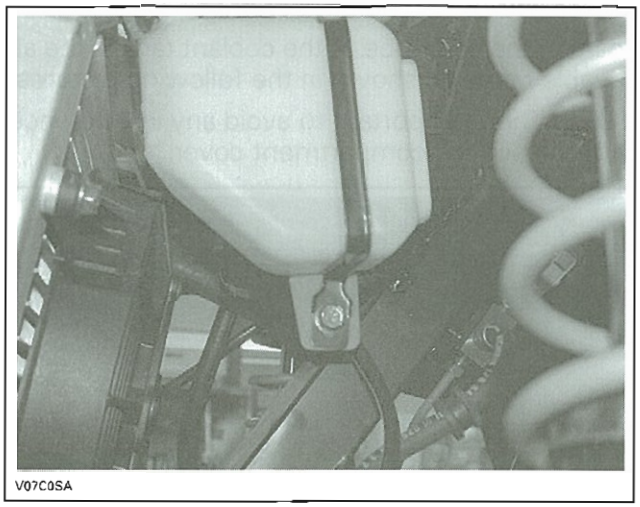
NOTE: On some 2008 models and on all 2009 models, a vent/overflow hose in the coolant tank cap allows excess pressure and coolant to escape.

When the system cools and the pressure decreases (generally after engine shutdown), the internal system pressure may become lower than atmospheric pressure. Coolant will then flow from the tank into the radiator to maintain it at a full state.

Coolant Tank Removal

Remove the LH inner fender panel, refer to *BODY* section.

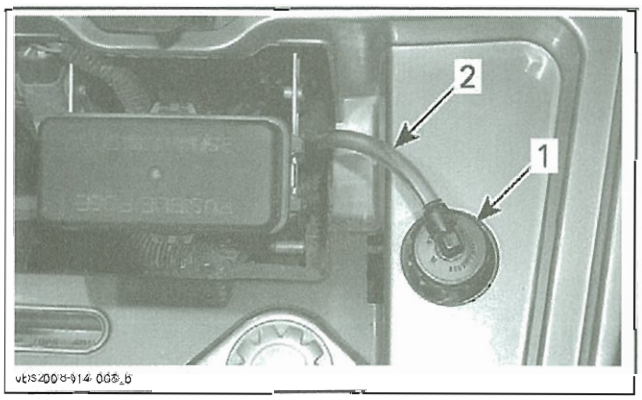
Remove the coolant tank support bolt.



TYPICAL — COOLANT TANK

Remove the service compartment cover to access top of coolant tank.

On applicable models, pull the coolant tank vent/overflow hose to the top of the vehicle.



TYPICAL
1. Coolant tank cap
2. Vent/overflow hose

Remove the coolant tank support screw and lower coolant tank sufficiently to access hoses connected to tank.

Disconnect the radiator overflow hose from the coolant tank.

Remove the support and lower the coolant tank.

NOTE: On applicable models, be careful not to snag the coolant tank vent hose to avoid breaking the cap or hose fitting as you lower the tank.

Empty coolant tank.

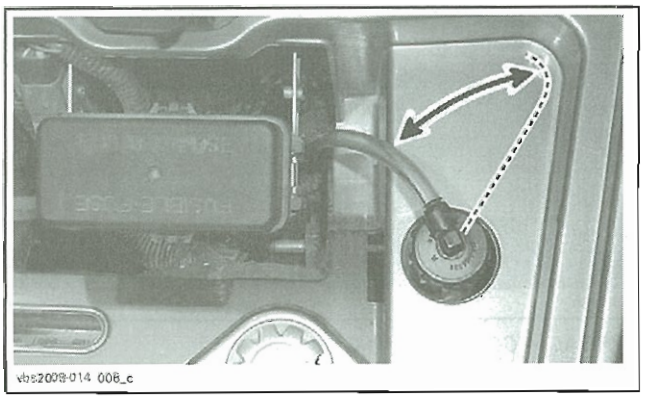
Coolant Tank Installation

Installation is the reverse of the removal procedure.

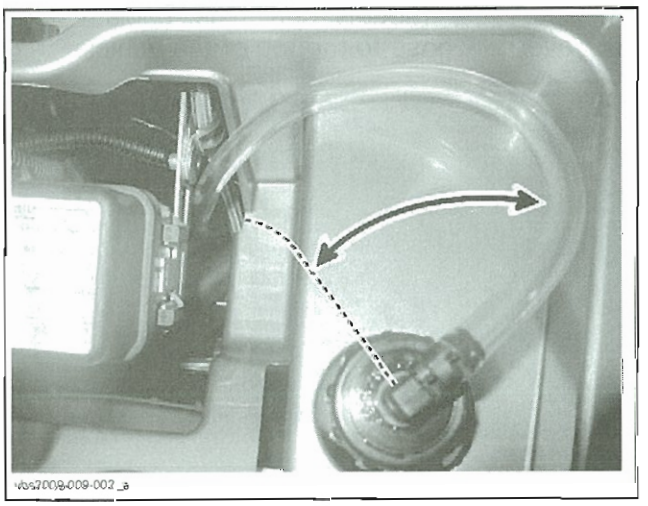
Torque tank mounting screw as specified in exploded view.

Position the vent tube of the coolant tank in the allowable range as shown in the following pictures.

NOTE: This is important to avoid any interference with the service compartment cover.



SHORT ROUTING



LONG ROUTING

CAUTION: Ensure the open end of the vent/overflow tube is routed down and away from moving parts, electrical components, or any component that may be adversely affected by overflowing coolant.

RADIATOR COOLING FAN

Radiator Cooling Fan Test

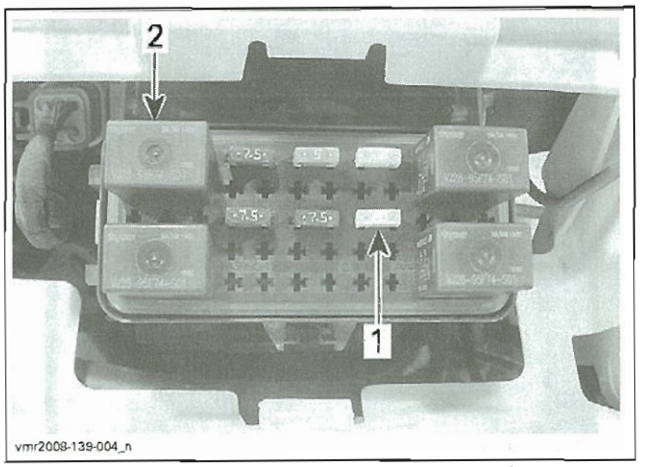
NOTE: It is not required to turn the ignition key to ON for this test.

Remove the service compartment cover.

Remove the fuse box cover.

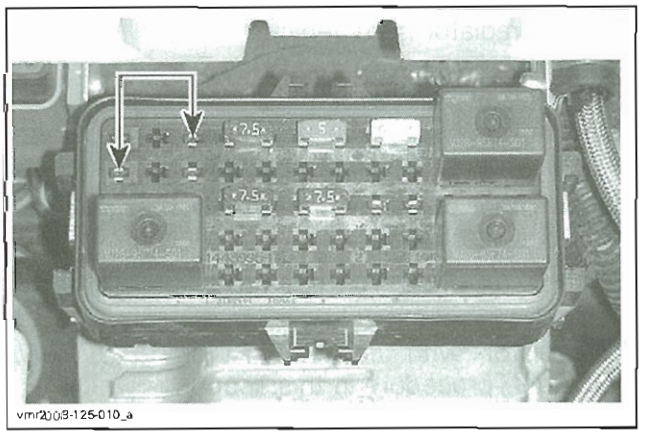
Remove the cooling fan fuse and test it to be sure that it is good.

Remove the cooling fan relay.



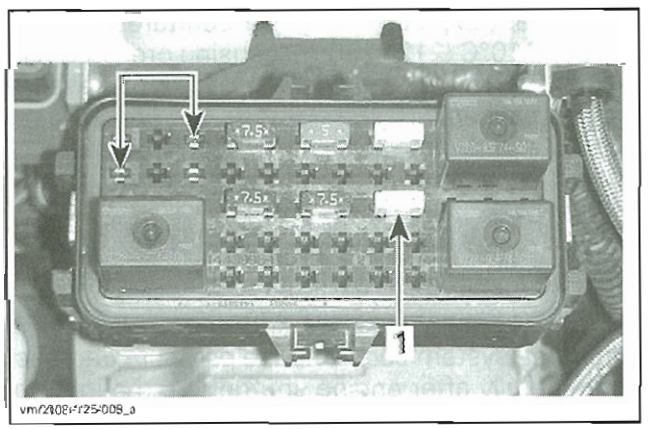
1. *Cooling fan fuse*
2. *Cooling fan relay*

Install an insulated jumper wire between contacts 1D and 3E of the fuse box.



JUMPER WIRE 1D TO 3E

As you install the cooling fan fuse, the fan should turn on.



1. *Reinstall cooling fan fuse*

If the fan functioned normally with a jumper installed in place of the relay, remove the cooling fan fuse and the jumper wire.

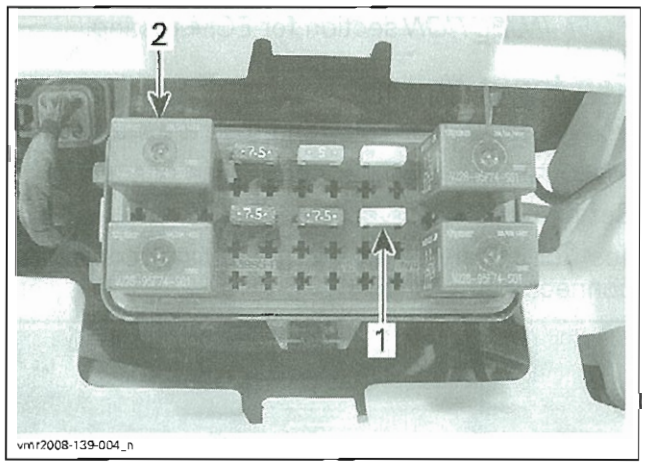
Carry out the following test:
- Fan relay input voltage
- Fan relay continuity
- Fan relay control circuit continuity.

If the fan does not function with a jumper installed in place of the relay, remove the cooling fan fuse and the jumper wire.

Carry out the following test:
- Fan input voltage
- Fan ground circuit continuity
- Fan power circuit continuity test.

Fan Relay Input Voltage Test

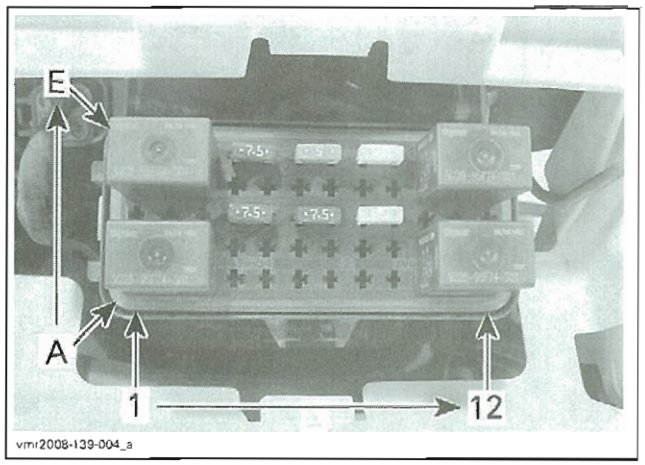
Remove cooling fan relay.



1. Cooling fan fuse
2. Cooling fan relay

Set the Fluke 115 multimeter (P/N 529 035 868) to Vdc and test fan relay input voltage as per following table.

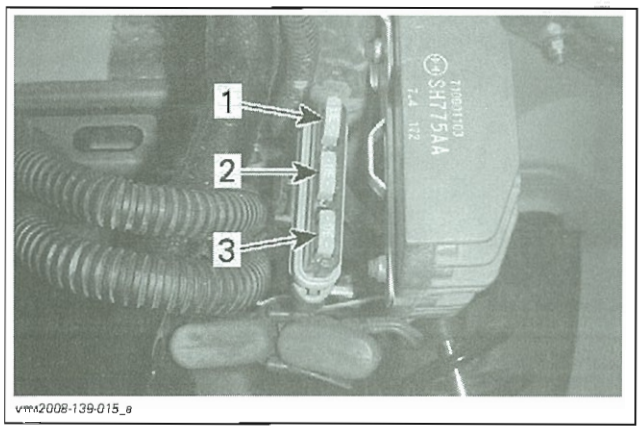
FAN RELAY INPUT VOLTAGE TEST		
TEST PROBES		READING
Contact 1D (fuse box)	Chassis ground	Battery voltage
Contact 3D (fuse box)		



FUSE BOX PIN-OUT

If battery voltage is measured, carry out a fan relay test.

If battery voltage is not measured, test the fan/accessories fuse in the rear fuse holde, and the wire continuity from said fuse to the fan relay.



REAR FUSE HOLDER (PF2)
1. Main fuse 30 A (F8)
2. Spare fuse 30 A
3. Fan/accessories fuse 30 A (F9)

Repair or replace fuse or wiring as required.

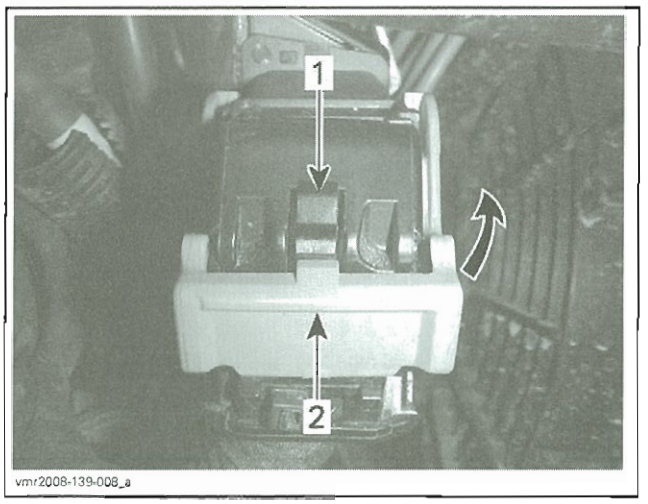
Fan Relay Test

To test the radiator cooling fan relay, refer to the *LIGHTS/GAUGE/ACCESSORIES* section. Use the accessories relay test procedure.

Replace relay as required.

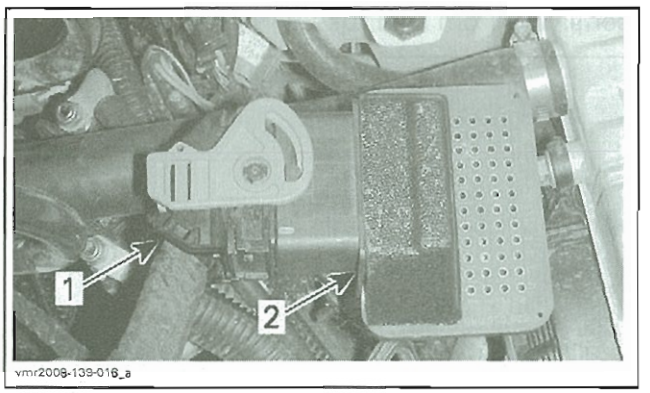
Fan Relay Control Circuit Test

Disconnect ECM connector.



1. *Press to release connector lock*
2. *Push to rotate connector lock upwards*

Install ECM connector onto the ECM adapter tool (P/N 529 036 085).

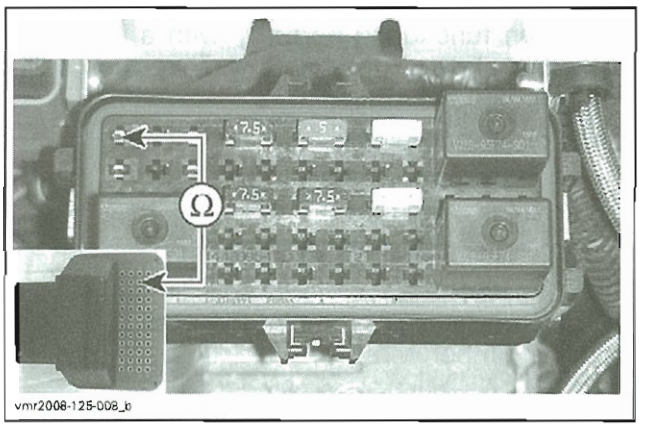


1. *ECM connector*
2. *Adapter tool*

Set multimeter to Ω setting.

Test for continuity of the relay control circuit ORANGE/WHITE wire as per following table.

FAN RELAY CONTROL CIRCUIT TEST		
TEST PROBES		RESISTANCE Ω @ 20°C (68°F)
Contact 1E (fuse box)	Pin B3 (ECM adapter)	Close to 0 Ω



FAN RELAY CONTROL CIRCUIT TEST

If continuity was not measured, repair or replace wiring/connector as required.

If cooling fan relay, relay input voltage and relay control circuit continuity tested good, the problem is related to the ECM. Refer to the *ELECTRONIC FUEL INJECTION* section for ECM testing.

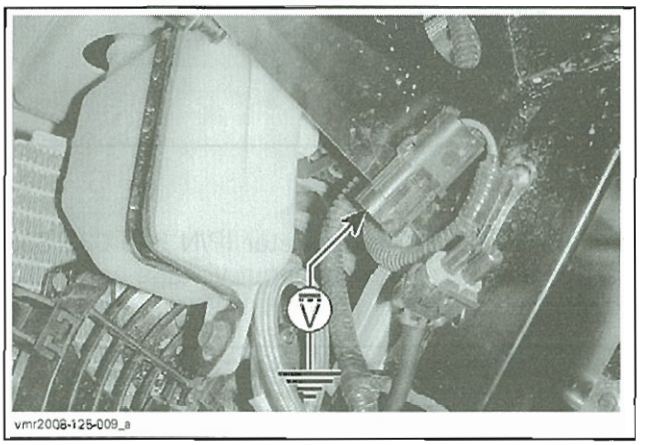
Fan Input Voltage Test

Ensure cooling fan relay and fuse are installed.

Disconnect the radiator cooling fan connector.

Set multimeter to Vdc.

Test for battery voltage at the radiator cooling fan connector BROWN/WHITE wire.



FAN INPUT VOLTAGE TEST (BROWN/WHITE WIRE)

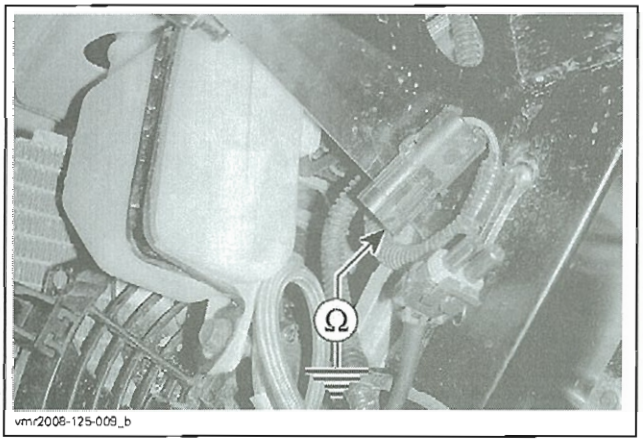
If battery voltage is measured, test fan ground circuit continuity.

If battery voltage was not measured, test fan power circuit continuity.

Fan Ground Circuit Continuity Test

Set multimeter to Ω setting.

Test for continuity of the fan ground wire (BLACK wire) to chassis ground.



FAN GROUND CIRCUIT CONTINUITY TEST (BKACK WIRE)

If continuity was not measured, repair or replace wiring/connector as required.

If fan input voltage and ground circuit continuity measured good, replace the radiator cooling fan.

Fan Power Circuit Continuity Test

Remove fan relay.

Remove fan fuse.

Test for continuity of the fan power circuit wiring as per following table.

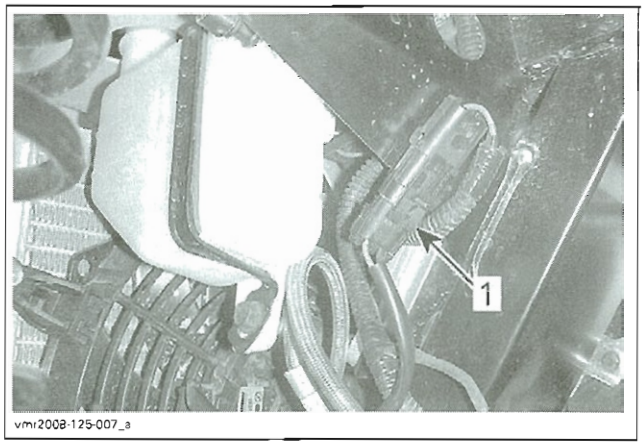
FAN POWER CIRCUIT CONTINUITY TEST			
FUSE BOX CONTACTS		FAN CONNECTOR	RESISTANCE Ω @ 20°C (68°F)
3E	9C	—	Close to 0 Ω
8C	—	Pin B (BR/WH)	

Repair or replace wiring/connectors as required.

Radiator Cooling Fan Removal

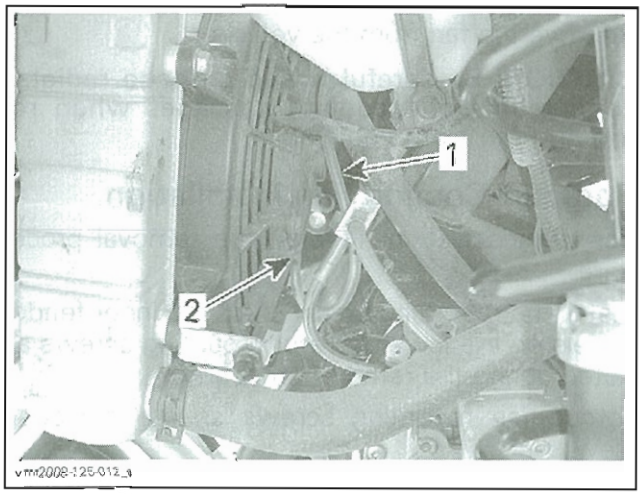
Remove both inner fender panels. Refer to the *BODY* section.

Disconnect radiator cooling fan connector.



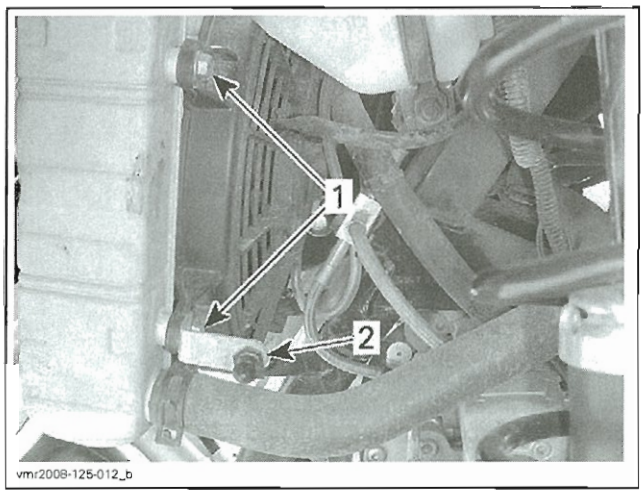
1. Radiator cooling fan connector

On 2009 models, remove the cooling fan vent tube.



TYPICAL
1. Radiator fan vent tube
2. Disconnect tube from fan motor

Remove the 4 fan mounting screws, refer to the exploded views. Note the position of the mounting bracket for the inner fender panel installation.



TYPICAL — LEFT SIDE ILLUSTRATED, RIGHT SIDE SIMILAR
1. *Radiator mounting screws*
2. *Mounting bracket for inner fender panel*

Remove the fan from the vehicle.

CAUTION: Be careful not to damage radiator cooling fins and coolant passages when removing fan from vehicle.

Radiator Cooling Fan Installation

For the installation, reverse the removal procedure.

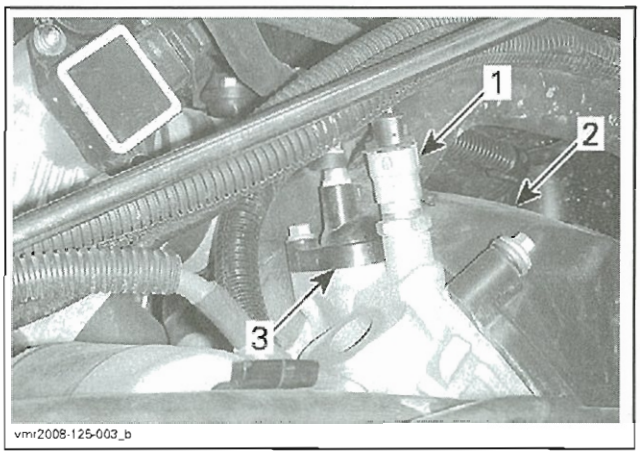
Install the mounting brackets for the inner fender panels on the lower radiator mounting screws as noted during the removal procedure.

Torque fan mounting screws as per exploded view.

Ensure to reconnect the fan vent tube on 2009 models.

COOLANT TEMPERATURE SENSOR (CTS)

The coolant temperature sensor is located next to the thermostat housing on the RH rear side of the cylinder head.



1. *Coolant temperature sensor*
2. *Valve cover*
3. *Thermostat housing*

Refer to *ELECTRONIC FUEL INJECTION* section for testing and replacement procedures of the coolant temperature sensor (CTS).

WATER PUMP COVER

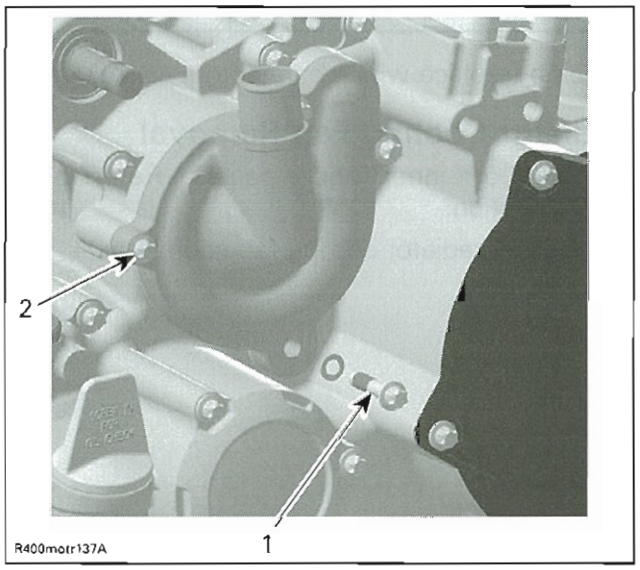
NOTE: The water pump cover is located on the engine MAG side (RH).

Water Pump Cover Removal

Drain cooling system, refer to *ENGINE COOLANT* in this section.

Remove radiator outlet hose from water pump housing.

Remove screws retaining water pump cover.



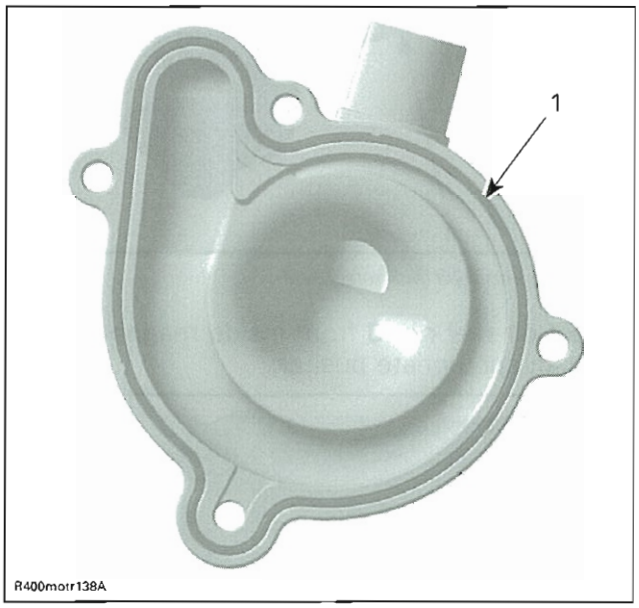
WATER PUMP COVER REMOVAL
1. *Mounting screws, cooling system drain plug with sealing washer*
2. *Mounting screw*

Pull on water pump cover to remove it.

Water Pump Cover Inspection

Check if gasket is brittle, hard or damaged.

Replace as required.



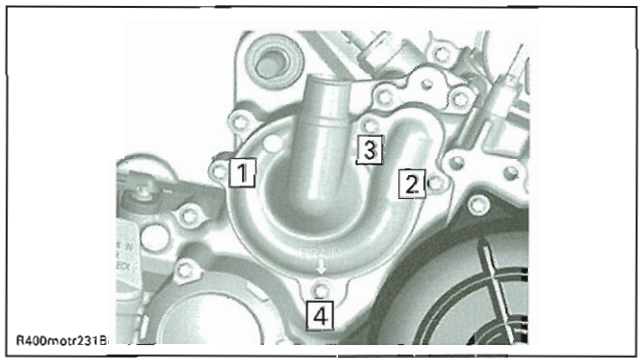
WATER PUMP COVER
1. Gasket

Water Pump Cover Installation

The installation is the opposite of the removal procedure.

CAUTION: To prevent leaking, make sure the gasket is properly inserted in the pump cover groove when you reinstall the water pump cover.

Tightening sequence for screws on water pump cover is as per following illustration (criss-cross). Apply torque specified in exploded view.

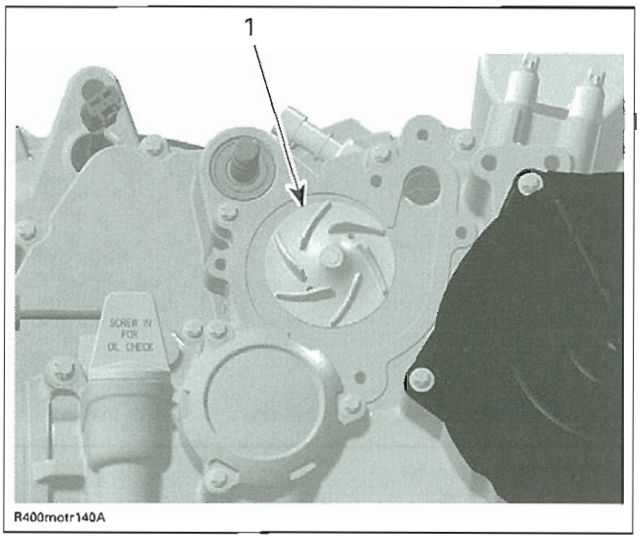


WATER PUMP IMPELLER

Water Pump Impeller Removal

Remove water pump cover as per previous procedure.

Unscrew impeller from water pump shaft.



1. Impeller

NOTE: Water pump shaft and impeller have right-hand threads. Remove by turning counterclockwise and install by turning clockwise.

Water Pump Impeller Inspection

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

Water Pump Impeller Installation

The installation is the opposite of the removal procedure.

NOTE: Be careful not to damage the impeller blades during installation.

Torque impeller as specified in exploded view.

WATER PUMP SHAFT AND SEALS

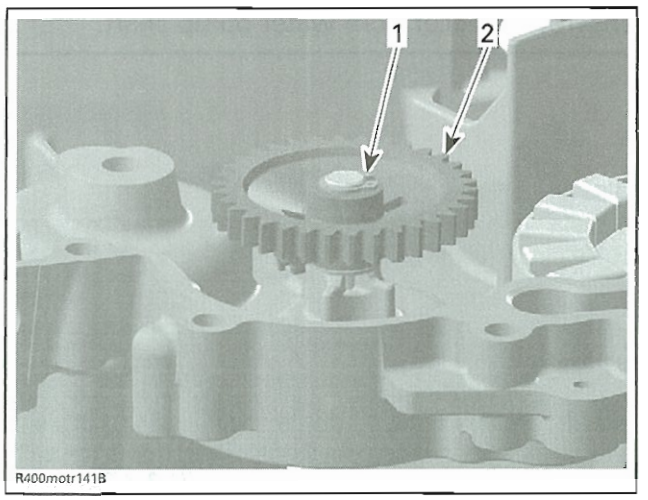
Water Pump Shaft and Seal Removal

Remove water pump cover no. 1.

Remove impeller no. 2.

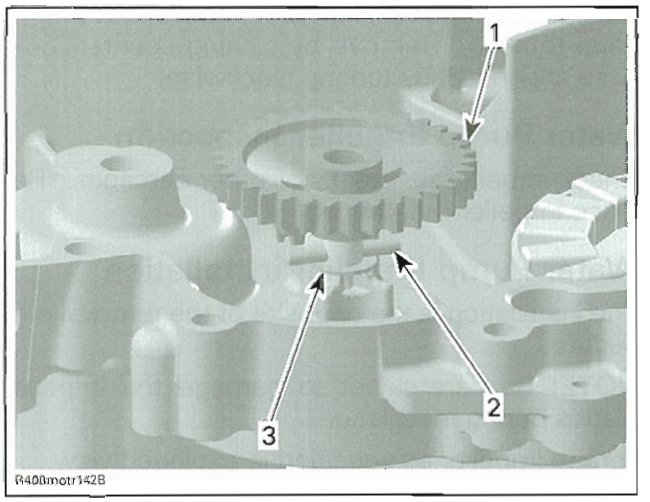
Remove magneto cover, refer to the *MAGNETO/STARTER* section.

Remove retaining ring (circlip) from the water pump gear using the appropriate pliers. Discard the retaining ring.



1. *Retaining ring (circlip)*
2. *Water pump gear*

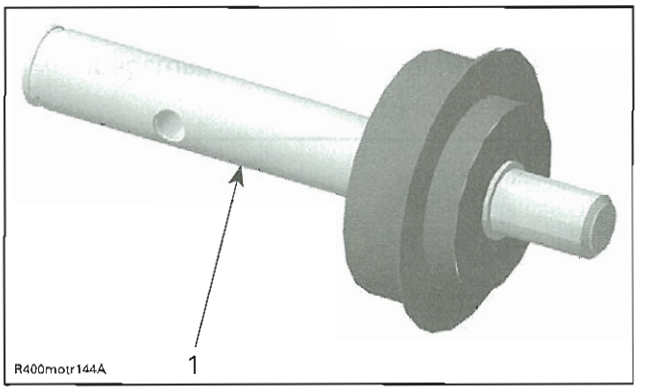
Remove water pump gear, needle pin and thrust washer.



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

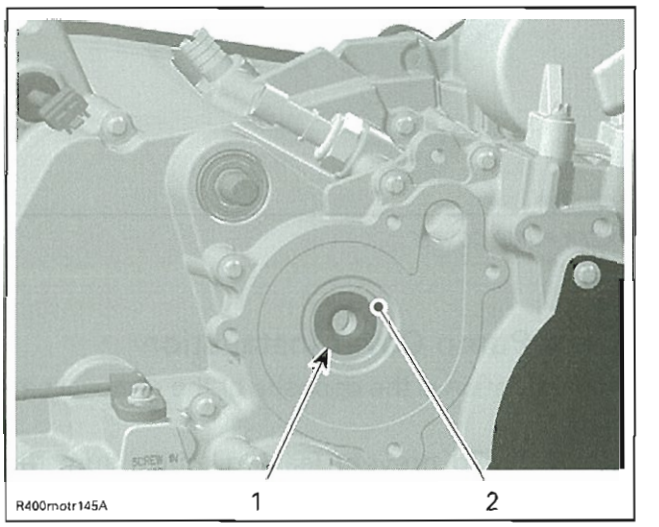
Using a soft hammer, tap on the end of the water pump shaft from inside the magneto cover to push the shaft and rotary seal out of the magneto cover.

CAUTION: Always replace rotary seal and water pump shaft no. 5 together. Also install a new oil seal no. 3 at the same time.



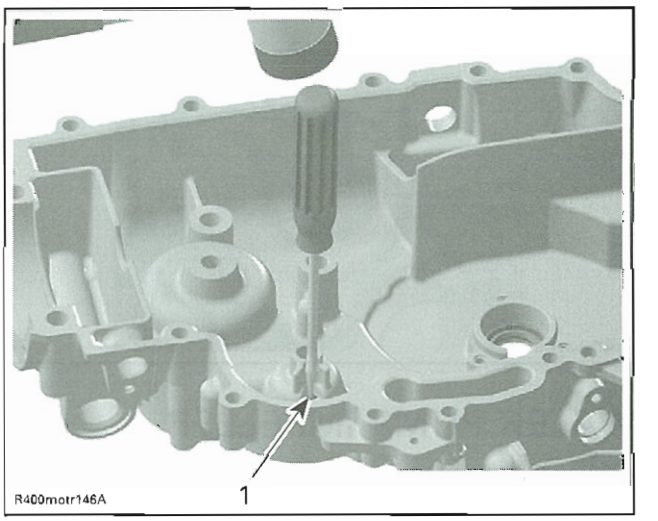
1. *Water pump shaft with rotary seal*

Extract oil seal no. 3 from inside magneto cover using an appropriate pusher.



1. *Oil seal behind the rotary seal*
2. *Rotary seal bore*

CAUTION: Be careful not to damage the surface of the rotary seal bore in magneto cover.



1. *Special area for oil seal removal*

Water Pump Shaft and Gear Inspection

Inspect water pump gear no. 4 for wear, cracks or broken teeth. Also inspect the gear snap (locking) mechanism to the needle pin. Replace if damaged.

Inspect shaft and rotary seal for wear or damages.

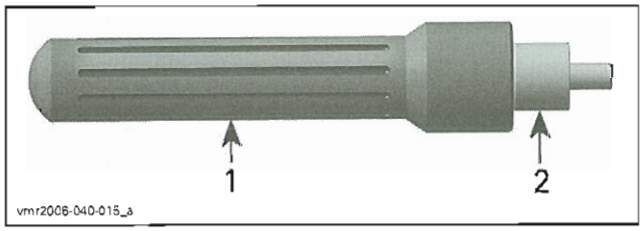
NOTE: Water pump shaft must rotate freely within the rotary seal no. 5. Otherwise, replace the assembly.

Water Pump Shaft and Seal Installation

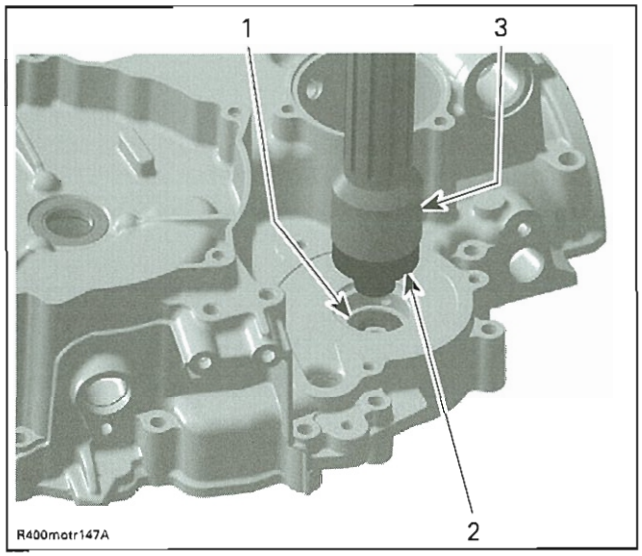
For installation, reverse the removal procedure. However, pay attention to the following.

CAUTION: When replacing water pump shaft, always replace retaining ring (circlip), oil seal, water pump shaft and rotary seal with new parts.

Install the water pump shaft oil seal no. 3 using oil seal pusher (P/N 529 035 757).

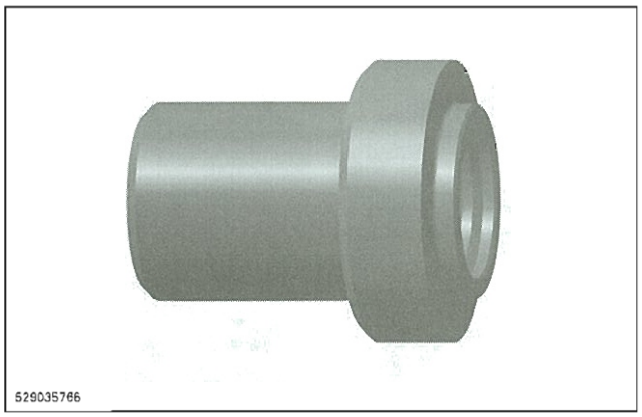


1. *Handle*
2. *Pusher*



1. *Oil seal for water pump shaft*
2. *Oil seal pusher*
3. *Handle for insertion jig*

Use water pump ceramic seal installer (P/N 529 035 766) to install the water pump shaft assembly.

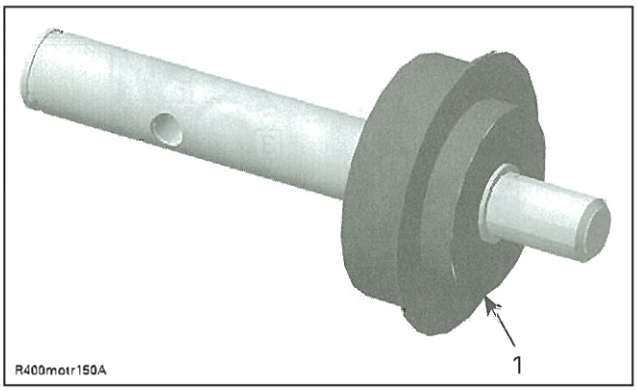


NOTE: Never use oil or grease in the press fit area of the oil seal and rotary seal bores.

Apply Super Lube grease (P/N 293 550 030) to the oil seal no. 3 after it is installed in the magneto cover.

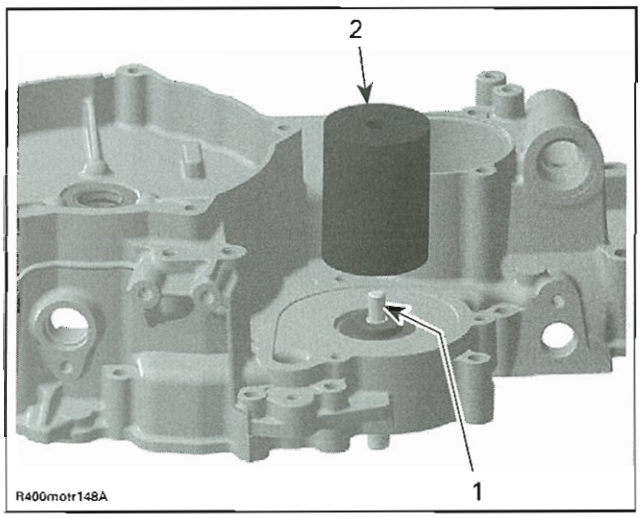
Apply a light coat of engine oil on the water pump shaft no. 5.

Press the water pump shaft assembly into the magneto cover using the outside area of the rotary seal.



1. *Surface used to press water pump shaft assembly in place*

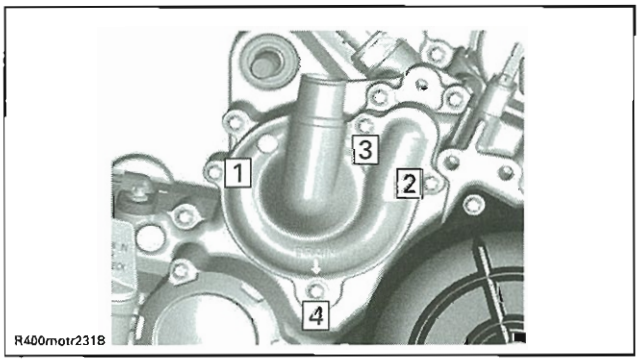
CAUTION: Never use a hammer for rotary seal installation. To avoid damaging the ceramic component, seal must be installed using a press.



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

Always use torque values specified in the exploded view.

Torque water pump cover screws as per sequence specified in following illustration.



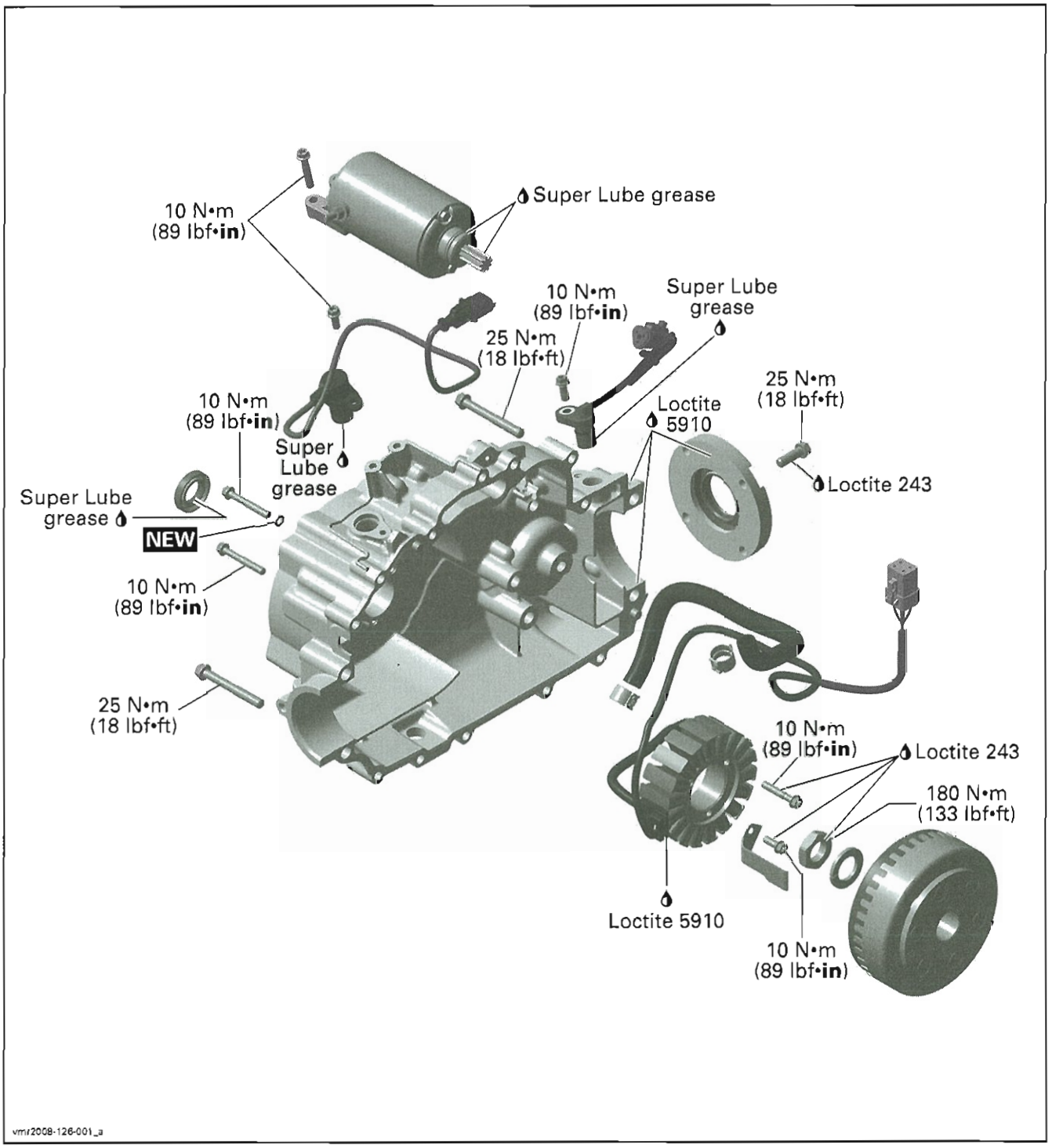
MAGNETO/STARTER

SERVICE TOOLS

Description	Part Number	Page
crankshaft protector	420 876 557	86
handle	420 877 650	82
magneto puller	529 035 748	86
oil seal installer	529 035 759	82
Fluke 111 multimeter	529 035 868	82–84, 87
oil seal protector	529 035 935	80, 82

SERVICE PRODUCTS

Description	Part Number	Page
dielectric grease	293 550 004	89
Super Lube grease	293 550 030	89
Loctite 5910	293 800 081	80
Loctite chisel (gasket remover)	413 708 500	80
pulley flange cleaner	413 711 809	86



GENERAL

The engine removal is necessary to work on magneto components except for the CPS (Crankshaft Position Sensor), vehicle speed sensor and oil seal.

Always perform the electric tests before removing or installing whatever component.

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

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

⚠ WARNING

Torque wrench tightening specifications must strictly be adhered to.
Locking devices (e.g.: locking tabs, elastic stop nuts, self-locking fasteners, cotter pin, etc.) must be installed or replaced with new ones where specified. If the efficiency of a locking device is impaired, it must be renewed.

PROCEDURES

MAGNETO COVER

Magneto Cover Removal

Remove engine from vehicle.

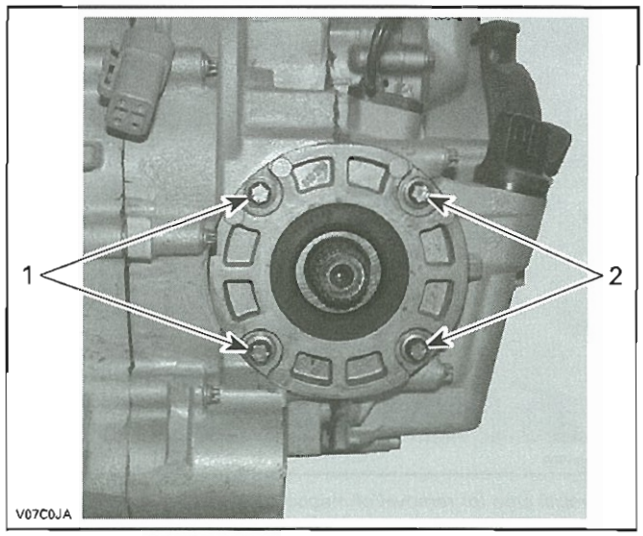
Remove 4WD coupling unit.

Lock crankshaft at TDC (refer to *CRANKCASE/CRANKSHAFT*).

Disconnect magneto, CPS and vehicle speed sensor connectors.

Remove:
- Rewind starter (refer to *REWIND STARTER*)
- Water pump cover (refer to *COOLING SYSTEM*)
- Starter
- Screws holding output shaft bearing flange in place.

NOTE: Remove the screws on magneto cover side and loosen only the screws on the crankcase side if the output shaft is not removed. Remove all screws and bearing flange if output shaft is removed.

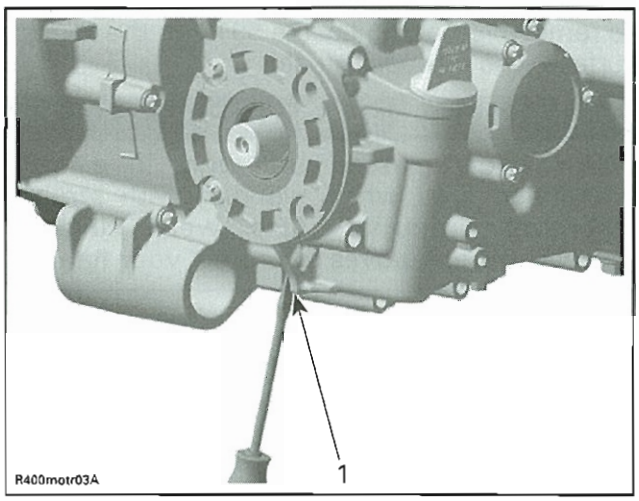


1. Loosen only these screws if output shaft is not removed
2. Remove these screws

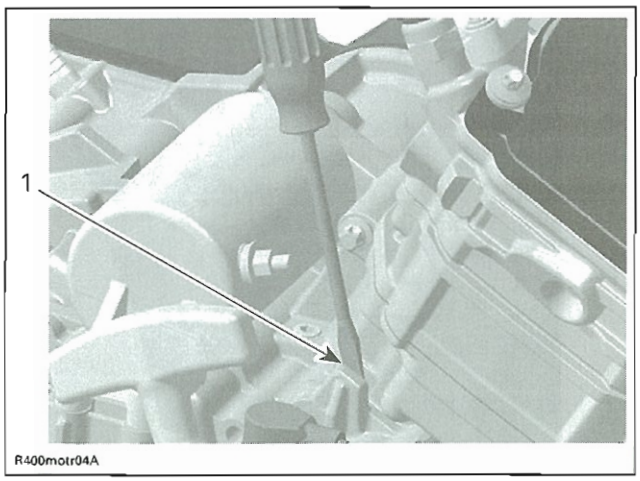
Remove magneto cover screws.

Remove magneto cover.

NOTE: Lift the magneto cover from the provided area using two flat screwdrivers prying equally at the same time.



1. Special area for removal of magneto cover



1. Special area for removal of magneto cover

Magneto Cover Inspection and Cleaning

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

NOTE: Clean all metal component in a non-ferrous metal cleaner. Use Loctite chisel (gasket remover) (P/N 413 708 500), or suitable equivalent. To remove remaining Loctite 5910 on the contact surface, use a copper brush.

⚠ 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.

Magneto Cover Installation

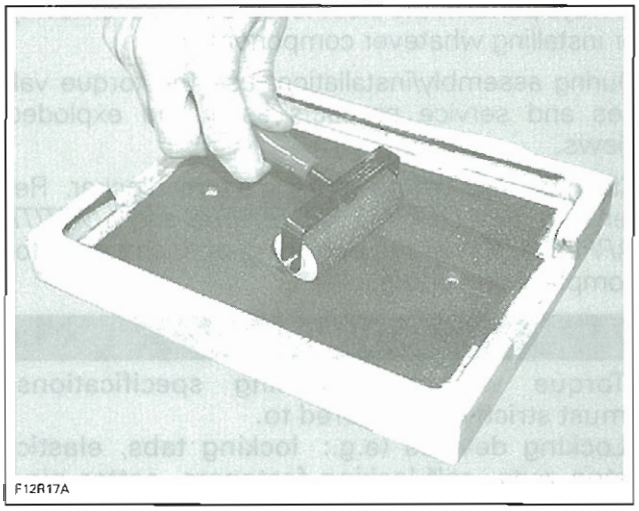
For installation, reverse the removal procedure. However, pay attention to the following.

Use the silicone-based Loctite 5910 (P/N 293 800 081) on mating surfaces.

IMPORTANT: When beginning the application of the 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 plexyglass plate and apply some sealant on it. Use a soft rubber roller (50 - 75 mm (2 - 3 in)) as per supplier (available in arts products suppliers for print making) and roll the sealant to get a thin uniform coat on the plate (spread as necessary). When ready, apply the sealant on magneto mating surfaces.

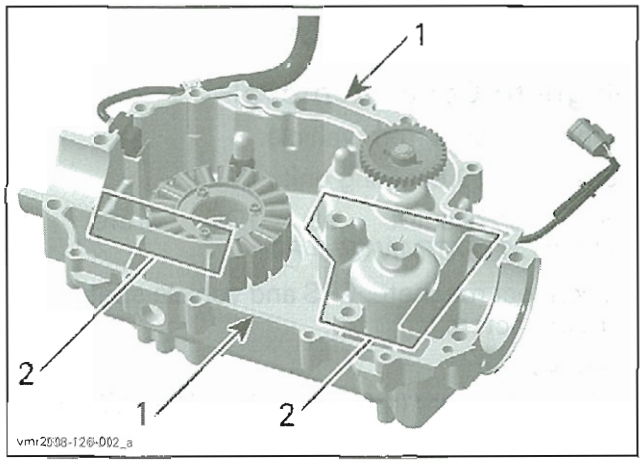
NOTE: It is recommended to apply this specific sealant as described here to get an uniform application without lumps. If you do not use the roller method, you may use your finger to uniformly distribute the sealant (using a finger will not affect the adhesion).



Apply Loctite 5910 all around the magneto cover mating surface except the areas described below.

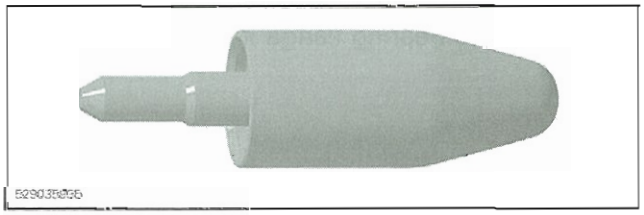
NOTE: Do not apply in excess as it will spread out inside cover.

CAUTION: Apply the product only in the shown areas.

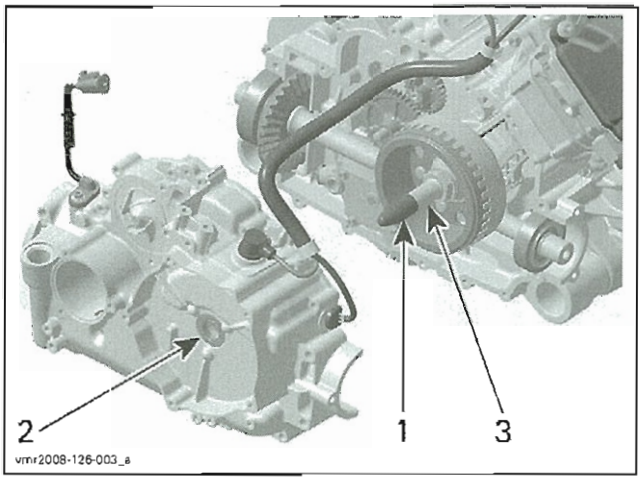


1. Mating surface on the magneto cover
2. No need to apply Loctite 5910

Install the oil seal protector (P/N 529 035 935) on crankshaft end to avoid damaging the oil seal during installation of the magneto cover.



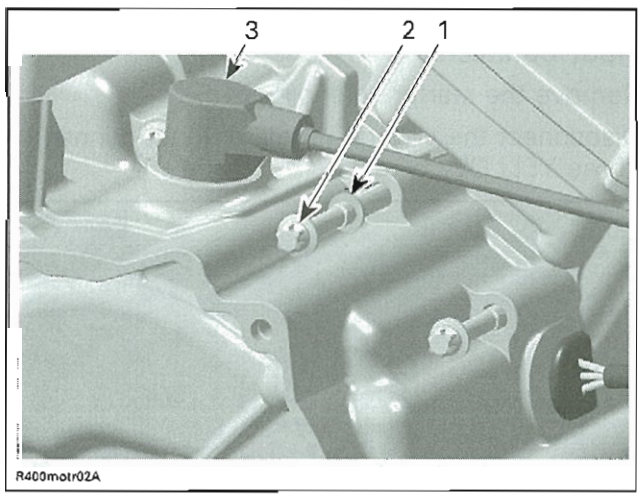
Install the magneto cover.



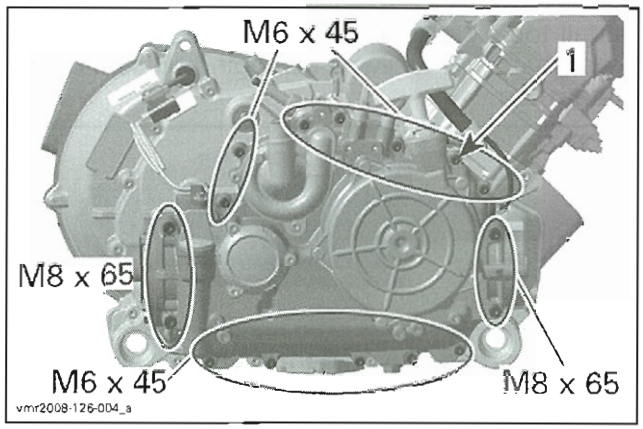
1. *Oil seal protector*
2. *Oil seal on magneto cover*
3. *Crankshaft MAG side*

Refer to the following illustration for proper installation of screws.

CAUTION: Never use the gasket ring a second time. Always install a new one.

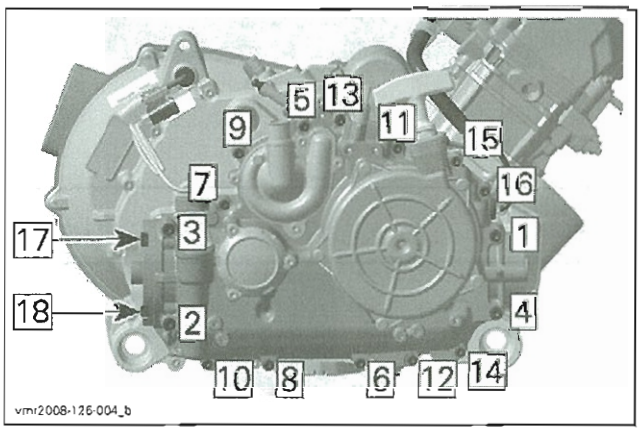


1. *Gasket ring*
2. *Screw M6*
3. *CPS (Crankshaft Position Sensor)*



1. *Gasket ring*

Tightening sequence for screws on magneto cover is as per following illustration.



Let the sealant dry before starting engine. Refer to the manufacturer's label for the sealant curing time.

OIL SEAL

Remove rewind starter (refer to *REWIND STARTER*) to access oil seal.

Oil Seal Inspection

Check the oil seal on the magneto cover. If brittle, hard or damaged, replace it.

Oil Seal Removal

NOTE: The oil seal can be removed with the magneto cover in place.

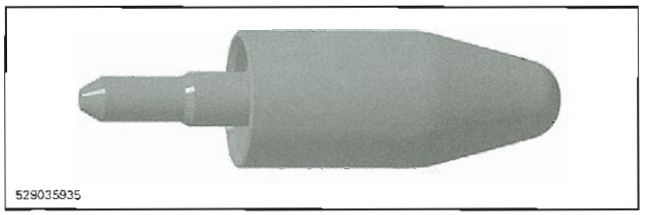
Pry out oil seal with a small screwdriver.

CAUTION: Be careful not to damage the oil seal bore of the magneto cover and/or the crankshaft when using a screwdriver.

Oil Seal Installation

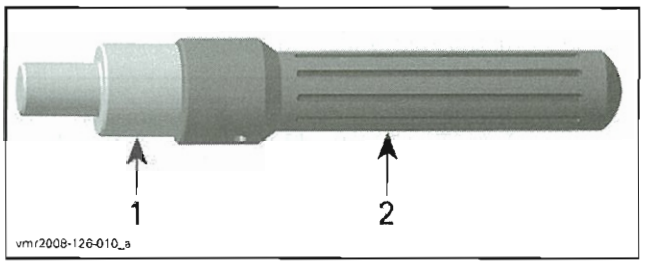
NOTE: Never use oil in the press fit area of oil seal.

Install the oil seal protector (P/N 529 035 935) on crankshaft end to avoid damaging oil seal during installation.

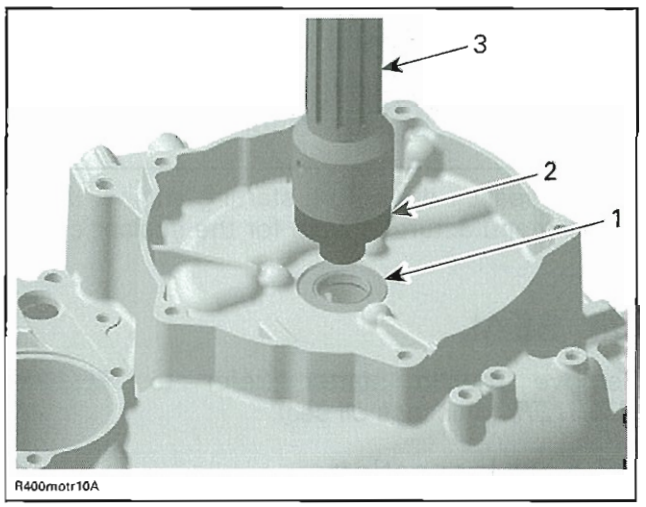


With Magneto Cover Removed

Using the oil seal installer (P/N 529 035 759) and the handle (P/N 420 877 650), install the oil seal in its location.



1. *Oil seal installer*
2. *Handle*



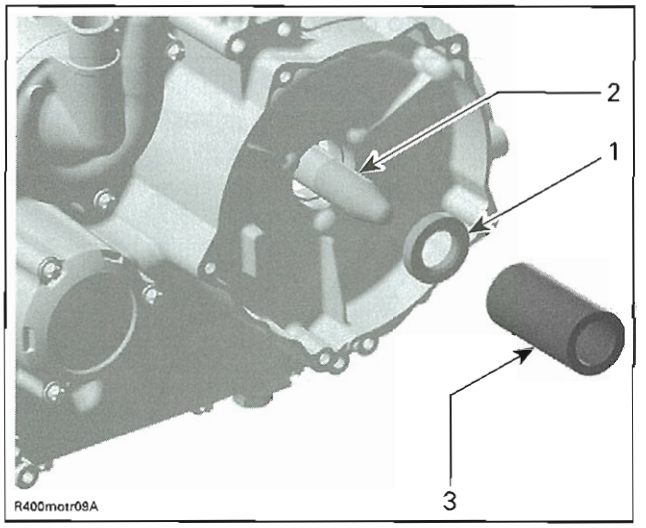
1. *Oil seal*
2. *Oil seal installer (P/N 529 035 759)*
3. *Handle (P/N 420 877 650)*

Reinstall other removed parts in the reverse order.

Install magneto cover, refer to *MAGNETO COVER* above.

Without Magneto Cover Removed

Using a suitable tube, with the proper diameter, install the oil seal as per following illustration.



1. *Oil seal*
2. *Oil seal protector*
3. *Tube*

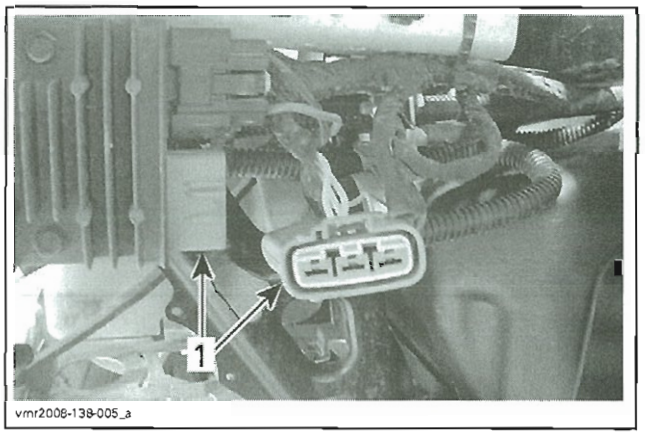
STATOR

Stator Continuity Test

Test at Voltage Regulator/Rectifier Input Connector

Remove the starter solenoid cover.

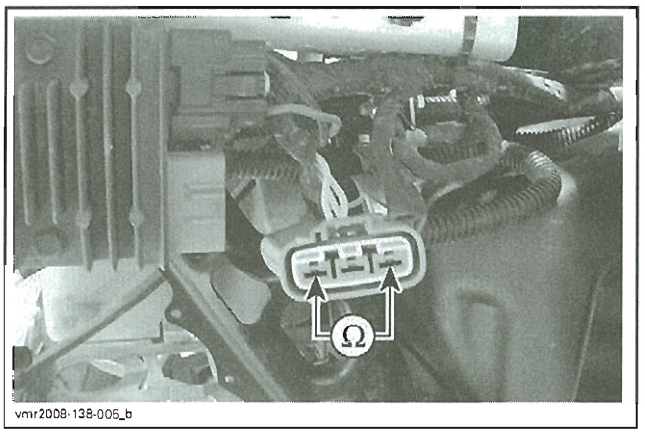
Disconnect the voltage regulator input connector (three YELLOW wires).



1. *Disconnect the voltage regulator input connector (three YELLOW wires)*

Set Fluke 111 multimeter (P/N 529 035 868) to Ω.

Connect multimeter between each pair of YELLOW wires.



STATOR CONTINUITY TEST

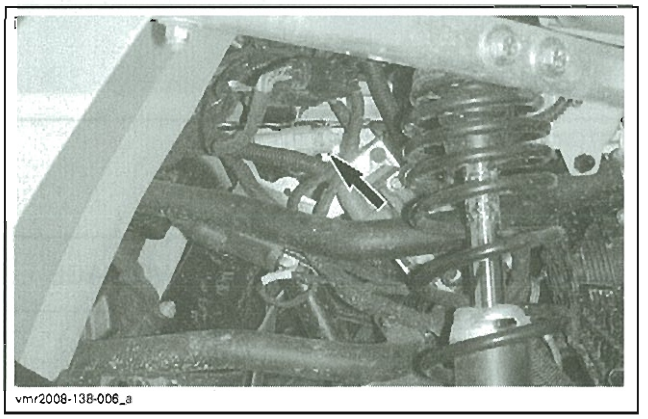
Read resistance as per following table.

YELLOW WIRES (EACH PAIR)	RESISTANCE @ 20°C (69°F)
1 and 2	0.1 - 1 Ω
1 and 3	
2 and 3	

If any reading is out of specification, repeat test at stator connector.

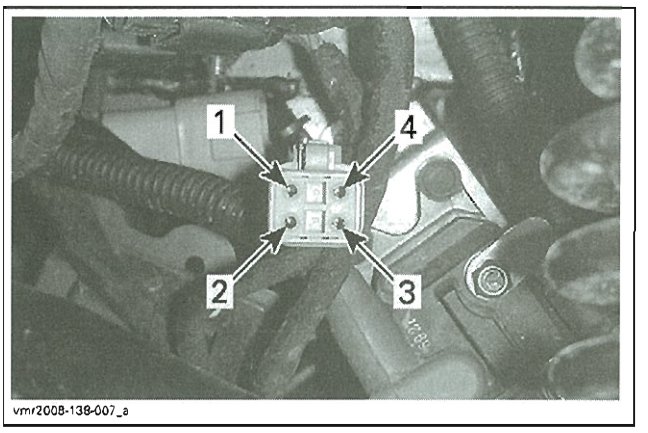
Test at Stator Connector

To access the stator connector, remove the RH inner fender panel, refer to *BODY* section.



STATOR CONNECTOR, INNER FENDER PANEL REMOVED

Disconnect the stator connector and repeat stator continuity test. Resistance readings should be as per previous table.



STATOR CONNECTOR PIN-OUT

NOTE: Pin 2 is not used.

If resistance readings are as specified, repair or replace connector or wiring between the front stator connector and the voltage regulator input connector.

If resistance readings are not as specified, the stator or the wiring is shorted to ground and requires to be repaired or replaced.

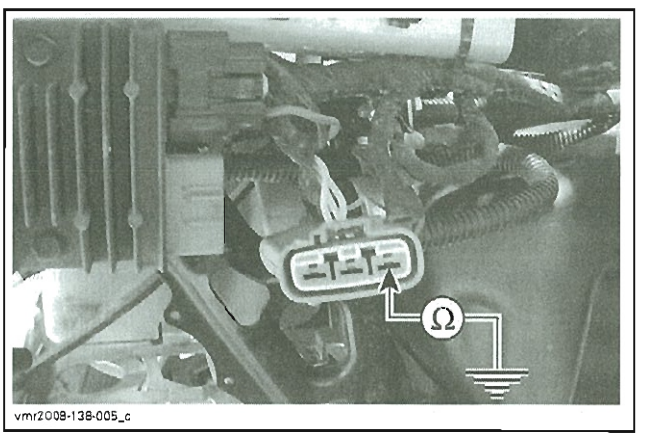
Stator Insulation Test

Test at Voltage Regulator/Rectifier Input Connector

To access connector, refer to *STATOR CONTINUITY TEST*.

Set Fluke 111 multimeter (P/N 529 035 868) to Ω.

Connect multimeter between any YELLOW wire and engine ground.



STATOR INSULATION TEST

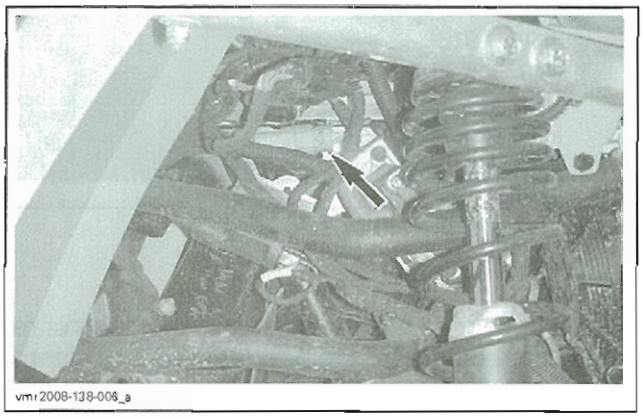
Read resistance.

TEST PROBES	RESISTANCE @ 20°C (69°F)
Any YELLOW wire and engine ground	Infinity (open circuit)

If there is a resistance or continuity, repeat test at stator connector.

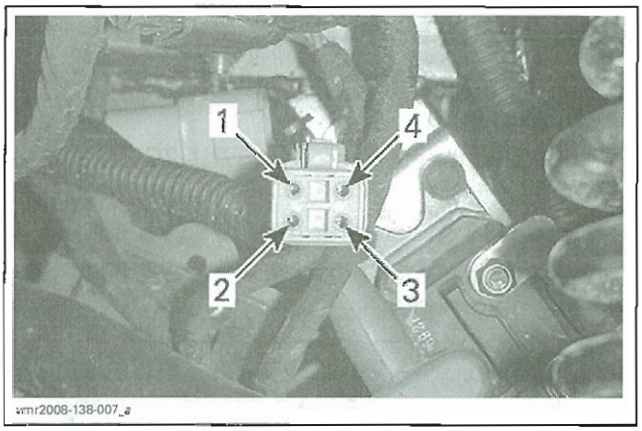
Test at Stator Connector

To access the stator connector, remove the RH inner fender panel, refer to *BODY* section.



STATOR CONNECTOR, INNER FENDER PANEL REMOVED

Disconnect the stator connector and repeat stator insulation test as per previous table.



STATOR CONNECTOR PIN-OUT

NOTE: Pin 2 is not used.

If resistance readings are as specified, repair or replace connector or wiring between the front stator connector and the voltage regulator input connector.

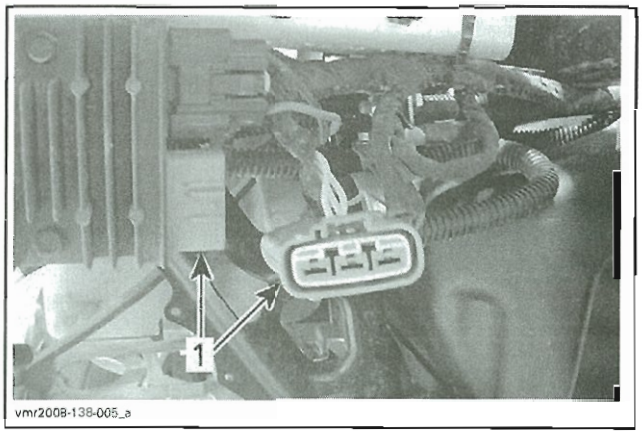
If resistance readings are not as specified, the stator or the wiring is shorted to ground and needs to be repaired or replaced.

Reinstall removed connectors and panels.

Stator Output Voltage Test

Test at Voltage Regulator/Rectifier Input Connector

Disconnect the voltage regulator input connector.

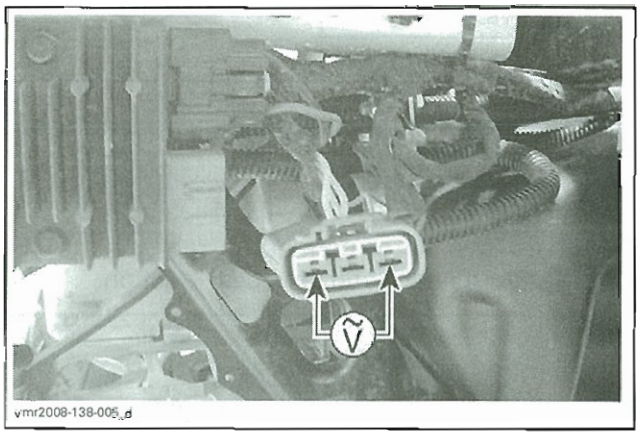


1. Disconnect the voltage regulator input connector

Set Fluke 111 multimeter (P/N 529 035 868) to Vac scale.

Start engine.

Connect multimeter between each pair of YELLOW wires.



STATOR OUTPUT VOLTAGE TEST

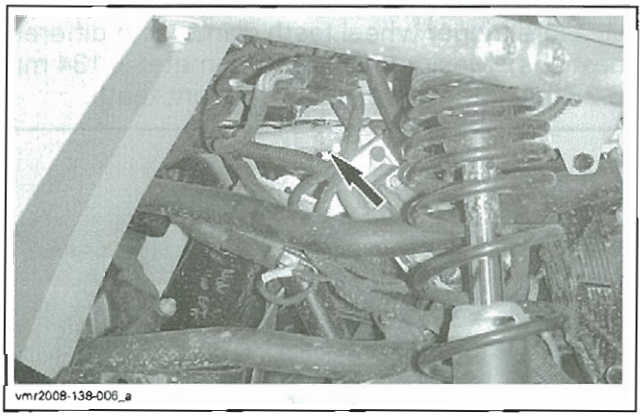
Read voltage.

TEST ENGINE SPEED	TERMINAL	VOLTAGE
4000 RPM	1 and 2	50 Vac minimum
	1 and 3	
	2 and 3	

If voltage is lower than specification, repeat test at front stator connector.

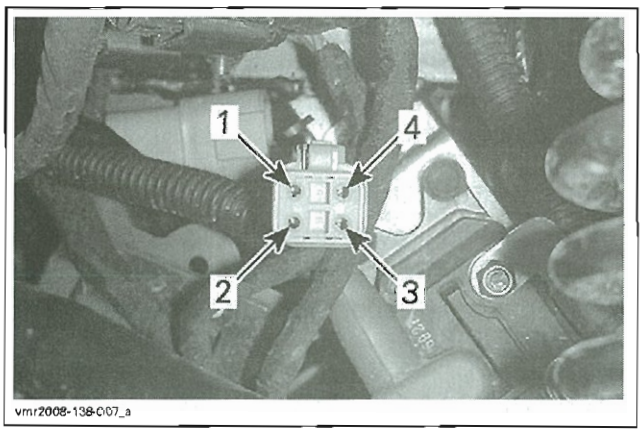
Test at Stator Connector

To access the stator connector, remove the RH inner fender panel, refer to *BODY* section.



STATOR CONNECTOR, RH INNER FENDER PANEL REMOVED

Disconnect the stator connector and repeat stator output voltage test as per previous table.



STATOR CONNECTOR PIN-OUT

NOTE: Pin 2 is not used.

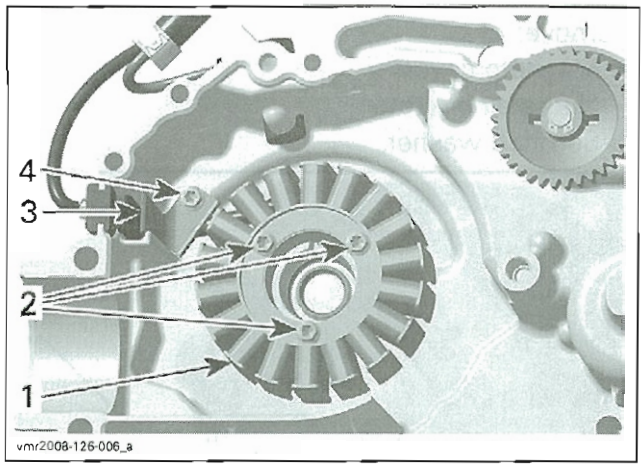
If voltage readings are as specified, repair or replace connector or wiring between front stator connector and the voltage regulator input connector.

If voltage readings are not as specified, repair or replace wiring, connector or stator.

Install removed connectors and panels.

Stator Removal

Remove:
- Magneto cover
- Stator screws
- Holding strip screw
- Stator.



1. *Stator*
2. *Stator screws*
3. *Holding strip*
4. *Holding strip screw*

Stator Inspection

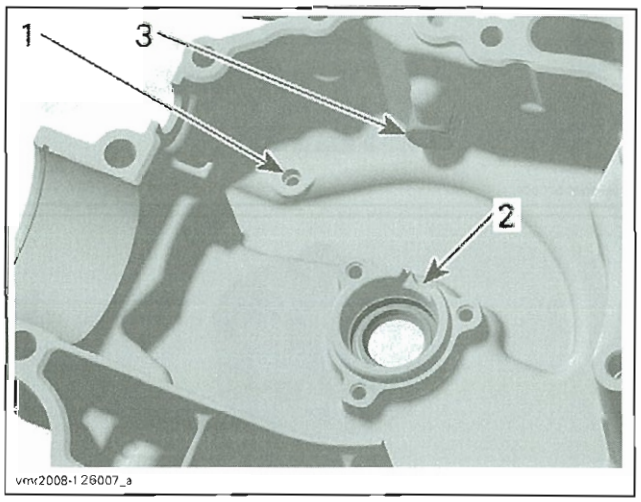
Check stator condition. If damaged replace it.

Stator Installation

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

CAUTION: When installing the stator take care that the cable is in place (guide for the wire).

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



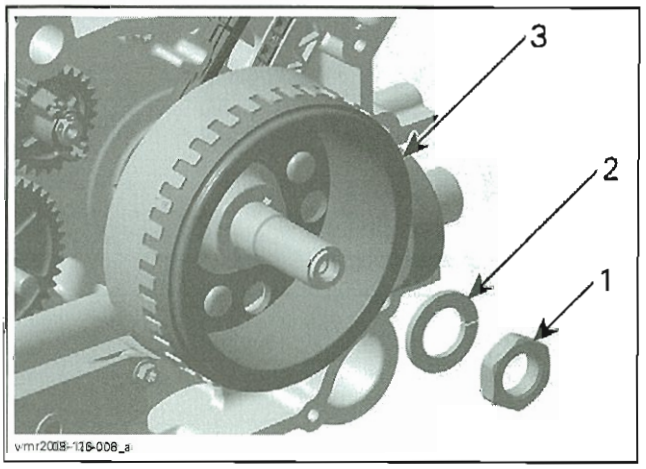
1. *Thread for cable holding strip*
2. *Notch for stator*
3. *Crank position sensor*

ROTOR

Rotor Removal

Lock crankshaft. Refer to *CRANKCASE/CRANKSHAFT*.

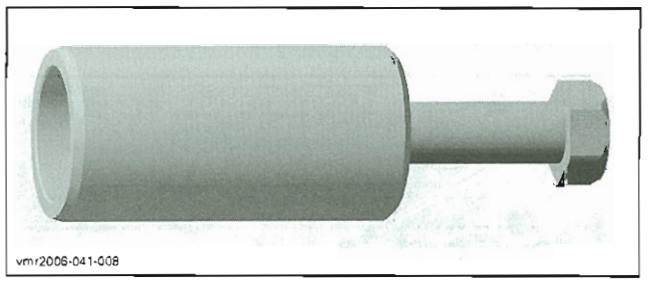
Remove:
- Magneto cover
- Nut retaining rotor
- Serrated washer.

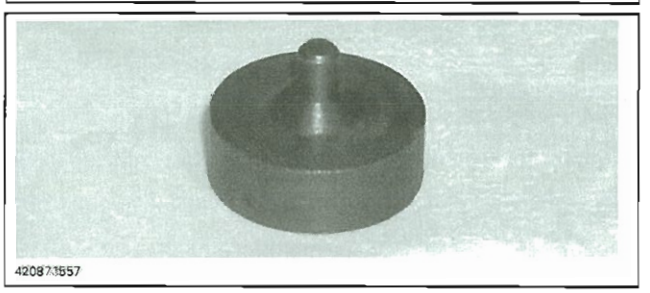


1. Nut
2. Serrated washer
3. Rotor

Install the magneto puller (P/N 529 035 748) and the crankshaft protector (P/N 420 876 557) then remove rotor.

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





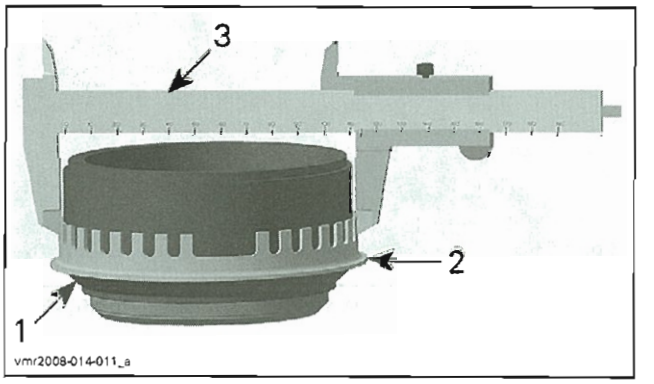
Rotor Inspection

Check inner side of rotor for scratches or other damage.

Check keyway of the rotor for wear or damages.

Check if trigger wheel teeth are bent or otherwise damaged.

Measure trigger wheel teeth diameter at different locations. Maximum allowed diameter is 134 mm (5.28 in). Otherwise, check for bent teeth.



1. Rotor
2. Trigger wheel
3. Maximum 134 mm (5.28 in)

Check woodruff key and keyway on the crankshaft and the serrated washer for wear or damages. Replace as necessary.

Rotor Installation

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

Clean crankshaft taper with pulley flange cleaner (P/N 413 711 809).

CRANKSHAFT POSITION SENSOR (CPS)

CPS Inspection

Check the CPS condition and replace it if necessary.

To test the CPS refer to *ELECTRONIC FUEL INJECTION*.

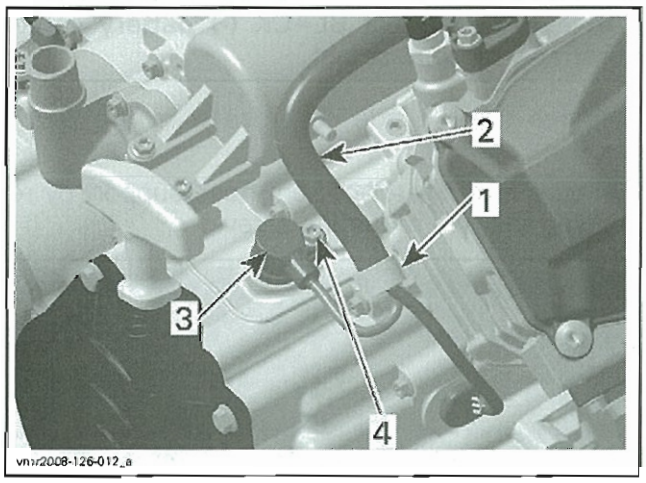
CPS Removal

Remove side panels. Refer to *BODY*.

Unplug CPS connector.

Remove conduit clips and corrugated tube from sensor and stator cables.

Unscrew the CPS screw and pull CPS to remove it.



1. *Conduit clip*
2. *Corrugated tube*
3. *Crankshaft position sensor*
4. *Screw*

CPS Installation

For installation, reverse the removal procedure.

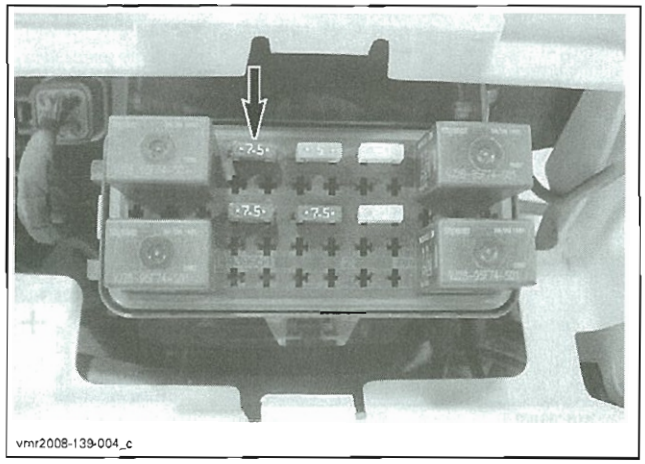
STARTER

Starter Voltage Test

Remove front storage cover.

Remove fuse box cover.

Remove fuse F3 to prevent engine from starting.

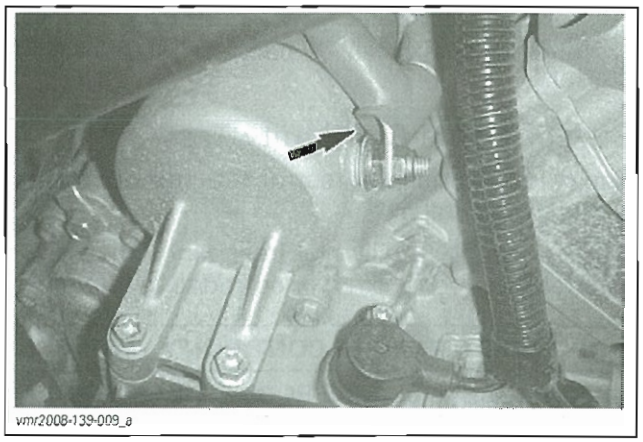


FUSE F3

NOTE: Check engine will be displayed in multi-function gauge, starter will crank engine but with an initial delay of approximately 4 seconds.

Remove RH side panel, refer to *BODY* section.

Pull back red rubber boot from starter terminal.



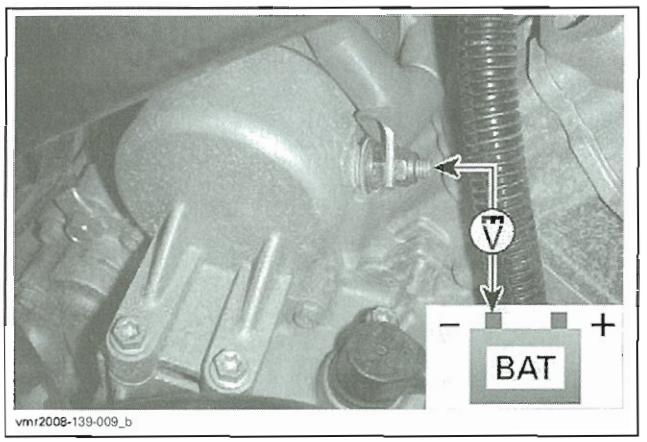
PULL BACK RED RUBBER BOOT

Set Fluke 111 multimeter (P/N 529 035 868) to Vdc.

Press the start button and measure for battery voltage between the starter terminal and chassis ground as the starter is cranking.

NOTE: Battery voltage will drop and fluctuate with starter cranking load.

STARTER VOLTAGE TEST		
RED PROBE	BLACK PROBE	MEASUREMENT
Starter terminal	Chassis ground	Battery voltage (fluctuating)



STARTER VOLTAGE TEST

If you do not obtain close to battery voltage at the starter terminal, carry out a continuity test of the wire between the starter and the solenoid.

If you obtained close to battery voltage at the starter terminal and the starter does not rotate, try a pull start to see if the engine is mechanically locked.

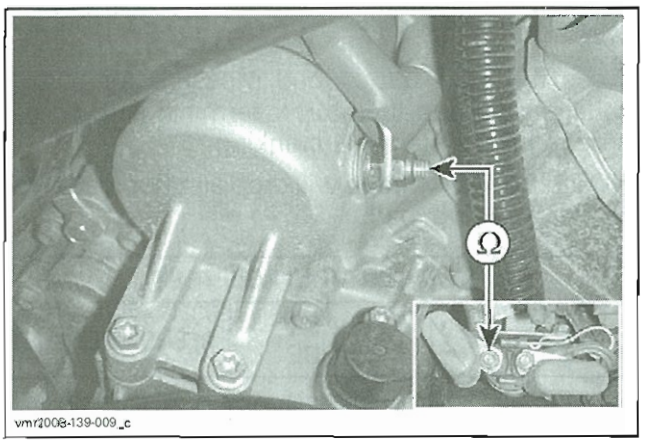
If engine rotates freely on a pull start, replace the starter.

Starter Cable Continuity Test

Carry out a continuity test of the starter cable as per following table.

NOTE: An abnormally high resistance may be attributable to loose, dirty, or corroded connections.

STARTER CABLE CONTINUITY TEST		
RED PROBE	BLACK PROBE	MEASUREMENT
Starter terminal	Solenoid starter terminal	Close to 0 Ω (continuity)



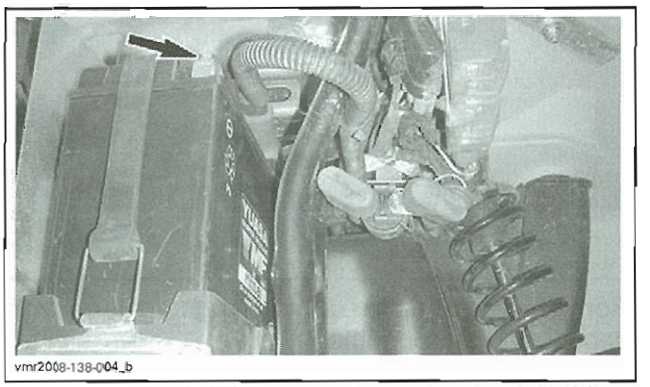
STARTER CABLE CONTINUITY TEST

Clean, repair, or replace wiring and connections between starter and solenoid as required.

Starter Removal

Make sure the ignition switch is in the OFF position.

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

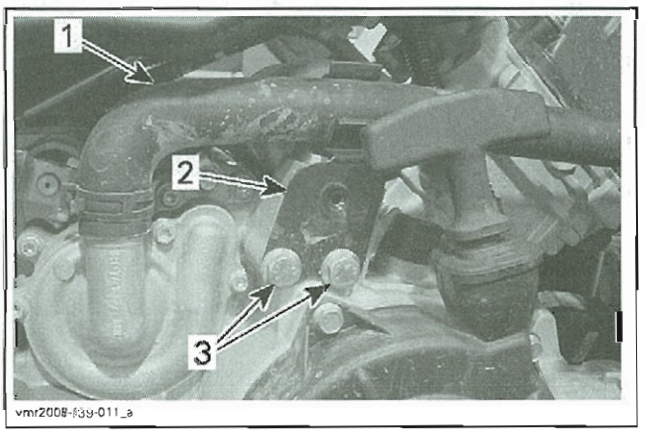


⚠ WARNING

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

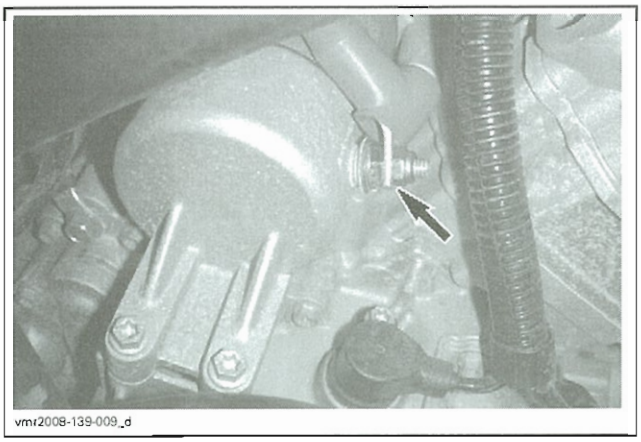
Remove the RH side cover, refer to the *BODY* section.

Remove the radiator coolant hose support by removing the two mounting screws.



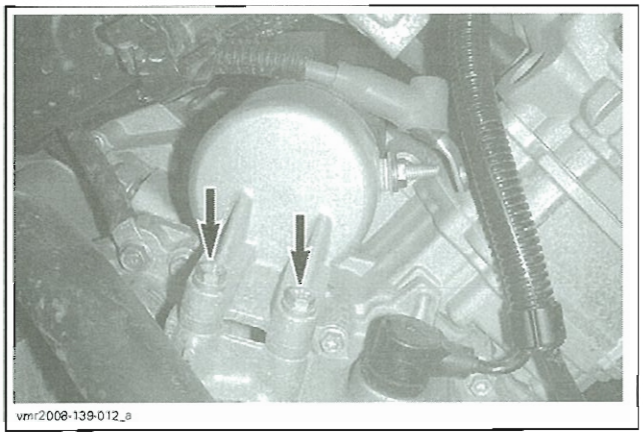
1. *Radiator coolant hose*
2. *Hose support*
3. *Remove support screws*

Disconnect the RED (+) power cable from starter.



Clean starter area.

Remove the starter mounting screws.

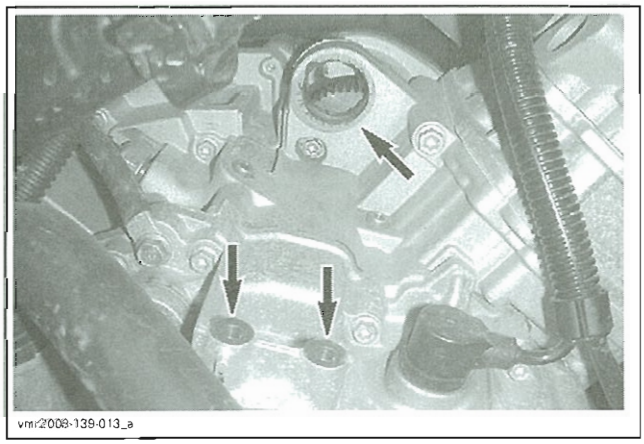


Pull starter out from gear box.

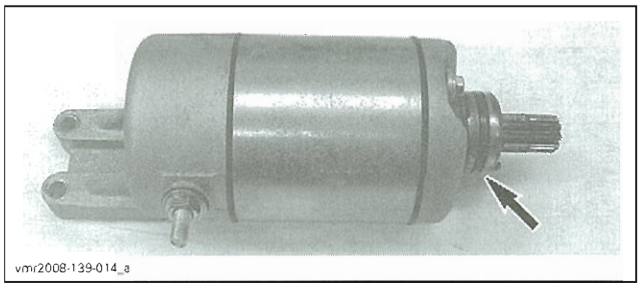
Starter Installation

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

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



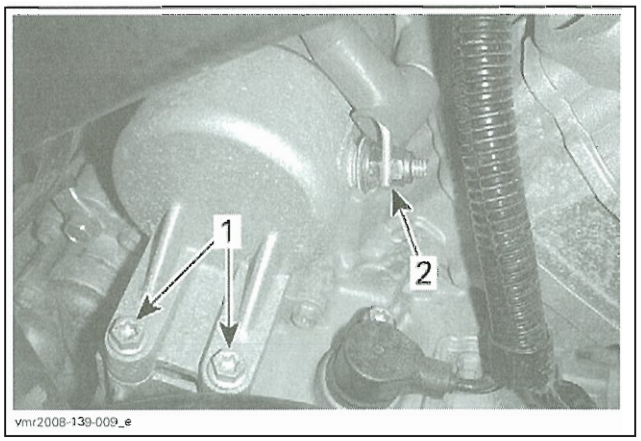
Apply Super Lube grease (P/N 293 550 030) to the starter O-ring seal.



Torque starter screws to 10 N•m (89 lbf•**in**).

Connect the RED (+) cable to the starter and torque nut to 6 N•m (53 lbf•**in**).

Apply dielectric grease (P/N 293 550 004) on starter terminal and nut.



1. *Torque starter mounting screws*
2. *Apply dielectric grease*

Connect the BLACK (-) battery cable.

⚠ WARNING

Always connect the RED (+) starter cable first, then the BLACK (-) battery cable last. Whenever connecting the RED (+) cable to the starter motor, always make sure the BLACK (-) battery cable is disconnected to prevent electric shock.

Test starter operation.

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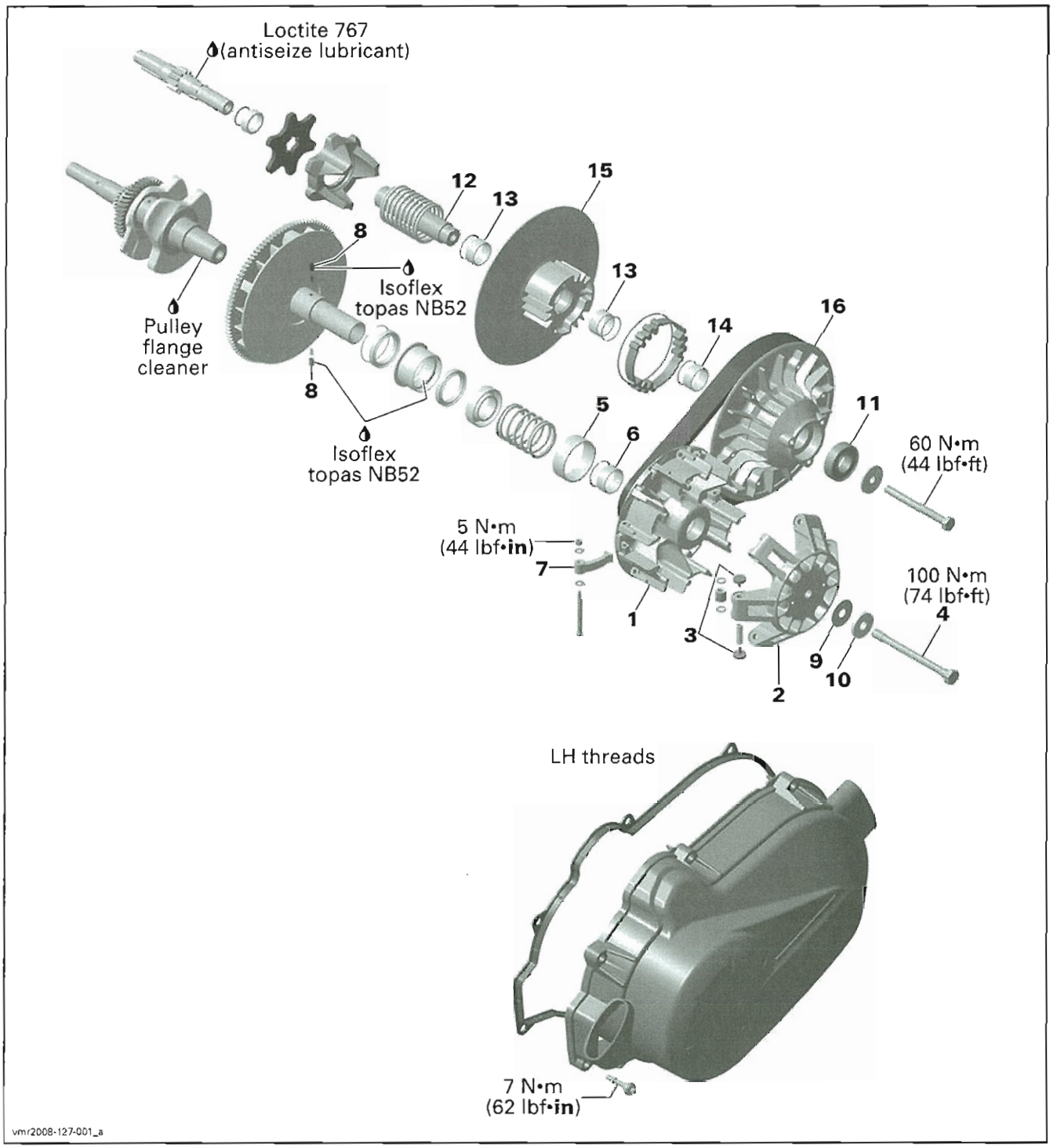
CONTINUOUSLY VARIABLE TRANSMISSION (CVT)

SERVICE TOOLS

Description	Part Number	Page
pulley holding tool	529 006 400	95, 104
drive pulley puller	529 035 746	96
driven pulley expander	529 035 747	94
pulley holding tool	529 035 771	104

SERVICE PRODUCTS

Description	Part Number	Page
Isoflex grease Topas NB 52	293 550 021	102
Loctite 5910	293 800 081	95
pulley flange cleaner	413 711 809	106



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 from vehicle.

This CVT is lubrication free. Never lubricate any components except drive pulley one-way clutch.

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

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

⚠ WARNING

Torque wrench tightening specifications must strictly be adhered to.
Locking devices (e.g.: locking tabs, elastic stop nuts, self-locking fasteners, cotter pin, etc.) must be installed or replaced with new ones where specified. If the efficiency of a locking device is impaired, it must be renewed.

⚠ 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.

CAUTION: Never use any type of impact wrench at drive pulley removal and installation.

⚠ WARNING

The clutch assembly is a precisely balanced unit. Never replace parts with used parts from another clutch assembly.

CAUTION: These pulleys have metric threads. Do not use imperial thread puller. Always tighten puller by hand to ensure that the drive pulley has the same type of threads (metric vs imperial) before tightening completely.

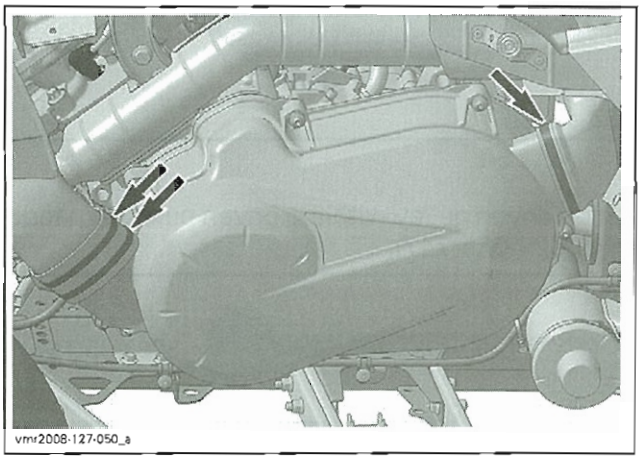
PROCEDURES

DRIVE BELT

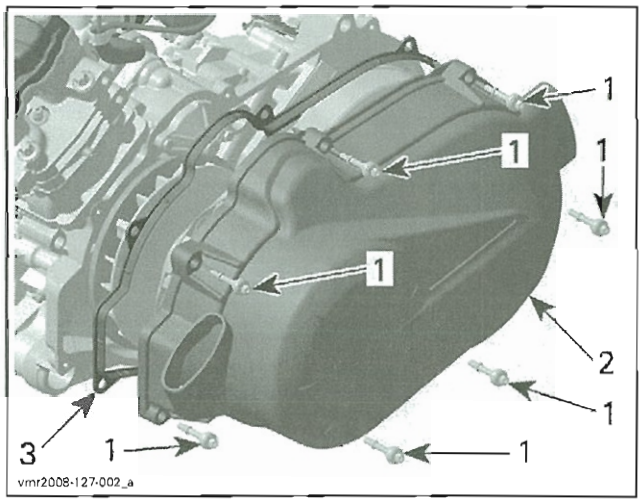
Drive Belt Removal

Remove:
- LH engine side panel
- LH footwell.

Unscrew clamps retaining CVT cover hoses.

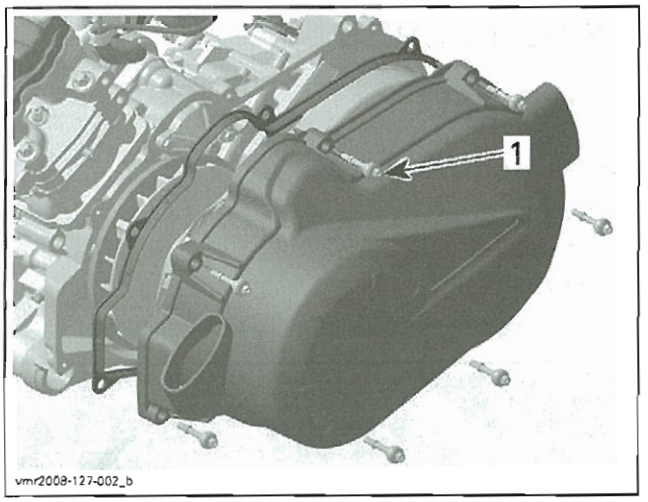


Remove retaining screws, CVT cover and its gasket.



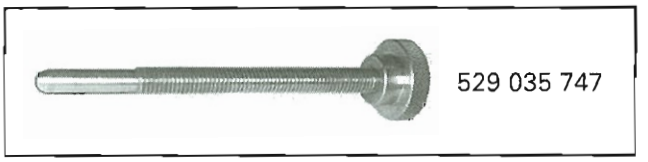
1. *Retaining screws*
2. *CVT cover*
3. *Gasket*

NOTE: Remove the center top screw last. This screw supports the cover during removal.

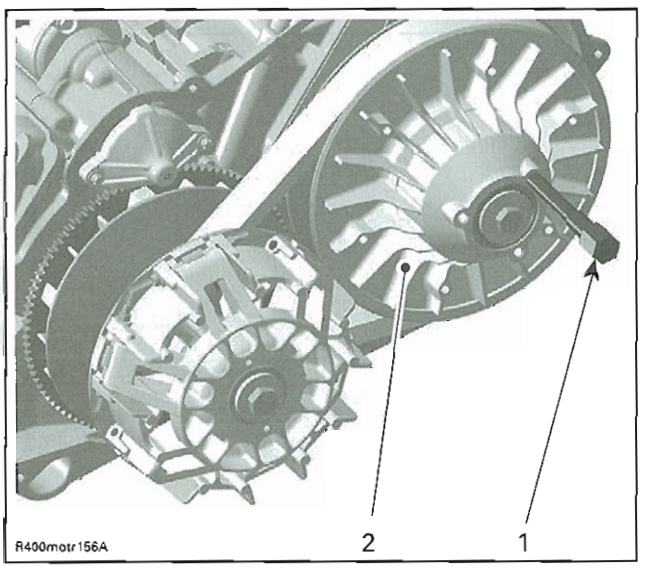


1. *Remove last*

Open driven pulley with the driven pulley expander (P/N 529 035 747).

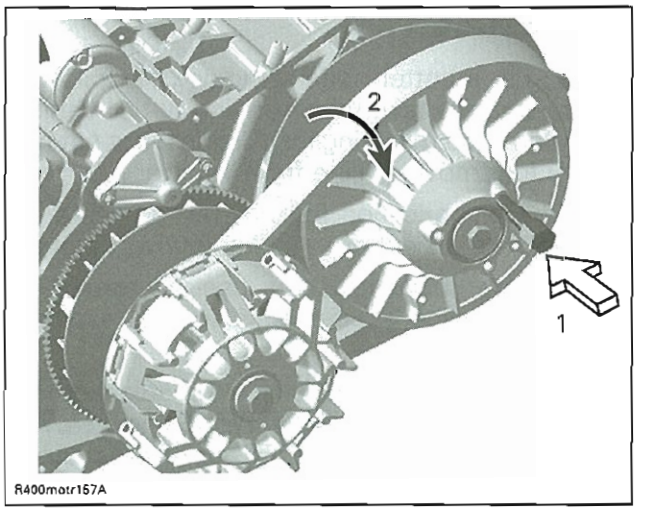


Screw tool in the threaded hole of driven pulley and tighten to open the pulley.



1. *Driven pulley expander*
2. *Fixed sheave of driven pulley*

To remove belt, slip the belt over the top edge of sliding sheave, as shown.



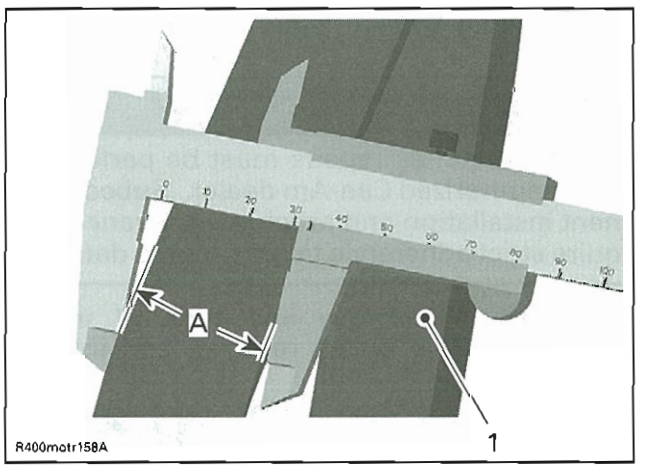
1. *Screw in of driven pulley expander*
2. *Removal direction for belt*

Drive Belt Inspection

Inspect belt for cracks, fraying or abnormal wear. Replace if necessary.

Check drive belt width at cord level. Replace if it is out of specification.

DRIVE BELT WIDTH	
SERVICE LIMIT	30.00 mm (1.181 in)

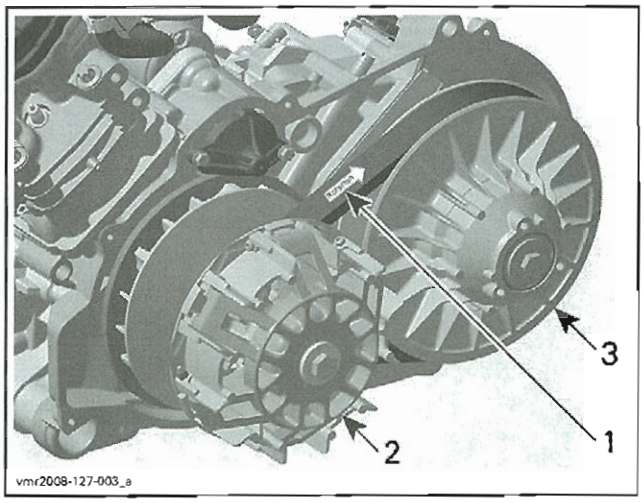


1. *Drive belt*
A. *Belt width*

Drive Belt Installation

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

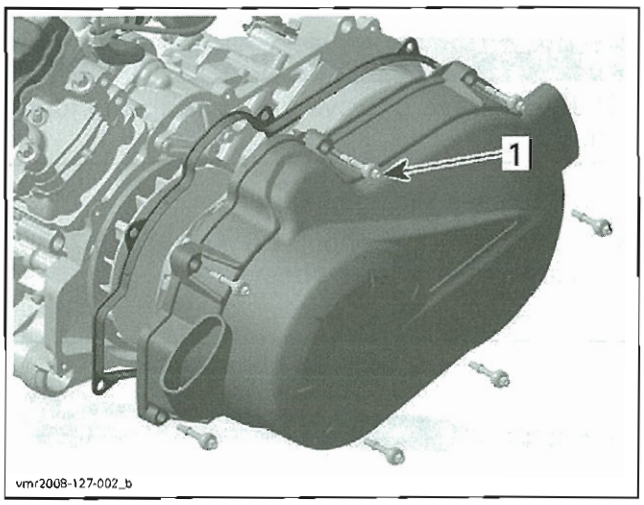
The maximum drive belt life span is obtained when the drive belt has the proper rotation direction. Install it so that the arrow printed on belt is pointing towards the back of the vehicle.



1. *Arrow towards the back of the vehicle*
2. *Drive pulley (front)*
3. *Driven pulley (rear)*

NOTE: To ease installation of CVT cover with gasket, put in a few locations, a small amount of Loctite 5910 (P/N 293 800 081) in the groove of CVT cover. Place the gasket in the groove and remove excessive Loctite. Install cover with gasket immediately.

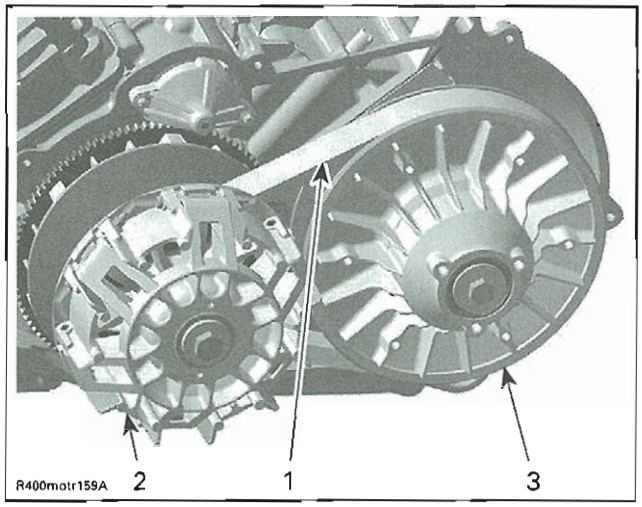
Install the center top screw of cover in first.



1. *Install first*

Install the other screws then torque them in a crisscross sequence.

DRIVE PULLEY



1. *Belt*
2. *Drive pulley*
3. *Driven pulley*

Drive Pulley Removal

Remove drive belt.

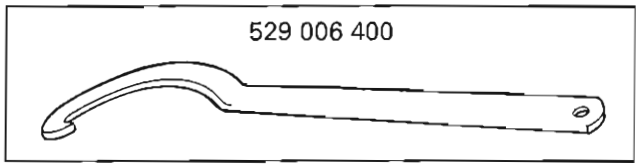
To block drive pulley, two methods can be used.

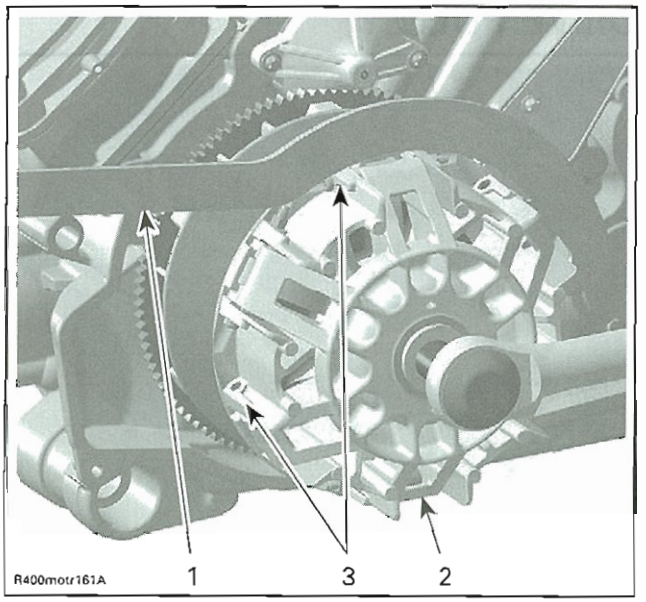
First Method

Lock crankshaft. Refer to *CRANKCASE/CRANKSHAFT* section.

Second Method

Block drive pulley with the pulley holding tool (P/N 529 006 400).

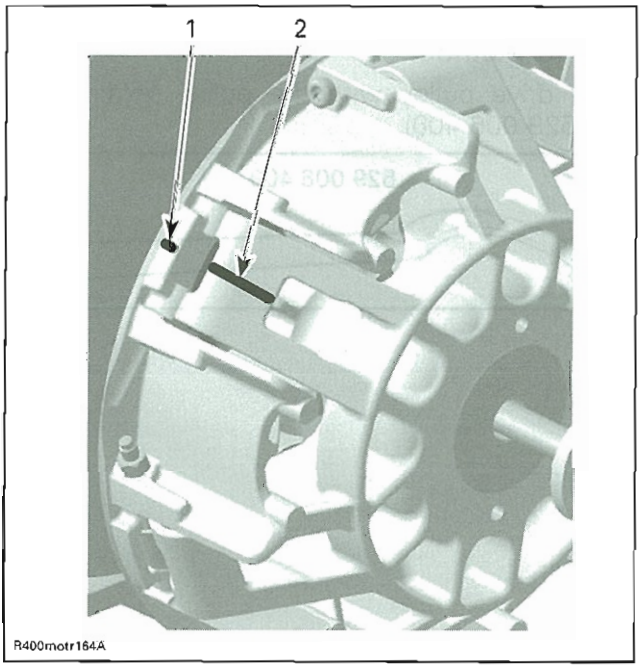




1. *Pulley holding tool*
2. *Drive pulley sliding sheave*
3. *Area to place holding tool hook*

Removal Procedure Continuation when Drive Pulley is Blocked

Prior to removing the drive pulley, mark sliding sheave and governor cup together to ensure correct reinstallation. There are 4 levers mounted out of 6 possible positions.

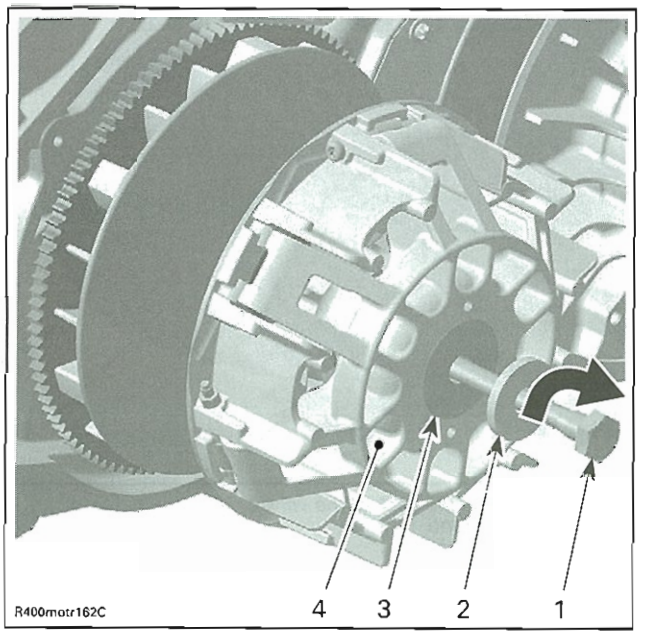


1. *Mark on drive pulley sliding sheave*
2. *Mark on governor cup*

Unscrew drive pulley screw clockwise.

CAUTION: Drive pulley screw has LH threads.

Remove screw, spring washer and thrust washer.



1. *Unscrew drive pulley screw*
2. *Spring washer*
3. *Thrust washer*
4. *Drive pulley sliding sheave*

Push the sliding sheave no. 1 of the drive pulley to release spring pressure then remove the screw completely.

⚠ WARNING

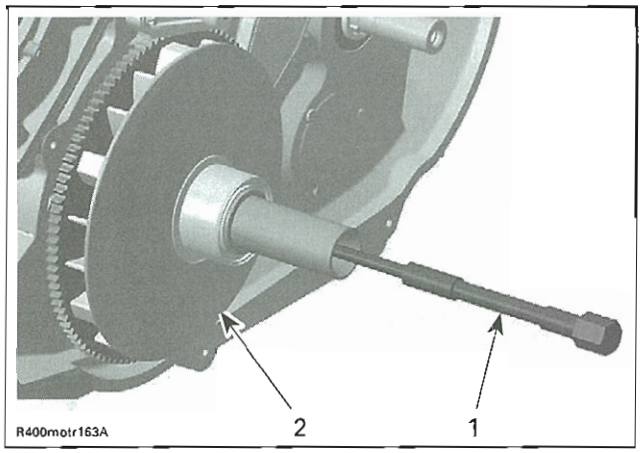
Sliding sheave of drive pulley is spring loaded.

Slowly release sliding sheave.

Screw the drive pulley puller (P/N 529 035 746) in fixed sheave to release sheave.

Withdraw fixed sheave.

529 035 746



1. *Drive pulley puller*
2. *Fixed sheave*

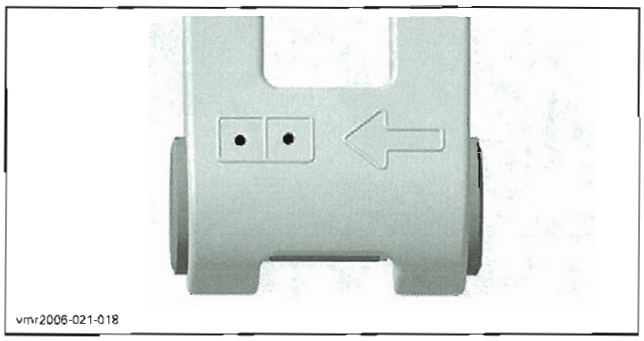
Drive Pulley Disassembly

Governor Cup

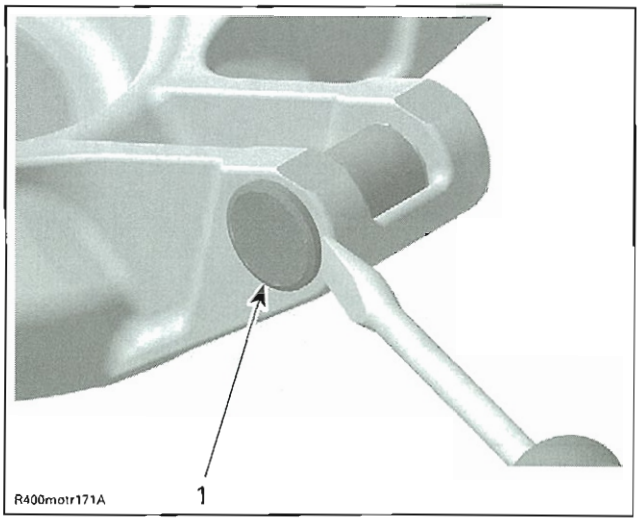
Carefully lift governor cup no. 2 until slider shoes no. 3 come at their highest position into guides.

NOTE: The following procedure is not necessary except if roller must be removed. Refer to *INSPECTION* before proceeding.

NOTE: Whenever removing a governor cup that has the 2 boxes marked (punch marks), replace it with a new one.



Remove slider shoes out of each bearing sleeve. Use a flat screwdriver if necessary.



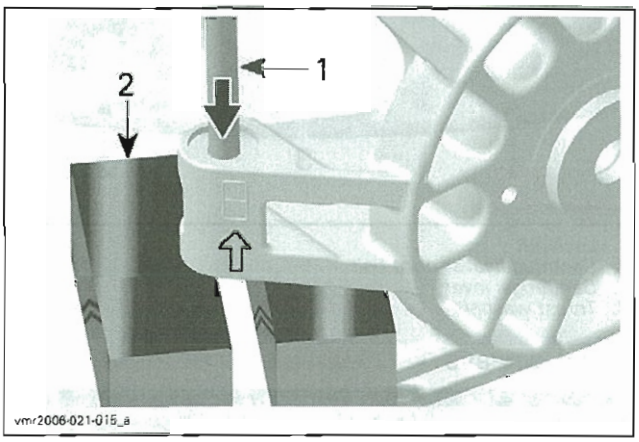
1. *Slider shoe*

Put governor cup on a vise. Use protection plates on the vise jaws to avoid marks and/or damages to the governor cup.

Push out bearing sleeve with an appropriate punch in the opposite direction of the protruding arrow.

NOTE: Use a punch with a smaller diameter than the bearing sleeve.

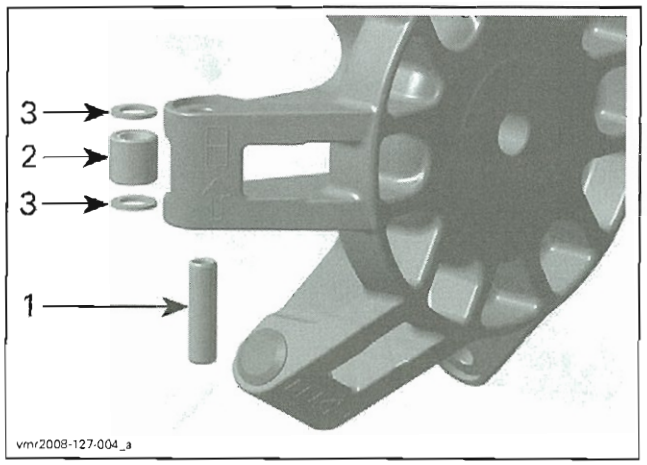
CAUTION: Do not clamp the governor cup in the vise to push out bearing sleeve. Governor cup will be damaged.



PUSHING OUT BEARING SLEEVE
1. *Punch*
2. *Vise*

CAUTION: Always replace all rollers at the same time. Partially worn rollers may cause damage to the CVT system.

Remove roller and thrust washers.

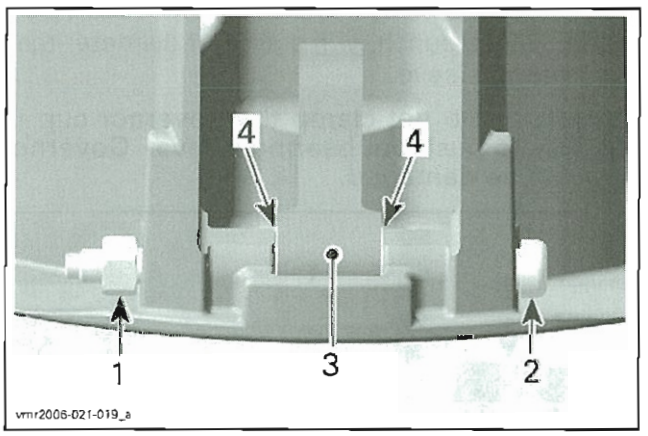


1. *Bearing sleeve*
2. *Roller*
3. *Thrust washers*

Sliding Sheave

Unscrew lock nut and remove centrifugal lever pivot bolt.

Remove centrifugal lever and both thrust washers.



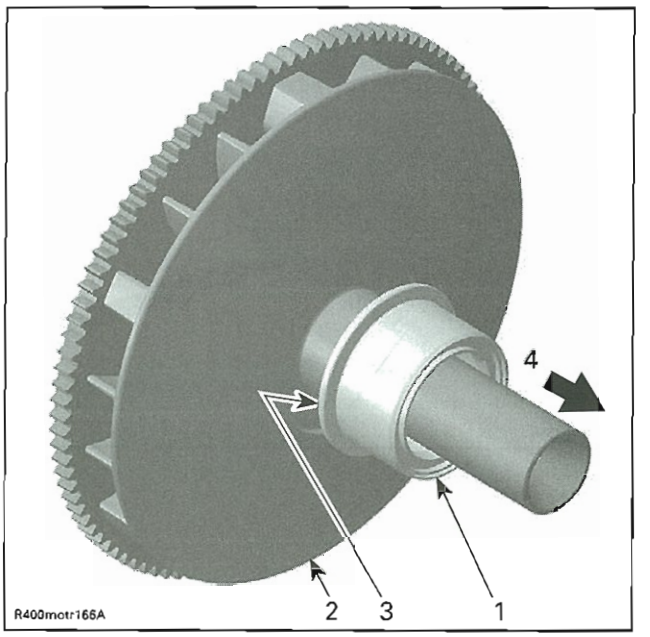
1. *Lock nut*
2. *Centrifugal lever pivot bolt*
3. *Centrifugal lever*
4. *Thrust washers*

Fixed Sheave

⚠ WARNING

Always wear safety glasses to remove spring sleeves.

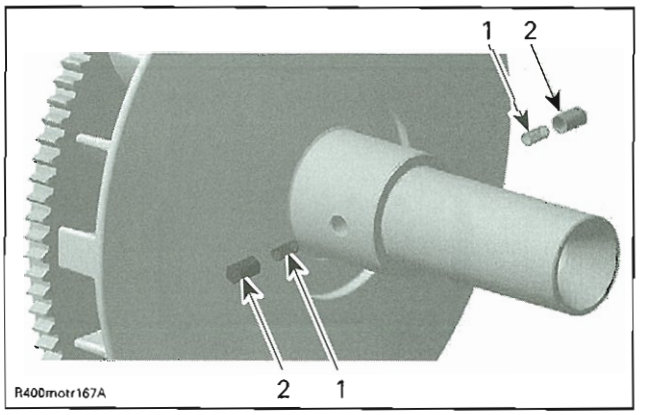
Pull one-way clutch slowly until the half of spring sleeves are visible.



1. *One-way clutch*
2. *Fixed sheave*
3. *Spring sleeve area*
4. *Direction of removal*

Hold both spring sleeves with fingers when pulling out the one-way clutch.

Release springs after one-way clutch removal.



1. *Spring*
2. *Spring sleeves*

Drive Pulley Cleaning

Clean pulley faces and shaft with fine steel wool and dry cloth.

Using a paper towel with cleaning solvent, clean crankshaft tapered end and the taper inside of the fixed sheave of the drive pulley, crankshaft threads and threads of drive pulley screw no. 4.

CAUTION: To avoid damage, make sure cleaner does not contact the crankshaft seal.

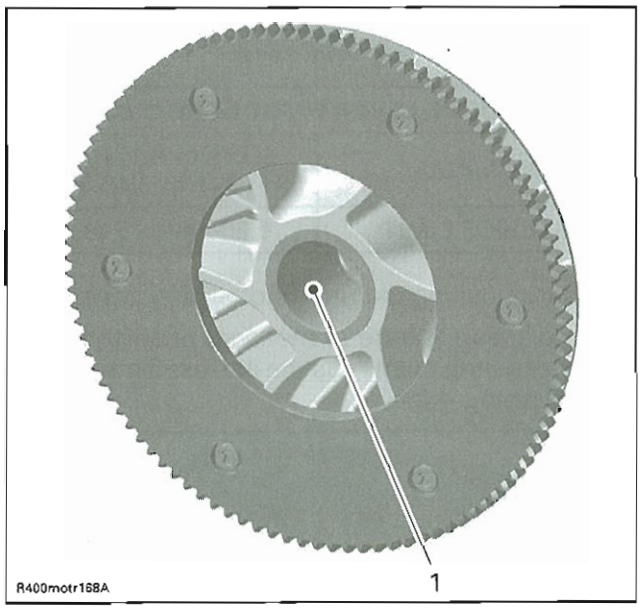
Remove all hardened oil deposits that have baked on crankshaft and pulley tapered surfaces with coarse or medium steel wool and/or sand paper no. 600.

CAUTION: Do not use any other type of abrasive.

Reclean mounting surfaces with paper towel and cleaning solvent.

Wipe off the mounting surfaces with a clean, dry paper towel.

CAUTION: Mounting surfaces must be free of any oil, cleaner or towel residue.



1. Taper of fixed sheave

Only use petrol base cleaner when cleaning bushings no. 5 and no. 6.

CAUTION: Do not use acetone to clean bushing.

Drive Pulley Inspection

Drive Pulley

Drive pulley should be inspected annually for wear or damages.

Governor Cup

Check governor cup no. 2 for cracks or other visible damages. Replace if necessary.

Roller

Check each roller for roundness of external diameter.

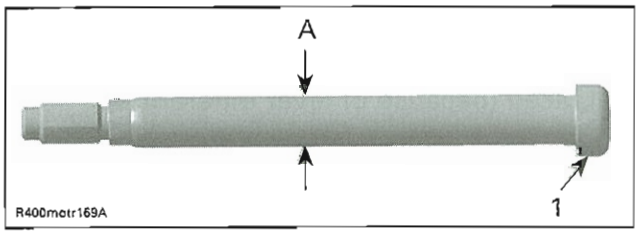
NOTE: Replace governor cup if the roller does not move freely.

Measure the roller diameter. If one roller is out of specification, replace all rollers.

ROLLER OUTER DIAMETER	
NOMINAL	13.70 to 13.90 mm (.539 to .547 in)
SERVICE LIMIT	13.20 mm (.519 in)
ROLLER INNER DIAMETER	
NOMINAL	8.05 to 8.15 mm (.317 to .321 in)
SERVICE LIMIT	9.00 mm (.354 in)

Centrifugal Lever Pivot Bolt

Measure diameter of centrifugal lever pivot bolt, replace if it is out of specification.



1. Centrifugal lever pivot bolt
A. Measure diameter here

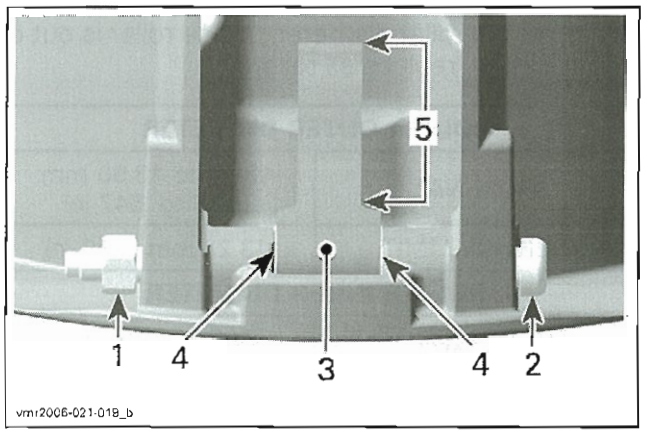
CENTRIFUGAL LEVER PIVOT BOLT DIAMETER	
NOMINAL	6.078 to 6.100 mm (.239 to .240 in)
SERVICE LIMIT	6.00 mm (.236 in)

Centrifugal Lever

Check bushing diameter in the centrifugal lever no. 7 for wear. If a centrifugal lever must be replaced, replace all levers at the same time.

CENTRIFUGAL LEVER BORE DIAMETER	
NOMINAL	6.035 to 6.078 mm (.238 to .239 in)
SERVICE LIMIT	6.200 mm (.244 in)

Replace centrifugal lever, thrust washers, centrifugal lever pivot bolts and lock nuts if the contact surfaces show heavy visible wear.



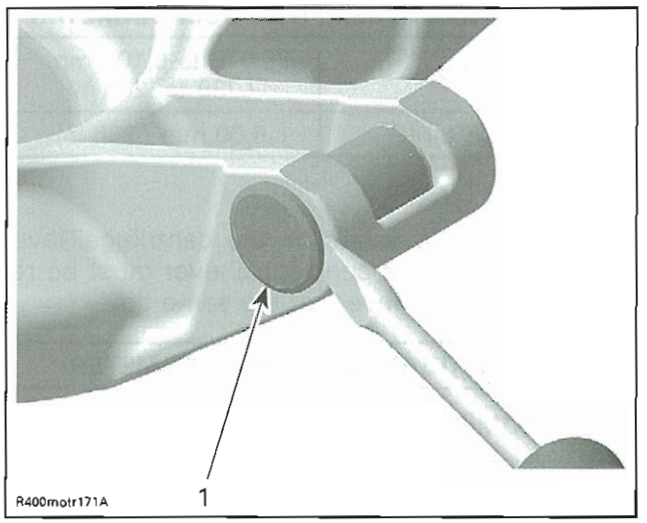
1. *Lock nut*
2. *Centrifugal lever pivot bolt*
3. *Centrifugal lever*
4. *Thrust washers*
5. *Contact surface to the roller*

CAUTION: Whenever replacing centrifugal levers, always replace all levers at the same time. Otherwise, the drive pulley will be unbalanced (because of lever differences).

Slider Shoe

Check slider shoes for visible wear and replace if damaged.

NOTE: If necessary, use a screwdriver to remove slider shoes.

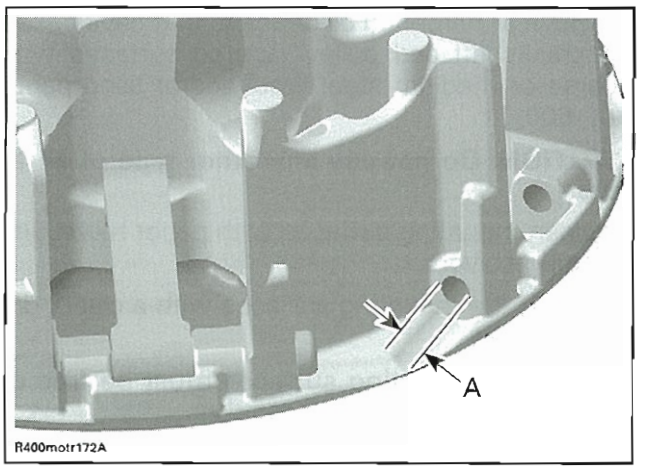


1. *Slider shoe*

Sliding Sheave

Check sliding sheave no. 1 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 damaged.

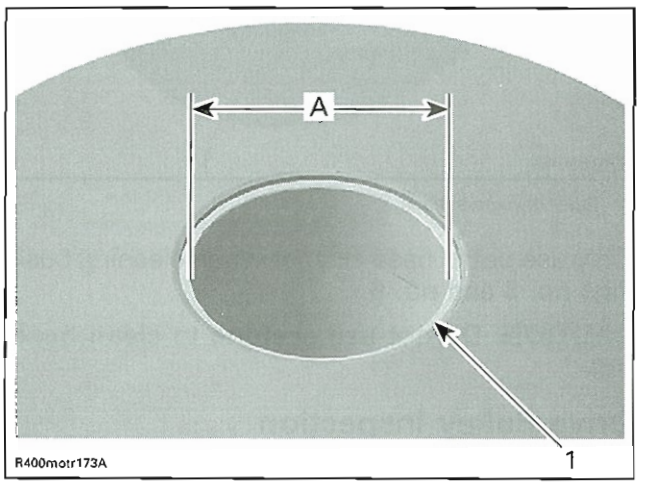


A. Centrifugal lever pivot bolt bore diameter

CENTRIFUGAL LEVER PIVOT BORE DIAMETER	
NOMINAL	6.113 to 6.171 mm (.241 to .243 in)
SERVICE LIMIT	6.300 mm (.248 in)

Measure bushing diameters of sliding sheave.

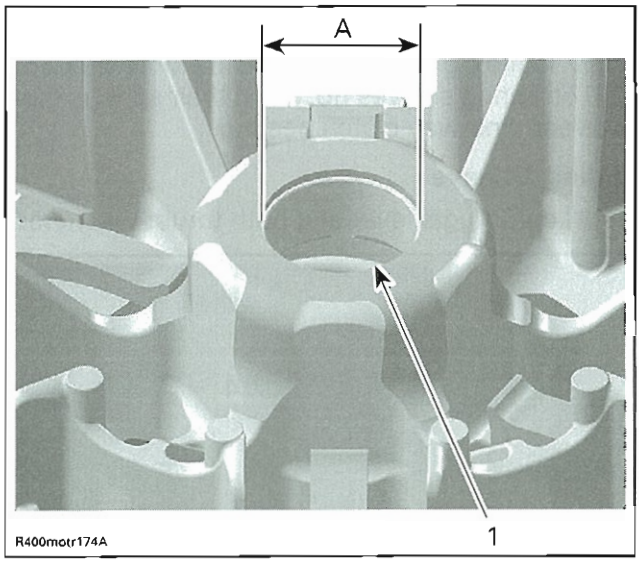
Use a dial bore gauge to measure bushing diameter. Measuring point must be at least 5 mm (1/4 in) from bushing edge.



1. *Bushing on fixed sheave side*

A. Bore diameter of bushing

SLIDING SHEAVE LARGE BUSHING	
NOMINAL	55.000 to 55.040 mm (2.165 to 2.167 in)
SERVICE LIMIT	55.200 mm (2.173 in)



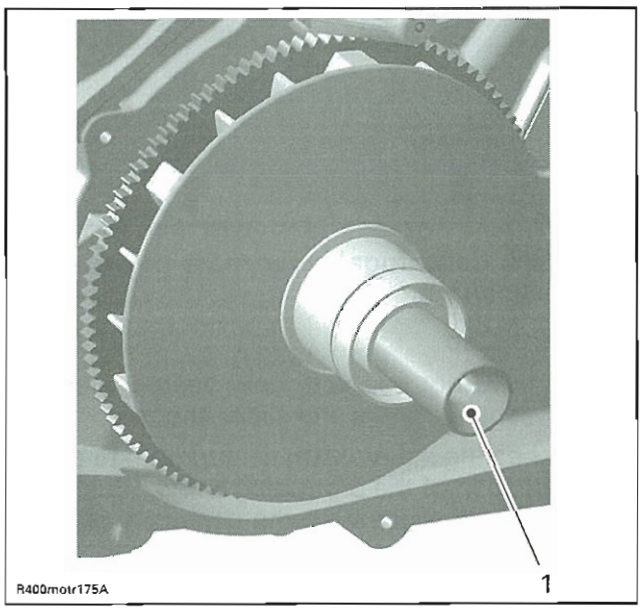
1. Bushing on governor cup side
A. Bore diameter of bushing

SLIDING SHEAVE SMALL BUSHING	
NOMINAL	30.000 to 30.040 mm (1.181 to 1.261 in)
SERVICE LIMIT	30.200 mm (1.189 in)

Replace sliding sheave if bushings **no. 5** and/or **no. 6** is (are) out of specification. Visually inspect coatings.

Fixed Sheave

Check fixed sheave contact surface to the governor cup for scoring and other damages. If so, replace fixed sheave.



1. Visually check here

Check for any marks on fixed sheave plate. Replace if necessary.

Check ring gear teeth for excessive wear or other damage. Replace fixed sheave if necessary.

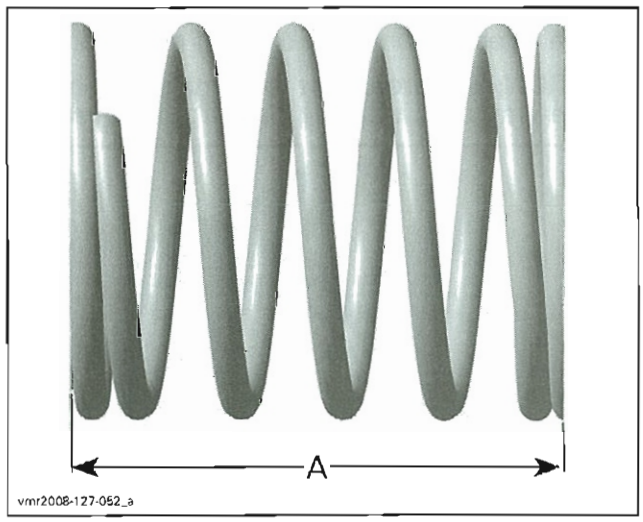
⚠ WARNING

Fixed sheave and ring gear are balanced together. Always replace both parts together otherwise severe injury and/or damages may occur.

Spring

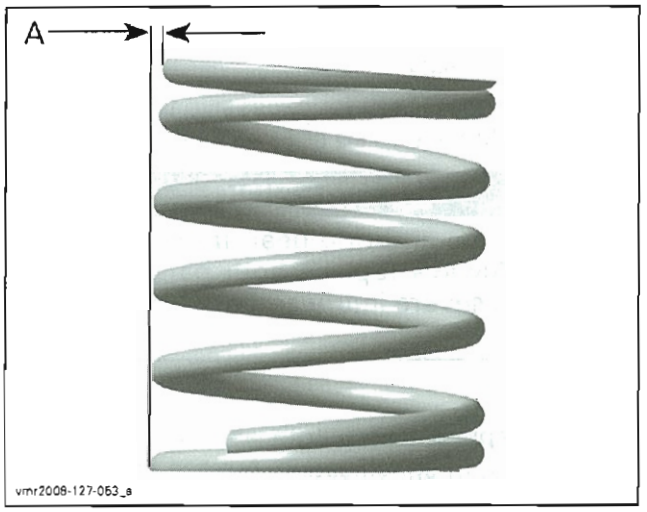
Measure spring free length and squareness. If spring is out of specification, replace by a new.

SPRING FREE LENGTH	
SERVICE LIMIT	75 mm (2.953 in)



A. Free length

CLUTCH SPRING SQUARENESS	
SERVICE LIMIT	4 mm (.157 in)

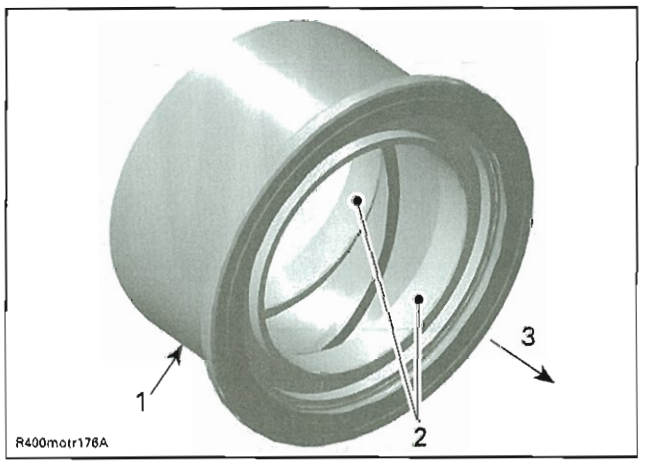


A. Squareness

One-Way Clutch

Check bearings for excessive play and smooth operation. Replace one-way clutch if necessary.

CAUTION: Be careful not to damage the inside of one-way clutch during bearing removal.



1. One-way clutch
2. Bearings
3. Drive pulley sliding sheave side

Measure length of spring sleeveno. 8 and check if edges on top of the spring sleeve are excessively worn. If out of specifications, replace both spring sleeves and springs at the same time.

SPRING SLEEVE LENGTH	
SERVICE LIMIT	9 mm (.276 in)

Drive Pulley Assembly

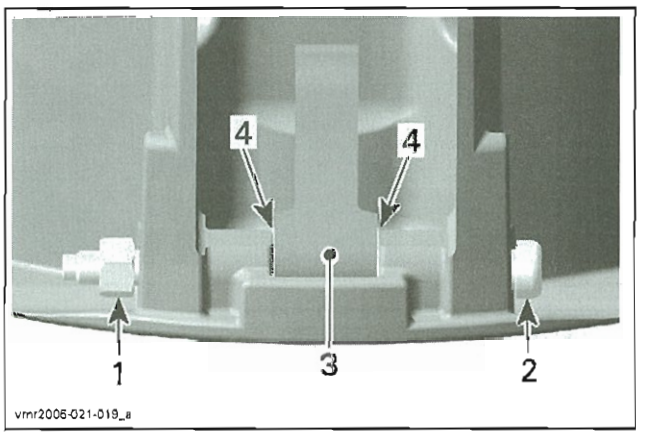
For assembly, reverse the disassembly procedure. Pay attention to following details.

One-Way Clutch

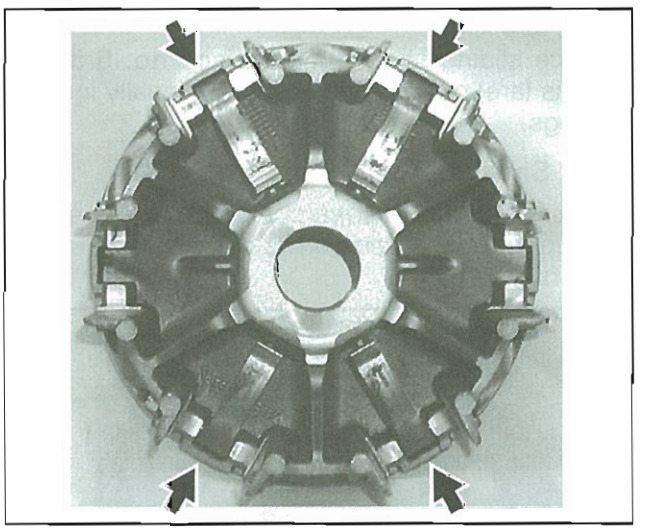
Apply Isoflex grease Topas NB 52 (P/N 293 550 021) on spring sleeves no. 8 and their springs then between one-way clutch bearings.

Sliding Sheave

Install centrifugal lever and both thrust washers.



1. Lock nut
2. Centrifugal lever pivot bolt
3. Centrifugal lever
4. Thrust washers



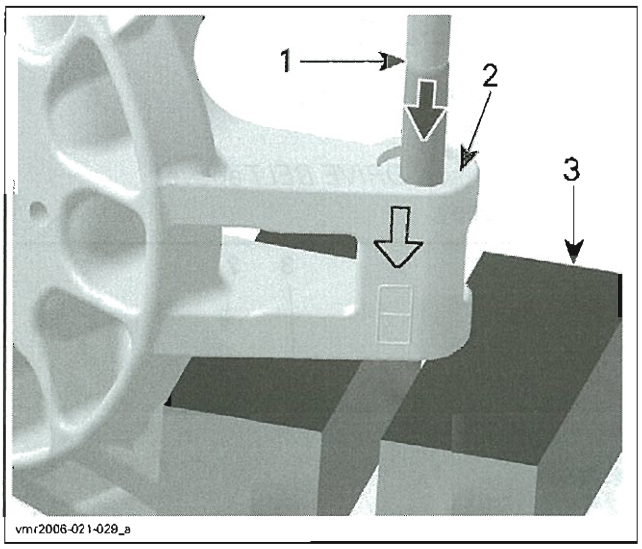
CAUTION: Centrifugal lever must move easily after installation.

Governor Cup

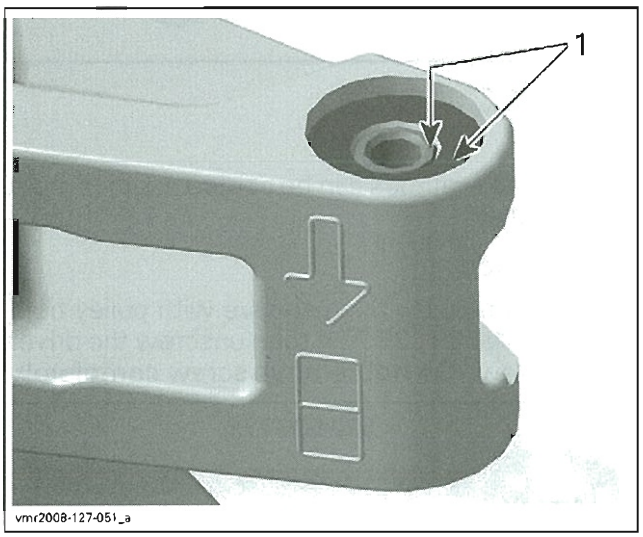
Rebuild governor cup with new bearing sleeves, thrust washers, rollers and slider shoes.

Push in bearing sleeve with an appropriate punch in the direction of the protruding arrow. Push until bearing sleeve aligns with the contact surface of the slider shoe.

CAUTION: Final position of bearing sleeve has to be flush with the contact surface of the slider shoes (no protrusion).



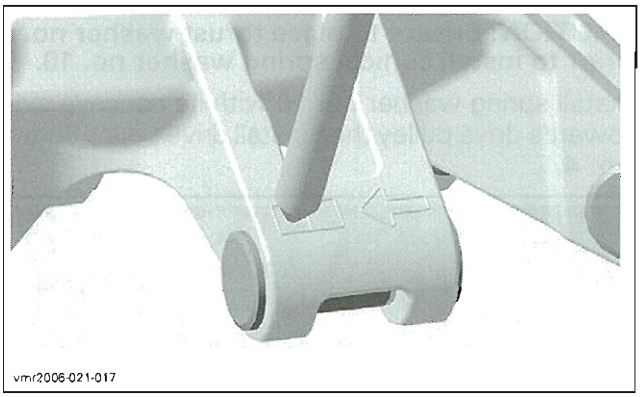
1. *Top edge of bearing sleeve*
2. *Mating surface of slider shoes*
3. *Vise*



1. *Flush surfaces*

Each time the bearing sleeves are replaced, punch a mark in an empty telltale box. If each box is already marked, replace governor cup with a new one.

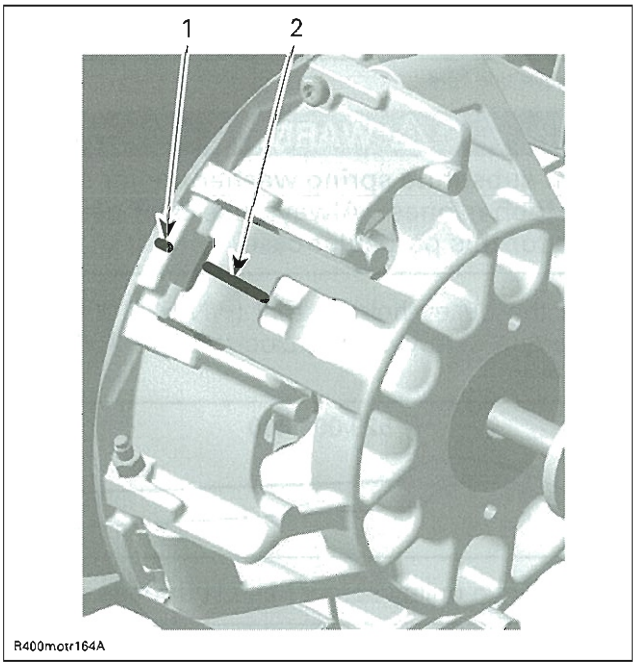
CAUTION: Make a visible mark in the box, but do not tap too hard. Severe damage tof the governor cup may appear.



CAUTION: Rollers must move easily after installation.

Insert slider shoes no. 3 into governor cup to properly slide in guides.

Align governor cup with sliding sheave using the marks traced at disassembly.



1. *Mark on drive pulley sliding sheave*
2. *Mark on governor cup*

Drive Pulley Installation

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

CAUTION: Do not apply antiseize or any lubricant on crankshaft and drive pulley tapers.

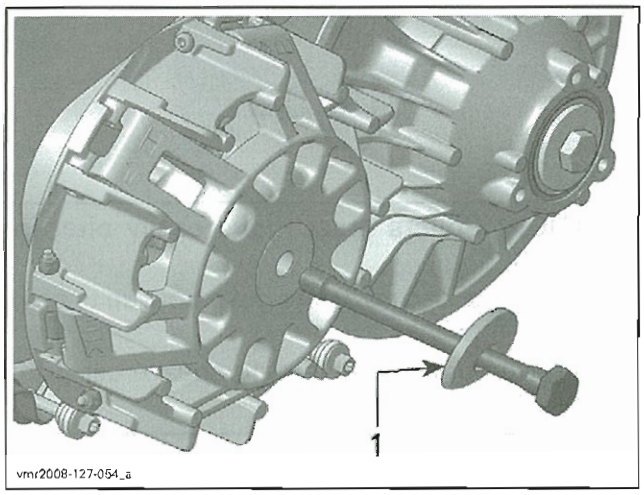
CAUTION: Never use any type of impact wrench at drive pulley removal and installation.

Clean mounting surfaces as described in *CLEANING* above.

Install drive pulley on crankshaft extension.

CAUTION: Ensure to place thrust washer no. 9 prior to install conical spring washer no. 10.

Install spring washer no. 10 with its concave side towards drive pulley then install drive pulley screw no. 4.

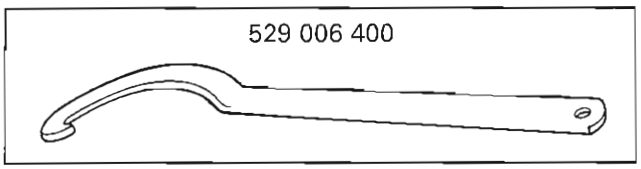


1. Concave side here

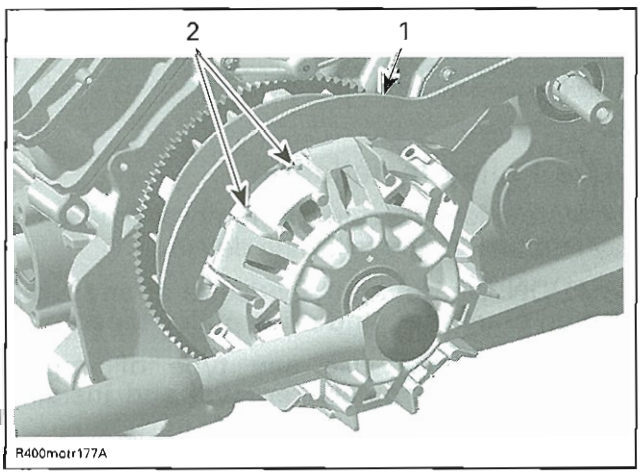
⚠ WARNING

Never substitute spring washer and/or screw with jobber ones. Always use BRP genuine parts for this particular case.

Install the pulley holding tool (P/N 529 006 400) and torque screw counterclockwise to 100 N•m (74 lbf•ft).



NOTE: Drive pulley screw has LH threads.

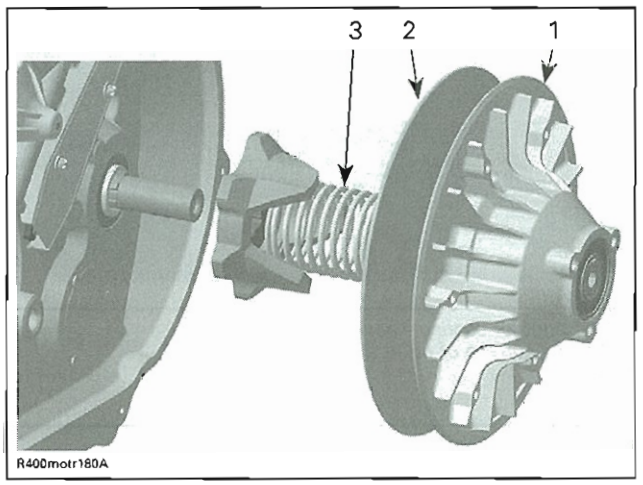


1. Pulley holding tool
2. Drive pulley removal/installation area

DRIVEN PULLEY

Driven Pulley Removal

Remove:
- Drive belt (see *DRIVE BELT* above)
- Driven pulley.

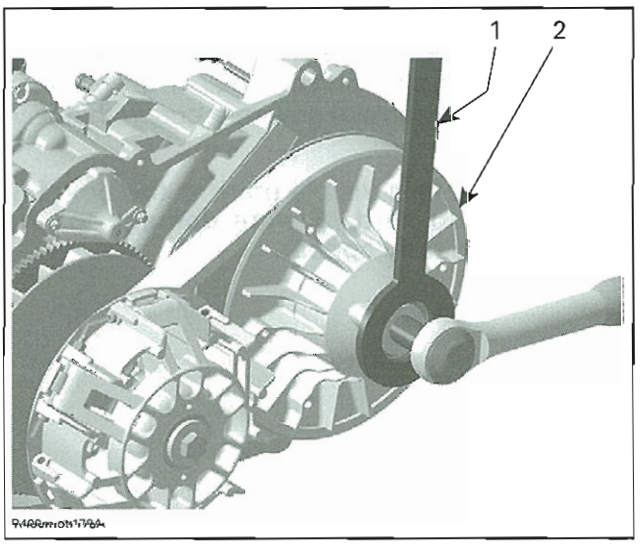


1. Fixed sheave of driven pulley
2. Sliding sheave of driven pulley
3. Spring

NOTE: Two methods can be carried out to remove driven pulley.

First Method

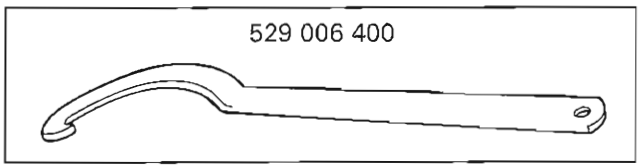
Block driven pulley fixed sheave with pulley holding tool (P/N 529 035 771) then unscrew the driven pulley screw. **Do not remove screw completely.**

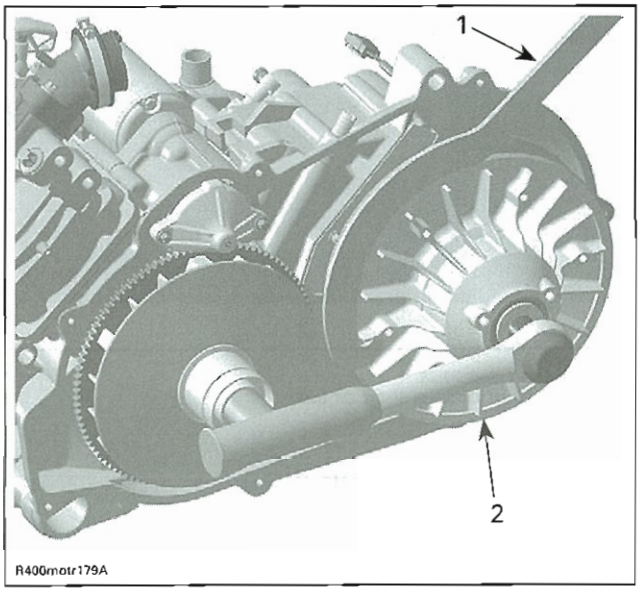


1. Pulley holding tool
2. Driven pulley fixed sheave

Second Method

Block driven pulley with pulley holding tool (P/N 529 006 400) then unscrew the driven pulley screw. Do not remove screw completely.





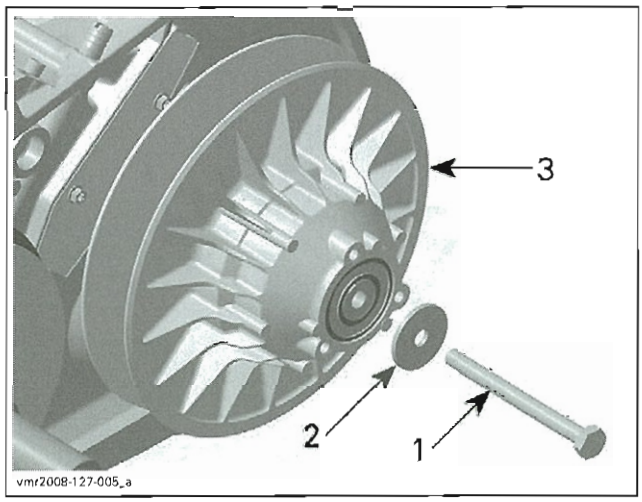
1. *Pulley holding tool*
2. *Driven pulley fixed sheave*

Removal Procedure Continuation when Driven Pulley is Blocked

Push the driven pulley and hold in this position while removing screw and washer.

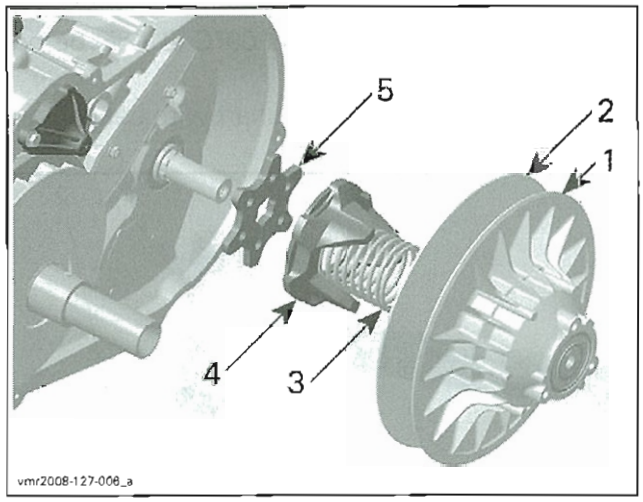
⚠ WARNING

Driven pulley is spring loaded. Hold driven clutch pulley tight and slowly remove the driven pulley screw to release spring tension.



1. *Driven pulley screw*
2. *Thrust washer*
3. *Driven pulley fixed sheave*

Remove the driven pulley with the spring, cam and the plate.

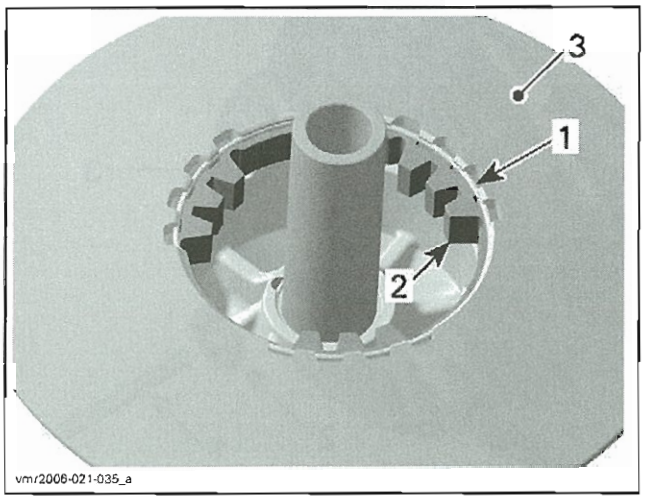


1. *Fixed sheave of driven pulley*
2. *Sliding sheave of driven pulley*
3. *Spring*
4. *Cam*
5. *Plate*

Driven Pulley Disassembly

Fixed Sheave

Remove retaining ring and lift torque gear.

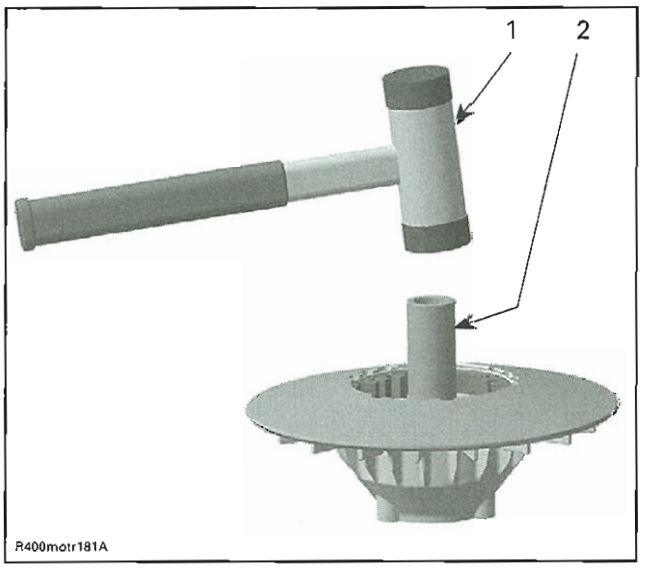


1. *Retaining ring*
2. *Torque gear*
3. *Fixed sheave of driven pulley*

NOTE: The following procedure is not necessary except if ball bearing no. 11 or shaft must be removed. Refer to *INSPECTION* before proceeding.

Heat ball bearing area up to 100°C (212°F) before removing ball bearing.

Use a soft hammer to push shaft with bearing out of fixed sheave.



1. *Soft hammer*
2. *Shaft*

Remove shaft from ball bearing.

Driven Pulley Cleaning

To remove a dust deposit from cam or shaft, use a dry cloth.

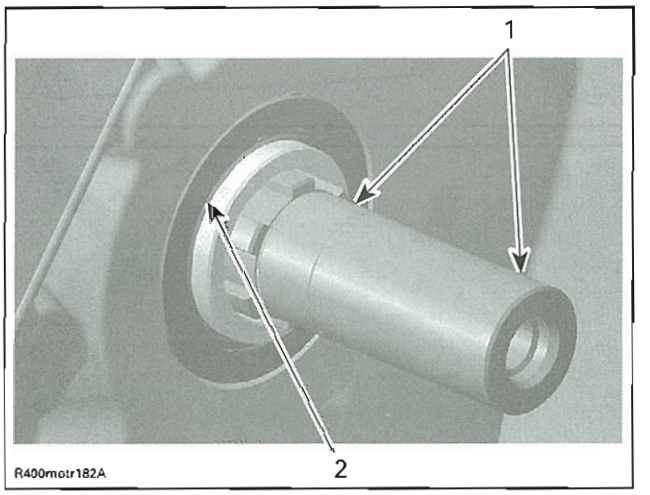
Clean pulley faces and shaft with fine steel wool and dry cloth.

Use pulley flange cleaner (P/N 413 711 809) to clean driven pulley.

Clean the CVT crankcase area from contamination.

Using a paper towel with cleaning solvent to clean main shaft end and the inside of the shaft no. 12.

CAUTION: To avoid damage, make sure cleaner does not contact the countershaft seal.



1. *Main shaft supports*
2. *Sealing lip of countershaft oil seal*

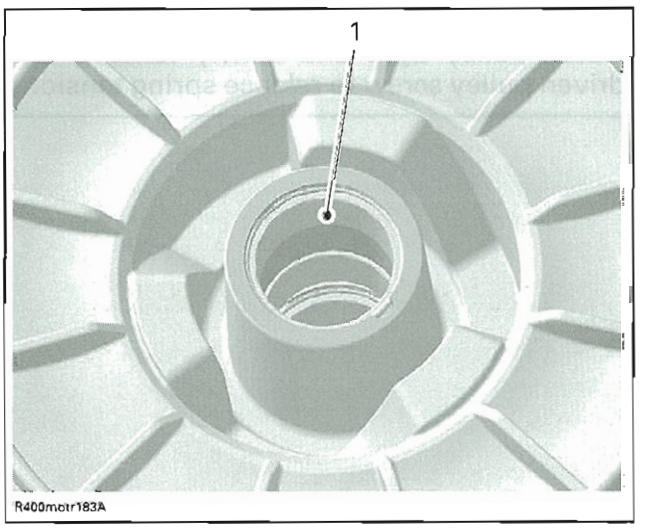
Driven Pulley Inspection

Sliding Sheave

Check bushings no. 13 for cracks, scratch and for free movement when assembled to sliding sheave.

Using a dial bore gauge, measure bushing diameters. Measuring point must be at least 5 mm (1/4 in) from bushing edges.

These bushings are not replaceable. Replace sliding sheave if bushings are out of specification. Visually inspect coatings.



1. *Bushing*

BUSHINGS BORE DIAMETER	
NOMINAL	30.060 to 30.100 mm (1.183 to 1.185 in)
SERVICE LIMIT	30.200 mm (1.189 in)

Fixed Sheave

Check ball bearing **no. 11** for free play and smooth operation. Replace if necessary.

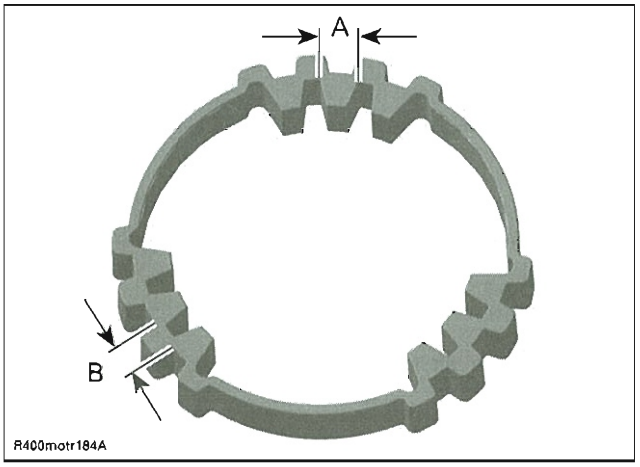
Check shaft **no. 12** for heavy wear or visible damage. Replace if necessary.

If the shaft is removed, measure bushing diameter with a dial bore gauge. Measuring point must be at least 5 mm (1/4 in) from bushing edge.

This bushing is not replaceable. Replace fixed sheave if bushing **no. 14** is out of specification. Visually inspect coatings.

BUSHING BORE DIAMETER	
NOMINAL	30.060 to 30.100 mm (1.183 to 1.185 in)
SERVICE LIMIT	30.200 mm (1.189 in)

Check torque gear for visible damage and wear limit with a caliper.

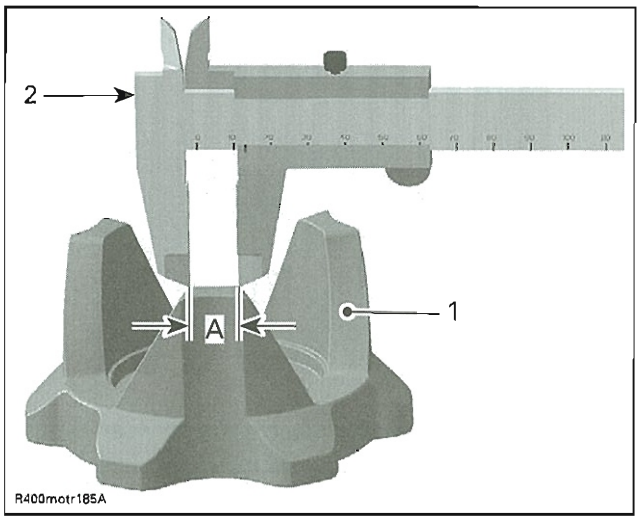


A. Measurement inside
B. Measurement outside

WEAR ON TEETH BOTH SIDES	
SERVICE LIMIT	7.500 mm (.295 in)

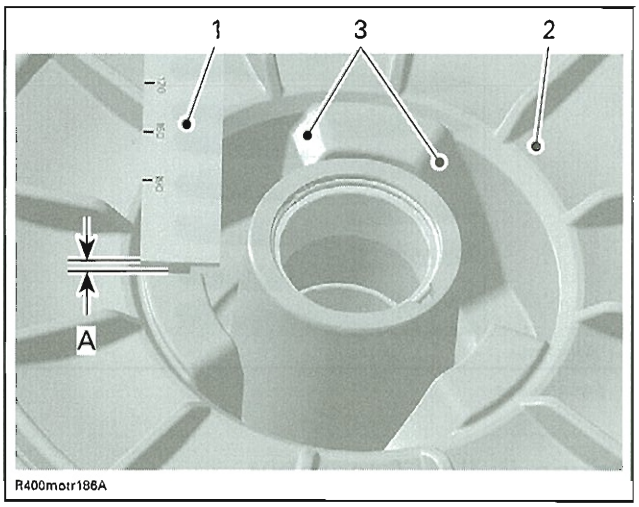
Cam

Check cam for visible damage and wear limit with a caliper.



1. Contact surfaces for power train
2. Caliper
A. Width to be measured due to wear on contact surface

WIDTH ON TOP SURFACE	
SERVICE LIMIT	6.000 mm (.236 in)



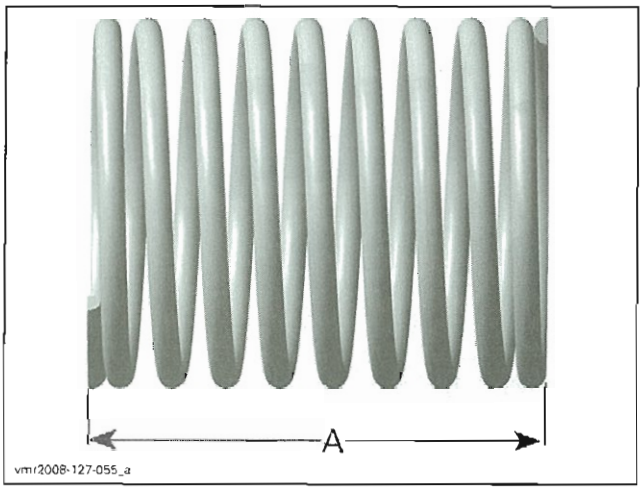
1. Caliper
2. Sliding sheave
3. Contact surface
A. Wear to be measured

WEAR ON CONTACT SURFACE	
SERVICE LIMIT	2.000 mm (.079 in)

Spring

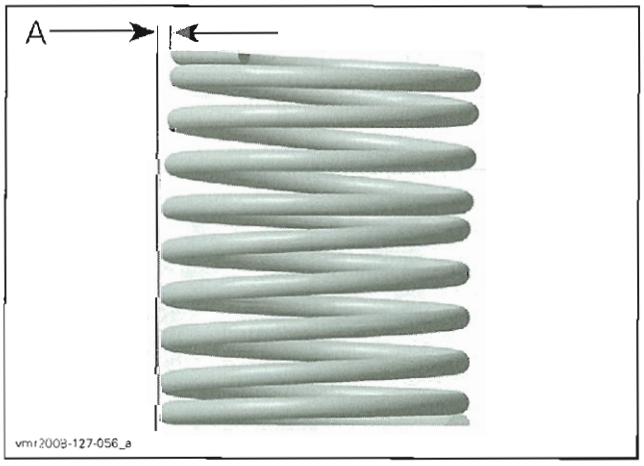
Measure spring free length and squareness. If spring **no. 33** is out of specification, replace by a new.

SPRING FREE LENGTH	
SERVICE LIMIT	164 mm (6.457 in)



A. Free length

CLUTCH SPRING SQUARENESS	
SERVICE LIMIT	3.8 mm (.150 in)



A. Squareness

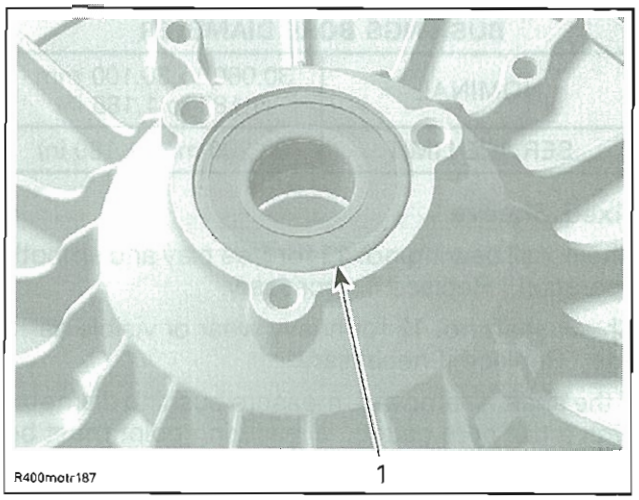
Driven Pulley Assembly

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.

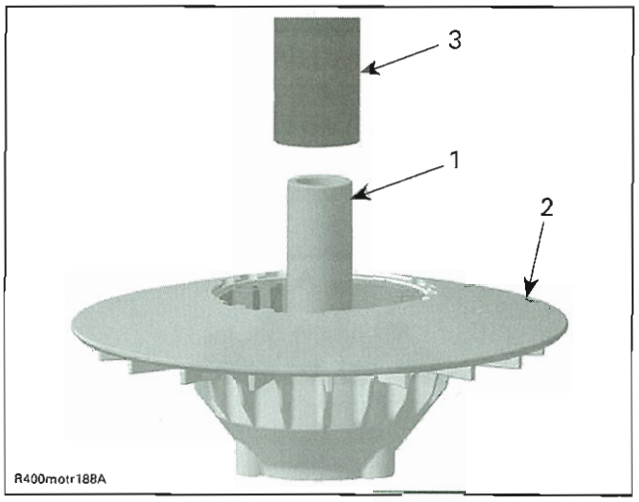
NOTE: Place new ball bearing in a freezer for 10 minutes before installation.

Install ball bearing with the writing on top and push only on the outer ring.



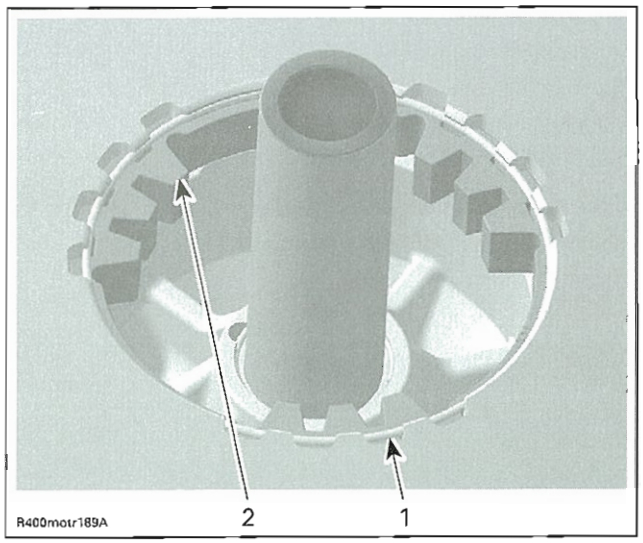
1. Ball bearing

CAUTION: Do not use a hammer, use a press only.



1. Shaft
2. Fixed sheave
3. Press machine

Install torque gear then secure it with retaining ring.



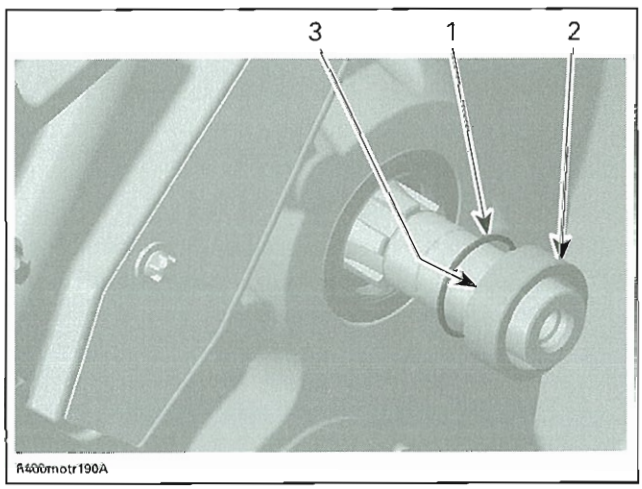
1. *Retaining ring*
2. *Torque gear*

Driven Pulley Installation

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

Place O-ring on main shaft splines and move it with spacer in end position.

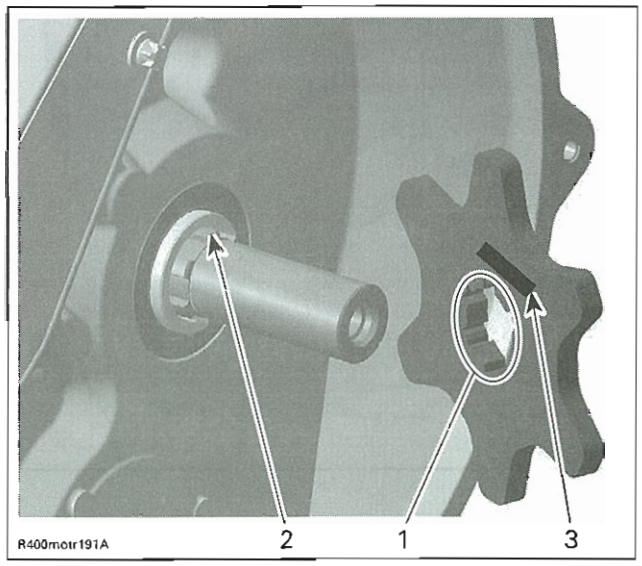
CAUTION: Chamfer on inside diameter of the spacer must face engine side.



1. *O-ring*
2. *Distance sleeve*
3. *Chamfered area of distance sleeve*

Install cam retainer on main shaft end the right way then install cam.

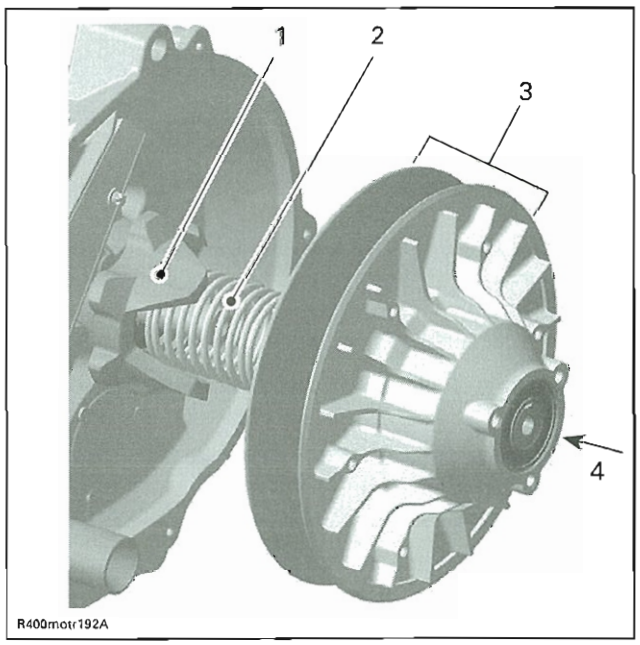
NOTE: Place cam retainer with printed mark "ENGINE SIDE" towards the engine.



1. *Sharp edge of cam retainer to engine side*
2. *Main shaft spline*
3. *Printed mark "ENGINE SIDE"*

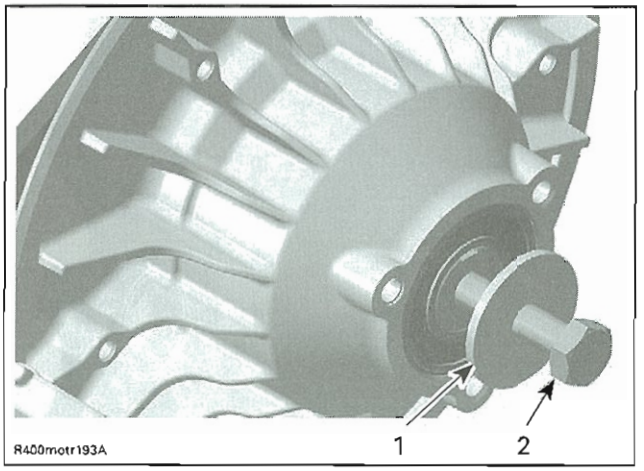
Install sliding sheave no. 15 into fixed sheave no. 16.

Place spring behind sliding sheave then align driven pulley with cam.



1. *Cam*
2. *Spring*
3. *Driven pulley*
4. *Location for pushing during screw installation*

Push the driven pulley by hand. Install the driven pulley screw and its washer.



1. Washer
2. Driven pulley screw

NOTE: Driven pulley end-play is 0 (zero).

Torque driven pulley screw.

CYLINDER HEAD/CYLINDER

SERVICE TOOLS

Description	Part Number	Page
dial gauge	414 104 700	115
valve spring compressor cup	529 035 725	128
valve spring compressor clamp	529 035 764	128
piston ring compressor tool	529 035 919	133
piston circlip installer	529 035 921	136
valve guide remover	529 035 924	131
camshaft locking tool	529 035 926	120, 132
valve guide installer	529 036 140	131

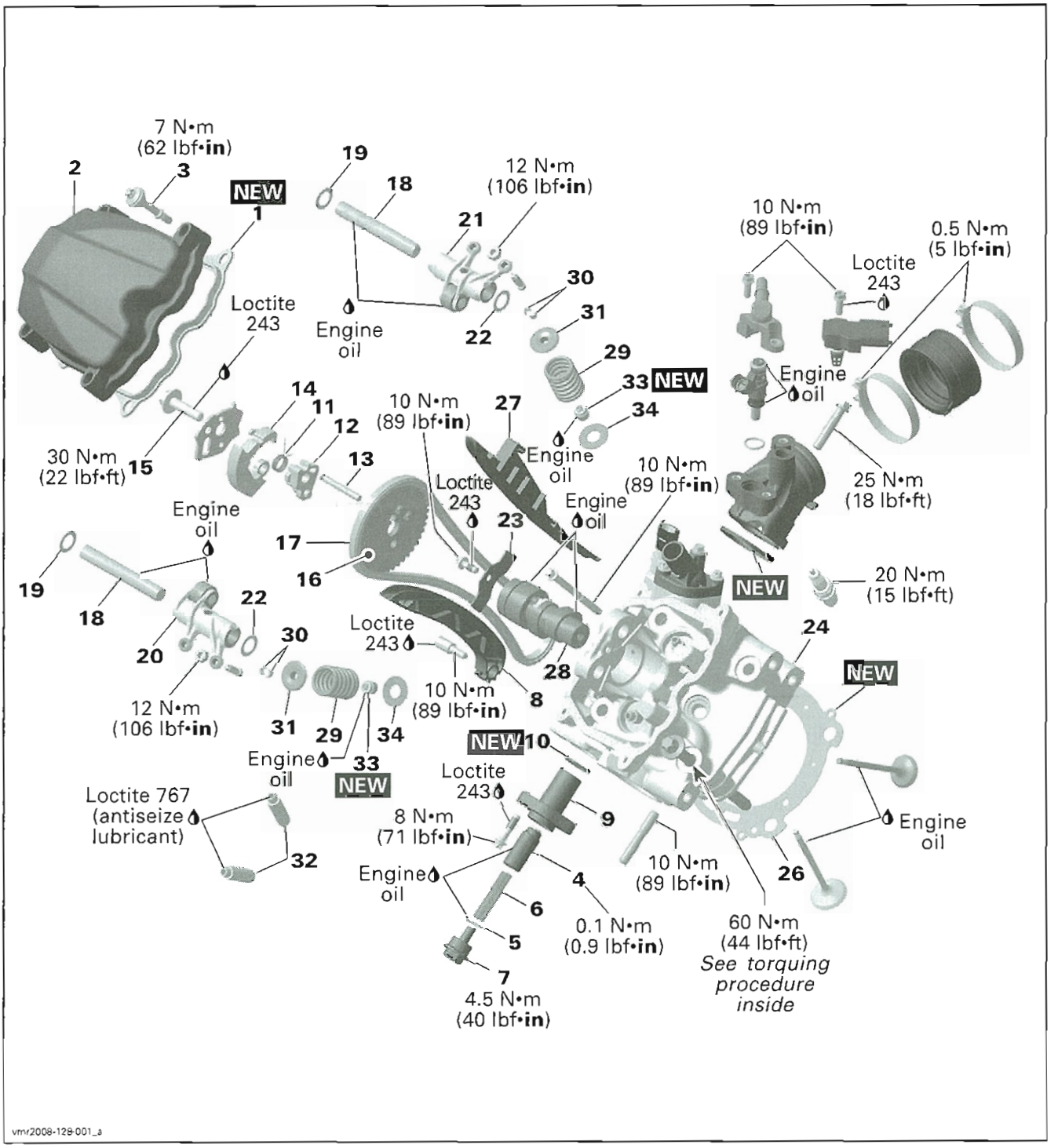
SERVICE TOOLS – OTHER SUPPLIER

Description	Part Number	Page
leak down test kit	529 035 661	116
valve stem seal pliers	Snap-on YA 8230	129

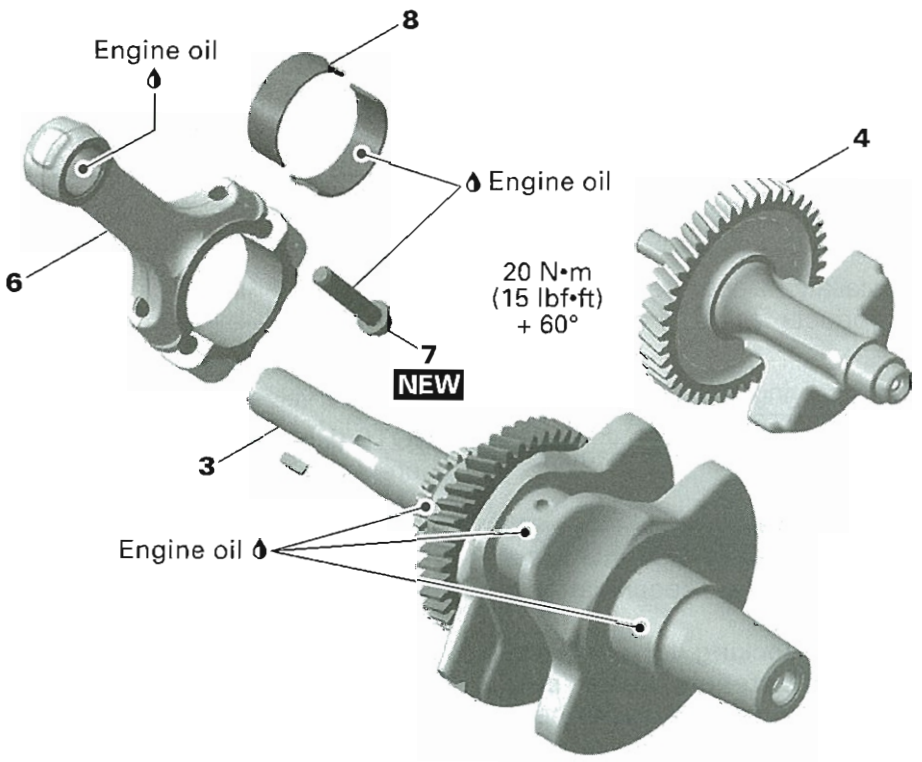
SERVICE PRODUCTS

Description	Part Number	Page
Loctite 243 (blue)	293 800 060	118, 122
Loctite 767 (antiseize lubricant)	293 800 070	131

CYLINDER HEAD



CYLINDER AND PISTON



R400motr18T

GENERAL

To work on cylinder head, cylinder and piston, the engine removal is not necessary.

Always place the vehicle on level surface.

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

When diagnosing an engine problem, always perform a cylinder leak test. This will help pinpoint a problem.

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

⚠ WARNING

Always disconnect battery or starter cables exactly in the specified order, BLACK (-) cable first.

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

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

⚠ WARNING

Torque wrench tightening specifications must strictly be adhered to.
Locking devices (e.g.: locking tabs, elastic stop nuts, self-locking fasteners, cotter pin, etc.) must be installed or replaced with new ones where specified. If the efficiency of a locking device is impaired, it must be renewed.

When disassembling parts that are duplicated in the engine, (e.g.: valves), it is a strongly recommended to note their position (PTO, MAG side) and to keep them as a "group". If you find a defective component, it would be much easier to find the cause of the failure among its group of parts (e.g.: you found a worn valve guide. A bent spring could be the cause and it will be easy to know which one among the springs is the cause to replace it if you grouped them at disassembly). Besides, since used parts have matched together during the engine operation, they will keep their matched fit when you reassemble them together within their "group".

Intake port/air filter contaminated (clogged) with dirt, sand, etc. (leads to worn valves, piston rings and finally to leak of power).

CAUTION: In case of piston rings and/or valve replacement, always clean the whole engine and change oil and oil filter.

MAINTENANCE

VALVE ADJUSTMENT

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

Remove valve cover.

Lock crankshaft to TDC compression (refer to *CRANKCASE/CRANKSHAFT* section).

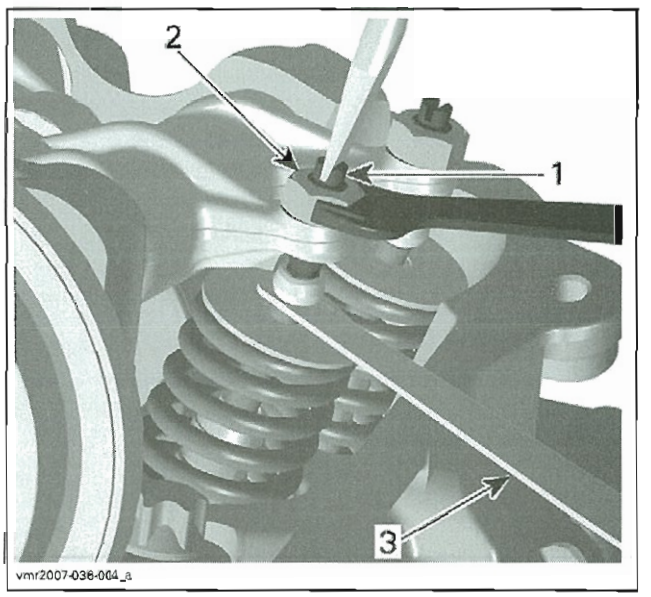
Using feeler gauge, check the valve clearance.

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

If the valve clearance is out of specification perform the valve clearance adjustment.

NOTE: Use mean value of exhaust/intake to ensure a proper valve adjustment.

Hold the adjusting screw at the proper position and torque the locking nut.



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

Repeat the procedure for each valve.

Before installing valve cover, recheck all valve adjustments.

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

Be careful not to burn yourself on hot engine parts.

Preparation

Disconnect battery.

⚠ WARNING

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

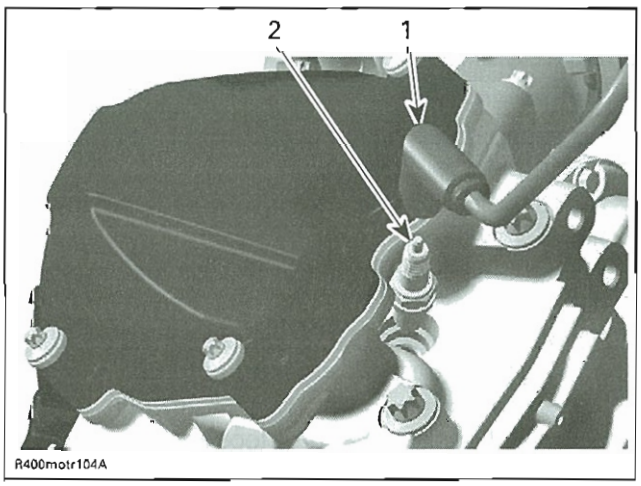
Remove radiator cap.

⚠ WARNING

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

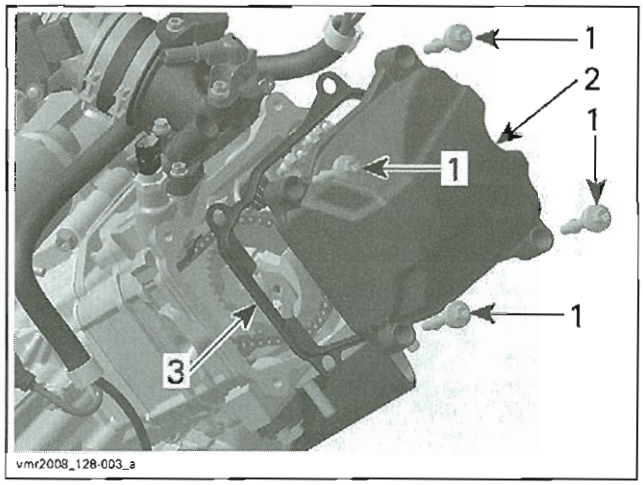
Refer to *BODY* and remove:
- LH side panel
- Engine cover
- Engine cover cap.

Remove spark plug.



1. *Spark plug cable*
2. *Spark plug*

Remove valve cover. Refer to *CYLINDER HEAD/CYLINDER.*



1. *Valve cover screws*
2. *Valve cover*
3. *Valve cover gasket*

Turn crankshaft until piston is at TDC of compression stroke. To turn the crankshaft, there are two possible procedures.

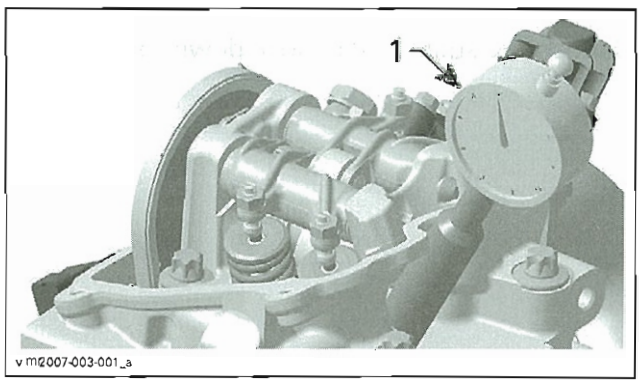
First Procedure:
- Turn the drive pulley.

Second Procedure:
- Use rewind starter.

Install a dial gauge (P/N 414 104 700) into spark plug hole.

Turn the crankshaft and set the piston to TDC of compression stroke.

NOTE: The engine must be accurately set to TDC of compression stroke. Otherwise the engine will continue to rotate when pressure builds up.

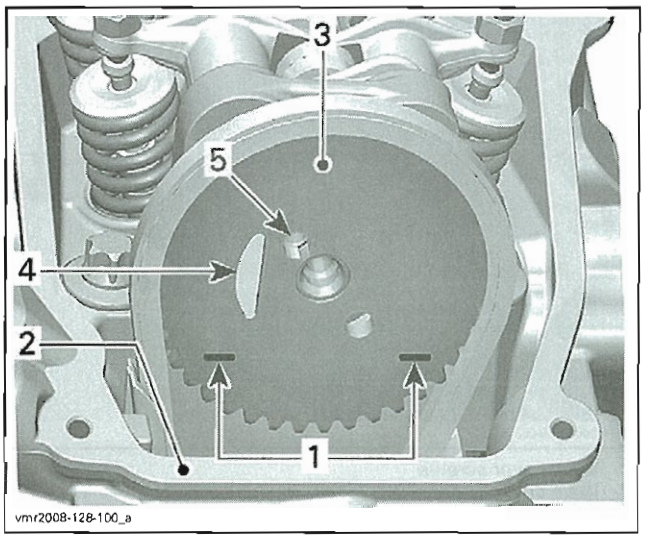


TYPICAL
1. *Dial gauge*

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

CAUTION: Pay attention not to scratch or damage piston/cylinder surface.

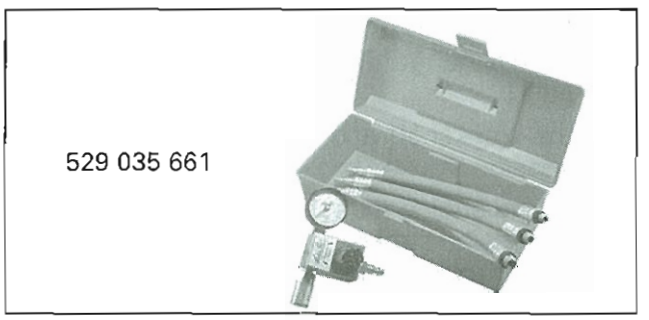
NOTE: At TDC of compression stroke, the marks on the camshaft timing gear have to be parallel to cylinder head edge as per following illustration.



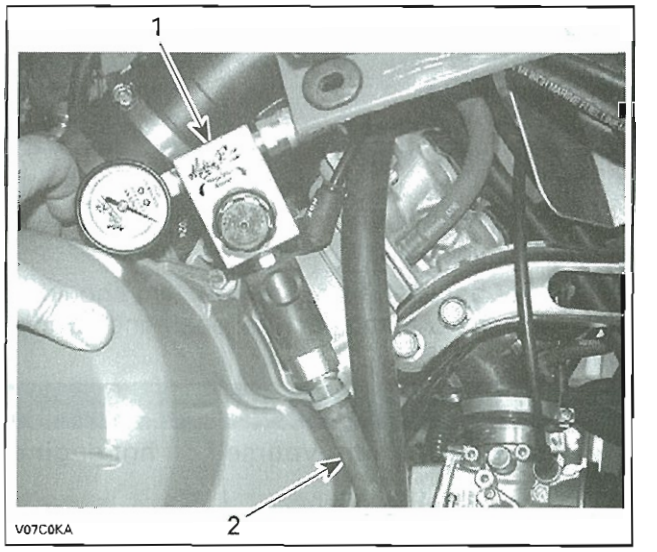
1. *Marks on camshaft timing gear*
2. *Cylinder head edge*
3. *Camshaft timing gear*
4. *Timing gear tab*
5. *Decompressor shaft bore*

Leak Test

Use the leak down test kit (P/N 529 035 661).



Connect air supply to the leak down test kit.



TYPICAL
1. *Leak tester*
2. *Air supply hose*

Set needle of measuring gauge to zero.

Install gauge adapter into previously cleaned spark plug hole.

Supply combustion chamber with air pressure.

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

LEAKAGE PERCENTAGE	ENGINE CONDITION
0% to 15%	Excellent condition
16% to 25%	Good condition
26% to 40%	Fair condition; engine will run and in some cases, performance might be affected
41% and higher	Poor condition, diagnose and repair engine

Diagnosis

Listen for air leaks.

- Air escaping on intake port/throttle body means leaking intake valve(s).
- Air escaping on exhaust port means leaking exhaust valve(s).
- Air bubbles out of radiator means leaking cylinder head gasket.
- Air/oil escaping from crankcase means damaged gasket and/or loosened screws.
- 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.

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

Reassembly

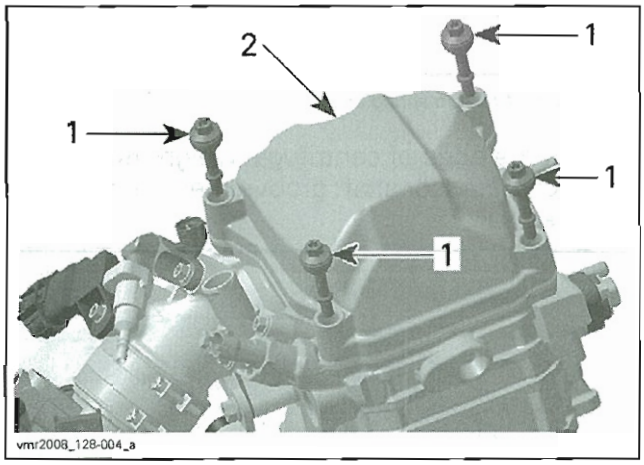
Reverse the preparation procedure. Ensure to respect torque values and use of appropriate products/lubricants. Refer to exploded views of other sections of this manual.

PROCEDURES

VALVE COVER

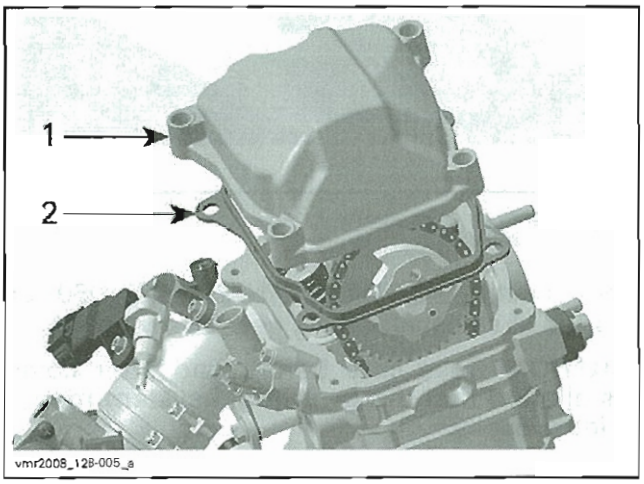
Valve Cover Removal

Remove distance screws of valve cover.



1. *Distance screws*
2. *Valve cover*

Remove valve cover and gasket.



1. *Valve cover*
2. *Gasket*

Valve Cover Inspection

Check the gasket no. 1 on the valve cover no. 2 if it is brittle, cracked or hard. If so, replace the gasket.

Valve Cover Installation

For installation, reverse the removal procedure.

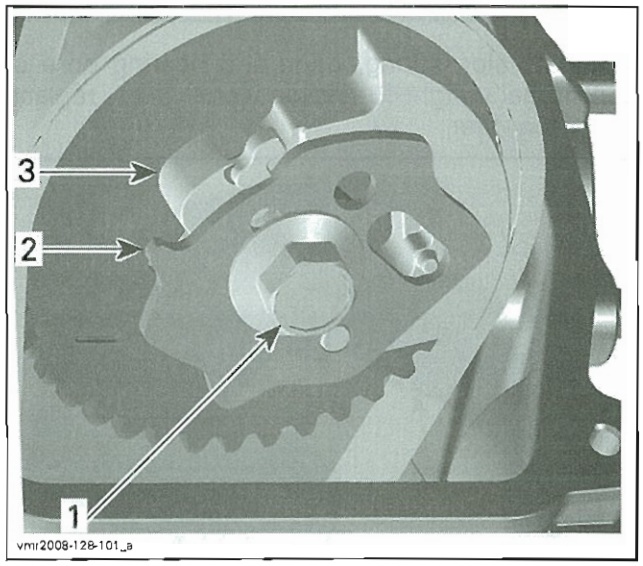
Torque the distance screws no. 3 in a criss-cross sequence.

DECOMPRESSOR

Decompressor Removal

Remove:

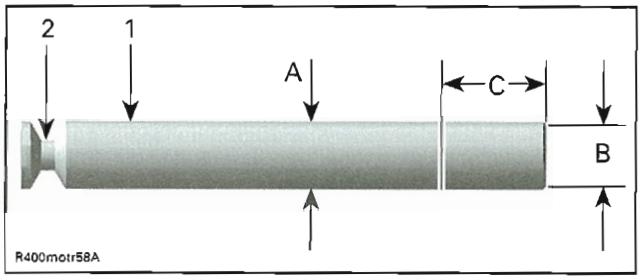
- Valve cover
- Camshaft timing gear screw
- Decompressor washer
- Centrifugal weight with torsion spring no. 11 and spacer no. 12
- Decompressor shaft no. 13.



1. *Camshaft timing gear screw*
2. *Decompressor washer*
3. *Centrifugal weight*

Decompressor Inspection

Check decompressor shaft for service limit, replace if out of specifications.

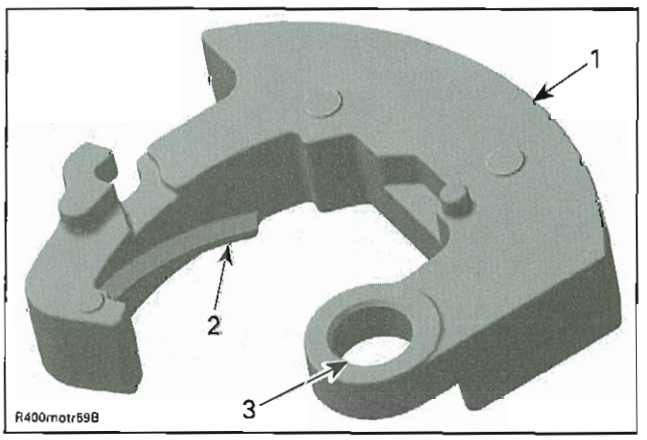


1. *Decompressor shaft*
2. *Groove for centrifugal weight*

A. *Measure here the bearing seat to cylinder head*
B. *Measure top end (contact to camshaft lobe exhaust)*
C. *7 mm (.276 in)*

DECOMPRESSOR SHAFT MEASUREMENT A	
NEW	5.578 to 5.590 mm (.219 to .220 in)
SERVICE LIMIT	5.450 mm (.215 in)
DECOMPRESSOR SHAFT MEASUREMENT B	
NEW	5.300 to 5.350 mm (.210 to .211 in)
SERVICE LIMIT	5.050 mm (.199 in)

Check torsion spring, edge and bearing bore of centrifugal weight for visible wear. If so, replace them together.

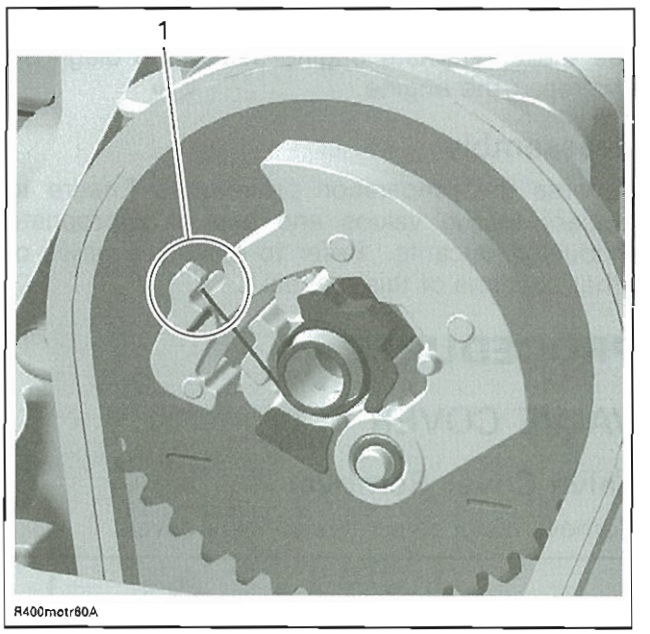


1. *Centrifugal weight*
2. *Edge of centrifugal weight*
3. *Bearing bore*

Decompressor Installation

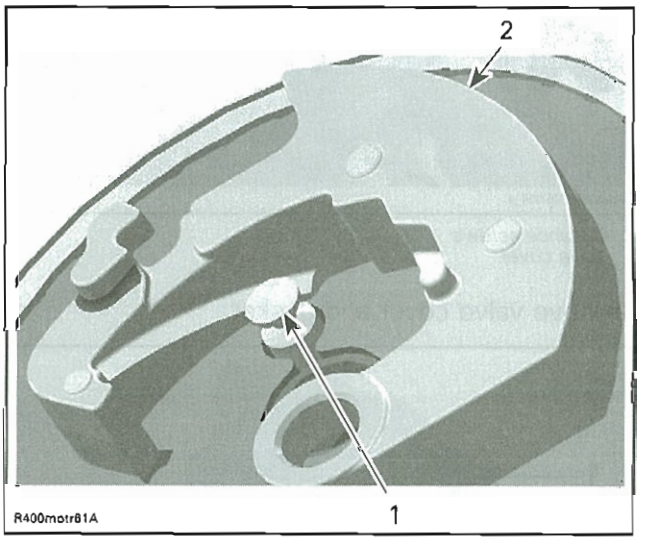
The installation is the reverse of the removal procedure, but pay attention to the following details.

Position the end of torsion spring properly in the centrifugal weight location.



1. *Position of torsion spring end*

Engage the edge of centrifugal weight no. 14 into the decompressor shaft groove then put the parts in place.



1. *Decompressor shaft groove*
2. *Centrifugal weight*

Apply Loctite 243 (blue) (P/N 293 800 060) on threads of camshaft timing gear screw no. 15.

CAUTION: Take care before and after cover installation that the centrifugal system moves (slides) easily.

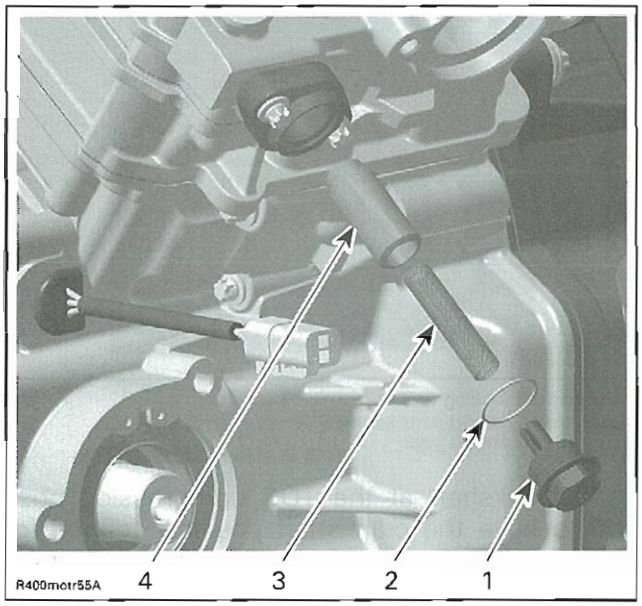
TIMING CHAIN TENSIONER

Tensioner Removal

⚠ WARNING

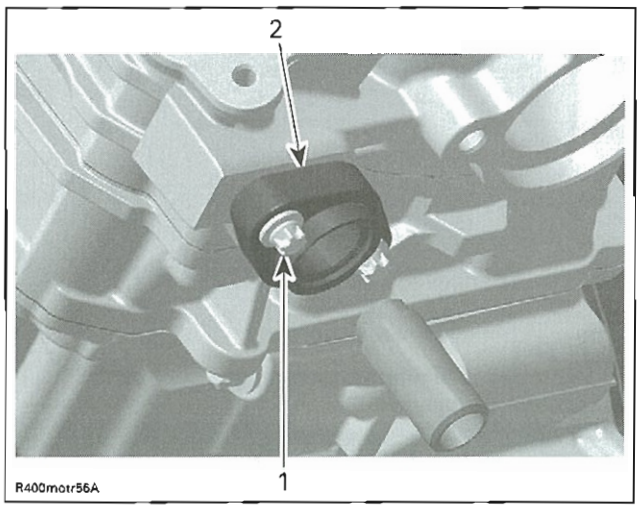
Chain tensioner is spring loaded. Never perform this operation immediately after the engine has been run because the exhaust system can be very hot. Wait until exhaust system is warm or cold.

Remove:
- Chain tensioner plug
- O-ring
- Spring
- Chain tensioner plunger.



1. Chain tensioner plug
2. O-ring
3. Spring
4. Chain tensioner plunger

Remove chain tensioner housing with its O-ring.



1. Chain tensioner screw
2. Chain tensioner housing

Tensioner Inspection

Check chain tensioner plunger no. 4 for free movement and/or scoring.

Check if possible chain guides for wear. Replace as necessary.

Check if O-ring no. 5 is brittle, cracked or hard. Replace as necessary.

Check condition of spring no. 6. Replace if broken or worn.

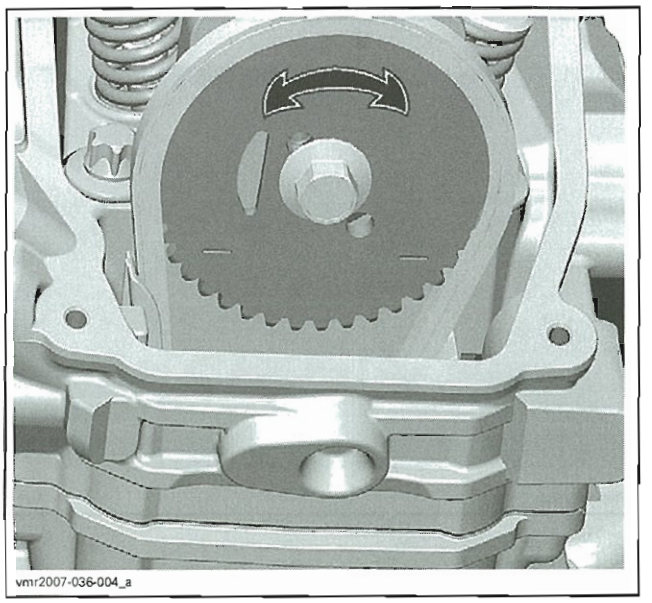
Check the housing no. 9 for cracks or other damages. Replace it if necessary.

Check if O-ring no. 10 is brittle, cracked or hard. Replace as necessary.

Tensioner Installation

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

NOTE: Before installing the chain tensioner make sure, that the camshaft timing gear can be moved back and forth.



TYPICAL — MOVE GEAR BACK AND FORTH

Apply engine oil on the plunger before installing.

NOTE: Slightly screw in the plunger until the tensioned chain allows no more back and forth movement of the camshaft timing gear. Then screw in the plunger an additional 1/8 turn to reach the required torque of 0.1 N•m (.9 lbf•**in**).

CAUTION: Improper adjustment of the chain tension will lead to severe engine damage.

Install the O-ring no. 5 on chain tensioner plug no. 7.

Fit the spring on one side into the slot of the plug screw and on the other side into the plunger. Turn spring only clockwise in order to fit the spring end into the notch of the plunger and to avoid loosening the plunger during spring installation. Do not preload the spring.

Then compress the spring and screw in the plug screw.

Finally tighten the plug screw to 4.5 N•m (40 lbf•**in**).

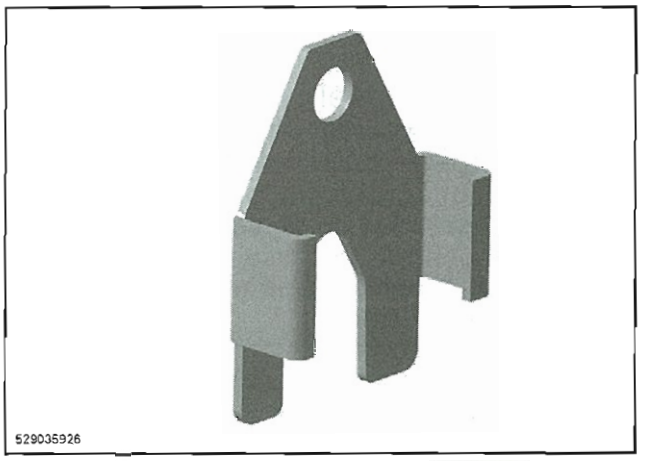
CAMSHAFT TIMING GEAR

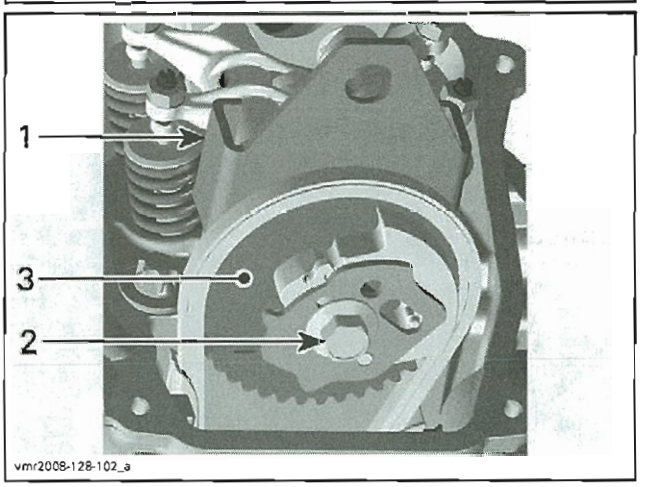
Camshaft Timing Gear Removal

Remove:

- Valve cover
- Chain tensioner.

Using the camshaft locking tool (P/N 529 035 926), lock the camshaft at TDC compression position to prevent timing chain stretching.





1. *Camshaft locking tool*
2. *Camshaft timing gear screw*
3. *Camshaft timing gear*

Lock crankshaft at the TDC compression position to have the crankshaft position defined for reassembly (refer to *CRANKCASE/CRANKSHAFT* section.

Remove the decompressor and the camshaft timing gear no. 16.

NOTE: Secure timing chain no. 17 with a retaining wire.

Camshaft Timing Gear Inspection

Check camshaft timing gear for wear or deterioration.

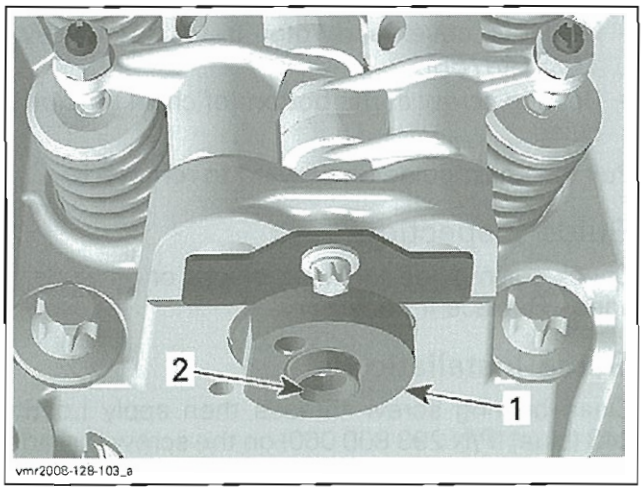
If teeth are worn or damaged, replace timing gear as well as the timing chain.

NOTE: For crankshaft gear, refer to *CRANKCASE/CRANKSHAFT*.

Camshaft Timing Gear Installation

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

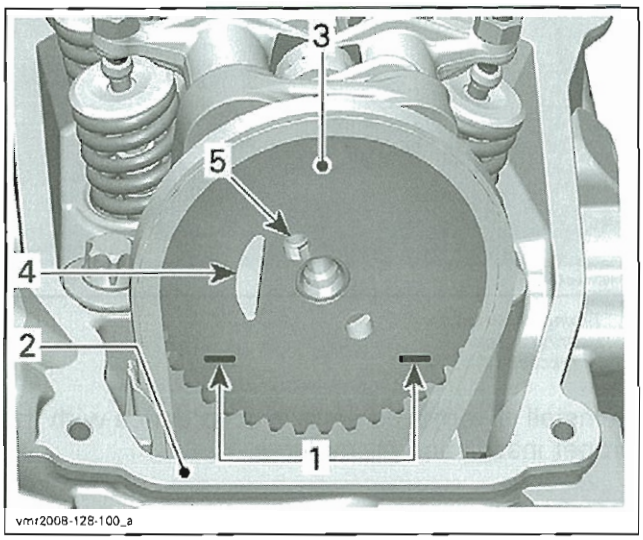
Clean mating surface and threads of camshaft prior to assemble camshaft timing gear.



1. *Mating surface on camshaft*
2. *Threads for camshaft timing gear screw*

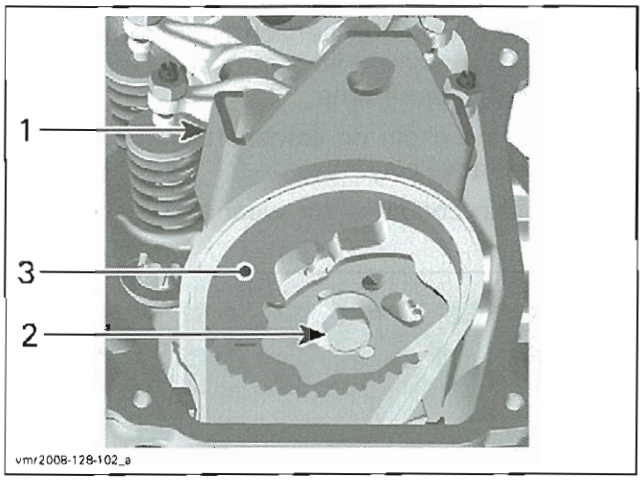
Camshaft timing gear must be at TDC compression before installing the timing chain.

Install camshaft timing gear so that the tabs are located into the flat zone of the camshaft. The printed marks on the camshaft timing gear have to be parallel to the cylinder head edge. See the following illustration for a proper positioning.



1. *Printed marks on camshaft timing gear*
2. *Cylinder head edge*
3. *Camshaft timing gear*
4. *Tab*
5. *Decompressor shaft bore*

CAUTION: Crankshaft and camshaft must be locked on TDC position to place camshaft timing gear and timing chain in the proper position. Never use the mark on the magneto to find the TDC. Only use the crankshaft locking tool to locate the TDC.



1. *Camshaft locking tool*
2. *Camshaft timing gear screw*
3. *Camshaft timing gear*

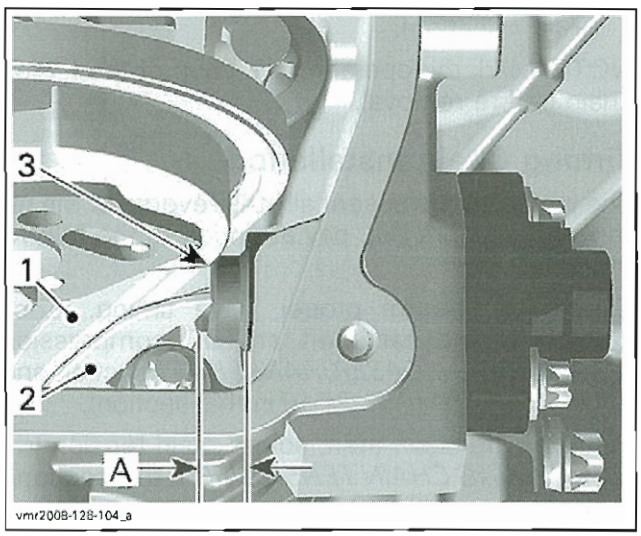
When the camshaft timing gear and the timing chain are installed, remove the crankshaft locking bolt as well as the camshaft locking tool.

Reinstall all other removed parts.

TIMING CHAIN

Timing Chain Inspection

The timing chain tensioner plunger protrusion gives a general information about the valve train (chain) condition.



1. *Camshaft timing gear*
2. *Timing chain guide*
3. *Chain tensioner plunger*

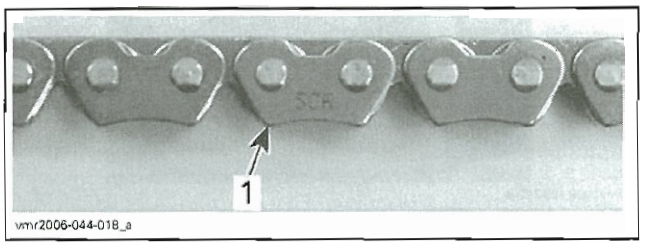
A. Chain tensioner plunger protrusion

CHAIN TENSIONER PLUNGER PROTRUSION	
SERVICE LIMIT	18.5 mm to 20 mm (.71 in to .79 in)

If protrusion exceeds service limit, replace timing chain, camshaft timing gear and timing chain guides at the same time.

Check timing chain on camshaft timing gear for excessive 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).

Timing Chain Removal

Remove:
- Engine from vehicle (refer to *ENGINE REMOVAL/INSTALLATION*)
- Valve cover, chain tensioner and camshaft timing gear
- Magneto cover and rotor (refer to *MAGNETO/STARTER* section)
- Output shaft (refer to *GEARBOX/OUTPUT SHAFT* section).

NOTE: Mark the operating direction of the timing chain before removal.

Timing Chain Installation

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

Ensure to perform proper valve timing. Lock crankshaft and camshaft at TDC compression (refer to *CRANKCASE/CRANKSHAFT* section and *CAMSHAFT TIMING GEAR* in this section).

Install timing chain then, adjust chain tension (refer to *TIMING CHAIN TENSIONER* in this section).

CAUTION: Improper valve timing will damage engine components.

TIMING CHAIN GUIDE (TENSIONER SIDE)

Guide Removal

Remove:
- Engine from vehicle (refer to *ENGINE REMOVAL/INSTALLATION*)
- Magneto cover and rotor (refer to *MAGNETO/STARTER*)
- Bearing screw at the bottom of chain tensioner guide.

Pull the chain guide downward to remove it.

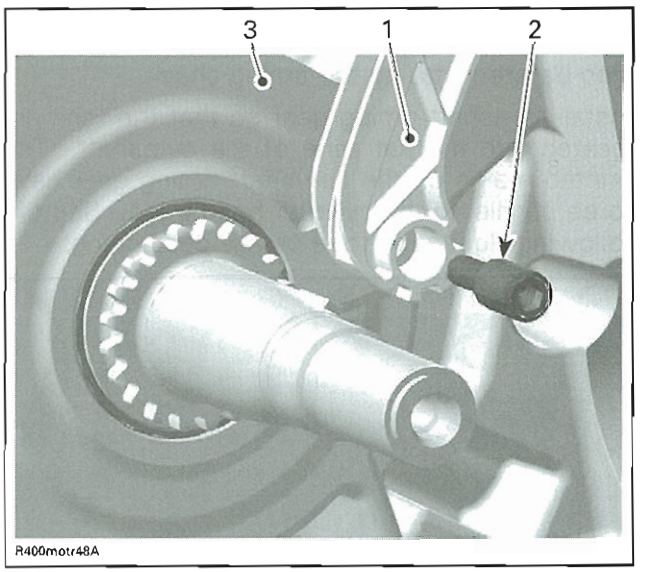
Guide Inspection

Check chain guide for wear, cracks or other damages. Replace if necessary.

Guide Installation

Clean bearing screw threads then apply Loctite 243 (blue) (P/N 293 800 060) on the screw threads.

Install the guide in crankcase housing then torque bearing screw to 10 N•m (89 lbf•**in**).



1. Timing chain guide
2. Bearing screw
3. Crankcase MAG side

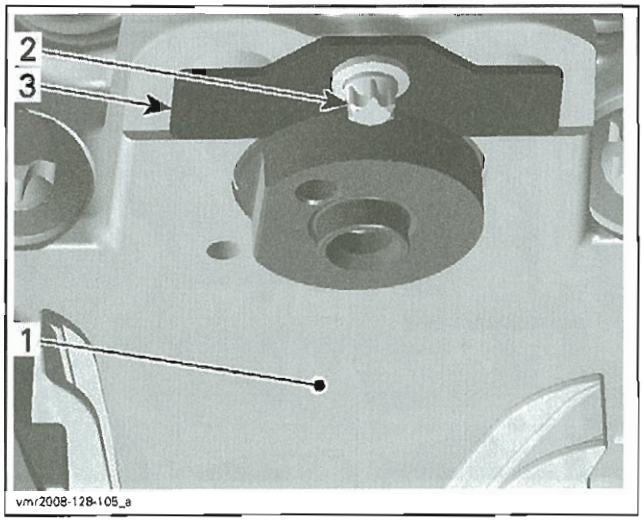
Reinstall all removed parts in accordance with the proper installation procedures.

ROCKER ARM

Rocker Arm Removal

Lock crankshaft to TDC compression, refer to *CRANKCASE/CRANKSHAFT*.

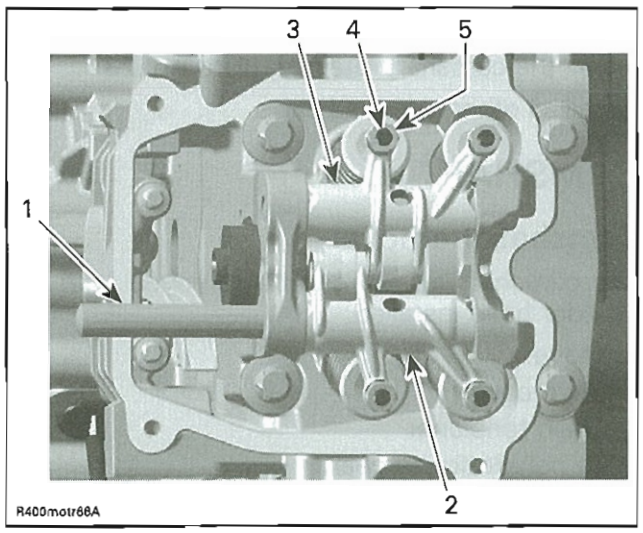
Remove:
- Valve cover
- Chain tensioner
- Camshaft timing gear no. 16
- Camshaft retaining plate.



1. Cylinder head
2. Camshaft retaining plate screw
3. Camshaft retaining plate

Remove rocker arm shafts.

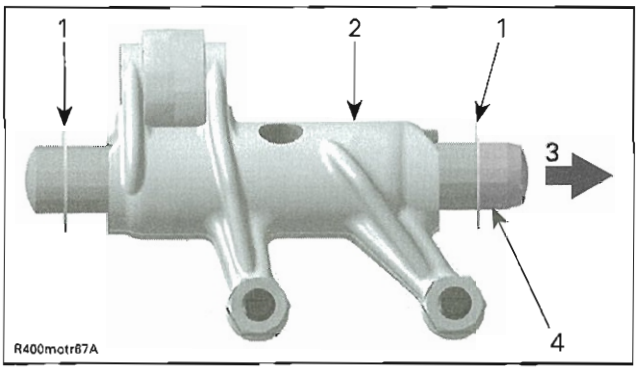
Remove rocker arms assembly (exhaust side and intake side) with adjustment screws and nuts.



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

Remove thrust washers no. 19 and no. 22.

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

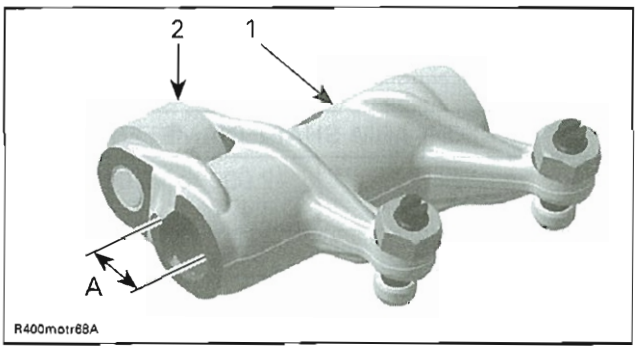


1. 2 thrust washers
2. Rocker arm (exhaust side)
3. Cylinder head — spark plug side
4. Big taper to PTO side

Rocker Arm Inspection

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.

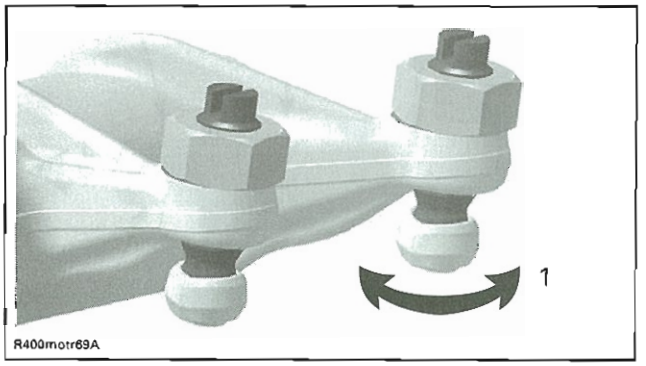


1. Rocker arm (exhaust side)
2. Roller
A. Bore for rocker arm shaft

Measure rocker arm bore diameter. If diameter is out of specification, change the rocker arm assembly.

ROCKER ARM BORE DIAMETER	
NEW	12.036 to 12.050 mm (.4739 to .4744 in)
SERVICE LIMIT	12.060 mm (.4748 in)

Check adjustment screws for free movement, cracks and/or excessive play.

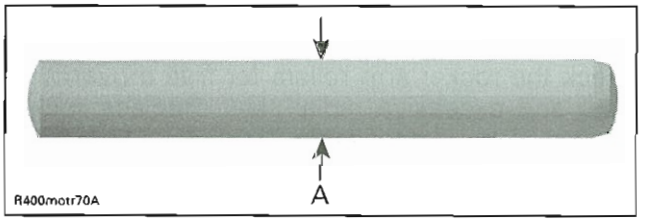


1. Free movement of adjustment screw top

Rocker Arm Shaft

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 to 12.018 mm (.4724 to .4731 in)
SERVICE LIMIT	11.990 mm (.4720 in)

Any area worn excessively will require parts replacement.

Rocker Arm Installation

NOTE: Use the same procedure for exhaust or intake rocker arm.

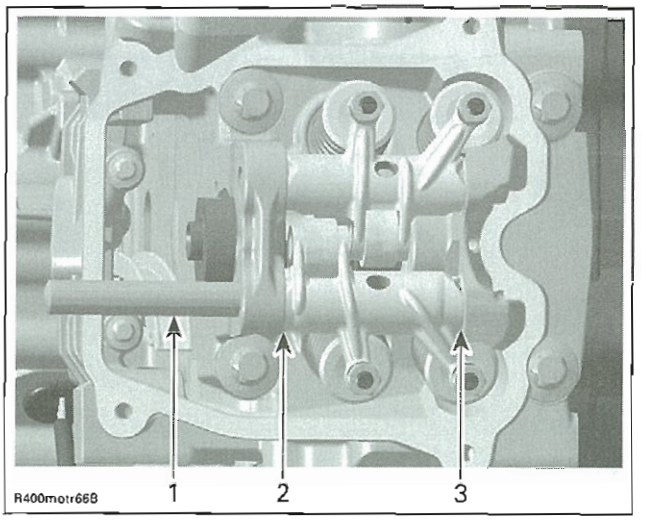
Apply engine oil on rocker arm shafts no. 18.

Install the rocker arm shafts with the chamfered edge first and use following procedure:

Insert a rocker arm shaft through rocker arm shaft bore.

Install thrust washer no. 19 then the proper rocker arm (exhaust no. 20 or intake no. 21).

Push in rocker arm shaft until its chamfer reaches the end of rocker arm bore.



1. Rocker arm shaft
2. Thrust washer (MAG side)
3. Thrust washer (PTO side)

Place the other thrust washer no. 22 and push rocker arm shaft to end position.

Install the other rocker arm by using the previous procedure.

Install the camshaft retaining plate no. 23.

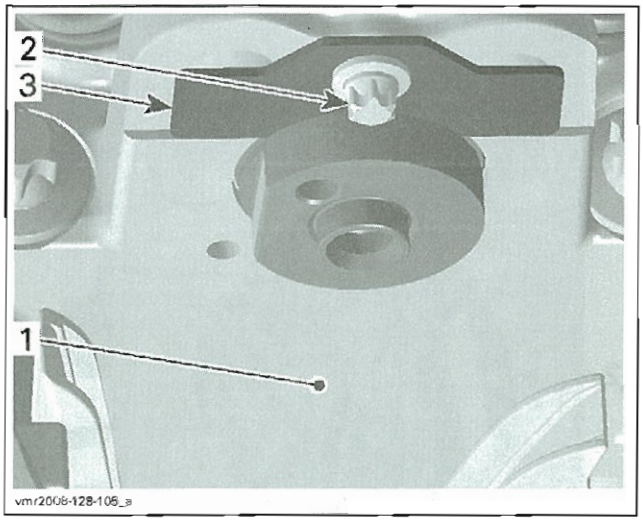
Install all other removed parts.

CAMSHAFT

Camshaft Removal

The camshaft no. 28 can be removed with the cylinder head installed.

Remove:
- Valve cover
- Chain tensioner
- Camshaft timing gear
- Camshaft retaining plate.

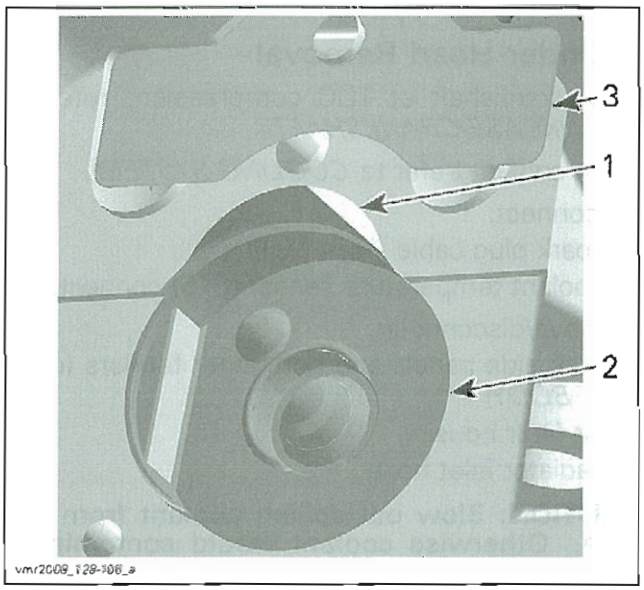


1. *Cylinder head*
2. *Camshaft retaining plate screw*
3. *Camshaft retaining plate*

Remove rocker arms (see *ROCKER ARM* above).

Remove the camshaft.

NOTE: For removal rotate camshaft so that intake/exhaust lobe shows to upper side of cylinder head.

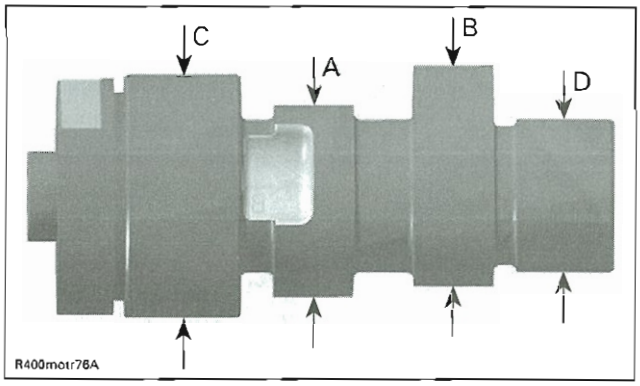


1. *Area for camshaft lobes*
2. *Camshaft*
3. *Camshaft retaining plate*

Camshaft Inspection

Check each lobe and bearing journal of camshaft for scoring, scuffing, cracks or other signs of wear.

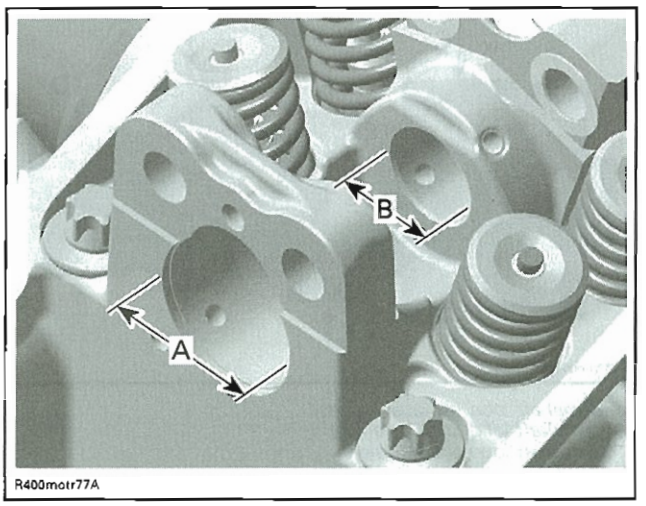
Measure camshaft bearing journal diameter and lobe height using a micrometer.



A. Camshaft lobe (exhaust valves)
B. Camshaft lobe (intake valves)
C. Camshaft journal MAG side
D. Camshaft journal PTO side

CAMSHAFT LOBE — EXHAUST VALVES	
NEW	31.937 to 32.137 mm (1.2574 to 1.2652 in)
SERVICE LIMIT	31.920 mm (1.2567 in)
CAMSHAFT LOBE — INTAKE VALVES	
NEW	32.253 to 32.453 mm (1.2698 to 1.2777 in)
SERVICE LIMIT	32.235 mm (1.2691 in)
CAMSHAFT JOURNAL — MAG SIDE	
NEW	34.959 to 34.975 mm (1.3763 to 1.3770 in)
SERVICE LIMIT	34.950 mm (1.3760 in)
CAMSHAFT JOURNAL — PTO SIDE	
NEW	21.959 to 21.980 mm (.8645 to .8654 in)
SERVICE LIMIT	21.950 mm (.8642 in)

Measure clearance between both ends of camshaft and cylinder head.



A. Cylinder head camshaft bearing MAG side
B. Cylinder head camshaft bearing PTO side

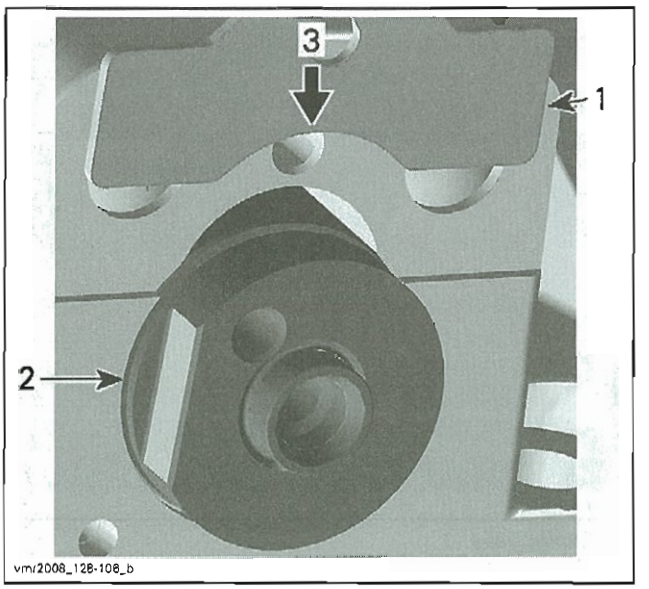
CYLINDER HEAD CAMSHAFT BEARING — MAG SIDE	
NEW	35.000 to 35.025 mm (1.3780 to 1.3789 in)
SERVICE LIMIT	35.040 mm (1.3795 in)
CYLINDER HEAD CAMSHAFT BEARING — PTO SIDE	
NEW	22.000 to 22.021 mm (.8661 to .8670 in)
SERVICE LIMIT	22.040 mm (.8677 in)

Replace parts that are not within specifications.

Camshaft Installation

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

Install camshaft in the opposite way of the removal then place the camshaft retaining plate no. 23 in the slot.



1. Camshaft retaining plate position
2. Slot retaining camshaft
3. Direction of movement

For other parts, refer to proper installation procedure.

CYLINDER HEAD

Cylinder Head Removal

Lock crankshaft at TDC compression, refer to *CRANKCASE/CRANKSHAFT*.

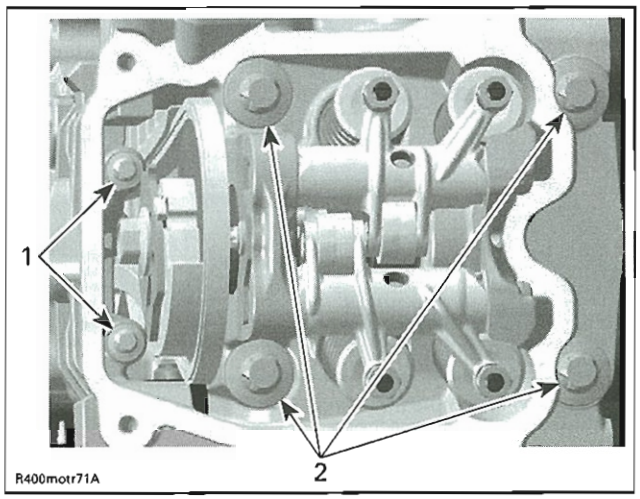
Drain coolant (refer to *COOLING SYSTEM*).

Disconnect:
- Spark plug cable
- Coolant temperature sensor (CTS) connector.

Remove/disconnect:
- Both side panels and both inner fenders (refer to *BODY*)
- Air filter housing
- Radiator inlet hose

CAUTION: Blow out spilled coolant from engine. Otherwise coolant would contaminate engine oil at cylinder head removal.
- MAPS, IACV and TPS connectors
- Fuel hose at fuel rail
- Injector connector
- LH upper engine support
- Exhaust pipe nuts
- Intake socket clamp (cylinder head side only)
- Chain tensioner
- Valve cover
- Camshaft timing gear
- Cylinder head screws M6

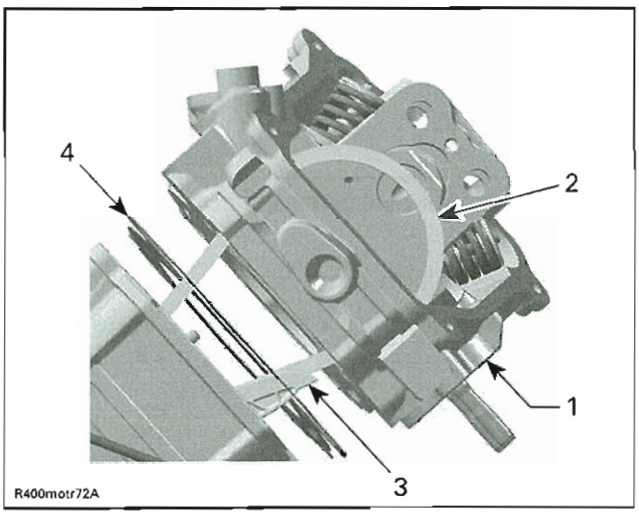
– Cylinder head screws M10 retaining cylinder head **no. 24** and cylinder **no. 25** to crankcase housings.



1. Cylinder head screws M6
2. Cylinder head screws M10

Pull up cylinder head.

Remove:
– Chain guide **no. 27** (opposite chain tensioner)
– Cylinder head gasket (discard).



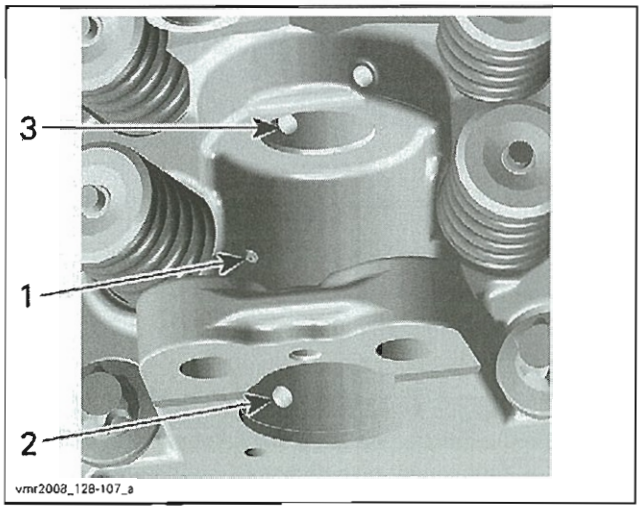
1. Cylinder head
2. Timing chain
3. Chain guide
4. Cylinder head gasket

Cylinder Head Inspection

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 MAG side
3. Oil supply to camshaft bearing journal PTO side

Cylinder Head Installation

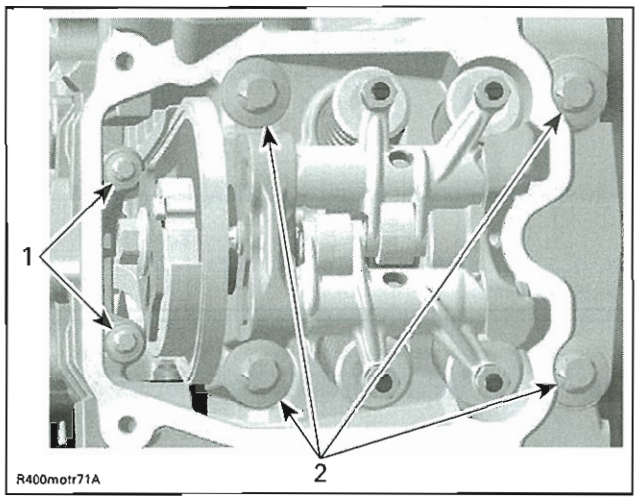
For installation, reverse the removal procedure. Pay attention to the following details.

Ensure dowel pins are in place.

Install a new cylinder head gasket **no. 26**.

First, torque cylinder head screws M10 in criss-cross sequence to 20 N•m (15 lbf•ft) then finish tightening to 60 N•m (44 lbf•ft).

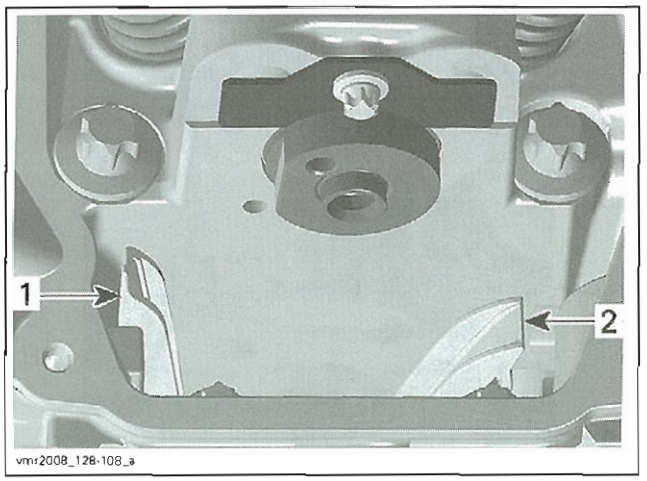
Torque cylinder head screws M8 to 10 N•m (89 lbf•**in**).



1. Cylinder head screws M6
2. Cylinder head screws M10

Check timing chain guide **no. 27** for movement.

CAUTION: Chain guide has to be fixed between cylinder and cylinder head.



1. Chain guide (fixed between cylinder and cylinder head)
2. Chain guide on tensioner side (mounted in crankcase)

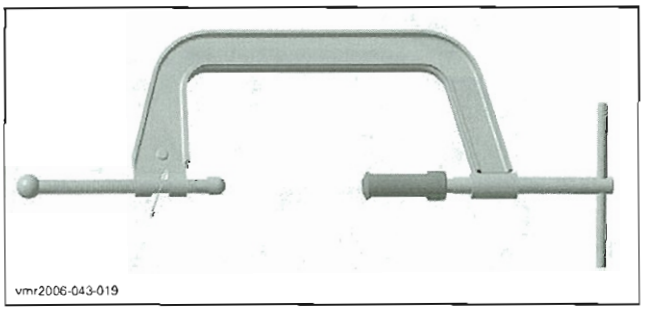
Remove crankshaft locking bolt then reinstall all other removed parts.

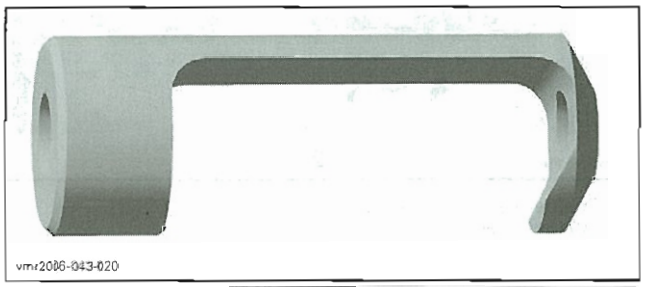
VALVE SPRING

Valve Spring Removal

Remove:
- Rocker arms no. 20 and no. 21
- Cylinder head no. 24.

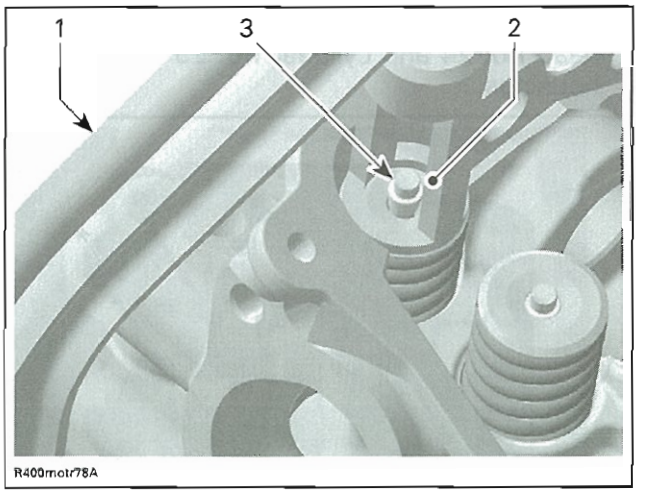
Compress valve spring no. 29; use the valve spring compressor clamp (P/N 529 035 764) and the valve spring compressor cup (P/N 529 035 725).



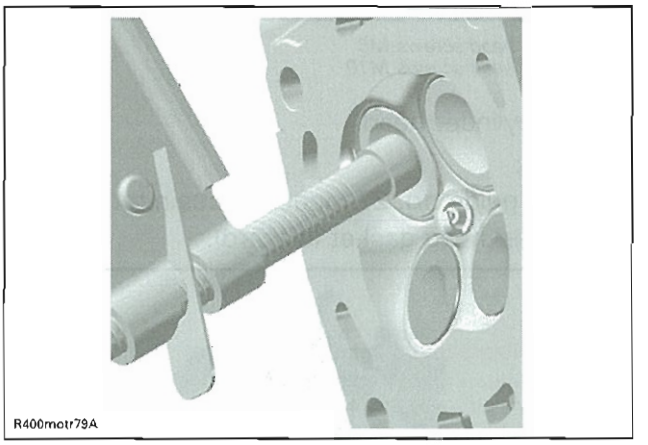


⚠ WARNING

Always wear safety glasses when disassembling valve springs. Be careful when unlocking valves. Components could fly away because of the strong spring preload.



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



LOCATE VALVE SPRING COMPRESSOR CLAMP IN CENTER OF THE VALVE

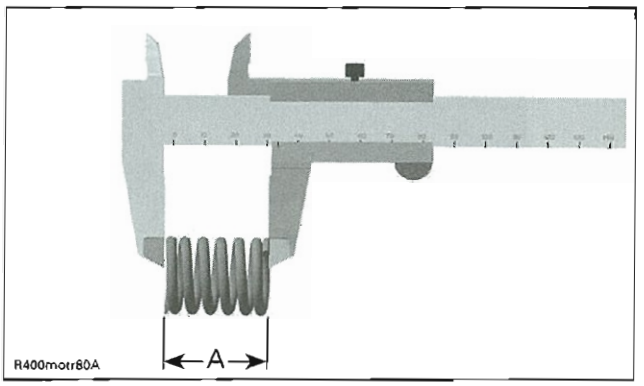
Remove valve cotters no. 30.

Withdraw valve spring compressor, valve spring retainer no. 31 and valve spring no. 29.

Valve Spring Inspection

Check valve springs for visible damages. If so, replace them.

Check valve springs for free length and straightness.



A. Valve spring length

VALVE SPRING FREE LENGTH	
NEW	40.81 mm (1.607 in)
SERVICE LIMIT	39.00 mm (1.535 in)

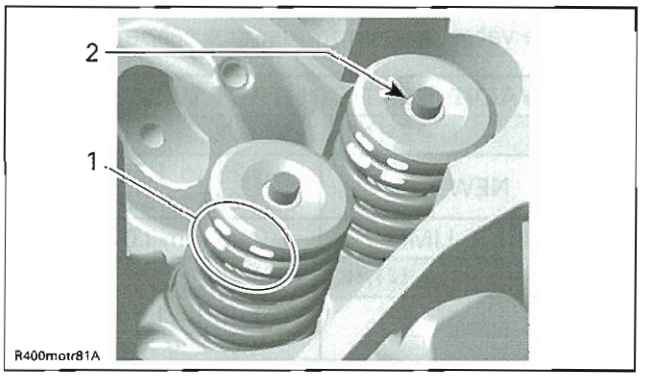
Replace valve springs if not within specifications.

Valve Spring Installation

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

Colored area of the valve springs must be placed on top.

NOTE: Valve cotters must be properly engaged in valve stem grooves.



1. Position of the valve spring
2. Valve cotters

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.

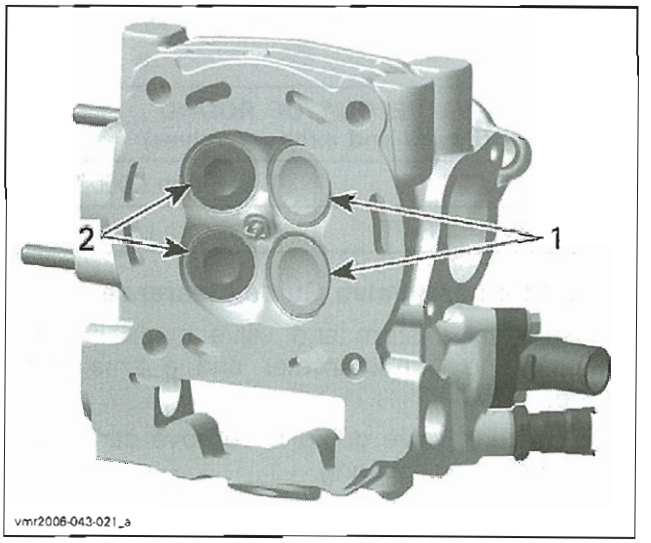
CAUTION: An improperly locked valve spring will cause engine damage.

VALVE

Valve Removal

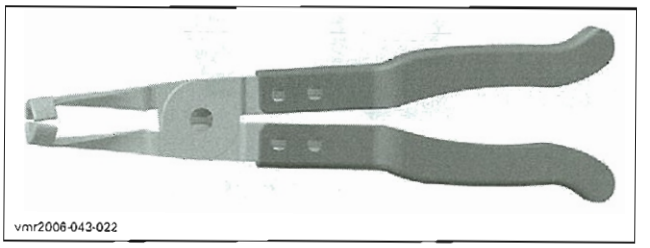
Remove valve spring(s) no. 29.

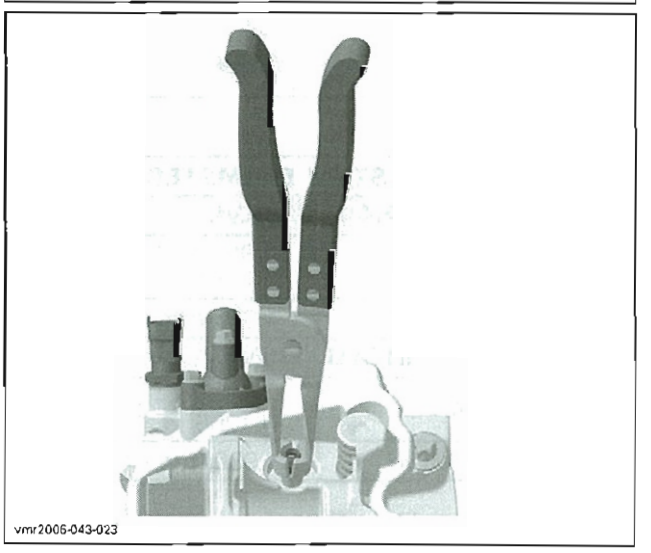
Push valve stem then pull valves out of valve guide no. 32.



1. Intake valve 31 mm (1.22 in)
2. Exhaust valve 27 mm (1.06 in)

Remove valve stem seal no. 33 with the valve stem seal pliers (P/N Snap-on YA 8230).





Valve Inspection

Valve Stem Seal

Inspection of valve stem seals is not needed because new seals should always be installed whenever cylinder head is removed.

Valve

Inspect valve surface, check for abnormal stem wear and bending. If out of specification, replace by a new one.

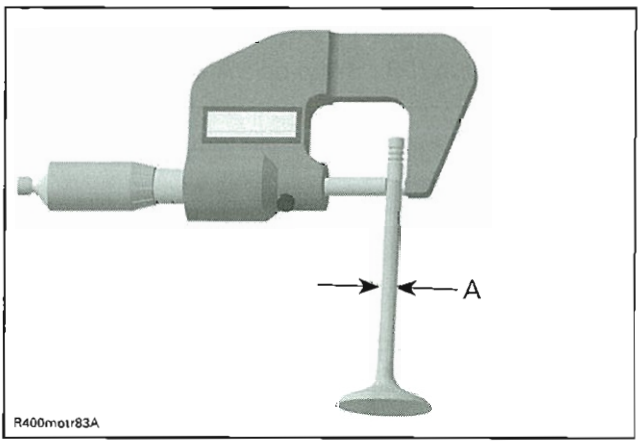
VALVE OUT OF ROUND (intake and exhaust valves)	
NEW	0.005 mm (.0002 in)
SERVICE LIMIT	0.06 mm (.0024 in)

Valve Stem and Valve Guide Clearance

Measure valve stem and valve guide in three places using a micrometer and a small bore gauge.

NOTE: Clean valve guide to remove carbon deposits before measuring.

Change valve if valve stem is out of specification or has other damages such as wear or friction surface.



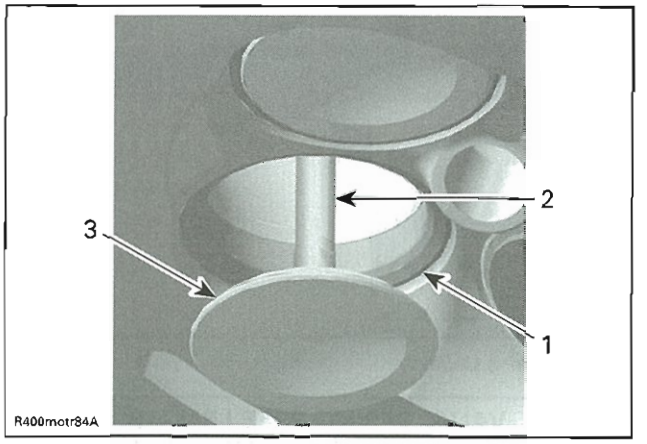
A. Valve stem diameter

VALVE STEM DIAMETER	
EXHAUST VALVE	
NEW	4.956 to 4.970 mm (.1951 to .1957 in)
SERVICE LIMIT	4.930 mm (.1941 in)
INTAKE VALVE	
NEW	4.966 to 4.980 mm (.1955 to .1960 in)
SERVICE LIMIT	4.930 mm (.1941 in)

Replace valve guide no. 32 if it is out of specification or has other damages such as wear or friction surface.

VALVE GUIDE DIAMETER (intake and exhaust valves)	
SERVICE LIMIT	5.050 mm (.1988 in)

Valve Face and Seat



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

Check valve face and seat for burning or pittings and replace valve or cylinder head if there are signs of damage.

Ensure to seat valves properly. Apply some lapping compound to valve face and work valve on its seat with a lapping tool (see *VALVE GUIDE PROCEDURE* below).

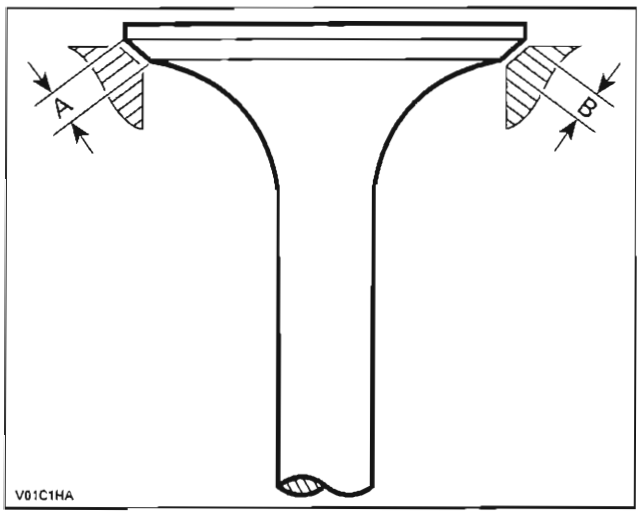
Measure valve face contact width.

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 to 1.55 mm (.049 to .061 in)
SERVICE LIMIT	2.00 mm (.078 in)
INTAKE VALVE	
NEW	1.05 to 1.35 mm (.041 to .053 in)
SERVICE LIMIT	1.80 mm (.070 in)

If valve seat contact width is too wide or has dark spots, replace the cylinder head.

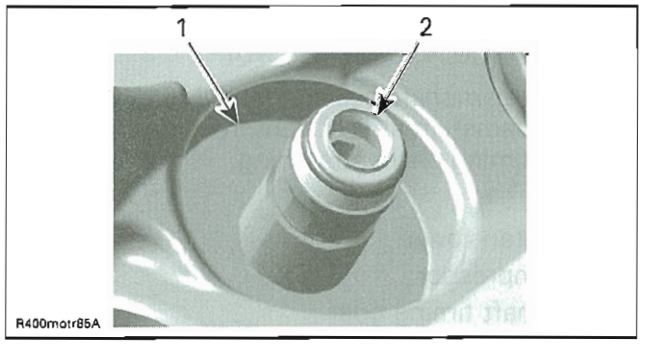


A. Valve face contact width
B. Valve seat contact width

Valve Installation

For installation, 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.



1. Thrust washer
2. Sealing lips of valve stem seal

Apply engine oil on valve stem and install it.

CAUTION: Be careful when valve stem is passed through sealing lips of valve stem seal.

To ease installation of valve 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.

CAUTION: An improperly locked valve spring will cause engine damage.

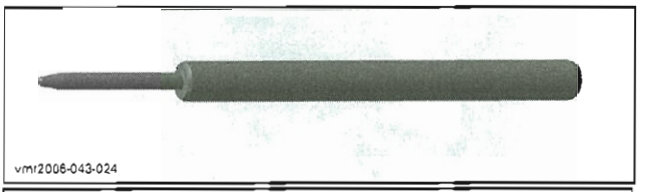
VALVE GUIDE

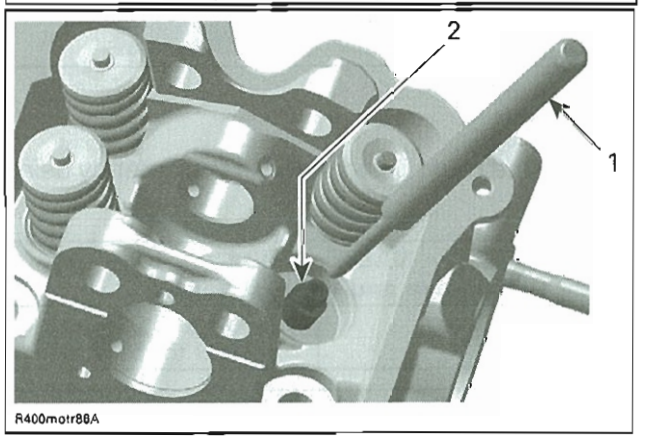
Valve Guide Removal

Remove:
- Cylinder head
- Valve spring
- Valves.

NOTE: Clean valve guide area from contamination before removal.

Using the valve guide remover (P/N 529 035 924) and a hammer, remove valve guide.





1. Valve guide remover
2. Valve guide

Valve Guide Inspection

Always replace valve stem seals whenever valve guides are removed.

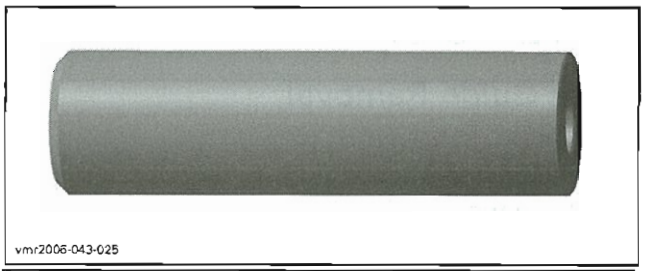
Clean the valve guide bore before reinstalling the valve guide into cylinder head.

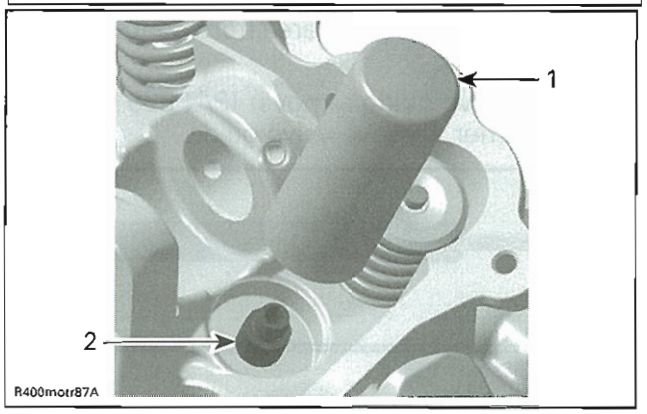
Valve Guide Installation

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

Apply Loctite 767 (antiseize lubricant) (P/N 293 800 070) on valve guide no. 32 prior to install it into the cylinder head no. 24.

Use the valve guide installer (P/N 529 036 140) to install valve guide in the cold cylinder head.

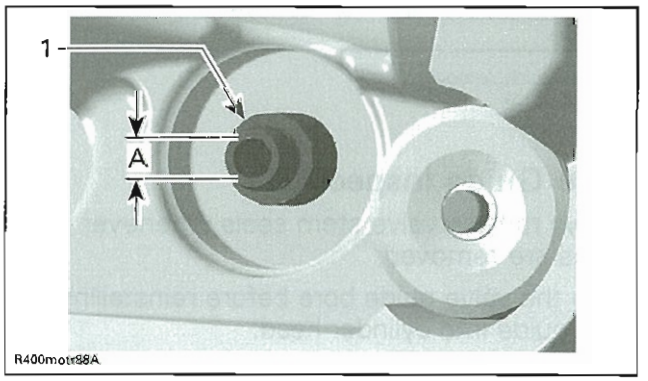




1. Valve guide installer
2. Valve guide

Valve guide must be adjusted in diameter by using a reamer.

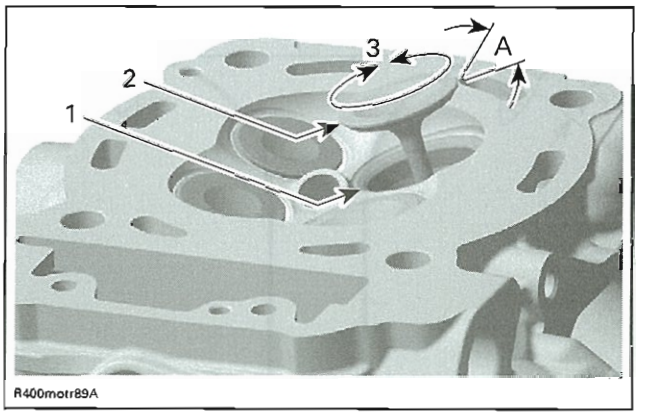
VALVE GUIDE (intake and exhaust valves)	
NEW	4.998 to 5.018 mm (.1968 to .1976 in)



1. Valve guide
A. Valve guide diameter

NOTE: Ensure to turn reamer in the right direction. Use cutting oil and make brakes to clean reamer/valve guide from metal shavings.

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

Cylinder Removal

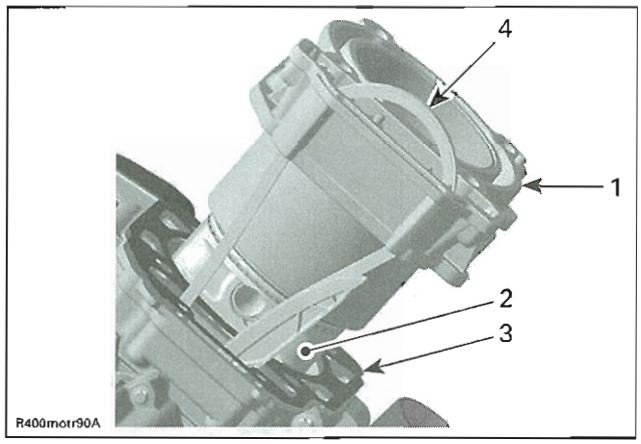
Lock crankshaft at TDC compression position, refer to *CRANKCASE/CRANKSHAFT*.

Using the camshaft locking tool (P/N 529 035 926), lock the camshaft at TDC compression position to prevent timing chain stretching.

Remove:
- Chain tensioner
- Decompressor
- Camshaft timing gear
- Cylinder head.

Pull cylinder **no. 25**.

Discard cylinder base and cylinder head gasket.



1. *Cylinder*
2. *Piston assembly*
3. *Cylinder base gasket*
4. *Camshaft timing chain*

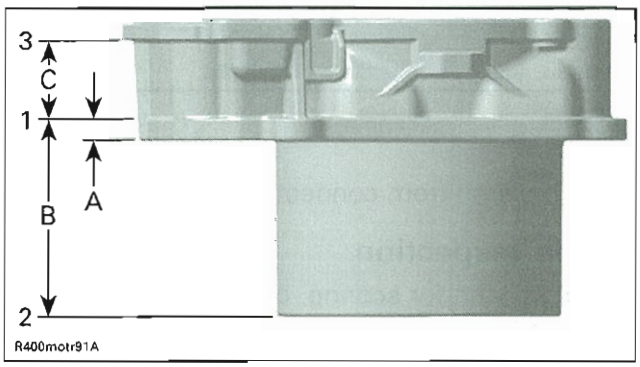
Cylinder Inspection

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 and if it is out of specifications, replace cylinder and piston ring set **no. 35**.

Measure cylinder bore at 3 recommended positions. See the following illustration.



1. *First measuring of diameter*
2. *Second measuring of diameter*
3. *Third measuring of diameter*

A. 7 mm (.276 in) from cylinder bottom
B. 68 mm (2.68 in)
C. 32 mm (1.260 in)

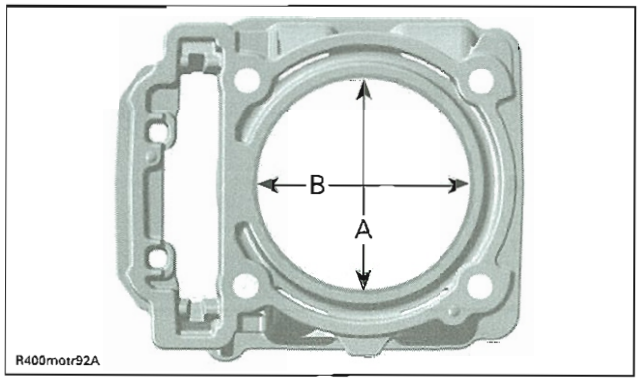
CYLINDER TAPER	
NEW	0.038 mm (.0015 in)
SERVICE LIMIT	0.090 mm (.0035 in)

Distance between measurements should not exceed the service limit mentioned above.

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

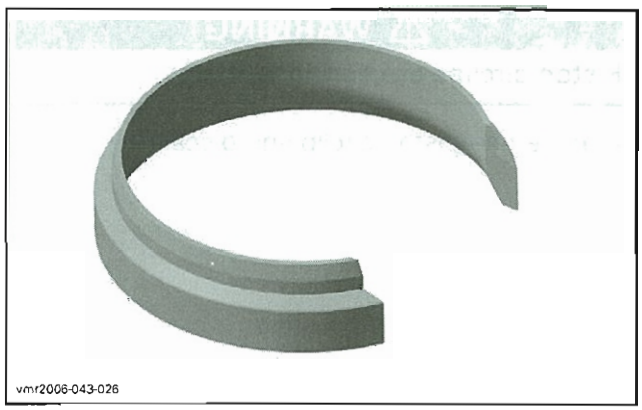
CYLINDER OUT OF ROUND	
NEW	0.015 mm (.0006 in)
SERVICE LIMIT	0.020 mm (.0008 in)

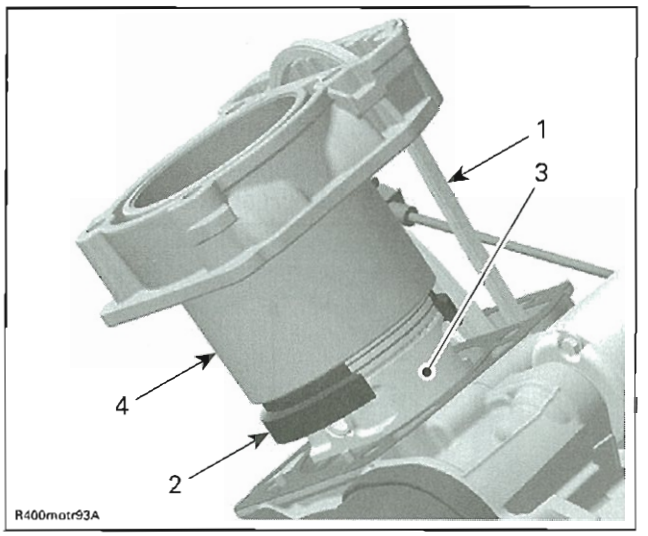
Cylinder Installation

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

Install a new cylinder base gasket **no. 36**.

Apply engine oil in the bottom area of the cylinder bore and also on the band of the piston ring compressor tool (P/N 529 035 919).





1. *Timing chain*
2. *Piston ring compressor tool*
3. *Piston*
4. *Cylinder*

NOTE: Put timing chain through the chain pit then put the cylinder in place.

Install cylinder head and the other parts in accordance with the proper installation procedures.

PISTON

Piston Removal

Remove:

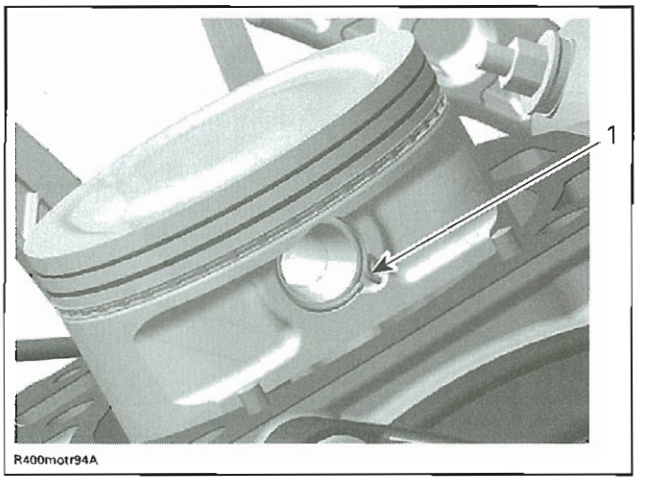
- Cylinder head no. 24
- Cylinder no. 25.

Place a rag under piston no. 37 and in the timing chain area.

⚠ WARNING

Piston circlips are spring loaded.

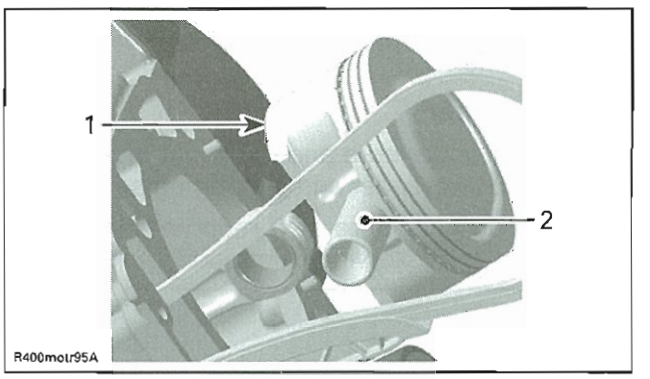
Remove one piston circlip and discard it.



1. *Piston circlip*

NOTE: The removal of both piston circlips is not necessary to remove piston pin.

Push piston pin out of piston.



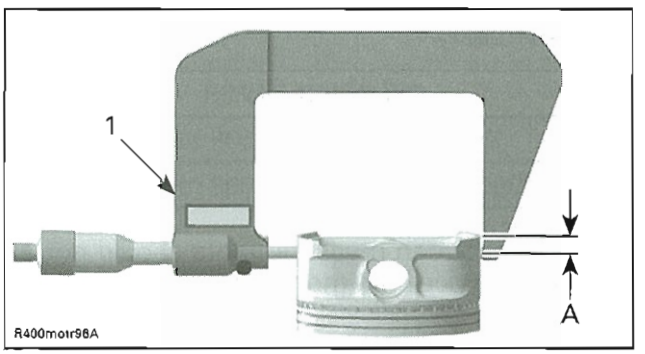
1. *Piston*
2. *Piston pin*

Detach piston from connecting rod.

Piston Inspection

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.



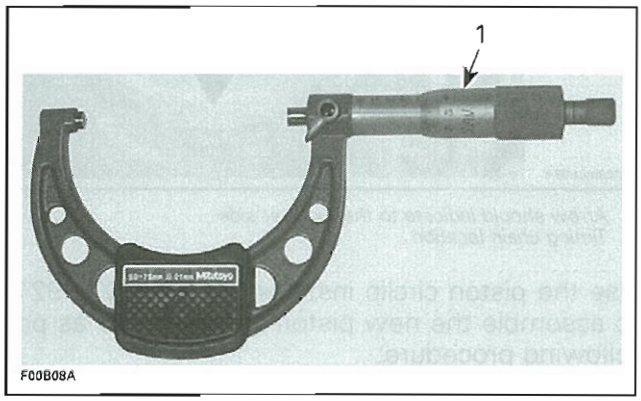
1. *Measuring perpendicularly (90°) to piston pin*
A. *8 mm (.315 in)*

The measured dimension should be as described in the following table. If not, replace piston.

PISTON MEASUREMENT	
NEW	90.950 to 90.966 mm (3.5807 to 3.5813 in)
SERVICE LIMIT	90.850 mm (3.577 in)

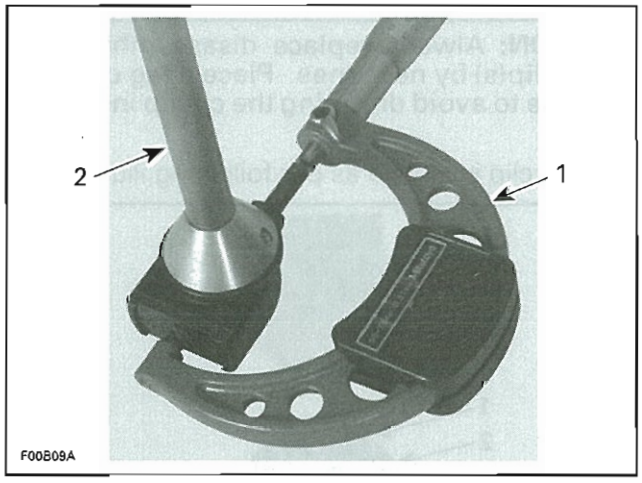
Piston/Cylinder Clearance

Adjust and lock a micrometer to the piston dimension.

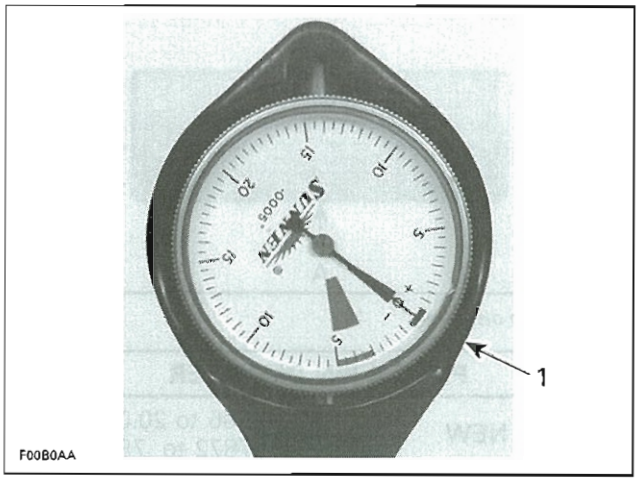


1. Micrometer set to the piston dimension

With the micrometer set to the dimension, adjust a cylinder bore gauge to the micrometer dimension and set the indicator to 0 (zero).



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	0.027 to 0.057 mm (.0011 to .0022 in)
SERVICE LIMIT	0.010 mm (.004 in)

NOTE: Make sure used piston is not worn. See *PISTON MEASUREMENT* above.

If clearance exceeds specified tolerance, replace cylinder.

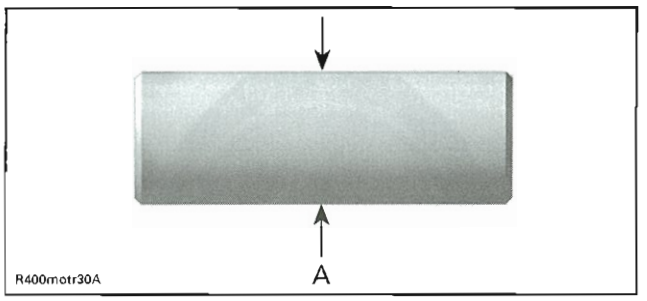
NOTE: Make sure the cylinder bore gauge indicator is set exactly at the same position as with the micrometer, otherwise the reading will be false.

Piston Pin

Using synthetic abrasive woven, clean piston pin no. 38 from deposits.

Inspect piston pin for scoring, cracking or other damages.

Measure piston pin. See the following illustration for the proper measurement position.



A. Piston pin diameter

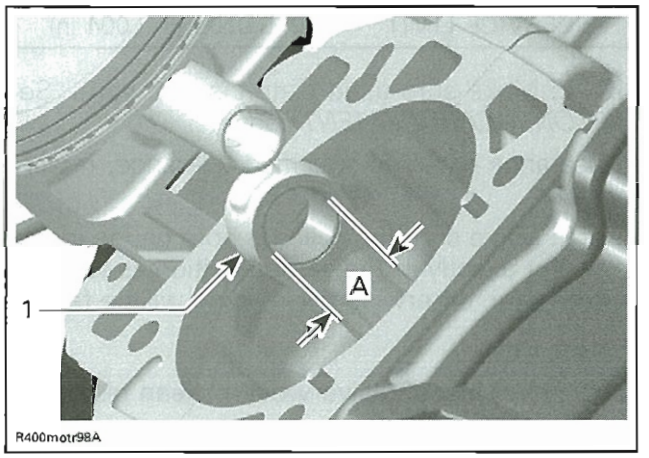
PISTON PIN DIAMETER	
NEW	19.996 to 20.000 mm (.7872 to .7874 in)
SERVICE LIMIT	19.980 mm (.7866 in)

Replace piston pin if diameter is out of specifications.

Piston Pin/Connecting Rod Bushing Clearance

Measure inside diameter of connecting rod.

CONNECTING ROD SMALL END DIAMETER	
NEW	20.010 to 20.020 mm (.7878 to .7882 in)
SERVICE LIMIT	20.060 mm (.7898 in)



1. Connecting rod small end
A. Connecting rod small end diameter

Replace connecting rod if diameter of connecting rod small end is out of specifications. Refer to *CRANKCASE/CRANKSHAFT* for removal procedure.

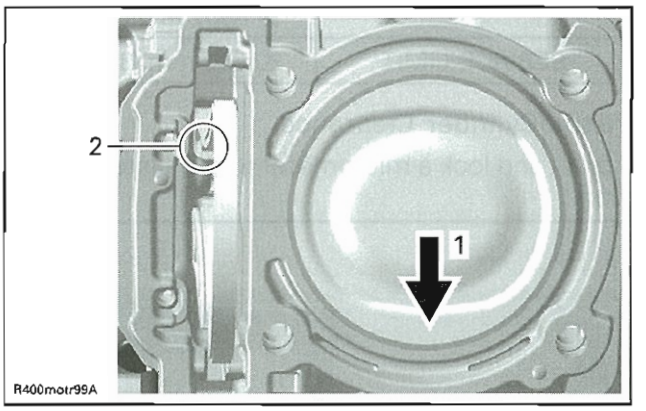
Piston Installation

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

Apply engine oil on the piston pin.

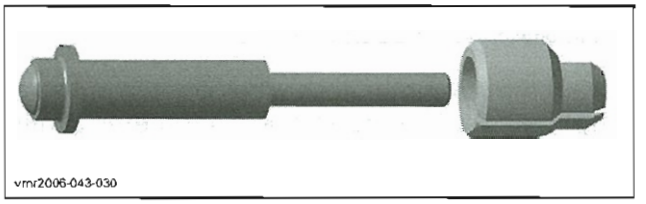
Place piston **no. 37** over connecting rod. Position the piston with the punched arrow towards the exhaust side.

Insert piston pin **no. 38** into piston and connecting rod.



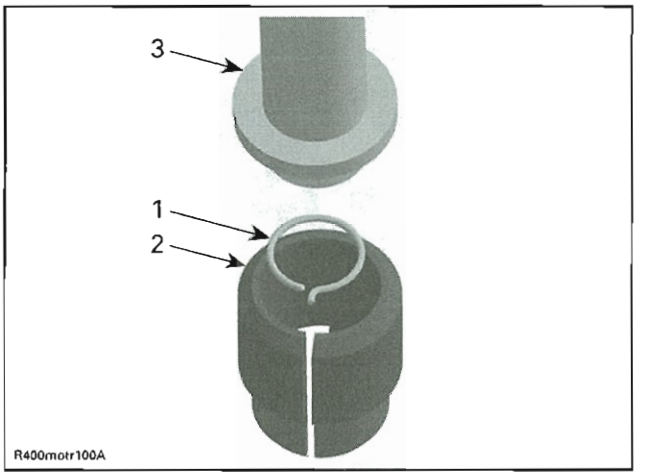
1. Arrow should indicate to the exhaust side
2. Timing chain location

Use the piston circlip installer (P/N 529 035 921) to assemble the new piston circlip **no. 39** as per following procedure:



CAUTION: Always replace disassembled piston circlip(s) by new ones. Place a rag on cylinder base to avoid dropping the circlip inside the engine.

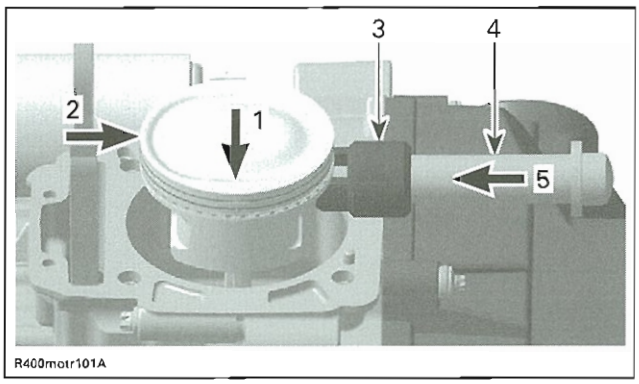
Place circlip in sleeve as per following illustration.



1. Circlip
2. Sleeve
3. Assembly jig from piston clip installer

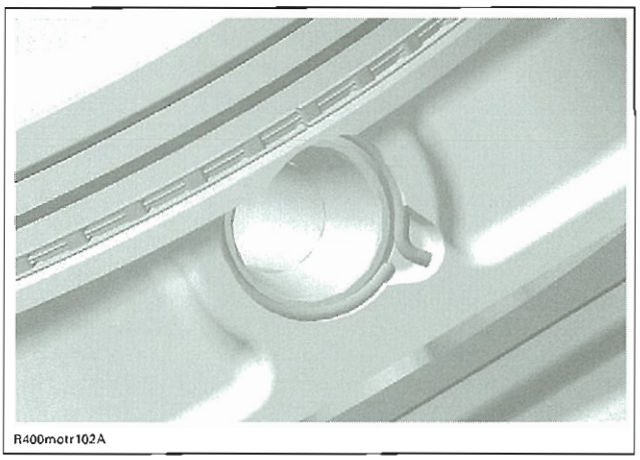
Push taper side of assembly jig until circlip reaches middle of sleeve.

Align sleeve with piston pin axis and push assembly jig until circlip engages in piston.



1. *Arrow should indicate to the exhaust side*
2. *Hold piston while pushing circlip in place*
3. *Sleeve*
4. *Assembly jig*
5. *Direction to push circlip*

NOTE: Take care that the hook of the piston circlip is positioned properly.



CORRECT POSITION OF THE PISTON CIRCLIP

PISTON RINGS

Ring Removal

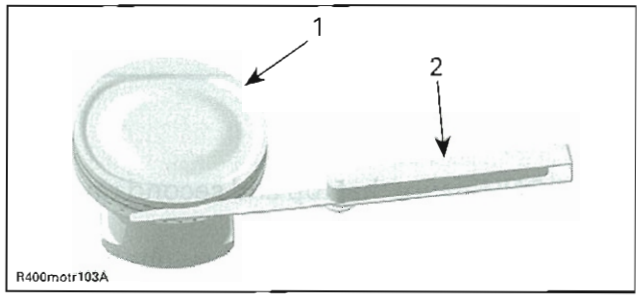
Remove:
- Cylinder head no. 24
- Cylinder no. 25
- Piston pin no. 37.

Ring Inspection

Ring/Piston Groove Clearance

Using a feeler gauge measure each ring/piston groove clearance. If the clearance is too large, the piston and the piston rings should be replaced.

RING/PISTON GROOVE CLEARANCE	
UPPER COMPRESSION RING	
NEW	0.030 to 0.070 mm (.0012 to .0028 in)
SERVICE LIMIT	0.150 mm (.0059 in)
LOWER COMPRESSION RING	
NEW	0.020 to 0.060 mm (.0008 to .0024 in)
SERVICE LIMIT	0.150 mm (.0059 in)
OIL SCRAPER RING	
NEW	0.010 to 0.180 mm (.0004 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	0.20 to 0.40 mm (.008 to .016 in)
SERVICE LIMIT	1.50 mm (.059 in)
LOWER COMPRESSION RING	
NEW	0.20 to 0.40 mm (.008 to .016 in)
SERVICE LIMIT	1.50 mm (.059 in)
OIL SCRAPER RING	
NEW	0.20 to 0.70 mm (.008 to .028 in)
SERVICE LIMIT	1.50 mm (.059 in)

Measure position for ring end gap in the area of 8 to 16 mm (.315 to .630 in) from top of cylinder.

NOTE: In order to correctly position the ring in the cylinder, use piston as a pusher.

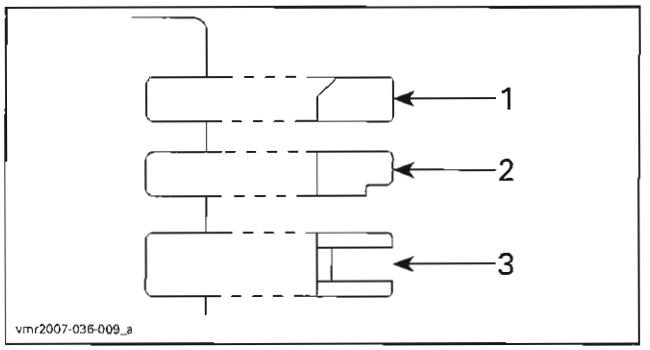
Using a feeler gauge, check ring end gap. Replace ring if gap exceeds above described specified tolerance.

Ring Installation

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

NOTE: First install spring and then rings of oil scraper ring.

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.



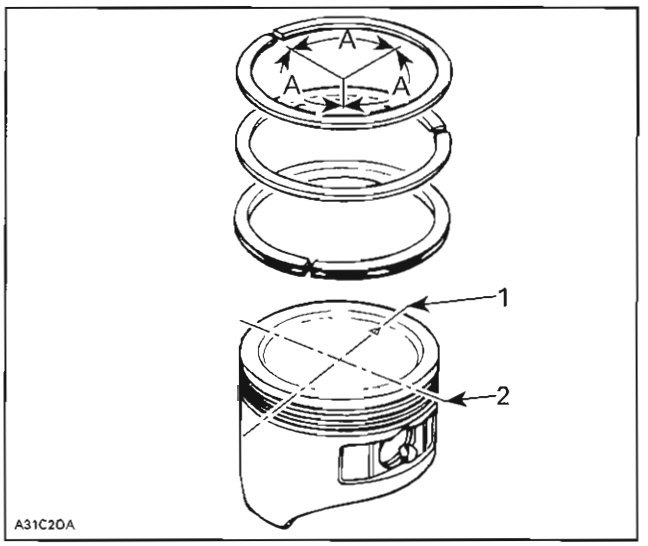
1. Upper compression ring
2. Lower compression ring
3. Oil scraper ring

CAUTION: Ensure that top and second rings are not interchanged.

NOTE: Use a ring expander to prevent breakage during installation. The oil ring must be installed by hand.

Check that rings rotate smoothly after installation.

Space the piston ring end gaps 120° apart and do not align the gaps with the piston pin bore or the thrust side axis.



1. DO NOT align ring gap with piston thrust side axis
2. DO NOT align ring gap with piston pin bore axis
A. 120°

CRANKCASE/CRANKSHAFT

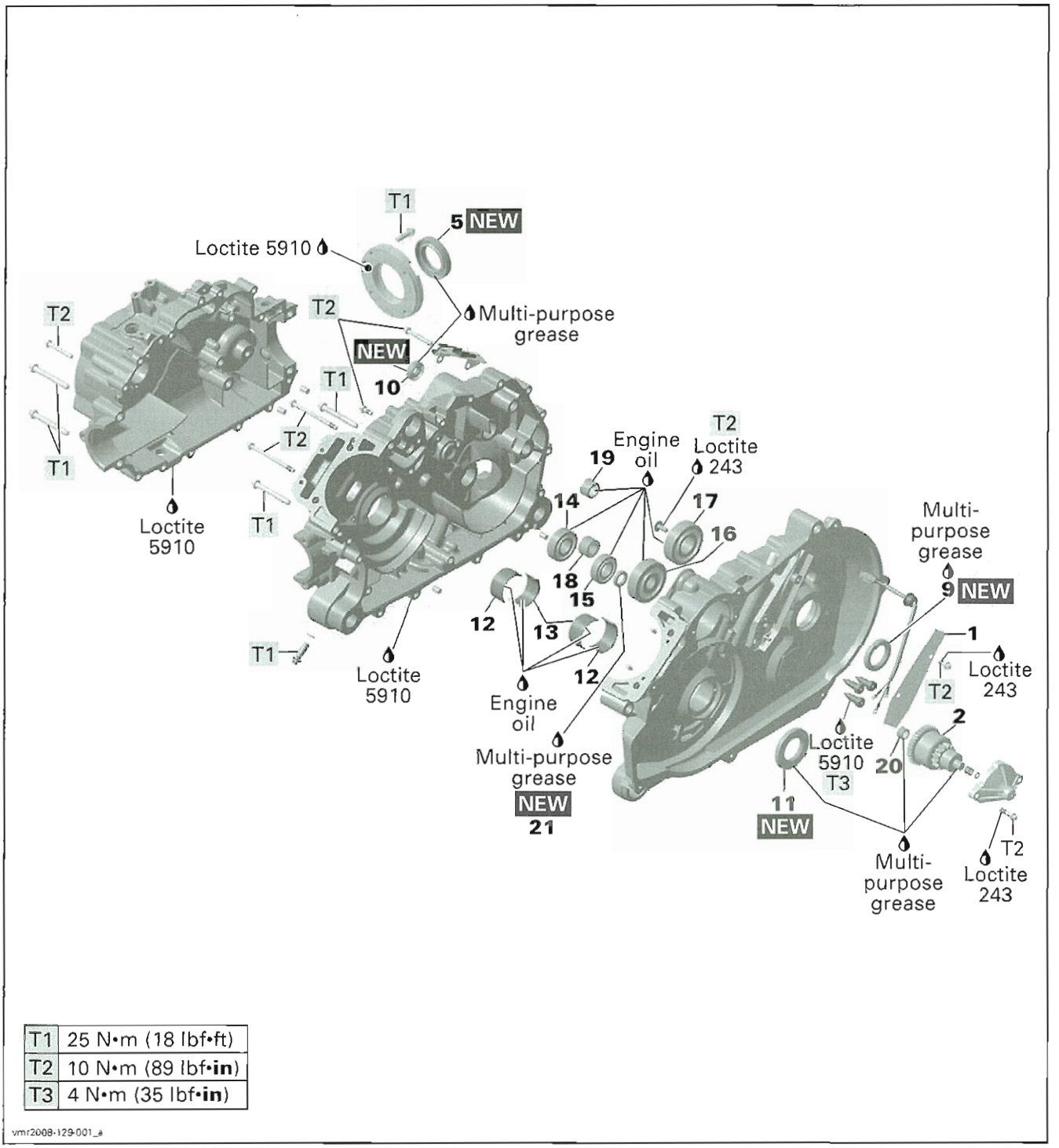
SERVICE TOOLS

Description	Part Number	Page
dial gauge	414 104 700	153
insertion handle	420 877 650	143–144, 147, 150–151
crankshaft locking bolt	529 035 617	154, 158
crankcase support PTO	529 035 754	148
needle bearing remover	529 035 756	151
oil seal installer	529 035 760	144
oil seal installer	529 035 761	143
needle bearing installer	529 035 762	150
needle bearing installer	529 035 763	150
crankcase support MAG	529 035 916	148
plain bearing remover/installer	529 035 917	147
oil seal installer	529 035 933	147
needle bearing installer	529 035 934	151
oil seal installer	529 035 941	143

SERVICE PRODUCTS

Description	Part Number	Page
pulley flange cleaner	413 711 809	158

CRANKCASE



T1	25 N•m (18 lbf•ft)
T2	10 N•m (89 lbf•**in**)
T3	4 N•m (35 lbf•**in**)

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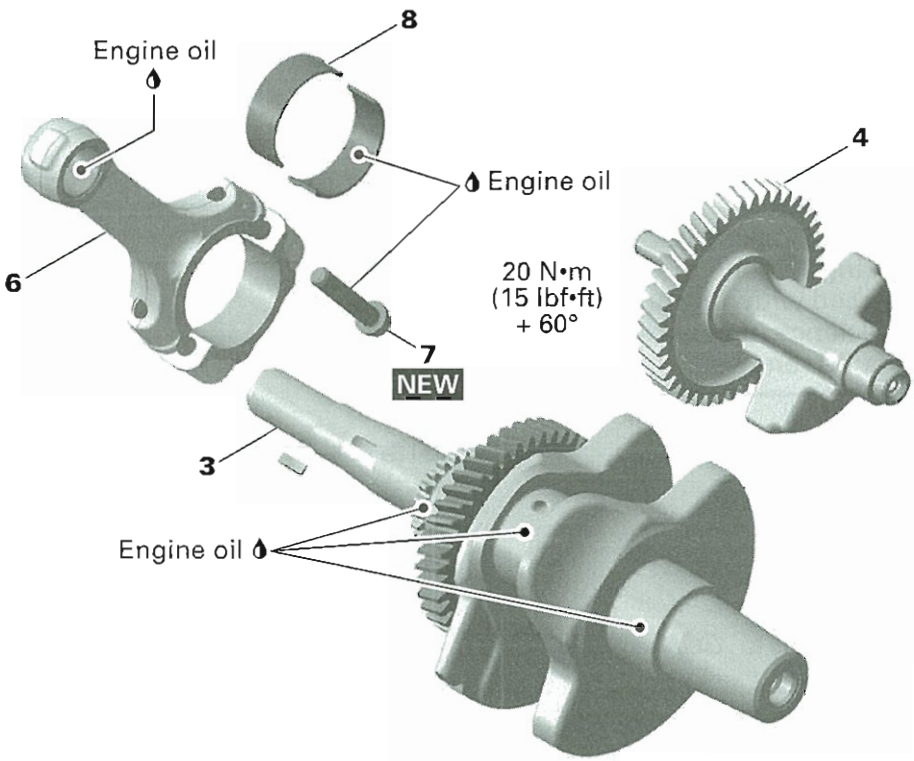
CRANKSHAFT/BALANCER SHAFT



R400motr16T

GENERAL

This section includes the procedures pertaining to the crankcase, crankshaft and balancer shaft. For the gearbox, follow the procedure for the *CRANKCASE* then refer to *GEARBOX/OUTPUT SHAFT* section.

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

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

⚠ WARNING

Torque wrench tightening specifications must strictly be adhered to.
Locking devices (e.g.: locking tabs, elastic stop nuts, self-locking fasteners, etc.) must be installed or replaced with new ones where specified. If the efficiency of a locking device is impaired, it must be renewed.

PROCEDURES

STARTER DRIVE

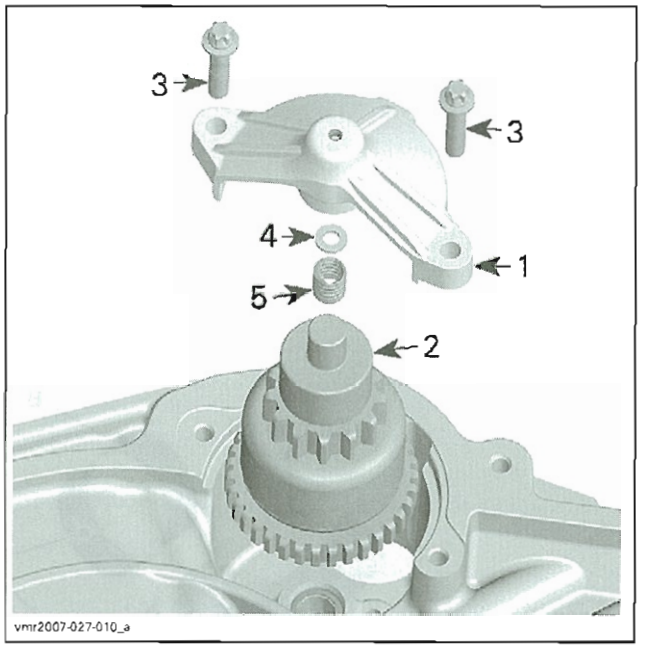
Starter Drive Removal

Remove drive pulley (refer to *CONTINUOUSLY VARIABLE TRANSMISSION*).

Remove screws retaining starter drive cover.

NOTE: Do not lose shims and/or spring during removal of starter drive cover.

Withdraw starter drive cover and pull out starter drive no. 2.

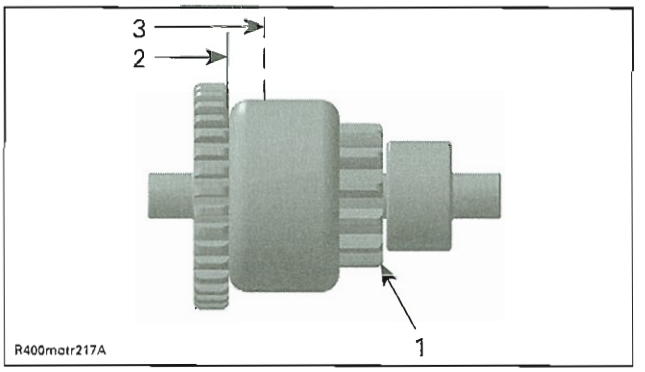


1. *Starter drive cover*
2. *Starter drive*
3. *Screws*
4. *Shim*
5. *Spring*

Starter Drive Inspection

Check if starter drive pinion is free of movement.

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



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

Replace needle bearing if damaged (see *BEARING REPLACEMENT PROCEDURE* in *CRANKCASE* further in this section).

Check starter drive cover for cracks and clean it before reinstallation.

Check bore inside starter drive cover if damaged, worn or otherwise damaged. Replace as necessary.

Starter Drive Installation

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

Apply multi-purpose grease inside starter drive pinion cover.

OUTPUT SHAFT OIL SEAL

Output Shaft Oil Seal Removal

NOTE: The output shaft oil seal no. 5 can be removed and installed without removing the engine from vehicle.

Drain engine oil, refer to *LUBRICATION SYSTEM*.

Disconnect the rear propeller shaft from output shaft, refer to *REAR DRIVE*.

Using a small screwdriver, remove the output shaft oil seal no. 5 from bearing flange.

CAUTION: Avoid scratching the bearing flange or output shaft during oil seal removal.

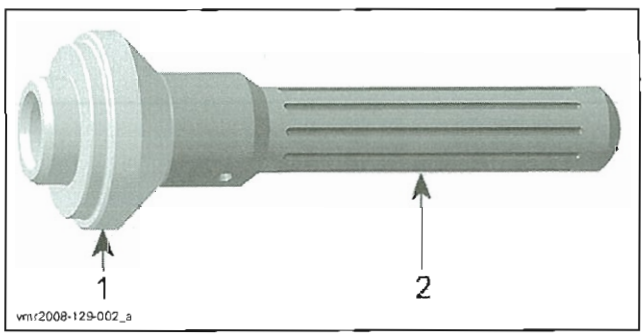
Output Shaft Oil Seal Inspection

Check bearing behind oil seal for contamination and/or metal shavings.

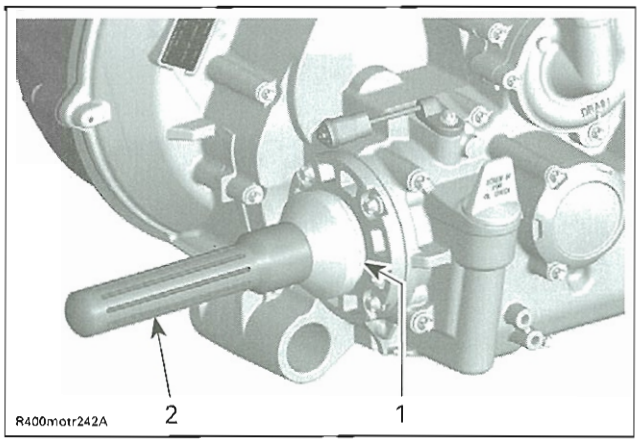
Check oil seal seating surface for grooves. Replace bearing flange if necessary.

Output Shaft Oil Seal Installation

Use the oil seal installer (P/N 529 035 941) and insertion handle (P/N 420 877 650) for installation of the oil seal.



1. *Oil seal installer*
2. *Installer handle*



1. *Oil seal installer*
2. *Installer handle*

Install all removed parts.

COUNTER SHAFT OIL SEAL

Counter Shaft Oil Seal Removal

NOTE: The counter shaft oil seal no. 9 can be removed without removing the engine from vehicle.

Remove the driven pulley. Refer to *CONTINUOUSLY VARIABLE TRANSMISSION*.

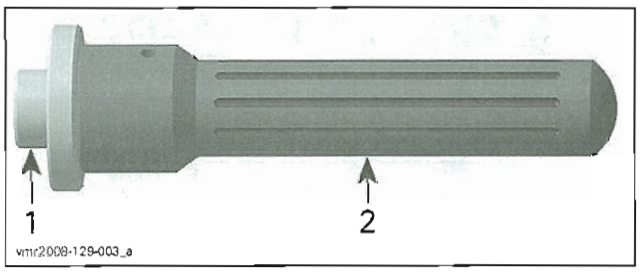
Using a small screwdriver, remove the counter shaft oil seal.

CAUTION: Avoid scratching the crankcase or counter shaft during oil seal removal.

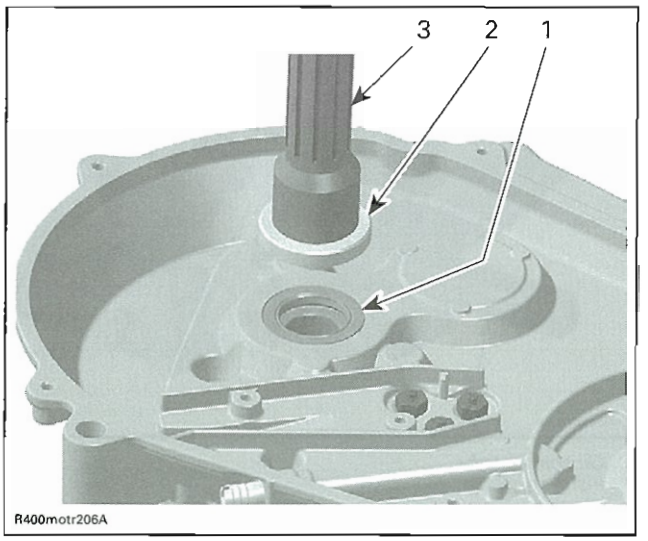
Counter Shaft Oil Seal Installation

Using a suitable tube with the proper diameter, install the oil seal.

If the engine is removed and crankcase is split, use the oil seal installer (P/N 529 035 761) and the insertion handle (P/N 420 877 650) to install seal.



1. *Oil seal installer*
2. *Installer handle*



1. Counter shaft seal
2. Oil seal installer
3. Installer handle

Install all removed parts.

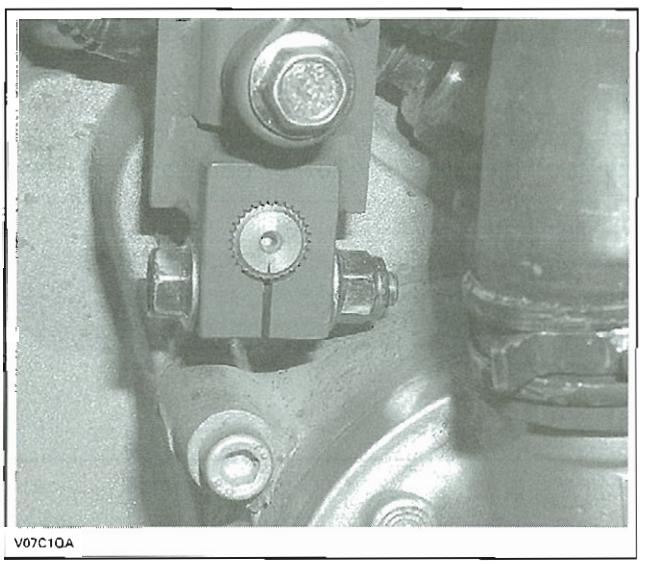
SHIFT SHAFT OIL SEAL

Shift Shaft Oil Seal Removal

NOTE: The shift shaft oil seal no. 10 can be removed without removing the engine from vehicle.

Scribe a mark on the end of shift shaft and on shifting plate.

Unscrew shifting plate bolt then remove shifting plate.



Using a small screwdriver, remove the shift shaft seal.

CAUTION: Avoid scratching the crankcase or shift shaft during oil seal removal.

Shift Shaft Oil Seal Installation

Using a suitable tube, with the proper diameter, install the seal.

Align the previous scribing marks and install the shifting plate.

Torque shifting plate bolt to 10 N•m (89 lbf•**in**).

CRANKSHAFT OIL SEAL

Crankshaft Oil Seal Removal

NOTE: The crankshaft oil seal no. 11 can be removed without removing the engine from vehicle.

Remove the drive pulley. Refer to the appropriate *CONTINUOUSLY VARIABLE TRANSMISSION.*

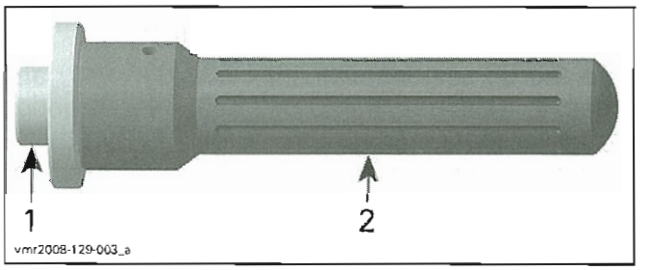
Using a small screwdriver, remove the crankshaft oil seal.

CAUTION: Avoid scratching the crankcase or crankshaft during oil seal removal.

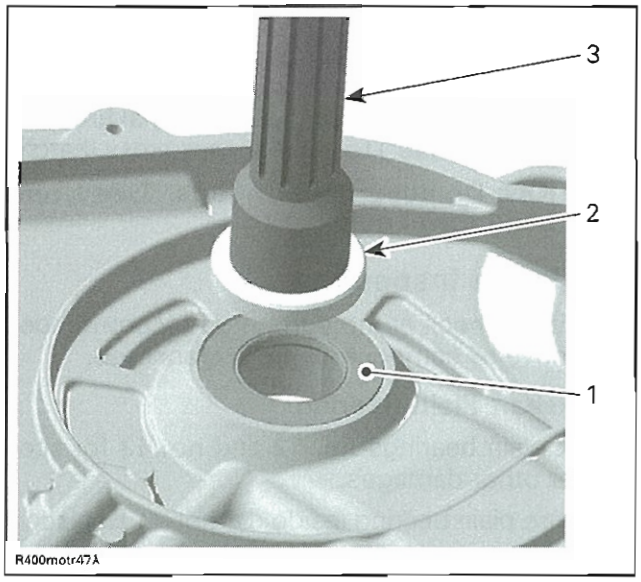
Crankshaft Oil Seal Installation

Using a suitable tube with the proper diameter, install the seal.

If the engine is removed and crankcase is split, use the oil seal installer (P/N 529 035 760) and the insertion handle (P/N 420 877 650).



1. Oil seal installer
2. Installer handle



1. *Oil seal (crankcase PTO side)*
2. *Oil seal installer*
3. *Installer handle*

CRANKCASE

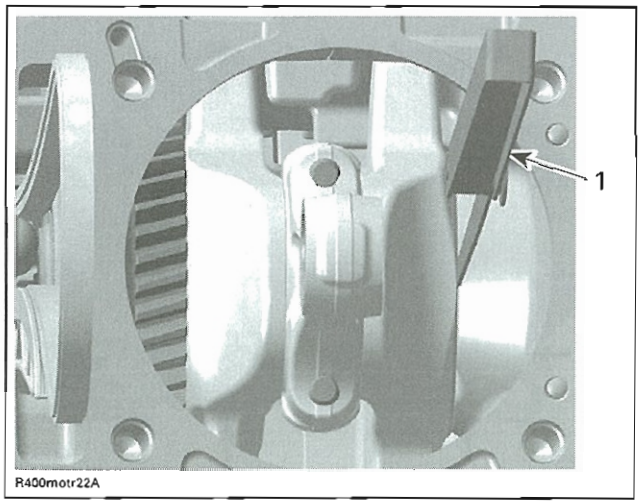
Crankcase Disassembly

NOTE: Oil pump removal from crankcase MAG side is not necessary, but recommended to see condition of oil pump (refer to *LUBRICATION SYSTEM*).

Remove:

- Engine from vehicle (refer to *ENGINE REMOVAL/INSTALLATION*)
- Magneto cover and rotor (refer to *MAGNETO/STARTER*)
- Output shaft (refer to *GEARBOX/OUTPUT SHAFT*)
- Cylinder head and cylinder (refer to *CYLINDER HEAD/CYLINDER*)
- Drive and driven pulley (refer to *CONTINUOUSLY VARIABLE TRANSMISSION*).

Measure axial clearance between the crankshaft and crankcase PTO with a feeler gauge.

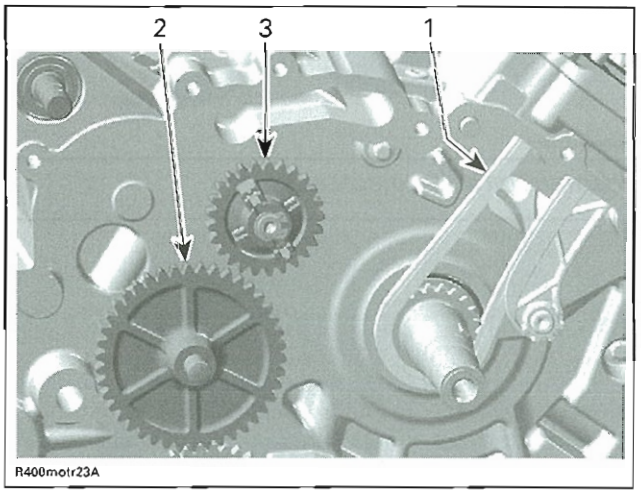


1. *Feeler gauge*

CRANKSHAFT AXIAL CLEARANCE	
NEW	0.1 to 0.4 mm (.0039 to .0157 in)

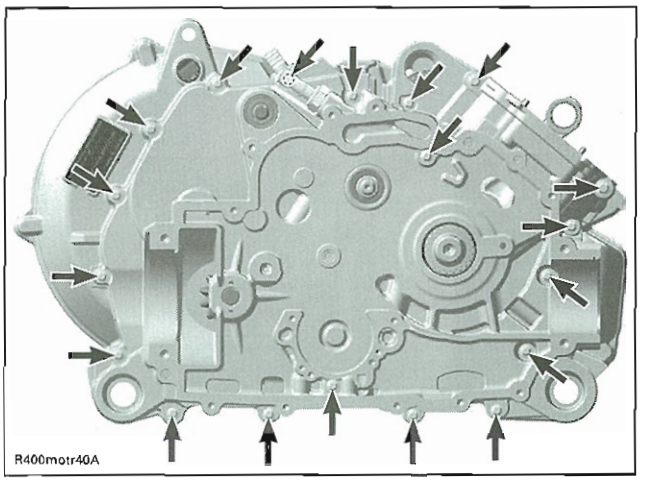
If measurement is out of specification, inspect butting faces of crankshaft and crankcase (MAG/PTO side) for excessive wear.

Remove drive gear and intermediate gear of water pump and oil pump.



1. *Timing chain*
2. *Intermediate gear, oil pump*
3. *Drive gear, water pump*

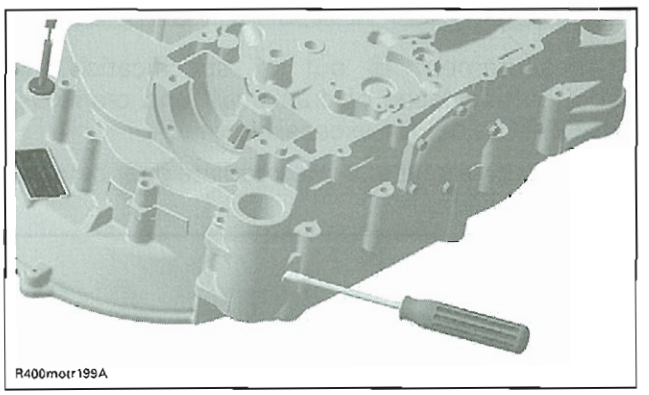
Remove crankcase retaining screws.



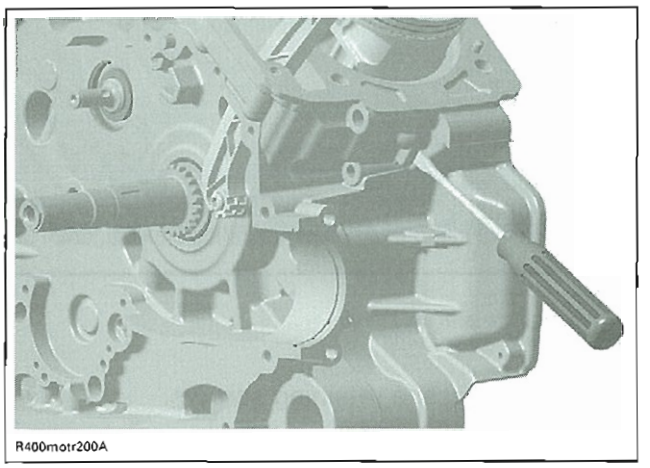
19 SCREWS

Place the crankcase on a wood stand, MAG side upwards.

Split crankcase with 2 screwdrivers.



POSITION FOR BIG FLAT SCREWDRIVER



POSITION FOR BIG FLAT SCREWDRIVER

Crankcase Cleaning

Clean all metal components in a solvent.

Clean oil passages and make sure they are not clogged.

Crankcase mating surfaces are best cleaned using a combination of the 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).

CAUTION: Do not wipe with rags. Use a new clean hand towel only.

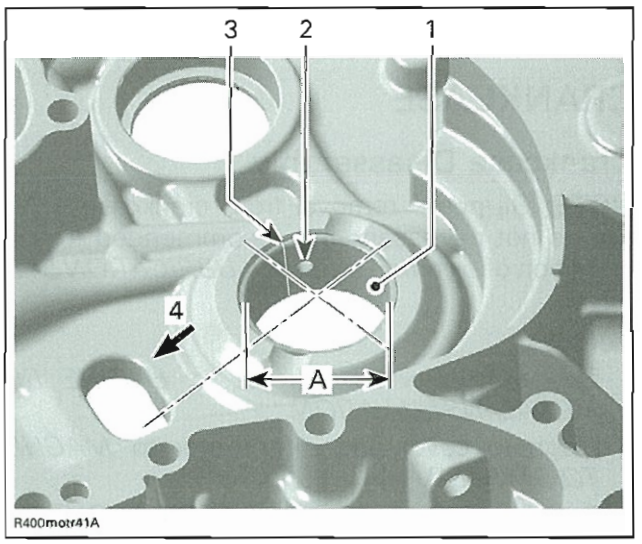
Crankcase Inspection

NOTE: To check some parts, it is recommended to remove all components from crankcase.

Crankshaft Plain Bearing

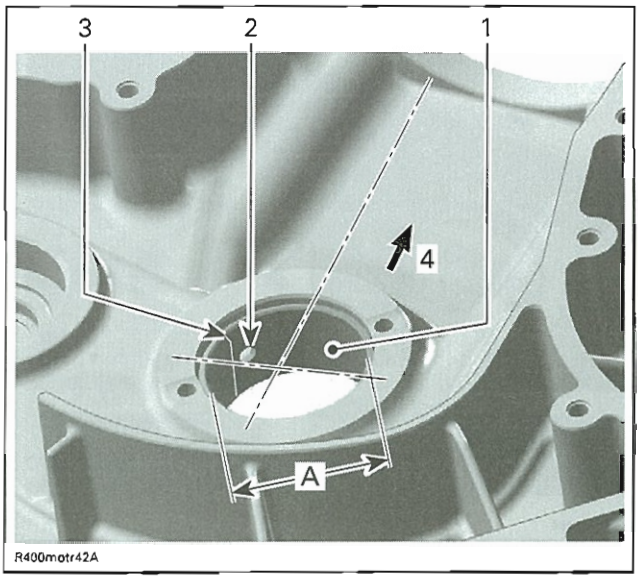
Check plain bearings no. 12 and no. 13 for scorings or other damages.

Measure plain bearing inside diameter. Replace if the measurement is out of specification (refer to *BEARING REPLACEMENT PROCEDURE*) further in this section.



1. *MAG plain bearing without groove*
2. *Oil bore*
3. *Split of the plain bearing halves*
4. *Cylinder base direction*

A. *Plain bearing inside diameter to be measured in area of oil bore*



1. *PTO plain bearing without groove*
2. *Oil bore*
3. *Split of the plain bearing halves*
4. *Cylinder base direction*

A. *Plain bearing inside diameter to be measured in area of oil bore*

PLAIN BEARING INSIDE DIAMETER (MAG/PTO)	
SERVICE LIMIT	42.070 mm (1.6563 in)

Crankshaft Oil Seal

Check oil seal no. 11 if brittle, hard or otherwise damaged. Replace if necessary.

NOTE: The oil seal is removed easily with a flat screwdriver.

Ball and Needle Bearings

Check bearings no. 14, no. 15, no. 16 and no. 17 as well as needle bearings no. 18, no. 19 and no. 20 for excessive play and smooth operation. Replace if necessary.

Balancer Shaft Oil Seal

Check oil seal no. 21 if brittle, hard or otherwise damaged. Replace if necessary.

Balancer Shaft Oil Seal Replacement Procedure

Balancer Shaft Oil Seal Removal

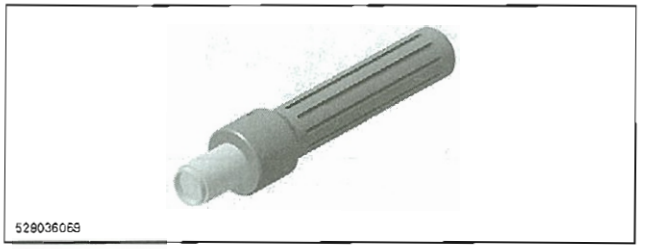
The oil seal no. 21 is removed easily with a flat screwdriver.

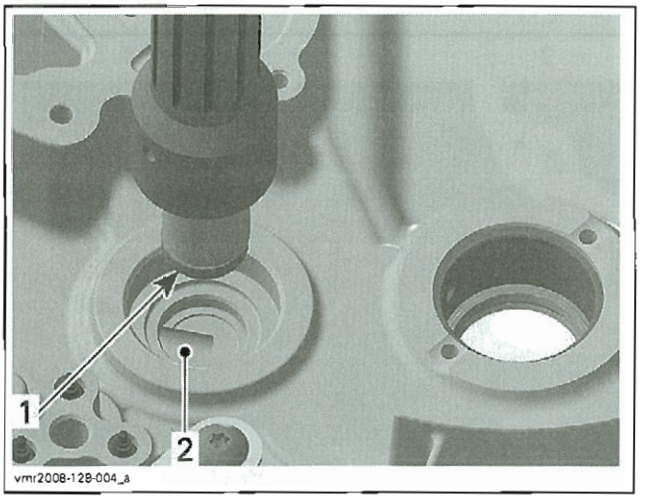
CAUTION: Avoid scoring bearing seat or oil seal bore in crankcase.

Balancer Shaft Oil Seal Installation

CAUTION: Oil seal must be installed with sealing lip towards balancer shaft.

Use the oil seal installer (P/N 529 035 933) and the insertion handle (P/N 420 877 650) to install oil seal.





1. *Balancer shaft oil seal (crankcase PTO side)*
2. *Bore for engine blow-by*

Bearing Replacement Procedure

CAUTION: Clean oil, outside and inside, from crankcase.

CAUTION: Always support crankcase properly when ball bearings, needle bearings or plain bearings are removed; otherwise, crankcase could be damaged.

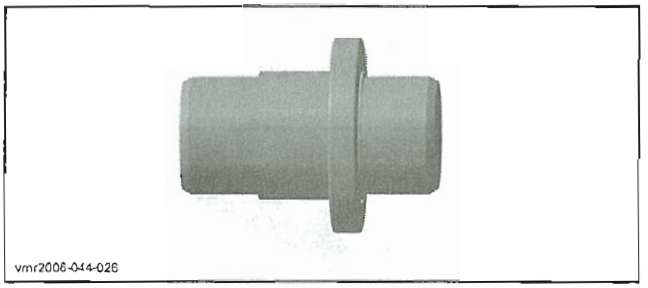
Unless otherwise instructed, never use hammer to install ball bearings, needle bearings or plain bearings. Use press machine only.

CAUTION: Ball bearings have to be installed with closed bearing cage to the engine outside.

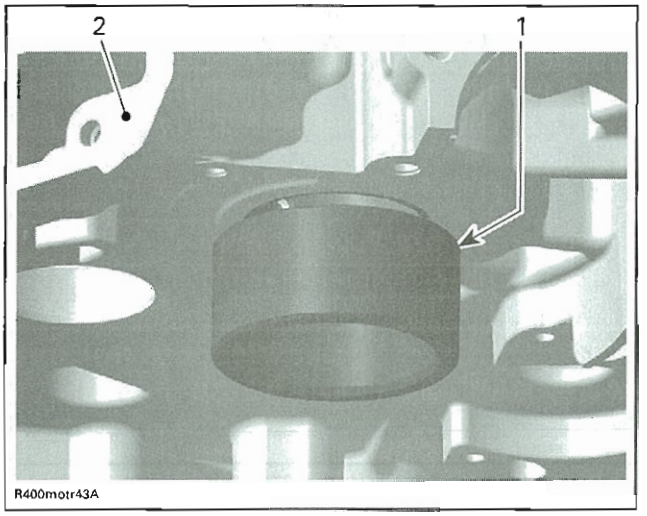
Crankshaft Plain Bearing Removal

NOTE: Always use a press for removal or installation of plain bearing halves.

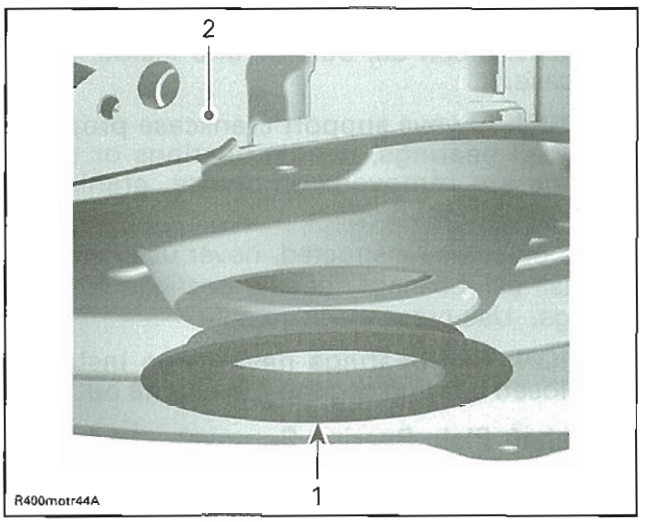
Remove plain bearings no. 12 and no. 13 with the plain bearing remover/installer (P/N 529 035 917).



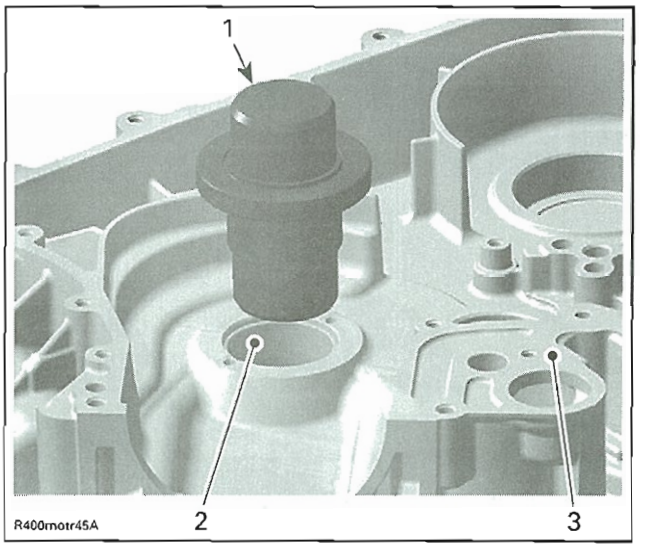
NOTE: Use crankcase support MAG (P/N 529 035 916) and crankcase support PTO (P/N 529 035 754) when removing plain bearings.



1. Crankcase support MAG
2. Crankcase MAG side



1. Crankcase support PTO
2. Crankcase PTO side

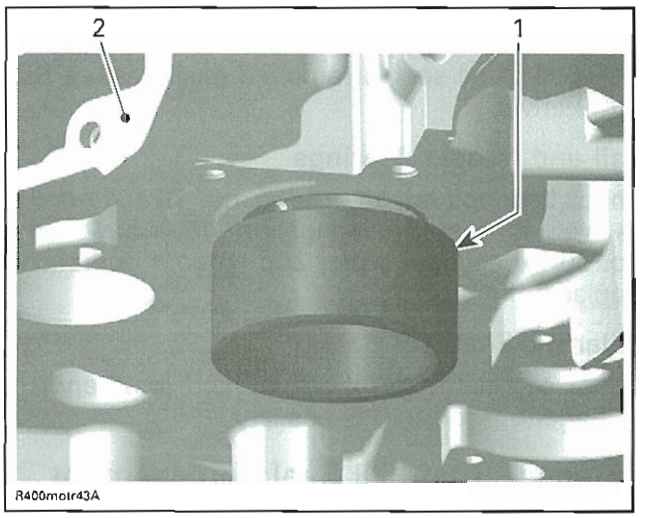


PUSH PLAIN BEARINGS OUTSIDE
1. Plain bearing remover/installer
2. Plain bearing
3. Crankcase PTO

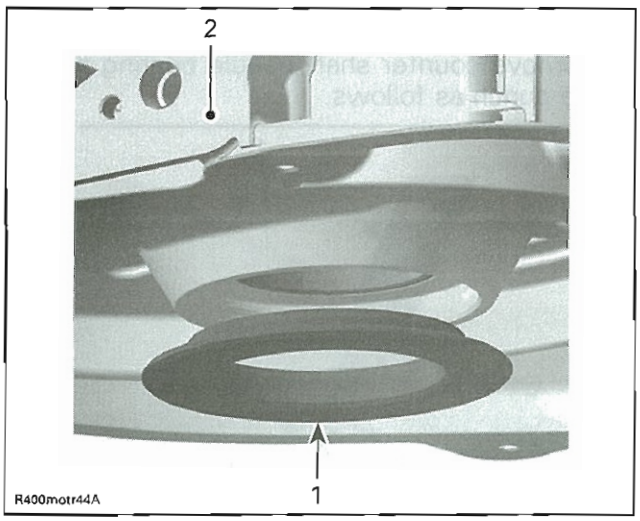
Crankshaft Plain Bearing Installation

To install the plain bearing turn the plain bearing remover/installer up side down.

NOTE: Use crankcase support MAG (P/N 529 035 916) and crankcase support PTO (P/N 529 035 754) when pushing plain bearing in place.

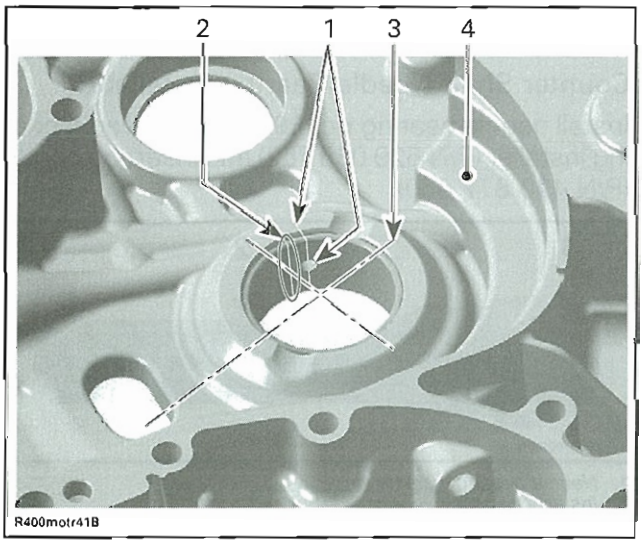


1. Crankcase support MAG
2. Crankcase MAG side

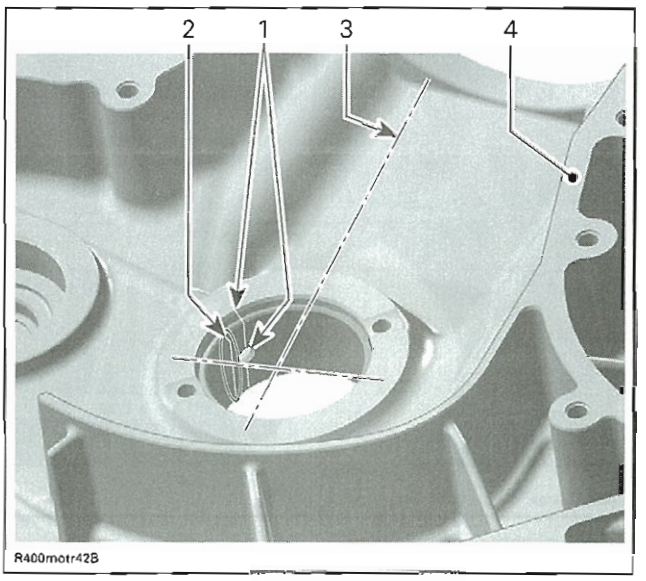


1. *Crankcase support PTO*
2. *Crankcase PTO side*

NOTE: Mark oil bore position on crankcase to align new plain bearing with crankcase thrust surface.

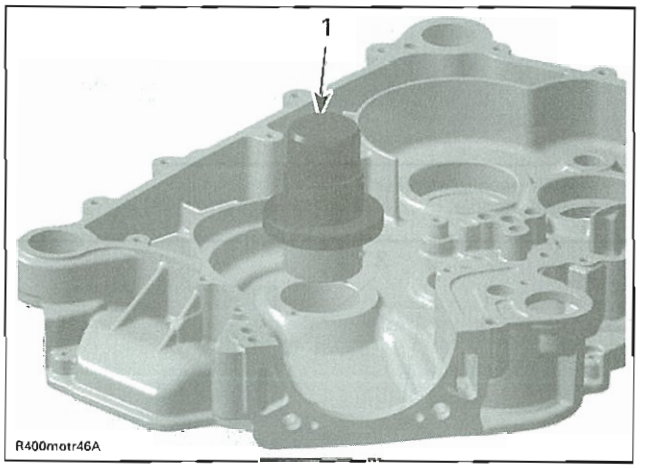


1. *Mark on crankcase and oil bore position*
2. *Split between bearing halves*
3. *Perpendicular axle to cylinder base*
4. *Crankcase MAG*



1. *Mark on crankcase and oil bore position*
2. *Split between bearing halves*
3. *Perpendicular axle to cylinder base*
4. *Crankcase PTO*

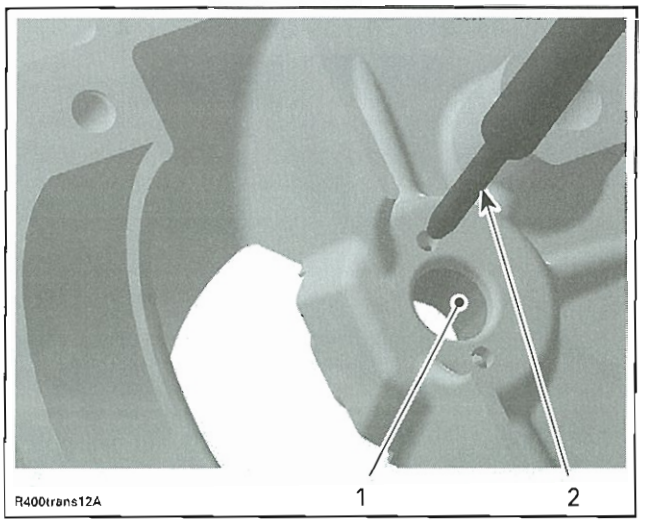
CAUTION: Push plain bearings MAG/PTO correctly in place to ensure oil supply to crankshaft (oil bore and split between plain bearing halves).



PUSH PLAIN BEARINGS INSIDE
1. *Plain bearing installer*

Bevel Gear Needle Bearing Removal

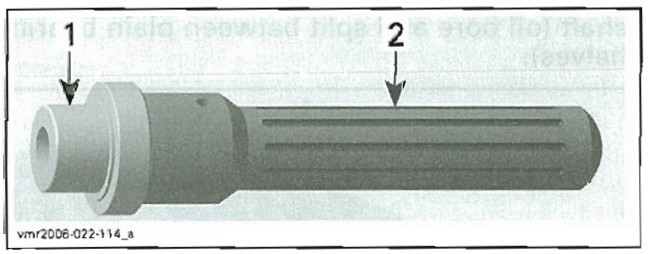
To remove bevel gear needle bearing no. 18, use a punch as follows.



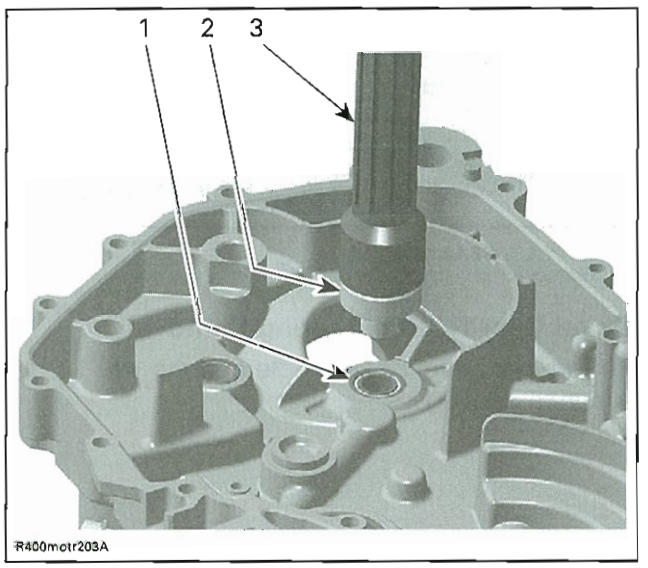
1. *Bevel gear needle bearing*
2. *Punch*

Bevel Gear Needle Bearing Installation

Install needle bearing no. 18 with the needle bearing installer (P/N 529 035 763) and insertion handle (P/N 420 877 650).



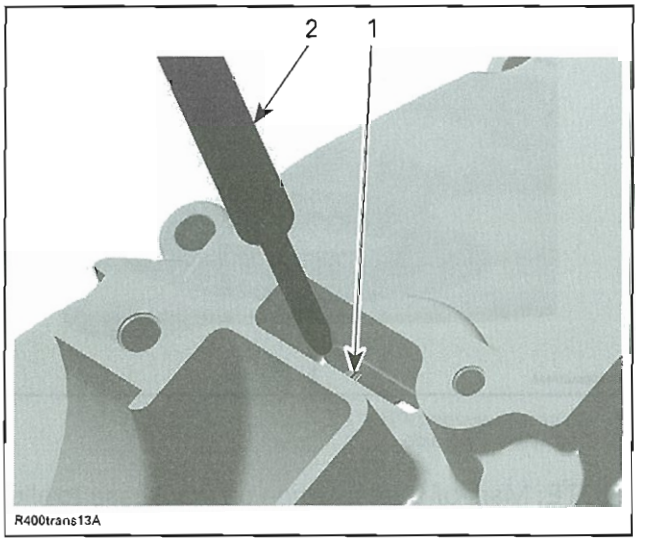
1. *Needle bearing installer*
2. *Installer handle*



BEVEL GEAR
1. *Bevel gear needle bearing*
2. *Needle bearing installer*
3. *Installer handle*

Counter Shaft Needle Bearing Removal

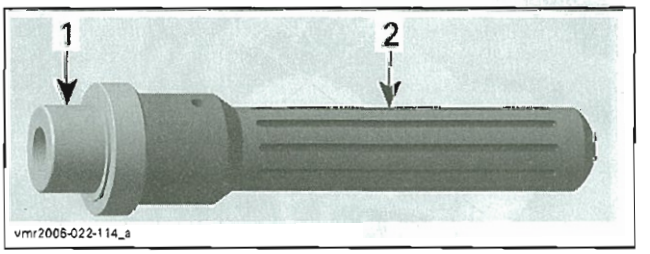
To remove counter shaft needle bearing no. 19, use a punch as follows.



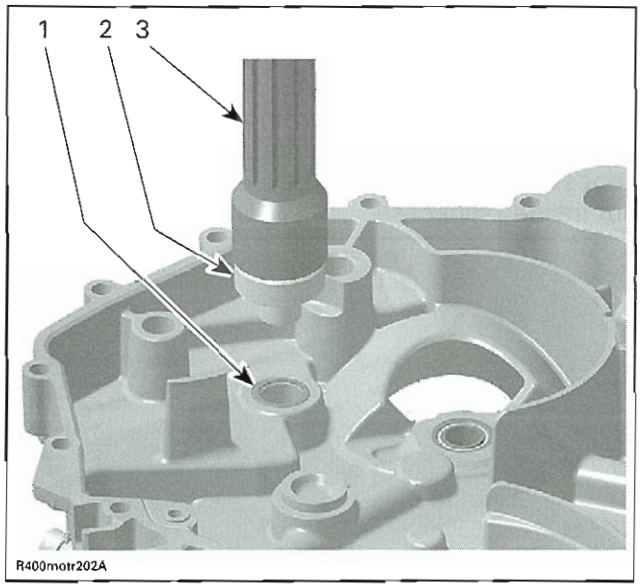
1. *Counter shaft needle bearing location*
2. *Punch*

Counter Shaft Needle Bearing Installation

Install needle bearing no. 19 with the needle bearing installer (P/N 529 035 762) and insertion handle (P/N 420 877 650).



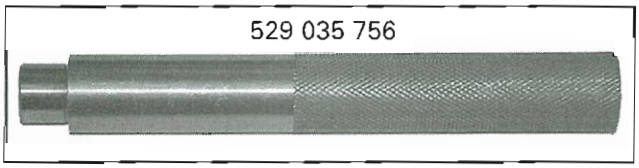
1. *Needle bearing installer*
2. *Installer handle*

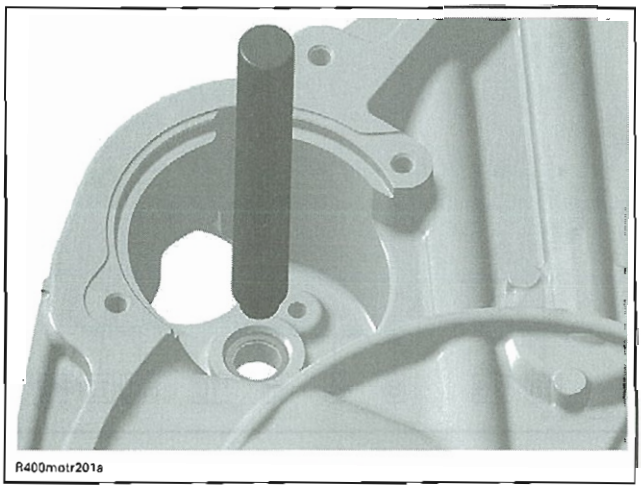


COUNTER SHAFT
1. *Counter shaft needle bearing*
2. *Needle bearing installer*
3. *Installer handle*

Starter Drive Needle Bearing Removal

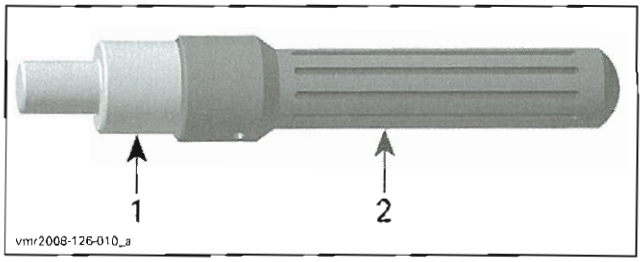
Use needle bearing remover (P/N 529 035 756) to remove needle bearing no. 20.



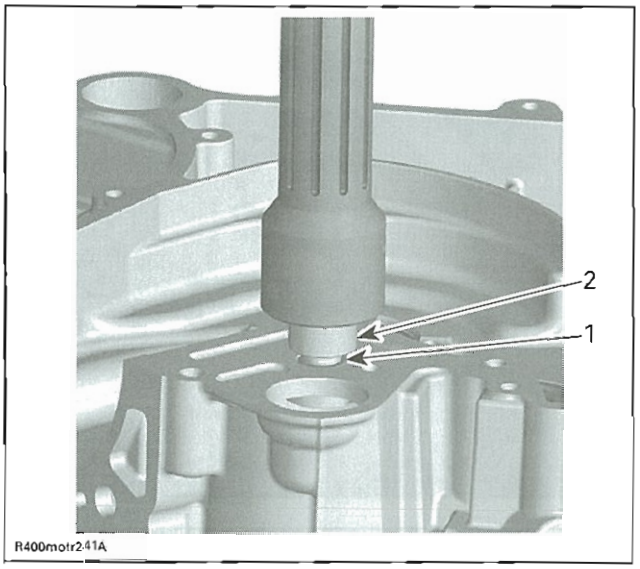


Starter Drive Needle Bearing Installation

Install needle bearing no. 20 with the needle bearing installer (P/N 529 035 934) and insertion handle (P/N 420 877 650).



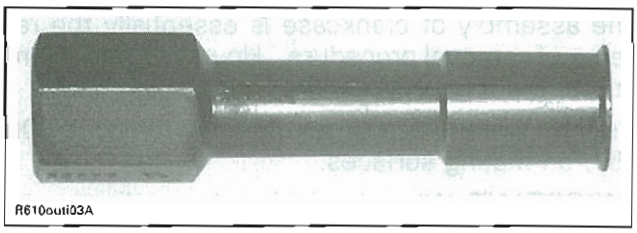
1. *Needle bearing installer*
2. *Handle*



STARTER DRIVE PINION
1. *Starter drive needle bearing PTO side*
2. *Needle bearing installer*

Balancer Shaft (PTO side) and Bevel Gear Ball Bearing Removal

To remove ball bearings no. 15 and no. 16, use a blind hole bearing puller.



BLIND HOLE BEARING PULLER

Balancer Shaft (PTO side) and Bevel Gear Ball Bearing Installation

Use a suitable installer for installing ball bearings no. 15 and no. 16.

Balancer Shaft (MAG side) Ball Bearing Removal

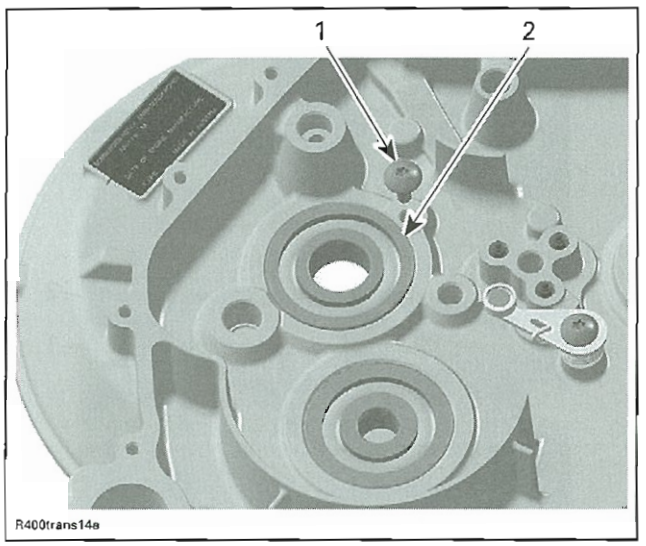
Ball bearing no. 14 can be easily removed with a suitable pusher from outside in.

Balancer Shaft (MAG side) Ball Bearing Installation

Use a suitable installer for installing ball bearing no. 14.

Counter Shaft (PTO side) Ball Bearing Removal

For counter shaft ball bearing no. 17 remove screw, then push bearing from outside in with a punch.



1. *Screw M6*
2. *Counter shaft ball bearing (PTO side)*

Counter Shaft (PTO side) Ball Bearing Installation

Use a suitable installer for installing ball bearing no. 17.

Crankcase Assembly

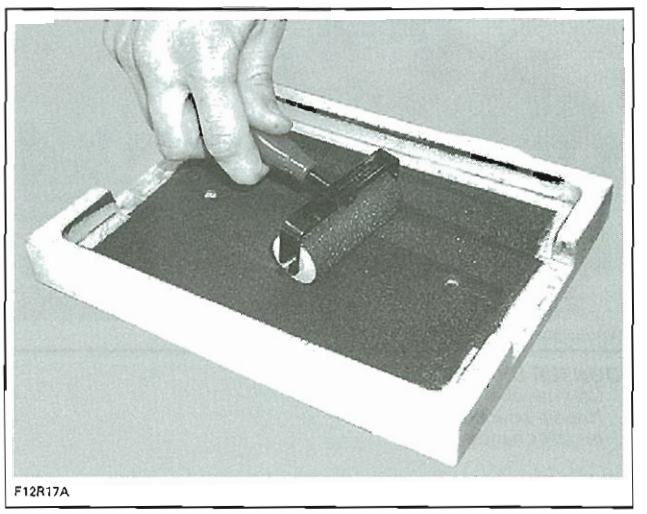
The assembly of crankcase is essentially the reverse of removal procedure. However, pay attention to the following details.

Use the silicone-based Loctite 5910 (P/N 293 800 081) on mating surfaces.

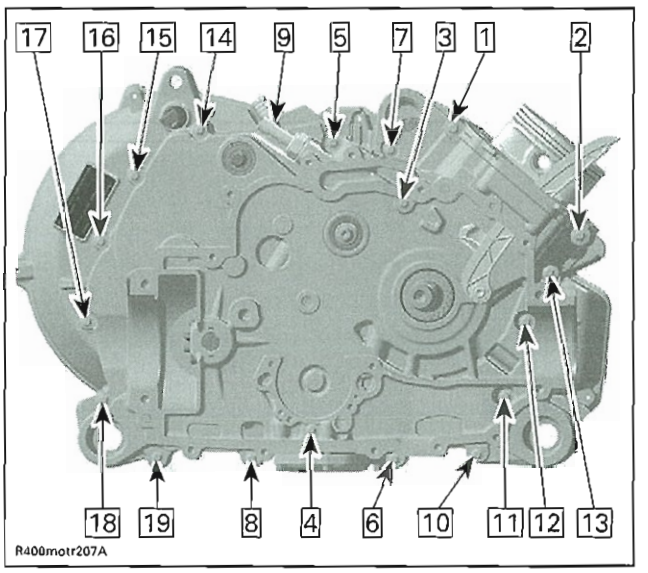
IMPORTANT: When beginning the application of the crankcase sealant, the assembly and the first torquing should be done within 10 minutes. It is suggested to have all you need on hand to save time.

Use a plexiglas plate and apply some sealant on it. Use a soft rubber roller (50 - 75 mm (2 - 3 in)) (available in arts products suppliers for printmaking) and roll the sealant to get a thin uniform coat on the plate (spread as necessary). When ready, apply the sealant on crankcase mating surfaces.

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). Do not apply in excess as it will spread out inside crankcase.



Torque crankcase screws by hand as per following sequence. Repeat procedure, retightening all screws according to the exploded views.



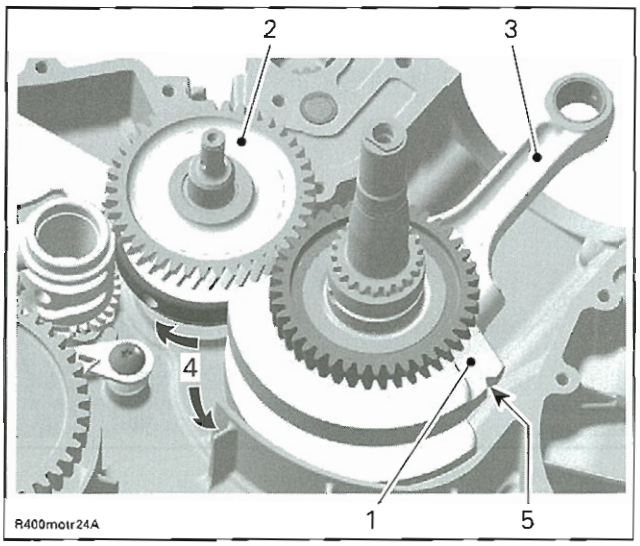
BALANCER SHAFT

Balancer Shaft Removal

Split crankcase (refer to *CRANKCASE*).

Remove the crankshaft locking bolt.

Align the dot of crankshaft gear with the balancer shaft gear dot then remove balancer shaft no. 4.



1. *Crankshaft*
2. *Balancer shaft*
3. *Connecting rod*
4. *Rotate crankshaft for balancer shaft removal*
5. *Groove for fixation at TDC*

Balancer Shaft Inspection

Check balancer shaft and replace if damaged.

Check ball bearings on MAG and PTO side for excessive play and smooth operation. Replace if necessary.

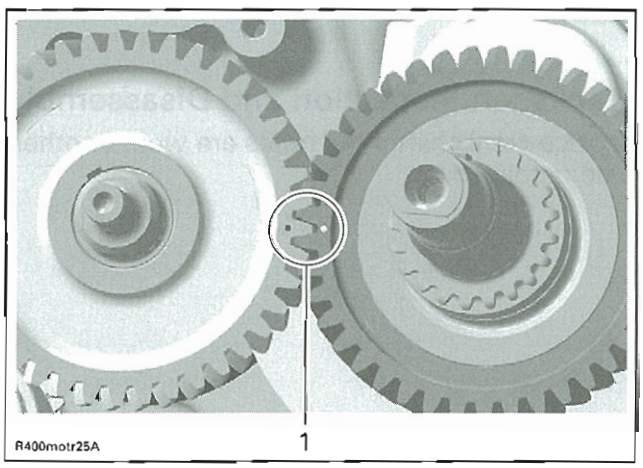
If the gear on the balancer shaft is damaged, replace balancer shaft.

Check gears on the crankshaft and replace crankshaft if necessary (refer to *CRANKSHAFT* below).

Balancer Shaft Installation

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

Align the dot on crankshaft gear with the balancer shaft gear dot.



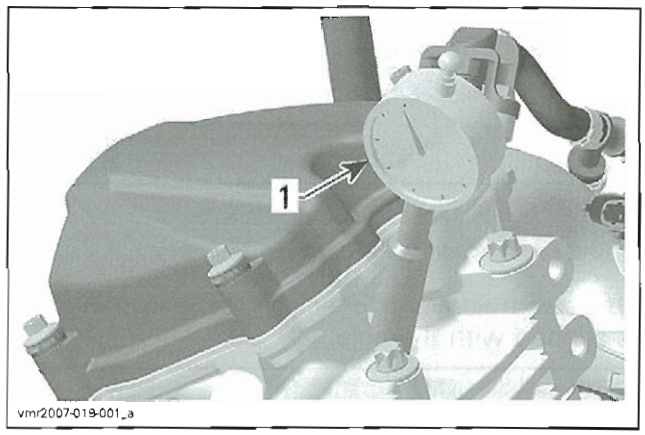
1. *Punched marks located in the gears*

CRANKSHAFT

Crankshaft Locking Procedure

Unplug spark plug cable then remove the spark plug.

Install the dial gauge (P/N 414 104 700).



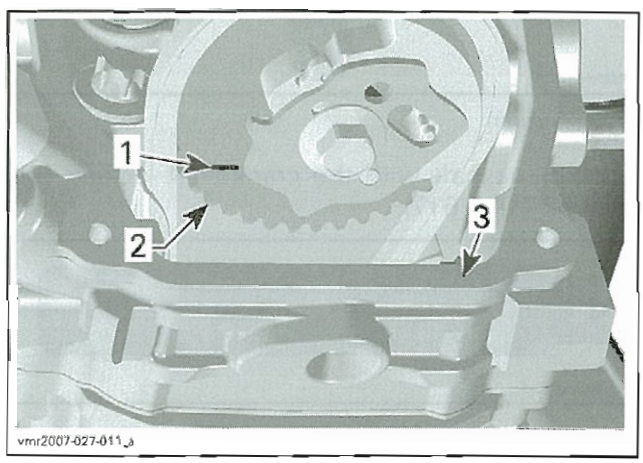
TYPICAL
1. *Dial gauge*

Pull rewind starter to rotate crankshaft until piston is at TDC.

TDC compression

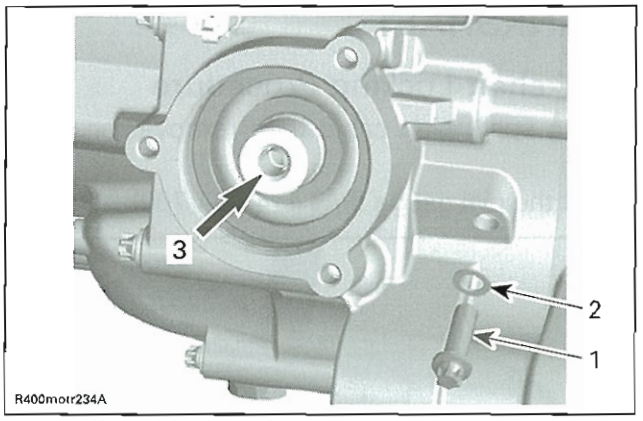
CAUTION: Never use the mark on the magneto to find the TDC. Only use the crankshaft locking tool to locate the TDC.

Remove valve cover and verify if the printed marks on the camshaft timing gear are parallel with the cylinder head edge. If so, the engine is at TDC compression position.



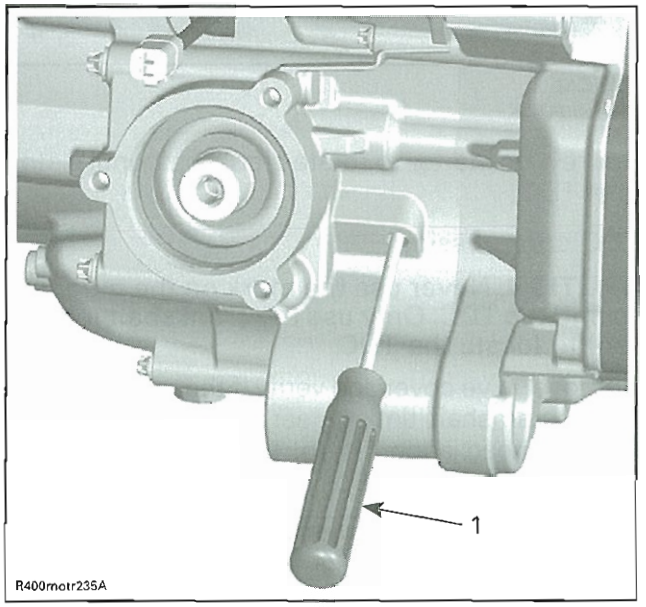
1. *Printed marks on camshaft timing gear*
2. *Camshaft timing gear*
3. *Cylinder head edge*

Remove screw and sealing ring.



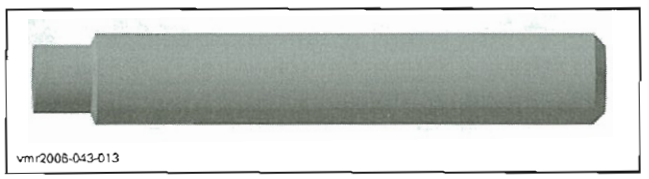
1. *Screw*
2. *Sealing ring*
3. *Output shaft on front side of vehicle*

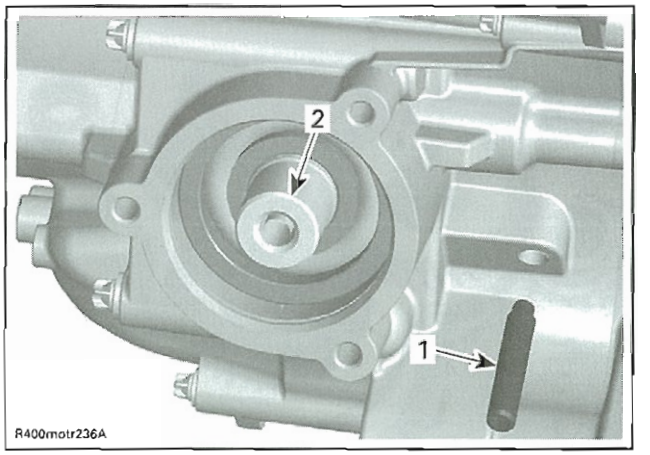
Use a screwdriver to check if groove in crankshaft is aligned with the hole.



1. *Screwdriver*

Lock crankshaft with the crankshaft locking bolt (P/N 529 035 617).



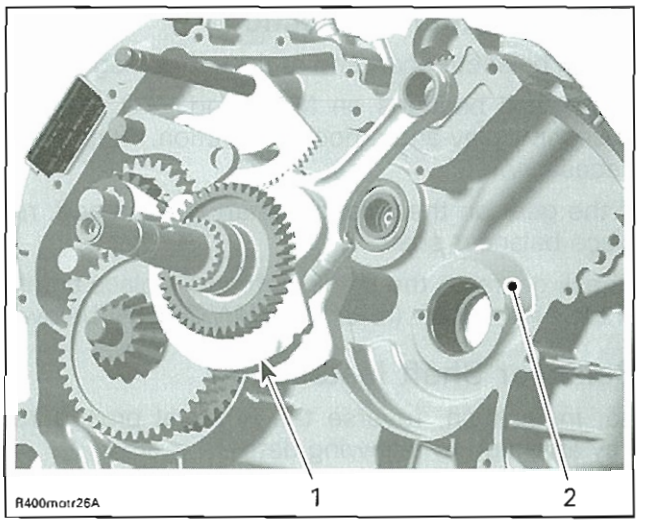


1. *Crankshaft locking bolt*
2. *Front output shaft area*

Crankshaft Removal

Remove:

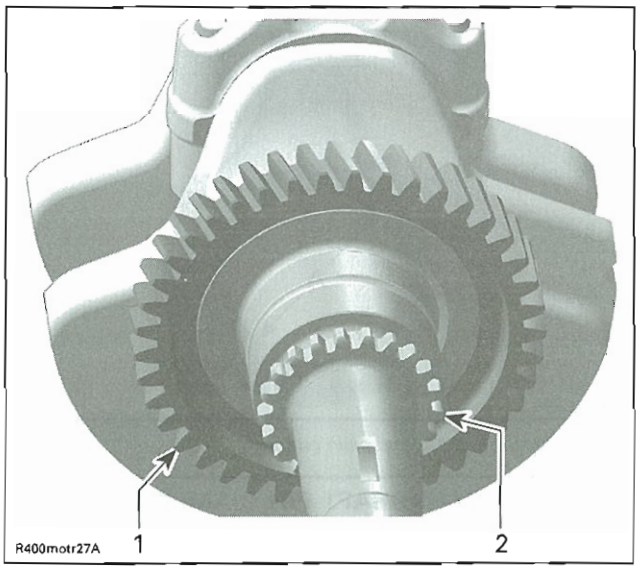
- Balancer shaft (see *BALANCER SHAFT*)
- Crankshaft no. 3.



1. *Crankshaft*
2. *Crankcase PTO*

Crankshaft Inspection and Disassembly

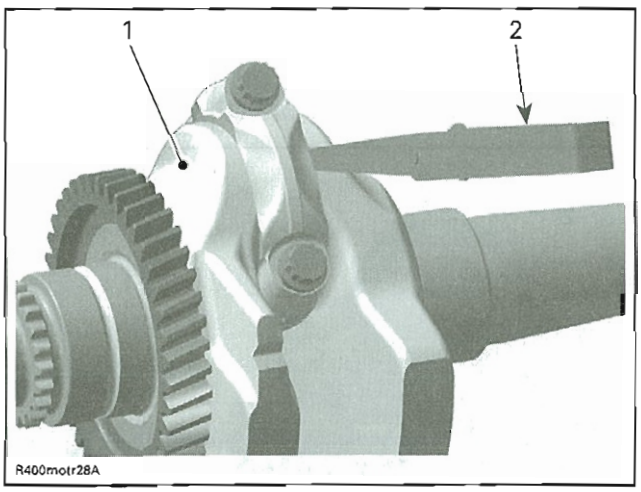
Replace crankshaft if the gears are worn or otherwise damaged.



1. Balancer gear
2. Crankshaft timing gear

Connecting Rod Big End Axial Play

Using a feeler gauge, measure distance between butting face of connecting rod and crankshaft counterweight. If the distance exceeds specified tolerance, replace the crankshaft.

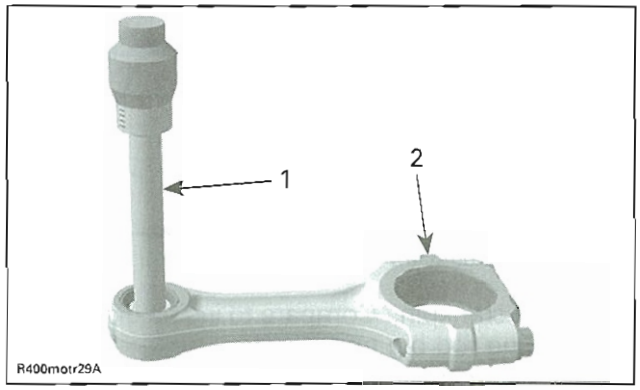


1. Crankshaft
2. Feeler gauge

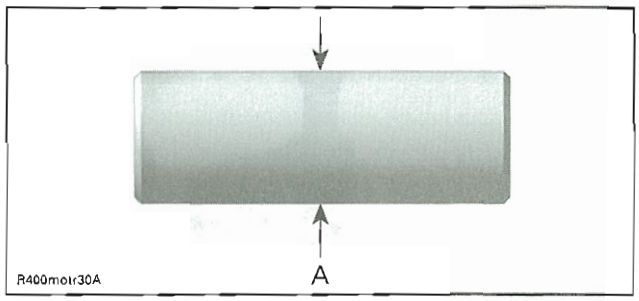
CONNECTING ROD BIG END AXIAL PLAY	
NEW	0.100 to 0.352 mm (.004 to .014 in)
SERVICE LIMIT	0.500 mm (.020 in)

Connecting Rod/Piston Pin Clearance

Measure piston pin. Compare to inside diameter of connecting rod no. 6.



1. Bore gauge
2. Connecting rod



A. Piston pin diameter in the area of the plain bearing

CONNECTING ROD SMALL END DIAMETER	
NEW	20.010 to 20.020 mm (.7878 to .7882 in)
SERVICE LIMIT	20.060 mm (.7898 in)
PISTON PIN DIAMETER	
NEW	19.996 to 20.000 mm (.7872 to .7874 in)
SERVICE LIMIT	19.980 mm (.7866 in)
CONNECTING ROD/PISTON PIN CLEARANCE	
SERVICE LIMIT	0.080 mm (.0035 in)

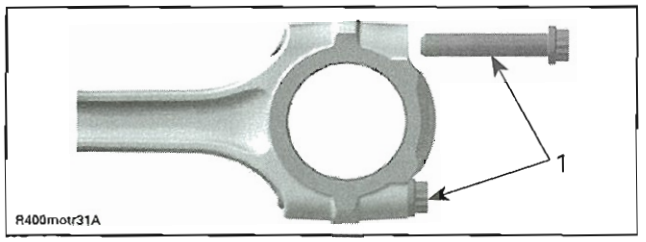
If the connecting rod small end diameter is out of specification, replace connecting rod.

Connecting Rod Big End Radial Play

NOTE: Prior to remove connecting rod from the crankshaft, mark big end halves together to ensure a correct reinstallation (cracked surface fits in only one position).

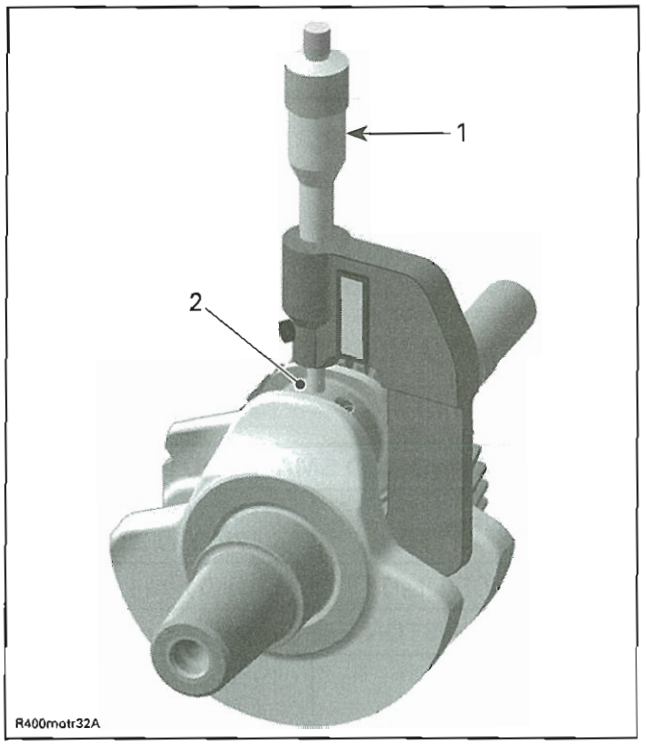
Remove connecting rod no. 6 from crankshaft no. 3.

CAUTION: Always replace connecting rod screws no. **7** if removing the connecting rod. It is also recommended to replace plain bearings no. **8.**



1. Connecting rod screw

Measure crankpin. Compare to inside diameter of connecting rod big end.

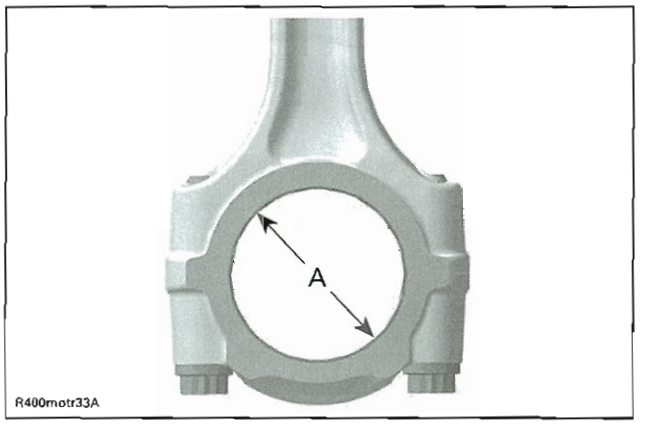


1. Micrometer
2. Crankpin area for plain bearings

To measure the connecting rod big end diameter, use the OLD screws no. 7.

Install the OLD plain bearings no. 8 as they were mounted initially.

Do the torque procedure as described further.

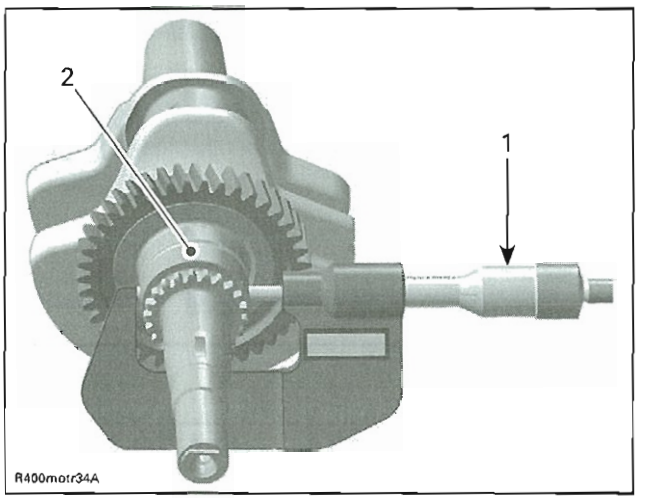


A. Connecting rod big end plain bearing

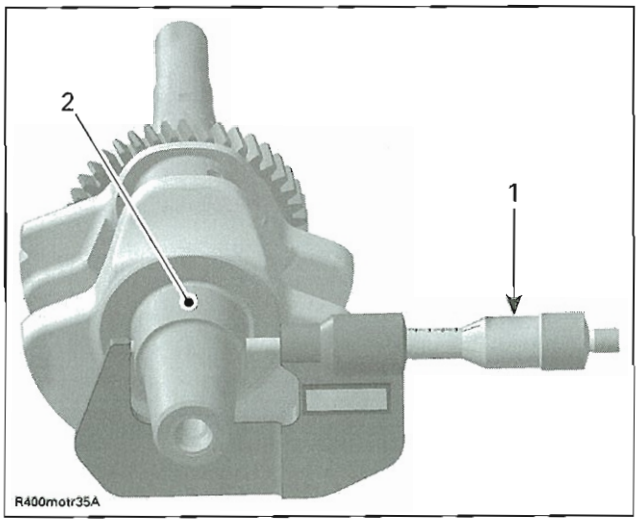
CRANKSHAFT PIN DIAMETER	
NEW	40.009 to 40.025 mm (1.575 to 1.576 in)
SERVICE LIMIT	39.980 mm (1.574 in)
CONNECTING ROD BIG END DIAMETER	
SERVICE LIMIT	40.100 mm (1.579 in)
CONNECTING ROD BIG END RADIAL PLAY	
SERVICE LIMIT	0.09 mm (.0035 in)

Crankshaft Radial Play MAG/PTO Side

Measure crankshaft on MAG/PTO side. Compare to inside diameter of MAG/PTO plain bearings.



1. Micrometer
2. Crankshaft area for MAG plain bearing



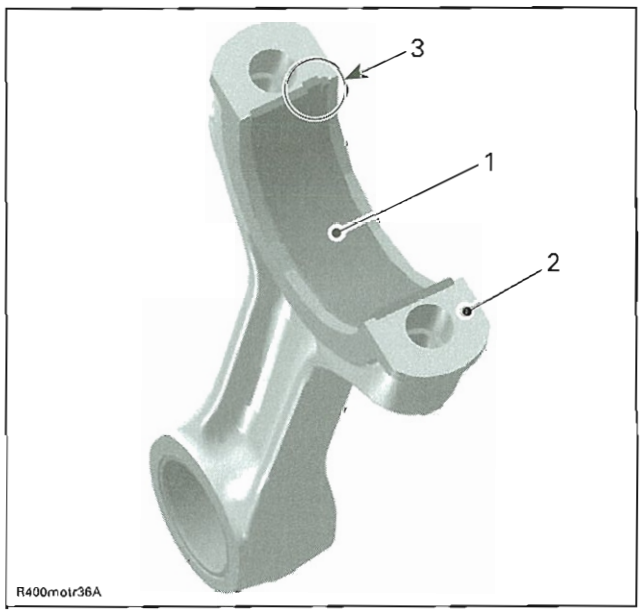
1. *Micrometer*
2. *Crankshaft area for PTO plain bearing*

CRANKSHAFT MAG/PTO DIAMETER	
NEW	42.024 to 42.040 mm (1.6545 to 1.6551 in)
SERVICE LIMIT	42.000 mm (1.6535 in)
CRANKSHAFT MAG RADIAL PLAY	
SERVICE LIMIT	0.07 mm (.0028 in)

Crankshaft Assembly

Use NEW bearings no. 8, when connecting rod big end diameter is out of specification.

Put plain bearings correctly in place and clean the split surface on both sides (cracked area) carefully.



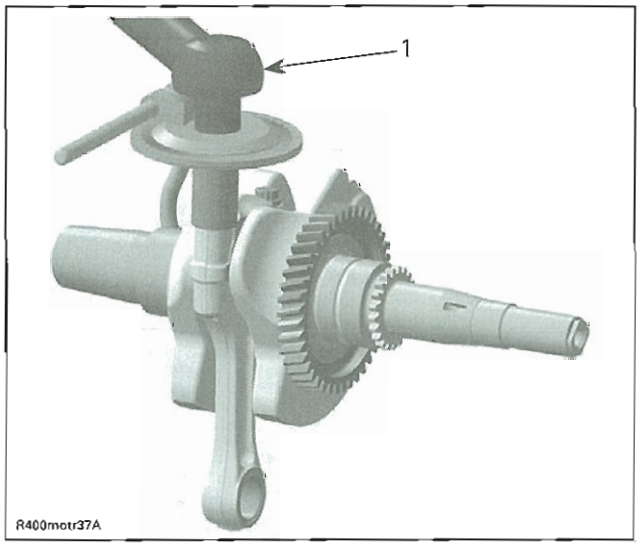
1. *Half plain bearing of connecting rod big end*
2. *Split surface of the connecting rod*
3. *Nose of bearing in line with connecting rod groove*

CAUTION: Always use NEW connecting rod screws for the final assembly of the crankshaft.

Torque NEW connecting rod screws no. 7 as per following procedure:

- Install screws with half of recommended torque in the exploded view. Do not apply any thread locker product.
- Torque with the recommended values in the exploded view.
- Finish tightening the screws with an additional 60° turn using an angle torque wrench.

CAUTION: Failure to strictly follow this procedure may cause screw to loosen and lead to engine damage.

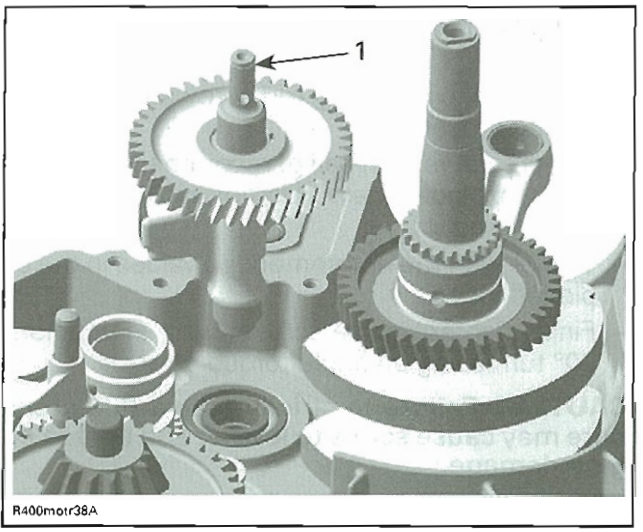


1. *Angle torque wrench*

Crankshaft Installation

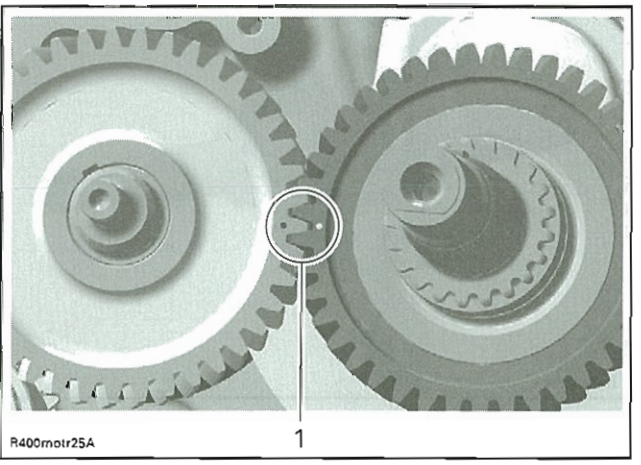
For installation, reverse the removal procedure. Pay attention to following details.

Install crankshaft first then balancer shaft.



1. Installer of balancer shaft

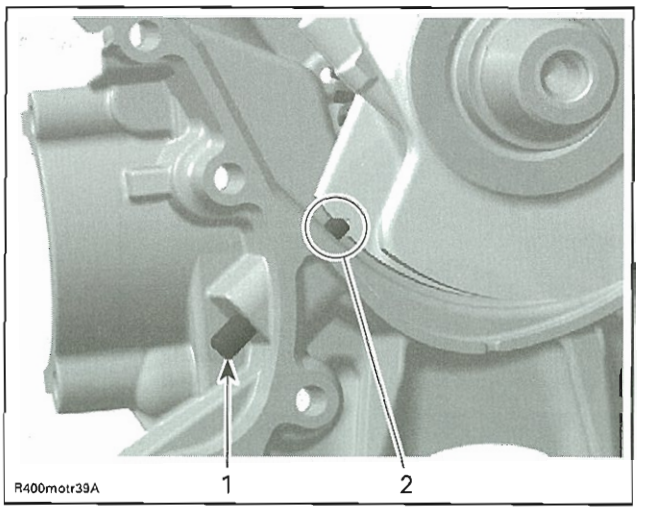
Align the marks of crankshaft and balancer shaft.



1. Punched marks located in the gears

After reinstalling of crankcase MAG, measure axial clearance of crankshaft with a feeler gauge on the PTO side between PTO crankcase and crankshaft thrust surface.

Install the crankshaft locking bolt (P/N 529 035 517) to keep the crankshaft in TDC position before installing the camshaft timing chain (refer to *CRANKSHAFT LOCKING PROCEDURE*).

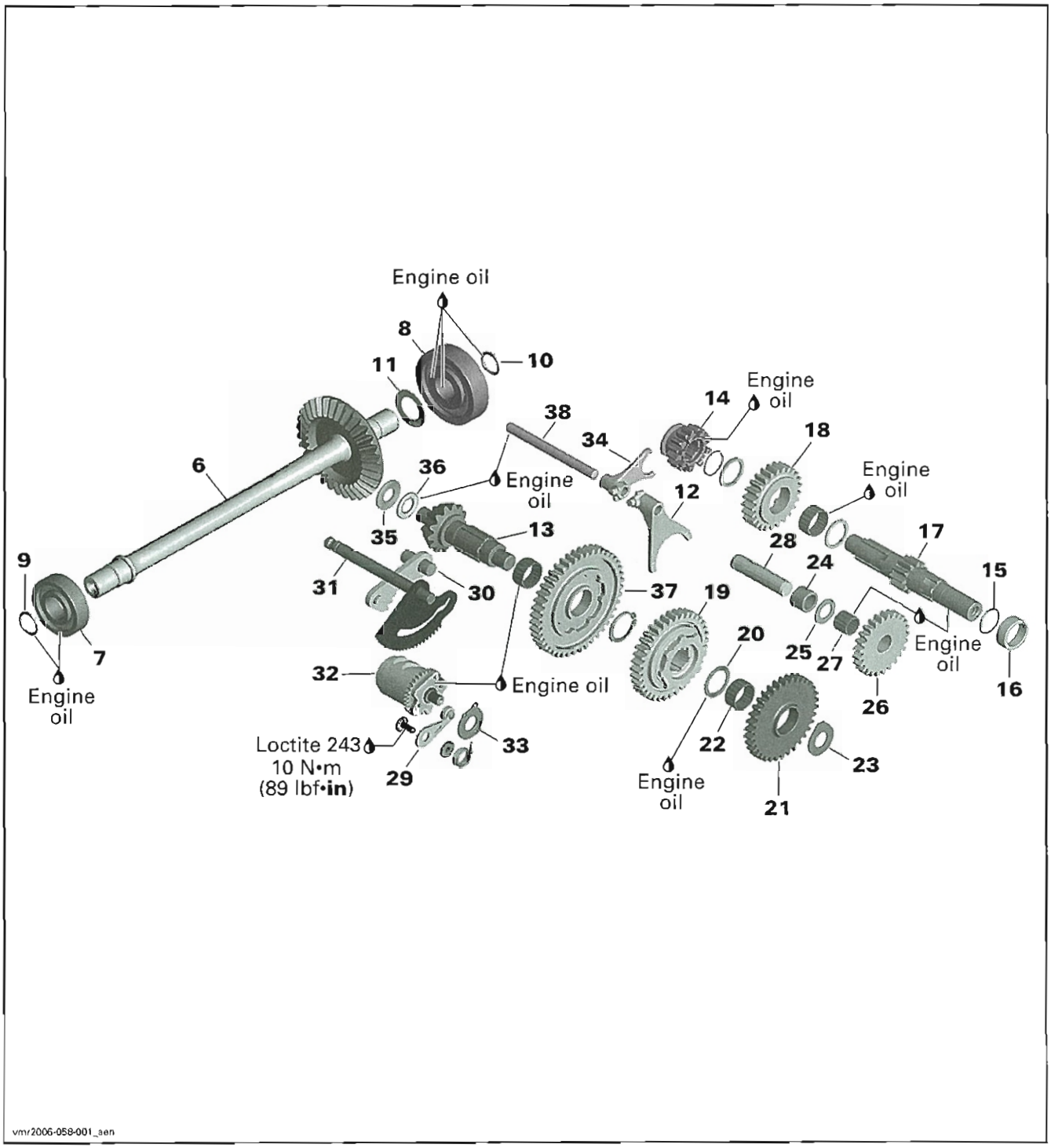


1. Crankshaft locking bolt
2. Engagement groove for TDC position of the piston

Using pulley flange cleaner (P/N 413 711 809), clean both crankshaft tapers before installing the rotor or the drive pulley.

CAUTION: Make sure the woodruff key on crankshaft MAG is present and correctly in place.

GEARBOX/OUTPUT SHAFT



GENERAL

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

⚠ WARNING

Torque wrench tightening specifications must strictly be adhered to.
Locking devices (e.g.: locking tabs, elastic stop nuts, self-locking fasteners, etc.) must be installed or replaced with new ones where specified. If the efficiency of a locking device is impaired, it must be renewed.

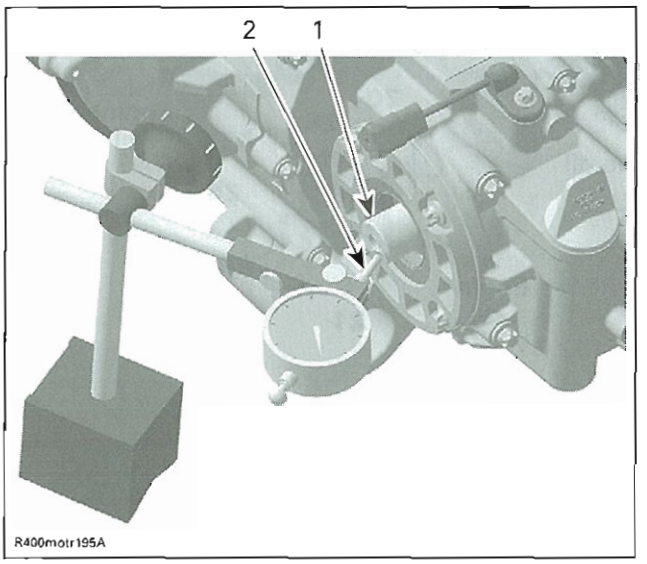
PROCEDURES

OUTPUT SHAFT

Output Shaft Removal

Remove the engine from the vehicle. Refer to *ENGINE REMOVAL/INSTALLATION* section.

Measure output shaft axial clearance prior to remove it.



1. *Output shaft*
2. *Dial indicator*

OUTPUT SHAFT AXIAL CLEARANCE	
SERVICE LIMIT	0.30 mm (.012 in)

If the output shaft axial clearance is out of specification, crankcase must be split and the bevel gear must be adjusted. See *GEARBOX ADJUSTMENT* in this section.

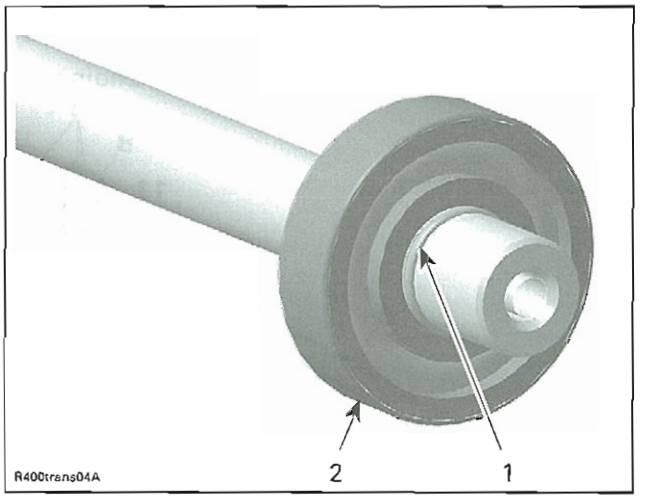
CAUTION: If the output shaft must be changed, always replace the bevel gear shaft at the same time.

Remove:
- Output shaft bearing cover
- Magneto cover and rotor (refer to *MAGNETO/STARTER*).

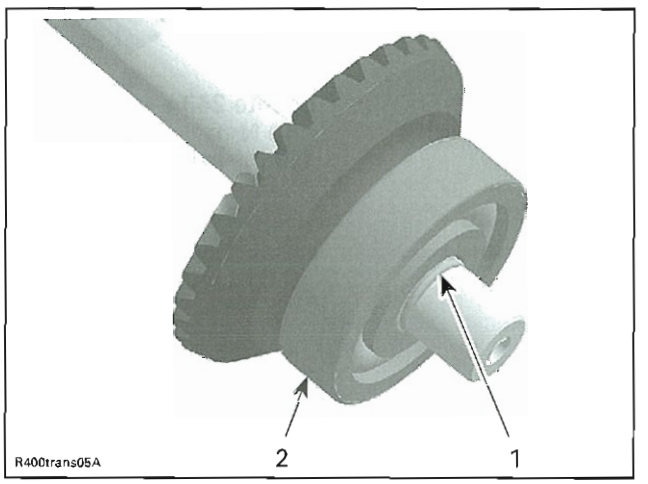
Use a soft hammer to remove output shaft no. 6 from housing.

Remove both O-rings and both bearings from output shaft.

NOTE: Both bearings on output shaft have a transition fit.

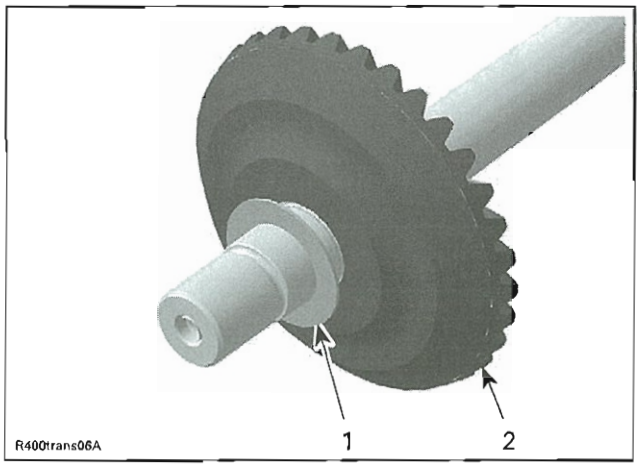


1. *O-ring*
2. *Bearing on front side*



1. *O-ring*
2. *Bearing on rear side*

Withdraw thrust washer.



1. Thrust washer
2. Output shaft ring gear

Output Shaft Inspection

Check output shaft for bending, cracks and other visible damages.

CAUTION: Always replace output shaft and bevel gear shaft at the same time.

Check output shaft gear for wear and teeth damages.

Check if output shaft bearings no. 7 and no. 8 turn freely and smoothly. Replace if necessary.

Replace output shaft seal if brittle, hard or damaged. Refer to *CRANKCASE/CRANKSHAFT* for replacement procedure.

Replace O-rings no. 9 and no. 10 if brittle, hard or damaged.

Clean crankcase and magneto cover mating surface and especially the bearing areas from metal particles or other contamination.

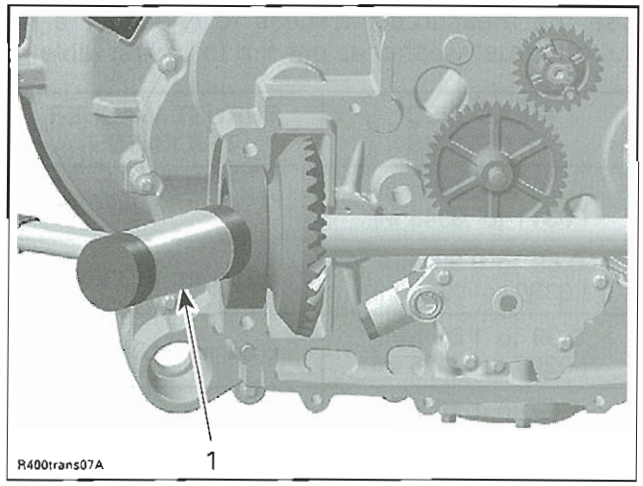
Output Shaft Installation

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

Adjust axial play as per following procedure:

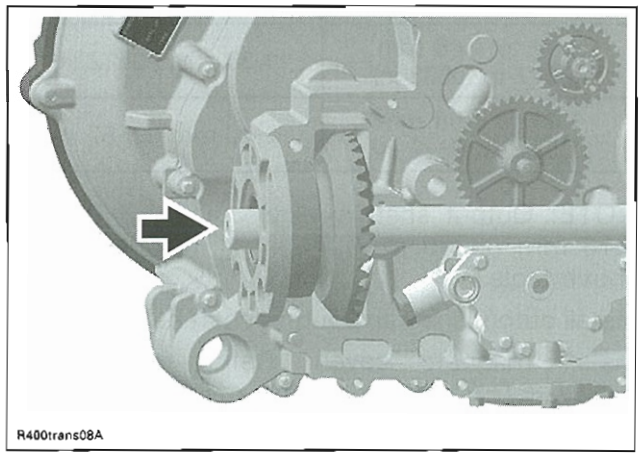
Install output shaft in housing **without** thrust washer no. 11.

Use a soft hammer to put bearings exactly in place against crankcase.



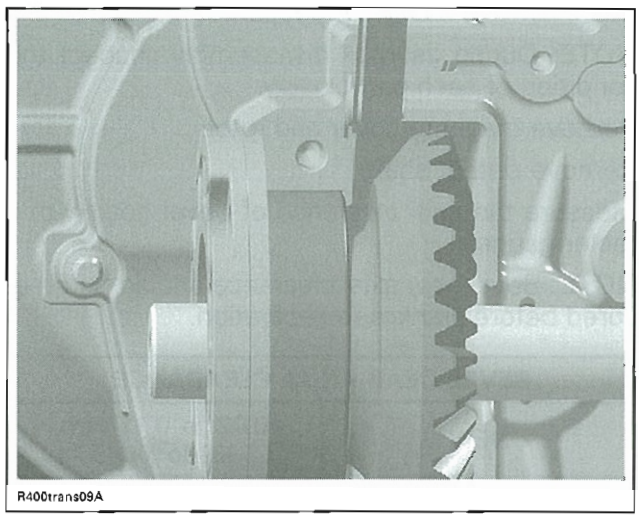
1. Soft hammer

Push output shaft as per following illustration.



WAY TO PUSH THE BEVEL GEARS TOGETHER

Install output shaft bearing cover and measure axial gap between bearing and output shaft gear with a feeler gauge.



Remove output shaft again and rebuild it with proper thrust washer.

Use the measured thickness to choose the required thrust washer as per the following table.

MEASURED THICKNESS	THRUST WASHER THICKNESS
0.79 to 0.88 mm (.0311 to .0346 in)	0.70 mm (.0276 in)
0.89 to 0.98 mm (.0350 to .0386 in)	0.80 mm (.0315 in)
0.99 to 1.08 mm (.0390 to .0425 in)	0.90 mm (.0354 in)
1.09 to 1.18 mm (.0429 to .0465 in)	1.00 mm (.0394 in)
1.19 to 1.28 mm (.0469 to .0504 in)	1.10 mm (.0433 in)
1.29 to 1.38 mm (.0508 to .0543 in)	1.20 mm (.0472 in)
1.39 to 1.48 mm (.0547 to .0583 in)	1.30 mm (.0512 in)
1.49 to 1.58 mm (.0587 to .0622 in)	1.40 mm (.0557 in)

NOTE: Output shaft axial clearance of 0.09 to 0.18 mm (.0035 to .0071 in) is included in the above table.

Install output shaft and output shaft bearing cover.

Install magneto cover. Refer to *MAGNETO/STARTER* section in this manual for procedure.

GEARBOX

Gearbox Disassembly

Remove engine from vehicle (refer to *ENGINE REMOVAL/INSTALLATION* section).

NOTE: During gearbox disassembly, inspect the condition of each part closely.

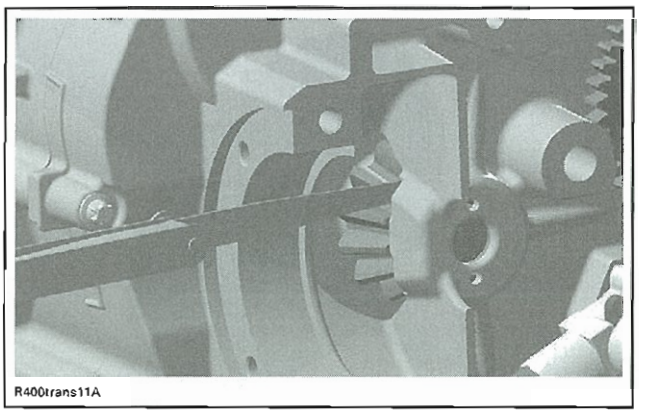
Remove magneto cover and rotor.

Remove output shaft.

Measure the axial clearance of bevel gear with a feeler gauge.

NOTE: Bevel gear axial clearance should be measured before crankcase separation.

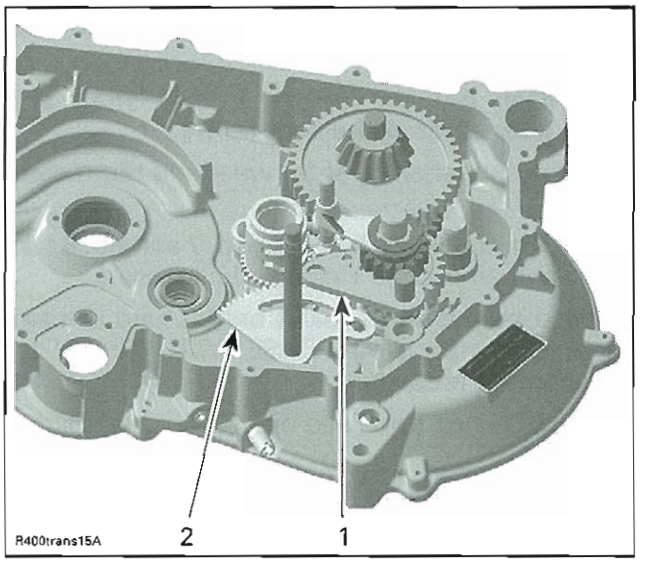
BEVEL GEAR AXIAL CLEARANCE	
NEW	0.02 to 0.11 mm (.0008 to .0043 in)
SERVICE LIMIT	0.15 mm (.006 in)



MEASURE AXIAL CLEARANCE OF BEVEL GEAR

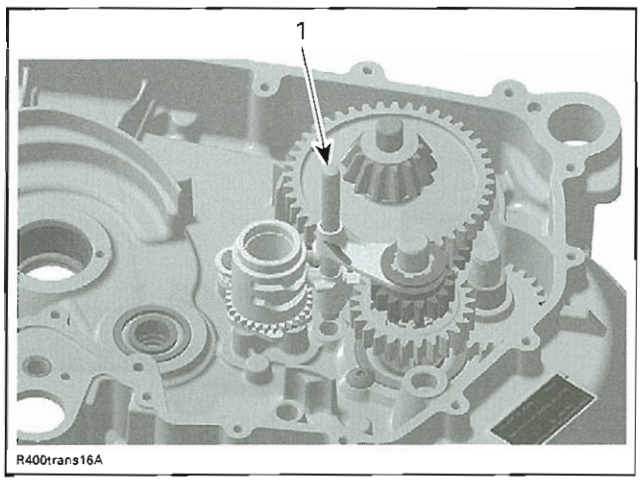
Separate crankcase, refer to *CRANKCASE/CRANKSHAFT*.

Remove balancer shaft, parking lever and shift shaft.



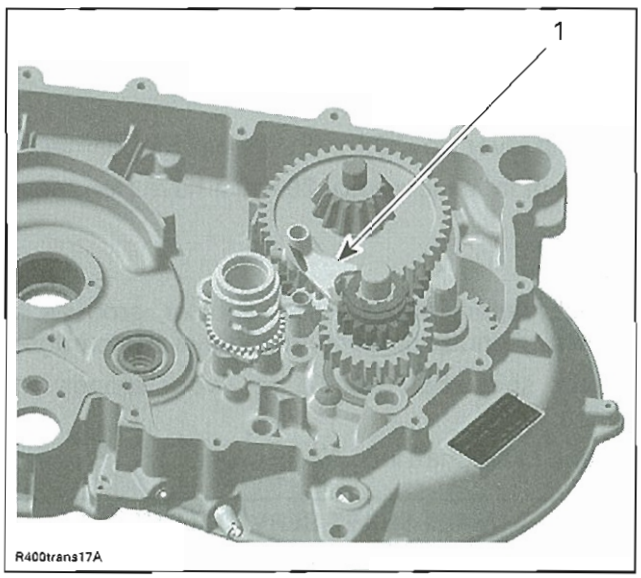
1. *Parking lever*
2. *Shift shaft*

Remove shift fork shaft.



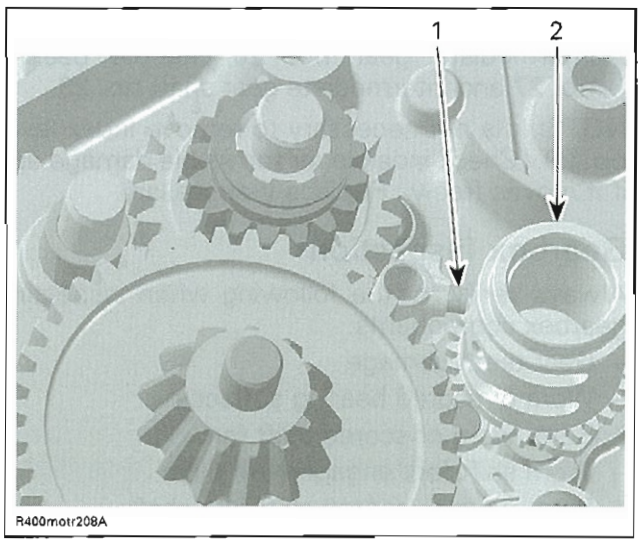
1. Shift fork shaft

Remove shift fork.



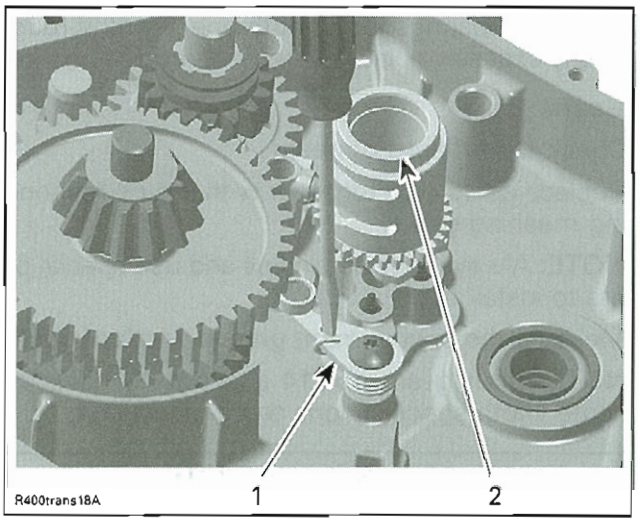
1. Shift fork (engaged in main shaft gear)

Disengage shift fork from shift drum.



1. Shift fork engagement pin
2. Shift drum

Insert a flat screwdriver in the slot of index lever. Turn screwdriver counterclockwise and remove shift drum.



1. Index lever
2. Shift drum

Remove:

- Shift fork no. 12
- Bevel gear shaft no. 13 with low range gear assembly
- Main gear no. 14
- O-ring no. 15 including distance sleeve no. 16 from main shaft no. 17 on engine PTO side
- Main shaft with high range gear no. 18 assembly
- Gear selection no. 19, thrust washer no. 20, reverse gear no. 21, needle bearing no. 22 and thrust washer no. 23

– Distance sleeve no. 24, thrust washer no. 25, intermediate gear no. 26, needle bearing no. 27 and intermediate gear shaft no. 28.

NOTE: It is not necessary to remove index lever no. 29. Check index lever for visible damage and if it moves freely. Replace if necessary.

Gearbox Inspection

Always verify for the following when inspecting gearbox components:

- Gear teeth damage
- Worn or scored bearing surfaces
- Bent, worn or scored shift fork
- Worn shift fork engagement pins
- Bent, worn or scored shift fork shaft
- Rounded engagement dogs and slots of gears
- Worn grooves on shift drum
- Worn gear engagement groove
- Worn splines on shafts and gears.

Bearings

Check all bearings for smooth operation. If rough or any excessive play is detected, replace bearing.

Gears

Check tooth flanks of gears.

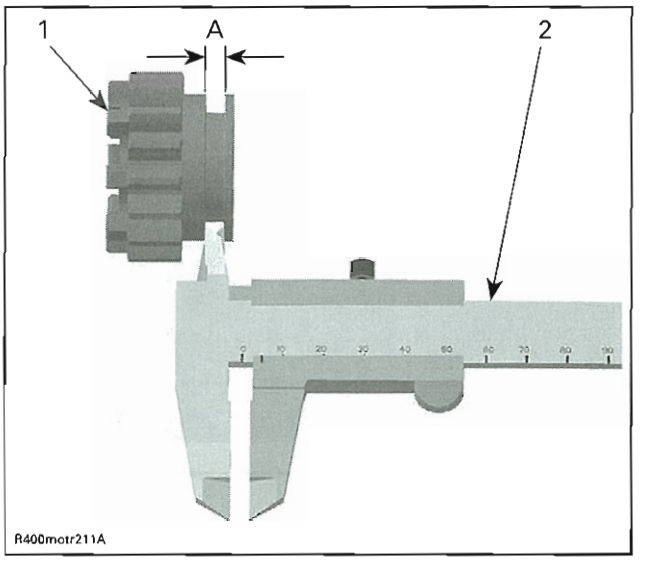
Replace gears only together with the corresponding meshing gears.

NOTE: Always replace circlips and use special pliers to install them.

Measure the engagement groove width of gears.

NOTE: Both gears no. 14 and no. 19 have the same width specifications and service limit.

GEAR GROOVE WIDTH	
NEW	5.00 to 5.10 mm (.197 to .201 in)
SERVICE LIMIT	5.20 mm (.205 in)



1. Main gear
2. Caliper
A. Engagement groove width

Levers

Parking lever no. 30 for cracks or other damages.

Roller of index lever no. 29 must have free movement.

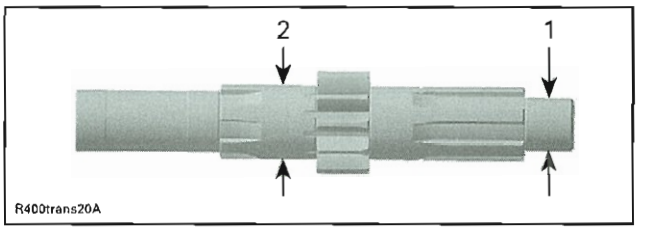
Shafts

Check taper grooves and annular grooves of shafts. Annular grooves must have sharp edges.

Check shift shaft no. 31 for worn splines and gears.

Check main shaft no. 17 for wear.

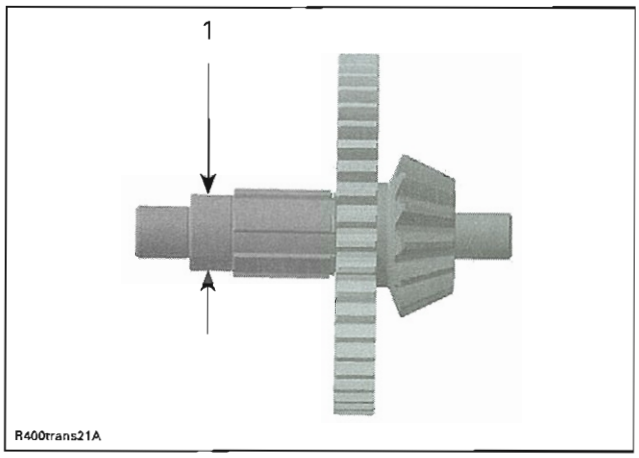
MAIN SHAFT SERVICE LIMIT	
MAG SIDE	17.990 mm (.708 in)
PTO SIDE	24.950 mm (.982 in)



1. Mag side
2. PTO side

Check bevel gear shaft no. 13.

BEVEL GEAR SHAFT SERVICE LIMIT	
PTO SIDE	24.990 mm (.984 in)



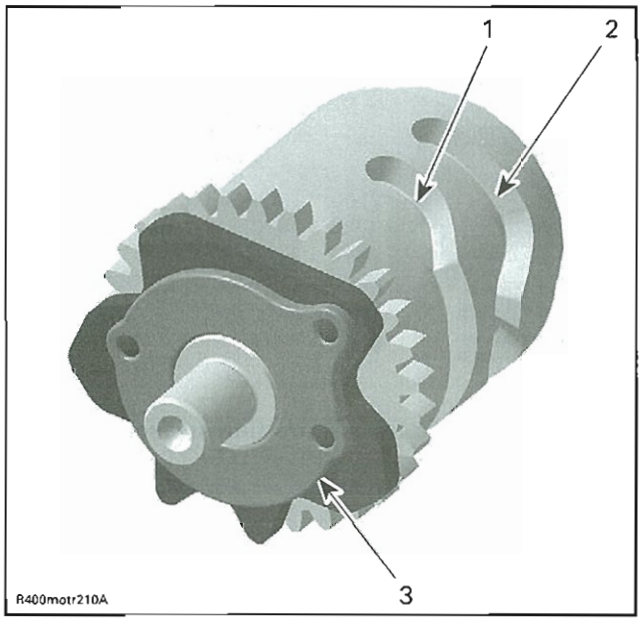
1. PTO side

Shift Drum

Check tracks of shift drum **no. 32** for scoring or heavy wear like rounded engagement slots.

Check index washer on shift drum for scoring or visible damages.

Replace isolating washer **no. 33** if there are signs of wear or visible damages.



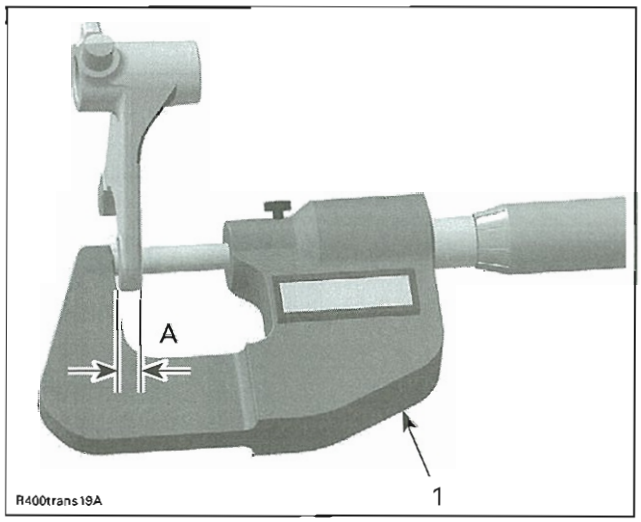
1. Track for the low/reverse gear shift fork
2. Track for the high gear shift fork
3. Isolating washer on the shift drum

Shift Forks

Check both shift forks **no. 12** and **no. 34** for visible damage, wear or bent shift fork claws.

Measure the shift fork claw thickness.

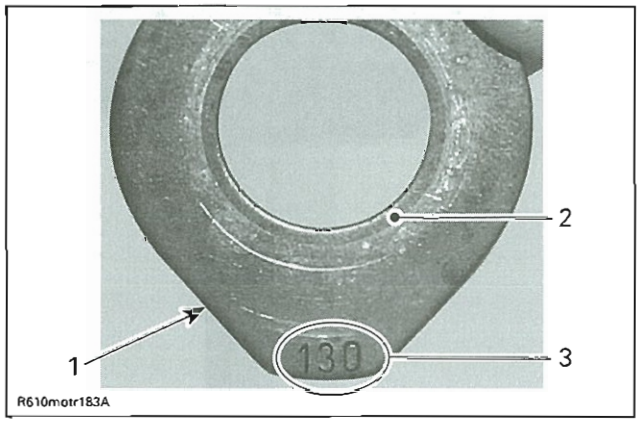
SHIFT FORK CLAW THICKNESS	
NEW	4.800 to 4.860 mm (.189 to .191 in)
SERVICE LIMIT	4.750 mm (.187 in)



1. Micrometer
A. Shift fork claw thickness

Thrust Washers

Check thrust washers **no. 23** and **no. 35** for wear. Always replace thrust washer by a new one with the same thickness, when reassembling the gearbox with existing output shaft **no. 6** and bevel gear **no. 13**.



1. Thrust washer for adjusting the bevel gear axial clearance on PTO side
2. Area where wear signs appear
3. Adjustment thickness of the washer

Gearbox Adjustment

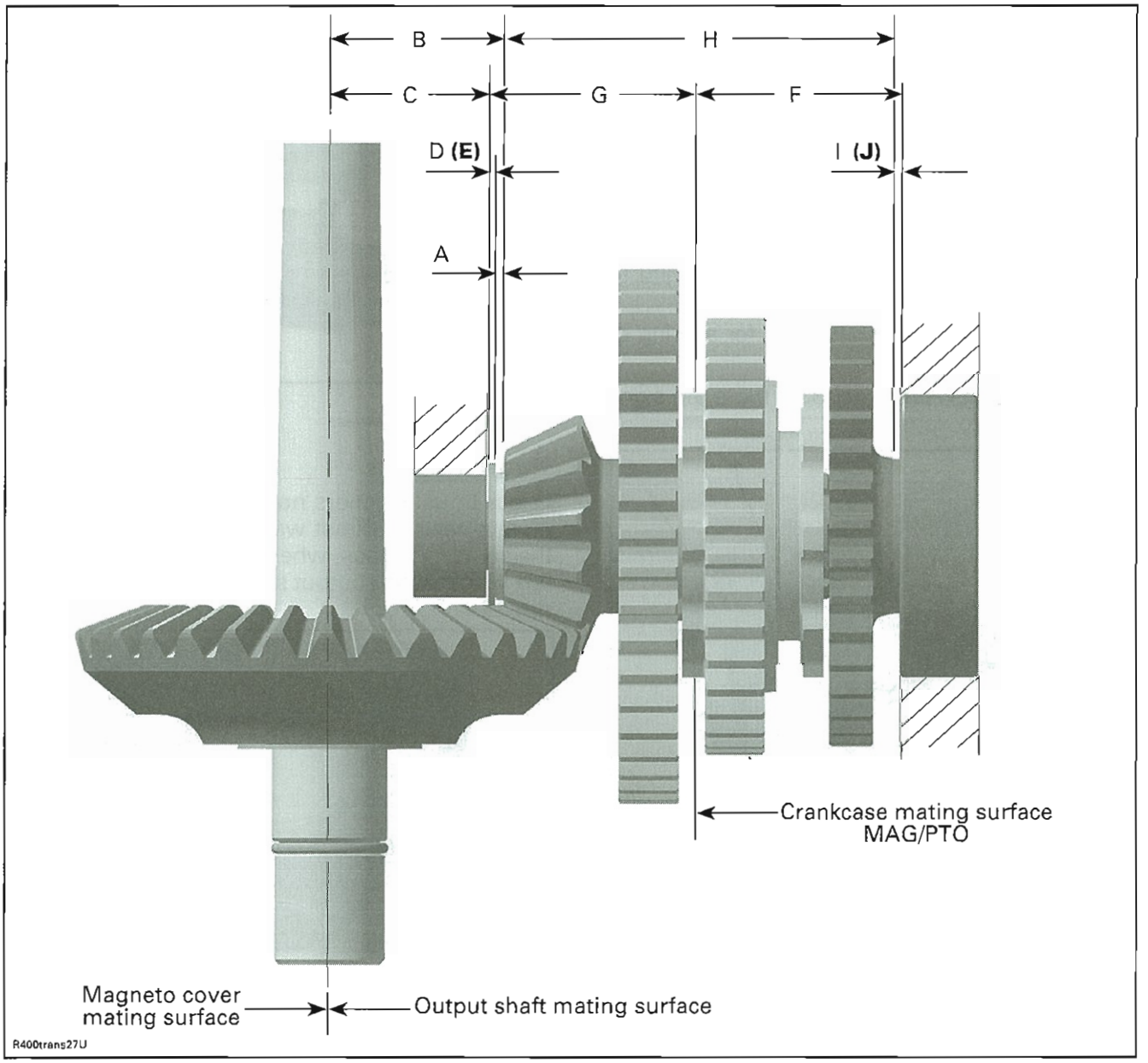
NOTE: When the output shaft axial clearance is out of specification or if the following parts are changed (output shaft, bevel gear or crankcase), the bevel gear adjustments must be verified.

The bevel gear adjustment includes:
- Bevel gear backlash on MAG side crankcase
- Bevel gear axial clearance on PTO side crankcase.

The bevel gear backlash is adjusted by finding the proper thrust washer thickness E as per following illustration.

The bevel gear axial clearance is adjusted by finding the proper thrust washer thickness J as per following illustration.

NOTE: Clean mating surface of crankcase before taking measurements. Refer to *CRANKCASE/CRANKSHAFT*.



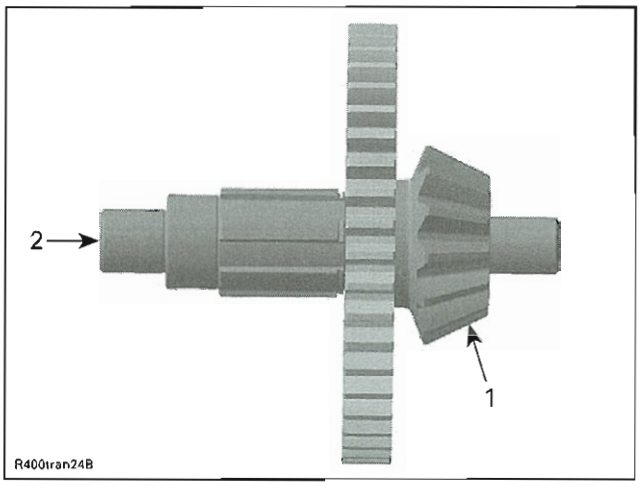
Bevel Gear Backlash Procedure (MAG Side Crankcase)

Use the following course of calculation to determine the theoretical thickness D of thrust washer **no. 35** on MAG side crankcase:

D = B - C - A

B = Distance between the thrust surface of bevel gear and the theoretical center of its taper. This is defined by manufacturer and written on the bevel gear shaft.

NOTE: Bevel gear reference number is a value between - 10 and + 10.

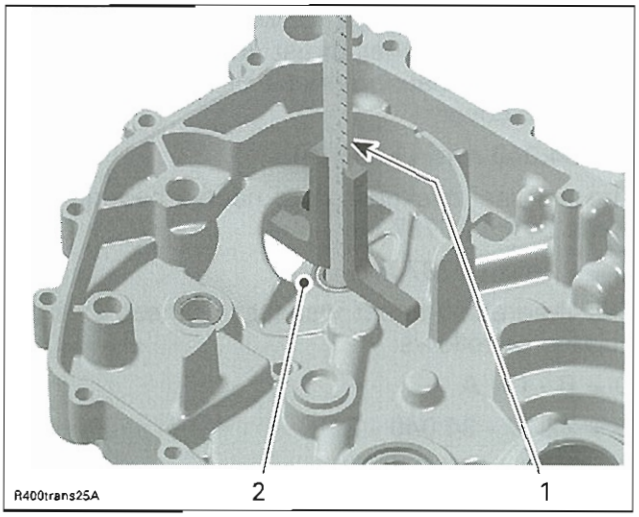


1. Bevel gear
2. Bevel gear reference number location

Use following course of calculation to find out value B.

$$B = \left(\frac{\text{bevel gear reference number}}{100}\right) + 37.8$$

C = Distance between the washer thrust surface in the MAG side and the mating surface of crankcase magneto cover.



1. Depth gauge
2. Washer thrust surface

A = 2 mm (.0787 in) nominal thickness of axial needle bearing **no. 36**.

When all the measurements are taken, calculate the theoretical thickness D of thrust washer using the formula (D = B - C - A).

Take the obtained theoretical thrust washer thickness D and choose the proper thrust washer number E according to the following table.

THEORETICAL THRUST WASHER THICKNESS **D**	THRUST WASHER 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

Example

Take the reference number on the bevel gear shaft: - 3.

B = (- 3/100) + 37.8

B = 37.77

Measure the distance C with a depth gauge, between the washer thrust surface in the MAG side and the mating surface of crankcase MAG/ magneto cover.

C = 34.040 mm (1.340 in)

The nominal thickness A of needle bearing is always 2 mm (.0787 in).

A = 2 mm (.0787 in)

The theoretical thrust washer thickness D is calculated as follows:

D = B - C - A

D = 37.77 - 34.040 - 2

D = 1.73 mm (.0681 in)

NOTE: Take the obtained theoretical thrust washer thickness D and choose the proper thrust washer according to table above.

In this example, the correct thrust washer number is 170.

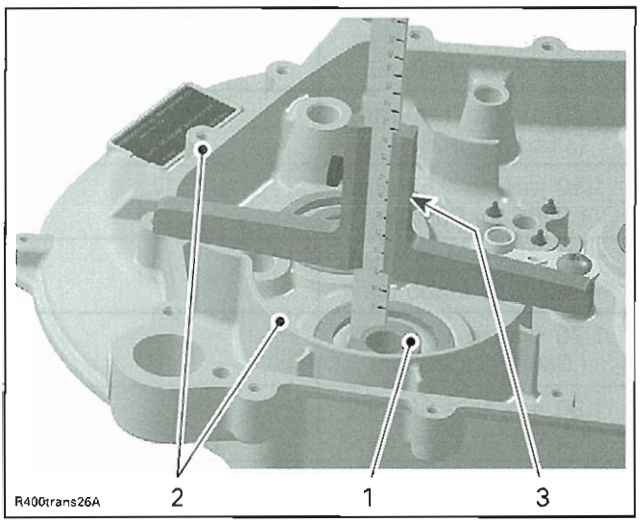
NOTE: The thrust washer number 170 represents a value equal at 1.70 mm (.0669 in).

Bevel Gear Axial Clearance Procedure (PTO Side Crankcase)

Use the following course of calculation to determine the theoretical thickness I of thrust washer no. 23 on PTO side crankcase:

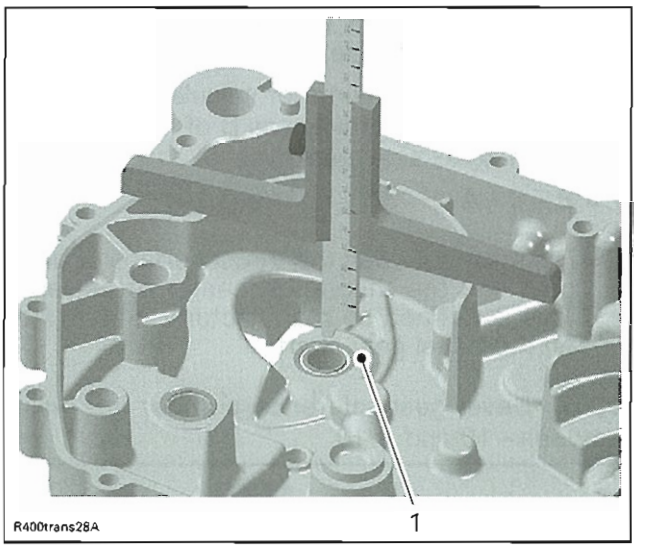
I = F + G - H - A - E

F = Distance between mating surface (crankcase PTO) to ball bearing inner race.



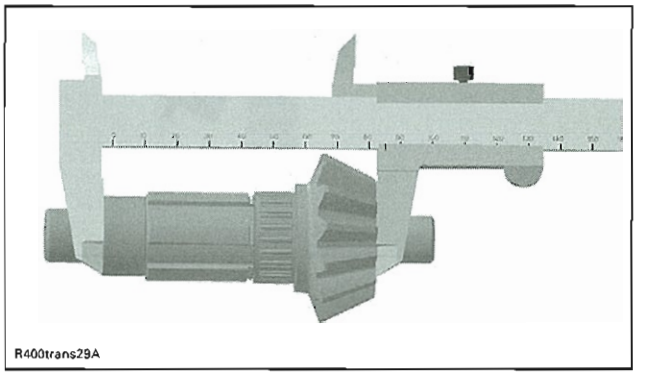
1. *Ball bearing inner race*
2. *Mating surface of crankcase PTO*
3. *Depth gauge*

G = Distance between mating surface of crankcase MAG and butting face.



1. *Butting surface*

H = Distance between thrust surfaces of bevel gear shaft.



A = 2 mm (.0787 in) nominal thickness of needle bearing no. 36.

E = The thrust washer number nominal value as found in the *BEVEL GEAR BACKLASH PROCEDURE*. For example, thrust washer number 170 represents a value of 1.70 mm (.0669 in).

When all the measurements are taken, calculate the theoretical thrust washer thickness I using the formula (I = F + G - H - A - E).

Take the obtained theoretical thrust washer thickness I and choose the proper thrust washer number J according to the following table.

THEORETICAL THRUST WASHER THICKNESS I	THRUST WASHER 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 (0.0677 to .0713 in)	170
1.82 mm to 1.91 mm (.0717 to .0752 in)	180

NOTE: Bevel gear axial clearance of 0.02 to 0.11 mm (.00079 to .00433 in) is included in the above table.

Example

Measure the distance F.

F = 51.800 mm (2.039 in)

Measure the distance G.

G = 39.080 mm (1.539 in)

Measure the distance H, between both butting surfaces of bevel gear shaft.

H = 85.680 mm (3.373 in)

The nominal thickness A of needle bearing is always 2 mm (.0787 in).

A = 2 mm (.0787 in)

E = The thrust washer number nominal value.

E = 1.70 mm (.0669 in)

The theoretical washer thickness I is calculated as follows:

I = F + G - H - A - E

I = 51.800 + 39.080 - 85.680 - 2 - 1.70

I = 1.50 mm

NOTE: Take the obtained theoretical thrust washer thickness I and choose the corresponding thrust washer number J according to table above.

In this example, the correct thrust washer number is 140.

NOTE: The thrust washer number 140 represents a value equal at 1.40 mm (.0551 in).

Gearbox Assembly

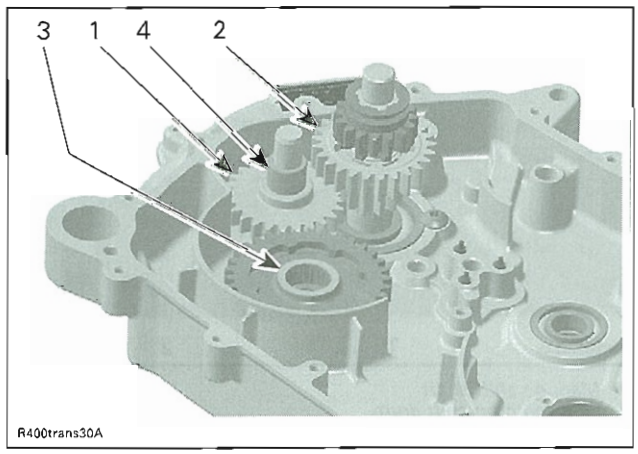
For assembly, reverse the disassembly procedure. Pay attention to the following details.

Install:

- Intermediate gear shaft no. 28, needle bearing no. 27, intermediate gear no. 26, thrust washer no. 25 and distance sleeve no. 24
- Thrust washer no. 23, needle bearing no. 22, reverse gear no. 21, thrust washer no. 20 and gear selection no. 19
- Main shaft no. 17 with high range gear no. 18 assembly
- Main gear no. 14
- Bevel gear shaft no. 13 with low range gear no. 37 assembly.

NOTE: If a new bevel gear is used, it is necessary to perform the bevel gear adjustments (see *GEARBOX ADJUSTMENT*). If the existing bevel gear is used, it is mandatory to use new thrust washers no. 23 and no. 35 with the same thickness and also a new axial needle bearing no. 36.

First install intermediate gear then main shaft and afterward the bevel gear.

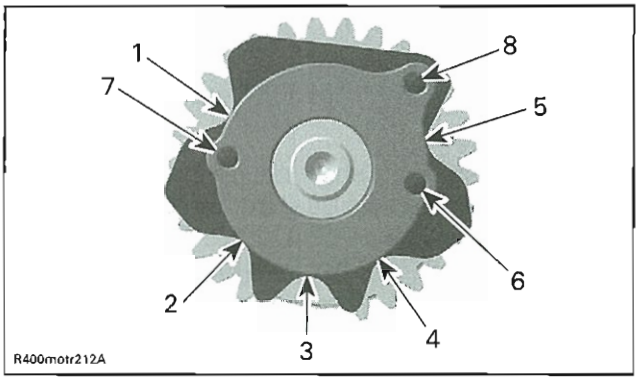


1. *Intermediate gear*
2. *Main shaft*
3. *Thrust washer after gear selection on bevel gear*
4. *Thrust washer between distance sleeve and reverse gear*

Install shift forks no. 12 and no. 34.

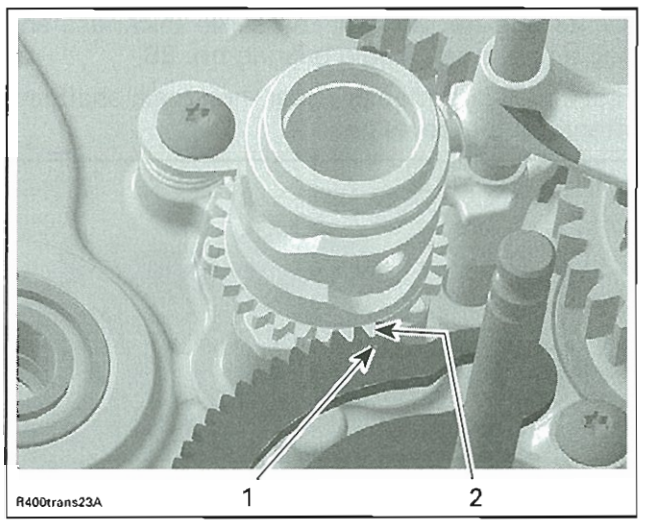
Put shift forks in place and afterward insert pin no. 38 with the chamfer on top for a better installation of crankcase MAG side.

Insert a flat screwdriver in the slot of index lever no. 29. Turn screwdriver counterclockwise and install shift drum on park position as per the following illustration.



1. *Parking stop location*
2. *Reverse stop location*
3. *Neutral stop location*
4. *High gear stop location*
5. *Low gear stop location*
6. *Contact to stop location for neutral/park position*
7. *Contact to reverse stop location*
8. *Pin to align isolating and index washer*

Insert shift shaft **no. 31** with mark in line to first tooth on shift drum.



1. *Mark on shift shaft*
2. *First tooth on shift drum*

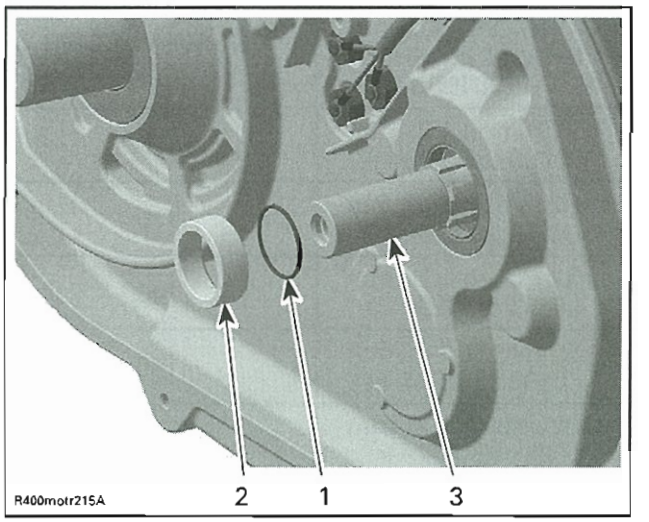
Install parking lever **no. 30**.

Run all gears as a final function check.

Install balancer shaft then close crankcase housings. Refer to *CRANKCASE/CRANKSHAFT*.

Install O-ring **no. 15** including distance sleeve **no. 16** on main shaft end PTO side.

CAUTION: Place O-ring including distance sleeve right away. Chamfered bore of distance sleeve has to face the engine.



1. *O-ring*
2. *Distance sleeve*
3. *Main shaft end PTO side*

Install all other removed parts.

GEARBOX POSITION SWITCHES

NOTE: First ensure shifter link rod is properly adjusted, Refer to *SHIFTER*.

The multifunction gauge uses one switch state (open or closed) for each P, N and R switch to determine the gearbox position.

Gearbox Position Switch Test with B.U.D.S.

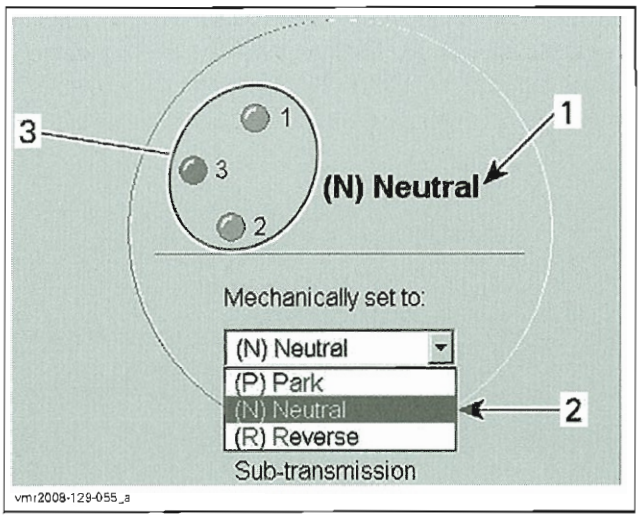
Connect B.U.D.S. Refer to *COMMUNICATION TOOLS/B.U.D.S. SOFTWARE*.

Select the **Monitoring tab** and go to **page 2** then use the **Sub-transmission** area.

Set the vehicle shifter lever to the position to test.

In B.U.D.S., select the position matching the shifter selection under **Mechanically set to:**.

Look at the "LED" area in B.U.D.S.



1. *Selected shifter position of vehicle*
2. *Choose position that matches the vehicle shifter selection*
3. *Test result (see table below): GREEN is good, RED is bad*

LED AREA IN B.U.D.S.	
NUMBER SHOWN IN B.U.D.S.	MATCHING SWITCH
1	Park
2	Reverse
3	Neutral

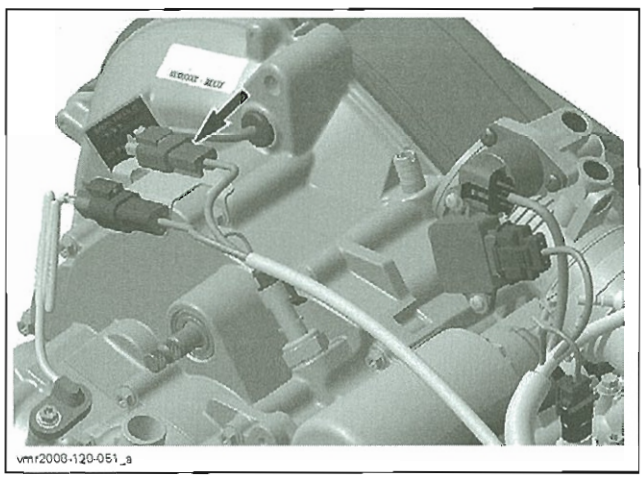
A GREEN LED should appear at the proper shifter position. If so, the switch is working.

A RED LED means the switch or wiring/connector is faulty. Carry out the resistance test.

Gearbox Position Switch Resistance Test

Remove air filter housing. Refer to *AIR INTAKE SYSTEM*.

Unplug gearbox position switch connector.

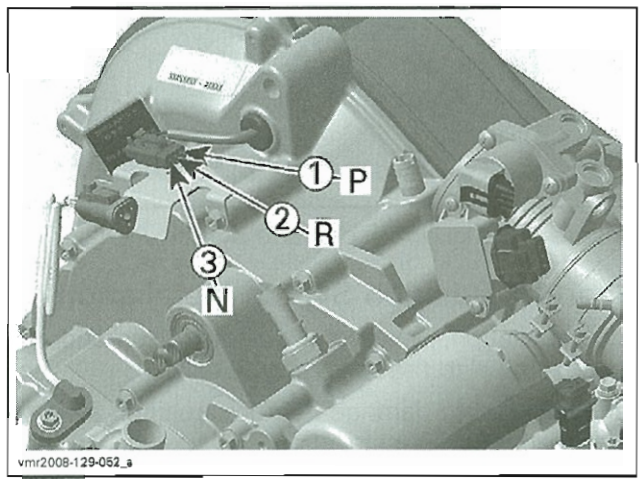


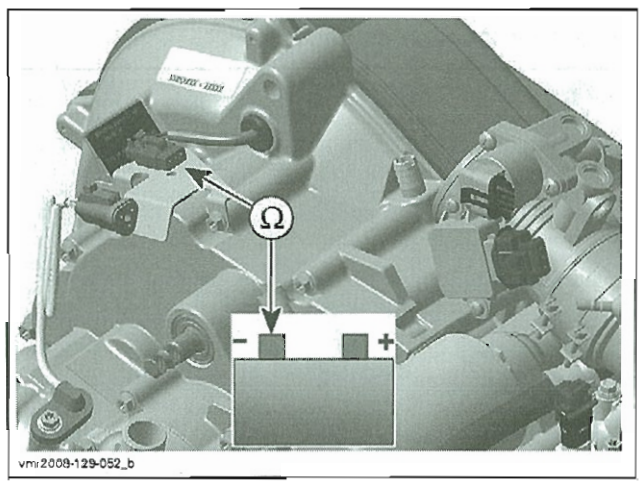
Use a multimeter and set it to Ω.

Set vehicle shifter in the position to test (P, R, N).

Measure the resistance of the pertaining switch using the following table.

SHIFTER POSITION	WIRE LOCATION		RESISTANCE
PARK	1 (BLUE)	Battery ground	Close to 0 Ω
REVERSE	2 (BROWN)		
NEUTRAL	3 (YELLOW/ GREEN)		





If test succeeded, switch is good.

If any switch is defective, check wiring/connector. If they it is good, replace switch with a new one.

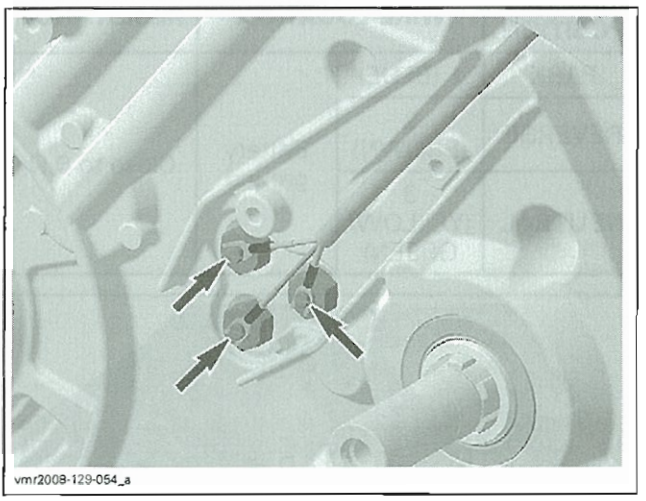
Gearbox Position Switch Removal

NOTE: The engine removal is not necessary to reach the gearbox position switches.

To reach the gearbox position switches, remove:
- CVT cover
- Driven pulley
- Protection plate no. 1.

NOTE: Clean area from dirt and belt dust before removing gearbox position switch(es).

Disconnect terminal.



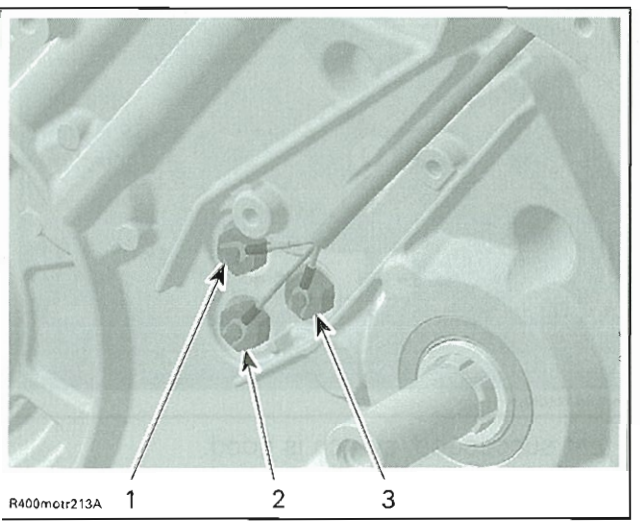
Unscrew the gearbox position switch.

Gearbox Position Switch Installation

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

Take care not to damage gearbox position switches threads during installation.

If all terminals were removed, put them back at the proper location as shown.

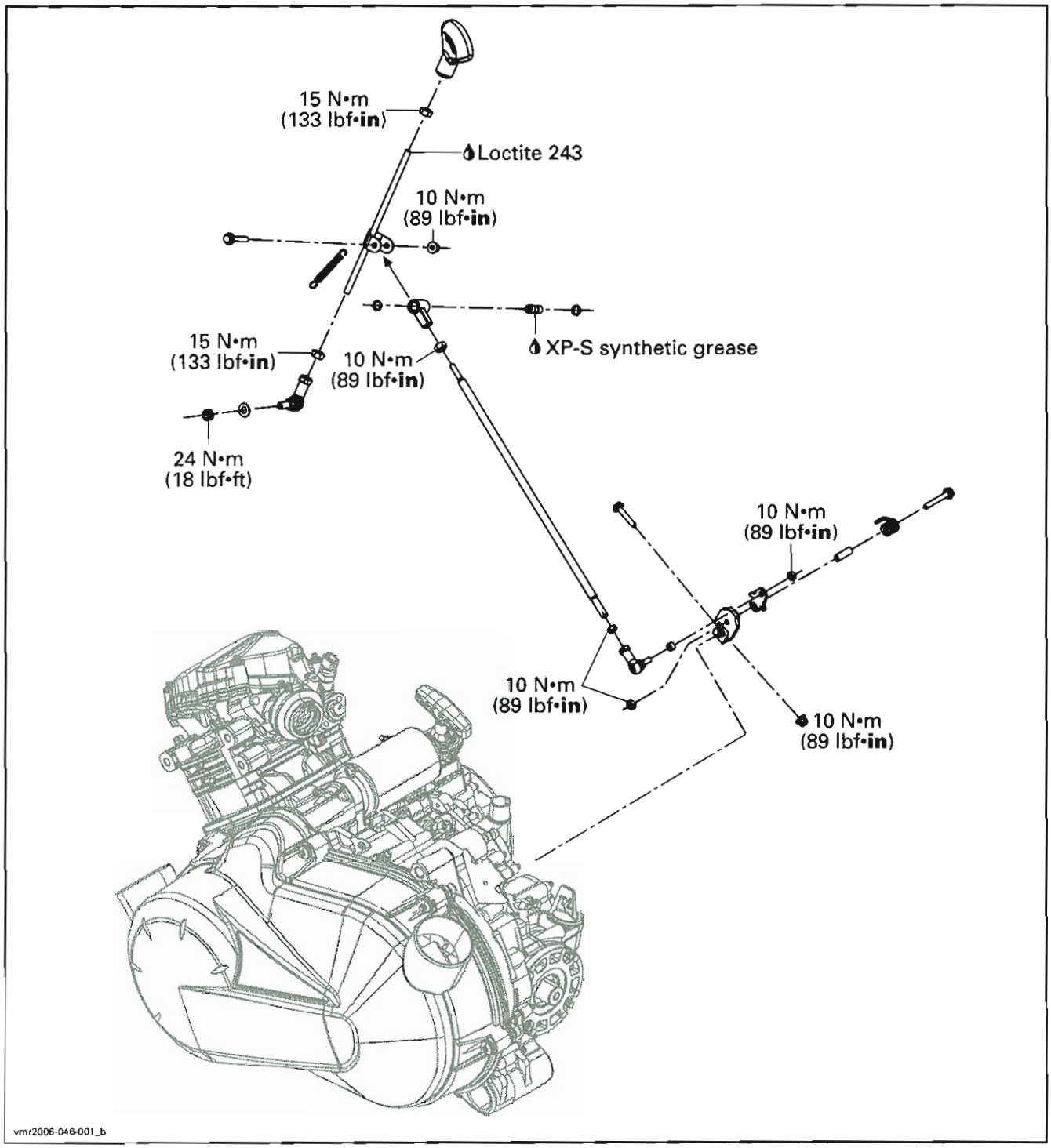


1. *Parking switch — BLUE wire*
2. *Reverse switch — BROWN wire*
3. *Neutral switch — GREEN/YELLOW wire*

SHIFTER

SERVICE PRODUCTS

Description	Part Number	Page
XP-S synthetic grease	293 550 010	175
Loctite 243 (blue)	293 800 060	174



GENERAL

Before performing any servicing on the shifter linkage system, be sure the shift lever is in NEUTRAL position and the parking brake is applied.

During assembly/installation, use the torque values and services products as in the exploded view.

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

⚠ WARNING

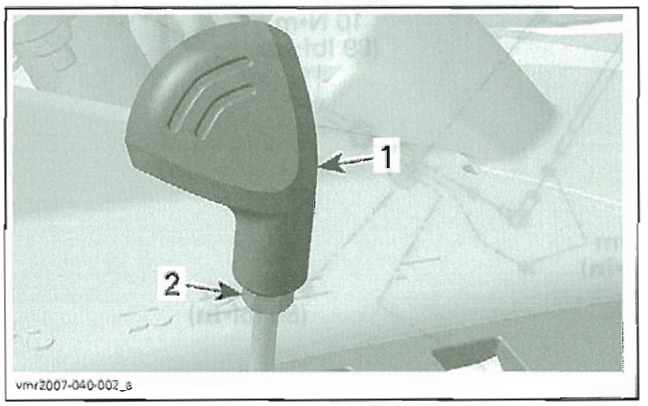
Torque wrench tightening specifications must strictly be adhered to.
Locking devices (e.g.: locking tabs, elastic stop nuts, self-locking fasteners, cotter pins, etc.) must be installed or replaced with new one where specified. If the efficiency of a locking device is impaired, it must be renewed.

PROCEDURES

HANDLE

Handle Removal

Loosen the nut under shift lever handle.



1. *Shift lever handle*
2. *Handle nut*

Unscrew shift lever handle.

Handle Installation

The installation is the reverse of removal procedure.

Apply Loctite 243 (blue) (P/N 293 800 060) on shift lever threads then screw the shift lever handle completely to the proper position. Lock it with the handle nut.

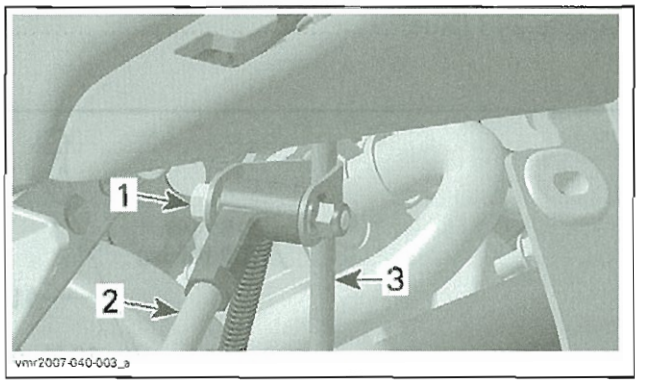
SHIFT LEVER

Shift Lever Removal

Remove RH side panel (refer to *BODY*).

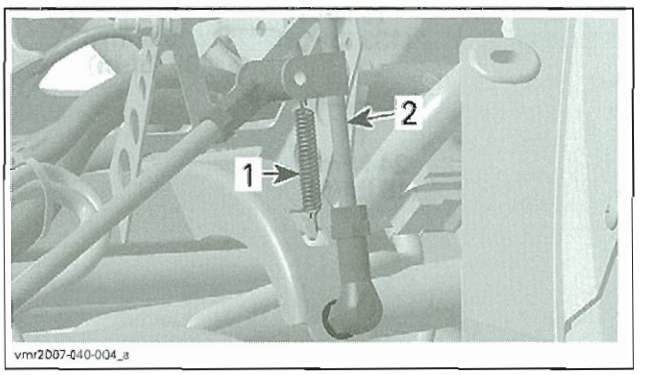
Remove the shift lever handle.

Remove the link rod bolt.



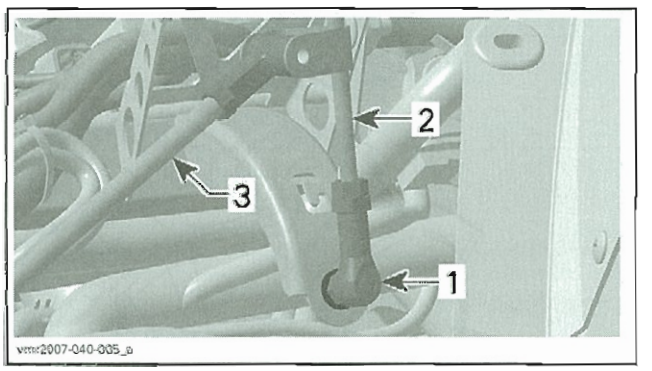
1. *Link rod bolt*
2. *Link rod*
3. *Shift lever*

Remove the tension spring.



1. *Tension spring*
2. *Shift lever*

Remove the tie rod from bracket.



1. *Tie-rod*
2. *Shift lever*
3. *Link rod*

Remove the shift lever.

Shift Lever Inspection

Check the shift lever for bending or cracks.

Check the tie-rod at the end of lever.

Replace the lever or the tie-rod if necessary.

Shift Lever Installation

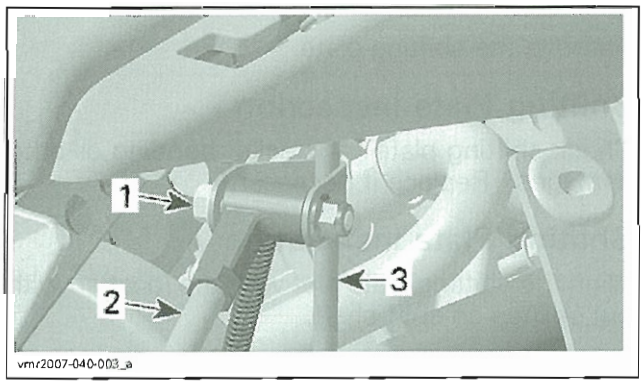
For installation, reverse the removal procedure.

LINK ROD

Link Rod Removal

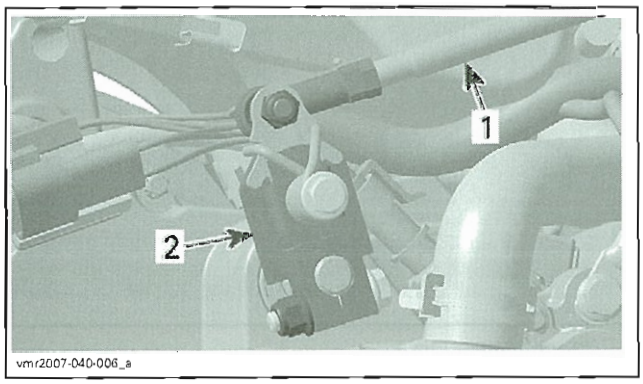
Remove the RH side panel (refer to *BODY*).

Remove the link rod bolt.



1. *Link rod bolt*
2. *Link rod*
3. *Shift lever*

Remove the link rod from shifting plate.



1. *Link rod*
2. *Shifting plate*

Remove the link rod.

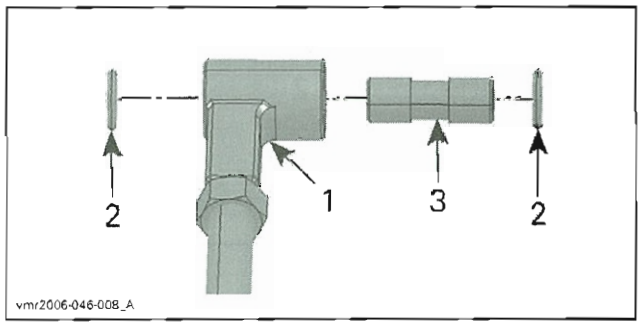
Link Rod Inspection

Check the link rod for bending or cracks.

Check the tie-rod at the end of link rod.

Replace the link rod if necessary.

Check both O-rings on threaded fitting and apply XP-S synthetic grease (P/N 293 550 010) on the bushing inside threaded fitting. Replace O-rings if necessary.



1. *Threaded fitting*
2. *O-rings*
3. *Bushing*

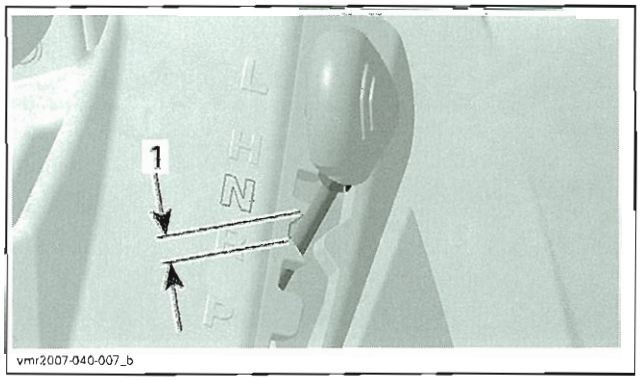
Link Rod Installation

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

Place the shift lever on NEUTRAL position.

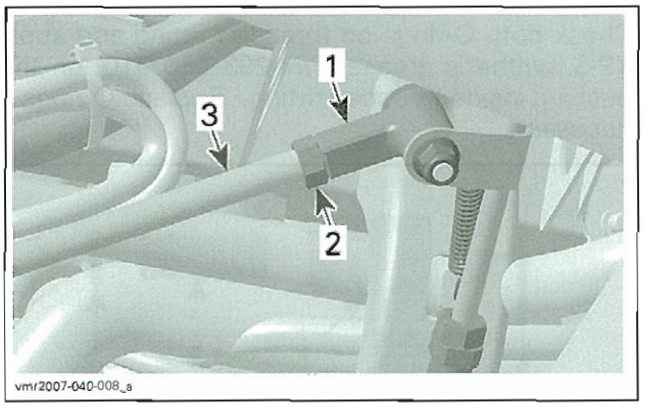
Install link rod.

Adjust the link rod so that the shift lever is located in the middle of NEUTRAL slot.



1. *Neutral slot*

Torque jam nuts.



1. Threaded fitting
2. Jam nut
3. Link rod

Verify if the shift lever moves into the PARK and LOW slots.

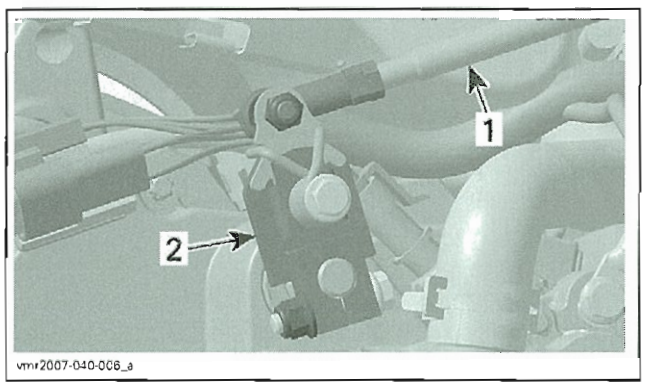
Install the side panel and test drive to confirm all is working well.

SHIFTING PLATE

Shifting Plate Removal

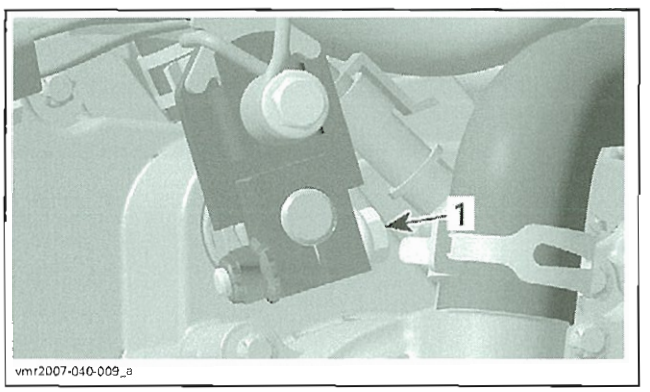
Remove the RH side panel (refer to *BODY*).

Remove the link rod from shifting plate.



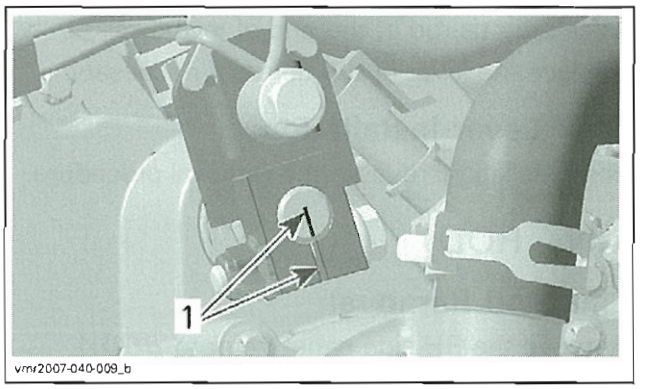
1. Link rod
2. Shifting plate

Remove the shifting plate bolt.



1. Shifting plate bolt

Mark the location of shifting plate before removing it from shift shaft.



1. Mark aligned with slot

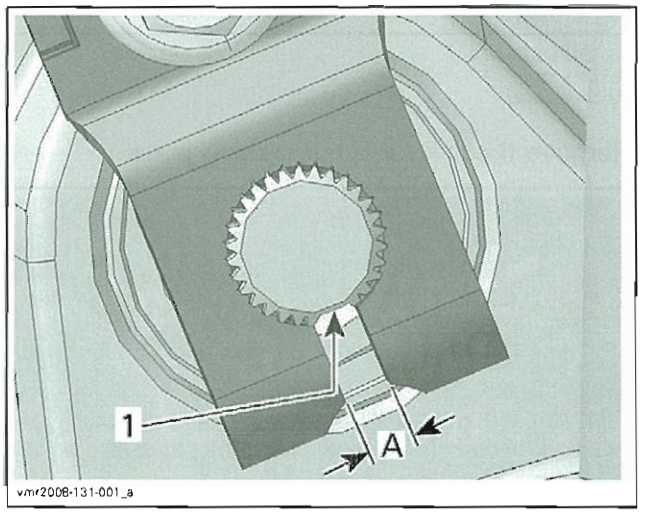
Remove the shifting plate.

Shifting Plate Inspection

Check shifting plate for cracks, bending or other damages. Replace if necessary.

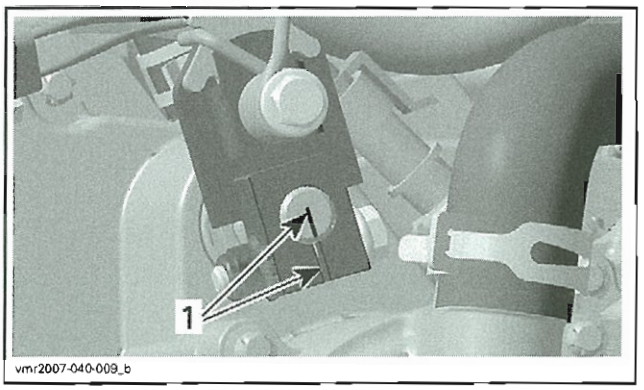
Shifting Plate Installation

Align the shifting plate slot with the location without splines on shift shaft.



1. No spline area
A. Shifting plate slot

NOTE: If the alignment spline is not present, align shifting plate slot with shift shaft mark previously traced. If you have no mark, turn ignition key ON and check if the NEUTRAL light is on.



1. Mark aligned with slot

Install the shifting plate bolt.

Install link rod and adjust it (refer to *LINK ROD* above).

Install side panel and check if the shifting system works well.

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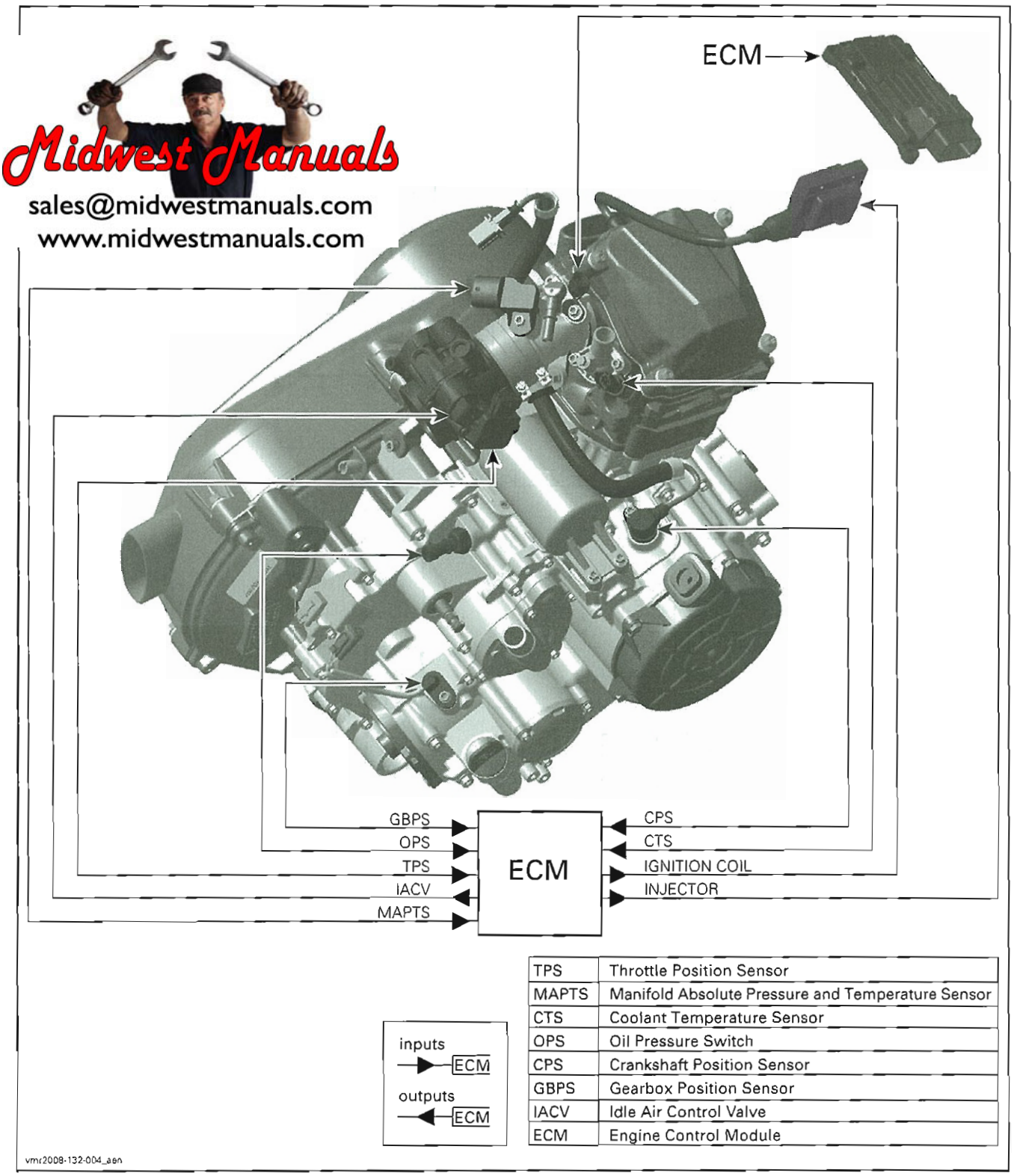
OVERVIEW

Engine Management System (EMS)



TPS	Throttle Position Sensor
MAPTS	Manifold Absolute Pressure and Temperature Sensor
CTS	Coolant Temperature Sensor
OPS	Oil Pressure Switch
CPS	Crankshaft Position Sensor
GBPS	Gearbox Position Sensor
IACV	Idle Air Control Valve
ECM	Engine Control Module

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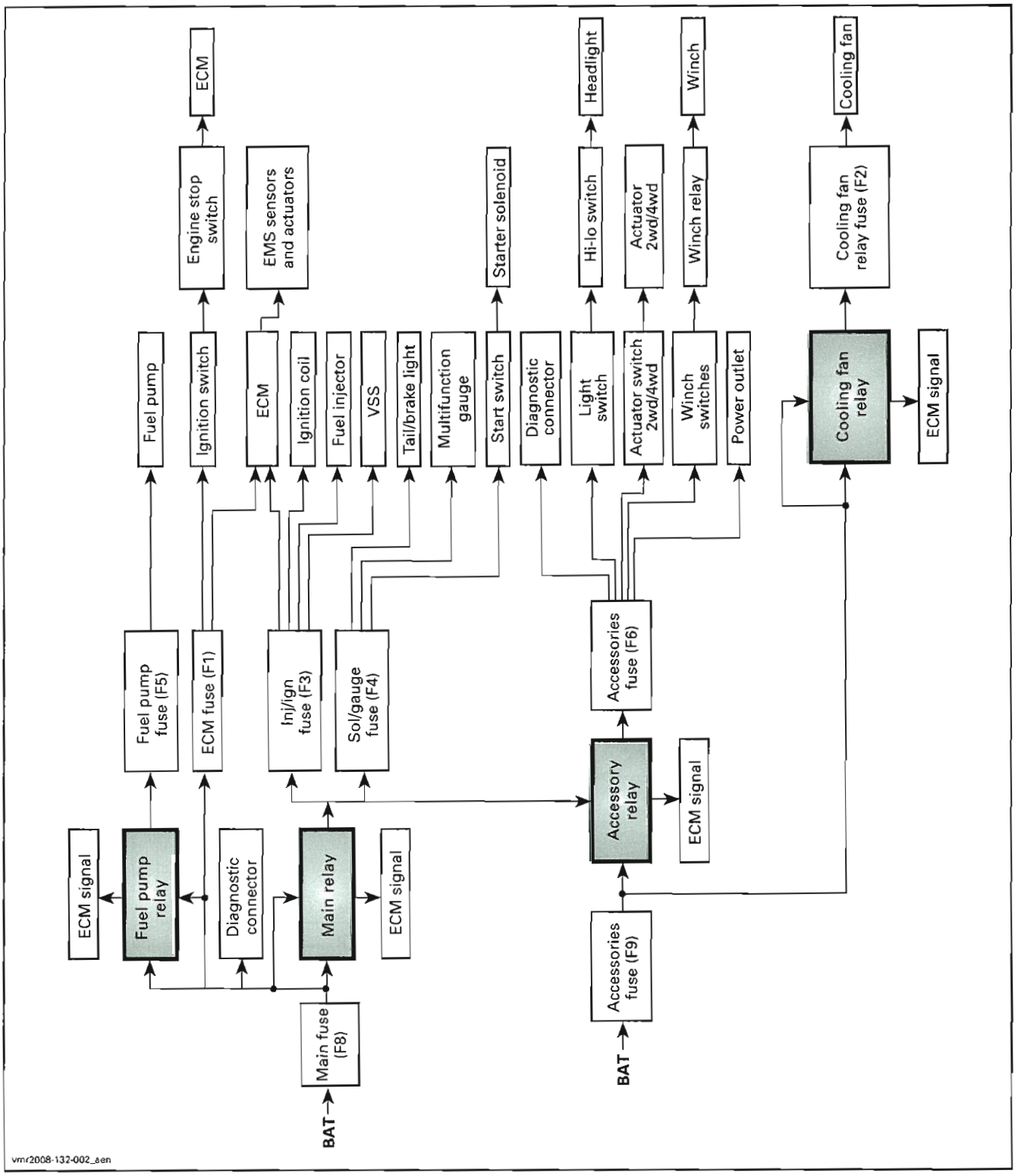
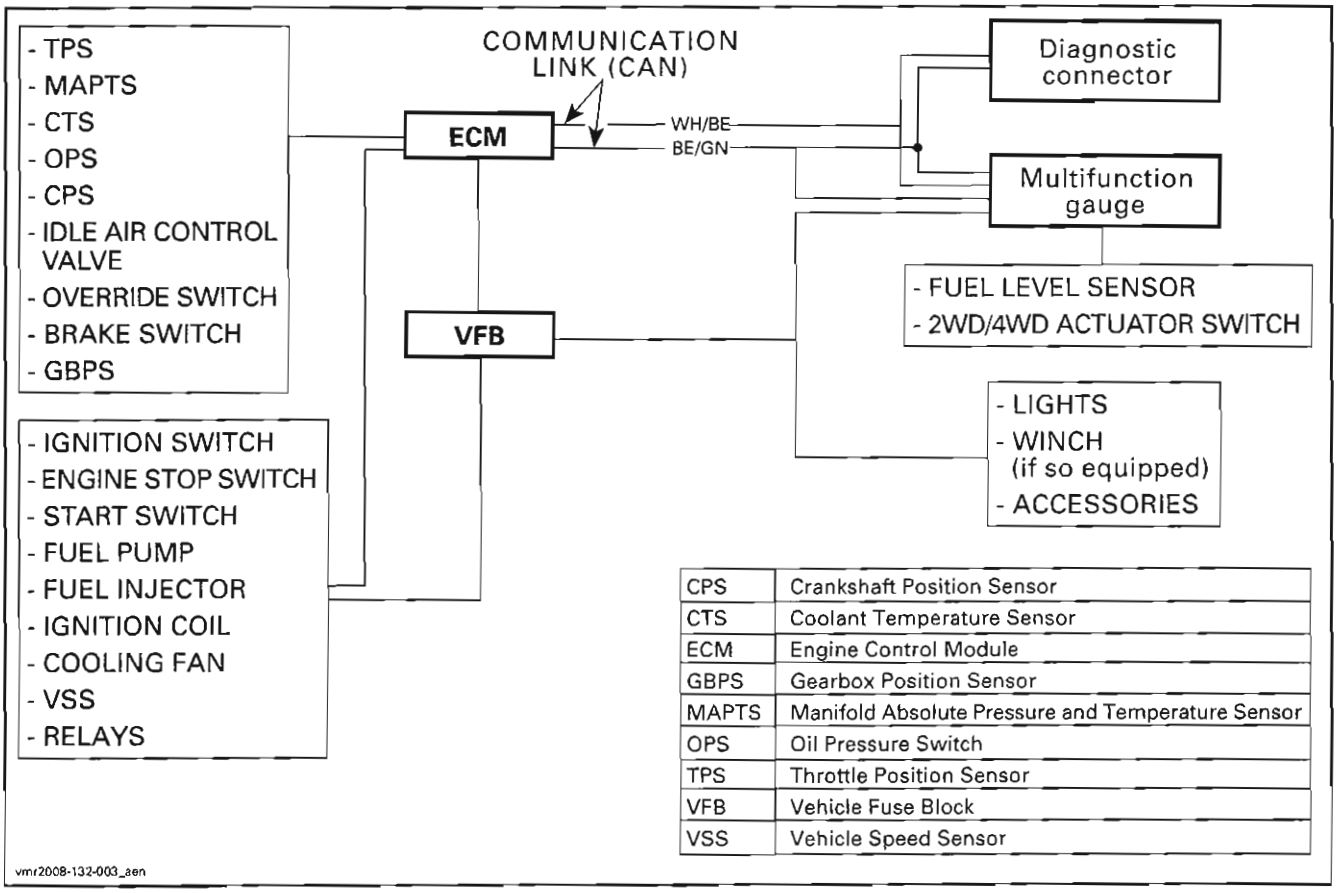
Power Distribution

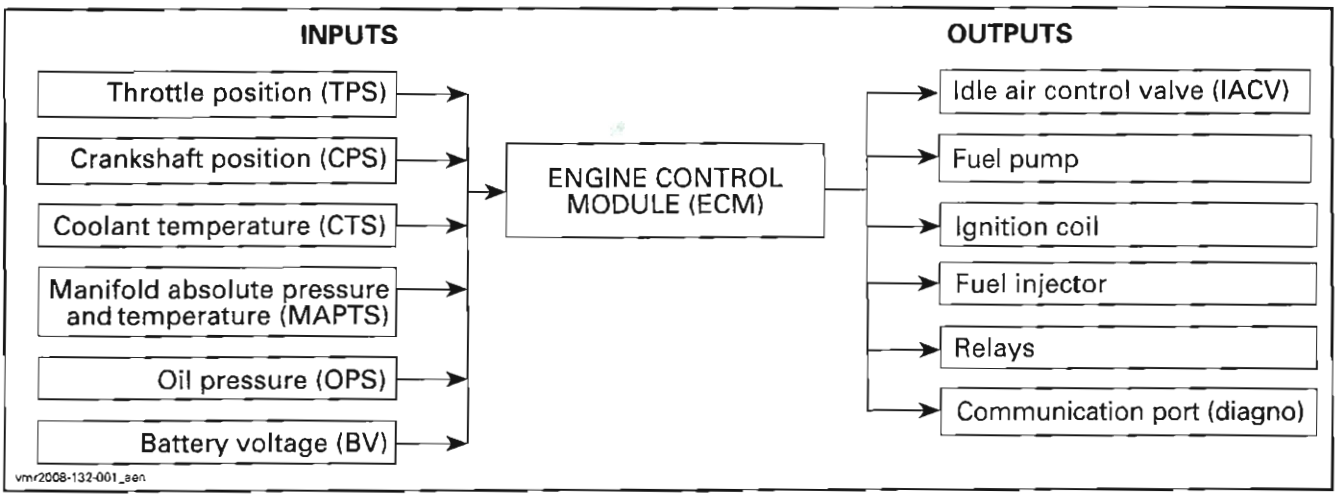


ECM and VFB Interaction with the Electrical System



CPS	Crankshaft Position Sensor
CTS	Coolant Temperature Sensor
ECM	Engine Control Module
GBPS	Gearbox Position Sensor
MAPTS	Manifold Absolute Pressure and Temperature Sensor
OPS	Oil Pressure Switch
TPS	Throttle Position Sensor
VFB	Vehicle Fuse Block
VSS	Vehicle Speed Sensor

ECM Inputs/Outputs



SYSTEM DESCRIPTION

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

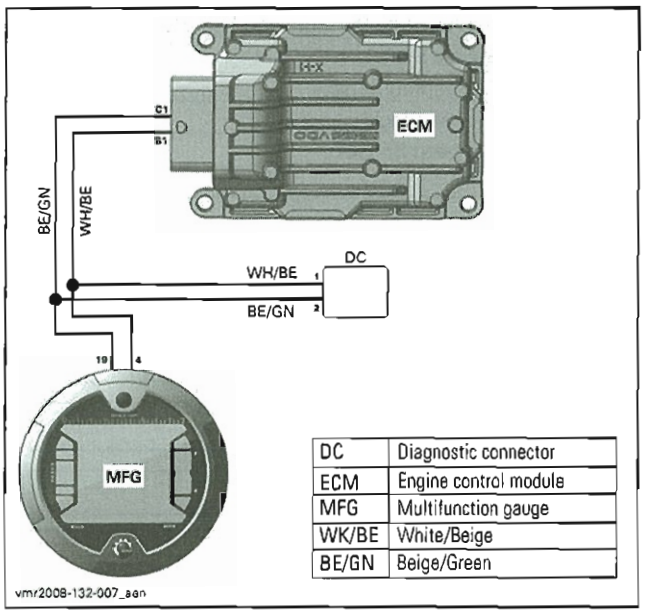
There are 4 main systems that are controlled by the engine management system (EMS):

1. Electronic fuel injection (EFI)
2. Ignition system
3. Starting system
4. Cooling system.

CONTROLLER AREA NETWORK (CAN)

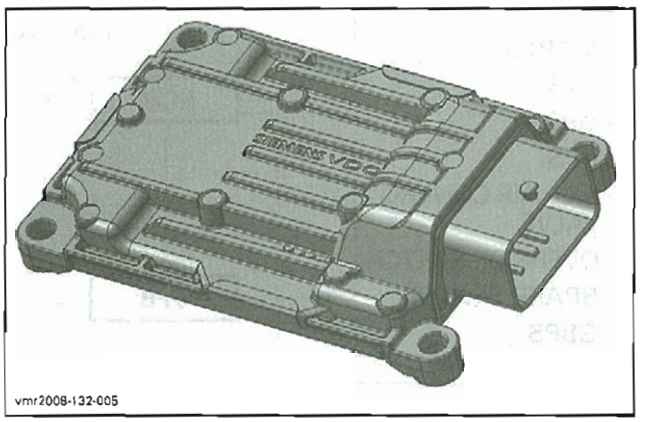
A communication link (CAN lines) is used to communicate between the ECM and the multifunction speedometer. CAN lines consist of a pair of wires (WHITE/BEIGE and BEIGE/GREEN).

The communication link is also used to communicate with the B.U.D.S. software. Refer to *COMMUNICATION TOOLS/B.U.D.S. SOFTWARE*.



DC	Diagnostic connector
ECM	Engine control module
MFG	Multifunction gauge
WK/BE	White/Beige
BE/GN	Beige/Green

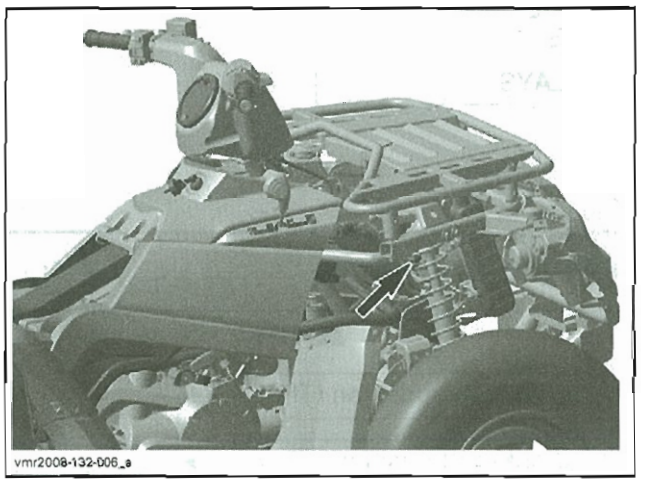
ENGINE CONTROL MODULE (ECM)



ECM

The ECM controls the electrical system and the engine management functions, by processing the information given by various sensors.

The ECM is located behind the radiator.



ECM LOCATION

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 (gearbox position sensor) 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 (vehicle speed sensor) and the GBPS (gearbox position sensor).

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 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 *MONITORING SYSTEM/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 *MONITORING SYSTEM/FAULT CODES* section for more information.

POWER DISTRIBUTION

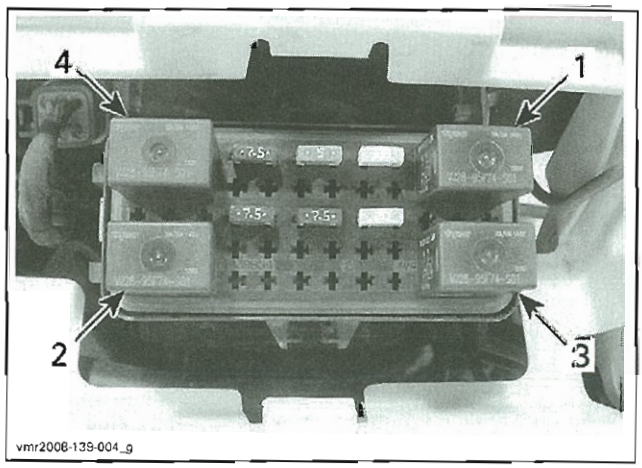
Four relays are used to distribute power to different components:

- Main relay
- Fuel pump relay
- Accessory relay
- Cooling fan relay.

The ECM provides the trigger signal to activate each relay individually.

When ignition key is turned ON and engine stop switch is in RUN position, the main relay, the fuel pump relay and the accessory relay are energized.

While starting the engine, fan relay and accessory relay are temporary disabled to make all power available for the starter, the fuel pump and the EMS.



1. *Main*
2. *Fuel pump*
3. *Accessories*
4. *Cooling fan*

NOTE: Some diodes are used in the electrical system. Diode failure may prevent engine cranking or may bring problem to the ECM. They are located in vehicle wiring harness. Refer to *STARTING SYSTEM* and *LIGHTS*.

Refer to the illustrations at the beginning of the section for a complete overview of the power distribution.

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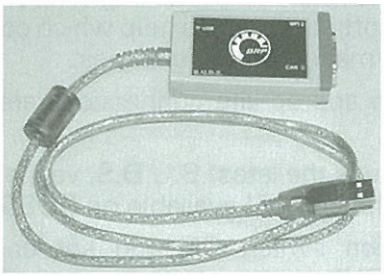
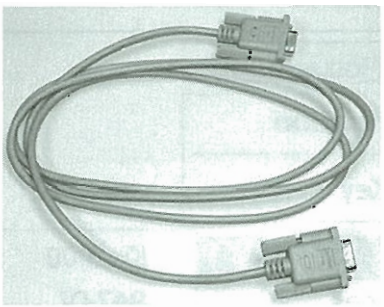
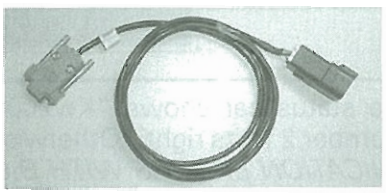
COMMUNICATION TOOLS/B.U.D.S. SOFTWARE

SERVICE TOOLS

MULTI-PURPOSE INTERFACE-2 (MPI-2)

PART REQUIRED
PC computer
B.U.D.S. software Use latest version compatible with the 400 EFI available on BOSSWeb
MPI-2 (P/N 529 036 018) 
Optional extension cable (P/N 529 035 697) 
Diagnostic cable (P/N 710 000 851) 

MPI-2 Power Supply

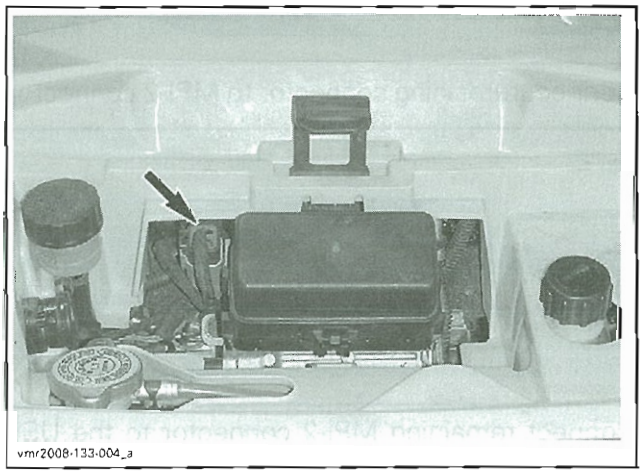
The MPI-2 uses the PC computer USB port for for its power supply.

Connections with Vehicle

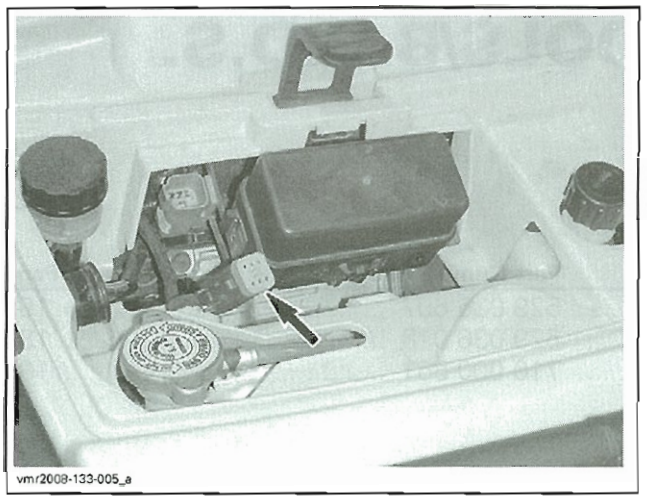
⚠ WARNING

If the computer you are using is connected to the 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 computer.

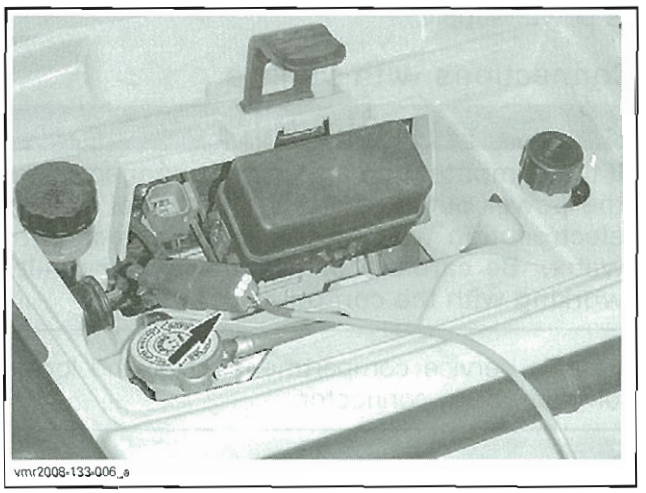
Remove service compartment cover and locate communication connector.



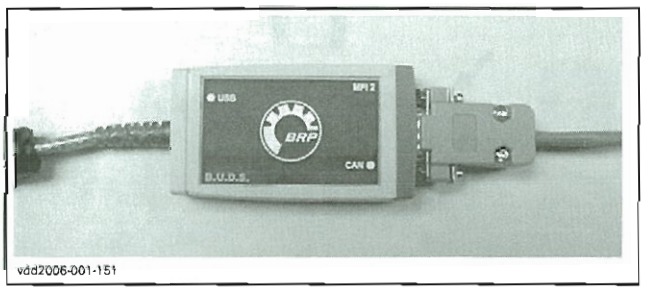
Unplug communication connector.



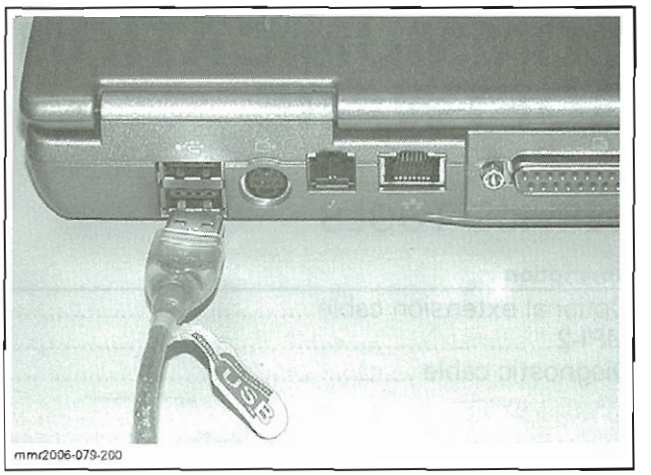
Connect diagnostic cable to vehicle connector.



Connect remaining connector to MPI-2 connector.



Connect remaining MPI-2 connector to the USB port of a PC (personal computer).



Use B.U.D.S. software as described further in *B.U.D.S. SOFTWARE*.

B.U.D.S. SOFTWARE

B.U.D.S. (Bombardier Utility and Diagnostic Software) is designed to allow electrical component inspection, to diagnose and monitor components and to carry out settings such as the closed throttle and idle actuator.

For more information pertaining to the use of the B.U.D.S. software, use its help which contains detailed information on its functions.

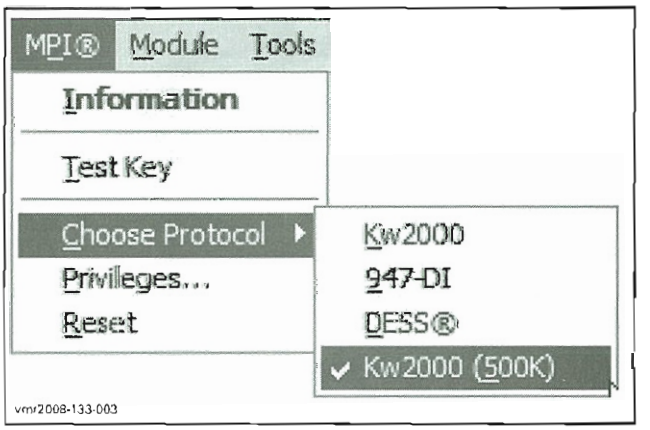
Ensure the appropriate connections are done for B.U.D.S.

Ensure to use the latest B.U.D.S. version compatible with the 400 EFI available on BOSSWeb.

Turn ignition switch ON and set engine stop switch to RUN to activate the communication.

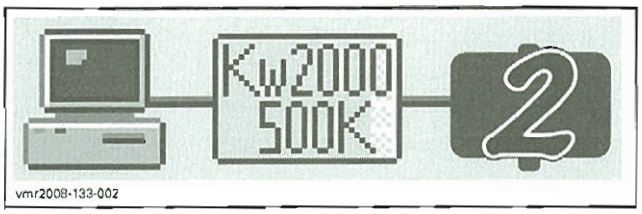
Start B.U.D.S.

Select the protocol "Kw2000 (500K)".



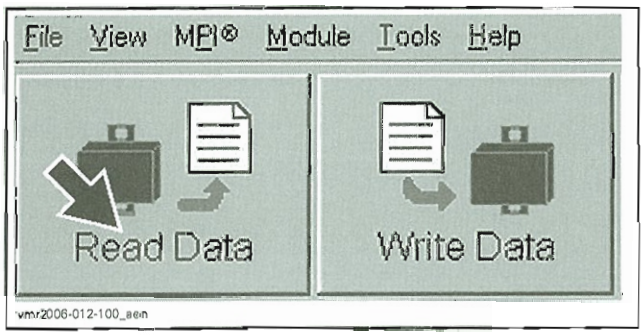
Ensure the status bar shows "Kw2000 (500K)" with the number 2 to its right. Otherwise, refer to *COMMUNICATION ERRORS WITH B.U.D.S.* further.

NOTE: Number 2 means that 2 "ECU" are connected (ECM and multifunction gauge).

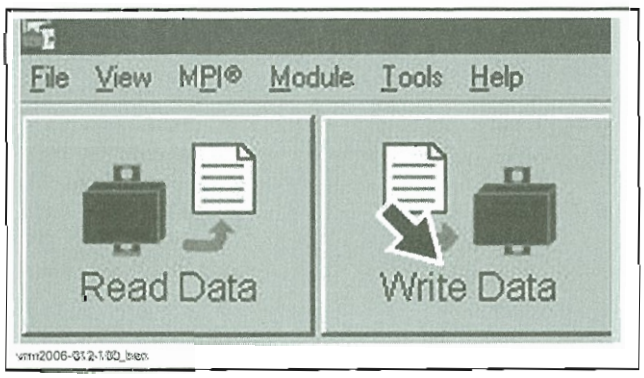


CONNECTION SUCCESSFUL

Transfer data from the ECM to B.U.D.S. by clicking the **Read Data** button in B.U.D.S.



When finished, transfer data from B.U.D.S. to the ECM by clicking the **Write Data** button in B.U.D.S.



Disconnect MPI connections and reconnect vehicle harness in protective cap.

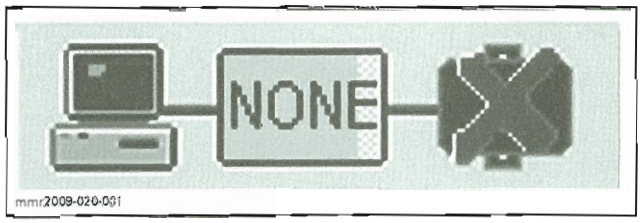
NOTE: There is a 120 Ω resistor in protective cap to minimize the possibility of communication error.

Changes in ECM

Anytime a change is brought in ECM through B.U.D.S., there will be an "EMS Tracking" message that will say "Remove key from vehicle". When this occurs, remove the key from ignition switch and wait until the message disappears (it lasts approximately 30 seconds after key removal).

Communication Problems

If an "X" is shown, this means there is no communication between the MPI and the ECM or the multifunction gauge.



The possible causes are:

- Wrong protocol is used.
- Both ECM and multifunction gauge are not communicating with the MPI.

NOTE: If a "1" is shown, either the ECM or the multifunction gauge is not communicating with the MPI.

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MONITORING SYSTEM/FAULT CODES

MONITORING SYSTEM

The EMS features a monitoring system that self-diagnose its electronic components (control modules, sensors and actuators) to ascertain they are not faulty or defective. This mode comes active when ignition key is turned on.

NOTE: Some components need the engine to be running so that they can be monitored (fuel injectors for example).

When a malfunction is currently detected, the ECM:

- 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.

When a minor fault occurs, the check engine pilot lamp will turn on. The fault may disappear automatically when the ignition key is turned off and kept off until lights turn off in multifunction speedometer, then turned back on.

When an important fault occurs, LIMP MODE will be displayed in the multi- function speedometer and check engine light will flash.

In the following situations, engine RPM will be limited.

CONDITION	MAX. ALLOWED RPM
High engine temperature	4000
Low battery voltage	5000
Low oil pressure	
Safety fuel cut-off (TPS or internal memory error)	
High battery voltage	7000

The following components or functions are monitored.

COMPONENT
EMS (TPS, CPS, MAPTS, CTS, OPS, IACV, GBPS, ignition coil and fuel injector)
Battery voltage
Engine RPM
Brake monitoring
CAN
ECM
Starter solenoid
Fuel pump
Cooling fan
Relays

FAULT CODES

Verify if the check engine pilot lamp is ON or blinks. If so, look for fault codes to diagnose the trouble.

The fault codes recorded in the ECM can be checked by using the software B.U.D.S. (refer to *COMMUNICATION TOOLS/BUDS SOFTWARE* section) or on the multi-function gauge.

Stored fault codes are kept in the ECM even if the battery is disconnected.

For more information pertaining to the fault codes (state, count, first, etc.) and report, refer to B.U.D.S. online help.

When using the service action suggested in the Fault section of B.U.D.S., the circuits are referred to as ECM pins A1-1, which means the wiring between the ECM pin A1 and the sensor pin 1.

IMPORTANT: After a problem has been solved, ensure to clear the fault(s) in the ECM using the B.U.D.S. software. This will properly reset the appropriate counter(s) and will also record that the problem has been fixed in the ECM memory.

NOTE: Many fault codes at the same time is likely to be burnt fuse(s) or a faulty relay.

How to Read Fault Codes Using B.U.D.S. Software

Refer to *COMMUNICATION TOOLS/B.U.D.S. SOFTWARE* section.

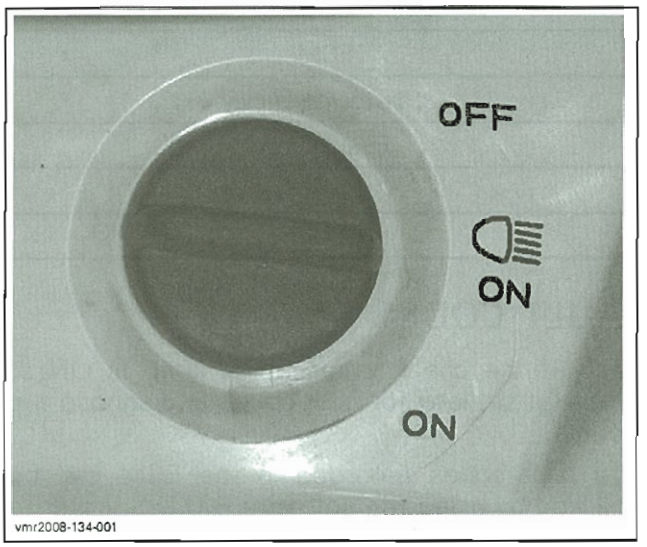
How to Read Fault Codes on the Multifunction Gauge

Fault codes starting with the letter "P" followed by 4 digits (P-1234) can be displayed in the multifunction gauge for troubleshooting.

NOTE: The multifunction gauge can display only fault codes that are active. Occured non-active faults can only be seen using B.U.D.S.

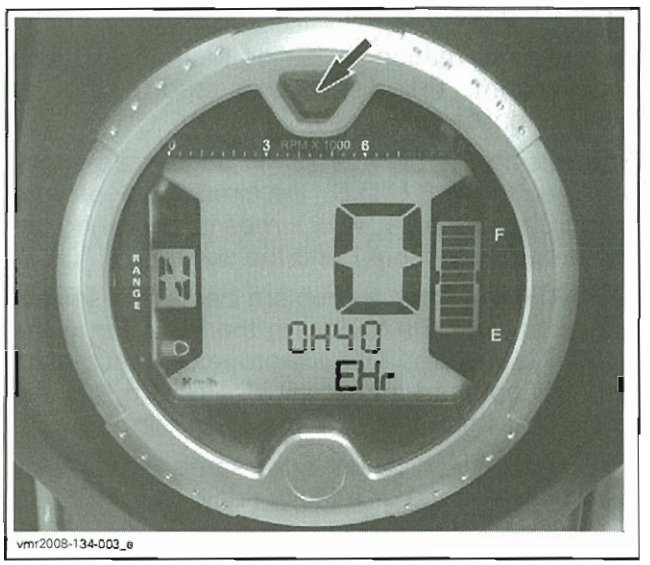
Proceed as follows:

Turn ignition key to "lights ON" position.



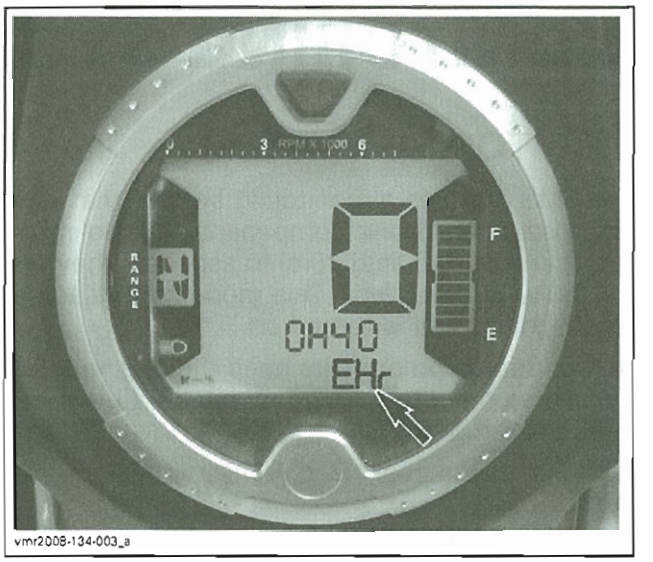
vmr2008-134-001

Use the mode button and scroll to Total Engine Hour (EHr) on the gauge.



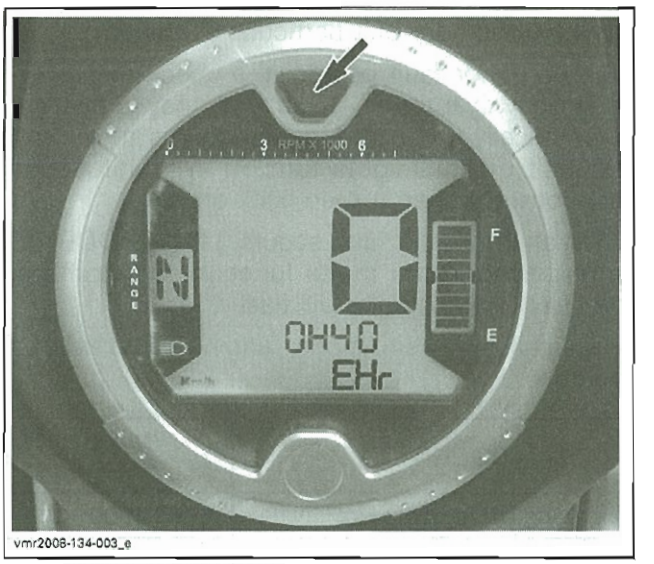
vmr2008-134-003_e

NOTE: Pay attention that the display shows EHr and not Ehr.

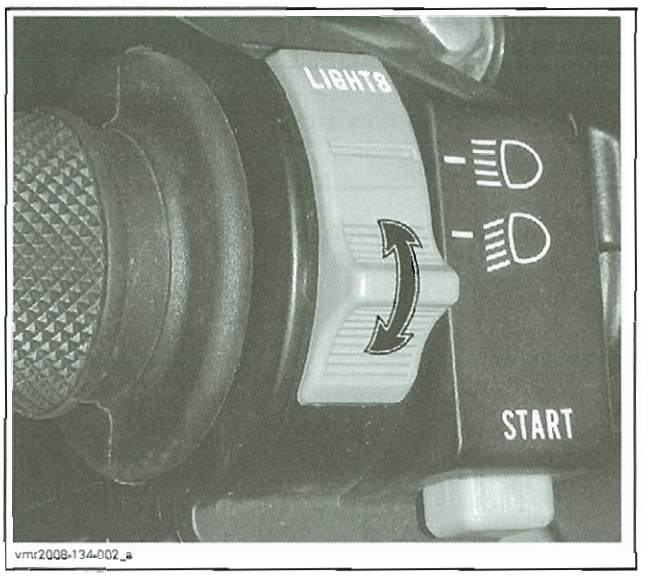


vmr2008-134-003_a

Press and HOLD mode button while QUICKLY toggling HI - LO beam.



vmr2008-134-003_e

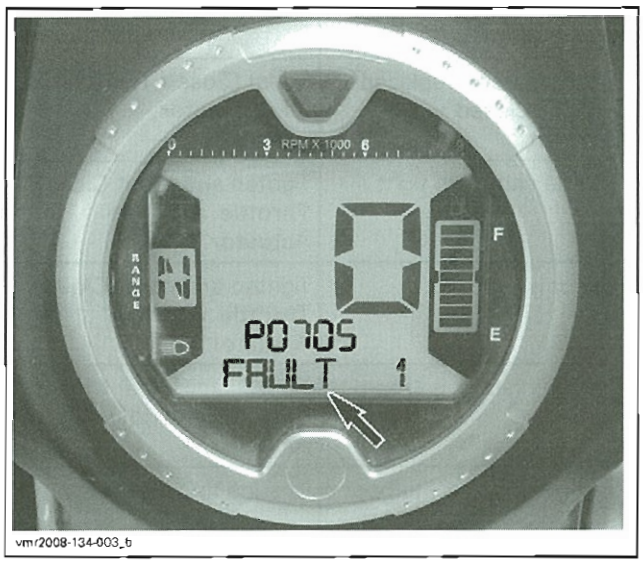


vmr2008-134-002_a

NOTE: A minimum of 3 HI - LO toggles must be completed within 2 seconds.

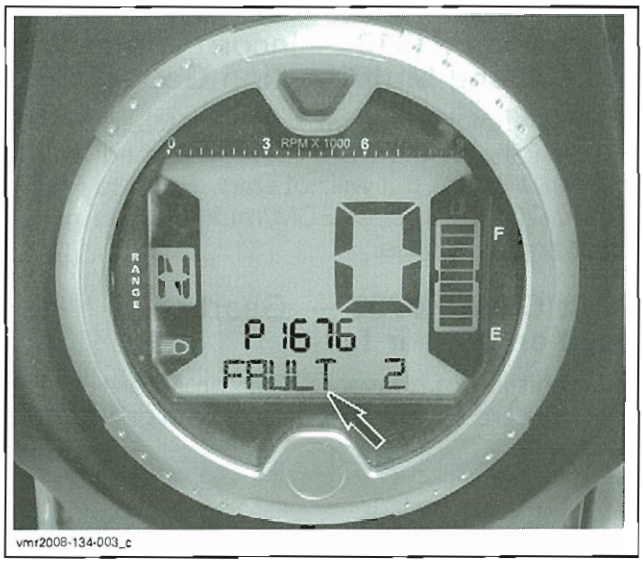
If there is no fault code, the NO ACTIVE P_CODE will be displayed.

If there is any fault code, it will be displayed.



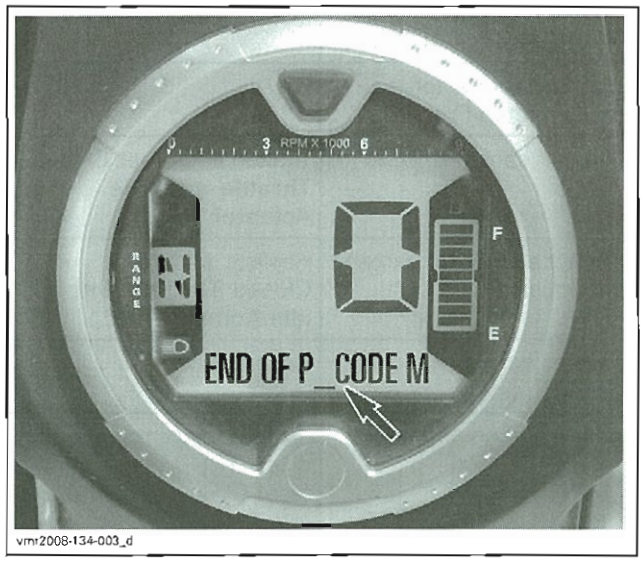
vmr2008-134-003_b

If there is more than one fault code, the next one will automatically appear after a small delay.



vmr2008-134-003_c

Once the last fault code is displayed, the gauge will display END OF P_CODE MODE then it will default back to normal operation.



vmr2008-134-003_d

NOTE: To quickly exit the on-board diagnostic mode, press and HOLD the mode button.

SPECIFIC FAULT CODES

TPS (Throttle Position Sensor) Faults

Faults which are reported in B.U.D.S. fall into two groups: TPS faults and adaptation faults. These are displayed on the B.U.D.S. system as TPS OUT OF RANGE and TPS ADAPTATION FAILURE.

TPS "OUT OF RANGE" Fault

It is caused by the sensor reading going out of its allowable range. This fault can occur during the whole range of movement of the throttle.

To diagnose this fully, it is recommended to operate the throttle through its full range. It is also recommended to release the throttle quickly as this may also reveal a fault that is intermittent.

POSSIBLE CAUSES	ACTION
Check if connector is disconnected from TPS	Fix.
Check if sensor is loose	Tighten and reset Closed Throttle and Idle Actuator.
Inspect sensor for damage or corrosion	Replace and reset Closed Throttle and Idle Actuator.
Inspect wiring (voltage test)	Repair.
Inspect wiring and sensor (resistance test)	If bad wiring, repair. If bad TPS, replace and reset Closed Throttle and Idle Actuator.
Test sensor operation (wear test)	Replace and reset Closed Throttle and Idle Actuator.

TPS "ADAPTATION FAILURE" Fault

It is caused by the idle position moving out of an acceptable range.

Following problems can be caused by a TPS "Adaptation Failure":

- Idle speed is out of range.
- Engine stops when throttle is released quickly.
- Engine runs inconsistent in low part load or low RPM.

POSSIBLE CAUSES	ACTION
Sensor has been replaced and TPS closed position not reset	Reset Closed Throttle and Idle Actuator.
Throttle body has been replaced and TPS closed position not reset	Reset Closed Throttle and Idle Actuator.
ECM has been replaced and TPS closed position not reset	Reset Closed Throttle and Idle Actuator.
Throttle cable too tight	Tighten and reset Closed Throttle and Idle Actuator.
Sensor is loose	Tighten and reset Closed Throttle and Idle Actuator.
Throttle bracket is loose	Tighten and reset Closed Throttle and Idle Actuator.
Idle speed screw (tamper proof) worn or loose	Change throttle body.
Idle bypass valve replaced but not reset	Reset Closed Throttle and Idle Actuator using B.U.D.S.

Fault Code P1513 — Incorrect Match of ECM and Multifunction Gauge

The multifunction gauge is not matched for the ECM/engine or the ECM is not matched for the engine will crank but will not start. Refer to *PARTS CATALOGS* for proper ECM/multifunction gauge according to vehicle.

Fault Code P0705 — Gearbox position sensor fault

This fault is not relevant. You can ignore it. The switches are used individually for the gearbox position.

FAULT CODE TABLE

FAULT CODE	DESCRIPTION	POSSIBLE FAULT	ACTION
107	Manifold absolute pressure sensor signal shorted to GND or Open	Faulty MAPTS - disconnected connector - faulty terminals - cut wires - Dirty sensor - shorted wire - disconnected sensor power	Make sure sensor's connector is fully inserted. Check for approximately 5 volts between sensor connector pins 1 and 2. Check circuits between MAPTS pins and ECM pins A1-1,G2-2 and F2-3 if open or shorted to GND.
108	Manifold absolute pressure sensor signal shorted to battery 12 V	Faulty MAPTS - disconnected connector - faulty terminals - cut wires - Dirty sensor - shorted wire - disconnected sensor power	Make sure sensor's connector is fully inserted. Check for approximately 5 volts between sensor connector pins 1 and 2. Check circuits between MAPTS pins and ECM pins A1-1,G2-2 and F2-3 if shorted to 12 V.
112	Manifold temperature sensor signal shorted to GND	Faulty MAPTS - disconnected connector - faulty terminals - cut wires - shorted wire to GND	Check for disconnected air temperature sensor on the intake. Check the air temperature sensor for approximately 2511 ohms at 20°C. Replace the sensor if necessary. Check circuits between Sensor pin 2 and ECM pin F3, between C3-1 and between A1-3.
113	Manifold temperature sensor signal shorted to battery 12 V or open	Faulty MAPTS - disconnected connector - faulty terminals - cut wires - shorted wire to battery	Check for disconnected air temperature sensor on the intake. Check the air temperature sensor for approximately 2511 ohms at 20°C. Replace the sensor if necessary. Check circuits between Sensor pin 2 and ECM pin F3, between C3-1 and between A1-3.
114	Manifold temperature sensor signal switched intermittent fault	Faulty MAPTS - partially disconnected connector - faulty terminals - cut wires - incoherent change in temperature reading	Check for disconnected air temperature sensor on the intake. Check the air temperature sensor for approximately 2511 ohms at 20°C. Replace the sensor if necessary. Check circuits between Sensor pin 2 and ECM pin F3, between C3-1 and between A1-3.
115	Coolant temperature too high	Refer to *ENGINE AND/OR COOLING SYSTEM* service manual section	Refer to *ENGINE AND/OR COOLING SYSTEM* service manual section.
116	Coolant temperature sensor signal implausible low temperature	Faulty CTS - disconnected connector - faulty terminals - cut wires - shorted wire - reading of cold temperature while engine is running and as gone over 72°C (162°F)	Check sensor resistor value between 1800 and 2200 at 22°C. Check circuits between sensor pins and ECM pin F4-1 and C3-2. Replace sensor if necessary. Refer to service manual for complete cooling system testing procedure.
117	Coolant temperature sensor signal shorted to battery 12 V	Faulty CTS - disconnected connector - faulty terminals - cut wires - shorted wire	Check sensor resistor value between 1800 and 2200 ohm at 22°C. Check circuits between sensor pins and ECM pin F4-1 and C3-2.
118	Coolant temperature sensor signal shorted to GND or disconnected	Faulty CTS - disconnected connector - faulty terminals - cut wires - shorted wire	Check for disconnected engine temperature sensor. Check sensor resistor value between 1800 and 2200 ohm at 22°C. Check circuits between sensor pins and ECM pin F4-1 and C3-2.

FAULT CODE	DESCRIPTION	POSSIBLE FAULT	ACTION
119	Coolant temperature sensor intermittent fault	Faulty CTS - partially disconnected connector - faulty terminals - cut wires - shorted wire - change in temperature too high from the sensed temperature	Check for disconnected engine temperature sensor. Check sensor resistor value between 1800 ohm and 2200 at 22°C. Check circuits between sensor pins and ECM pin F4-1 and C3-2.
122	Throttle position sensor shorted to GND or open	Faulty TPS - disconnected connector - faulty terminals - cut wires - shorted wire to GND - Sensor voltage missing	Check circuits between TPS pins and ECM pins A1-1, G3-3 and G2-2. Refer to the service manual for complete throttle position sensor testing procedure.
123	Throttle position sensor shorted to Battery 12 V	Faulty TPS - disconnected connector - faulty terminals - cut wires - shorted wire to Battery	Check circuits between TPS pins and ECM pins A1-1, G3-3 and G2-2. Refer to the service manual for complete throttle position sensor testing procedure.
230	Fuel pump relay disconnected	Faulty relay - faulty terminal under the relay or at engine connector - Dirt stuck on relay blades and/or terminals - wires from the ECM to the relay cut	Look for damaged or disconnected fuel pump relay, damaged circuit wires, damaged connectors or damaged ECM output pins. Check circuit from relay pin 1B to ECM pin J1.
231	Fuel pump relay signal pin shorted to GND	Faulty relay - faulty terminal under the relay or at engine connector - Dirt or water stuck on relay blades and/or terminals - wires from the ECM to the relay shorted to a GND	Check for damaged or disconnected fuel pump relay, damaged circuit wires, damaged connectors or damaged ECM output pins. Check circuit from relay pin 1B to ECM pin J1.
232	Fuel pump relay signal pin shorted to battery 12 V	Faulty relay - faulty terminal under the relay or at engine connector - Dirt stuck on relay blades and/or terminals - wires from the ECM to the relay shorted to a power source	Check for damaged or disconnected fuel pump relay, damaged circuit wires, damaged connectors or damaged ECM output pins. Check circuit from relay pin 1B to ECM pin J1.
261	Injector signal shorted to GND	Faulty injector - water and/or dirt in injector connector - shorted wires	Check for approximately 12 ohms on injector. Check circuit between Injector pin 1 and ECM L4 if shorted to GND.
262	Injector signal shorted to battery 12 V	Faulty injector - water and/or dirt in injector connector - shorted wires	Check for approximately 12 ohms on injector. Check circuit between Injector Pin 1 and ECM L4 if shorted to 12 V.
267	Starter solenoid not connected	Faulty solenoid - faulty terminal at solenoid or at engine connector - Dirt stuck on solenoid blades and/or terminals - wires from the ECM to the solenoid cut	Check solenoid/gauge fuse. Look for damaged or disconnected starter solenoid, damaged circuit wires, damaged connectors or damaged ECM output pins. Check circuit from solenoid OR/BR wire to ECM pin L3.
268	Starter solenoid shorted to GND	Faulty solenoid - faulty terminal at solenoid or at engine connector - Dirt or water stuck on solenoid blades and/or terminals - wires from the ECM to the solenoid shorted to a GND	Check for damaged or disconnected starter solenoid, damaged circuit wires, damaged connectors or damaged ECM output pins. Check circuit from solenoid OR/BR wire to ECM pin L3.

FAULT CODE	DESCRIPTION	POSSIBLE FAULT	ACTION
269	Starter solenoid shorted to battery 12 V	Faulty solenoid - faulty terminal at solenoid or at engine connector - Dirt stuck on solenoid blades and/or terminals - wires from the ECM to the solenoid shorted to a power source	Check for damaged or disconnected starter solenoid, damaged circuit wires, damaged connectors or damaged ECM output pins. Check circuit from solenoid OR/BR wire to ECM pin L3.
335	RPM signal lost	Damaged encoder wheel - damaged CPS - metal dirt stuck on CPS - CPS wires damaged and/or shorted to the engine or frame - squeezed CPS wires between the magneto cover and engine	Check circuit between CPS and ECM pin E1 and D1. Check CPS coil resistor value approx 260 ohm. Check CPS AC voltage value approx 1 V. Check CPS wires. Check if CPS is dirty with metal particle. Check encoder wheel.
336	RPM signal fault	Damaged encoder wheel - damaged CPS - metal dirt stuck on CPS - CPS wires damaged and/or shorted to the engine or frame - squeezed CPS wires between the magneto cover and engine	Check circuit between CPS and ECM pin E1 and D1. Check CPS coil resistor value approx 260 ohm. Check CPS AC voltage value approx 1 V. Check CPS wires. Check if CPS is dirty with metal particle. Check encoder wheel.
339	RPM signal fault	Damaged encoder wheel - damaged CPS - metal dirt stuck on CPS - CPS wires damaged and/or shorted to the engine or frame - squeezed CPS wires between the magneto cover and engine	Check circuit between CPS and ECM pin E1 and D1. Check CPS resistor value approx 260 ohm. Check CPS AC voltage value approx 1 V. Check CPS wires. Check if CPS is dirty with metal particle. Check encoder wheel.
351	Ignition coil signal shorted to Battery 12 V	Faulty primary ignition coil - wire shorted to battery 12 V	Check for 1 +/-0.5 ohm between ignition coil pins. Check circuit between ignition coil (-) and ECM pin M1 if shorted to 12 V.
480	Engine cooling fan relay disconnected	Faulty relay - faulty terminal under the relay or at engine connector - dirt stuck on relay blades and/or terminals - wires from the ECM to the relay cut	Look for damaged or disconnected cooling fan relay, damaged connectors or damaged ECM output pins. Check circuit from relay pin 1E to ECM pin B3.
484	Engine cooling fan relay signal pin shorted to battery 12 V	Faulty relay - faulty terminal under the relay or at engine connector - Dirt stuck on relay blades and/or terminals - wires from the ECM to the relay shorted to a power source	Check cooling fan fuse. Check for damaged or disconnected cooling fan relay, damaged circuit wires, damaged connectors or damaged ECM output pins. Check circuit from relay pin 1E to ECM pin B3.
485	Engine cooling fan relay signal pin shorted to GND or disconnected	Faulty relay - faulty terminal under the relay or at engine connector - dirt or water stuck on relay blades and/or terminals - wires from the ECM to the relay shorted to a GND	Check for damaged or disconnected cooling fan relay, damaged circuit wires, damaged connectors or damaged ECM output pins. Check circuit from relay pin 1E to ECM pin B3.
508	Idle air control valve pin(s) shorted to battery 12 V	Faulty IACV - disconnected connector - faulty terminals - cut wires - shorted wire	Make sure IACV connector is fully inserted. Check circuits between idle valve motor pins and ECM pins D3-1, E4-2, C4-3 and D4-4.

FAULT CODE	DESCRIPTION	POSSIBLE FAULT	ACTION
509	Idle air control valve pin(s) disconnected or shorted to GND	Faulty IACV - disconnected connector - faulty terminals - cut wires - shorted wire	Make sure IACV connector is fully inserted. Check circuits between idle valve motor pins and ECM pins D3-1, E4-2, C4-3 and D4-4.
520	Oil pressure switch fault	Faulty OPS - disconnected connector - faulty terminals - cut wires - shorted wire to battery	Check for disconnected oil pressure switch on engine. Check the pressure switch contact when engine is running over idle speed. Replace the switch if necessary. Check circuits between switch and ECM pin F2.
560	Throttle position sensor 5 V power supply pin shorted to battery 12 V	Shorted wire - faulty TPS sensor	Check circuits between TPS pin 1, MAPTS pin 1 and pin 3 and ECM pin A1. Check TPS and MAPTS.
561	Throttle position sensor 5 V power supply pin shorted to GND or open	Shorted wire - faulty TPS sensor	Check circuits between TPS pin 1, MAPTS pin 1 and pin 3 and ECM pin A1. Check TPS and MAPTS.
562	Battery voltage under 8 V at main relay voltage input	Battery voltage too low - disconnected connector - faulty terminals - cut wires	Check battery voltage for 12 to 13 volts with engine stopped. Check battery voltage for 13.8 to 15.0 volts with engine idling. Check connections on magneto and voltage regulator.
563	Battery voltage over 16 V at main relay voltage input	Battery voltage too high - faulty voltage regulator - faulty magneto	Check battery voltage for 13.8 to 15.0 volts with engine idling. Replace voltage regulator if necessary.
600	CAN communication port off	CAN communication port shorted - Incompatible CAN communicating component connected on CAN port	Check for damage circuit between diagnostic connector 1 and 2 and ECM B1 and C1. Replace multifunction gauge if necessary. Test with disconnected multifunction gauge.
615	Starter solenoid not connected	Faulty solenoid - faulty terminal at solenoid or at engine connector - dirt stuck on solenoid blades and/or terminals - wires from the ECM to the solenoid cut	Check solenoid/gauge fuse. Look for damaged or disconnected starter solenoid, damaged circuit wires, damaged connectors or damaged ECM output pins. Check circuit from solenoid OR/BR wire to ECM pin L3.
616	Starter solenoid shorted to GND	Faulty solenoid - faulty terminal at solenoid or at engine connector - dirt or water stuck on solenoid blades and/or terminals - wires from the ECM to the solenoid shorted to a GND	Check for damaged or disconnected starter solenoid, damaged circuit wires, damaged connectors or damaged ECM output pins. Check circuit from solenoid OR/BR wire to ECM pin L3.
617	Starter solenoid shorted to battery 12 V	Faulty solenoid - faulty terminal at solenoid or at engine connector - dirt stuck on solenoid blades and/or terminals - wires from the ECM to the solenoid shorted to a power source	Check for damaged or disconnected starter solenoid, damaged circuit wires, damaged connectors or damaged ECM output pins. Check circuit from solenoid OR/BR wire to ECM pin L3.

FAULT CODE	DESCRIPTION	POSSIBLE FAULT	ACTION
705	Gearbox position sensor fault	Not plaussible GBPS combination - shorted to GND wire - faulty sensor - worn or erratic contact - mechanical failure	Check for disconnected transmission connector. Check switch continuity separately in all position (PR & N). Replace the switch if necessary. Check circuits between switch and ECM pin J3 H2 & H4. Check for misplaced terminal on gearbox.
821	Neutral switch fault	Faulty switch - disconnected connector - faulty terminals - cut wires - shorted wire	Check circuit between neutral switch and ECM H4. Check switch. Check pilot lamp circuit.
1104	Throttle position sensor out of range at first initialization	Faulty TPS - disconnected connector - faulty terminals - cut wires - shorted wire	Check cable adjustment. Check circuit between ECM and TPS: A1-1, G2-2 and G3-3. Make sure throttle lever is against throttle stop. Reset the ECM 3 times (ON-OFF-ON X3).
1107	Manifold absolute pressure sensor shorted to GND or open circuit	Faulty MAPTS - dirty sensor - connector loose - short wire	Make sure sensor's connector is fully inserted. Clean the sensor. Check circuit MAPTS A1-3 and F2-4.
1108	Manifold absolute pressure sensor shorted to battery 12 V	Faulty MAPTS - dirty sensor - water or dirt in the connector- shorted wire	Make sure sensor's connector is fully inserted. Clean the sensor. Check circuit MAPTS G2-1 and F2-4.
1263	Injector disconnected	Faulty injector - cut wires - faulty terminals	Check ignition fuse. Check for approximately 12.2 ohms on injector. Check circuit between Injector pin 1 and ECM L4 if open.
1335	RPM signal too high (12000)	Damaged encoder wheel - damaged CPS - metal dirt stuck on CPS - CPS wires damaged and/or shorted to the engine or frame - squeezed CPS wires between the magneto cover and engine - tampered engine	Check circuit between CPS and ECM pin E1-1 and D1-2. Check CPS coil resistor value approx 260 ohm. Check CPS AC voltage value approx 0.95 V. Check CPS wires. Check if CPS is dirty with metal particle. Check encoder wheel.
1351	Ignition coil disconnected	Faulty primary ignition coil - disconnected coils - cut wires - faulty terminals	Check ignition fuse. Check for 1 +/- 0.5 ohm between ignition coil pins. Check circuit between ignition coil (-) and ECM pin M1. Check circuit between ignition coil (+) and ignition fuse.
1513	Incorrect match of ECM and multifunction gauge	The multifunction gauge is not matched for the ECM/engine - ECM is not matched for engine	Ensure the ECM is the correct one for the engine. Ensure the multifunction gauge is the correct one for the vehicle. Properly match ECM and multifunction gauge with B.U.D.S.
1514	No detection of security exchange	Faulty multifunction gauge	Check if multifunction gauge is powered. If not check fuse & power. Check circuit between multifunction gauge communication (18 & 19) and (R & S) and ECM (C1 & B1). Replace multifunction gauge if necessary.
1520	Oil pressure unplausible or too low	Refer to *ENGINE AND/OR OIL PRESSURE SYSTEM* in service manual section	Refer to *ENGINE AND/OR OIL PRESSURE SYSTEM* in service manual section.

FAULT CODE	DESCRIPTION	POSSIBLE FAULT	ACTION
1562	Battery voltage under 8 V at key switch voltage input	Battery voltage too low - disconnected connector - faulty terminals - cut wires	Check battery voltage for 12 to 13 volts with engine stopped. Check battery voltage for 13.8 to 15.0 volts with engine idling. Check connections on magneto and voltage regulator.
1563	Battery voltage over 16 V at key switch voltage input	Battery voltage too high - faulty voltage regulator -faulty magneto	Check battery voltage for 13.8 to 15.0 volts with engine idling. Replace voltage regulator if necessary.
1600	CAN communication information 208 missing	Multifunction gauge missing, faulty or not connected properly	Check for damage circuit between diagnostic connector 1 and 2 and ECM B1 and C1. Replace multifunction gauge if necessary.
1601	CAN communication information 514 missing	Multifunction gauge missing, faulty or not connected properly	Check for damage circuit between diagnostic connector 1 and 2 and ECM B1 and C1. Replace multifunction gauge if necessary.
1674	Accessory relay open circuit	Faulty relay - faulty terminal under the relay or at engine connector - Dirt stuck on relay blades and/or terminals - wires from the ECM to the relay cut	Check ACC fuse. Damaged connectors or damaged ECM output pins. Check circuit from relay pin 12A to ECM pin K2. Check circuit from relay Pin 10A to ACC fuse 9B.
1675	Accessory relay shorted to GND	Faulty relay - faulty terminal under the relay or at engine connector - dirt or water stuck on relay blades and/or terminals - wires from the ECM to the relay shorted to a GND	Damaged circuit wires, damaged connectors or damaged ECM output pins. Check circuit from relay pin 12A to ECM pin K2.
1676	Accessory relay shorted to battery 12 V	Faulty relay - faulty terminal under the relay or at engine connector - dirt stuck on relay blades and/or terminals - wires from the ECM to the relay shorted to a power source	Check ACC fuse. Damaged circuit wires, damaged connectors or damaged ECM output pins. Check circuit from relay pin 12A to ECM pin K2.

ELECTRONIC FUEL INJECTION

SERVICE TOOLS

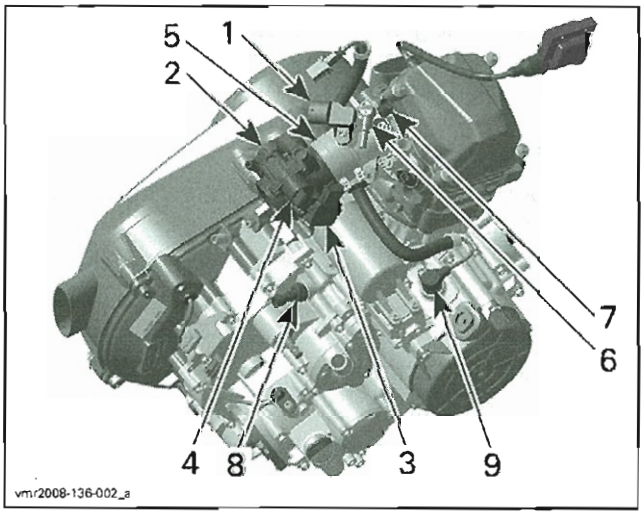
Description	Part Number	Page
tachometer	529 014 500	201
cable luber	529 035 738	202
Fluke 115 multimeter	529 035 868	205–206, 211–213, 215, 217–219, 223–225
ECM adapter	529 036 085	205–206, 211–212, 215, 217–218, 220, 222–224

SERVICE PRODUCTS

Description	Part Number	Page
cable lubricant	293 600 041	203
Loctite 243	293 800 060	212, 219
Gunk Intake Medic	Not sold by BRP	214

GENERAL

SYSTEM DESCRIPTION



1. *Manifold absolute pressure and temperature sensor (MAPTS)*
2. *Throttle body*
3. *Throttle position sensor (TPS)*
4. *Idle air control valve (IACV)*
5. *Intake manifold*
6. *Fuel rail*
7. *Injector*
8. *Coolant temperature sensor*
9. *Crankshaft position sensor*

The ECM is the central point of the engine management system. It reads the signals from different sensors which indicate engine operating conditions at micro-second intervals.

The ECM reads the inputs from the sensors, makes computations, uses pre-determined parameters and activates the outputs to the injector.

Signals from sensors are used by the ECM to determine the injection and ignition parameters (fuel maps required for optimum air-fuel ratio.

Air Induction

Air flows through the air filter housing mounted under the seat. It contains an air filter that prevent dust and particles from being drawn into the engine.

Air is then drawn through the throttle body mounted on the engine intake side.

Absolute pressure and air temperature are measured in the intake manifold.

Air then flows through the intake manifold to the combustion chamber.

Throttle Body

The 46 mm throttle body is connected to the intake manifold. Fitted on the throttle body, there is the TPS and the idle air control valve which allows the ECM to control the idle speed while the throttle plate is closed.

Intake Manifold

The intake manifold is connected to the engine cylinder head. It provides support for the throttle body, fuel injector and the fuel rail.

The air intake manifold is a resonator between the throttle body and the air intake at the cylinder head.

Fuel Rail

One fuel rail is mounted on the intake manifold. The fuel rail ensures all the time, that enough fuel can be delivered to the fuel injector. The fuel rail is fed by the fuel pump with the properly regulated fuel pressure.

Fuel Injector

One fuel injector is used to inject fuel into the intake port of the cylinder head.

GENERAL RECOMMENDATIONS

Engine problems are not necessarily related to the electronic fuel injection system.

It is important to ensure the engine is in proper operating condition and the electrical system is not at fault.

When replacing a component, always check its operation after installation.

Fuel System

⚠ 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 to working on the fuel system. Always disconnect battery exactly in the specified order, BLACK (-) cable first.

⚠ WARNING

Fuel lines remain under pressure at all times. Always proceed with caution and use appropriate safety equipment when working on pressurized fuel system. Wear safety glasses.

Proceed with care when removing or installing pressure test equipment or disconnecting fuel line connections.

Slowly disconnect the fuel hose to minimize spilling. Cover the fuel line connection with an absorbent shop rag. Wipe off any fuel spillage.

⚠ WARNING

Do not allow fuel to spill on hot engine parts or electrical connectors. The evaporating fuel on the hot components or on the electrical connectors produce highly inflammable fuel vapors that can easily be ignited by the heat, a spark, electrostatic discharge or stray current resulting in a fire or an explosion.

Never use a hose pincher on injection system high pressure hoses.

Replace any damaged or deteriorated fuel lines.

The fuel pump is activated each time electrical power is turned on. A pressure test must be carried out before turning the ignition key to ON and setting the engine run/stop switch to RUN

⚠ WARNING

Always carry out a fuel pressure test whenever a fuel system component has been disconnected during a maintenance procedure. A missed fuel leak could result in severe injury or death.

After performing a fuel pressure test, use the valve on the fuel pressure gauge to release the pressure (if so equipped).

Electrical System

It is important to check that the electrical system is functioning properly:

- Battery
- Fuses
- Relay(s)
- Ground connections
- Wiring connectors.

Never use a battery charger to substitute temporarily the battery as it may cause the ECM (engine control module) to work erratically or not to work at all. Check related-circuit fuse solidity and condition with an ohmmeter. Visual inspection could lead to false results.

Ensure that all electronic components are genuine. Any modification on the wiring harness may lead to generate fault codes or bad operation.

NOTE: For diagnostics purposes, use B.U.D.S. software. See *MONITORING SYSTEM/FAULT CODES* subsection.

Check related-circuit fuse solidity and condition with an ohmmeter. Visual inspection could lead to false results.

After a problem has been solved, ensure to clear the fault(s) in the ECM using the B.U.D.S. software. Refer to *MONITORING SYSTEM/FAULT CODES* subsection.

⚠ WARNING

Some EMS components are continuously powered by the battery when ignition key is turned on and engine stop switch is set in RUN position. The ECM switches the circuit to the ground to complete the electrical circuits it controls. Take this into account when troubleshooting. Always disconnect the battery prior to disconnecting any electric or electronic parts.

Electrical Connectors

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

Make sure terminals are properly crimped on wires and fastened in housing, and that they are free of corrosion or moisture.

When probing terminals, pay attention not to bend the terminal as this could bring a loose connection that would be difficult to troubleshoot.

Pay attention to the following:

- ECM connectors: Do not apply dielectric grease or any other lubricant.
- Other connectors: Apply a silicon-based dielectric grease or other appropriate lubricant.

Resistance Measurement

When measuring the resistance with an ohmmeter, all values are given for a temperature of 20°C (68°F). The resistance value of a resistance varies with the temperature. The resistance value for usual resistor or windings (such as injectors) increases as the temperature increases. However, our temperature sensors are NTC types (Negative Temperature Coefficient) and work the opposite which means that the resistance value decreases as the temperature increases. Take it into account when measuring at temperatures different from 20°C (68°F). Use the proper table for resistance variation relative to temperature for temperature sensors. See the specific sensor.

The resistance value of a temperature sensor may test good at a certain temperature but it might be defective at other temperatures. If in doubt, try a new sensor.

Also remember this validates the operation of the sensor at room temperature. It does not validate the over temperature functionality. To test it, the sensor could be removed from the engine and heated with a heat gun while it is still connected to the harness to see if the ECM will detect the high temperature condition and generate a fault code.

BASIC ADJUSTMENTS

IDLE SPEED

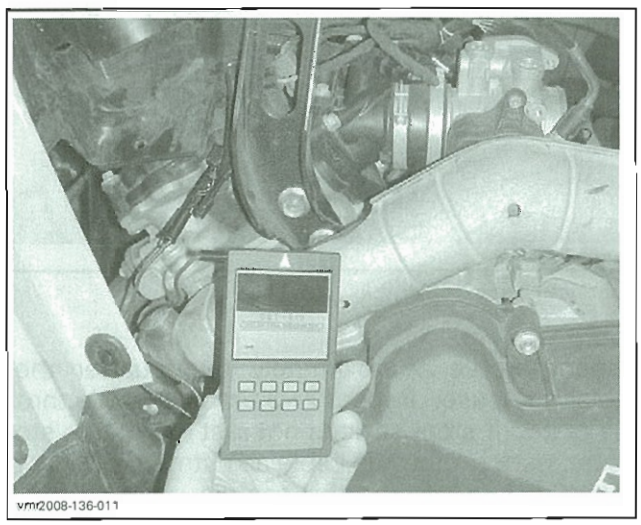
The idle speed is not adjustable. The ECM controls the idle speed of the engine.

CAUTION: 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.

If desired, the engine RPM can be verified with a tachometer (P/N 529 014 500).

Remove LH side panel. Refer to *BODY*.

Install the tachometer wire on spark plug cable.



CLOSED THROTTLE AND IDLE ACTUATOR RESET

NOTE: 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:

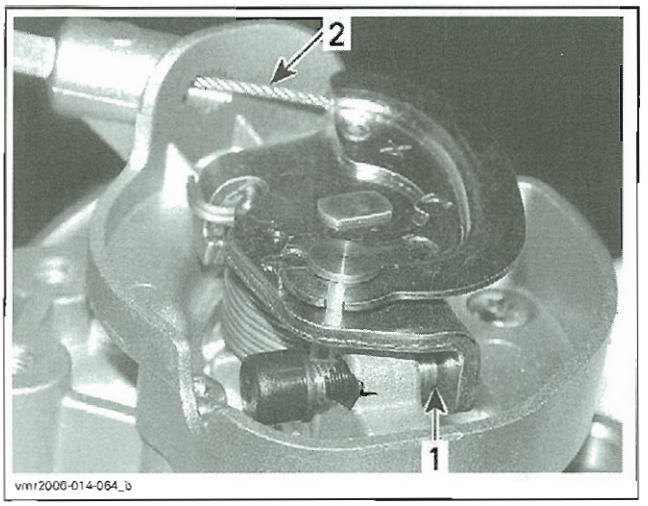
- TPS is loosened, removed or replaced.

- Throttle body is replaced.
- IACV is replaced.
- ECM is replaced.

CAUTION: An improperly set TPS or idle air control valve may lead to poor engine performance and emission compliance could possibly be affected. In addition, improper idle air control valve reset may lead to poor engine starting, improper idle (too low or too high) and engine stop on deceleration.

Use the B.U.D.S. software to perform this adjustment.

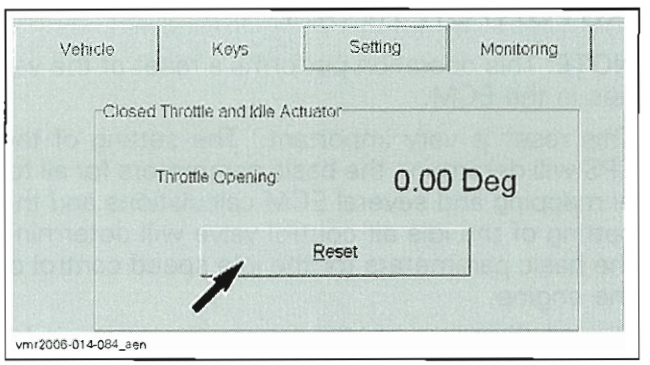
Remove throttle body cover and ensure the throttle cam of throttle body rests against set screw without any tension in the cable.



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 section.

To reset valve and TPS, click on the **Reset** button in the **Setting** section of B.U.D.S.



NOTE: If throttle was opened more than 3°, while clicking the **Reset** button, a fault code will appear.

Start engine and make sure it operates normally through its full engine RPM range. If fault codes appear, refer to *MONITORING SYSTEM/FAULT CODES* section for more information.

PROCEDURES

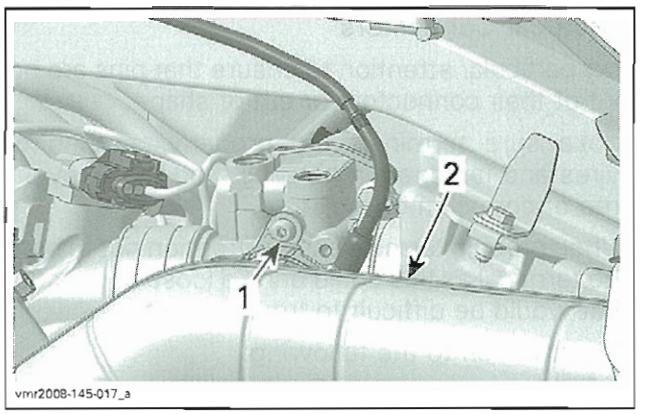
THROTTLE CABLE

Throttle Cable Lubrication

Remove *THROTTLE LEVER* from handlebar. See procedure in the *STEERING* section.

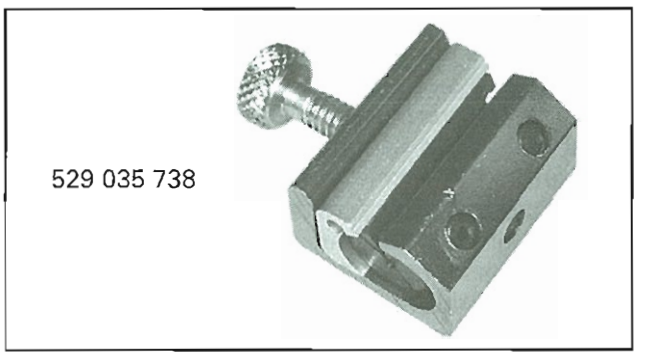
Refer to *BODY* section to remove the following parts:
- LH side panel
- Console.

Remove the throttle body cover.



1. *Throttle body cover screw*
2. *Exhaust pipe*

Install the cable luber (P/N 529 035 738) on cable end, against the throttle cable adjuster.



NOTE: If the cable luber is not available, insert the needle of the lubricant can into the end of the throttle cable adjuster.

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

Spray the cable lubricant (P/N 293 600 041) into the cable until the lubricant runs out at throttle body end of the throttle cable.

NOTE: If the recommended lubricant is not available, an equivalent silicone lubricant can be used.

⚠ WARNING

Always use a silicone-based lubricant. Using another lubricant (like a water-based lubricant) could cause the throttle lever/cable sticking or stiffness.

Install all removed parts and adjust throttle cable.

Throttle Cable Removal

At Handlebar

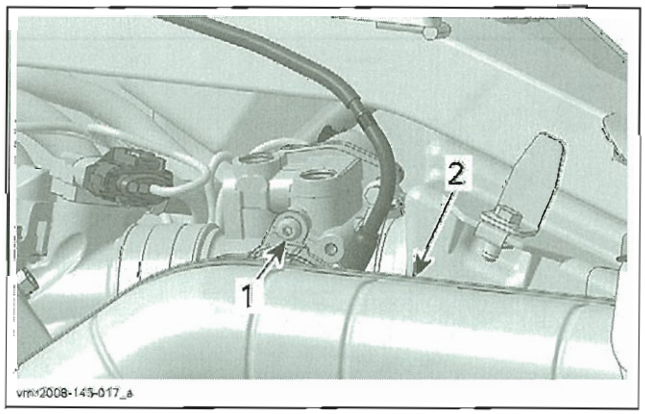
Use the same procedure as the throttle lever in the *STEERING* section.

At Throttle Body

Refer to *BODY* section to remove the following parts:

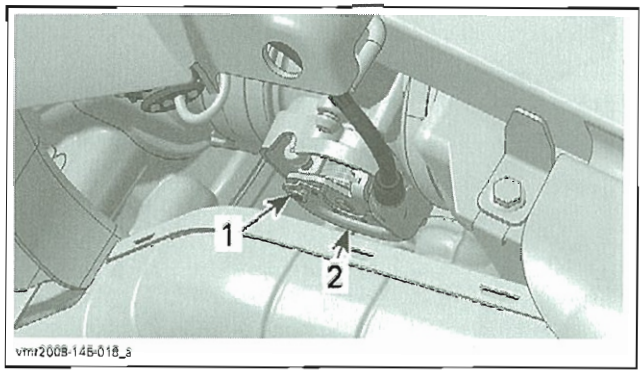
- LH side panel
- Console.

Remove the throttle body cover.



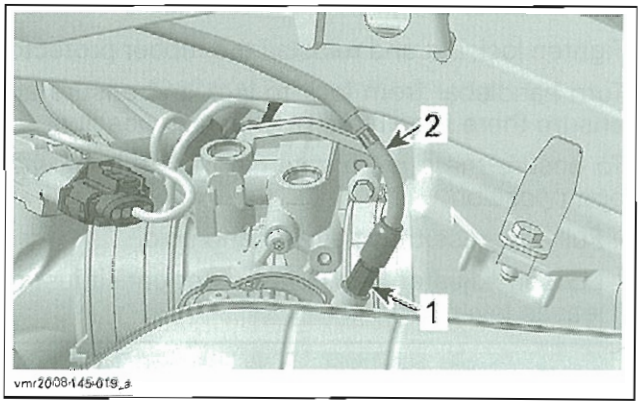
1. *Throttle body cover screw*
2. *Exhaust pipe*

Detach throttle cable from the throttle body cam.



1. *Cable barrel*
2. *Throttle body cam*

Unscrew the cable from throttle body.



1. *Cable screwed connection*
2. *Throttle cable*

Cut all locking ties retaining throttle cable to frame.

Remove the throttle cable from the vehicle noting its correct routing.

Throttle Cable Installation

The installation is the reverse of the removal procedure.

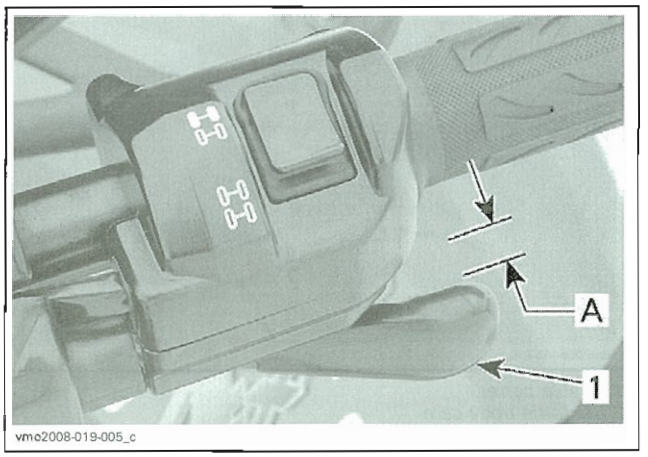
Proceed with throttle cable adjustment.

Throttle Cable Adjustment

Slide rubber protector back to expose throttle cable adjuster.

Loosen lock nut then turn the adjuster to obtain correct throttle lever free play.

NOTE: Measure throttle free play at the tip of throttle lever.



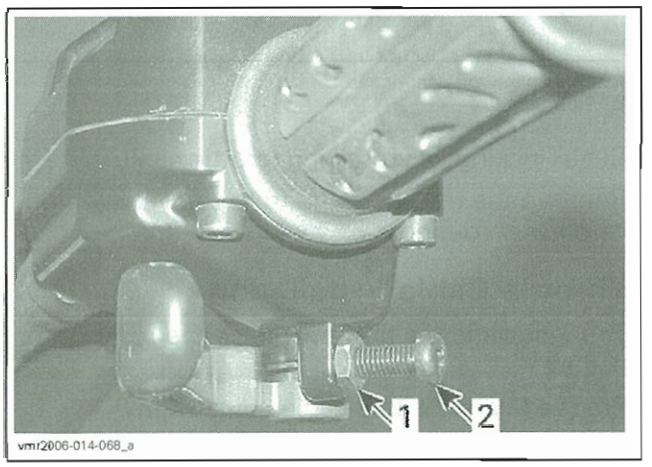
1. Throttle lever
A. 2 to 4 mm (5/64 to 5/32 in)

Tighten lock nut and reinstall the rubber protector.

Turn handlebar from lock to lock and ensure and ensure there is still free-play in each position.

To ensure there is no strain in the cable at wide open position:

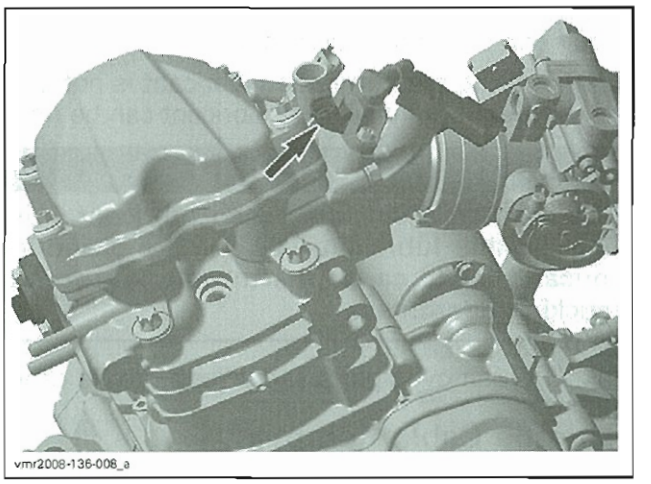
- Fully depress throttle lever and hold.
- Loosen adjuster lock nut/adjuster until it just releases lever.



1. Adjuster lock nut
2. Adjuster

- 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.

FUEL INJECTOR



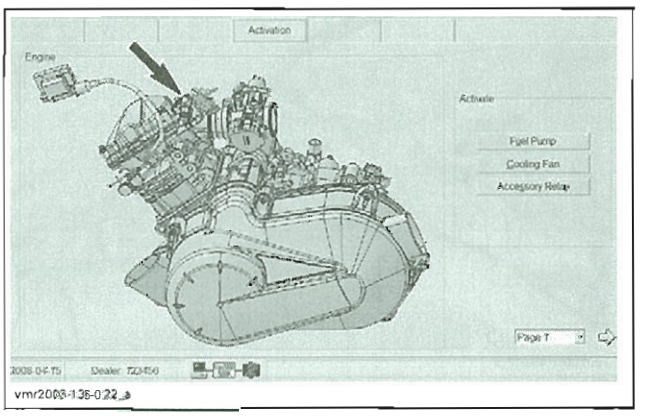
Injector Leakage Test

The leakage test is validated when performing the fuel pump pressure test. Refer to *FUEL TANK/ FUEL PUMP*.

Injector Test with B.U.D.S.

Turn ignition key ON and set engine stop switch to RUN.

Using the B.U.D.S. software, energize the fuel injector from the Activation section.



You should hear the injector working.

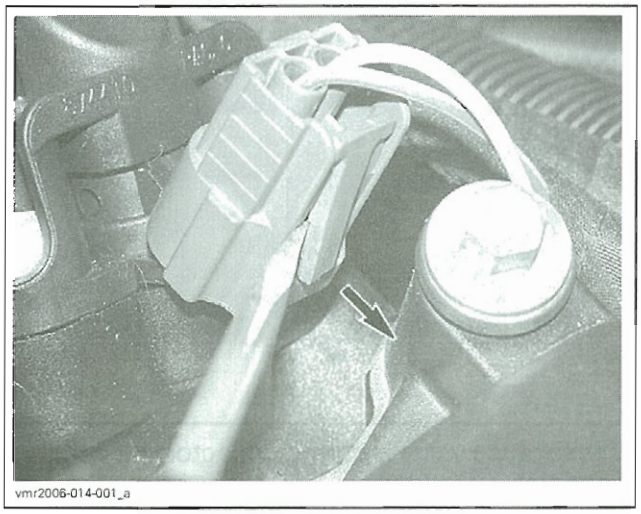
This validates the injector mechanical and electrical operation.

If the injector does not work, check injector input voltage.

Injector Input Voltage Test

Disconnect the connector from the injector.

NOTE: If connector is hard to unlock, gently use a screwdriver to release connector.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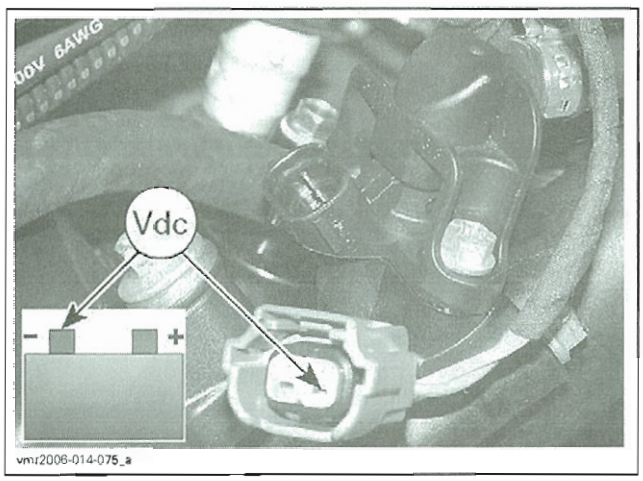
NOTE: It is not necessary to activate the injector since it is continuously powered.

Use the Fluke 115 multimeter (P/N 529 035 868) and select Vdc. Read voltage.

INJECTOR CONNECTOR		MEASUREMENT
WIRE		
VIOLET/BLUE	Battery ground	Battery voltage



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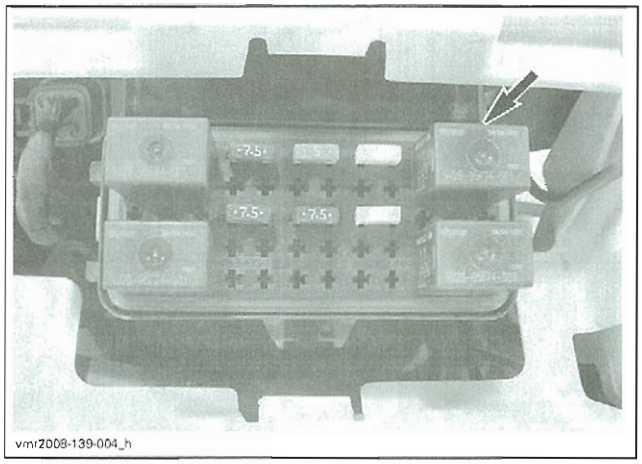
If input voltage is good, carry out the *INJECTOR CONTROL CIRCUIT TEST*.

If input voltage is not good, check continuity between main relay and injector as follows.

Remove main relay from its socket.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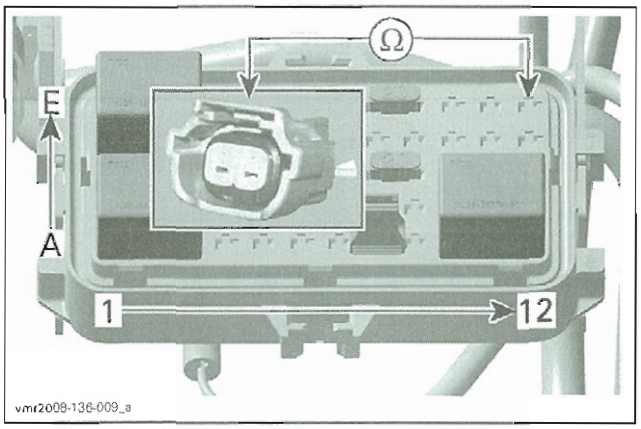
Use the Fluke 115 multimeter (P/N 529 035 868) and select Ω.

Read resistance.

INJECTOR CIRCUIT		MEASUREMENT
WIRE		
VIOLET/BLUE	Main relay socket pin 12E	Close to 0 Ω



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- If continuity is good, check relay and wiring from battery.
- If continuity is faulty, repair/replace wiring from relay socket to injector.

Injector Control Circuit Test

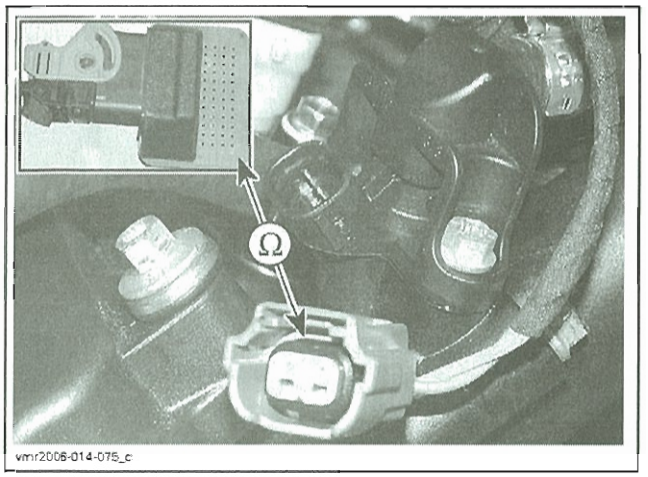
Disconnect ECM connector.

Install ECM adapter (P/N 529 036 085) on ECM connector.

Use the Fluke 115 multimeter (P/N 529 035 868) and select Ω.

Probe terminals as follows.

INJECTOR CONTROL CIRCUIT		MEASUREMENT
ECM	INJECTOR	
L4	1	Close to 0 Ω



If control circuit is faulty, repair/replace wiring/connectors.

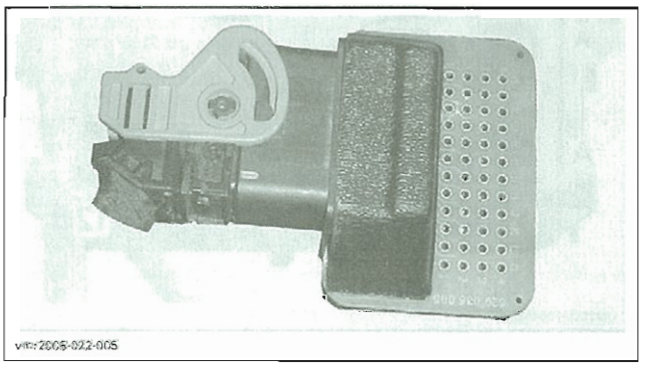
If control circuit and all tests applicable to the injector are good, try a new ECM. Refer to *ECM*.

Injector Resistance Test (At ECM Connector)

Reconnect the injector connector.

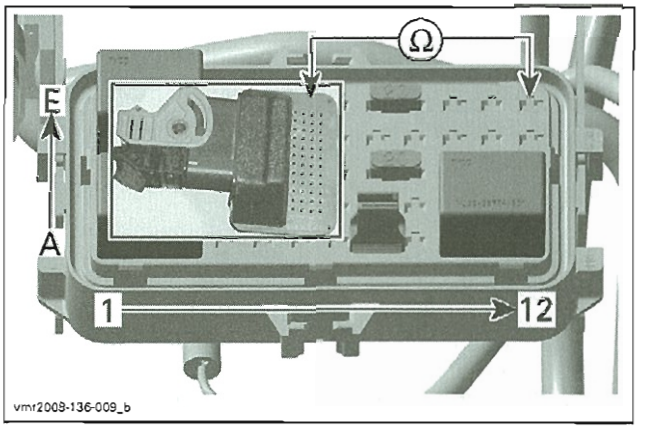
Disconnect the ECM connector.

Install ECM adapter (P/N 529 036 085) on ECM connector.



Using the Fluke 115 multimeter (P/N 529 035 868), check resistance value between terminals as follows.

RELAY SOCKET TERMINAL	ECM CONNECTOR	RESISTANCE @ 20°C (68°F)
12E	L4	Approximately 12 Ω



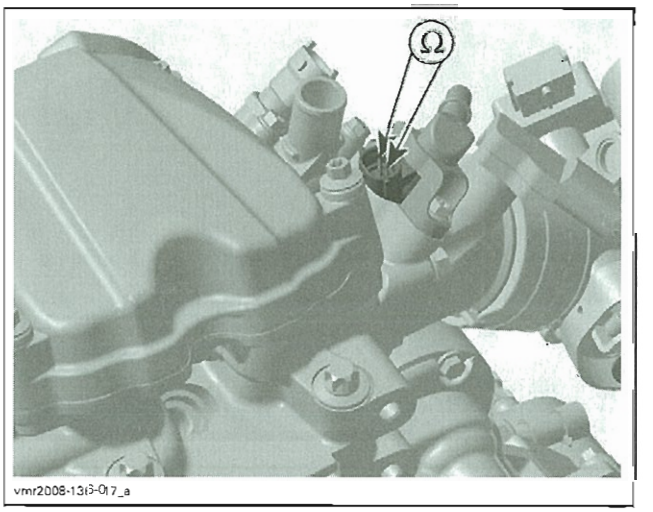
If resistance value is correct, injector coil is in good condition.

If resistance value is incorrect, repeat test at injector connector.

Injector Resistance Test (At Component)

Remove injector connector and check resistance value between injector pins as follows.

INJECTOR PIN		RESISTANCE @ 20°C (68°F)
1	2	Approximately 12 Ω



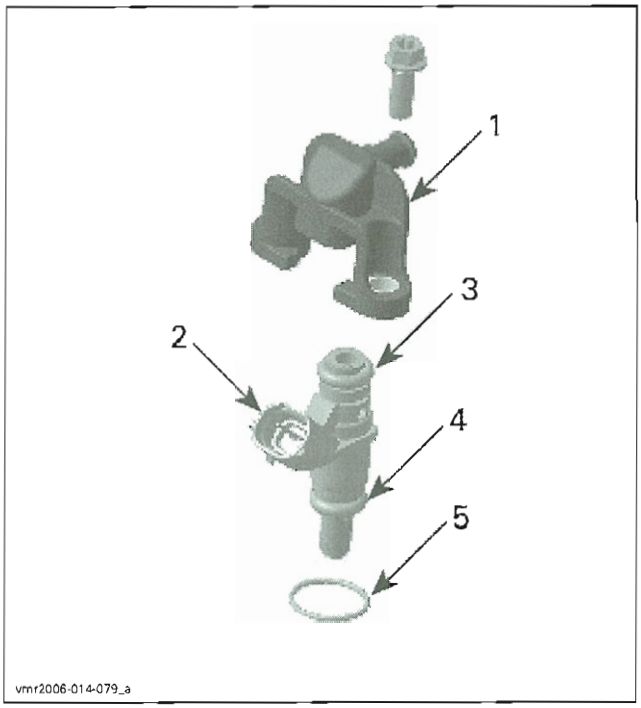
If readings are out of specifications, replace injector.

If readings are good, repair/replace wiring/connectors from ECM to injector.

Injector Removal

Remove the fuel rail from the engine. Refer to *FUEL RAIL* for the procedure.

The fuel injector can be easily pulled out of the fuel rail.



FUEL RAIL ASS'Y
1. *Fuel rail*
2. *Fuel injector*
3. *Injector top O-ring*
4. *Injector bottom O-ring*
5. *Manifold O-ring*

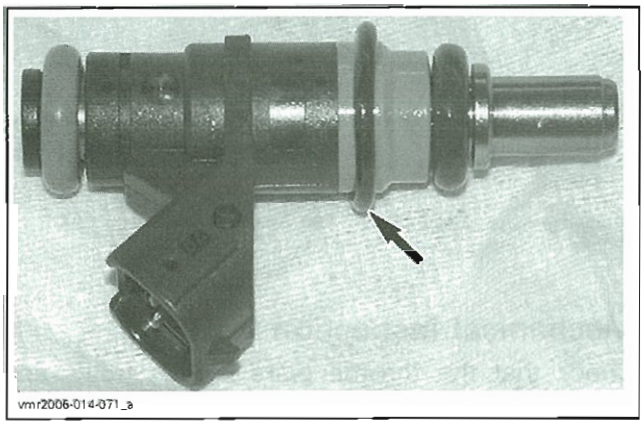
Injector Installation

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

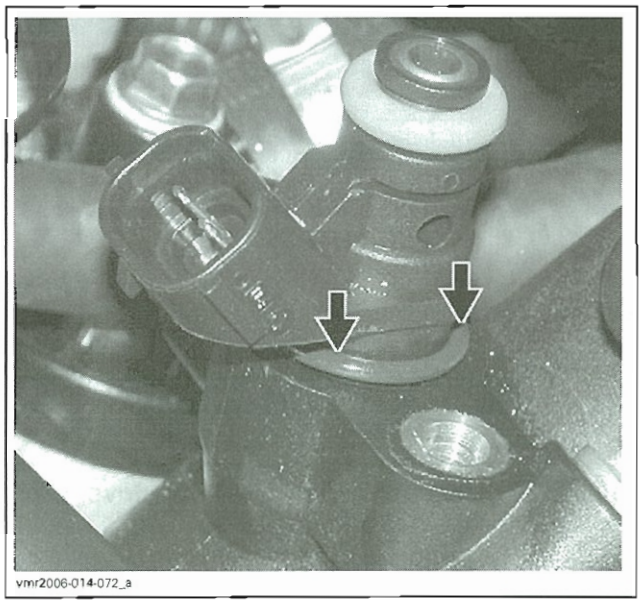
Install new O-rings.

Apply a thin film of engine oil to O-rings to ease insertion in rail.

Position the manifold O-ring as shown on injector.



Carefully insert injector in manifold paying attention to the manifold O-ring. Gently push in evenly all around while inserting injector. O-ring must be completely inserted and not visible, before finishing pushing injector.



Firmly push injector until it bottoms.

Reinstall fuel rail. See above.

FUEL RAIL

Fuel Rail Removal

Turn ignition key OFF.

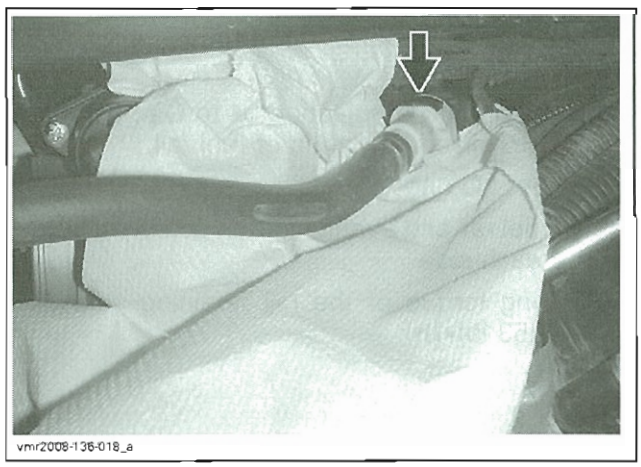
Remove side panels. Refer to *BODY*.

Remove air filter housing. Refer to *AIR INTAKE SYSTEM*.

⚠ WARNING

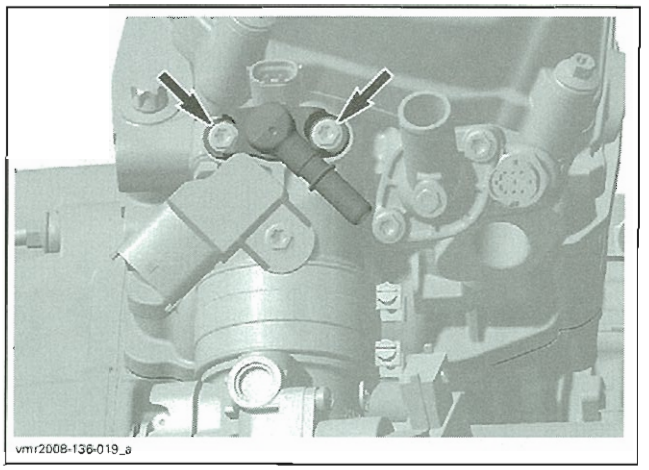
Prior to disconnecting the quick fitting, ensure engine and exhaust system are not hot.

Wrap a rag around the inlet hose and release the quick fitting.



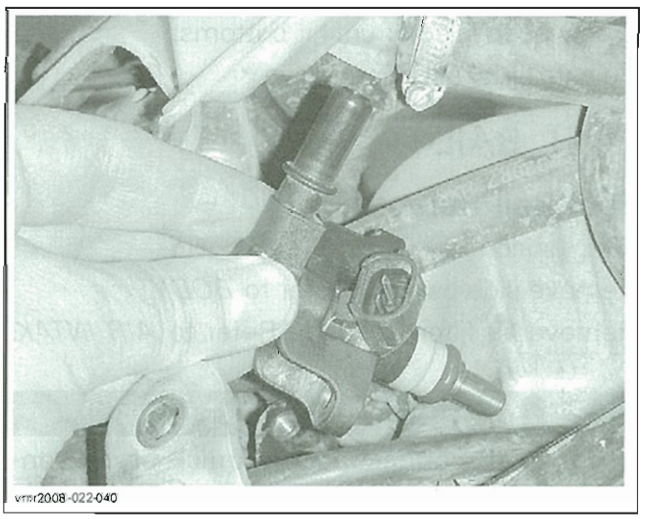
Unplug injector connector.

Unscrew rail retaining screws.



NOTE: To reach the screws, a 1/4 inch drive, 8 mm hexagonal socket works well.

Gently pull rail up by hand.



TYPICAL

Fuel Rail Installation

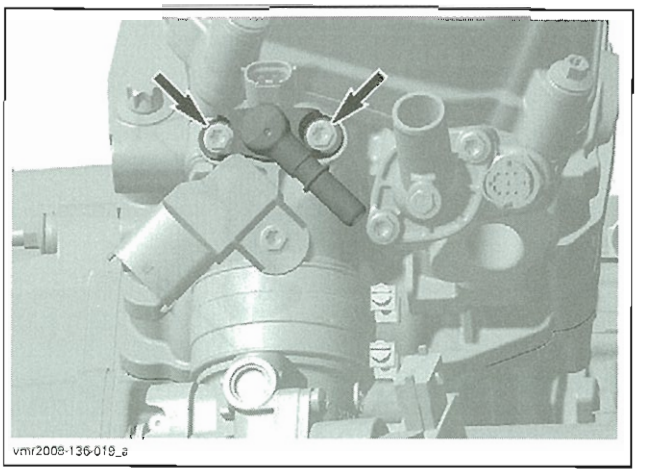
For installation, reverse the removal process but pay attention to the following.

Apply a thin film of injection oil to O-rings of fuel injector to ease installation of fuel rail.

Install new O-rings.

Install fuel rail and evenly tighten screws a little at a time each side.

Tightening torque of the rail retaining screws is 6 N•m (53 lbf•**in**).

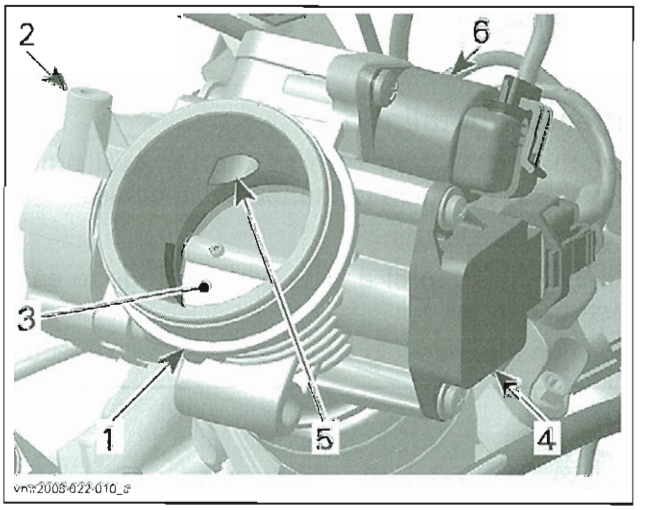


Secure inlet hose to injector.

⚠ WARNING

Perform a fuel pressure test and ensure that there is no leak. Refer to *FUEL TANK/FUEL PUMP*. Run engine and check for leaks.

THROTTLE BODY

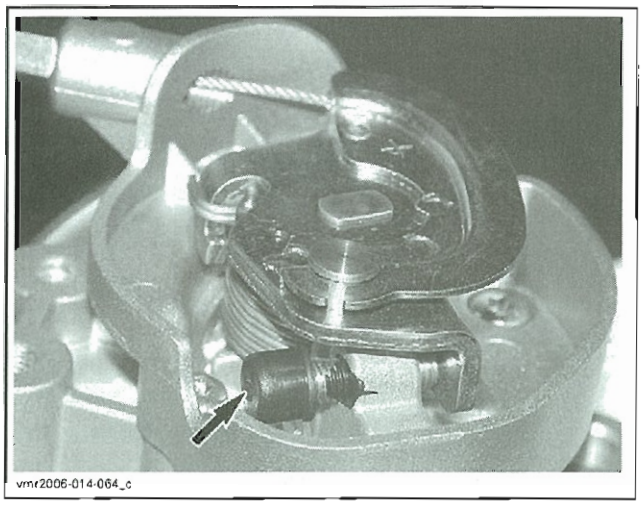


1. *Throttle body*
2. *Throttle cable attachment*
3. *Throttle plate*
4. *TPS*
5. *Idle air bypass channel*
6. *Idle air control valve*

Mechanical Inspection

Check that the throttle plate moves freely and smoothly when depressing throttle lever.

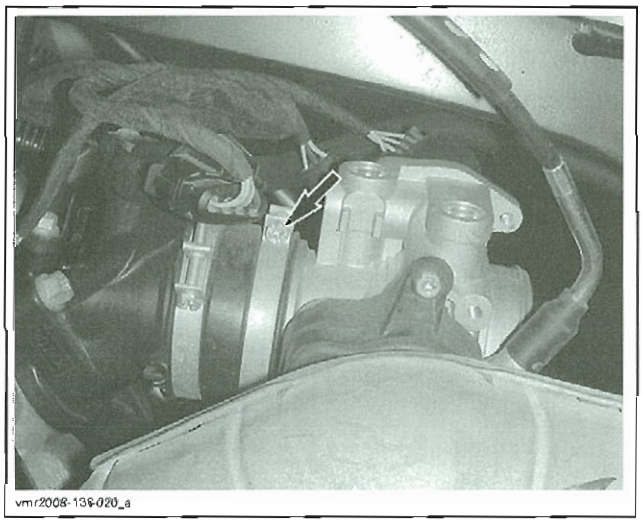
IMPORTANT: Never attempt to adjust the sealed idle stop screw. It is calibrated at the factory. If the screw adjustment is changed, the throttle body must be replaced.


vmr2006-014-064_c

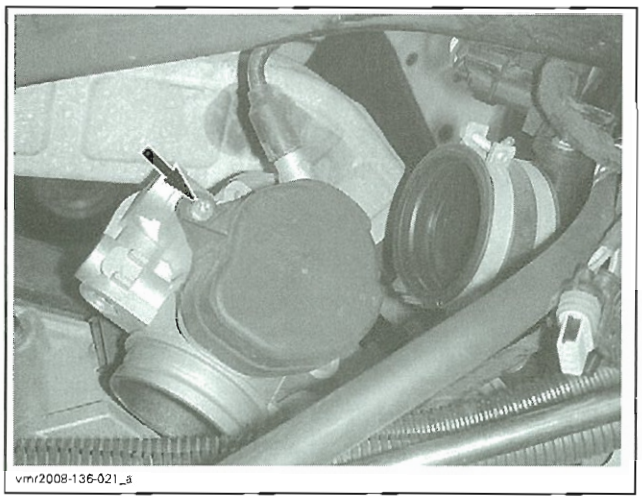
Throttle Body Removal

To remove the throttle body from engine, proceed as follows:

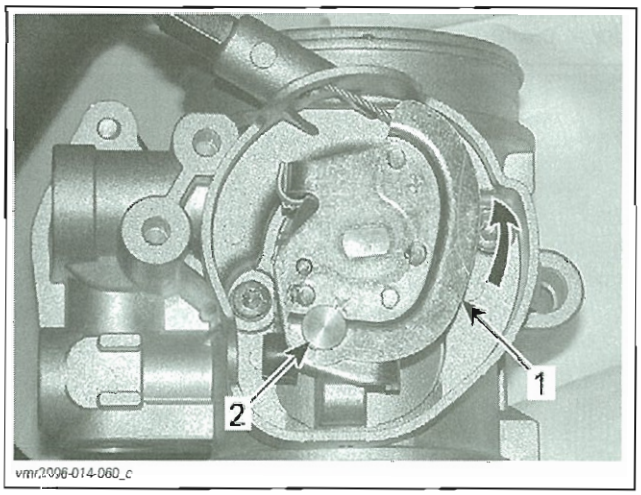
- Remove side panels. Refer to *BODY*.
- Remove air filter housing. Refer to *AIR INTAKE SYSTEM*.
- Unplug TPS and IACV connectors.
- Loosen throttle body clamp.


vmr2008-136-020_a

- Pull out throttle body.
- Remove throttle body cover.


vmr2008-136-021_a

- Turn throttle lever and pull out cable barrel.



vmr2006-014-060_c

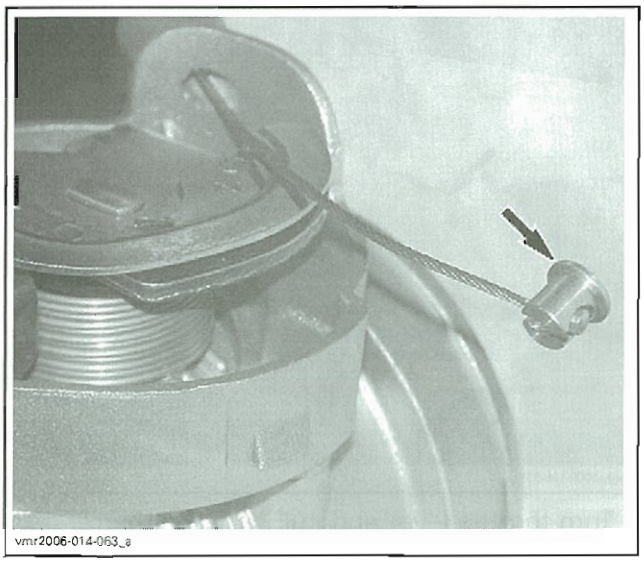
1. Throttle lever
2. Cable barrel

- Remove barrel from cable.
- Pull out throttle cable.

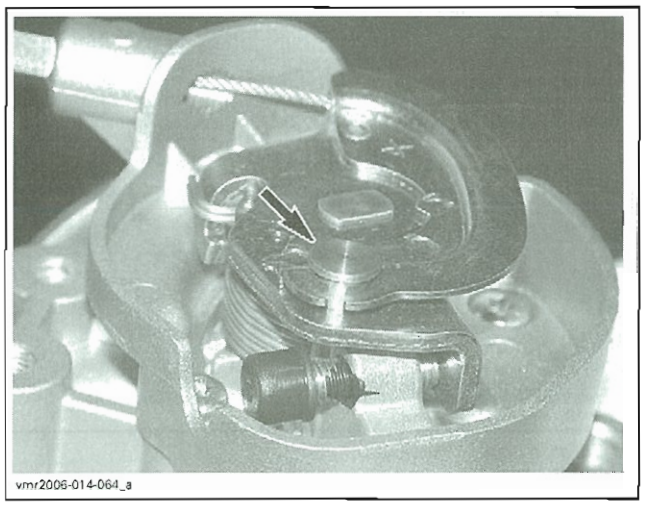
Throttle Body Installation

Installation of the throttle body is the reverse of the removal procedure. Pay attention for the following details.

Properly install cable barrel to throttle cable end.

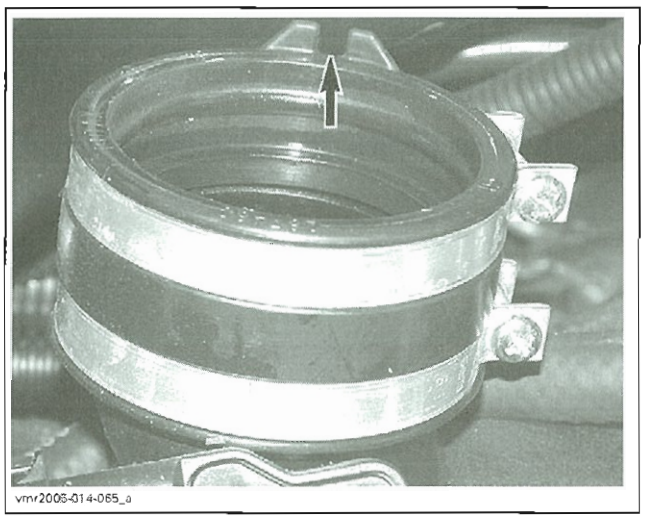

vmr2006-014-063_a

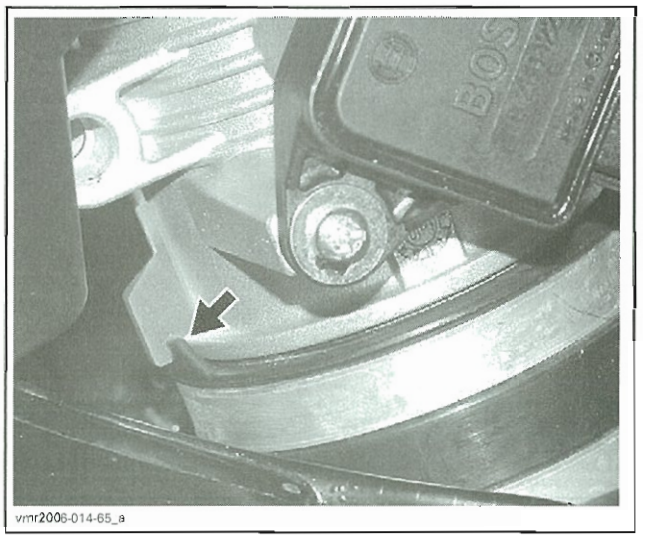
Hook cable to throttle lever.


vmr2006-014-064_a

Do not reinstall cover yet.

Install throttle body on intake manifold. Ensure to index throttle body tab with boot notch.


vmr2006-014-065_a


vmr2006-014-65_a

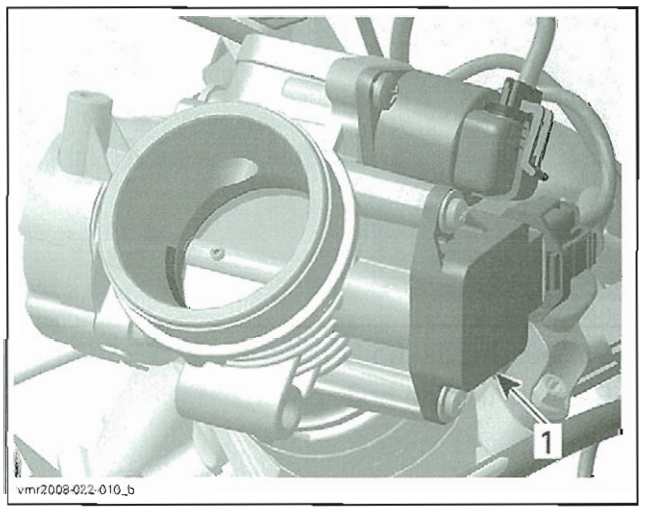
When the throttle body has been replaced, ensure to:

- Check throttle cable adjustment. Refer to *THROTTLE CABLE* in this section.
- Reset the Closed Throttle and Idle Actuator. Refer to *BASIC ADJUSTMENTS* in this section.

THROTTLE POSITION SENSOR (TPS)

General

The throttle position sensor (TPS) is a potentiometer that sends a signal to the ECM which is proportional to the throttle shaft angle.



vmr2008-022-010_b

1. Throttle position sensor (TPS)

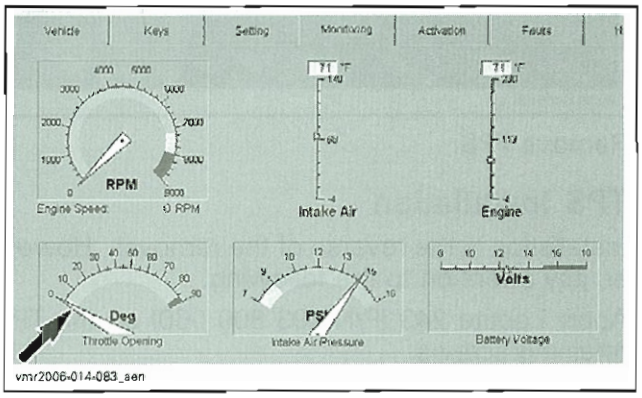
IMPORTANT: Prior to testing the TPS, ensure that mechanical components/adjustments of throttle body are adequate.

The EMS may generate several fault codes pertaining to the TPS. Refer to *MONITORING SYSTEM/FAULT CODES* section for more information.

TPS Wear Test

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**.



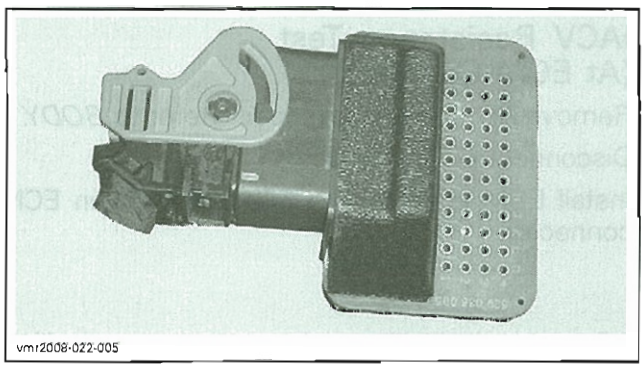
Slowly and regularly depress the throttle. Observe the needle movement. It must change gradually and regularly as you move the throttle. If the needle "sticks", bounces, suddenly drops or if any discrepancy between the throttle movement and the needle movement is noticed, it indicates that the TPS needs to be replaced or the computer used may be too slow to transfer data fast enough for real time display.

TPS Resistance Test

Ensure TPS is connected to wiring harness.

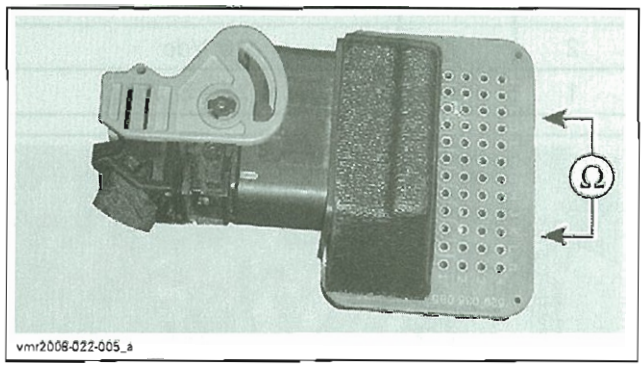
Disconnect the ECM connector.

Install ECM adapter (P/N 529 036 085) on ECM connector.



Using the Fluke 115 multimeter (P/N 529 035 868), check resistance values on ECM connector as per the following table.

ECM CONNECTOR		THROTTLE IDLE POSITION	WIDE OPEN THROTTLE POSITION
PIN		RESISTANCE Ω @ 20°C (68°F)	
G3	G2	990 - 1190	2569 - 2769
G2	A1	1919 - 2119	1919 - 2119
G3	A1	2617 - 2817	1042 - 1242



NOTE: The resistance value should change smoothly and proportionally to throttle movement. Otherwise, replace TPS.

If resistance values are correct, perform the *VOLTAGE TEST* below.

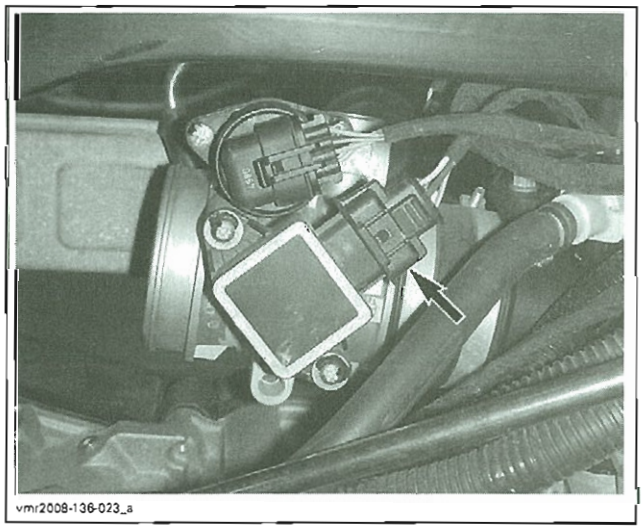
If resistance values are incorrect, check wiring harness. If wiring is faulty, repair/replace. If wiring is good, replace TPS.

Reconnect ECM connector.

TPS Voltage Test

Check the ECM voltage output to the TPS as follows.

Disconnect connector from TPS.

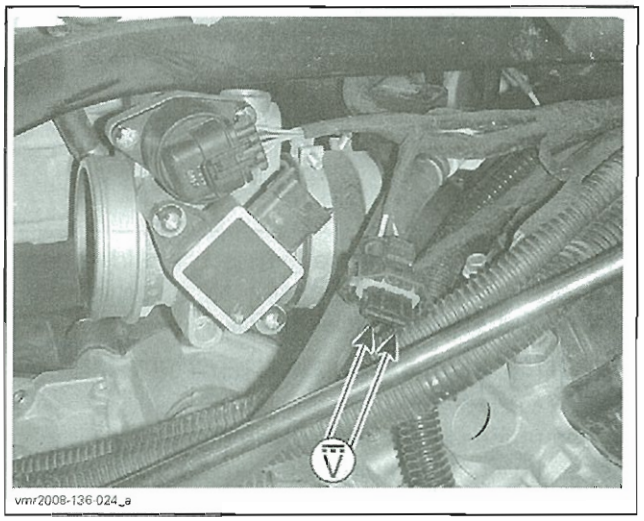


Turn ignition key ON and set engine stop switch to RUN.

Use the Fluke 115 multimeter (P/N 529 035 868) and select Vdc.

Check the voltage readings from harness connector as follows.

CONNECTOR PIN		VOLTAGE
1	2	5.0 Vdc
2	3	0 Vdc
1	3	4.75 - 5 Vdc


vmr2008-136-024_a

If voltage test is not good, check/repair wiring harness. If wiring and all tests applicable to the TPS are good, try a new ECM. Refer to *ECM*.

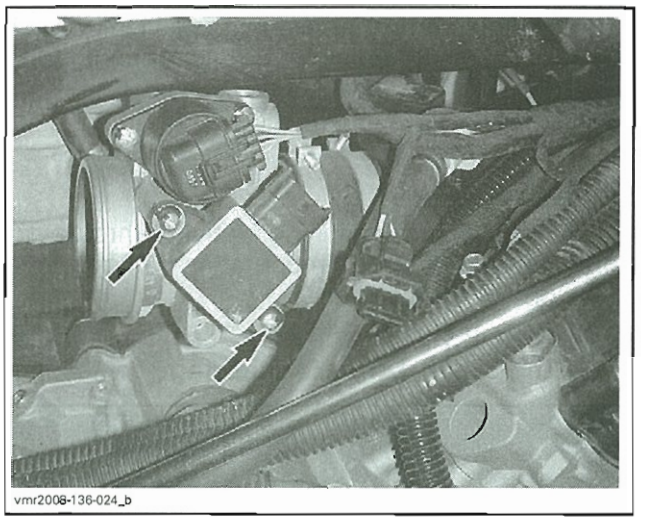
If voltage test is good, everything is in order (assuming resistance test was performed).

TPS Removal

Remove RH side panel. Refer to *BODY*.

Remove air filter housing. Refer to *AIR INTAKE SYSTEM*.

Loosen two screws retaining the TPS.


vmr2008-136-024_b

Remove TPS.

TPS Installation

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

Apply Loctite 243 (P/N 293 800 060) on the TPS retaining screws.

Torque screws to 3 N•m (27 lbf•**in**).

Reinstall remaining removed parts.

Proceed with the **Closed Throttle and Idle Actuator Reset**. See *BASIC ADJUSTMENTS* at the beginning of this section.

IDLE AIR CONTROL VALVE

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 idle air control valve may be necessary as a test.

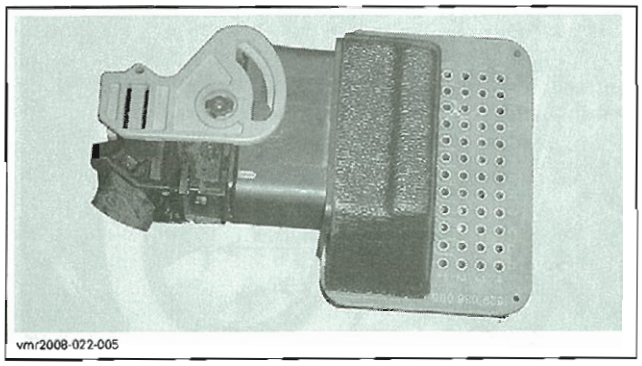
If an erratic engine idle is experienced, clean the idle air bypass in throttle body.

IACV Resistance Test (At ECM Connector)

Remove RH front inner fender. Refer to *BODY*.

Disconnect ECM connector.

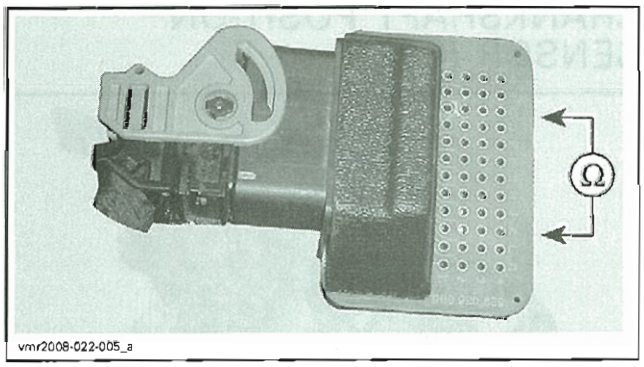
Install ECM adapter (P/N 529 036 085) on ECM connector.



Use the Fluke 115 multimeter (P/N 529 035 868) and select Ω.

Check the resistance of both windings.

ECM CONNECTOR		MEASUREMENT
PIN		RESISTANCE Ω @ 20°C (68°F)
D3	D4	45 - 55
E4	C4	



If resistance test of valve windings is good, valve should work.

If the resistance of any winding is not good, measure resistance at the IACV valve.

IACV Valve Resistance Test (At Component)

Remove RH side panel. Refer to *BODY*.

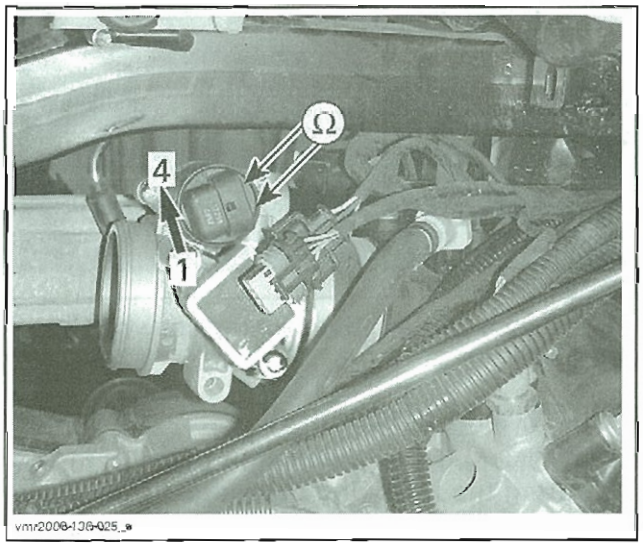
Remove air filter housing. Refer to *AIR INTAKE SYSTEM*.

Disconnect IACV valve connector.

Check the resistance between pins as shown.

NOTE: It is easier to remove IACV to measure the resistance.

IDLE AIR CONTROL VALVE		MEASUREMENT
PIN		RESISTANCE Ω @ 20°C (68°F)
1	4	45 - 55
2	3	

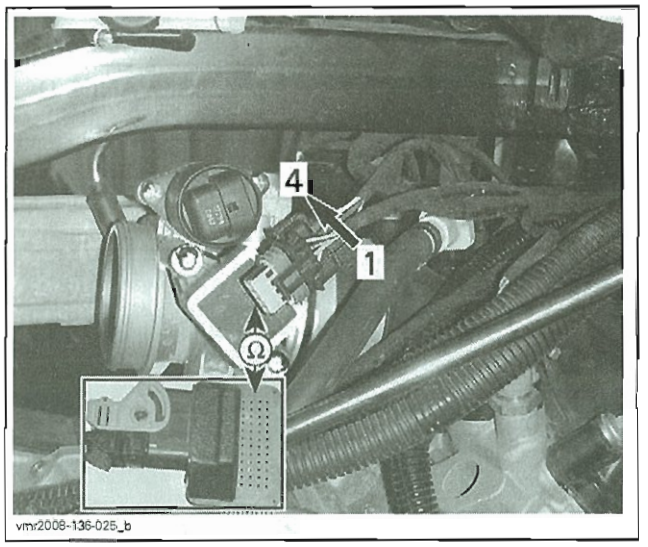


If the resistance of any winding is not good, replace the idle air control valve.

If resistance test of valve windings is good but the resistance test at ECM failed, check continuity of IACV wiring between ECM and IACV.

IACV Valve Circuit Resistance Test

IDLE AIR CONTROL VALVE CIRCUIT		MEASUREMENT
IACV PIN	ECM PIN	RESISTANCE @ 20°C (68°F)
1	D3	Close to 0 Ω
2	E4	
3	C4	
4	D4	



If resistance test failed, repair/replace wiring/connectors.

IACV Visual Inspection

CAUTION: Make sure the ignition key is turned off during the following procedure.

Remove idle air control valve from throttle body.

Check the piston and air bypass channel for dirt/deposits which can cause a sticking or leaking piston.

CAUTION: 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 damaged.

Use a throttle body cleaner such as Gunk Intake Medic or the equivalent.

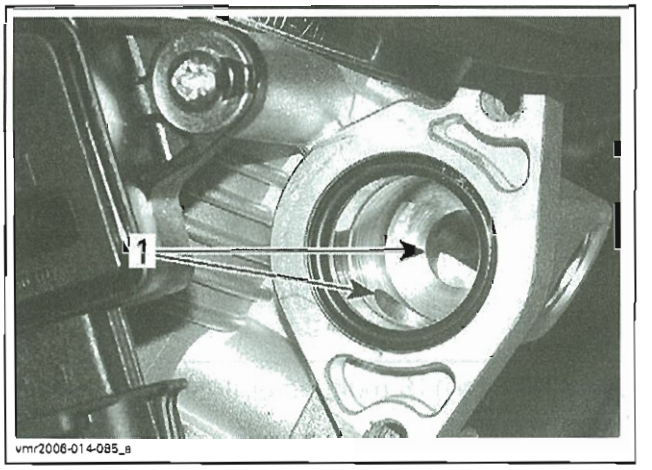
⚠ WARNING

Only use an appropriate throttle body cleaner that will not damage O-rings, MAPS sensor and idle control valve.

Clean idle air bypass in throttle body from contamination then use an air gun to dry it.

⚠ WARNING

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

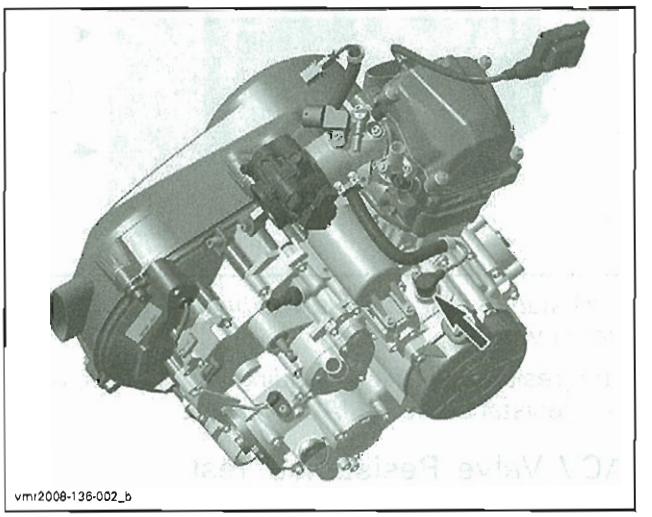


1. Clean bore from contamination

Clean all remaining parts and install the idle air control valve on the throttle body.

Proceed with the **Closed Throttle and Idle Actuator Reset**. See procedure in *BASICS ADJUSTMENTS* at the beginning of this section.

CRANKSHAFT POSITION SENSOR (CPS)

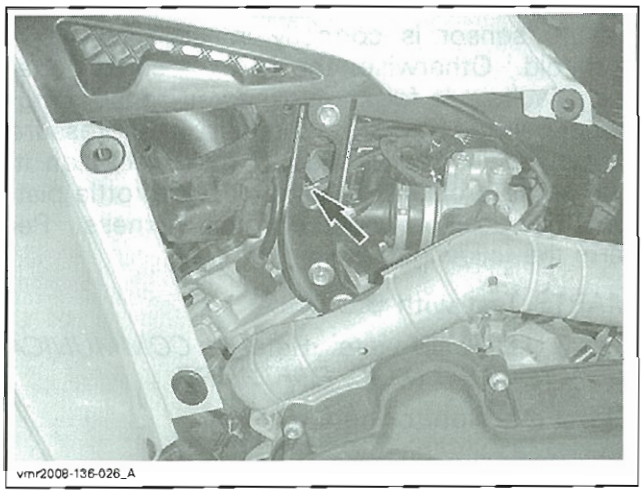


NOTE: Take into account that a CPS fault can be triggered by bent or missing encoder wheel teeth. First check fault codes (refer to *MONITORING SYSTEM/FAULT CODES*) then check the teeth condition if necessary (refer to *MAGNETO/STARTER*).

CPS Voltage Test

Remove LH panel. Refer to *BODY*.

Unplug CPS connector.

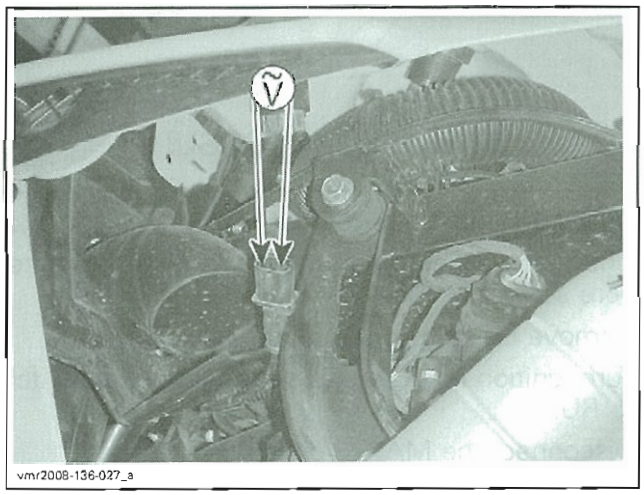


Use the Fluke 115 multimeter (P/N 529 035 868) and select Vac.

Probe terminals as shown.

Crank engine and read voltage.

CPS CONNECTOR		MEASUREMENT
PIN		VOLTAGE
1	2	1 Vac min.



If test succeeded, CPS is good.

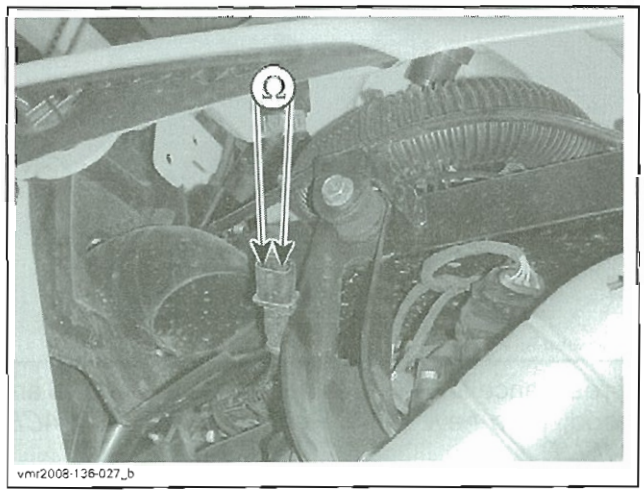
If test failed, perform the resistance test.

CPS Resistance Test (At Component)

Use the Fluke 115 multimeter (P/N 529 035 868) and select Ω.

Probe terminals as shown.

CPS CONNECTOR		MEASUREMENT
PIN		RESISTANCE @ 20°C (68°F)
1	2	Approximately 910 Ω



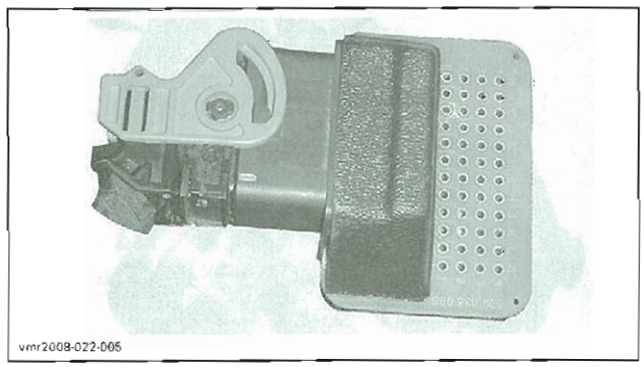
If resistance is not within specifications, replace the CPS.

If resistance tests good at component, reconnect the CPS connector and repeat the test at the ECM connector.

CPS Resistance Test (At ECM Connector)

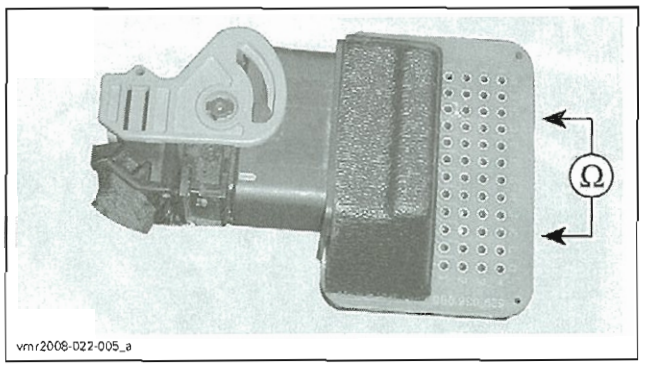
Disconnect ECM connector.

Install ECM adapter (P/N 529 036 085) on ECM connector.



Using the Fluke 115 multimeter (P/N 529 035 868), recheck resistance as per table.

ECM CONNECTOR		MEASUREMENT
PIN		RESISTANCE @ 20°C (68°F)
D1	E1	Approximately 910 Ω



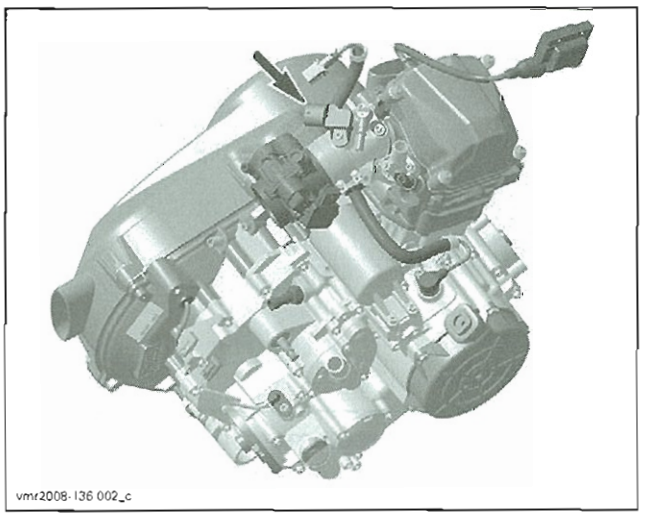
If resistance and all tests applicable to the CPS are good, try a new ECM. Refer to *ECM REPLACEMENT*.

If resistance value is incorrect, repair the connectors or replace the wiring harness between ECM connector and the CPS.

CPS Replacement

Refer to *MAGNETO/STARTER*.

MANIFOLD ABSOLUTE PRESSURE AND TEMPERATURE SENSOR (MAPTS)



NOTE: This sensor is a multifunction device.

Sensor Pressure Function

When engine is started and it runs at idle speed, the sensor reads the absolute pressure and stores it in the ECM. Thereafter, it reads the manifold air pressure at operating RPMs.

Ensure sensor is correctly installed on intake manifold. Otherwise, the MAPTS could generate a fault code for an unexpected sensor range at idle when it reads the absolute pressure. Remove sensor and check for oil or dirt on its end and if problem persists, check throttle plate condition/position and the wiring harness. Perform the following tests.

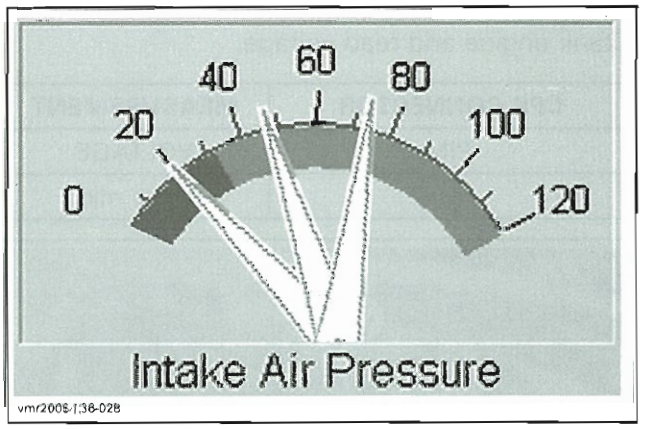
MAPTS Test with B.U.D.S.

Use B.U.D.S. software. Refer to *COMMUNICATION TOOLS/B.U.D.S. SOFTWARE*.

Select the **Monitoring** tab.

Start engine.

Needle should move as you throttle the engine. Otherwise, perform the voltage and continuity tests.



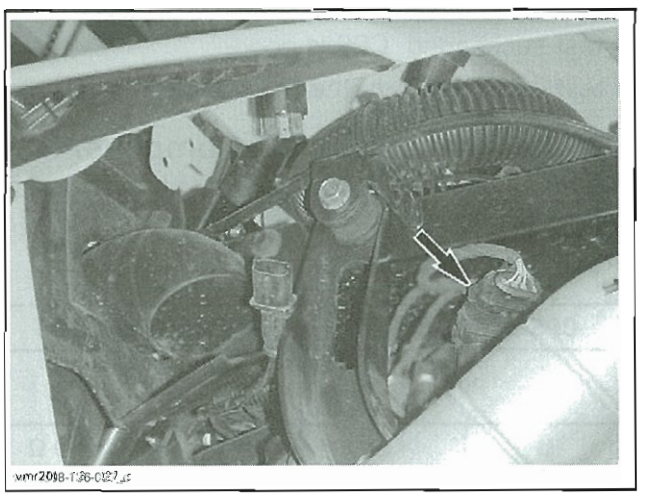
MAPTS Input Voltage Test

Check the voltage output from ECM to the pressure sensor.

Remove LH side panel. Refer to *BODY*.

Turn ignition key ON and set engine stop switch to RUN.

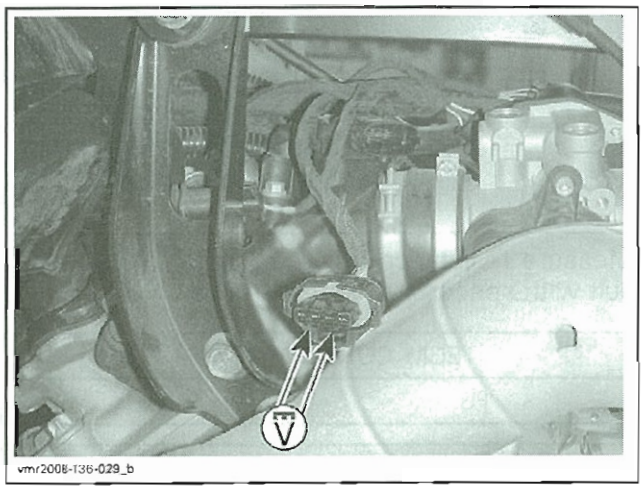
Disconnect the MAPTS connector.



Use the Fluke 115 multimeter (P/N 529 035 868) and select Vdc.

Read voltage.

MAPTS CONNECTOR		MEASUREMENT
PIN		VOLTAGE
1	3	5 Vdc



If voltage test is good, test continuity of the pressure signal circuit.

If voltage test is not good, check the continuity of the power and ground circuits.

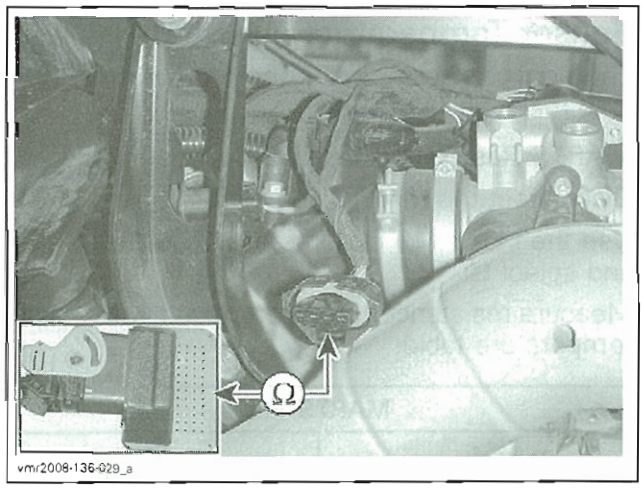
MAPTS Pressure Signal Continuity Test

Disconnect the ECM connector.

Use the Fluke 115 multimeter (P/N 529 035 868) and select Ω.

Check the continuity as follows.

MAPTS CIRCUIT		MEASUREMENT
MAPS PIN	ECM PIN	RESISTANCE @ 20°C (68°F)
4	F2	Close to 0 Ω



If continuity is good, replace MAPTS.

If continuity is not good, repair/replace wiring/connectors between the ECM and the MAPTS.

MAPTS Power and Ground Circuits Continuity Test

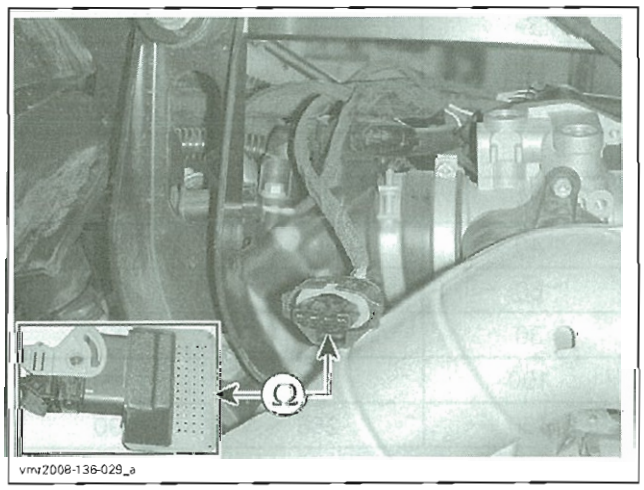
Disconnect the ECM connector.

Install ECM adapter (P/N 529 036 085) on ECM connector.

Use the Fluke 115 multimeter (P/N 529 035 868) and select Ω.

Check the continuity as follows.

MAPTS CIRCUIT		MEASUREMENT
MAPS PIN	ECM PIN	RESISTANCE @ 20°C (68°F)
1	G2	Close to 0 Ω
3	A1	



If continuity is not good, repair/replace wiring/connectors between the ECM and the MAPTS.

If continuity and all tests applicable to MAPTS are good, try a new ECM. Refer to *ECM*.

Sensor Temperature Function

The sensor also monitors the temperature at intake manifold.

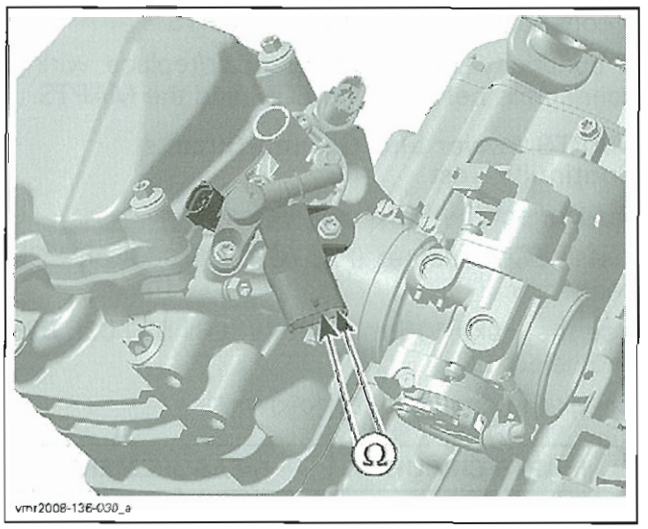
MAPTS Resistance Test (At Component)

Disconnect the MAPTS connector.

Use the Fluke 115 multimeter (P/N 529 035 868) and select Ω.

Measure resistance. Compare result with sensor temperature table.

MAPTS PIN	
1	2



SENSOR TEMPERATURE TABLE		
TEMPERATURE		RESISTANCE (OHMS)
°C	°F	MAPTS
- 30	- 22	28000
- 20	- 4	14500
0	32	5500
20	68	2500
40	104	1200
60	140	600
80	176	320
100	212	180
130	266	90

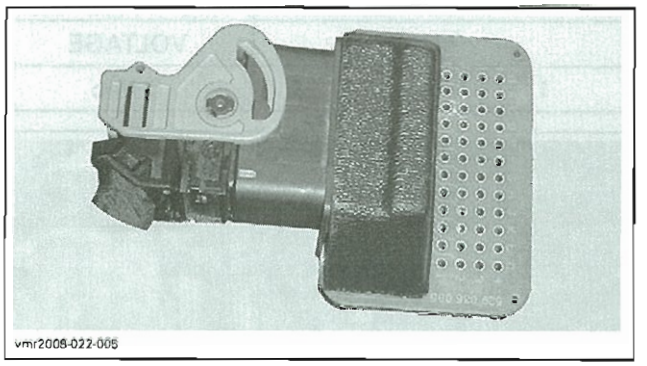
If resistance is not within specification, replace the MAPTS.

If resistance tests good, reconnect the MAPTS and repeat test at ECM connector.

MAPTS Resistance Test (AT ECM Connector)

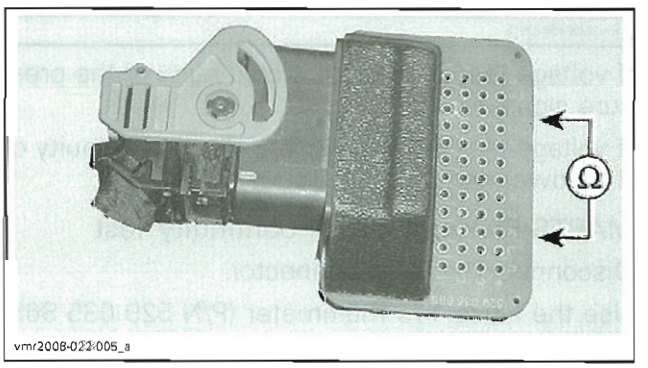
Disconnect the ECM connector.

Install ECM adapter (P/N 529 036 085) on ECM connector.



Measure resistance between pins. Compare result with sensor temperature table.

ECM CONNECTOR PIN	
F3	G2



If resistance value is incorrect, check the continuity of the temperature sensor circuits.

If resistance value and all tests applicable to the MAPTS are good, try a new ECM. Refer to *ECM*.

MAPTS Power and Ground Circuits Continuity Test

Disconnect the ECM connector.

Install ECM adapter (P/N 529 036 085) on ECM connector.

Use the Fluke 115 multimeter (P/N 529 035 868) and select Ω.

Check the continuity as follows.

MAPTS CIRCUIT		MEASUREMENT
MAPTS PIN	ECM PIN	RESISTANCE @ 20°C (68°F)
1	G2	Close to 0 Ω
2	F3	

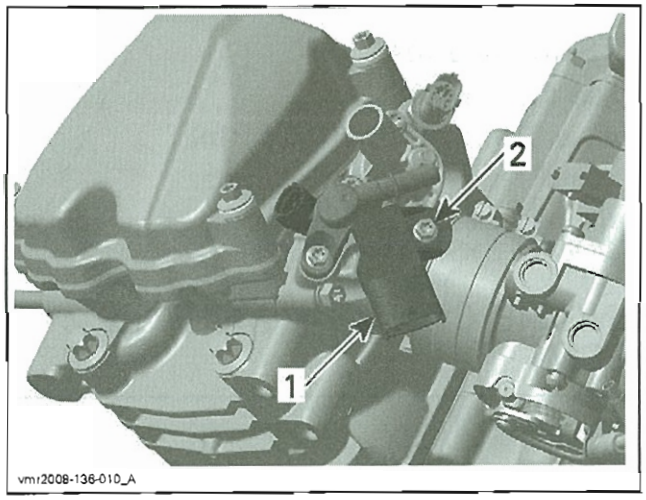
If continuity is not good, repair/replace wiring/connectors between the ECM and the MAPTS.

If continuity and all tests applicable to the MAPTS are good, try a new ECM. Refer to *ECM*.

MAPTS Removal

Remove LH side panel. Refer to *BODY*.

Disconnect MAPTS connector and remove the MAPTS.

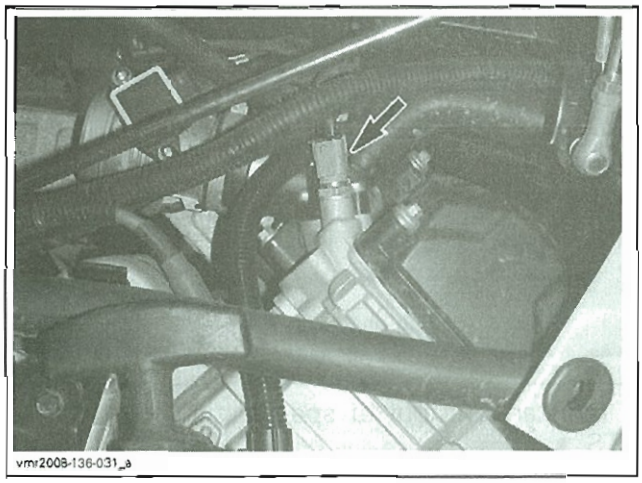


1. *MAPTS*
2. *Retaining screw*

MAPTS Installation

Apply Loctite 243 (P/N 293 800 060) on screw then torque to 6 N•m (53 lbf•**in**).

COOLANT TEMPERATURE SENSOR (CTS)



RH SIDE OF VEHICLE

CTS Resistance Test (At Component)

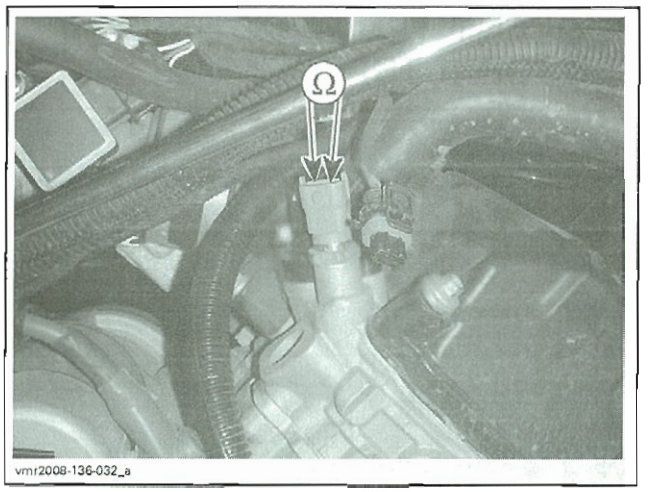
Disconnect CTS connector.

Use the Fluke 115 multimeter (P/N 529 035 868) and select Ω.

Measure the resistance of the sensor. Compare result with sensor temperature table.

CTS PIN	
1	2

SENSOR TEMPERATURE TABLE		
TEMPERATURE		RESISTANCE (OHMS)
°C	°F	CTS
- 40	- 40	45000
- 30	- 22	28000
- 20	- 4	15000
0	32	5750
20	68	2600
40	104	1200
60	140	600
80	176	320
100	212	180
130	266	90



If resistance is out of specification, replace the CTS.

If resistance tests good, reconnect the CTS connector and repeat test at ECM connector.

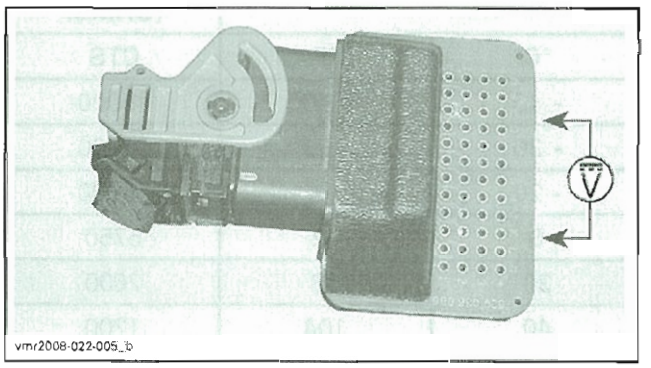
CTS Resistance Test (At ECM Connector)

Disconnect ECM connector.

Install ECM adapter (P/N 529 036 085) on ECM connector.

Check resistance on the ECM connector. Compare result with sensor temperature table.

ECM CONNECTOR		MEASUREMENT
PIN		RESISTANCE Ω @ 20°C (68°F)
C3	F4	2280 - 2736



If resistance and all tests applicable to the CTS are good, try a new ECM. Refer to *ECM REPLACEMENT*.

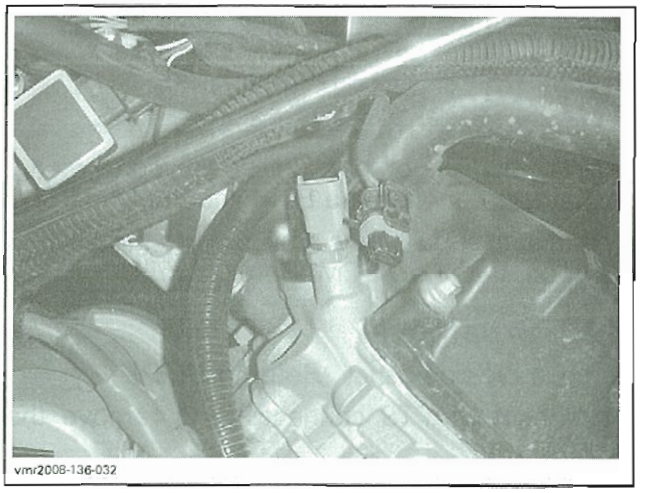
If resistance value is incorrect, repair the connectors or replace the wiring harness between ECM connector and the CTS.

CTS Removal

Drain coolant. Refer to *COOLING SYSTEM*.

Disconnect CTS connector.

Remove CTS.



CTS Installation

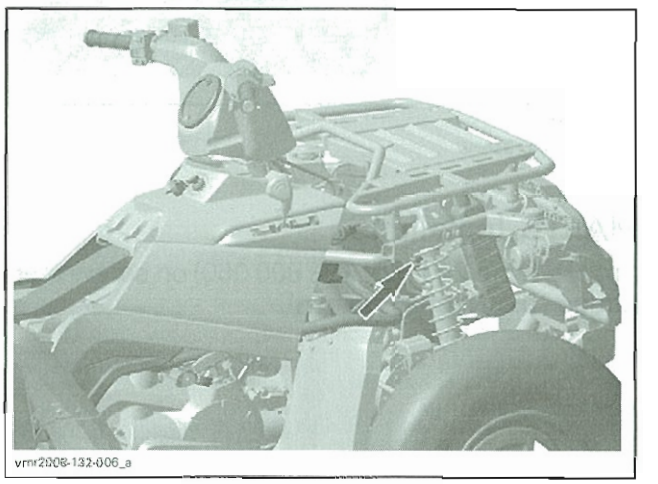
Install the new CTS.

Torque CTS to 17 N•m (150 lbf•**in**).

Reinstall remaining removed parts.

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

ENGINE CONTROL MODULE (ECM)

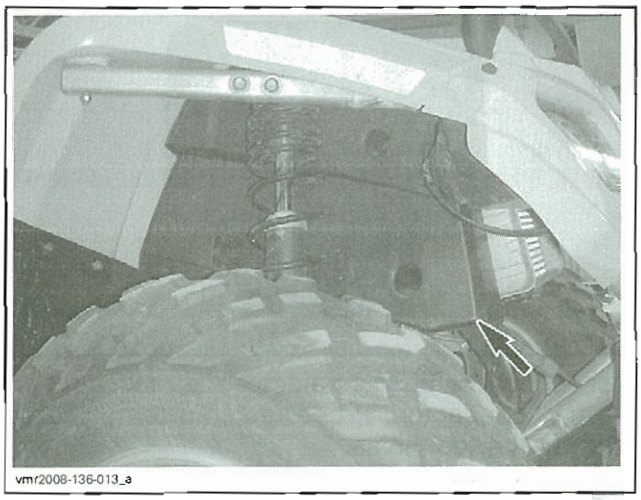


ECM LOCATION

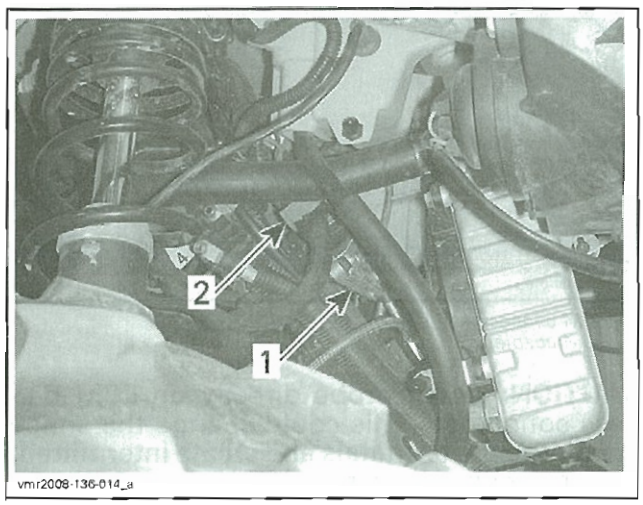
NOTE: Prior to replacing an ECM, ensure to conduct all testing procedures.

ECM Connector Removal

To reach ECM connector, remove RH front inner fender. Refer to *BODY*.

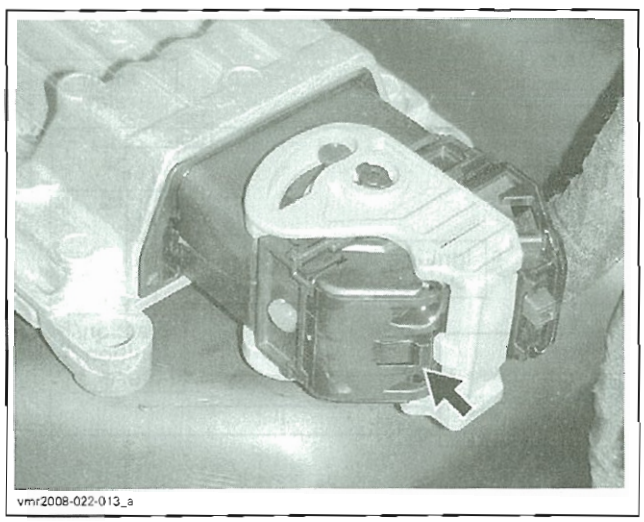


FRONT RH SIDE



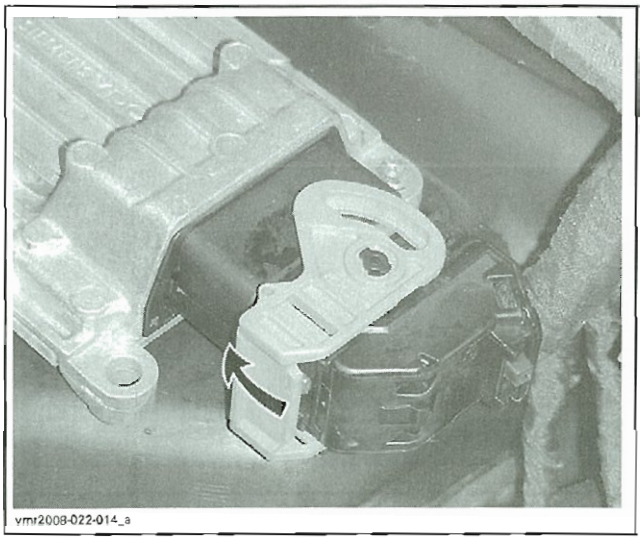
1. *ECM*
2. *ECM connector*

Push and hold the locking tab.



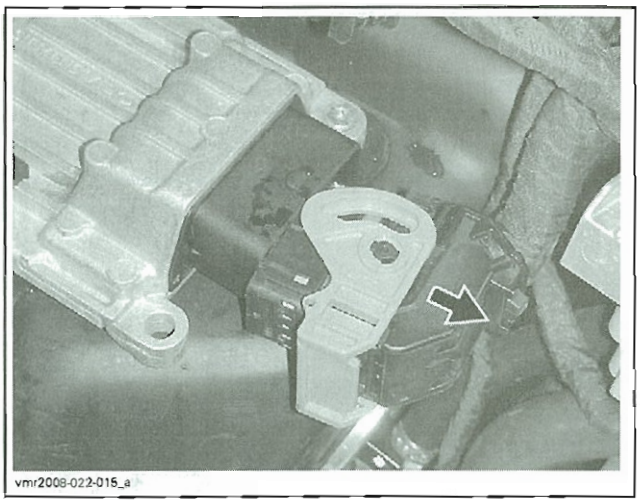
TYPICAL

Rotate connector lock until it stops.



TYPICAL

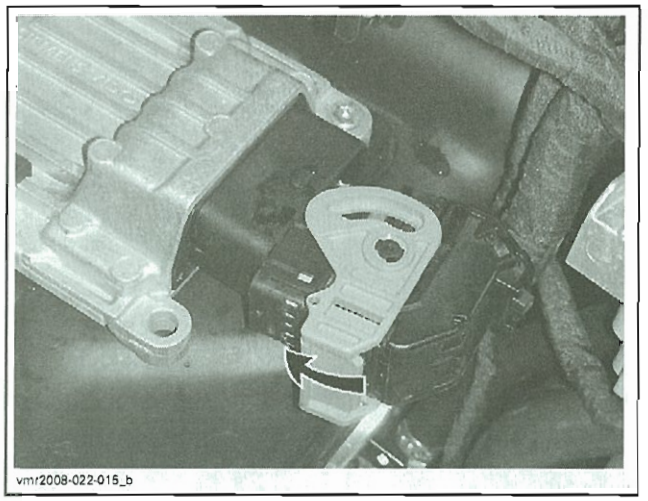
Pull out connector.



TYPICAL

ECM Connector Installation

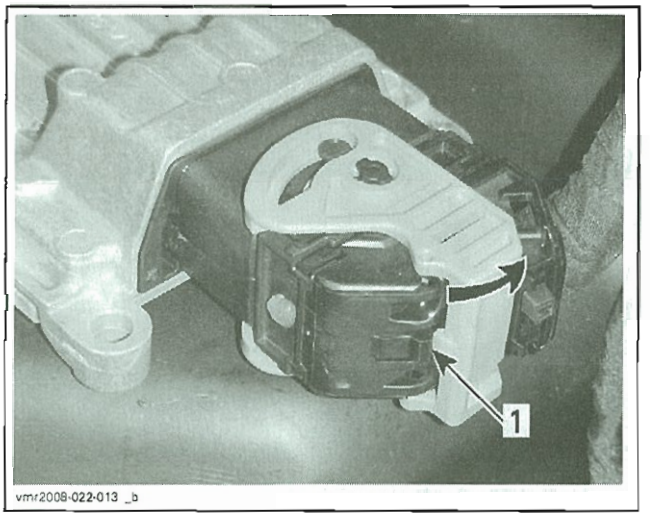
Fully open connector lock.



TYPICAL

Install connector to ECM.

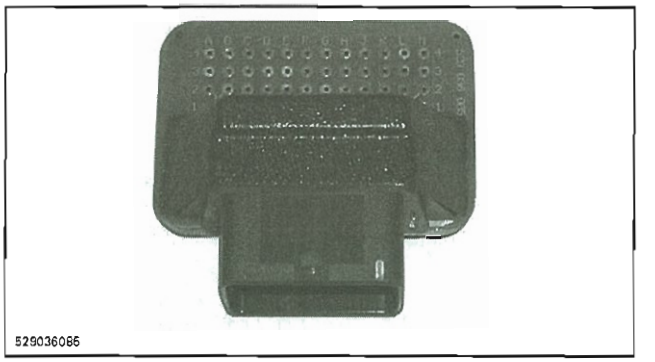
Rotate connector lock until it snaps locked.



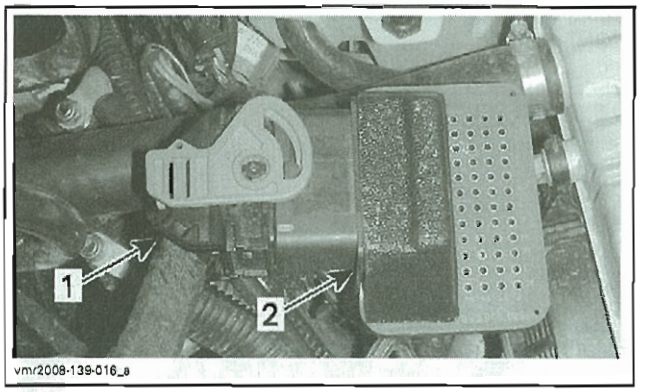
TYPICAL
1. Locked here

ECM Connector Probing

The most recommended and safest method to probe ECM connector terminals is to use the ECM adapter (P/N 529 036 085). This tool will prevent deforming or enlarging terminals which would lead to bad ECM terminal contact creating intermittent or permanent problems.



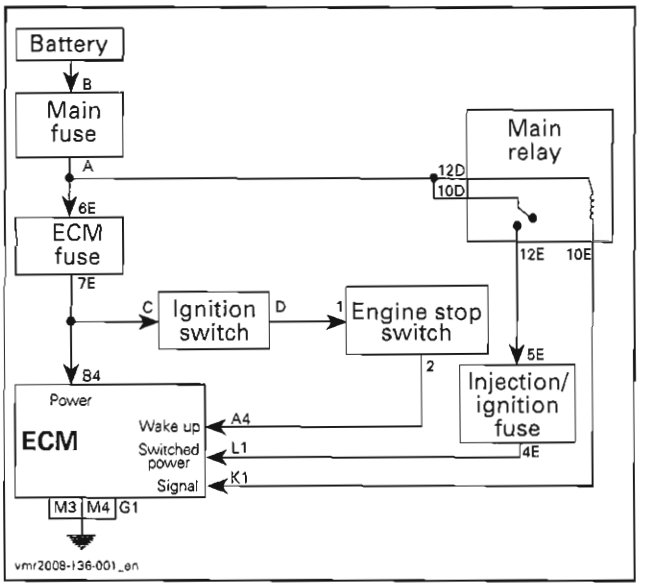
Disconnect the ECM connector and reconnect on the tool connector. Probe required terminals directly in the tool holes.



1. ECM connector
2. ECM adapter

CAUTION: Never probe directly on ECM harness connector. This could change the shape or enlarge the terminals and create intermittent or permanent contact problems.

Power Supply to ECM



When engine stop switch is set to STOP or ignition key is turned OFF, ECM will turn off after approximately 30 seconds. All the electrical system will then be cut-off.

ECM Quick Troubleshooting Tips

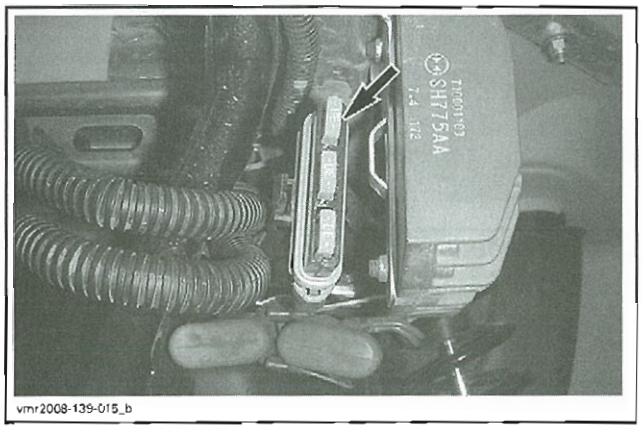
Turn ignition key to ON AND set engine stop switch to RUN.

QUICK INDICATION THAT ECM IS NOT WORKING (assuming the observed component is working)
Multifunction gauge does not turn on.
Rear light does not turn on.
Headlights do not turn on (with ignition key at light position).
Fuel pump does not turn on for approx. 5 seconds (when turning key on and setting engine stop switch RUN).

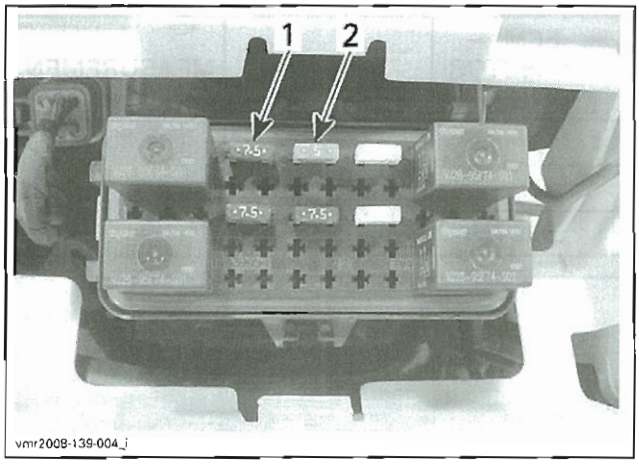
If ECM does not Turn on, Check the Following:

Ensure battery power is good.

Check main fuse, ECM fuse and injector/ignition fuse.



MAIN FUSE



ECM FUSE IN FRONT SERVICE COMPARTMENT
1. *Injector/ignition fuse*
2. *ECM fuse*

If fuses test good, carry out all the ECM tests.

If Engine Stop Running for no Reason, Check the Following:

It may be caused by the ECM that is improperly reset (it restarts).

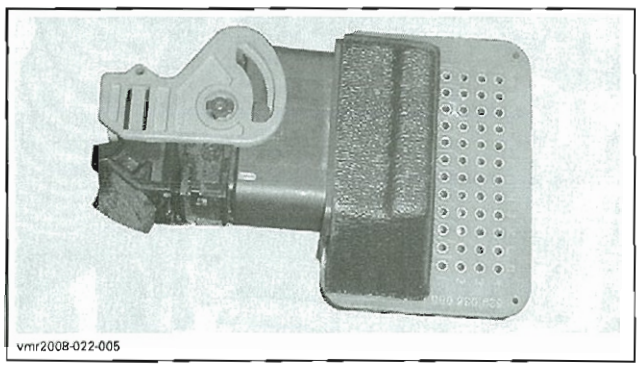
If it occurs when using the winch, check diodes D5 and D6. Refer to *LIGHTS, GAUGE AND ACCESSORIES*.

NOTE: A short circuited diode (D5 or D6) will cause the accessory fuse (F6) to burn.

ECM Grounds Test

Disconnect ECM connector.

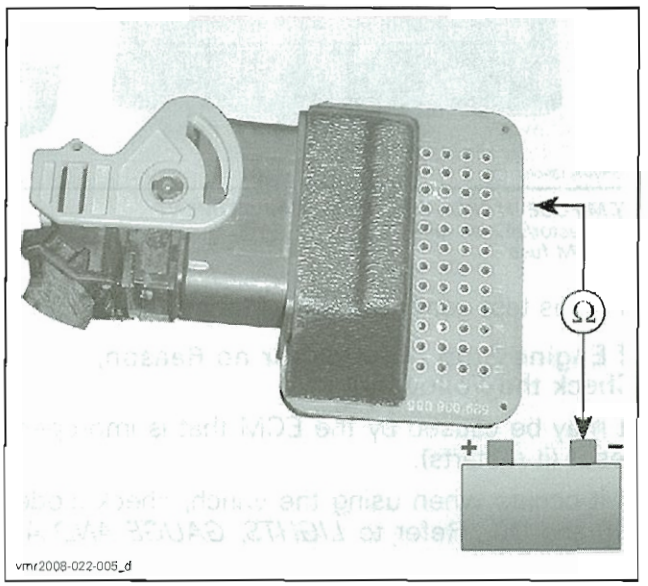
Install ECM adapter (P/N 529 036 085) on ECM connector.



Use the Fluke 115 multimeter (P/N 529 035 868) and select Ω.

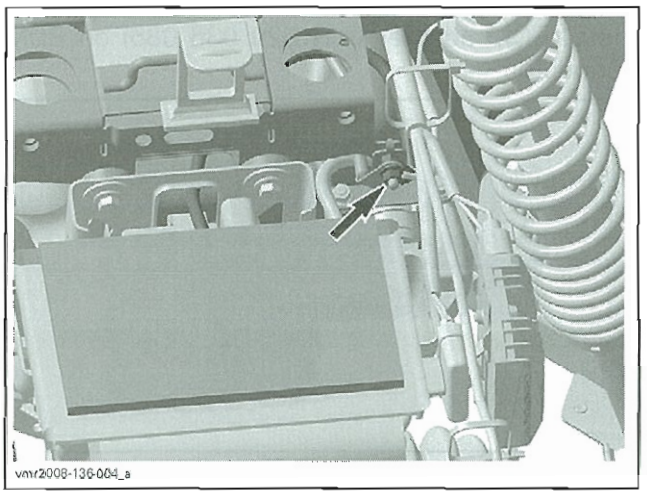
Check continuity of ground connections as follows.

ECM CONNECTOR PIN	BATTERY	MEASUREMENT
G1	Battery ground post	Close to 0 Ω (continuity)
M3		
M4		

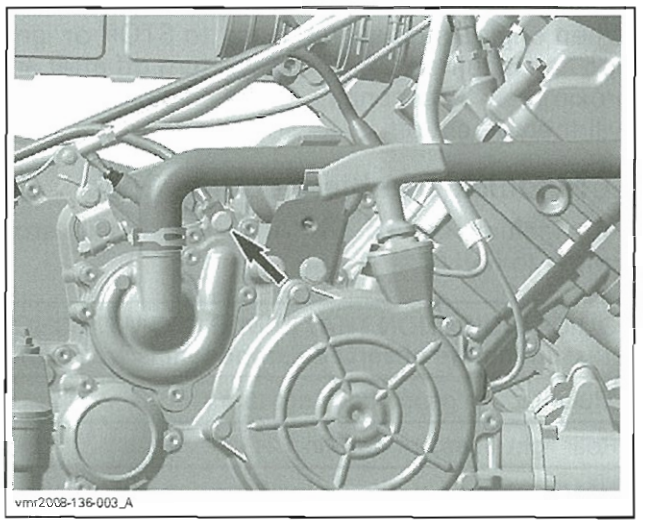


If test succeeded, ECM grounds are adequate.

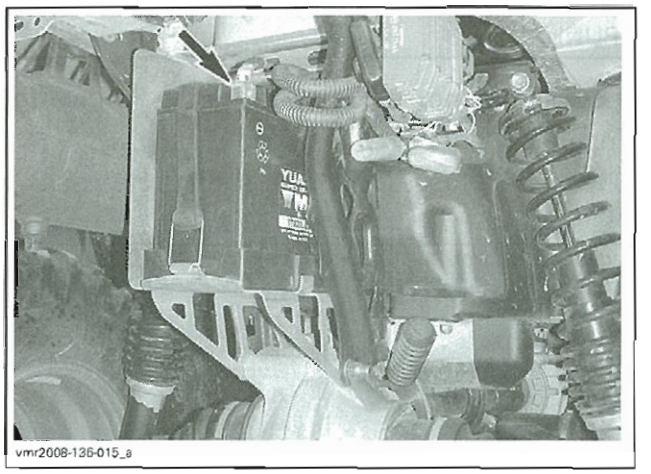
If test failed, ensure wiring/connectors are good and repair/replace as necessary. If wiring/connectors are good, check the following grounds.



FRAME GROUND



ENGINE GROUND

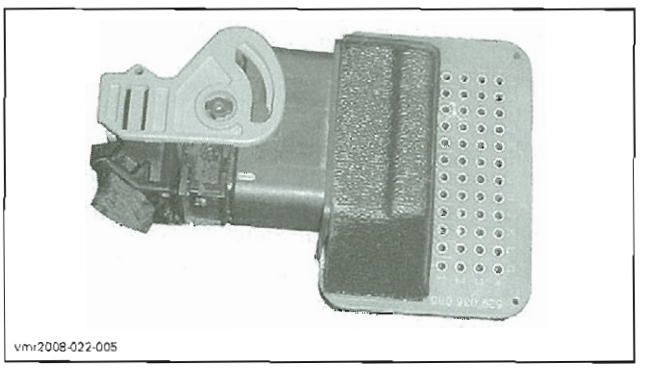


BATTERY GROUND

ECM Power Circuit Test

Disconnect ECM connector.

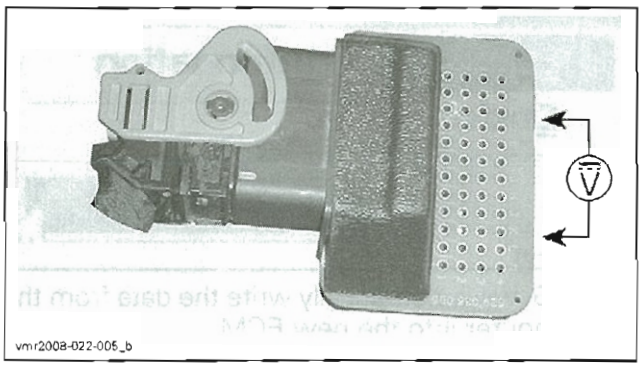
Install ECM adapter (P/N 529 036 085) on ECM connector.



Use the Fluke 115 multimeter (P/N 529 035 868) and select Vdc.

Check voltage as follows.

ECM CONNECTOR PIN		MEASUREMENT
B4	G1	Battery voltage



If voltage is out of specification, check wiring/connectors from battery to ECM.

If voltage is as per specification, carry out the *ECM WAKE UP CIRCUIT TEST.*

ECM Wake Up Circuit Test

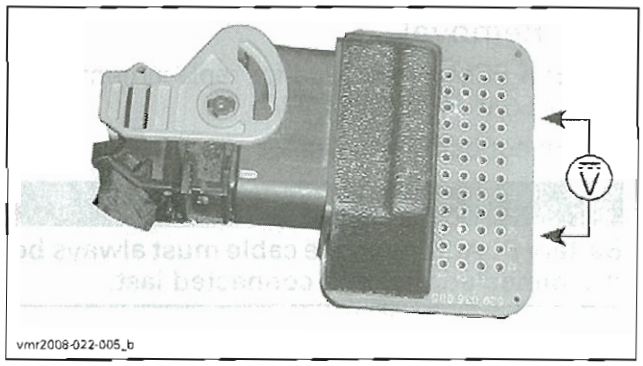
Turn ignition key to ON.

Set engine stop switch to RUN.

Use the Fluke 115 multimeter (P/N 529 035 868) and select Vdc.

Check voltage as follows.

ECM CONNECTOR PIN		MEASUREMENT
A4	G1	Battery voltage



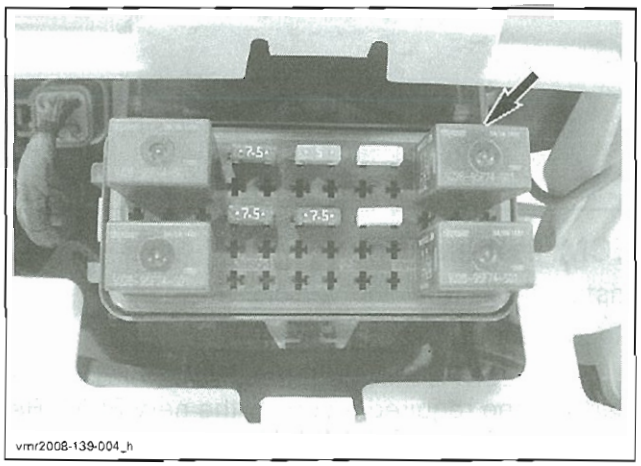
If voltage is out of specification, check wiring/connectors from ECM fuse to ECM through ignition and engine stop switches. Refer to *IGNITION SYSTEM.*

If voltage is as per specification, carry out the *MAIN RELAY CIRCUIT TEST.*

Main Relay Circuit Test

Remove service cover. Refer to *BODY.*

Pull out the main relay from its socket.



Remove the accessory relay and temporarily install to the main relay location.

If ECM is now working, replace the faulty main relay with a new one.

If ECM still does not work:

- Check control circuit wiring/connectors from main fuse through the relay socket to ECM.
- Check power circuit wiring/connectors from main fuse through the relay socket and through the injector/ignition fuse to ECM.

If any circuit is faulty, repair/replace wiring/connectors.

If everything tested good but ECM does not work, try a new ECM.

ECM Removal

NOTE: If ECM is removed for replacement, refer first to *ECM REPLACEMENT.*

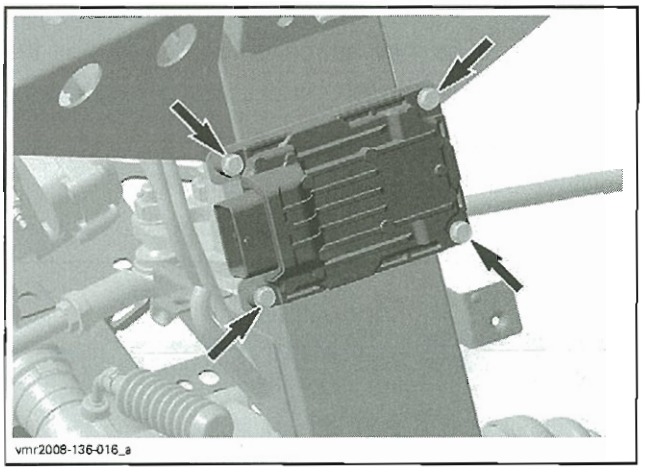
Disconnect battery cables.

⚠ WARNING

Battery BLACK negative cable must always be disconnected first and connected last.

Disconnect ECM connector. Refer to *ECM CONNECTOR REMOVAL.*

Unscrew retaining screws and remove the ECM from vehicle.



ECM Installation

Install the ECM to the vehicle.

Reconnect ECM connector.

If a new ECM is installed, transfer/enter data and perform the required resets to the new ECM. Refer to *ECM REPLACEMENT* below.

ECM Replacement

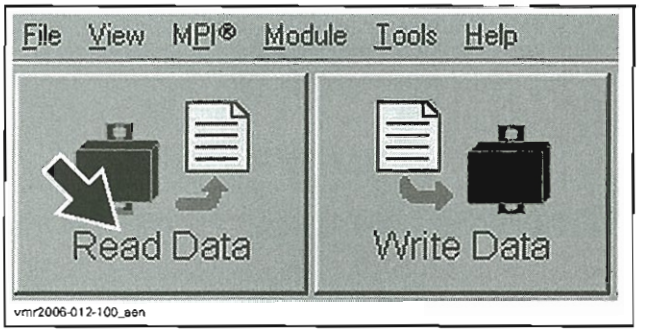
To transfer/enter data to the new ECM, there are 2 possible methods.

- If the faulty ECM **can** be read with B.U.D.S., refer to *ECM AUTOMATED DATA TRANSFER.*
- If the faulty ECM **cannot** be read with B.U.D.S., refer to *ECM MANUAL DATA ENTRY.*

ECM Automated Data Transfer

To transfer the previous ECM recorded information to the new ECM, use the B.U.D.S. software and proceed as follows.

In B.U.D.S., click the **Read Data** button to load the information from the faulty ECM.

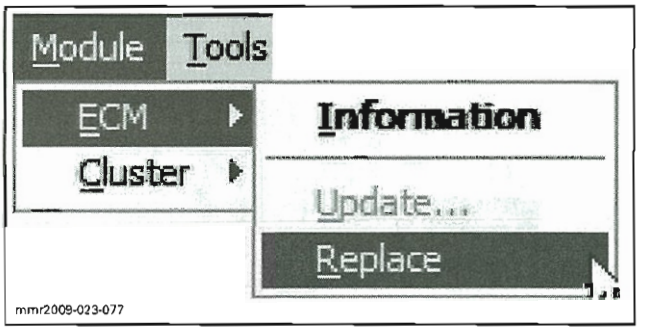


Keep B.U.D.S. running while replacing ECMs. The data will remain stored in the PC computer as long as B.U.DS. is running.

Remove the faulty ECM.

Install and connect the new ECM.

From B.U.D.S., choose **ECM**, **Replace** under **Module**.

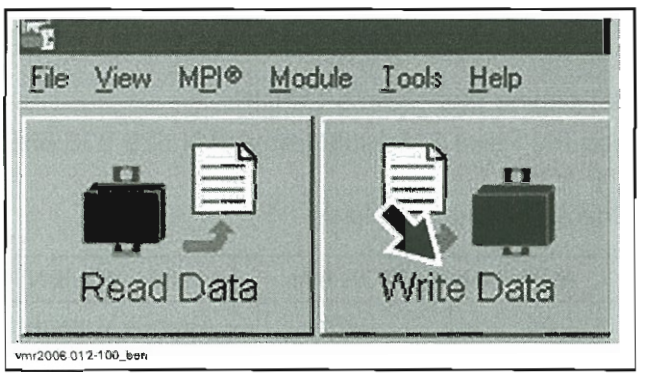


B.U.D.S. will automatically write the data from the PC computer into the new ECM.

Go to the **Setting** tab.

Reset the **Closed Throttle and Idle Actuator**. Refer to *CLOSED THROTTLE RESET.*

In B.U.D.S., click the **Write Data** button to save the information to ECM.



Reinstall remaining removed parts.

ECM Manual Data Entry

First, data needs to be collected.

There are 2 possible methods to collect the required information.

- Use B.U.D.S. software and get the data from a saved **.mpem** file on your PC computer.
- Collect the information from the vehicle.

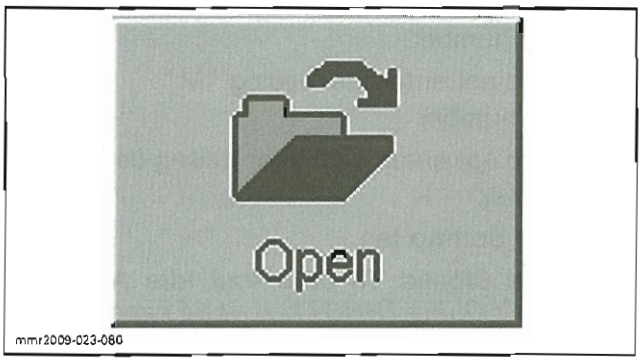
1st Collecting Method: Get the Data from a Saved .mpem File

Remove the faulty ECM.

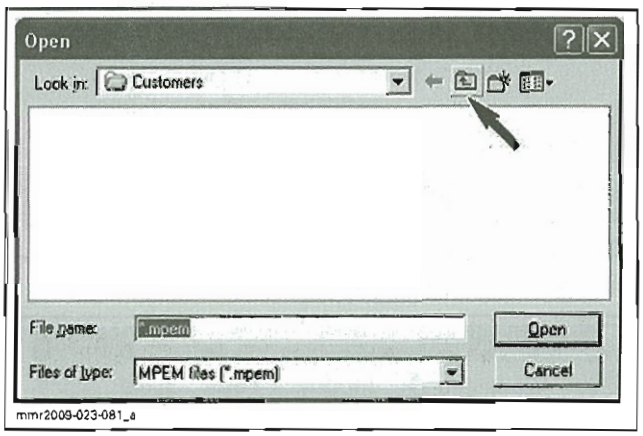
Install and connect the new ECM.

Use B.U.D.S. software.

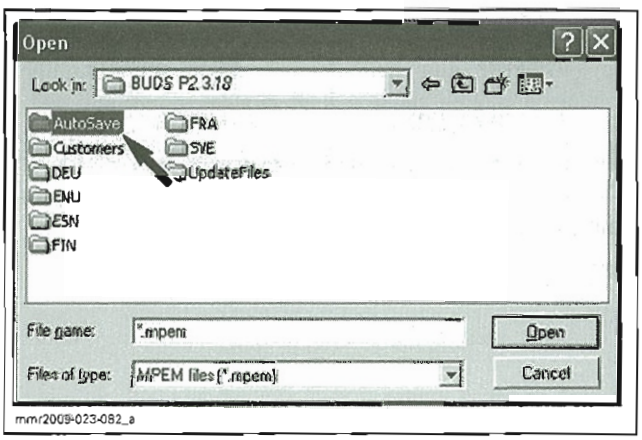
Click on the **Open** button.



Click once on the **Folder Up** button in the open box.

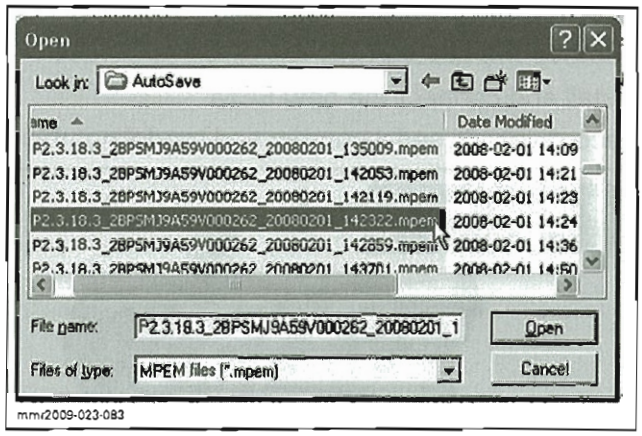


Double click on the **AutoSave** folder.



NOTE: You may have to go to another **AutoSave** folder from a previous version of B.U.D.S.

Choose the latest file saved for this specific vehicle.



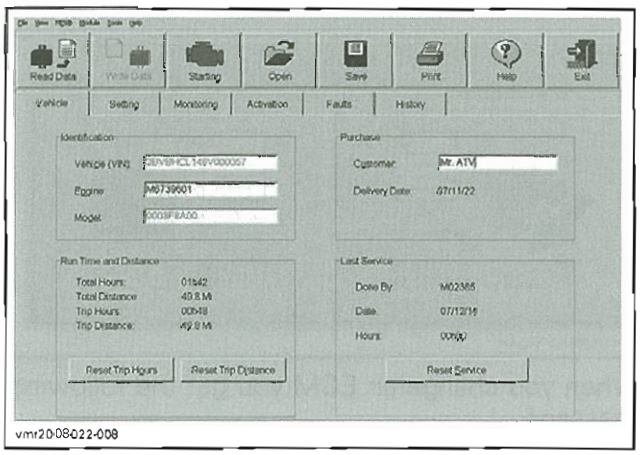
TYPICAL

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: P2.3.18.3_2BPSMJ9A59V000262_20080201_142322.mpem B.U.D.S. version = P2.3.18.3 VIN = 2BPSMJ9A59V000262 Date file was read = 2008-02-01 Hour file was read = 14h 23m 22s

Go to the **Vehicle** tab and record the following information.

- Vehicle (V.I.N.) number
- Engine number (without the leading "M")
- Model number
- Customer.



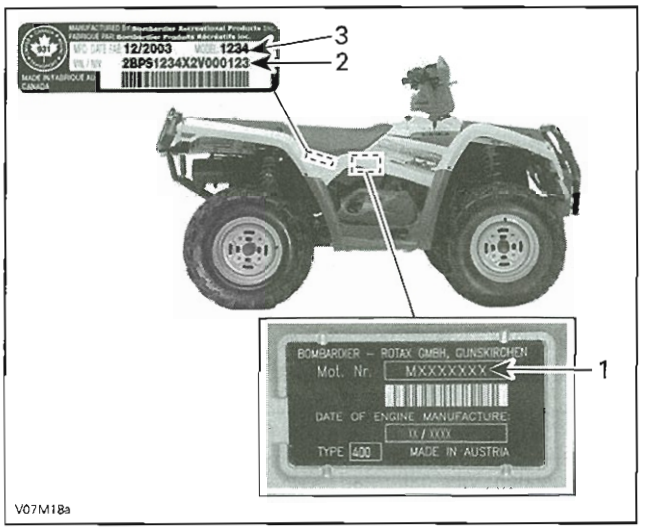
Enter data into ECM as detailed in *ENTERING THE COLLECTED INFORMATION INTO THE ECM* below.

2nd Collecting Method: Collect the Information from the Vehicle

Remove the faulty ECM.

Install and connect the new ECM.

Record vehicle serial number and model number.



TYPICAL
1. *E.I.N. (Engine Identification Number)*
2. *V.I.N. (Vehicle Identification Number)*
3. *Model*

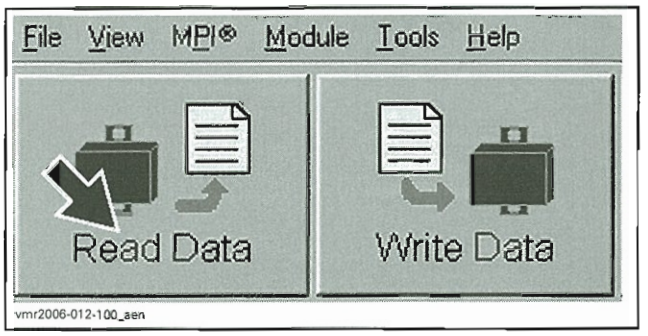
Record engine serial number.

Enter data into ECM as detailed in *ENTERING THE COLLECTED INFORMATION INTO THE ECM* below.

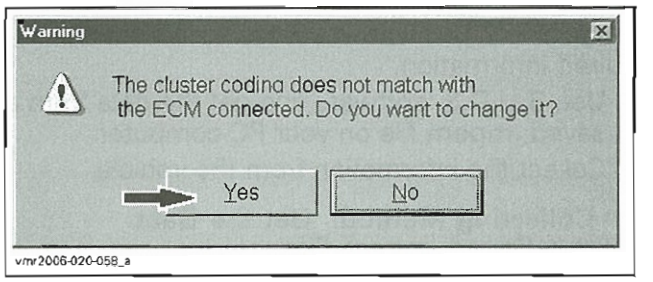
Entering the Collected Information into the ECM

Use B.U.D.S. to enter the recorded data into the new ECM.

In B.U.D.S., click the **Read Data** button to read the new "empty" ECM.



When you change an ECM you get the following message.



Click **Yes** to update the system to acquire the new ECM and to allow engine starting.

Go to the **Vehicle** tab and enter the information you recorded previously.

- Vehicle (V.I.N.) number
- Engine number

NOTE: Do not enter the leading "M".

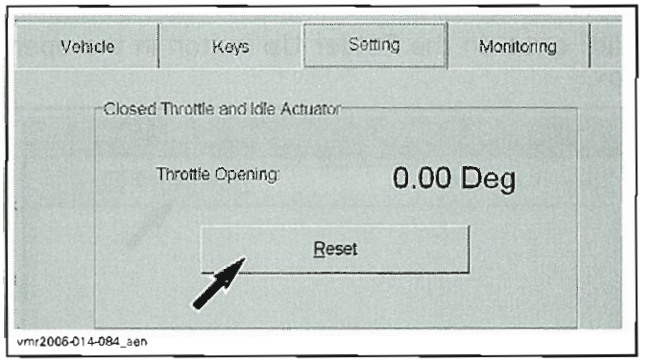
- Model number

NOTE: Do not enter leading or trailing 0s (zeros).

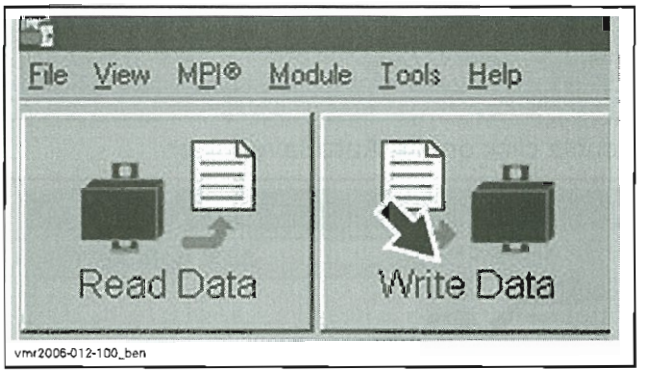
- Customer.

Go to the **Setting** tab.

Reset the **Closed Throttle and Idle Actuator**. Refer to *CLOSED THROTTLE RESET* above.



Click on the **Write Data** button.



Reinstall remaining removed parts.

Test run engine.

FUEL TANK/FUEL PUMP

SERVICE TOOLS

Description	Part Number	Page
Oetiker pliers	295 000 070	237
small hose pincher	295 000 076	234
vacuum/pressure pump	529 021 800	234
pressure gauge	529 035 709	236
Fluke 115 multimeter	529 035 868	244, 249
T-fitting	529 036 023	236
ECM adapter tool	529 036 085	246, 250

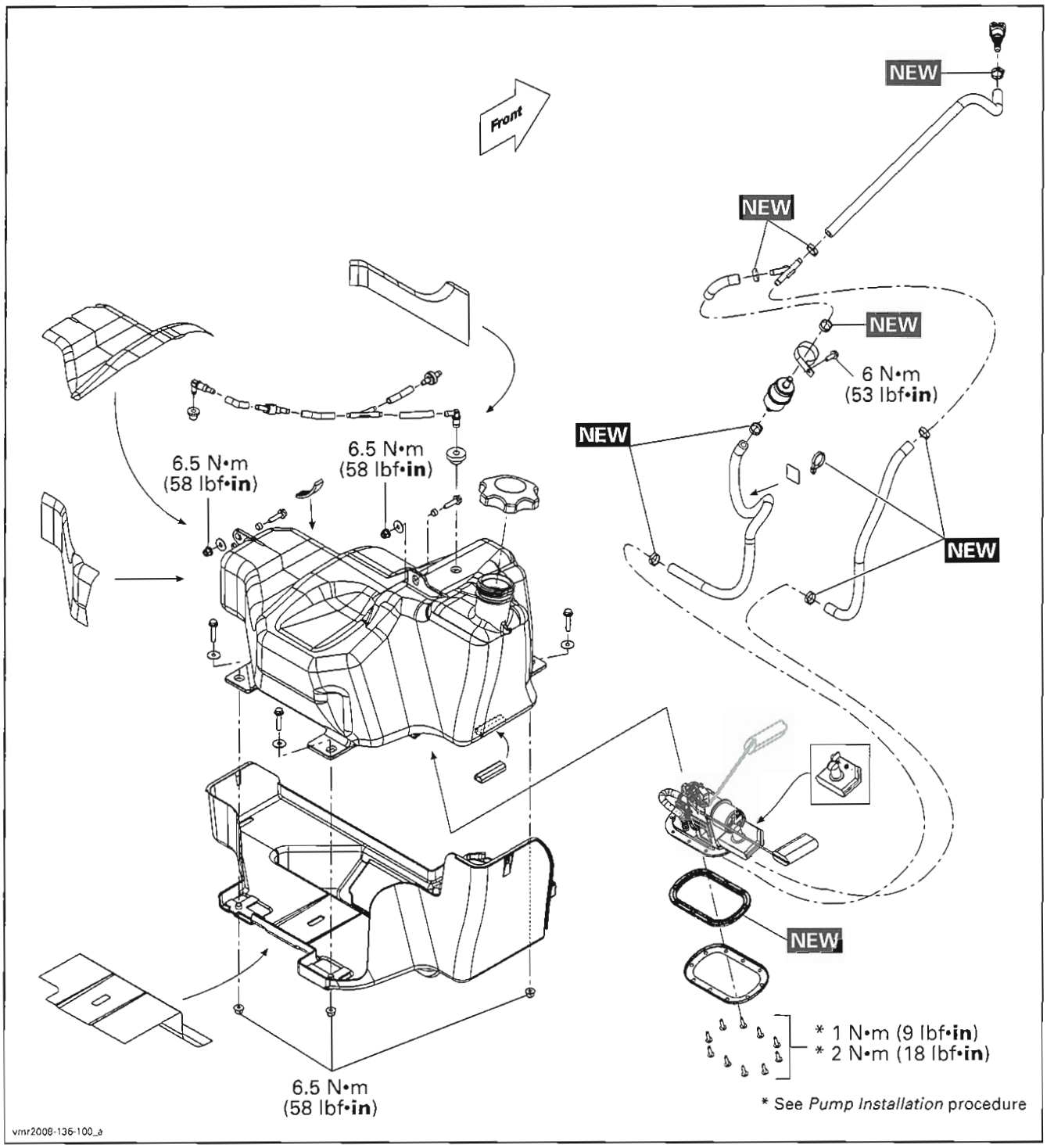
SERVICE TOOLS – OTHER SUPPLIER

Description	Part Number	Page
Fluke rigid back probe	TP88	249

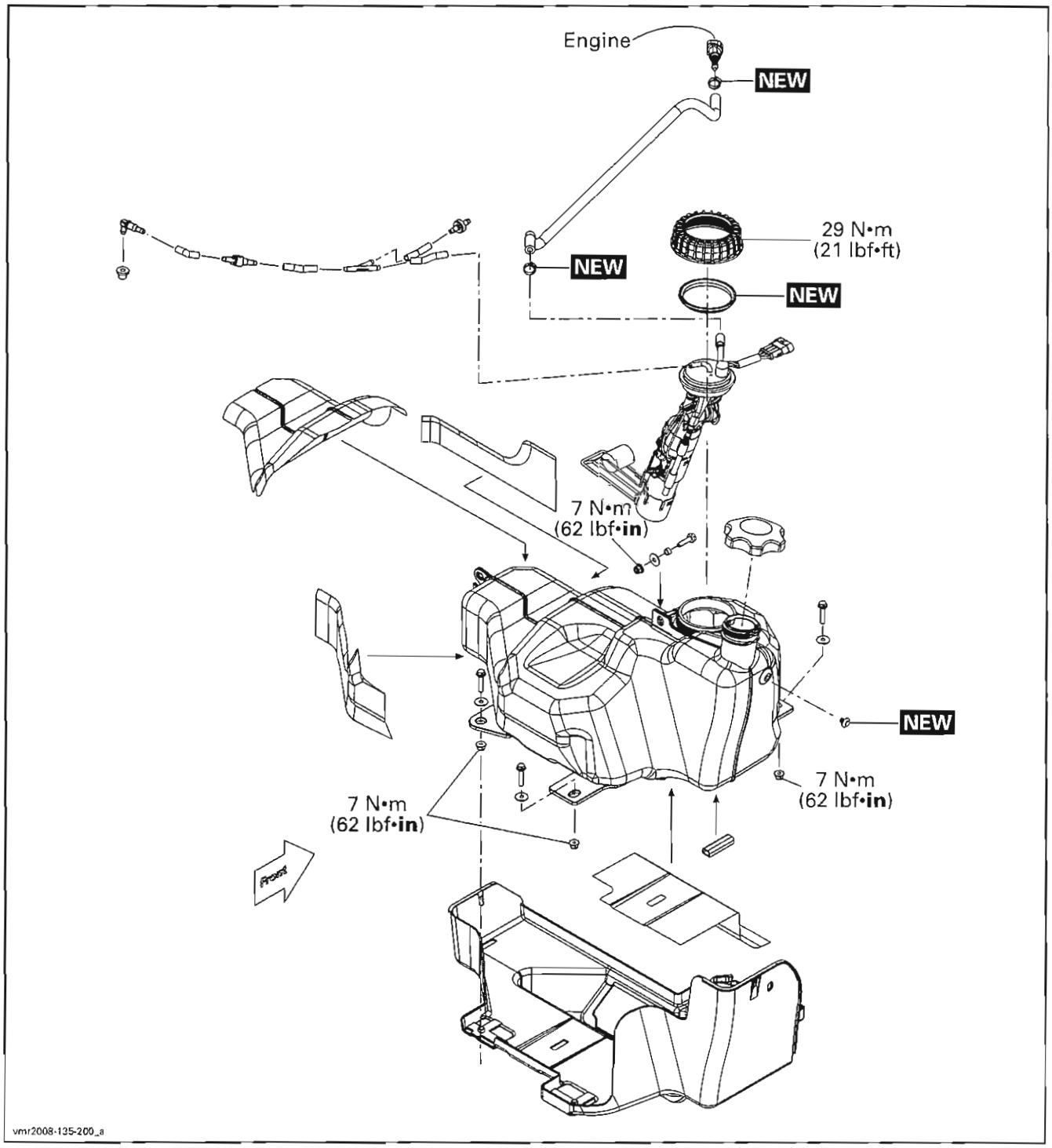
SERVICE PRODUCTS

Description	Part Number	Page
fuel pump nut tool	529 035 899	252

2008 MODELS



2009 MODELS



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 to working on the fuel system. Always disconnect battery exactly in the specified order, BLACK (-) cable first.

Whenever working on fuel system, always verify for water or dust infiltration in reservoir.

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

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

⚠ WARNING

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

⚠ WARNING

Fuel lines remain under pressure at all times. Always proceed with caution and use appropriate safety equipment when working on pressurized fuel system. Always wear safety glasses.

Proceed with care when removing/installing pressure test equipment or disconnecting fuel line connections.

Slowly disconnect the fuel hose to minimize spilling. Cover the fuel line connection with an absorbent shop rag. Wipe off any fuel spillage.

⚠ WARNING

Do not allow fuel to spill on hot engine parts or electrical connectors. The evaporating fuel on the hot components or on the electrical connectors produce highly inflammable fuel vapors that can easily be ignited by the heat, a spark, electrostatic discharge or stray current resulting in a fire or an explosion.

Never use a hose pincher on injection system high pressure hoses.

Replace any damaged or deteriorated fuel lines.

When the repair is complete, ensure that all hoses are connected and secured. The fuel pump is activated each time electrical power is turned on. A pressure test must be carried out before turning the ignition key to ON and setting the engine run/stop switch to RUN.

⚠ WARNING

Always carry out a fuel pump pressure test and/or a fuel tank leak test whenever a related fuel system component has been removed during a maintenance procedure. A missed fuel leak could result in severe injury or death.

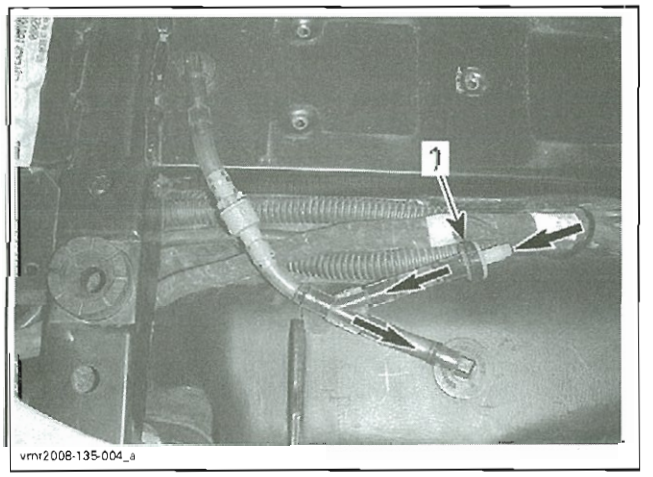
After performing a fuel pump pressure test, use the valve on the fuel pressure gauge to release the pressure (if so equipped).

Fuel Tank Vent System Operation

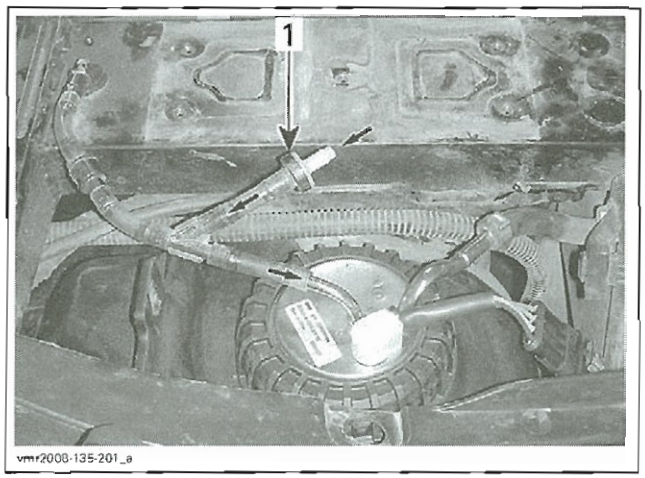
The fuel tank is equipped with a vent system that provides over pressure relief and negative pressure relief of the fuel tank.

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.

The vent inlet check valve also prevents fuel from flowing out through the inlet of the vent system.

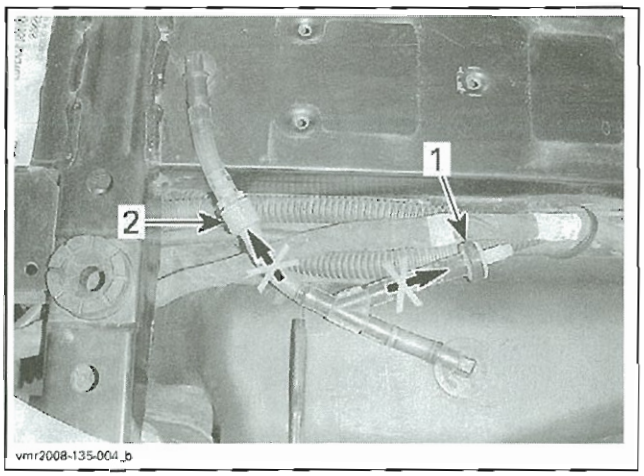


2008 MODELS
1. Vent inlet check valve

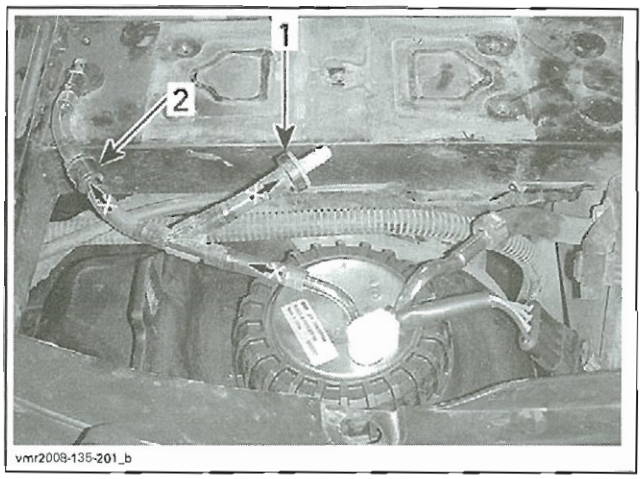


2009 MODELS
1. *Vent inlet check valve*

If the pressure in the fuel tank builds up and exceeds 2.5 - 7.6 kPa (.36 - 1.1 PSI), then the pressure relief valve opens and lets the excess pressure evacuate through the vent system OUTLET.



2008 MODELS
1. *Inlet check valve blocks fuel*
2. *Outlet pressure relief valve allows pressure to go out*



2009 MODELS
1. *Inlet check valve blocks fuel*
2. *Outlet pressure relief valve allows pressure to go out*

INSPECTION

FUEL TANK LEAK TEST

⚠ WARNING

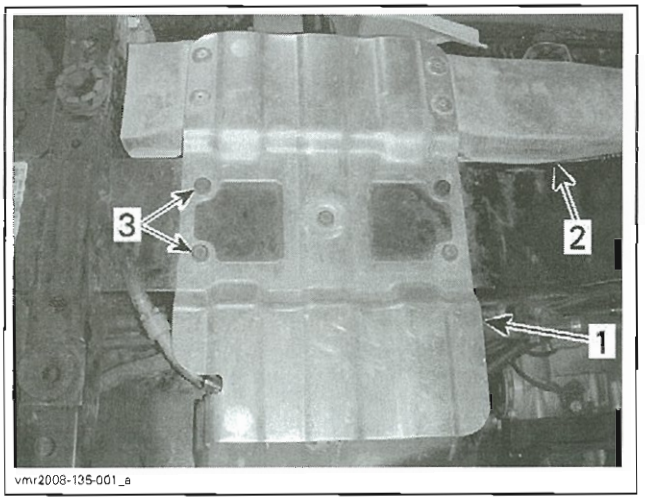
Always carry out a fuel tank leak test whenever fuel tank shows signs of wear or damage which may cause a leak, or when the fuel pump has been removed or replaced, or if you suspect a leak. If damage is severe, fuel tank should be replaced even if no leak is present. Do not attempt to repair a plastic fuel tank.

Refill fuel tank.

Remove seat.

All Models except MAX Models

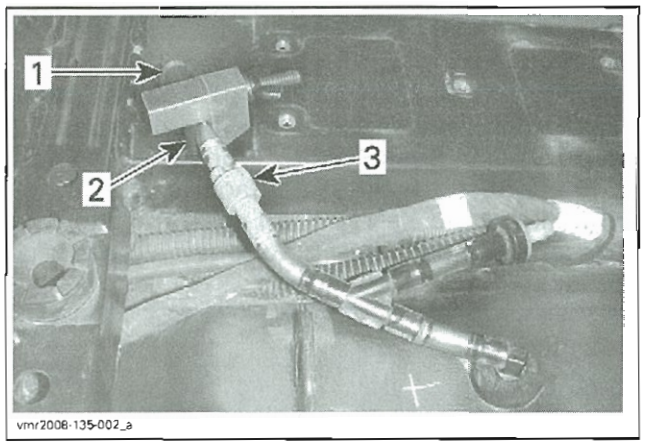
Remove the seat reinforcement plate.



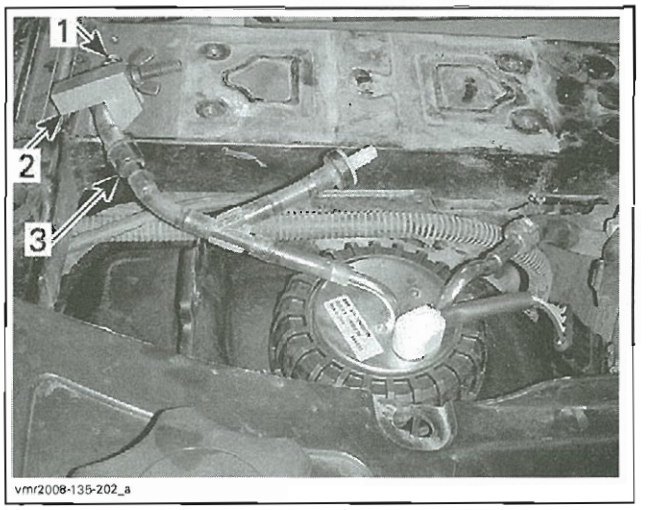
TYPICAL
1. *Seat reinforcement plate*
2. *Exhaust heat shield*
3. *Retaining screws (5)*

All Models

Install a small hose pincher (P/N 295 000 076) on vent line (OUTLET side).

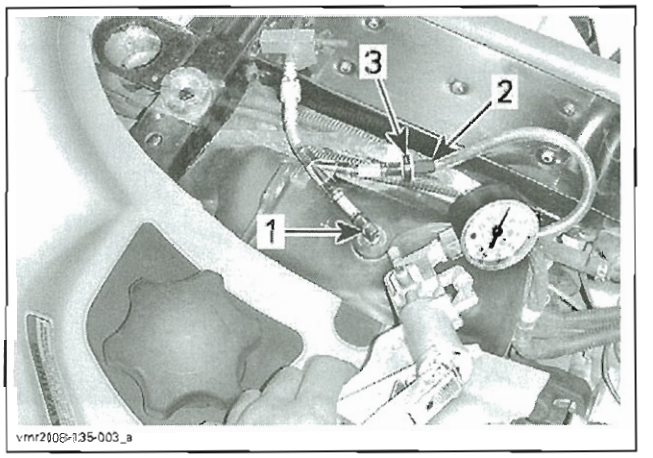


2008 MODELS
1. *Vent system outlet*
2. *Small hose pincher*
3. *Vent pressure relief valve*

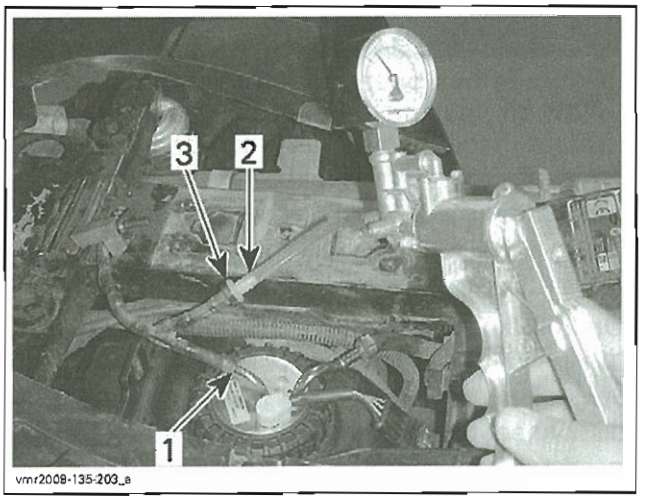


2009 MODELS
1. *Vent system outlet*
2. *Small hose pincher*
3. *Vent pressure relief valve*

Using the vacuum/pressure pump (P/N 529 021 800), pressurize fuel tank through vent line (INLET side).



2008 MODELS
1. *Fuel tank vent*
2. *Vent inlet line*
3. *Vent check valve*



2009 MODELS
1. *Fuel tank vent*
2. *Vent inlet line*
3. *Vent check valve*

Pressurize fuel tank as follows.

PRESSURE	TIME WITHOUT PRESSURE DROP
21 kPa (3 PSI)	3 minutes

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

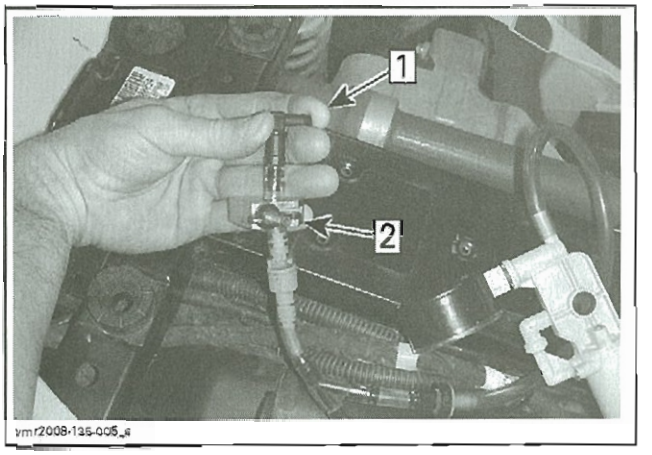
To locate a leak, check for a fuel smell or leaking fuel.

To ease locating leak(s), spray soapy water on all hose connections and components; bubbles will indicate the leak location(s).

Fuel Tank Check Valve and Pressure Relief Valve Test

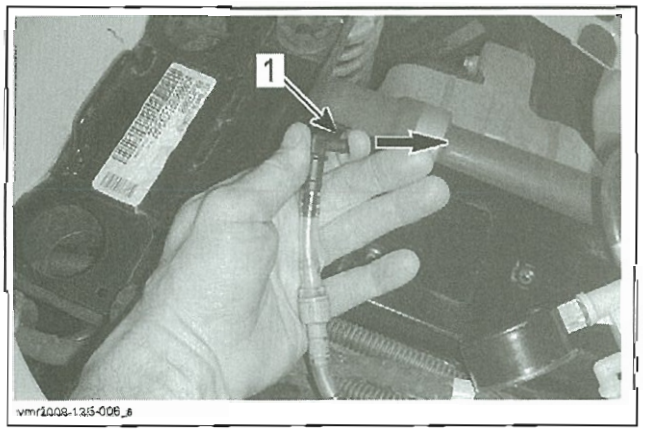
While tank is still pressurized from the previous fuel tank leak test, carry out the following procedure:

Block the vent outlet as you remove the hose pincher.



Step 1: Block vent outlet with finger
Step 2: Remove hose pincher

Alternately touch and release end of pressure relief valve. You should feel pressurized air flowing out indicating relief valve is working.



PRESSURE RELIEF TEST
1. *Release vent outlet and feel for air flowing out*

Using the pressure/vacuum pump, increase fuel tank pressure until the pressure relief valve opens.

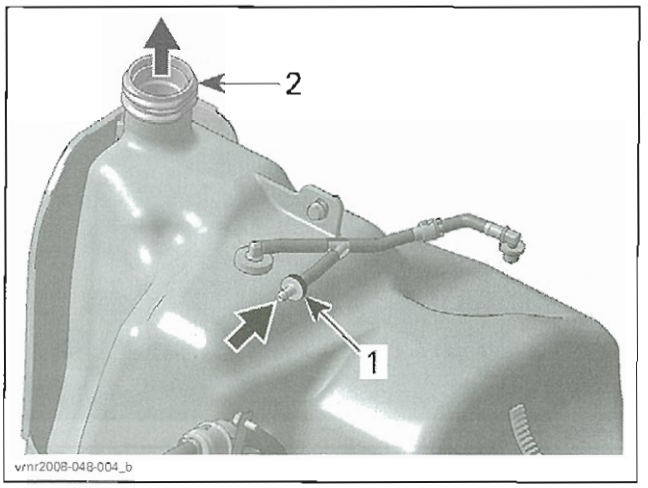
NOTE: Pressure relief valve should open when the fuel tank pressure exceeds 2.5 - 7.6 kPa (.36 - 1.1 PSI) preventing fuel tank overpressure. This validates pressure relief valve operation.

Remove fuel tank cap.

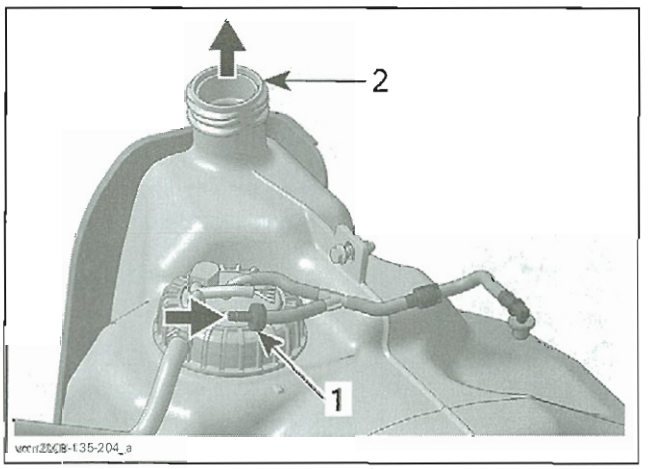
NOTE: You should hear remaining air pressure within fuel tank escape as fuel cap seal is loosened.

Blow air in through vent inlet check valve.

NOTE: Air must flow freely through inlet check valve and out fuel tank filler neck.



2008 MODELS
1. *Blow air through vent inlet check valve*
2. *Airflow out of filler neck*



2009 MODELS
1. *Blow air through vent inlet check valve*
2. *Airflow out of filler neck*

Reinstall removed parts.

FUEL PUMP PRESSURE TEST

The pressure test will show the available pressure at the fuel pump outlet. It validates the pressure regulator, the fuel pump and tests for leaks in the system.

NOTE: See also the diagnostic flow chart in the *TROUBLESHOOTING* section to help diagnose a fuel system related problem.

Ensure there are no leaks from hoses and fittings. Repair any leak.

Before proceeding with the pressure test ensure the battery is fully charged. Battery voltage must be over 12 volts.

⚠ WARNING

If engine has been recently running, always allow engine and exhaust system time to cool before disconnecting any fuel component.

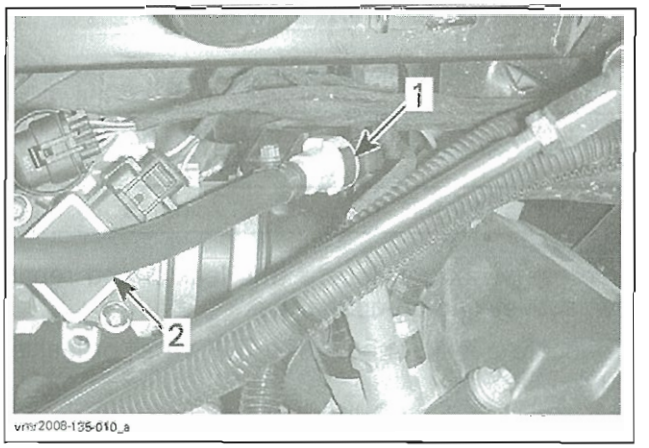
Ensure there is enough gas in fuel tank.

Remove the seat and the RH side body panel, refer to the *BODY* section.

On 2009 models, remove air filter housing. Refer to *AIR INTAKE SYSTEM*.

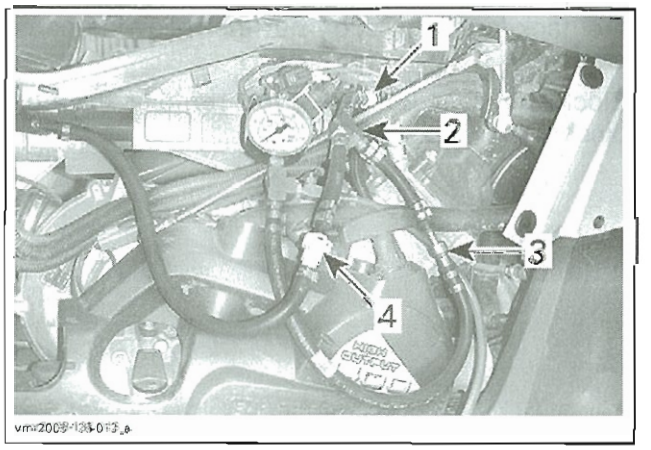
Wrap shop rags around the fuel hose at the quick disconnect fitting on the RH side of the engine.

Carefully disconnect the fuel pump outlet hose at the fuel rail quick disconnect fitting by pressing on the release tab.



1. *Fuel hose quick disconnect at fuel rail*
2. *Fuel hose from fuel filter*

Install fuel pressure gauge (P/N 529 035 709) and T-fitting (P/N 529 036 023) between disconnected hoses (in-line installation).



TYPICAL
1. *Fuel rail fitting*
2. *T-fitting — In-line installation*
3. *Fuel pressure gauge connection*
4. *Vehicle fuel hose connection*

Turn ignition key to ON.

Set engine run/stop switch to RUN and observe fuel pressure.

FUEL PRESSURE	350 kPa (51 PSI)

Turn ignition key OFF then back ON. Repeat the test.

A rapid pressure drop indicates leakage either from the fuel rail or from the fuel pump check valve.

Check fuel rail for leaks. If it is not leaking, replace fuel pump.

A slow pressure drop indicates leakage either from the fuel injector or from the fuel pressure regulator.

Check fuel injector for leaks. If it is not leaking, replace fuel pump.

If there is no leakage, start engine and observe fuel pressure. The fuel pressure should be the same as above.

If pressure is within limits, fuel pump and pressure regulator are functioning normally.

Remove pressure gauge and T-fitting.

Reconnect fuel pump oulet hose quick disconnect fitting to fuel rail.

⚠ WARNING

Wipe off any fuel spillage. Fuel is flammable and explosive under certain conditions. Always work in a well ventilated area.

Reinstall removed parts.

PROCEDURES

FUEL HOSE AND OETIKER CLAMPS

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

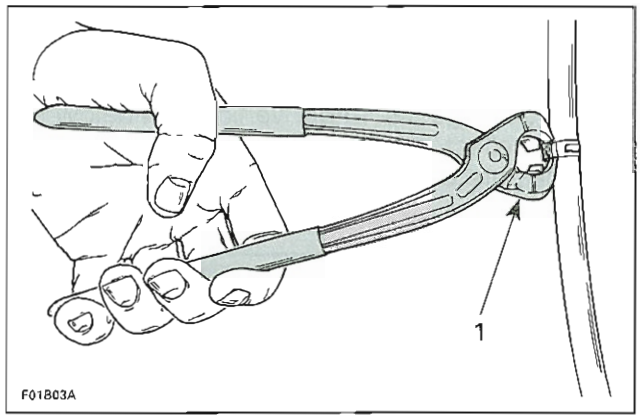
Use of fuel lines other than those recommended by BRP may compromise fuel system integrity.

⚠ WARNING

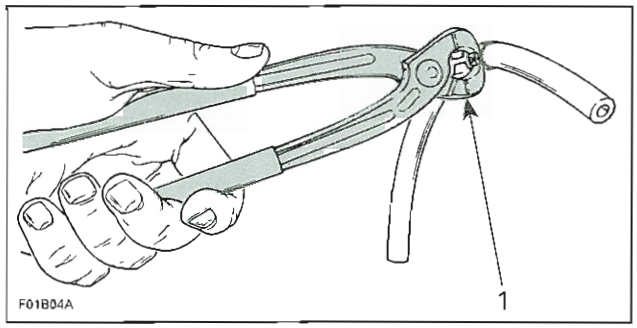
Whenever removing a hose in the fuel system, always use new Oetiker clamps at assembly. Then validate fuel system tightness by performing a fuel pump pressure test.

Oetiker Clamp Replacement

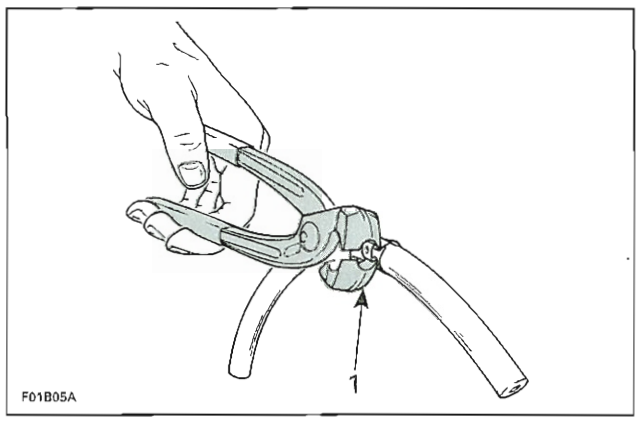
To secure or cut Oetiker clamps on fuel lines, use Oetiker pliers (P/N 295 000 070).



1. Cutting clamp



1. Securing clamp



1. Securing clamp in limited access

IN-LINE FUEL FILTER (2008 MODELS)

Replace fuel filter as per maintenance chart schedule. Refer to *MAINTENANCE*.

Filter Removal

Disconnect battery, refer to *CHARGING SYSTEM* section.

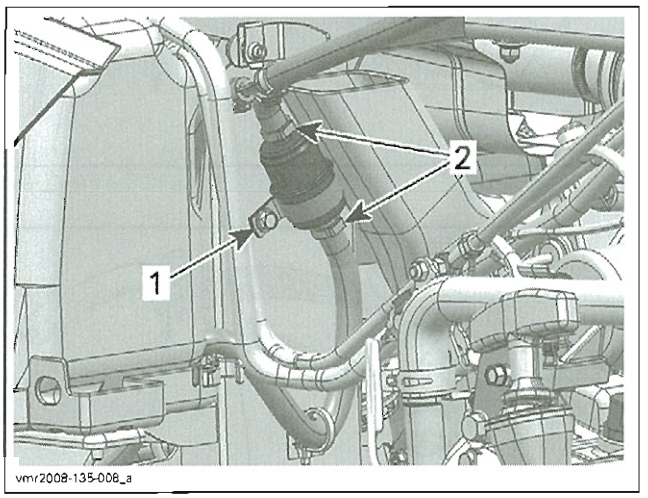
Remove seat, refer to the *BODY* section.

Remove RH side panel, refer to *BODY* section.

Remove air filter housing, refer to the *AIR INTAKE SYSTEM* section.

Slide a drainage pan under vehicle just below fuel filter to collect any fuel that may drain when the fuel lines are disconnected.

Remove fuel filter retaining screw.



1. Fuel filter retaining screw
2. Oetiker clamps (2)

Remove fuel filter Oetiker clamps (2).

Wrap a shop rag around the top fuel hose and pull hose off filter.

Repeat previous step for bottom fuel hose.

NOTE: Secure fuel hose in an upright position to limit amount of fuel draining from hose.

Filter Inspection

If fuel filter is suspected of being clogged, it may be tested as follows.

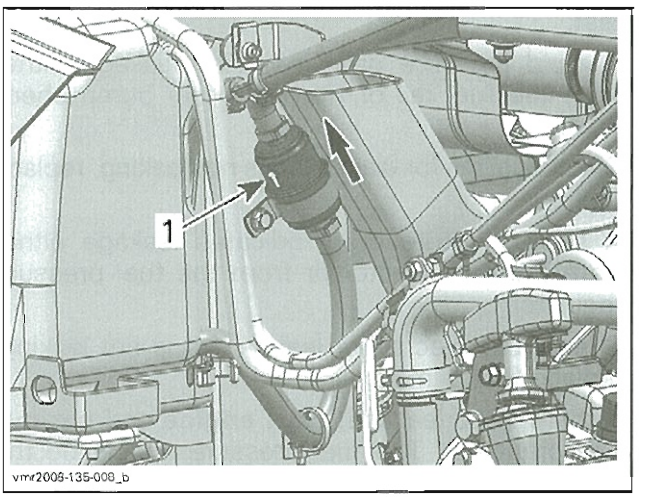
Using low pressure compressed air, blow air through fuel filter.

NOTE: Air should flow easily through filter. If in doubt, install a new filter.

Filter Installation

Insert new Oetiker clamps on fuel hoses prior to installing hoses on filter.

Use arrow on filter to position filter according to fuel flow.



FUEL FLOW DIRECTION
1. Flow direction arrow on fuel filter

Follow previous procedure for proper Oetiker clamp installation.

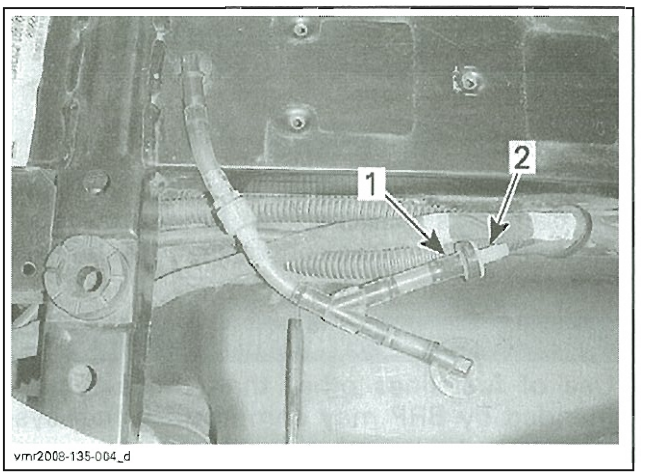
Ensure there are no kinks in fuel lines and assure proper routing.

Torque filter retaining screw to 6 N•m (53 lbf•**in**)

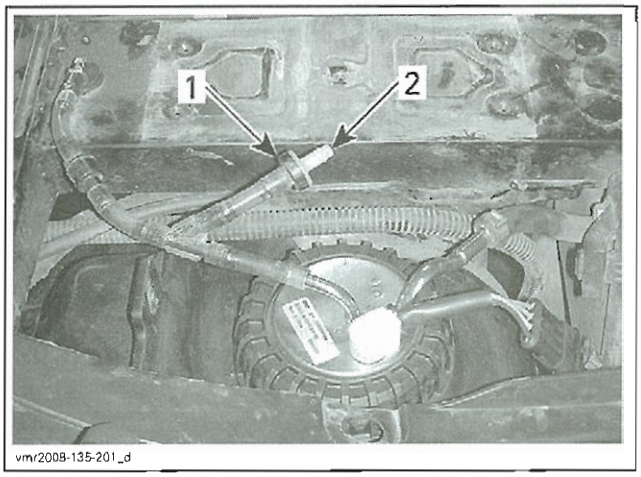
FUEL TANK

Fuel Tank Check Valve and Pressure Relief Valve Installation

Always install check valve with the black side connected to vent line.

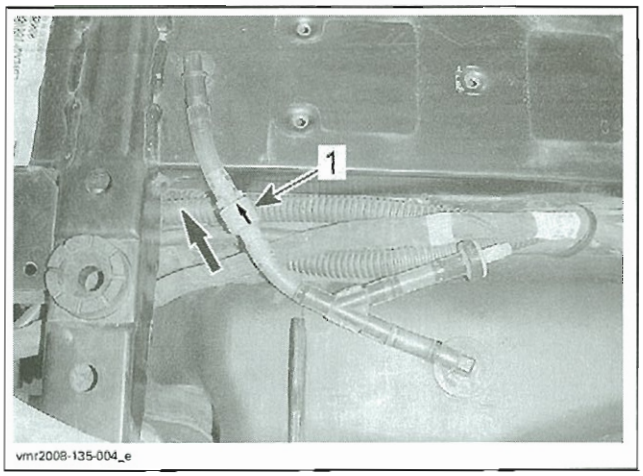


2008 MODELS
1. Black side connected to vent
2. White side open to atmosphere

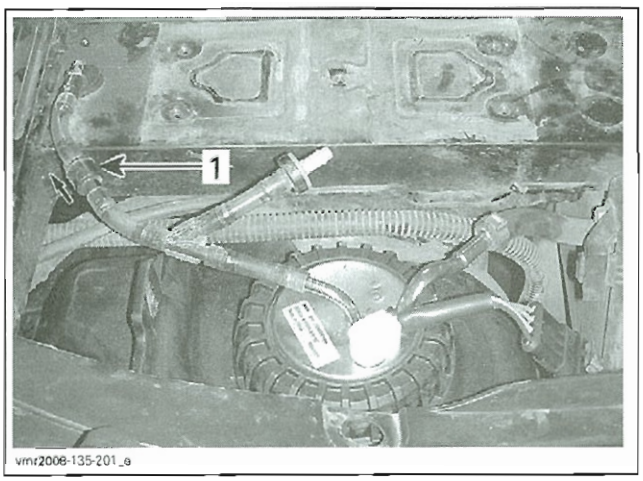


2009 MODELS
1. *Black side here*
2. *White side open to atmosphere*

Always reinstall pressure relief valve according to arrow on valve as shown.



2008 MODELS – FLOW DIRECTION
1. *Pressure relief valve*



2009 MODELS – FLOW DIRECTION
1. *Pressure relief valve*

Fuel Tank Draining

⚠ WARNING

Never perform this operation when the engine and/or the exhaust system is/are hot. Never use a hose pincher on injection system high pressure hoses.

Remove fuel tank cap and siphon gas into an approved fuel container.

Fuel Tank Removal

Drain fuel tank.

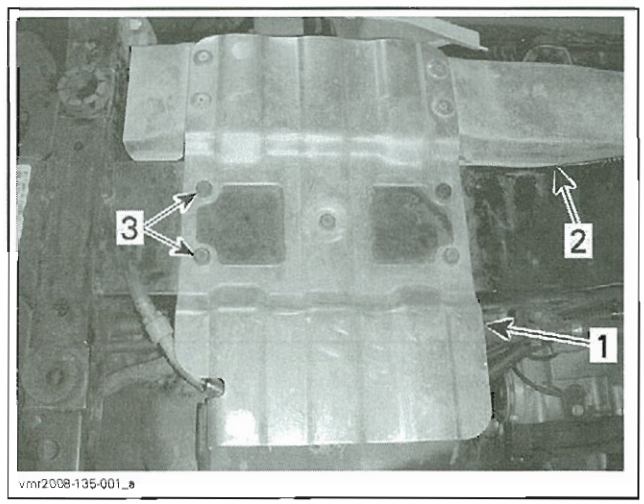
Release fuel pressure by running engine until it runs out of gas.

Disconnect battery, refer to *CHARGING SYSTEM* section.

Remove seat, refer to the *BODY* section.

All Models except MAX Models

Remove the seat reinforcement plate.

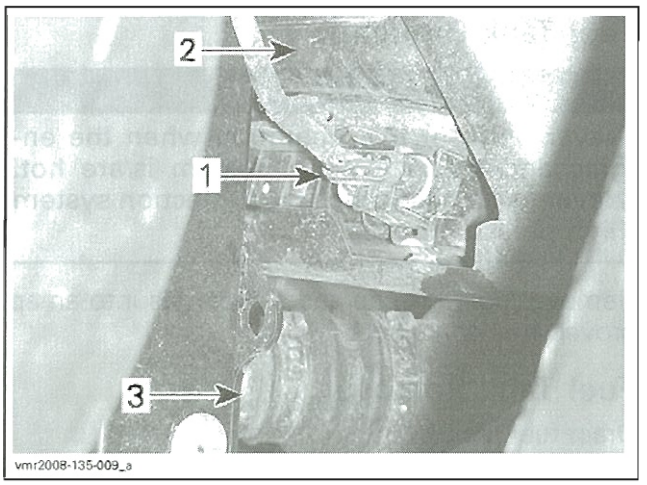


TYPICAL
1. *Seat reinforcement plate*
2. *Exhaust heat shield*
3. *Retaining screws (x5)*

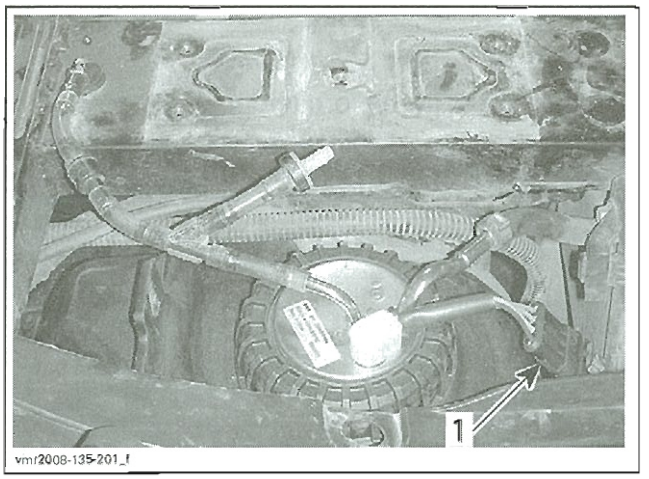
All Models

Remove side panels and rear fender assembly, refer to *BODY* section.

Disconnect the fuel pump connector.



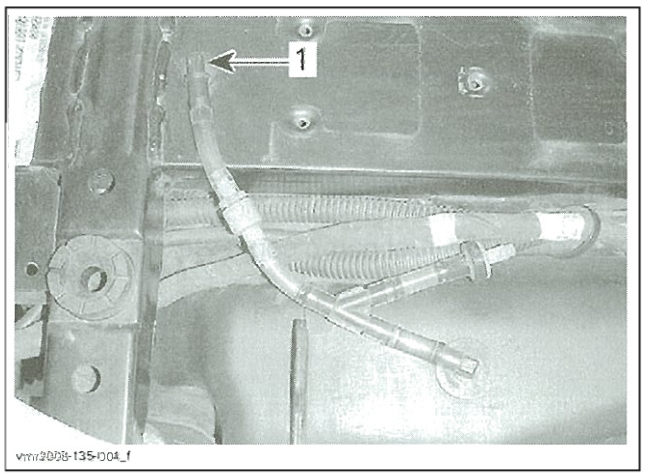
2008 MODELS
1. *Fuel pump connector*
2. *Fuel tank*
3. *Rear drive shaft*



2009 MODELS
1. *Fuel pump connector*

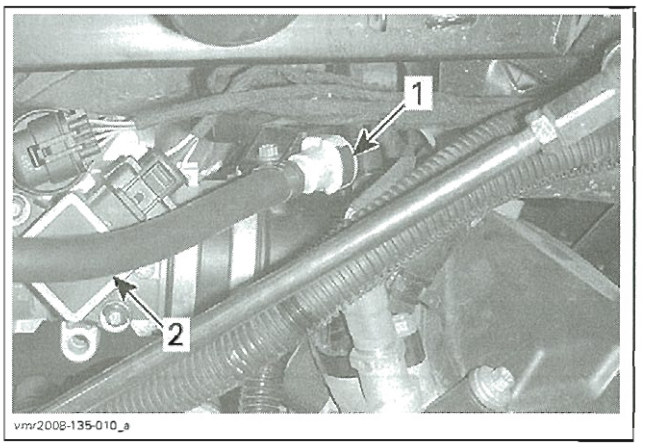
2008 Models

Disconnect vent tube OUTLET from frame.



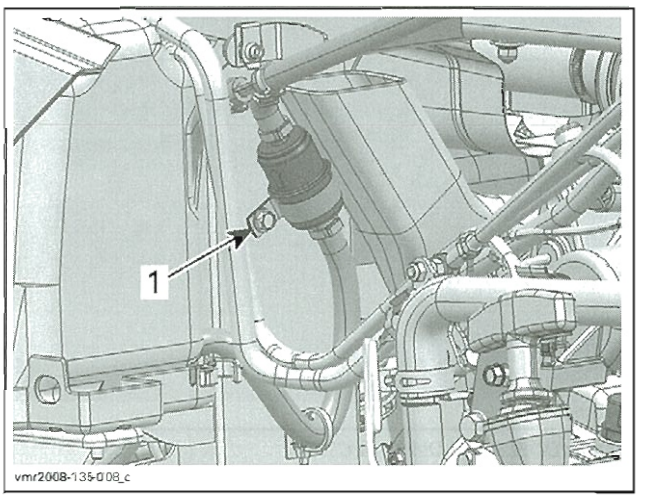
1. *Vent tube*

Disconnect fuel line at fuel rail quick disconnect fitting.



1. *Fuel rail quick disconnect*
2. *From fuel filter*

Remove screw securing in-line fuel filter to vehicle frame.

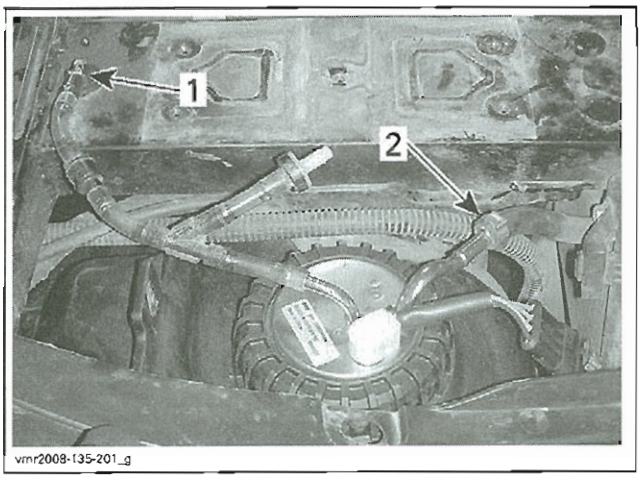


1. *Fuel filter mounting screw*

2009 Models

Pull out vent system OUTLET from frame.

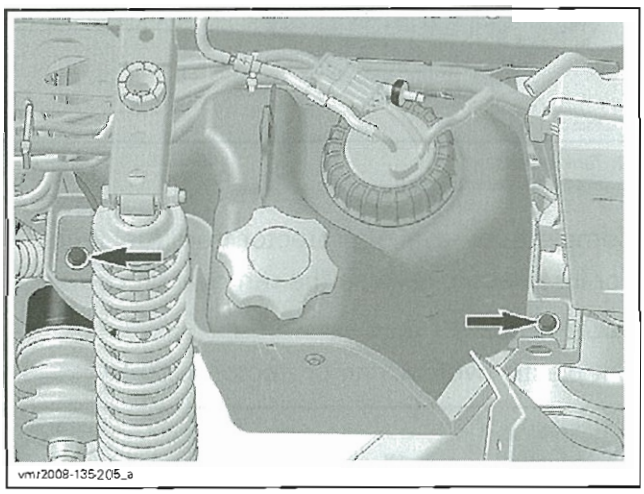
Disconnect fuel hose at fuel pump fitting.



1. *Pull out vent outlet*
2. *Fuel pump fitting*

All Models except MAX

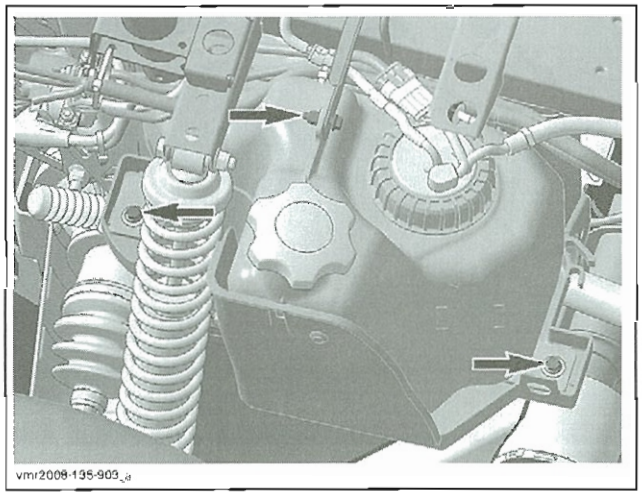
Remove 2 fuel tank retaining screws on right side of the tank.



TYPICAL – 2009 MODEL SHOWN

MAX Models

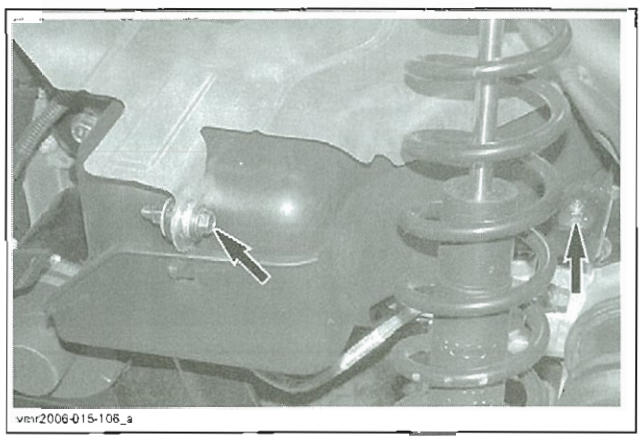
Remove 3 fuel tank retaining screws on right side of the tank.



TYPICAL – 2009 MODEL SHOWN

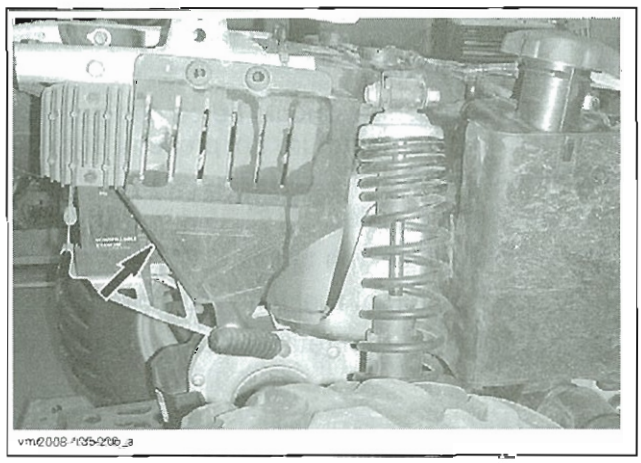
All Models

Remove the upper and the lower fuel tank retaining screws on the left side of the tank.



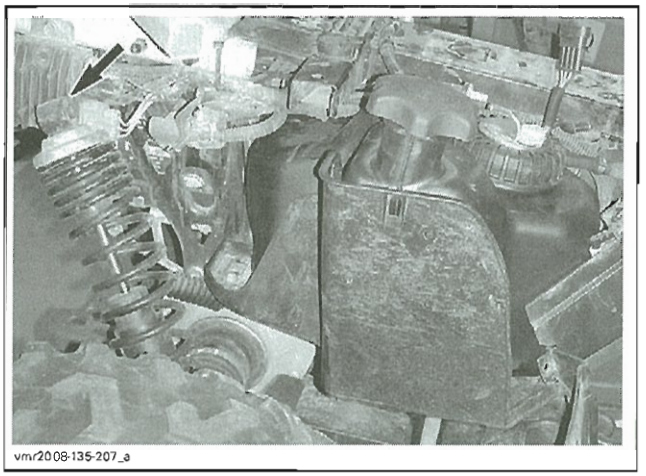
LH FUEL TANK MOUNTING SCREWS (2)

Remove voltage regulator/rectifier protector.



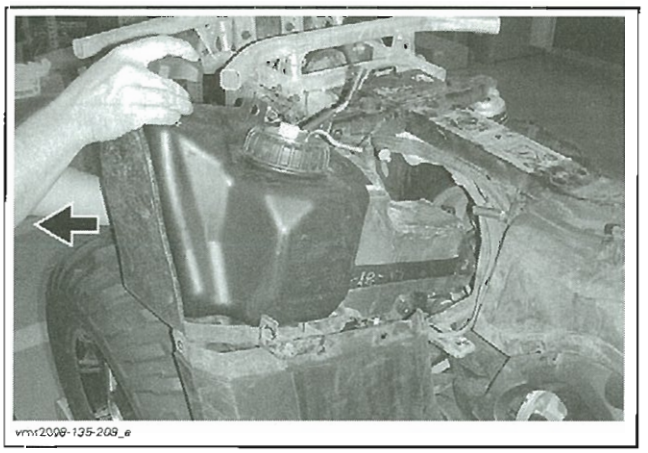
Lift frame sufficiently to extend RH rear shock absorber and remove its upper mounting screw.

Move shock absorber rearwards.



TYPICAL – 2009 MODEL SHOWN

Pull fuel tank out from the RH side of vehicle.



TYPICAL – 2009 MODEL SHOWN

Fuel Tank Protector Removal and Installation

2008 Models

To release protector from fuel tank, carry out the following procedure:

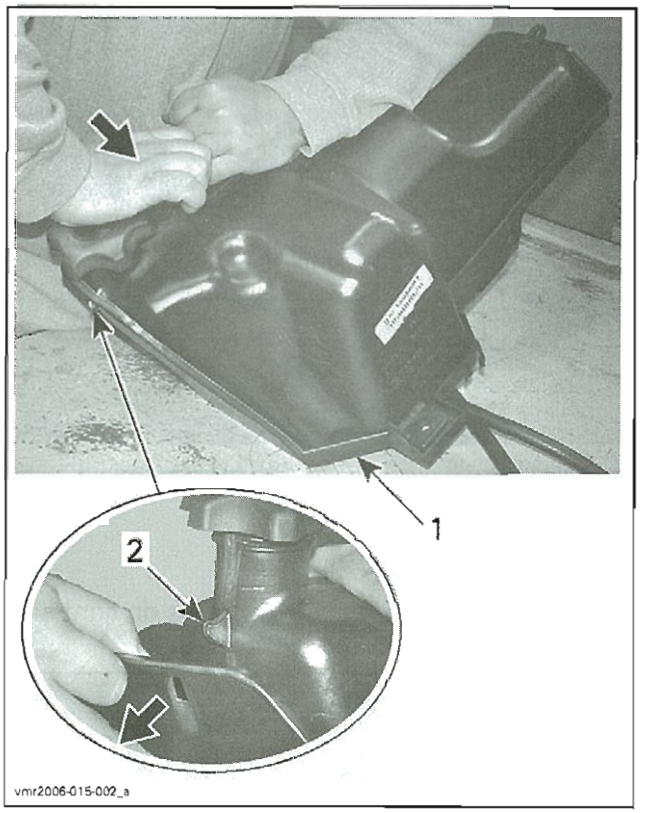
NOTE: This procedure should be carried out with parts at room temperature to prevent possible cracking of plastic.

Work on a stable table.

Lay front of fuel tank on table.

Firmly press on top of fuel tank and hold.

Unhook protector from retaining tab on fuel tank.



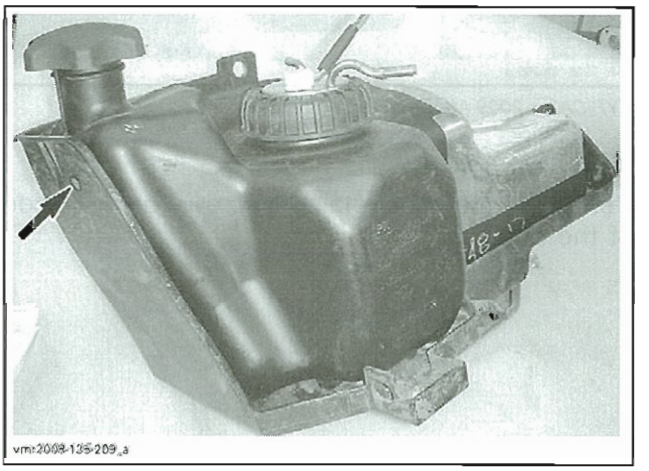
1. *Tank protector*
2. *Protector retaining tab*

Complete removal of protector from fuel tank.

For installation, reverse the removal procedure.

2009 Models

Cut plastic rivet locking protector to tank.



Pull out tank from protector.

For installation, use a new plastic rivet.

Fuel Tank Inspection

Inspect fuel tank for any damages or cracks which may result in fuel leaks.

Inspect tank and protector attachment points 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

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

2008 Models Only

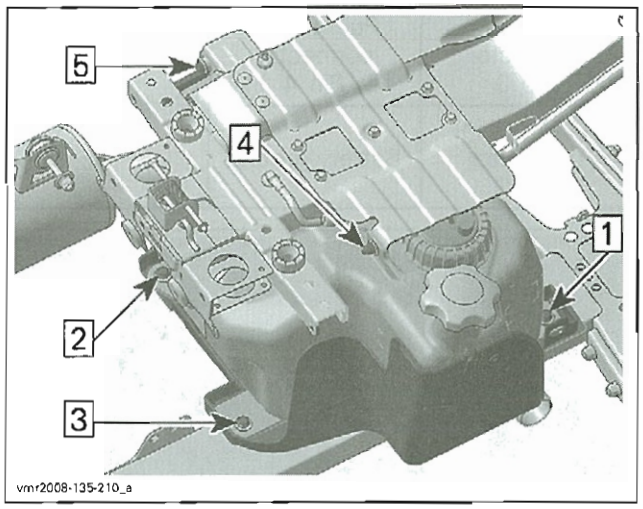
CAUTION: Ensure wiring harness is on top of fuel tank.

Torque in-line fuel filter retaining screw to 6 N•m (53 lbf•**in**).

All Models except MAX

Reinstall the seat reinforcement plate.

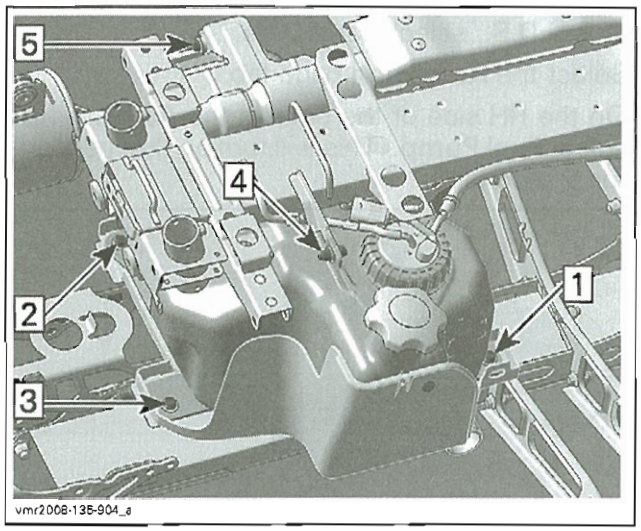
Install and torque fuel tank retaining screws to 7 N•m (62 lbf•**in**) as per following sequence.



TYPICAL – 2009 MODEL SHOWN

All MAX Models

Install and torque fuel tank retaining screws to 7 N•m (62 lbf•**in**) as per following sequence.



TYPICAL – 2009 MODEL SHOWN

All Models

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 section.

FUEL PUMP (2008)

Fuel Pump Quick Test

Set engine stop switch to RUN.

Turn ignition key to ON and listen for fuel pump operation.

NOTE: Fuel pump will come ON for a few seconds (up to 5 sec.), then stop. This is to pressurize the fuel injector system prior to engine start.

If the fuel pump came on for a few seconds and shut off, the fuel pump, ECM, and associated circuits are functioning normally. However, this does not validate fuel pump pressure.

If fuel pump did not come on, check in B.U.D.S. for applicable fault codes. Refer to *COMMUNICATION TOOLS/B.U.D.S. SOFTWARE* section.

Then carry out a *FUEL PUMP INPUT VOLTAGE TEST*.

Set ignition switch to OFF.

Fuel Pump Activation In B.U.D.S.

The fuel pump can be activated using B.U.D.S. software as per following procedure.

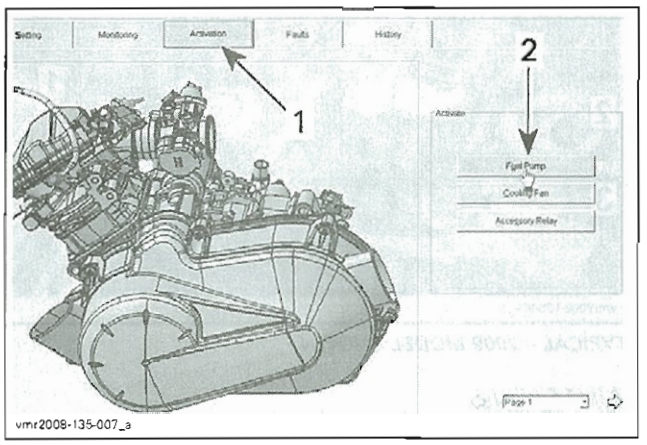
NOTE: The fuel pump cannot be disabled using B.U.D.S. software. It can only be activated for 5 second intervals for pump testing.

Connect vehicle to the latest applicable B.U.D.S. software, refer to the *COMMUNICATION TOOLS/B.U.D.S. SOFTWARE* section.

In B.U.D.S., select Read Data.

Select the Activation page tab.

On the RH side of the page in the Activate field, select Fuel Pump. This will turn on the fuel pump for 5 seconds.

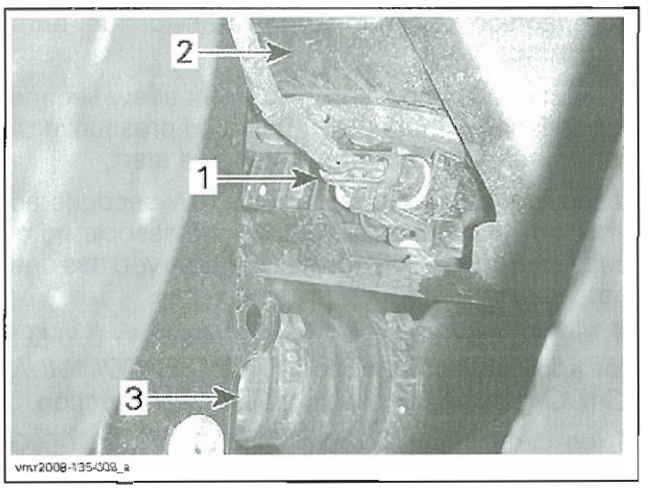


FUEL PUMP ACTIVATION IN B.U.D.S.
1. *Select the Activation page tab*
2. *Select Fuel Pump button*

Fuel Pump Input Voltage Test

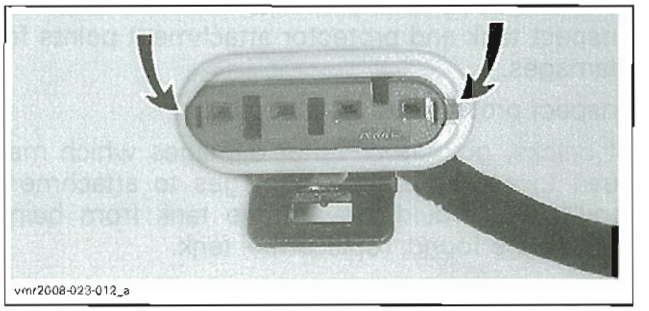
From the LH side of the vehicle, locate the fuel pump connector.

Disconnect the fuel pump connector.



1. *Fuel pump connector*
2. *Fuel tank*
3. *Rear driveshaft*

Remove the red plastic pin lock from the connector.



PLASTIC PIN LOCK TABS

Set Fluke 115 multimeter (P/N 529 035 868) to Vdc.

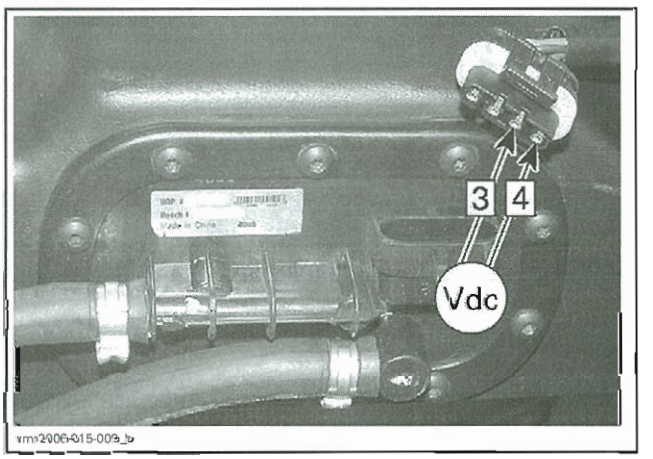
Connect multimeter between pins 3 and 4 of the fuel pump wiring connector.

Turn ignition key ON.

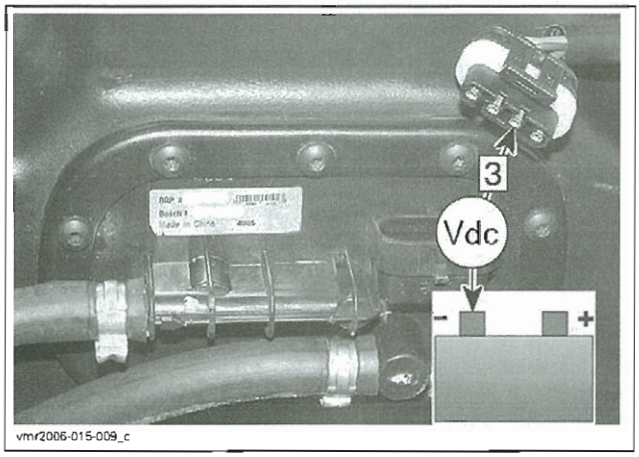
Set engine run/stop switch to RUN.

Read voltage as follows.

FUEL PUMP INPUT VOLTAGE TEST		
TEST PROBES		VOLTAGE READING
Fuel pump connector Pin 3	Fuel pump connector Pin 4	Battery voltage
Fuel pump connector Pin 3	Battery ground	



TYPICAL



TYPICAL

OBSERVATION	SIGNIFICATION
Battery voltage is read for approx 5 seconds, then it will drop to approx. 6 Vdc for 1 second, then to 0 Vdc	– Validates fuel pump relay R2 supplies power to fuel pump. – Validates the fuel pump relay ground circuit through ECM. – Validates fuel pump ground circuit. – When voltage drops to approx 6 Vdc, it validates the ECM functions to switch fuel pump ON and OFF.

OBSERVATION	POSSIBLE CAUSE
Battery voltage is not read	– Fuel pump power supply circuit from fuel pump relay R2 is defective. – Fuel pump ground circuit to ECM is defective. – ECM is faulty.

If battery voltage was read for both fuel pump input voltage tests, carry out a fuel pump winding continuity test.

If battery voltage is not read between pins 3 and 4 of the fuel pump connector but is good to chassis ground, test for continuity of the fuel pump ground circuit wire (fuel pump connector pin 4 to chassis ground). Repair or replace wiring as required.

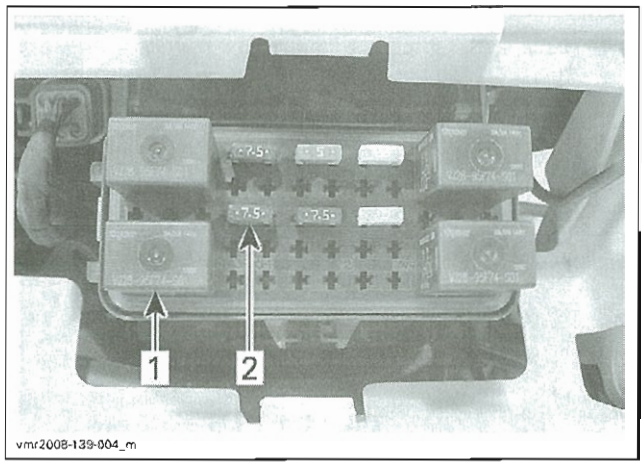
If battery voltage is not read to chassis ground, carry out the following:

- Fuel pump fuse (see following illustration)
- Fuel pump relay input voltage test
- Fuel pump relay test (refer to *LIGHTS/GAUGE/ACCESSORIES*)
- Fuel pump motor circuit wiring continuity
- Fuel pump relay ground circuit continuity.

Fuel Pump Relay Input Voltage Test

Remove front compartment cover and fuse box cover.

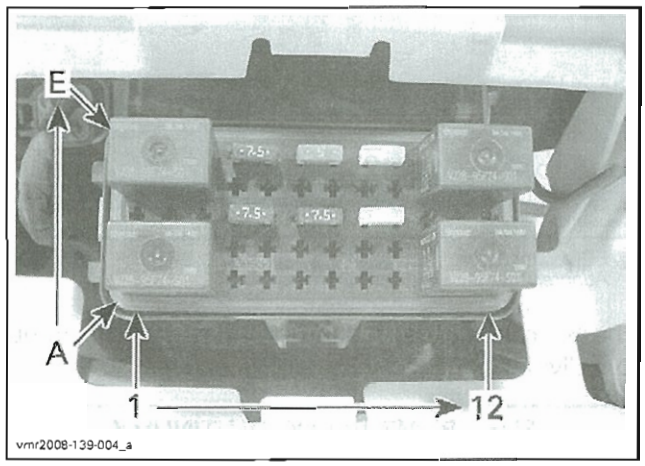
Remove fuel pump relay.



1. *Fuel pump relay*
2. *Fuel pump fuse*

Measure for fuel pump relay input voltage at fuse box contacts as per following table.

FUEL PUMP RELAY INPUT VOLTAGE TEST		
TEST PROBES		READING
Contact 1A	Chassis ground	Battery voltage
Contact 3A		



FUSE BOX PIN-OUT

If battery voltage is read, test wiring for continuity between fuse box (contact 3B) and fuel pump connector (pin 3).

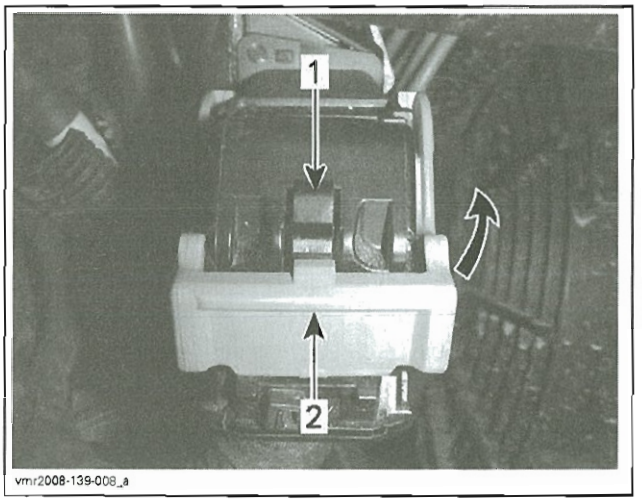
Also test fuel pump relay ground circuit continuity to ECM connector.

Repair or replace wiring as required.

Fuel Pump Relay Continuity (Ground Circuit)

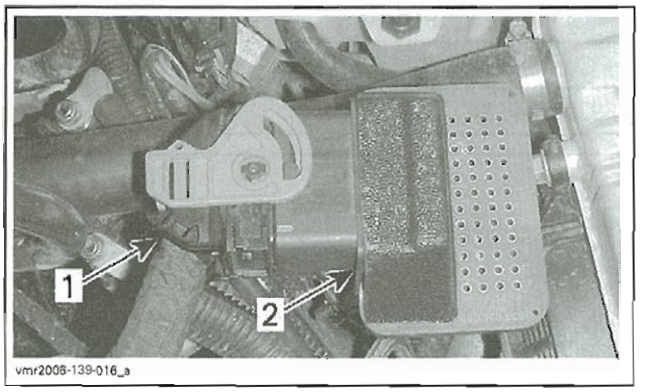
Remove RH inner fender panel, refer to the *BODY* section.

Disconnect ECM connector.



1. Press to release connector lock
2. Push to rotate connector lock upwards

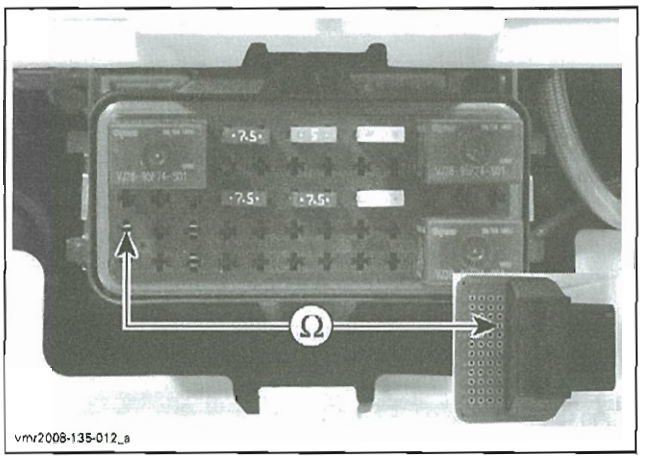
Install ECM connector onto the ECM adapter tool (P/N 529 036 085).



1. ECM connector
2. Adapter tool

Check continuity of fuel pump relay ground circuit to ECM as per following table.

FUEL PUMP RELAY CONTINUITY (GROUND CIRCUIT)		
ECM ADAPTER	FUSE BOX CONTACT	RESISTANCE Ω @ 20°C (68°F)
Pin J-1	Contact 1-b	Close to 0 Ω



If ground circuit continuity is good, check ECM. Refer to *ENGINE MANAGEMENT SYSTEM* section.

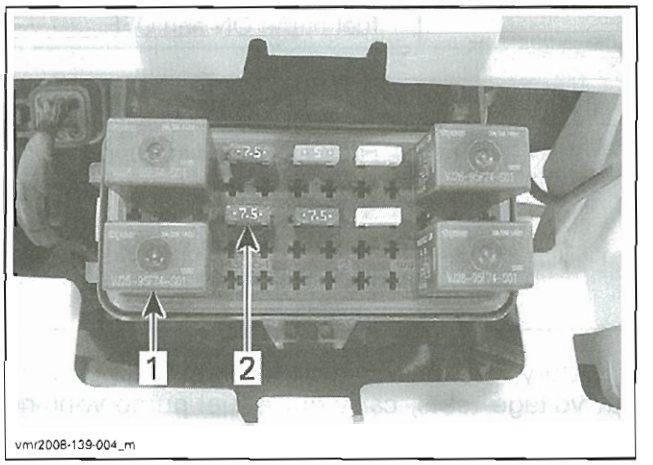
Remove tools.

Install removed parts and connectors.

Fuel Pump Winding Continuity Test

NOTE: This test is valid assuming that continuity of wiring to fuel pump was tested good.

Remove the fuel pump relay.

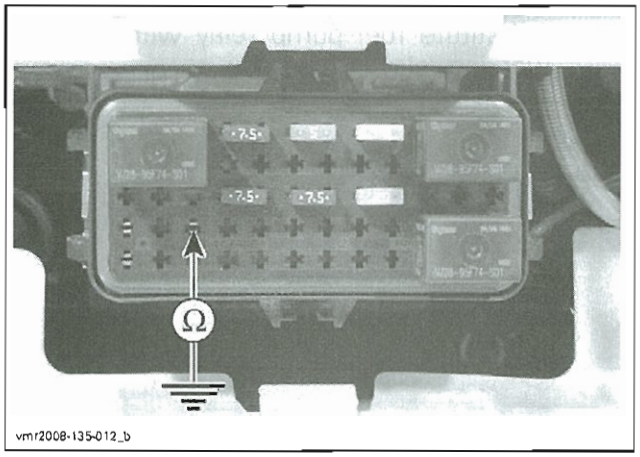


1. Fuel pump relay
2. Fuel pump fuse

Set multimeter to Ω.

Measure the fuel pump motor winding as per following table.

FUEL PUMP WINDING CONTINUITY TEST		
TEST PROBES		RESISTANCE Ω @ 20°C (68°F)
Fuse box contact 3B	Chassis ground	Approximately 1.5 Ω



FUEL PUMP WINDING CONTINUITY TEST

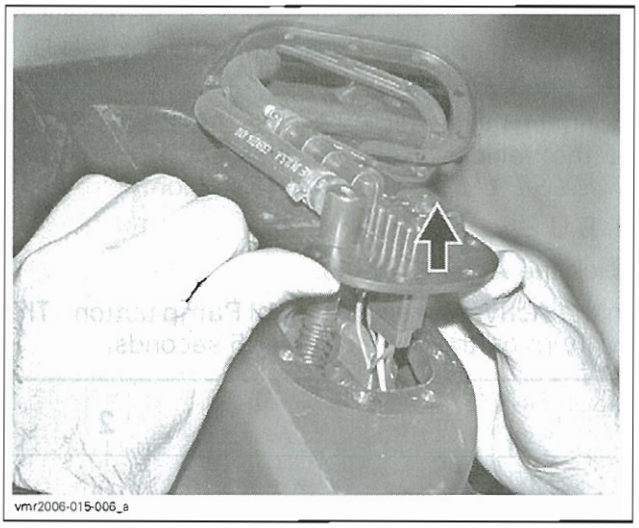
If fuel pump motor winding resistance is not as per table, replace the fuel pump.

Fuel Pump Removal

Remove fuel tank, see procedure in this section.

Remove fuel pump retaining screws.

Gently push pump up as illustrated.



GASKET AND FLANGE NOT SHOWN FOR CLARITY OF ILLUSTRATION

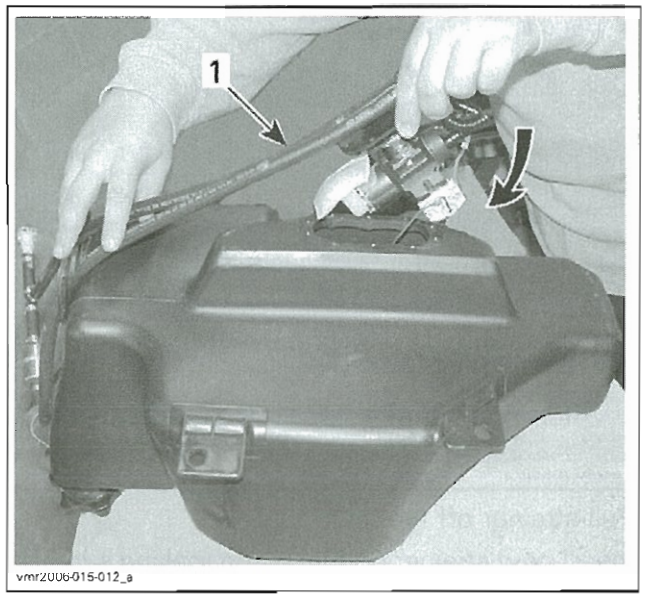
CAUTION: While pulling out the fuel pump, pay attention to fuel sensor float arm. Float arm can get stuck and bend reducing fuel sensor accuracy.

Fuel Pump Installation

For installation, reverse the removal process but pay attention to the following.

Install a new gasket.

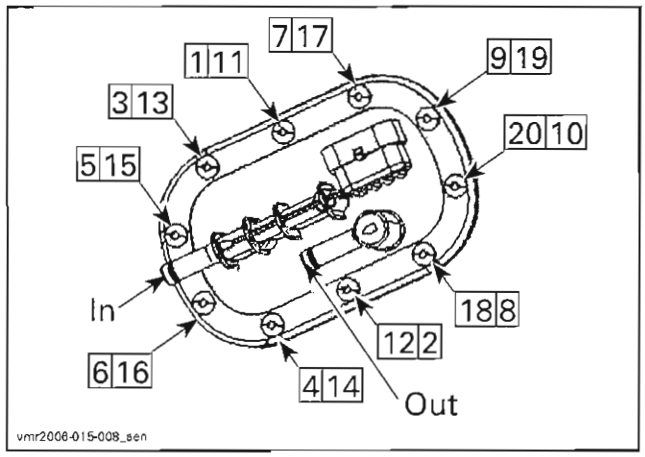
Pay attention to pump orientation as in following illustration.



GASKET AND FLANGE NOT SHOWN FOR CLARITY OF ILLUSTRATION
1. Fuel line on this side

Tighten retaining screws as per sequence in following illustration. For the initial pre-torque sequence (1 to 10), turn screws only enough for gasket to make proper contact between parts, 1 N•m (9 lbf•**in**). For the final torque sequence 11 to 19, properly torque screws to 2 N•m (18 lbf•**in**).

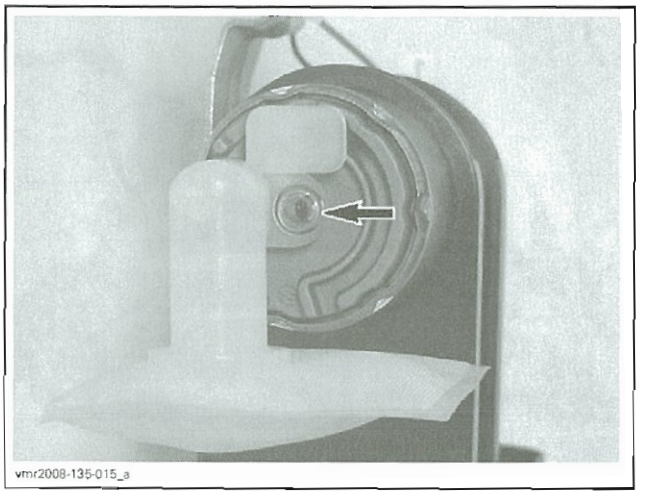
Install hoses on IN and OUT fittings using new Oetiker clamps.



Fuel Pump Strainer Replacement

Remove fuel pump as per procedure in this section.

Remove push nut securing strainer to fuel pump.


vmr2008-135-015_a

Pull strainer off fuel pump.

Insert new strainer on fuel pump making sure that it pressed in tightly against pump face.

Press in new push nut to secure strainer.

Reinstall fuel pump as per procedure described in this section.

FUEL PUMP (2009)

Fuel Pump Quick Test

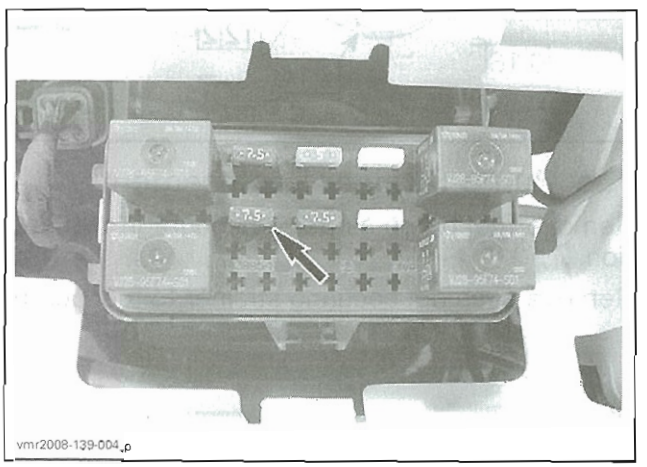
Set engine stop switch to RUN.

Turn ignition key to ON.

Listen to fuel pump operation.

Fuel pump should come ON for for a few seconds, then stop.

- If so, the fuel pump, ECM, and associated circuits are functioning normally. However, keep in mind this does not validate fuel pump pressure.
- Otherwise, carry out the following step(s) until the pump works.
  - Check fuel pump fuse.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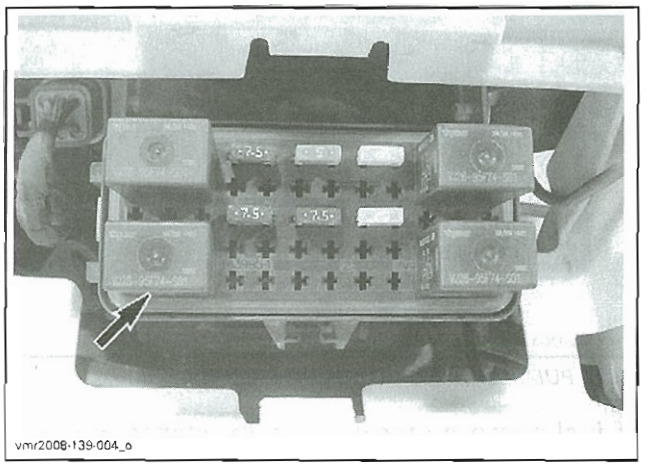
  - Substitute fuel pump relay with a known working relay in fuse box.


vmr2008-139-004_o

  - Check in B.U.D.S. for applicable fault codes. Refer to *COMMUNICATION TOOLS/B.U.D.S. SOFTWARE* section.
  - Carry out a fuel pump input voltage test.

Set ignition switch to OFF.

Fuel Pump Activation In B.U.D.S.

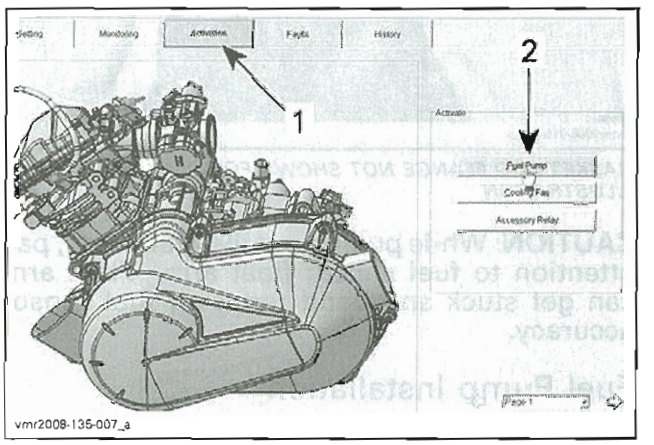
The fuel pump can be activated using B.U.D.S. software.

Connect the latest applicable B.U.D.S. software to the vehicle. Refer to the *COMMUNICATION TOOLS/B.U.D.S. SOFTWARE* section.

In B.U.D.S., click **Read Data**.

Click the **Activation** tab.

In the **Activate** area, click **Fuel Pump** button. This will turn on the fuel pump for 5 seconds.



vmr2008-135-007_a

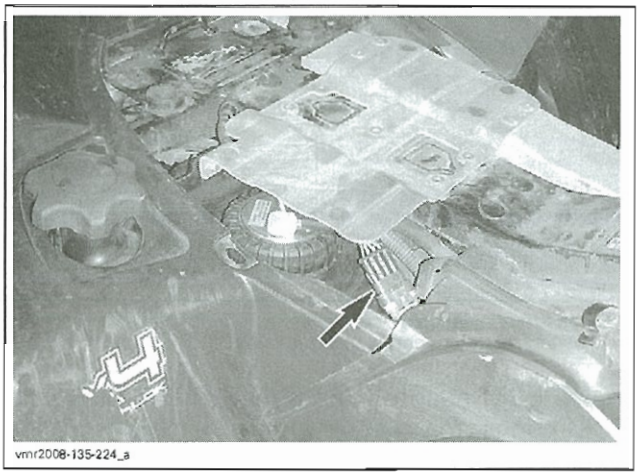
FUEL PUMP ACTIVATION IN B.U.D.S.
1. *Click the Activation tab*
2. *Click Fuel Pump button*

Fuel Pump Input Voltage Test

Remove seat.

From the RH side of the vehicle, Idisconnect the fuel pump connector.

NOTE: It may be necessary to remove seat reinforcement plate and/or LH side panel to make room.



Use the Fluke 115 multimeter (P/N 529 035 868) and the Fluke rigid back probe (P/N TP88).

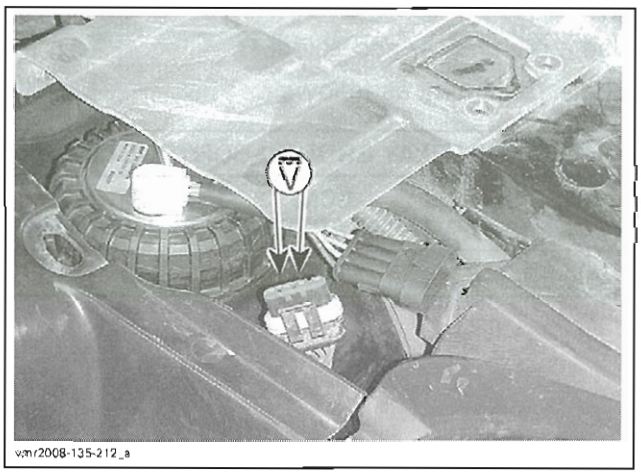
Set multimeter to Vdc.

Turn ignition key ON.

Set engine run/stop switch to RUN.

Read voltage as follows.

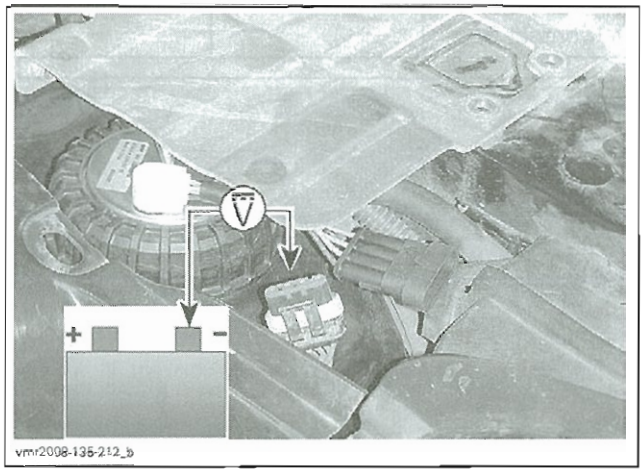
FUEL PUMP INPUT VOLTAGE TEST		
FUEL PUMP CONNECTOR		VOLTAGE READING
Pin 3	Pin 4	Battery voltage



If battery voltage is read, carry out a fuel pump winding resistance test.

If battery voltage is not read carry out this voltage test.

FUEL PUMP INPUT VOLTAGE TEST		
FUEL PUMP CONNECTOR	BATTERY	VOLTAGE READING
Pin 3	Ground	Battery voltage



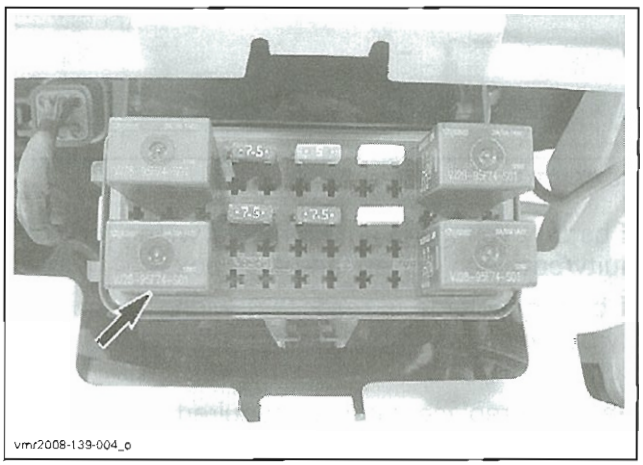
If battery voltage is now read, check fuel pump ground circuit. Refer to *FUEL PUMP WINDING RESISTANCE TEST*.

If battery voltage is still not read, check fuel pump supply circuit. Refer to *FUEL PUMP RELAY INPUT VOLTAGE TEST*.

Fuel Pump Relay Input Voltage Test

Remove front compartment cover and fuse box cover.

Remove fuel pump relay.

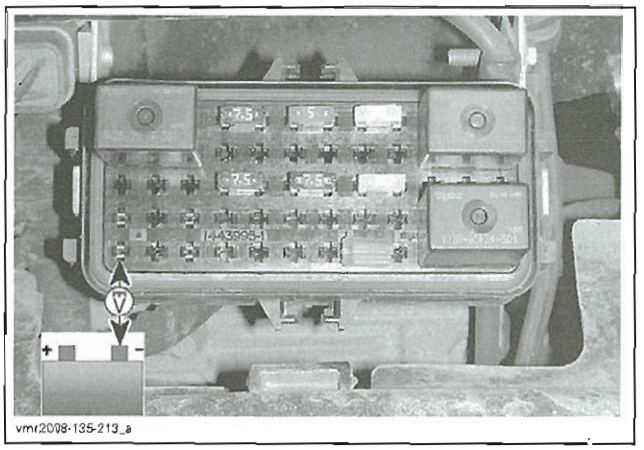


Turn ignition key ON.

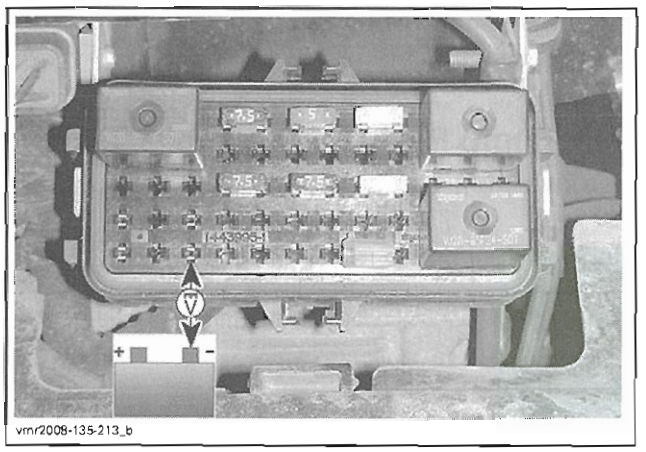
Set engine run/stop switch to RUN.

Measure fuel pump relay input voltage at fuse box contacts.

FUEL PUMP RELAY INPUT VOLTAGE TEST		
TEST PROBES		READING
Fuse box contact 1A	Battery ground	Battery voltage
Fuse box contact 3A		



CONTACT 1A



CONTACT 3A

If battery voltage is not read, test wiring for continuity between battery and fuse box.

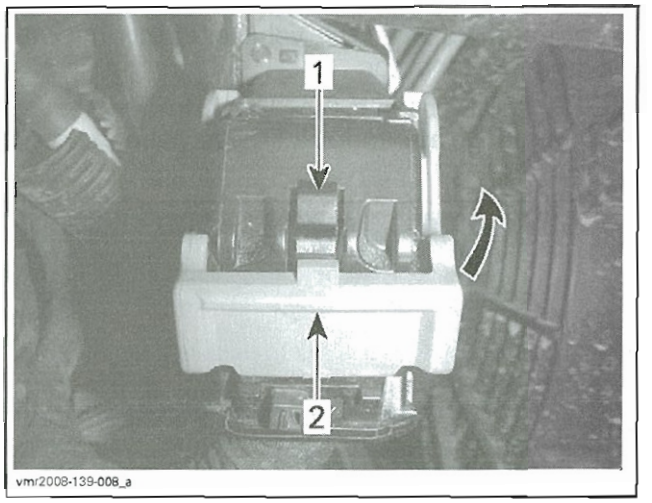
If battery voltage is read, test wiring for continuity between fuse box (contact 3B) and fuel pump connector (pin 3).

Repair or replace wiring as required.

Fuel Pump Relay Ground Control Circuit

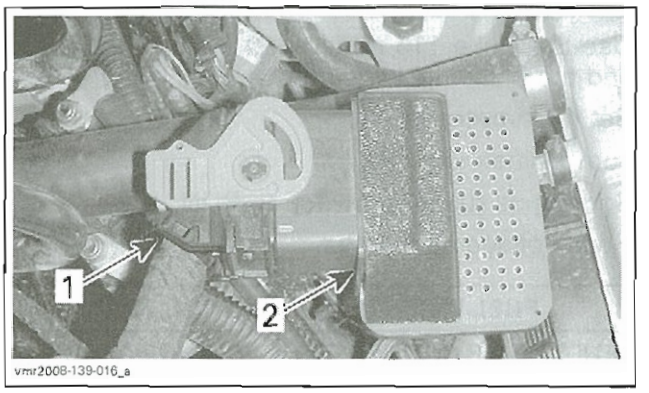
Remove RH inner fender panel, refer to the *BODY* section.

Disconnect ECM connector.



1. Press to release connector lock
2. Push to rotate connector lock upwards

Install ECM adapter tool (P/N 529 036 085) onto ECM connector.

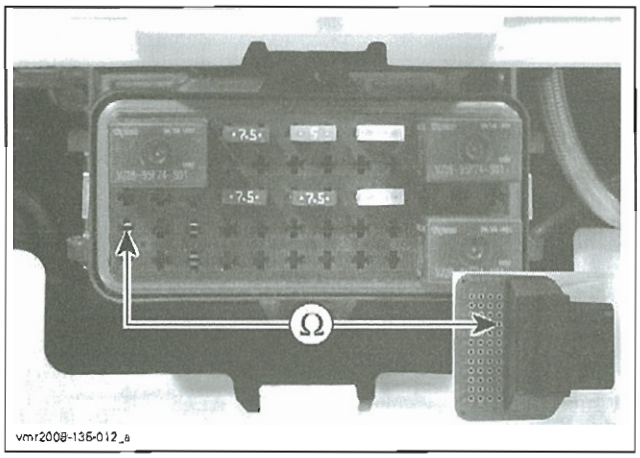


1. ECM connector
2. Adapter tool

Use a multimeter and select Ω.

Check continuity as follows.

FUEL PUMP RELAY GROUND CONTROL CIRCUIT		
FUSE BOX CONTACT	ECM ADAPTER	RESISTANCE Ω @ 20°C (68°F)
Contact 1B	Pin J1	Close to 0 Ω



If continuity is good, check ECM. Refer to *ENGINE MANAGEMENT SYSTEM* section.

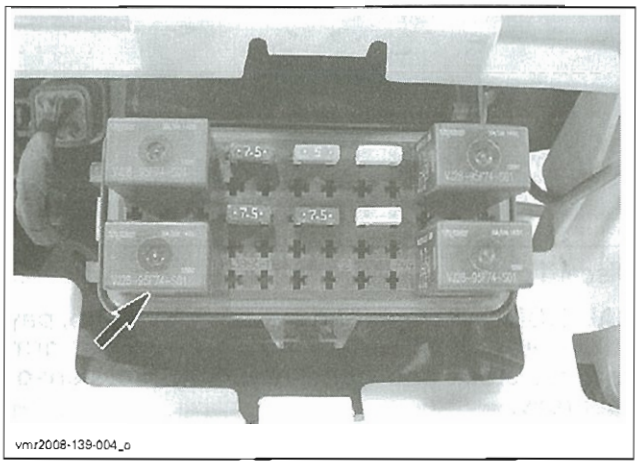
If continuity is not good, repair/replace wiring/connectors between ECM and fuse box.

Remove tool.

Install removed parts and connectors.

Fuel Pump Winding Resistance Test

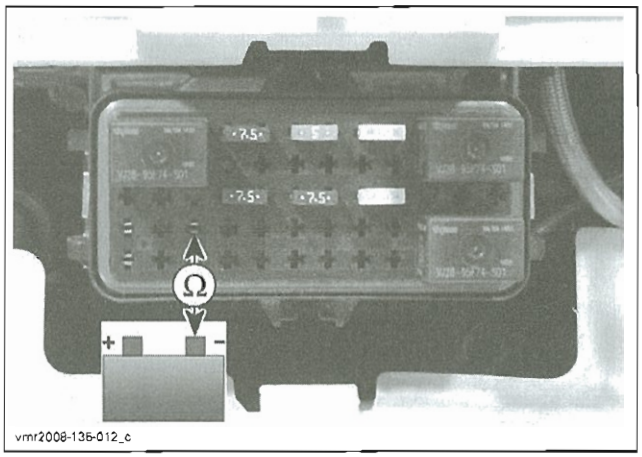
Remove the fuel pump relay.



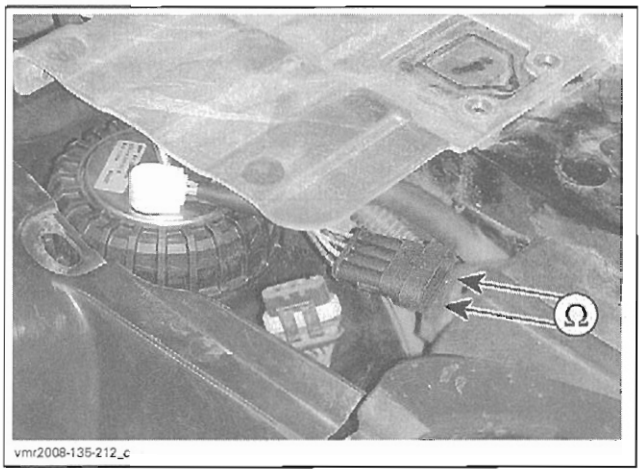
Set multimeter to Ω.

Measure winding as follows.

FUEL PUMP WINDING RESISTANCE TEST		
TEST PROBES		RESISTANCE Ω @ 20°C (68°F)
Fuse box contact 3B	Battery ground	Approximately 2.5 Ω



If resistance test failed, disconnect fuel pump connector and measure winding again directly to fuel pump connector.



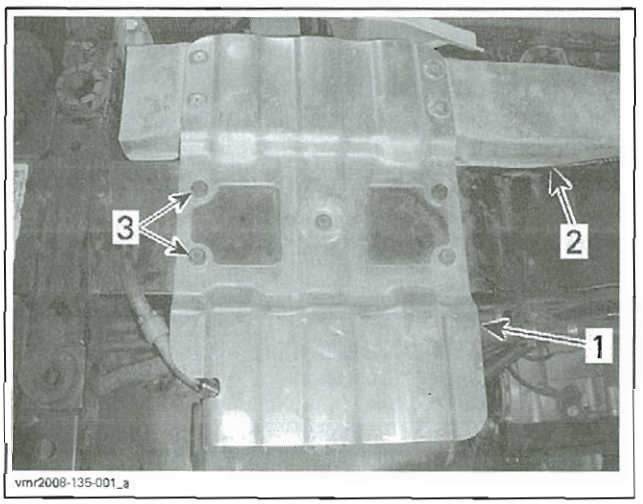
If test failed, check pump wiring/connector and if good, replace fuel pump.

If test succeeded check wiring/connectors from fuse box and to battery ground. Repair/replace as necessary.

Fuel Pump Removal

Remove seat.

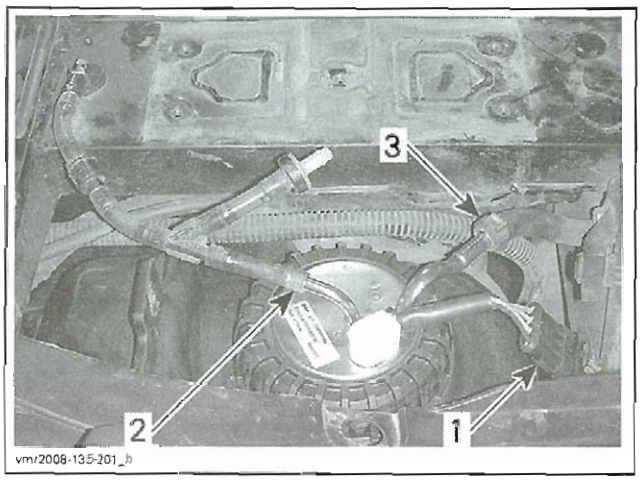
All Models except MAX: Remove seat reinforcement plate.



TYPICAL
1. *Seat reinforcement plate*
2. *Exhaust heat shield*
3. *Retaining screws (x5)*

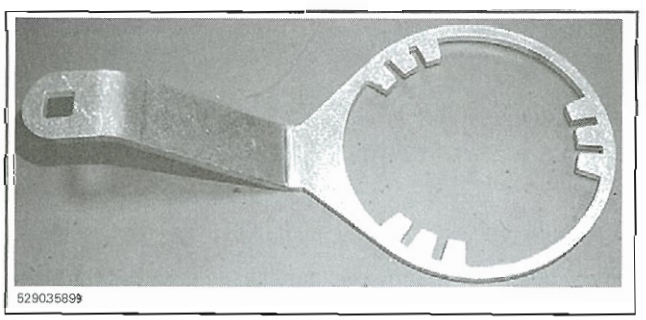
Disconnect electric connector, vent line and fuel hose from fuel pump.

NOTE: Wrap shop rags around the fuel hose prior to removal.



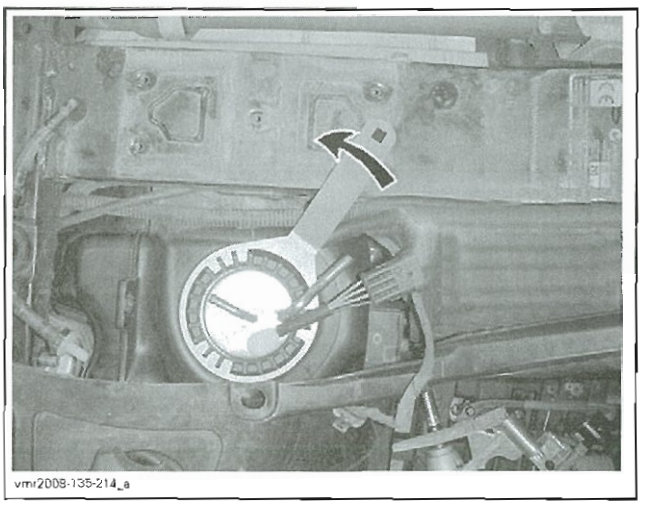
1. *Electric connector*
2. *Vent line*
3. *Fuel hose*

Use the fuel pump nut tool (P/N 529 035 899).

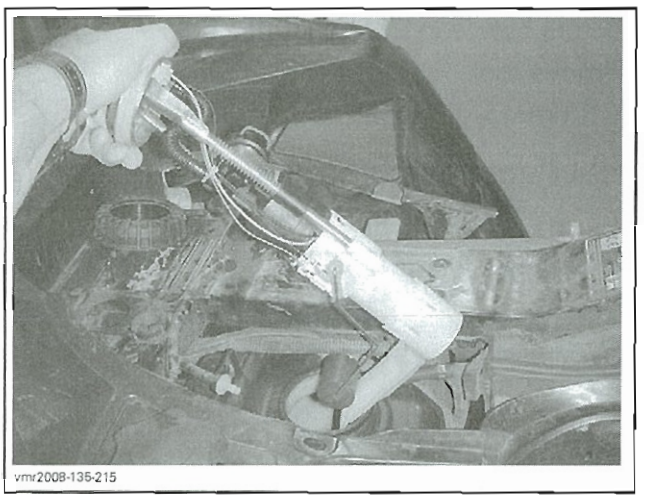


Unscrew fuel pump retaining nut.

CAUTION: Replace fuel pump gasket whenever fuel pump retaining nut is loosen.



Carefully pull out fuel pump.



Discard gasket.

CAUTION: While pulling out the fuel pump, pay attention to fuel sensor float arm. Float arm can get stuck and bend reducing fuel sensor accuracy.

Wipe off any fuel spillage.

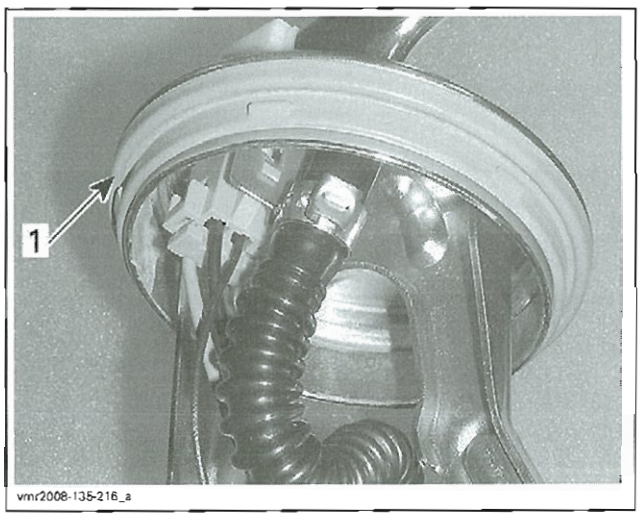
Fuel Pump Installation

For installation, reverse the removal process but pay attention to the following.

CAUTION: Never install a damaged pump or a dropped pump.

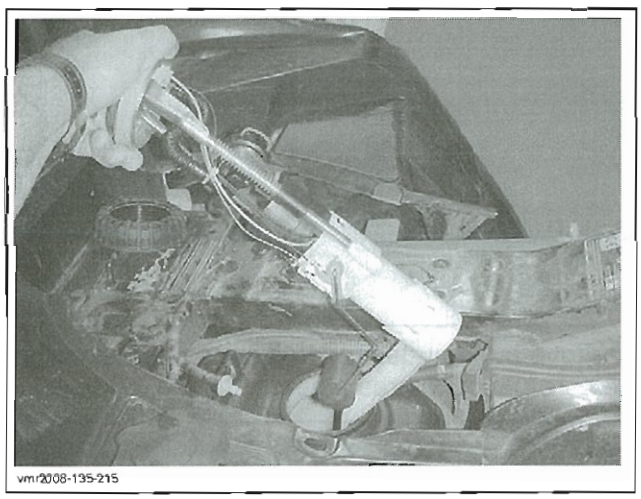
Install a NEW gasket.

Place gasket so that its flange will be between pump and tank mounting surface.

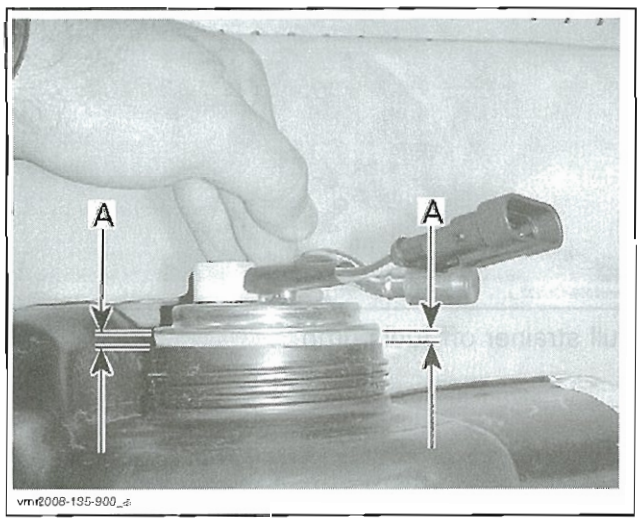


1. Gasket flange here

Pay attention to pump orientation as in following illustration.

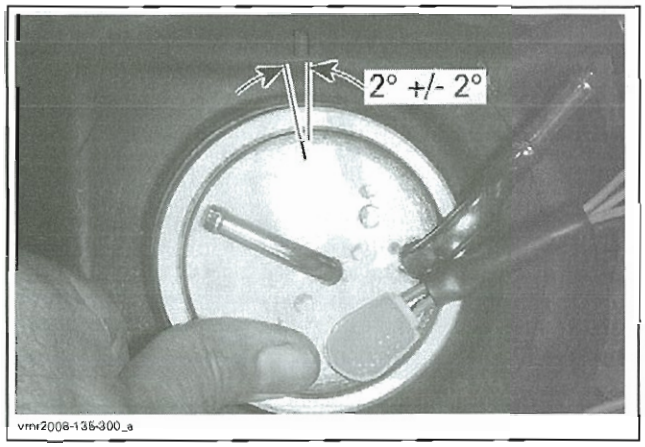


Firmly push against pump to align its gasket parallel with tank surface (all around).



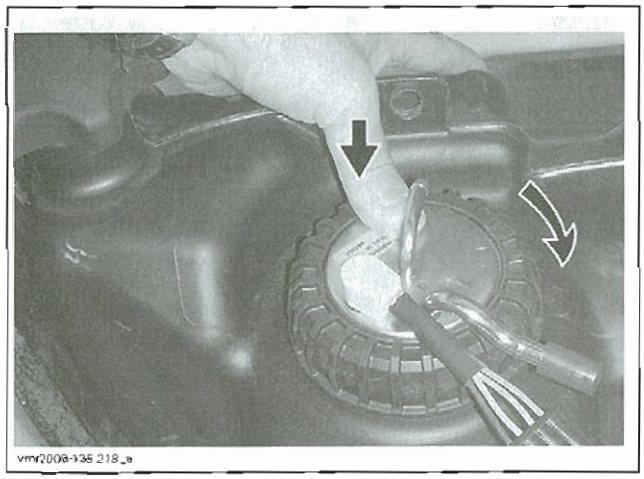
FUEL TANK REMOVED FROM VEHICLE FOR CLARITY
A. Gasket parallel with tank surface (all around)

While maintaining pump seated, rotate pump to align its mark with the mark on the fuel tank as per the following specification.

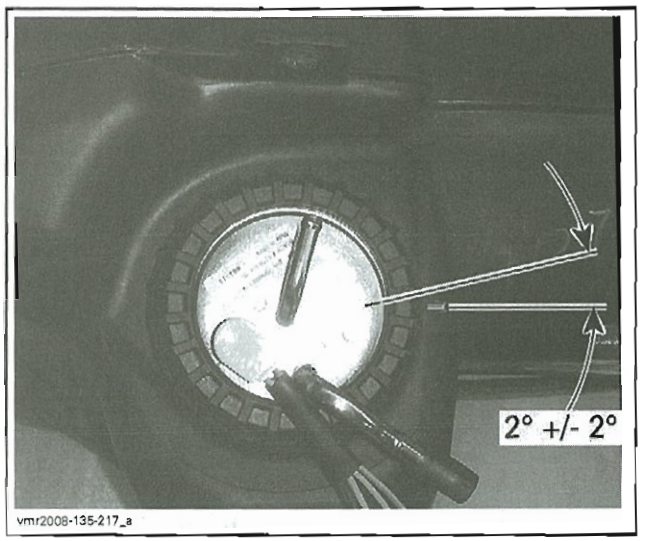


ANGLE PURPOSELY EXAGGERATED IN ILLUSTRATION FOR CLARITY

While firmly holding pump against tank, engage fuel pump nut threads. Slightly tighten nut while holding pump to prevent it from turning.

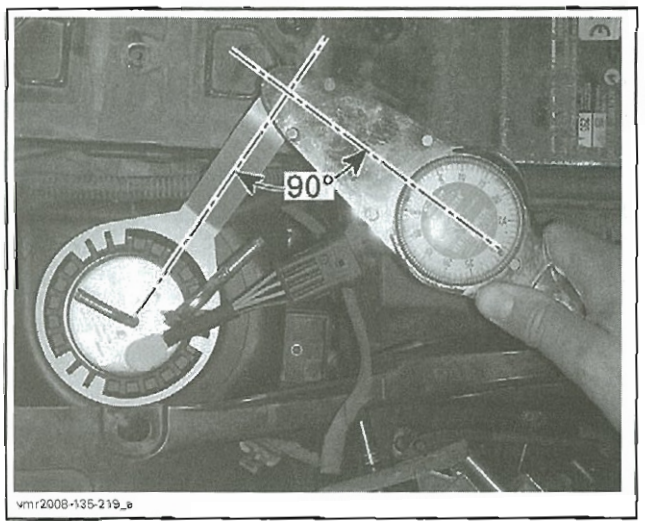


Ensure pump is still aligned as per specification.



ANGLE PURPOSELY EXAGGERATED IN ILLUSTRATION FOR CLARITY

To apply the proper torque to the pump nut, use a torque wrench and install it perpendicularly (90°) to the tool handle.



TORQUE WRENCH PERPENDICULAR TO TOOL HANDLE

Torque nut while ensuring pump does not rotate as nut is tightened. Reposition as necessary.

Secure fuel hose with a new clamp.

Reinstall remaining removed parts.

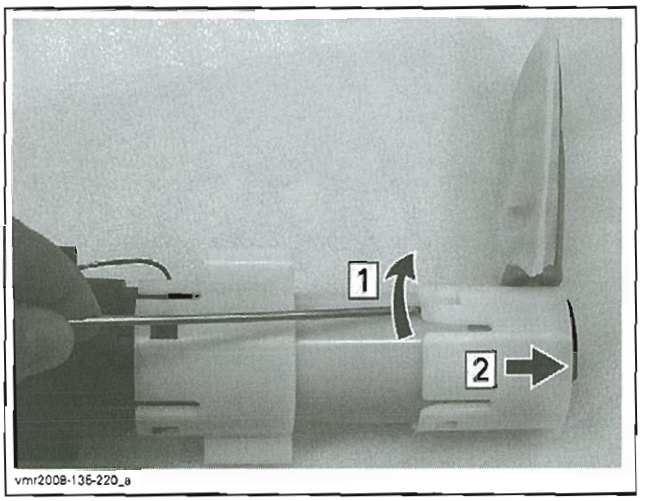
Refuel tank and ensure there are no leaks by performing a *FUEL TANK LEAK TEST* and a *FUEL PUMP PRESSURE TEST* as described in this section.

Check fuel level sensor operation.

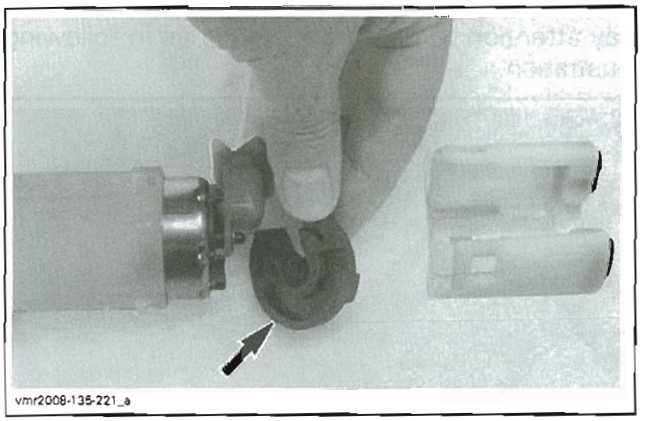
Fuel Pump Strainer Replacement

Remove fuel pump.

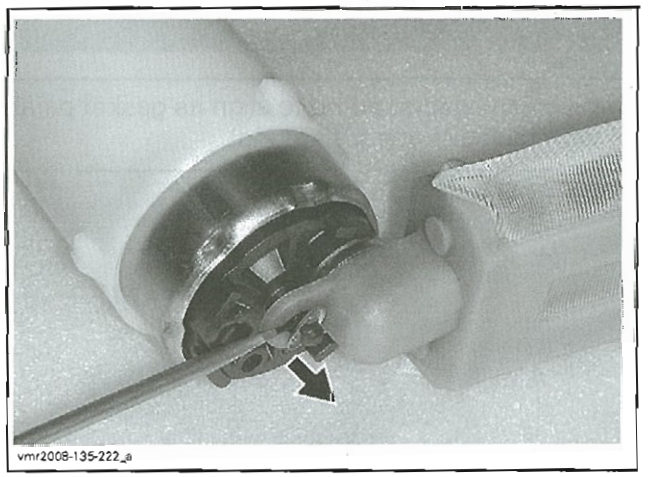
Unlock 2 tabs of plastic ring on opposite sides.



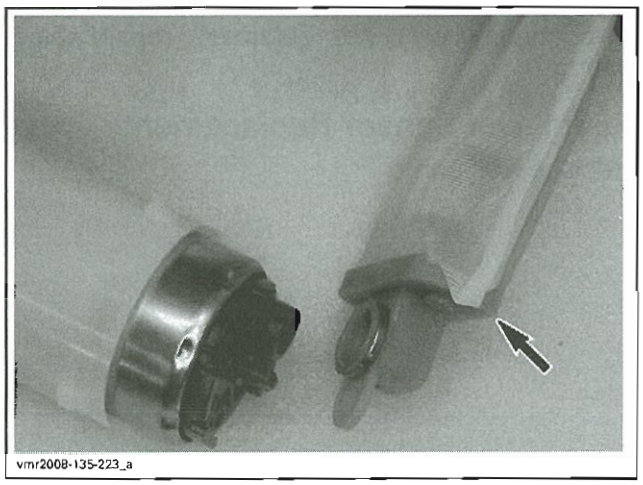
Remove rubber pad.



Remove push nut securing strainer to fuel pump. Be careful not to break the plastic pin.



Pull strainer off fuel pump.


vmr2008-135-223_a

NOTE: A non serviceable filter is located in fuel pump. If it is clogged, replace fuel pump.

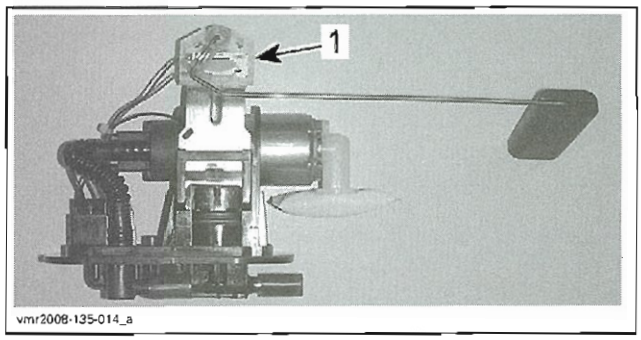
Insert the new strainer on fuel pump making sure topressit in tightly against pump face.

Press in a NEW push nut to secure strainer.

Reinstall remaining removed parts.

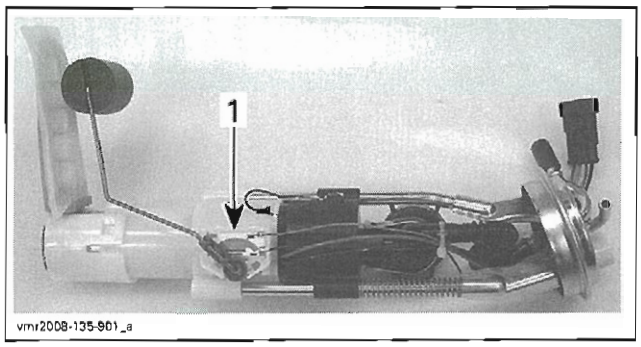
FUEL LEVEL SENSOR

The fuel level sensor is a float actuated variable resistance type sensor that is part of the fuel pump.



vmr2008-135-014_a

FUEL PUMP (2008 MODEL)
1. Fuel level sensor

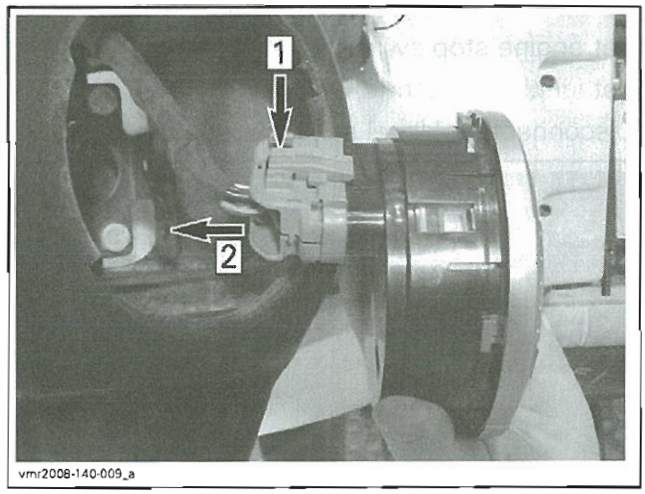


vmr2008-135-901_a

FUEL PUMP (2009 MODEL)
1. Fuel level sensor

Fuel Level Sensor Resistance Test

Remove and disconnect multifunction gauge, refer to the *LIGHTS/GAUGE/ACCESSORIES* section.



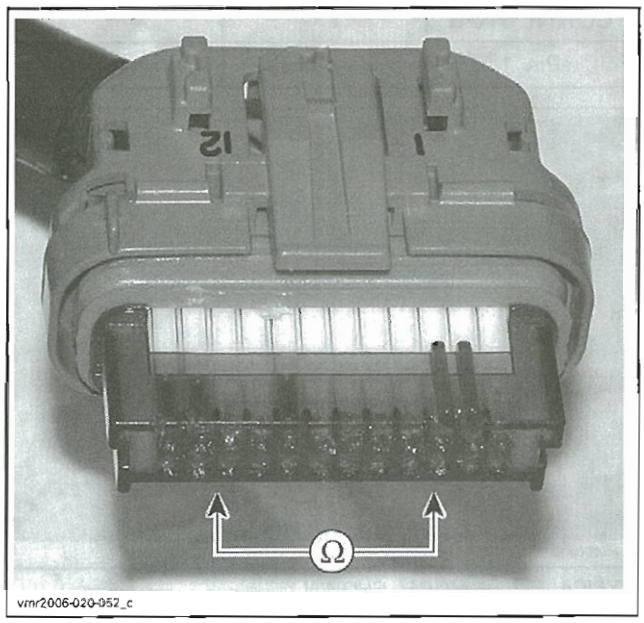
vmr2008-140-009_a

Step 1: Press to release
Step 2: Pull connector off gauge

Use a multimeter and select Ω.

Measure the resistance of the sensor as follows.

FUEL LEVEL SENSOR RESISTANCE TEST		
FUEL LEVEL	GAUGE CONNECTOR	RESISTANCE Ω @ 20°C (68°F)
Full	Pins 4 and 21	5 Ω ± 2
Empty		100 Ω ± 7



vmr2006-020-052_c

If readings are out of specification check wiring/connectors between multifunction gauge and fuel level sensor. If wiring is good, replace fuel level sensor.

If readings are as per specification, test sensor input voltage from multifunction gauge.

Connect and install multifunction gauge.

Fuel Level Sensor Input Voltage Test

Set engine stop switch to RUN.

Set ignition switch to ON.

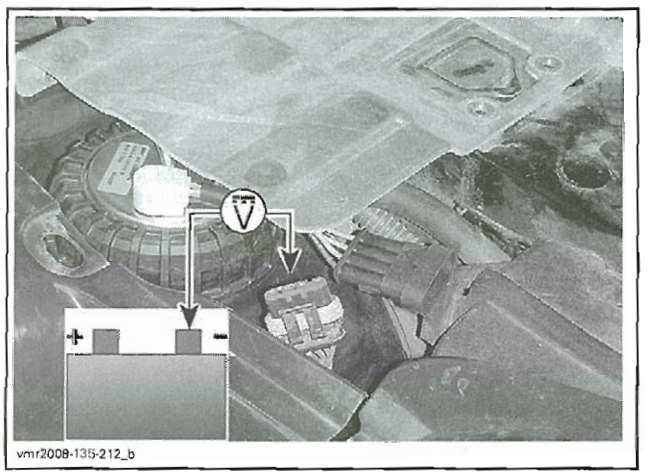
Disconnect fuel level sensor connector.

TYPICAL – 2009 MODEL SHOWN

Use a multimeter and select Vdc.

Measure the input voltage as follows.

FUEL LEVEL SENSOR INPUT VOLTAGE TEST		
FUEL LEVEL SENSOR CONNECTOR	BATTERY	VOLTAGE READING
Pin 1	Ground	Battery voltage



TYPICAL – 2009 MODEL SHOWN

If battery voltage is not read, test wiring continuity between sensor and multifunction gauge.

If wiring was good, replace multifunction gauge.

If continuity was not obtained, repair/replace wiring.

Fuel Level Sensor Replacement

Replace fuel pump.

IGNITION SYSTEM

SERVICE TOOLS

Description	Part Number	Page
Fluke 111 multimeter	529 035 868	259, 261–263
ECM adapter tool	529 036 085	262

SERVICE PRODUCTS

Description	Part Number	Page
Super lube	293 550 030	265
heat sink paste	420 897 186	265

GENERAL

IGNITION SYSTEM OPERATION

The battery supplies 12 Vdc from fuse F3, to the primary side of the ignition coil. The ECM completes the circuit by switching it to ground at the right moment.

As the engine rotates, a signal from the CPS (crankshaft position sensor) relative to the position of the piston in the cylinder, is produced and sent to the ECM. The ECM uses this signal as well as engine RPM to establish the exact moment at which the ignition spark is required. It then provides the ground to the primary winding of the ignition coil.

With the ground provided by the ECM, current flows through the primary coil winding which induces a higher current potential in the secondary winding. This high current potential jumps across the spark plug gap and ignites the fuel/air mixture within the cylinder.

Ignition Timing

Ignition timing is not adjustable.

TROUBLESHOOTING

IGNITION SYSTEM TESTING

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

The ECM controls the ignition system and can detect an open or short circuit in the ignition coil primary winding. However, it does not monitor the secondary winding.

Ignition Testing Sequence

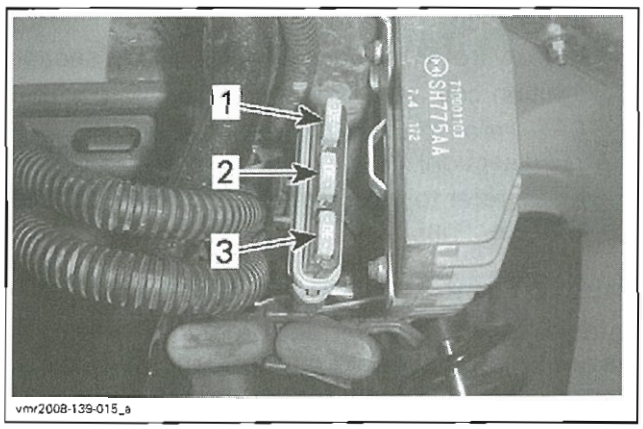
Set engine stop switch to RUN.

Turn the ignition switch to the ON position.

No Multifunction Gauge and Taillight

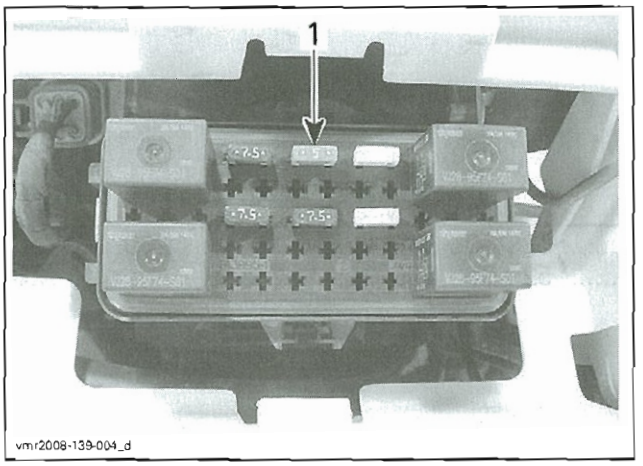
If the multifunction gauge and taillight do not function, the ECM may not be powered. Check the following:

- 30 A main fuse (F8)



1. *Main fuse (F8)*
2. *Spare fuse*
3. *Fan/accessories fuse (F9)*

- 5 A ECM fuse (F1)



1. Fuse F1

- Battery (refer to *CHARGING SYSTEM*).

If the items in the previous list tested good, the problem may also be related to one of the following:

- Fuse F4
- Main relay
- Ignition switch
- Engine STOP switch
- ECM.

For the main relay circuit and ECM testing, refer to the *ELECTRONIC FUEL INJECTION (EFI)* section.

Multifunction Gauge and Taillight Turn ON

If the multifunction gauge and taillight turn ON, the ignition switch and engine shut off switch are functioning normally.

Test the following items in the indicated order:

1. Spark plug
2. Battery (refer to *CHARGING SYSTEM* section)
3. Ignition coil
4. CPS (refer to *ELECTRONIC FUEL INJECTION (EFI)* section)
5. ECM (refer to *ELECTRONIC FUEL INJECTION (EFI)* section).

Intermittent Ignition Problems

In dealing with intermittent problems there is no easy diagnosis. Problems that occur only during normal engine operation may be related to vibrations, or the engine operating temperature, and have to be tested under similar conditions.

Some intermittent problems may be attributable to loose, dirty or corroded connections, or water infiltration, and may be resolved by cleaning the contacts and applying a dielectric grease for protection. Always check for these problems before replacing expensive components and apply the protective grease as specified in the procedures.

Multiple Problems

There is always the possibility of more than one component being at fault. If, after a component has been replaced, the problem still persists, carefully repeat the testing procedure to find the other faulty part.

PROCEDURES

Safety Precautions

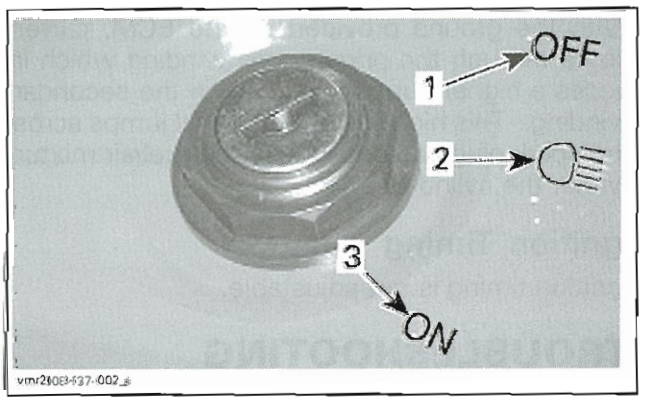
⚠ WARNING

To prevent powerful electric shock while cranking engine, do not touch any of the ignition components (ignition coil, spark plug wire, etc.) nor tester leads. Also make sure that tester leads do not touch any metallic object.

IGNITION SWITCH

Ignition Switch Operation

The ignition switch is a three position switch, OFF, ON with headlights, ON without headlights.



TYPICAL
1. OFF
2. ON with headlights
3. ON without headlights

The primary function of the ignition switch is to provide a signal to the ECM of the intent to start (wake up signal) and run the engine.

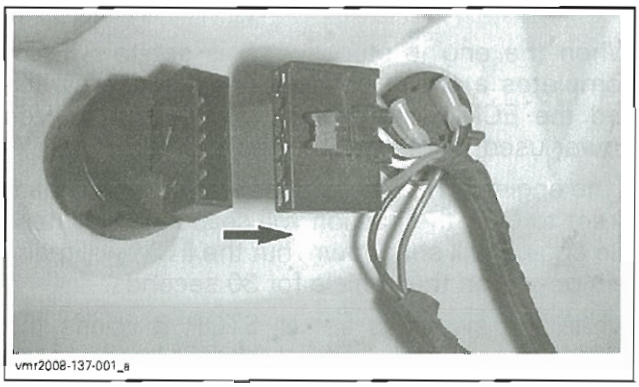
The ignition switch receives 12 Vdc directly from the ECM fuse (F1). When the ignition switch is set to ON (with or without headlights), it sends a power signal to the ECM through the engine stop switch (RUN position). This wakes up the ECM which then waits for the START switch signal to engage the starter, and control ignition timing for proper engine operation.

If the engine is running and the ignition switch is turned to the OFF position, ignition will cease immediately, the engine will shut down, but the ECM will maintain power on the vehicle for 30 seconds.

Ignition Switch Input Voltage Test

Remove console, refer to the *BODY* section.

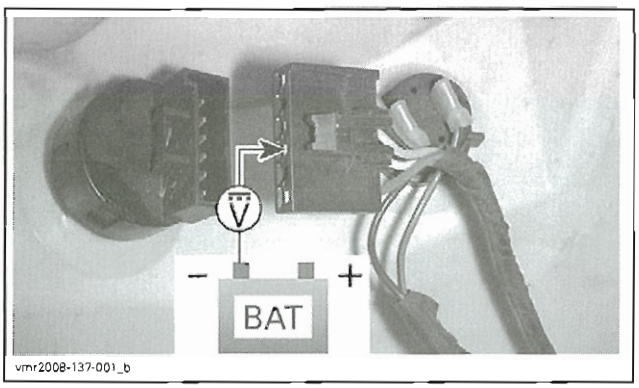
Disconnect the ignition switch connector.



Set the Fluke 111 multimeter (P/N 529 035 868) to Vdc.

Measure the ignition switch input voltage as follows.

IGNITION SWITCH INPUT VOLTAGE TEST		
IGNITION SWITCH CONNECTOR		VOLTAGE
Pin "C" (BE wire)	Battery ground	Battery voltage



IGNITION SWITCH INPUT VOLTAGE TEST

If you do not obtain battery voltage, test the following:

- Main fuse F8
- ECM fuse F1
- Wiring harness.

If ignition switch input voltage is good, test the following:

- Ignition switch continuity
- Engine stop switch
- Wiring and connectors.

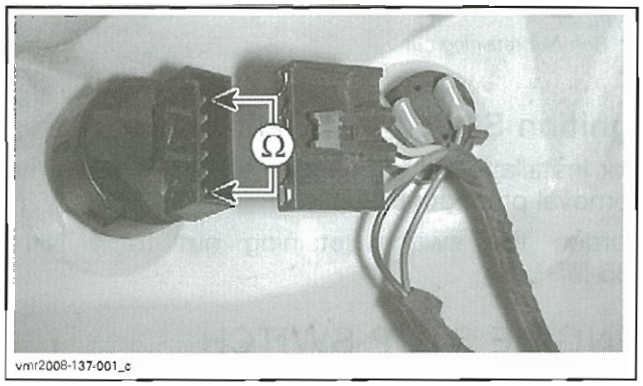
Ignition Switch Continuity Test

Set the Fluke 111 multimeter (P/N 529 035 868) to Ω.

Measure the resistance through the ignition switch between the following pins.

NOTE: Connector pins "B" and "E" are not used.

IGNITION SWITCH CONTINUITY TEST		
IGNITION SWITCH POSITION	IGNITION SWITCH PINS	RESISTANCE
OFF	Pins "A" to "F"	Infinite (OL)
	Pins "C" to "D"	
ON (w/lights)	Pins "A" to "F"	0.2 ± 0.2 Ω max.
	Pins "C" to "D"	
ON (w/o lights)	Pins "A" to "F"	Infinite (OL)
	Pins "C" to "D"	0.2 ± 0.2 Ω max.



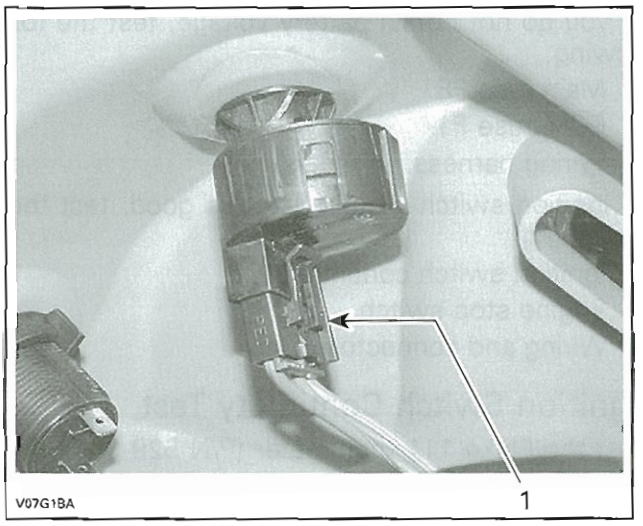
IGNITION SWITCH CONTINUITY TEST

Replace switch if defective.

Ignition Switch Removal

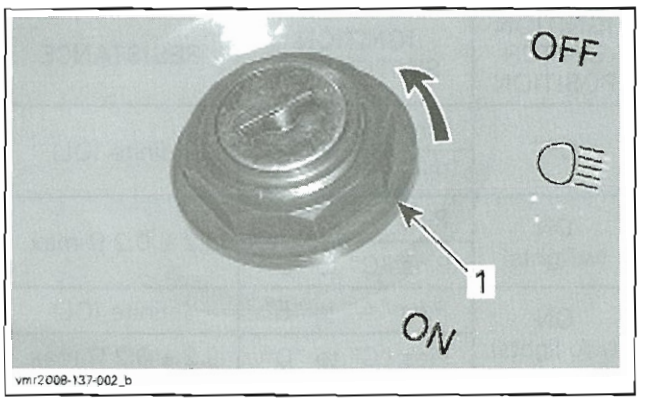
Remove the console, refer to the *BODY* section.

Disconnect the ignition switch connector.



TYPICAL
1. Disconnect ignition switch connector

While holding switch with one hand, unscrew the ignition switch retaining nut with the other.



TYPICAL
1. Remove retaining nut

Ignition Switch Installation

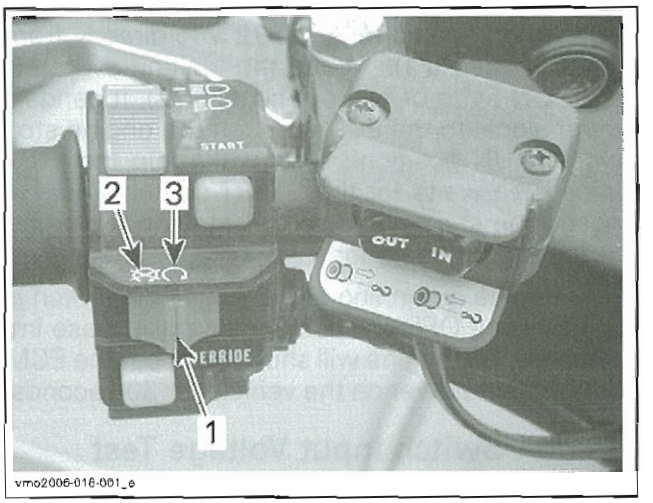
For installation of the ignition switch, reverse the removal procedure.

Torque the switch retaining nut to 4 N•m (35 lbf•**in**).

ENGINE STOP SWITCH

Engine Stop Switch Operation

The engine stop switch functions as an engine shutoff switch for a normal shutdown or for an emergency situation. It can be quickly activated without letting go of the handlebars.



1. Engine stop switch button
2. STOP position
3. RUN position

When the engine stop switch is set to RUN, it completes a circuit between the ignition switch and the ECM. This circuit provides the 12 Vdc power used to initialize the ECM.

If the engine is running and the engine stop switch is set to OFF, the ignition will cease immediately, the engine will shut down, but the ECM will maintain power on the vehicle for 30 seconds.

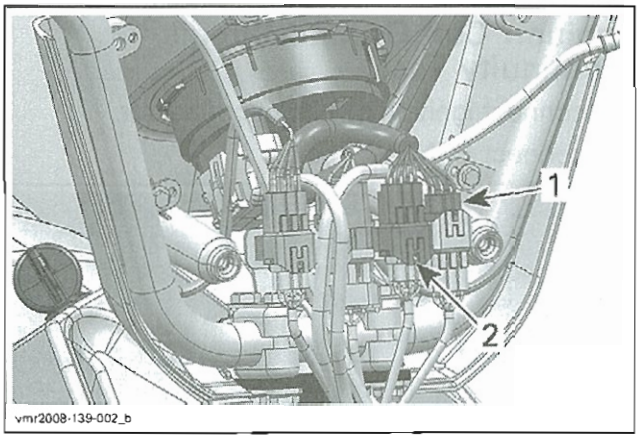
When the switch is set to STOP, it opens the 12 Vdc circuit to pin "A4" of the ECM and applies a ground to pin "K3".

If the engine stop switch is left in the STOP position when the ignition switch is turned to ON, the ECM will not be initialized, the multifunction gauge and tail light will not turn ON.

Engine Stop Switch Continuity Test

Remove the front steering cover, refer to the *BODY* section.

Disconnect the multifunction switch connectors, MG1 and MG2.

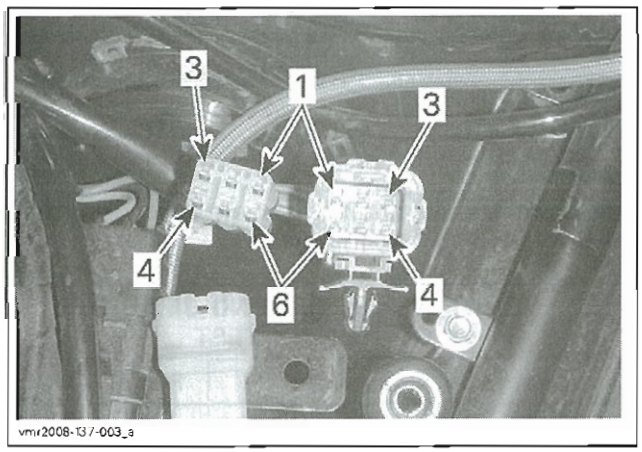


MULTIFUNCTION SWITCH CONNECTORS
1. *Disconnect MG1*
2. *Disconnect MG2*

Set the Fluke 111 multimeter (P/N 529 035 868) to Ω.

Measure the resistance through the stop switch (steering harness side) as per following table.

ENGINE STOP SWITCH CONTINUITY TEST			
POSITION	CONNECTOR		RESISTANCE
Switch to STOP	MG2 pin 3 (BK)	MG1 pin 3 (BK/WH)	1 Ω max.
	MG1 pin 1 (BR)	MG1 pin 2 (YL)	Infinite (OL)
Switch to RUN	MG2 pin 3 (BK)	MG1 pin 3 (BK/WH)	Infinite (OL)
	MG1 pin 1 (BR)	MG1 pin 2 (YL)	1 Ω max.

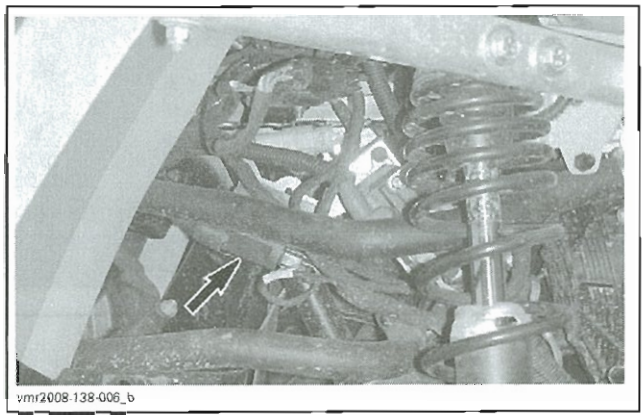


MG1 AND MG2 PIN OUT

Replace multifunction switch assembly if engine stop switch continuity test results are not as per specification.

IGNITION COIL

The ignition coil is mounted under the top RH side of the frame, along the steering column, in front of the engine.



IGNITION COIL LOCATION

When troubleshooting an ignition coil problem, first carry out a spark occurrence test, refer to *SPARK PLUG* in this section.

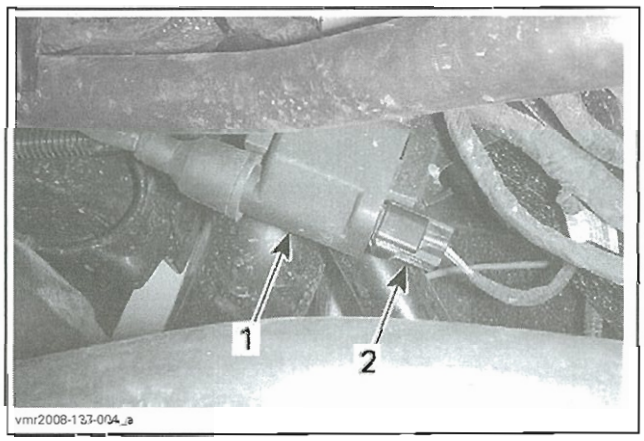
If there is no spark, carry out the coil input voltage test, then the coil resistance tests.

Ignition Coil Input Voltage Test

Ensure ignition coil is properly powered as follows.

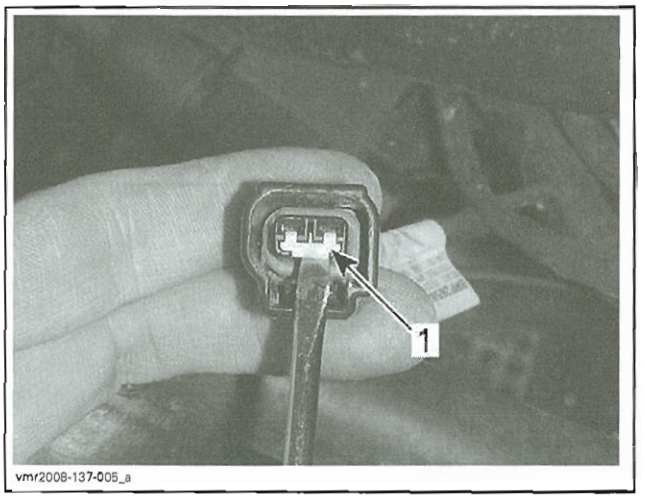
Remove RH inner fender. Refer to the *BODY* section.

Disconnect the ignition coil input connector.



1. *Ignition coil*
2. *Coil input connector*

Using a small screwdriver, remove the plastic connector pin lock for easy access to pins.



1. Remove plastic pin lock

Set the Fluke 111 multimeter (P/N 529 035 868) to Vdc.

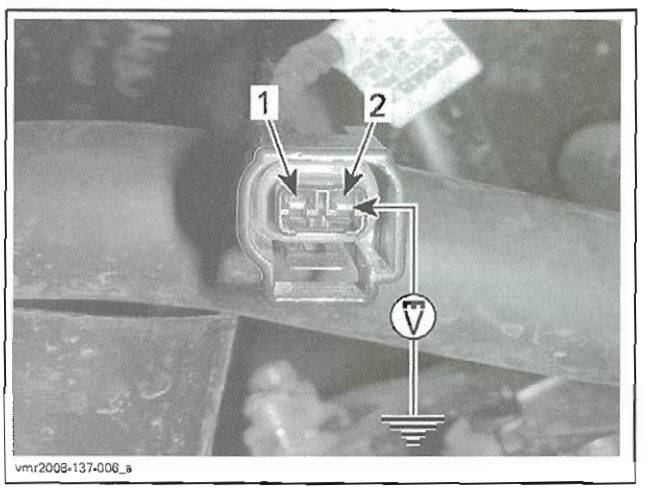
Measure battery voltage between the battery terminal on the starter solenoid and battery ground.

Set engine stop switch to RUN.

Turn ignition switch to ON.

Measure coil input voltage as follows.

IGNITION COIL INPUT VOLTAGE TEST	
IGNITION COIL CONNECTOR	VOLTAGE
Pin 2 with chassis ground	Battery voltage



IGNITION COIL INPUT VOLTAGE TEST
1. Pin 1 (VIOLET/BLUE)
2. Pin 2 (BROWN/ORANGE)

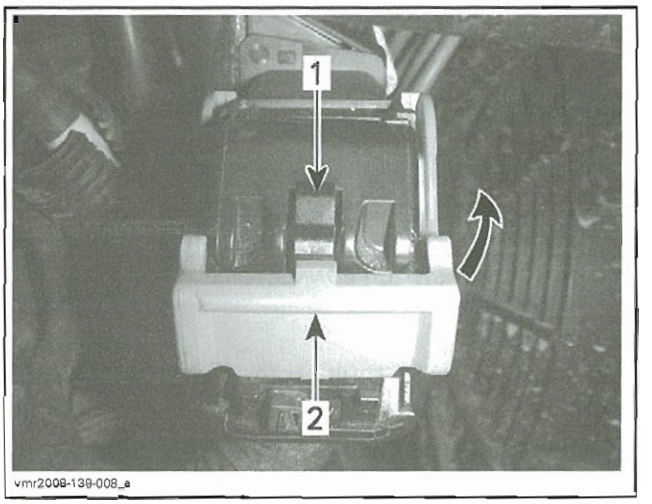
If you did not read battery voltage, check continuity of the ignition coil input circuit.

If battery voltage was read, disconnect the ECM connector and check continuity of the ignition coil ground circuit.

Ignition Coil Ground Circuit Continuity Test

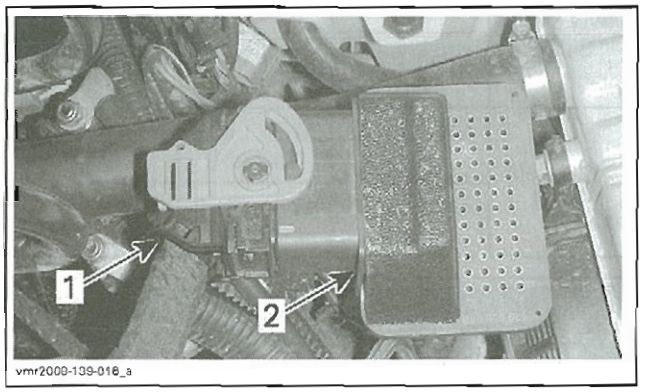
Disconnect ignition coil input connector.

Disconnect ECM connector.



1. Press to release connector lock
2. Push to rotate connector lock upwards

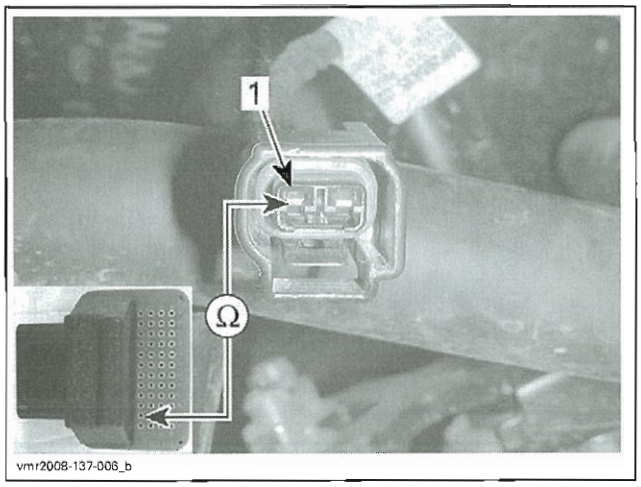
Install the ECM connector onto the ECM adapter tool (P/N 529 036 085).



1. ECM connector
2. Adapter tool

Measure for continuity through the coil ground wire to the ECM as follows.

IGNITION COIL GROUND CIRCUIT CONTINUITY TEST		
TEST PROBES		RESISTANCE
Coil input connector pin 1	ECM pin M1	Close to 0 Ω



COIL GROUND CIRCUIT CONTINUITY TEST
1. Pin 1 (BROWN/ORANGE)

Ignition Coil Resistance Tests

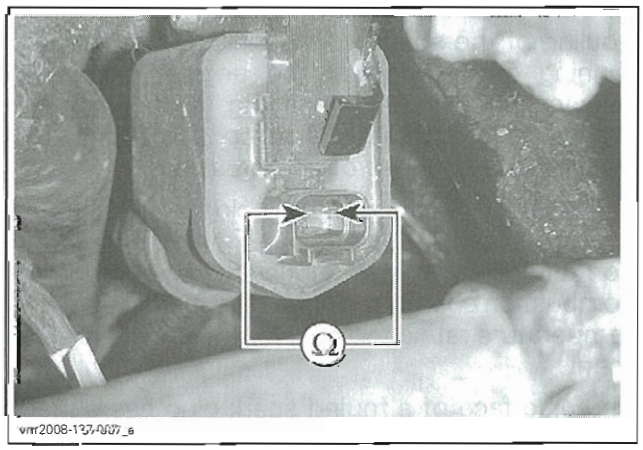
NOTE: An ignition coil with good resistance measurements can still be faulty. Voltage leak can occur at high voltage levels which is not detectable with an ohmmeter. Replacing the ignition coil may be necessary as a test.

Primary Winding Resistance Test

Disconnect the ignition coil input connector.

Set the Fluke 111 multimeter (P/N 529 035 868) to Ω and test the coil resistance as follows.

IGNITION COIL PRIMARY WINDING RESISTANCE TEST		
IGNITION COIL INPUT CONNECTOR		RESISTANCE @ 20°C (68°F)
Pin 1	Pin 2	0.63 ± 0.03 Ω



COIL PRIMARY WINDING RESISTANCE TEST

If the primary coil resistance is not within specification, replace the ignition coil.

If it tests good, test the secondary winding resistance.

Secondary Winding Resistance Test

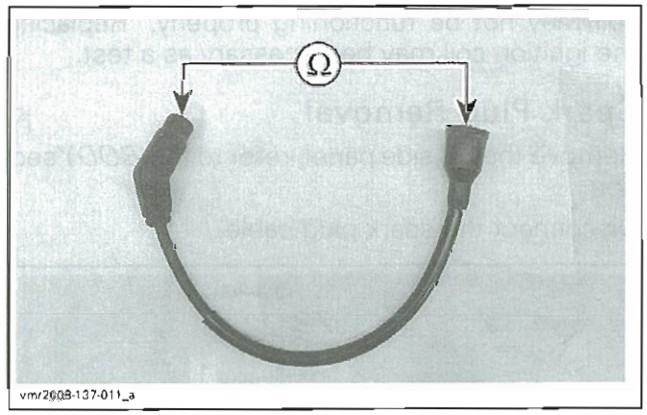
A resistance test of the ignition coil secondary winding is not possible due to internal circuitry.

Spark Plug Cable Resistance Test

Disconnect the spark plug cable from the spark plug and the ignition coil.

Measure resistance through the cable.

SPARK PLUG CABLE		RESISTANCE @ 20°C (68°F)
Coil side	Spark plug side	5 KΩ ± 1 KΩ



SPARK PLUG CABLE RESISTANCE TEST

If resistance value obtained is not close to value specified, or cable shows signs of deterioration, replace spark plug cable.

SPARK PLUG

Testing for Spark Occurrence

⚠ WARNING

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

Use an approved inductive type spark tester to test for ignition. Follow spark tester manufacture procedures.

Remove the LH side panel for access to the spark plug and spark plug cable.

Turn ignition switch to ON.

Set engine stop switch to RUN.

Press and hold the start button.

If nothing happens when the start button is pressed, refer to the *STARTING SYSTEM* section.

If the starter rotates the engine and there is no spark indicated by the tester, follow the ignition system troubleshooting sequence as indicated.

If the inductive spark tester indicates ignition to the spark plug, install a new spark plug.

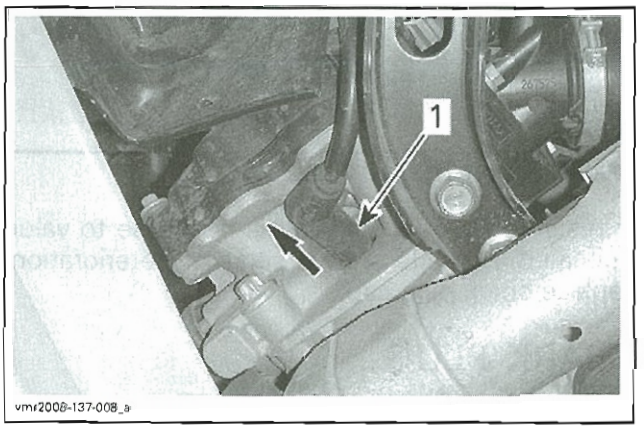
If a known good spark plug does not solve the problem, continue testing the other system components. The ignition spark may not be correct due to other system components being out of tolerance.

NOTE: Keep in mind that even if there is a spark during this static test, the voltage requirement to produce a spark in the combustion chamber is higher when the engine is running. The ignition coil may not be functioning properly. Replacing the ignition coil may be necessary as a test.

Spark Plug Removal

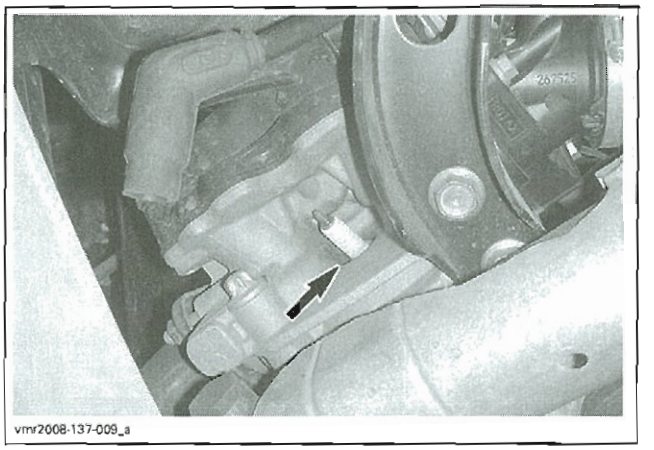
Remove the LH side panel, refer to the *BODY* section.

Disconnect the spark plug cable.



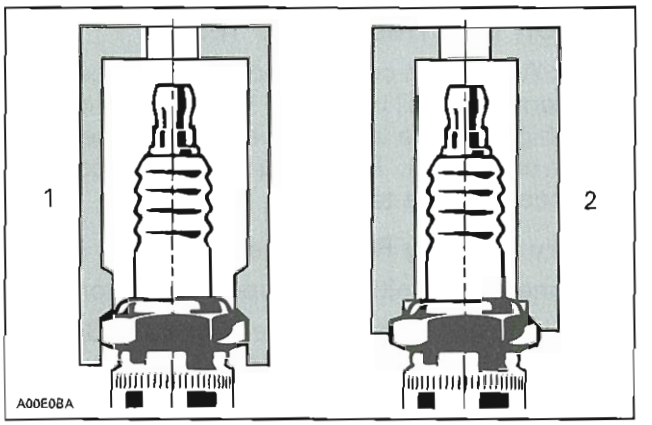
1. Remove spark plug cable

Clean the area around the spark plug with pressurized air.



CLEAN AREA AROUND SPARK PLUG

Using an approved spark plug socket, release the spark plug torque.



1. Proper socket
2. Improper socket

Remove wrench and socket from the spark plug and unscrew it by hand.

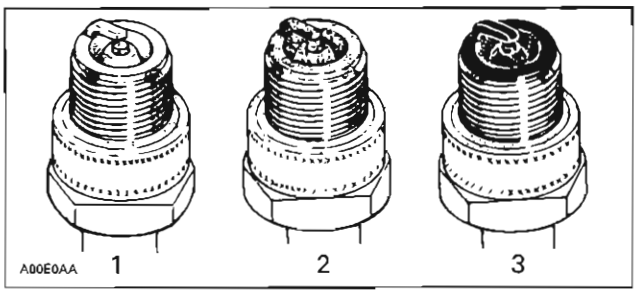
Troubleshooting a Fouled Spark Plug

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

Other possible causes are: a clogged air filter, incorrect or bad fuel, defective ignition system, incorrect spark plug gap, lubricating oil entering the combustion chamber, or use of a spark plug with a temperature rating too cold for the engine requirement.

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

Spark Plug Analysis



TYPICAL
1. *Overheated (light 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 prescribed intervals, examining the plug face (i.e. the part of the plug projecting into the combustion chamber).

Spark Plug Installation

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

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

- Using a wire type feeler gauge, set the electrode gap to 0.7 – 0.8 mm (.028 – .032 in).
- Apply a light coat of heat sink paste (P/N 420 897 186) over the spark plug threads and gasket.
- Hand screw spark plug into cylinder head until it bottoms out.
- Torque spark plug to 20 N•m (15 lbf•ft) using an approved spark plug socket and torque wrench.
- Apply Super lube (P/N 293 550 030) to the electrical contact inside the spark plug cap before installing it on the spark plug.

CHARGING SYSTEM

SERVICE TOOLS

Description	Part Number	Page
Fluke 111 multimeter	529 035 868	269, 271

SERVICE TOOLS – OTHER SUPPLIER

Description	Part Number	Page
Extech inductive ammeter	380941	270
Electro Specialties battery load tester	710	272

SERVICE PRODUCTS

Description	Part Number	Page
dielectric grease	293 550 004	273–274

GENERAL

SYSTEM DESCRIPTION

The purpose of the charging system is to keep the battery at a full state of charge.

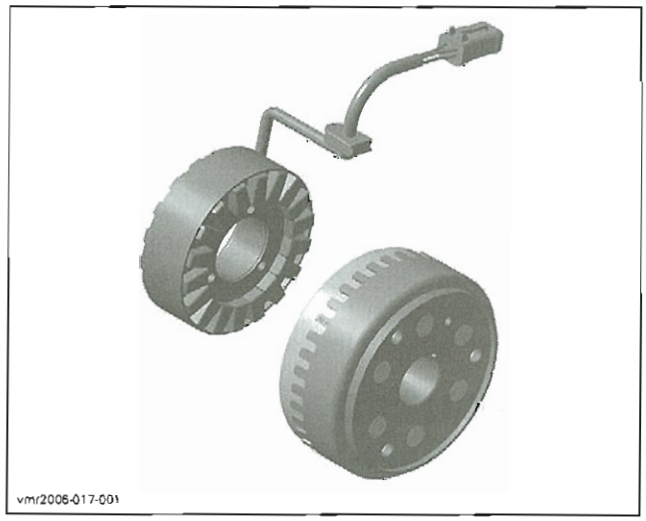
NOTE: For an overview of the vehicle electrical system, refer to *ENGINE MANAGEMENT SYSTEM* section.

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.



TYPICAL

Voltage Regulator

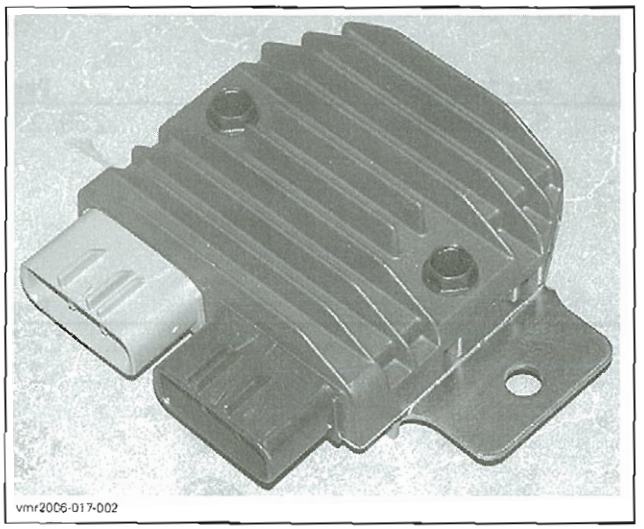
The regulator receives AC current from the magneto and transforms it into direct current (DC).

The voltage regulator output voltage is distributed as follows:

- 30 A main fuse
- 30 A Fan/Accessories fuse
- Battery.

The voltage regulator limits voltage to prevent any damage to electrical components.

MODEL	VOLTAGE Vdc
400 EFI	14.8



TYPICAL

NOTE: If the battery will not stay charged, the problem can be any of the charging system components. If these all test good, try a new voltage regulator.

Battery

The battery supplies DC power to the electric starter for cranking the engine. During engine starting, it also supplies DC power to every electrical and electronic systems 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.

PROCEDURES

It is good practice to check for fault codes using the B.U.D.S. software as a first troubleshooting step. Refer to *MONITORING SYSTEM/FAULT CODES* section.

NOTE: First, ensure the battery is in good condition prior to performing the following tests.

VOLTAGE REGULATOR

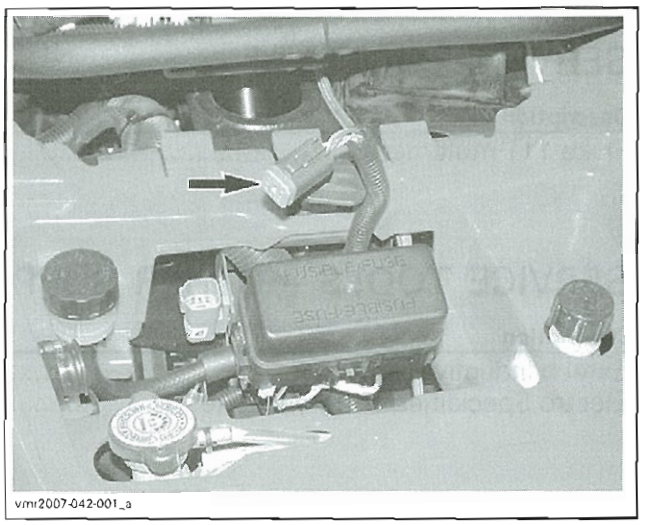
Voltage Regulator Continuity Test

Due to internal circuitry, there is no static test available.

Voltage Test Using B.U.D.S.

Remove the front storage cover, refer to *BODY* section.

Remove the diagnostic connector from its storage cap.



DIAGNOSTIC CONNECTOR

Connect to the latest B.U.D.S. software, refer to *COMMUNICATION TOOLS/B.U.D.S. SOFTWARE* section.

Start engine.

⚠ WARNING

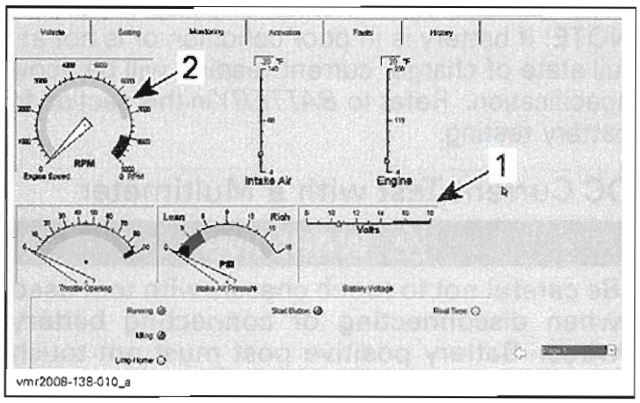
Before starting engine, make sure parking brake is set and transmission is selected to park "P" or neutral "N". Failure to comply with this procedure may result in equipment damage, severe injury and possibly loss of life.

In B.U.D.S., select Read Data.

Select the Monitoring tab.

On the monitoring page, read the 12 Vdc system voltage on the Battery Voltage meter and the engine RPM on the Engine Speed indicator as per following table.

TEST ENGINE SPEED	VOLTAGE
4000 RPM	14.4 - 15.2 Vdc



TYPICAL
1. *Voltage indication*
2. *RPM indication*

If voltage is below specification, test the following:
- Voltage regulator ground wire continuity
- Stator (refer to *MAGNETO/STARTER*)
- Wiring and connectors.

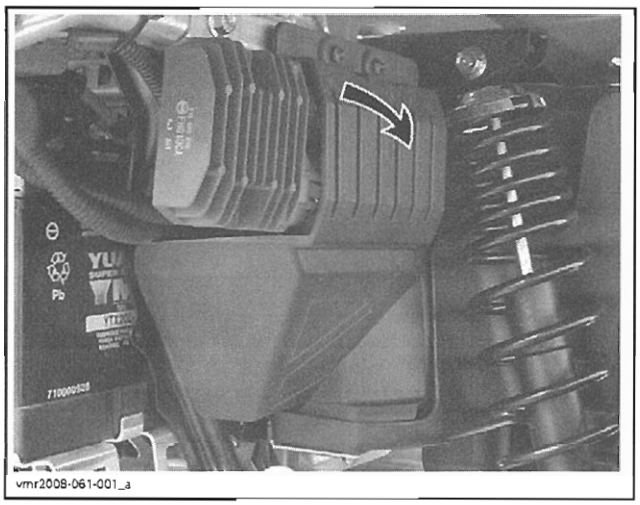
If voltage is above specification, replace voltage regulator.

Install all removed parts and connectors.

Voltage Test with a Multimeter

Proceed as follows:

Remove starter solenoid cover.

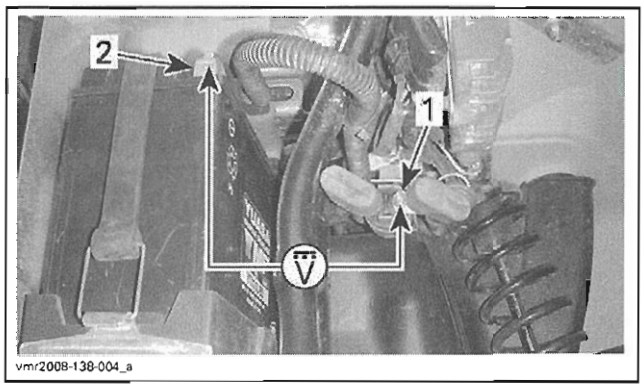


STARTER SOLENOID COVER REMOVAL

Pull back red rubber boot from starter solenoid (battery terminal).

Set Fluke 111 multimeter (P/N 529 035 868) to Vdc scale.

Connect the multimeter between the solenoid battery terminal and the negative battery post.



CHARGING SYSTEM VOLTAGE TEST
1. *Solenoid battery terminal*
2. *Negative battery post*

Start engine.

Read voltage as follows.

CHARGING SYSTEM VOLTAGE TEST	
TEST ENGINE SPEED	VOLTAGE
4000 RPM	14.4 - 15.2 Vdc

If voltage is above specification, replace voltage regulator.

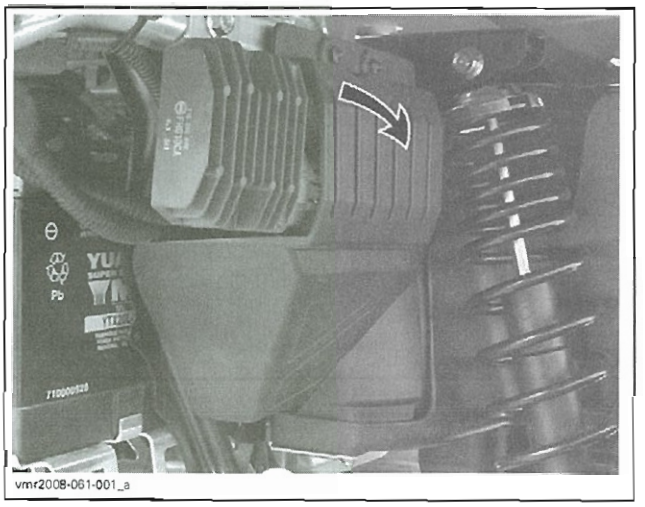
If voltage is below specification, test the following:
- Battery cable from voltage regulator to starter solenoid
- Voltage regulator ground wire continuity
- Stator (refer to *MAGNETO/STARTER*)
- Wiring and connections from stator to voltage regulator.

Remove multimeter and install red rubber boot over solenoid battery terminal.

Reinstall starter solenoid cover.

DC Current Test with an Inductive Ammeter

Remove starter solenoid cover.

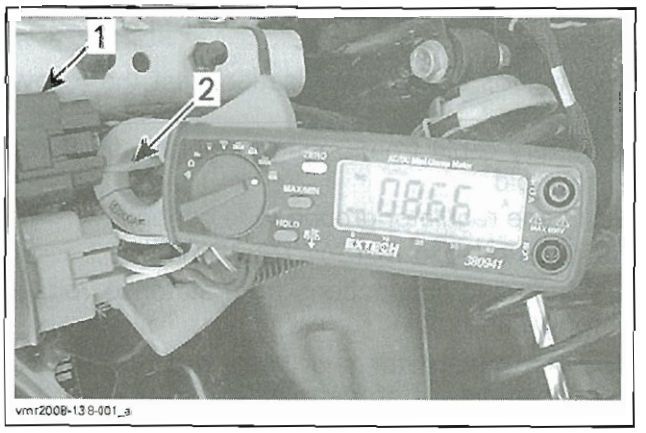


STARTER SOLENOID COVER REMOVAL

Use an inductive ammeter such as theExtech inductive ammeter (P/N 380941) or equivalent.

Turn on the ammeter and select Adc.

Locate the RED wire of the voltage regulator (voltage output) and clamp the ammeter over it.



DC CURRENT TEST WITH INDUCTIVE AMMETER
1. *Output connector of voltage regulator*
2. *Ammeter clamped over RED wire*

Start engine.

Read current.

TEST ENGINE SPEED	CURRENT
4000 RPM	Approx. 8.5 A

NOTE: Current reading may be higher depending on battery state of charge, and accessory loads applied.

If current reading is far below specification, test magneto (stator) output prior to concluding that voltage regulator is faulty.

NOTE: If battery is in poor condition or is not at a full state of charge, current reading will be above specification. Refer to *BATTERY* in this section for battery testing.

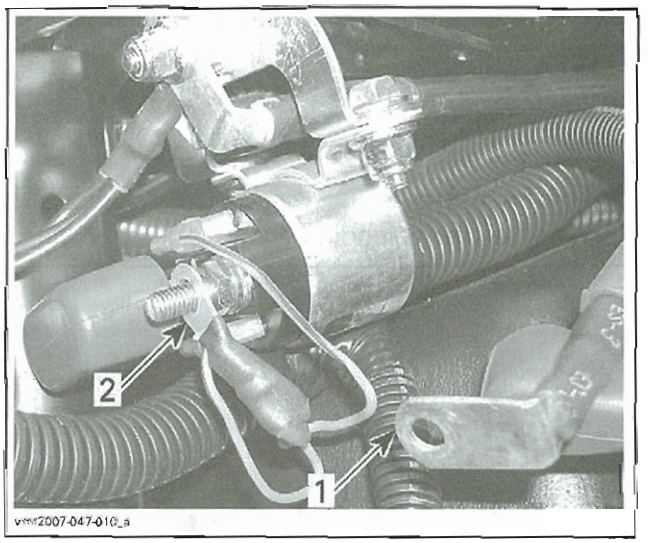
DC Current Test with a Multimeter

⚠ WARNING

Be careful not to touch chassis with tool used when disconnecting or connecting battery wires. Battery positive post must not touch chassis when moving battery. Pay particular attention to the battery support mounting bolt near the battery positive terminal in the forward end of the battery support.

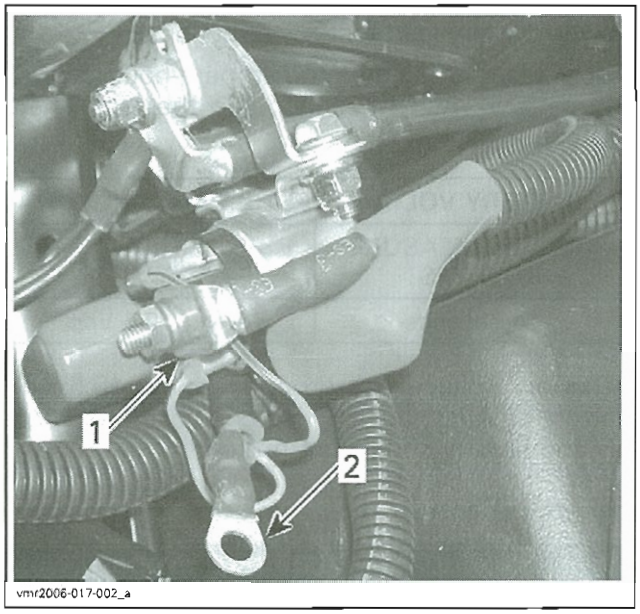
Disconnect the BLACK (-) negative battery cable from the battery.

Disconnect the RED (+) battery cable and the RED voltage regulator wire from the starter solenoid.



TYPICAL
1. *Remove battery cable*
2. *Remove this terminal lug with the RED voltage regulator wire*

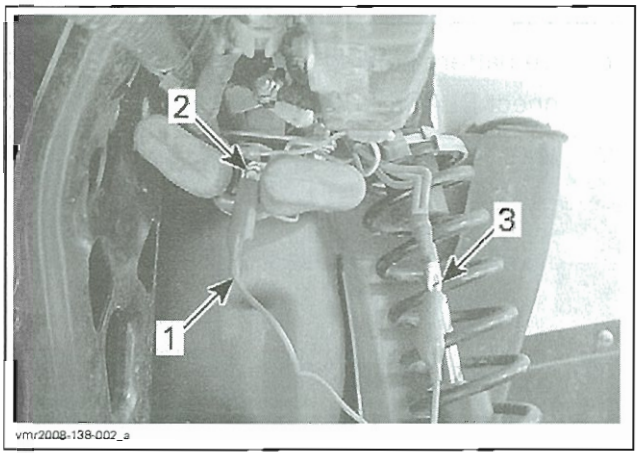
Reconnect battery cable to starter solenoid.



1. Battery cable installed
2. Voltage regulator wire disconnected

Reconnect the BLACK (-) negative battery cable to the battery.

Connect a jumper wire between the disconnected voltage regulator wire and the solenoid battery terminal.



1. Jumper wire
2. Starter solenoid battery terminal
3. Voltage regulator wire

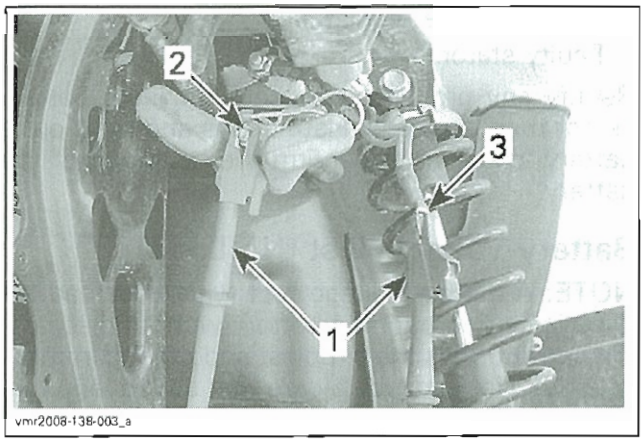
CAUTION: During engine starting, current draw is above the multimeter function capacity (10 Adc). Connect multimeter after engine is started, otherwise it would be in OVERLOAD possibly resulting in equipment damage.

Start engine.

Remove the jumper wire.

Set Fluke 111 multimeter (P/N 529 035 868) to Adc.

Connect multimeter probes between voltage regulator wire and the disconnected solenoid battery terminal.



DC CURRENT TEST WITH MULTIMETER
1. Multimeter probes
2. Starter solenoid battery terminal
3. Voltage regulator wire

Read current as follows.

TEST ENGINE SPEED	CURRENT
4000 RPM	Approx. 3 - 7 A

If current is below specification, test magneto (stator) output prior to concluding that regulator is faulty.

NOTE: If battery is in poor condition or is not at a full state of charge, current reading will be above specification. Refer to *BATTERY* in this section for battery testing.

Properly reconnect voltage regulator wire to starter solenoid.

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.

Troubleshooting

Weak or Discharged Battery

If you have a frequently weak or discharged battery, check for the following:

- Battery posts or cable terminal loose or oxidized
- Faulty battery (does not keep a full charge)
- Loose or bad starter solenoid connections

- Loose or bad engine and chassis ground connections
- Faulty system wiring or connections
- Faulty voltage regulator
- Faulty stator.

Rectify any problem identified, recharge battery as per manufacturers instructions and carry out a battery load test to confirm the condition of the battery.

Battery Voltage Test (No Load)

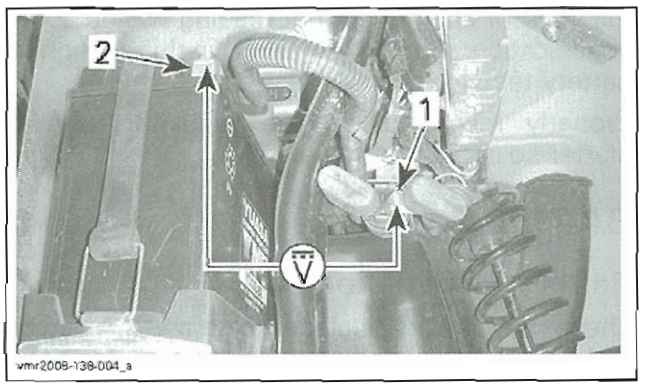
NOTE: A battery voltage test without a load applied is carried out on a battery without discharging current. It is the simplest and most commonly used. However, be aware that the voltage test can indicate that the battery is in good condition even though the battery does not have enough power to crank the engine. A load test gives a more accurate indication of the condition of the battery.

Check the charge condition using a multimeter.

With a multimeter, voltage readings appear instantly to show the state of charge.

If the battery has just received a charge, allow it to rest for 1 - 2 hours before taking a voltage reading.

Set multimeter to Vdc and connect between the battery negative terminal and the starter solenoid battery terminal. Always respect polarity.



BATTERY VOLTAGE TEST
1. *Solenoid battery terminal*
2. *Battery negative terminal*

FULLY CHARGED BATTERY VOLTAGE
12.5 Vdc minimum

Battery Voltage Test (Load Applied)

This is the best test used to determine the condition of the battery. Use a load testing device such as the Electro Specialties battery load tester (P/N 710). It has a 500 A carbon pile adjustable load.

Follow battery load tester instructions.

Apply a load of 3 times the ampere-hour rating of the battery. At 14 seconds into the test, check battery voltage.

BATTERY VOLTAGE TEST (LOAD APPLIED)	
TIME TO MEASURE INTO TEST	VOLTAGE
14 seconds	Min. 10.5 Vdc

If battery voltage has dropped below 10.5 Vdc, battery storage capacity has decreased appreciably and battery should be replaced.

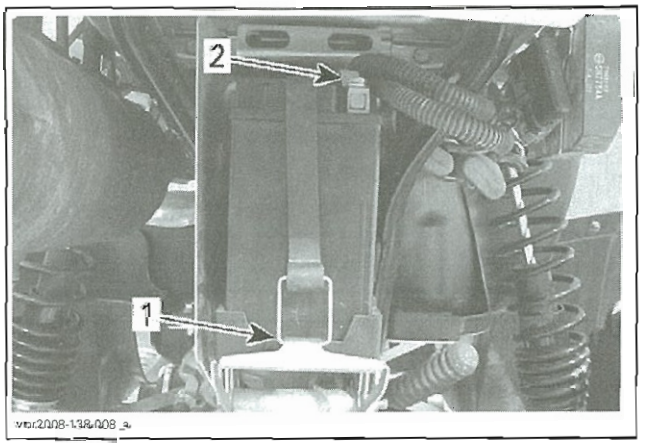
Battery Removal

⚠ WARNING

Always disconnect BLACK (-) cable first. This will open the battery circuit and remove the possibility of causing a spark, or a short circuit with the vehicle when disconnecting the RED (+) battery cable. Electrolyte or fuel vapors can be present and a spark may ignite them, possibly causing an explosion which could result in severe personal injuries, or death.

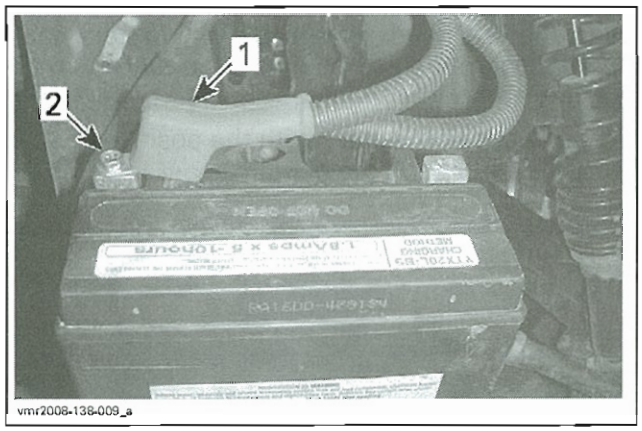
Remove battery holding strap.

Disconnect BLACK (-) cable.



1. *Remove battery holding strap*
2. *Disconnect BLACK (-) battery cable*

Pull back battery to reach the RED (+) cable battery posts.

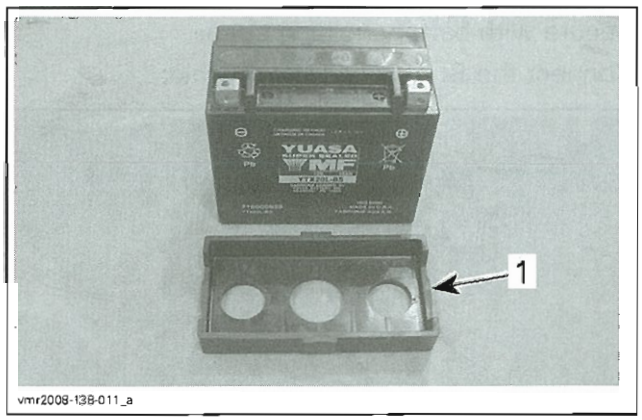


1. Pull back RED rubber boot
2. Disconnect RED (+) battery cable

Pull back the red rubber boot and disconnect the RED (+) battery cable.

Remove battery from support.

If replacing battery, remove the battery insulator pad.



1. Battery insulator pad

Battery Cleaning

With the battery removed from vehicle, clean the battery rack, insulator pad, cables and battery posts using a solution of baking soda and water.

Remove corrosion (if present) from battery cable terminals and battery posts using a firm wire brush. Rinse thoroughly with clear water and dry using a clean cloth.

Apply a light coat of dielectric grease (P/N 293 550 004) on terminals.

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.

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.

CAUTION: 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.

Perform a *BATTERY UNLOADED TEST*.

An automatic charger is a fast and convenient way for error-proof charging.

Always follow the battery manufacturers charging instructions.

Battery should be charged at a slow charge rate of 1/10 its given 10 hours. capacity.

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

⚠ WARNING

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

Install the battery insulator pad on the battery.

Insert the fasteners in the battery posts.

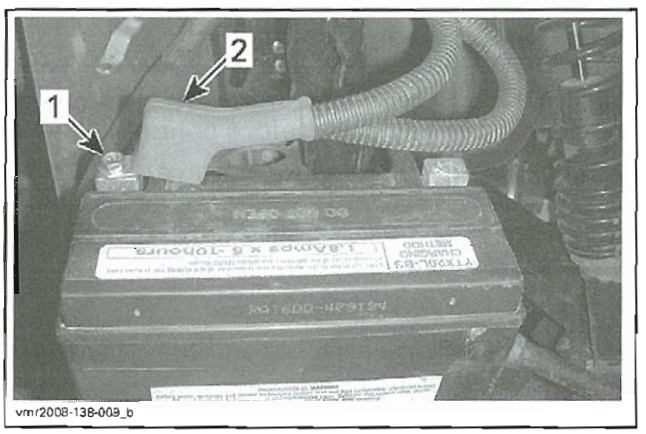
Place battery on a support behind vehicle with the positive terminal to the left.

Route the RED (+) battery cable over and in line with the battery lengthwise.

Connect the RED battery cable to the positive (+) battery post.

Apply silicone dielectric grease (P/N 293 550 004) on battery posts and connections.

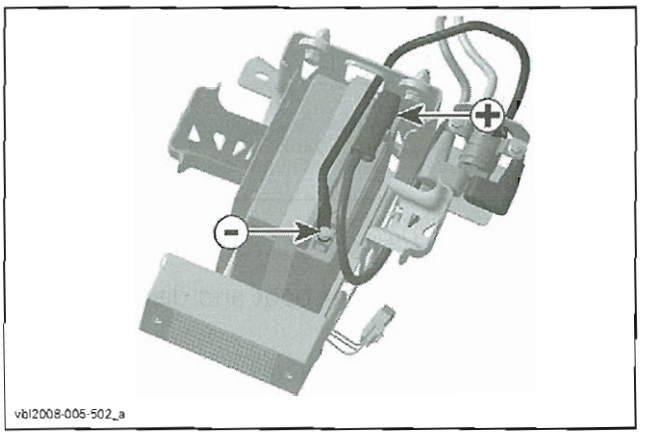
Install the red rubber boot over the battery post.



BATTERY TERMINALS FACING VEHICLE
1. *Connect RED (+) battery cable*
2. *Install red rubber boot over battery post*

With the left hand, lift the BLACK battery cable and holding strap as you insert the battery in the battery support.

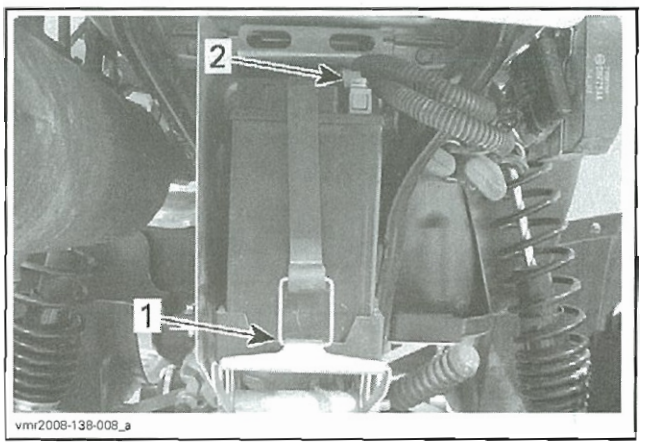
Properly position battery with the positive post towards the front and the negative post towards the rear.



BATTERY CABLE ROUTING

Secure with battery holding strap.

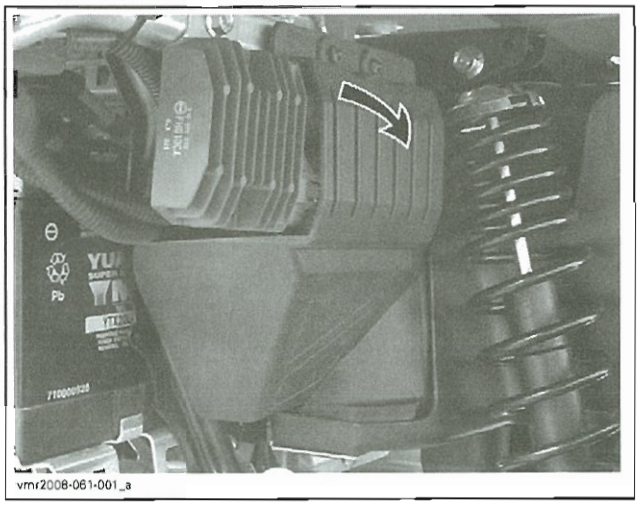
Connect the BLACK (-) battery cable.



1. *Secure with battery holding strap*
2. *Connect the BLACK (-) battery cable*

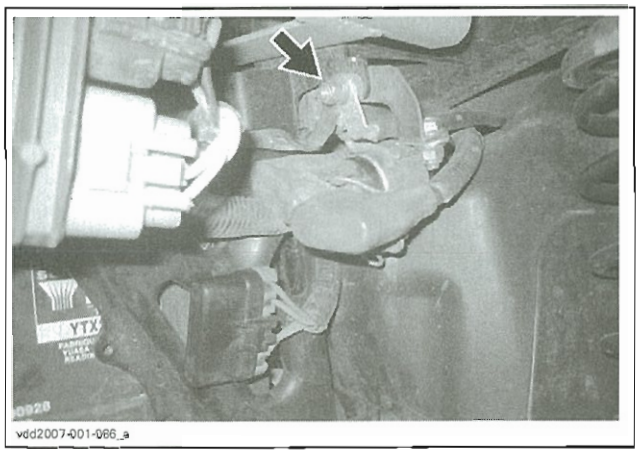
ELECTRICAL SYSTEM MAIN GROUND

Remove starter solenoid cover.



STARTER SOLENOID COVER REMOVAL

Ensure main ground connection is clean and tight.



ELECTRICAL SYSTEM MAIN GROUND

Reinstall starter solenoid cover.

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STARTING SYSTEM

SERVICE TOOLS

Description	Part Number	Page
Fluke 111 multimeter	529 035 868	279, 281–283
ECM adapter tool	529 036 085	281

GENERAL

STARTING SYSTEM OPERATION

When the START button is pressed, 12 Vdc is applied through the start switch 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 or Neutral
- Start button is pressed and held.

NOTE: The engine can be cranked by the starter when the transmission is in **High**, **Low**, or **Reverse** if either the brake lever or brake pedal is applied.

TROUBLESHOOTING

NOTE: It is good practice to check for fault codes using B.U.D.S. software as a first troubleshooting step. Refer to *MONITORING SYSTEM/FAULT CODES*.

Starter Will Not Crank Engine

No Multifunction Gauge and Taillight

If the multifunction gauge and taillight do not turn ON (assuming bulb and gauge are good), refer to *IGNITION SYSTEM* section.

Multifunction Gauge and Taillight Turn ON

If the "Engine cranking conditions" are met and the starter will not crank the engine, try a **pull start**.

If the **engine can be started** (pull start), check the following in this order:

- Battery (refer to *CHARGING SYSTEM*)
- Starter solenoid
- Start button switch
- Starter (refer to *MAGNETO/STARTER*)
- Wiring and connections.

PROCEDURES

START BUTTON

Start Button Quick Test

Set transmission lever to the PARK position.

Set engine stop switch to RUN.

Turn ignition switch ON.

Press and hold start button. The starter should start to crank the engine immediately.

NOTE: If the engine does not crank, set transmission to Neutral or apply the brakes using the brake lever or brake pedal, as you press the start button. Also confirm the gear selection indicator in the multifunction gauge displays the selected gearshift lever position.

If the starter cranks over the engine with the breaks applied, check the shifter adjustment and the gearbox position sensor and wiring. Refer to the *SHIFTER* and *GEARBOX/OUTPUT SHAFT* sections.

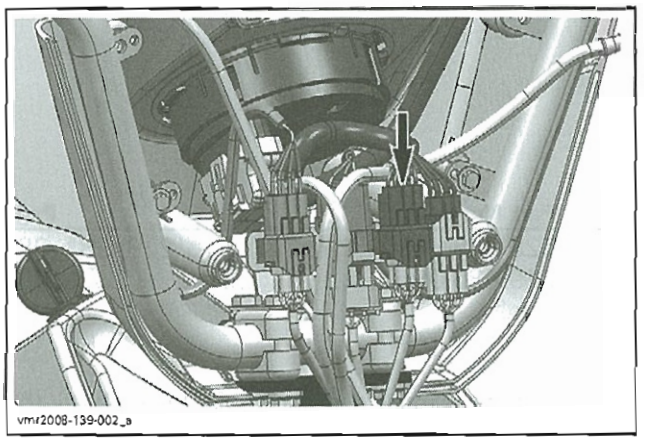
If it still does not function, test the start button continuity.

Start Button Continuity Test

If engine does not crank when pressing the start button, test the start button switch as follows.

Remove the front steering cover.

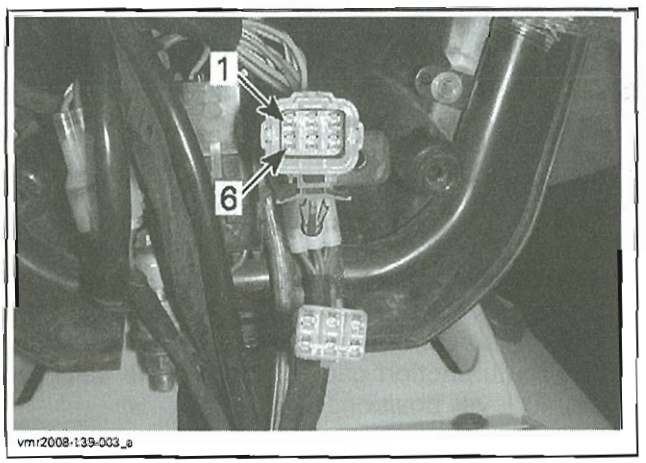
Disconnect the multifunction switch connector (MG2).



MULTIFUNCTION SWITCH CONNECTOR (MG2)

Test start button switch continuity as follows.

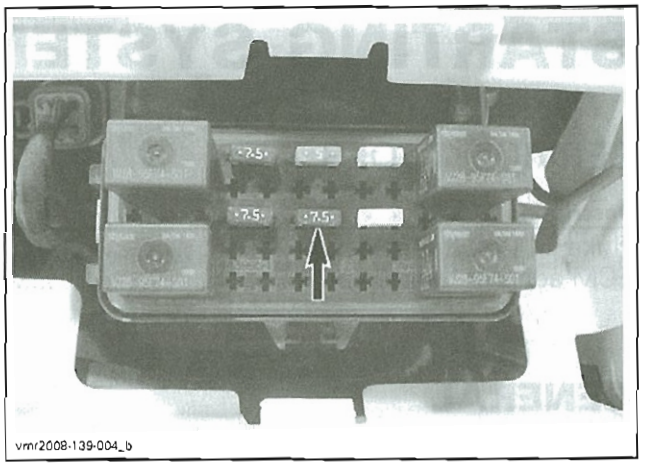
START BUTTON	MULTI-FUNCTION SWITCH CONNECTOR (MG2)	RESISTANCE
Released	Pin 6 (RD/VI) and Pin 1 (YL/RD)	Infinite (OL)
Depressed and held		0.6 Ω max.



MG2 STEERING HARNESS CONNECTOR PIN-OUT

If start switch does not test as specified, replace the multifunction switch assembly.

If start switch tests as specified, remove fuse F4.

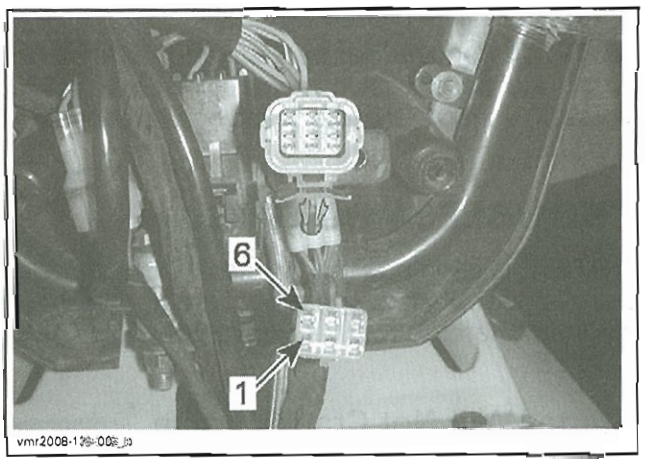


FUSE F4

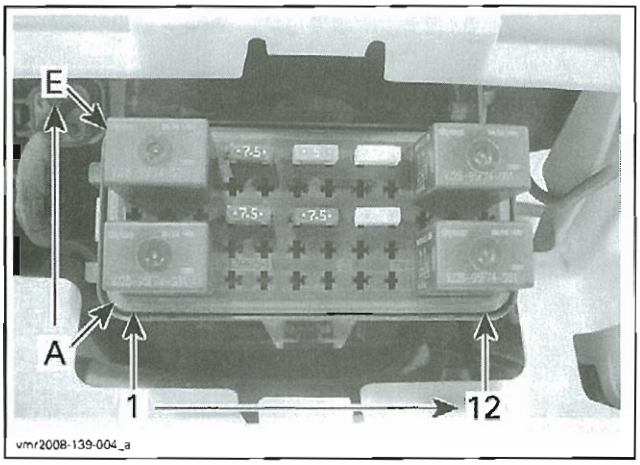
Test continuity of the following main vehicle harness wires:

- **YL/RD wire** from multifunction switch connector (MG2 contact 6) to starter solenoid
- **OR/GN wire** from MG2 (contact 1) to fuse F4 (contact 6C fuse removed).

MG2 (vehicle harness side)	TO	RESISTANCE
Pin 6 (YL/RD)	Starter solenoid YL/RD wire	Close to 0 Ω
Pin 1 (OR/GN)	Fuse F4 (contact 6C)	Approx. 1.0 Ω



MG2 VEHICLE HARNESS CONNECTOR PIN-OUT



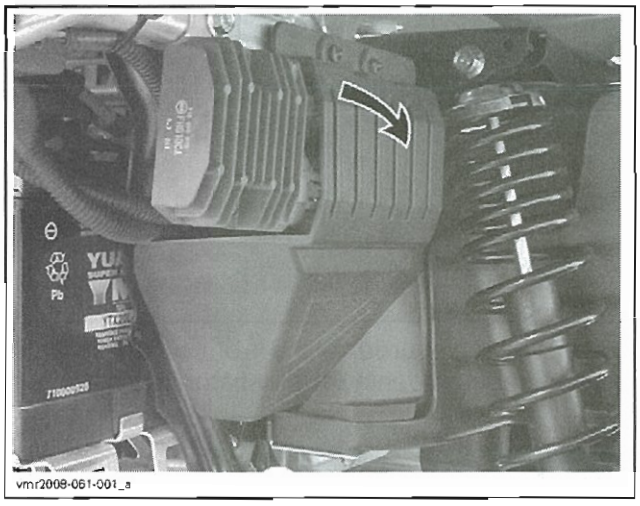
FUSE BOX PIN-OUT

Repair or replace wiring/connections.

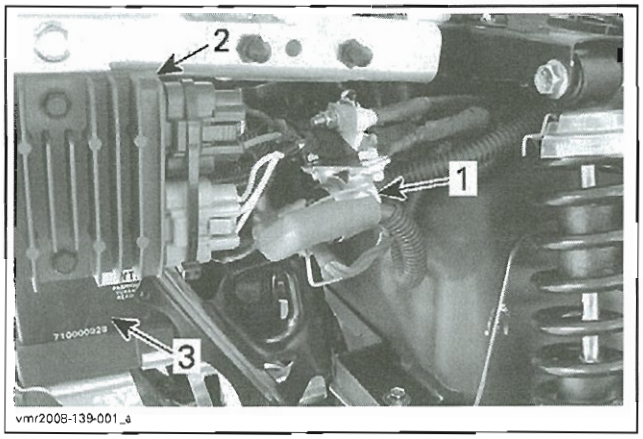
STARTER SOLENOID

The starter solenoid is located to the right of the battery, forward of the voltage regulator/rectifier.

To access the starter solenoid, remove the starter solenoid cover.



STARTER SOLENOID COVER



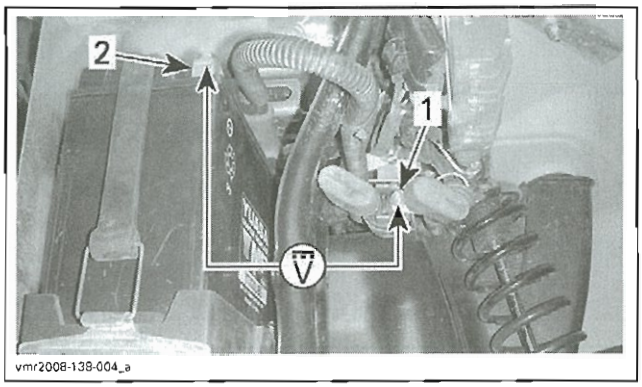
1. *Starter solenoid*
2. *Voltage regulator/rectifier*
3. *Battery*

Power Signal to Solenoid Coil Test

Set transmission to Park, or Neutral.

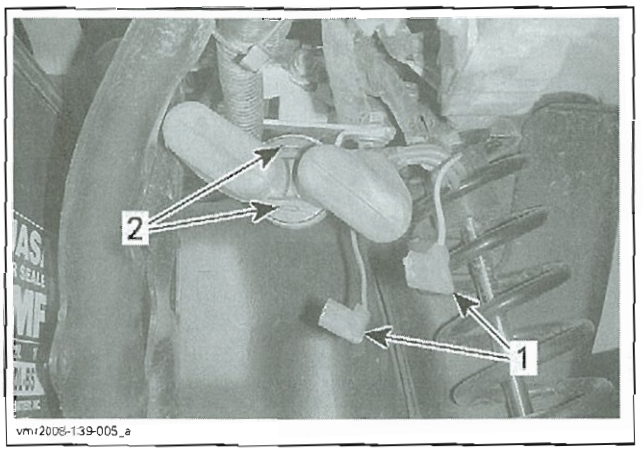
Set Fluke 111 multimeter (P/N 529 035 868) to Vdc.

Measure battery voltage between solenoid battery terminal and battery ground.



BATTERY VOLTAGE TEST
1. *Solenoid battery terminal*
2. *Battery negative (–) terminal*

Disconnect the small wires from the solenoid.

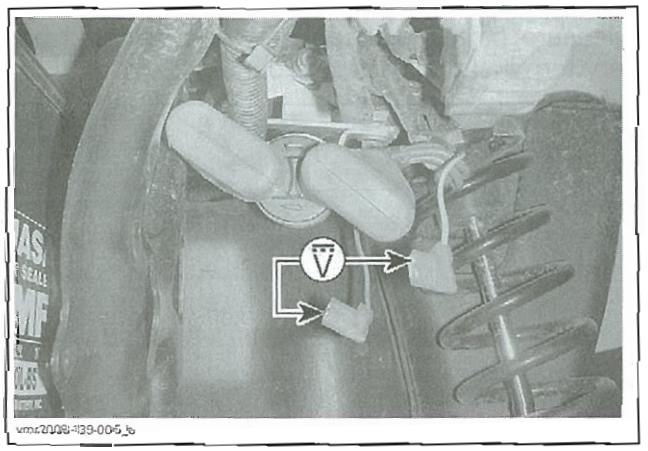


DISCONNECT SOLENOID COIL WIRES
1. *Small solenoid coil wires*
2. *Small solenoid coil terminals*

Set engine stop switch to RUN.

Turn ignition switch to ON.

Press start button and measure the voltage at the small solenoid coil wires as follows.



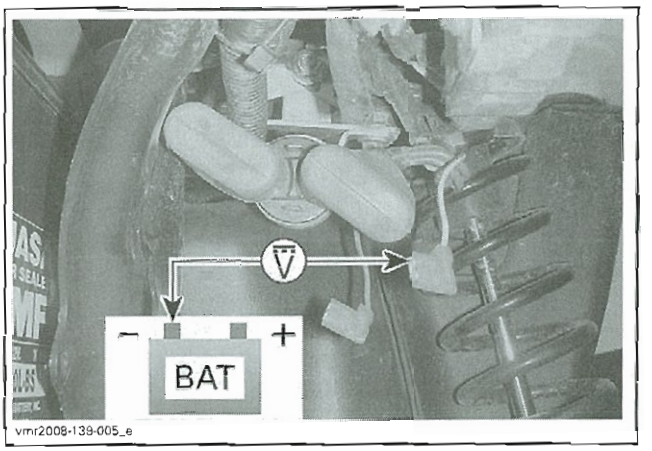
SOLENOID COIL POWER SIGNAL TEST

START BUTTON	WIRES	VOLTAGE
Released	YL/RD and OR/BR	Approx. 0 Vdc
Depressed and held		Battery voltage

If voltage is as specified, carry out a *SOLENOID CONTINUITY TEST*, see procedure in this section.

If voltage is not as specified, carry out the following voltage check.

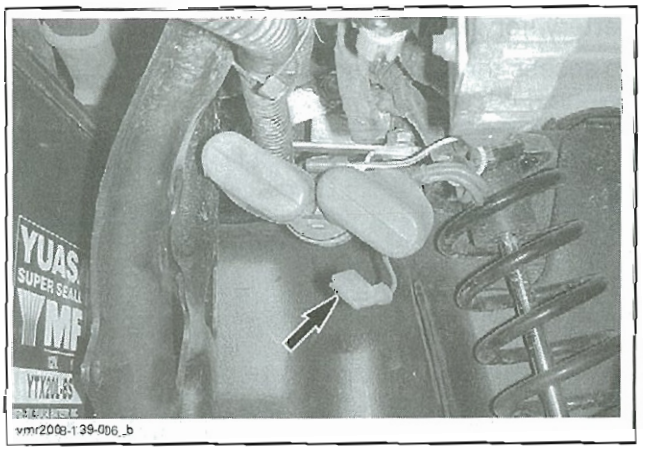
START BUTTON	WIRES	VOLTAGE
Released	YL/RD and battery ground	0 Vdc
Depressed and held		Battery voltage



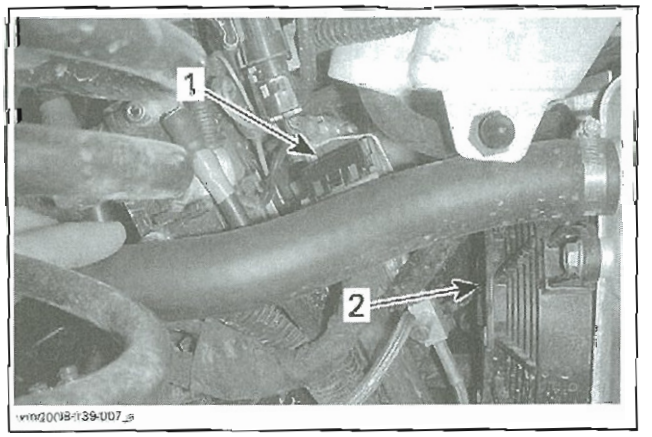
If voltage is as specified, test continuity of solenoid ground control circuit.

Solenoid Ground Control Circuit Test

Disconnect small terminal with OR/BR wire from solenoid.

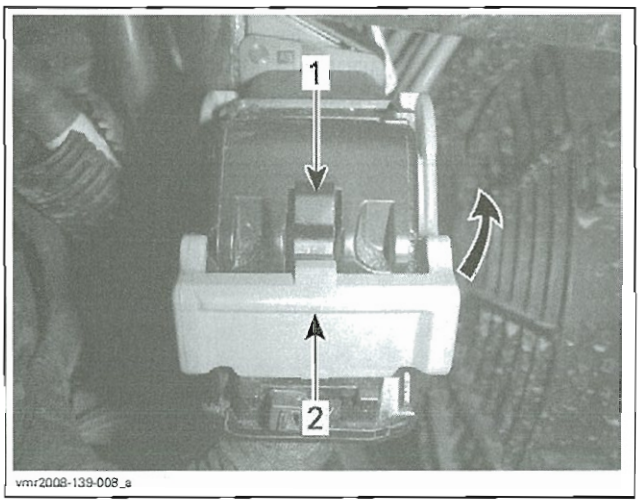


Locate ECM secured to the front of the forward frame riser, just behind the radiator cooling fan.



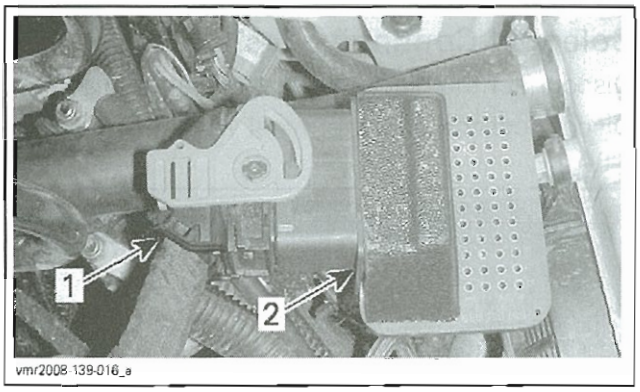
1. *ECM*
2. *Radiator cooling fan*

Disconnect ECM connector.



1. Press to release connector lock
2. Push to rotate connector lock upwards

Install the ECM connector onto the ECM adapter tool (P/N 529 036 085).

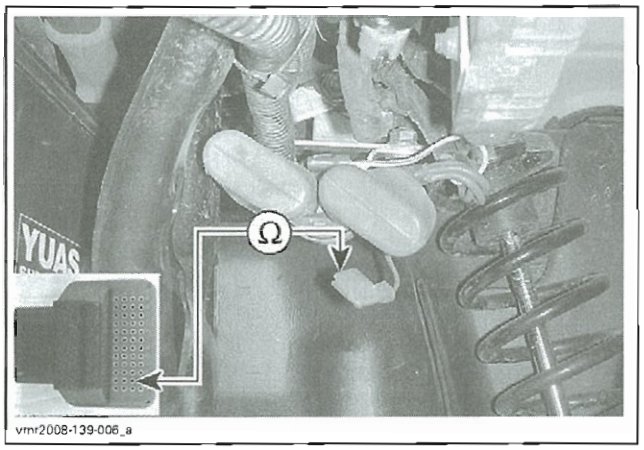


1. ECM connector
2. ECM adapter tool

Set Fluke 111 multimeter (P/N 529 035 868) to Ω.

Read resistance as follows.

SOLENOID GROUND CONTROL CIRCUIT		
TEST PROBES		RESISTANCE
Solenoid OR/BR wire	ECM pin L3	Close to 0 Ω



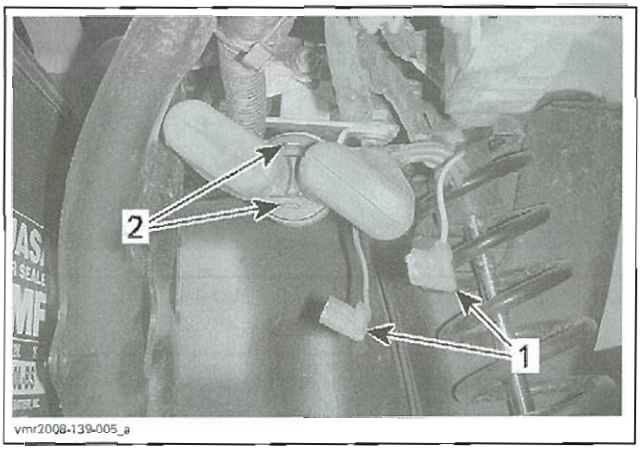
SOLENOID GROUND CONTROL CIRCUIT TEST

If resistance is not as specified, repair or replace wiring/connections.

If solenoid input circuits and ground control circuit continuity tested good, test ECM ground circuits. Refer to *ELECTRONIC FUEL INJECTION (EFI)* section.

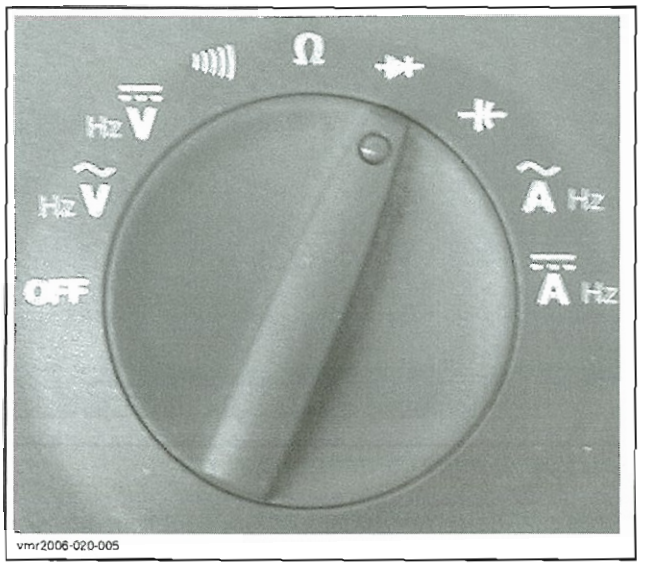
Solenoid Diode Test

Disconnect small terminals from solenoid.



1. Small solenoid coil wires
2. Small solenoid coil terminals

Use the Fluke 111 multimeter (P/N 529 035 868) and set it to the diode symbol as shown.



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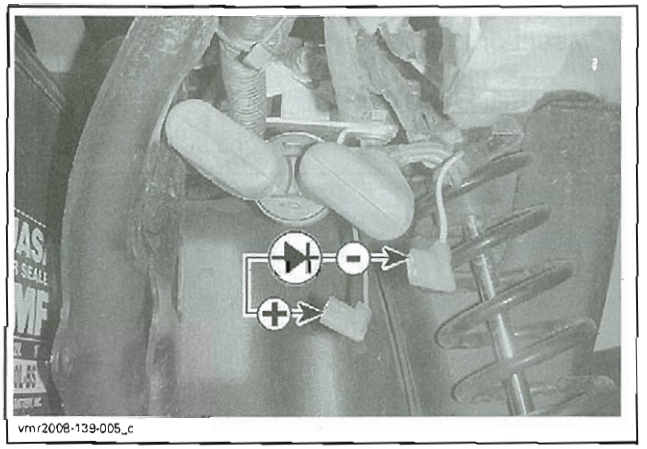
Probe wires while paying attention to the diode polarity.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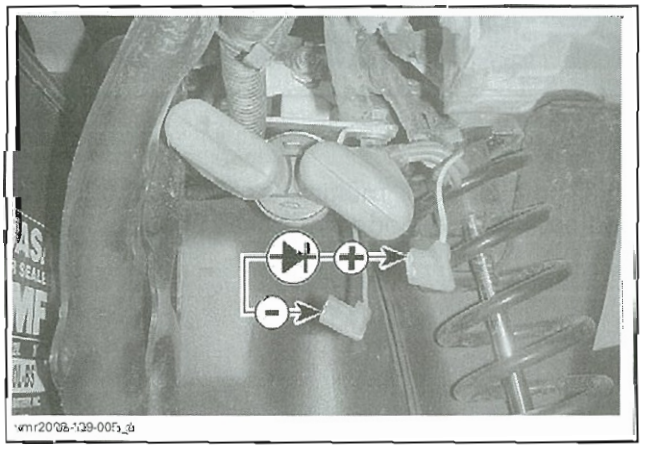
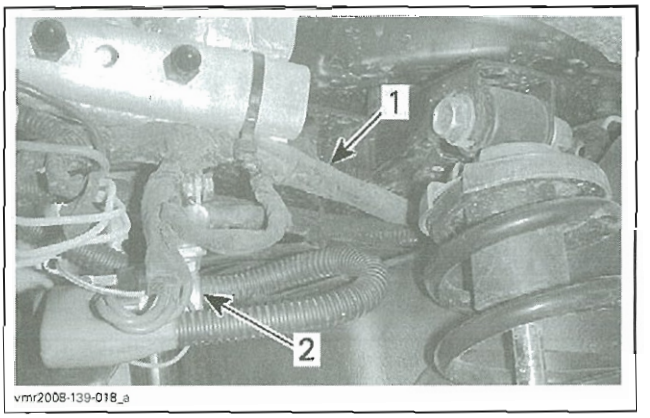
FORWARD POLARITY, MUST BE AROUND 0.5 V


vmr2008-139-005_a

REVERSE POLARITY, MUST BE OPEN CIRCUIT

If test failed, replace diode.

NOTE: Diode is located in main wiring harness near solenoid. It is approximately 22 cm (8-3/4 in) from the main fuse holder as shown in following picture.



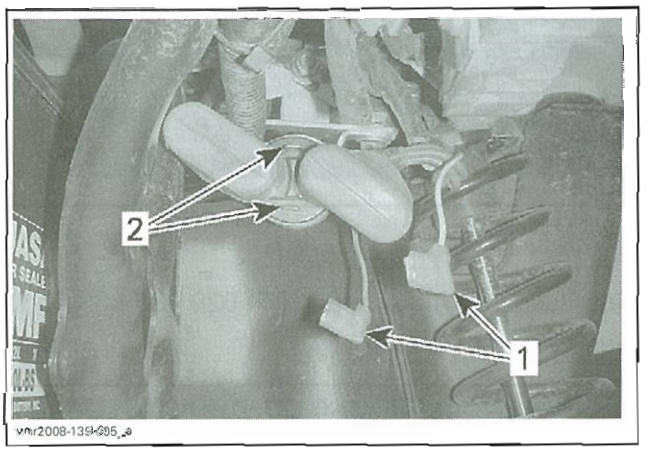
vmr2008-139-018_a

1. *D4 diode location*
2. *Starter solenoid*

Solenoid Continuity Test

Disconnect the black (-) negative battery cable.

Disconnect the small terminal wires from the solenoid.



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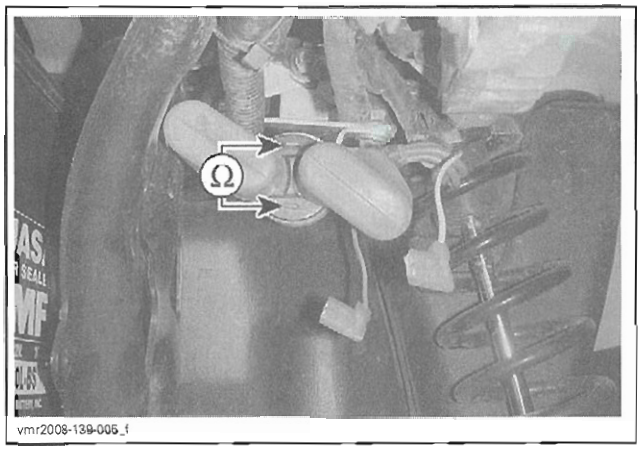
1. *Small solenoid coil wires*
2. *Small solenoid coil terminals*

Set Fluke 111 multimeter (P/N 529 035 868) to Ω.

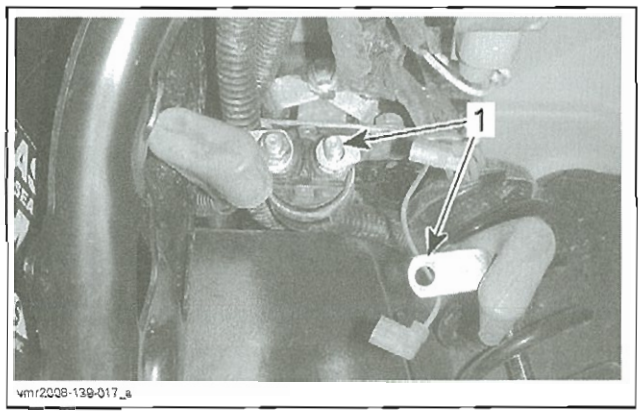
Measure solenoid coil resistance as follows.

SOLENOID TERMINALS		MEASUREMENT
		RESISTANCE @ 20°C (68°F)
A	B	Approx. 6 Ω



SOLENOID COIL CONTINUITY TEST

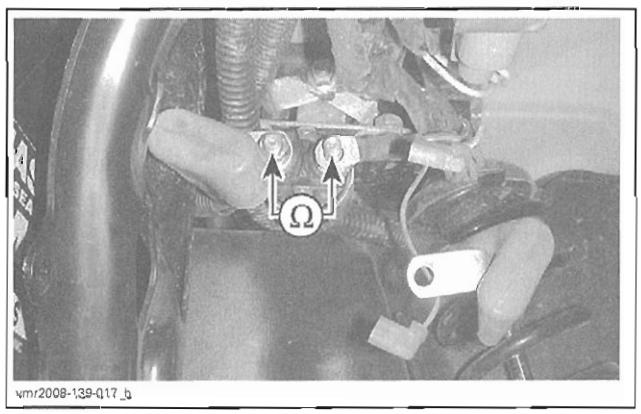
Disconnect the battery cable at the solenoid terminal.



1. Disconnect battery cable from solenoid

Test for a stuck solenoid plunger by measuring the resistance across the solenoid contacts as follows.

SOLENOID POSTS		MEASUREMENT
Battery post	Starter post	Open circuit



If any measurement is out of specification, replace solenoid.

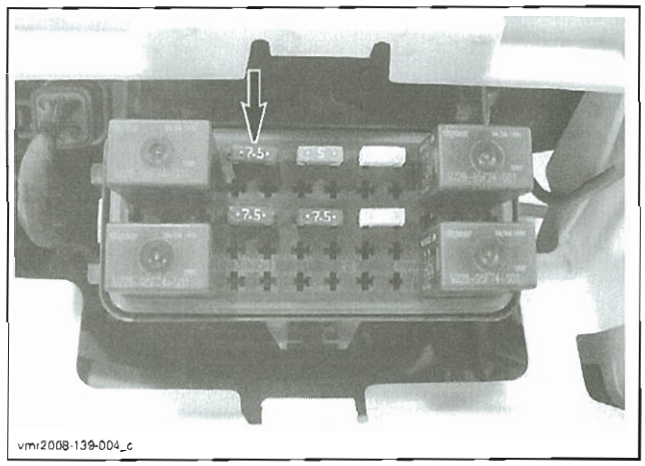
Reconnect all wires and cables.

NOTE: Torque the large solenoid cable terminals to 4 N•m (35 lbf•in).

Solenoid Dynamic Test

Remove fuse F3 to prevent engine from starting.

NOTE: Check engine will be displayed in multifunction gauge, starter will crank engine but with an initial delay of approximately 4 seconds.



FUSE F3

Set transmission to Park or Neutral.

Turn ignition switch to ON.

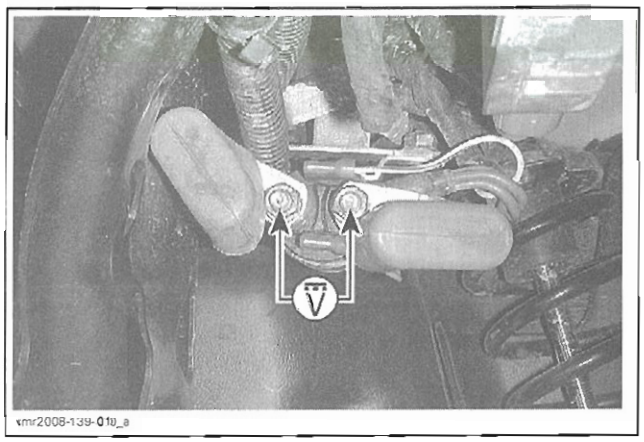
Set engine stop switch to RUN.

Set Fluke 111 multimeter (P/N 529 035 868) to Vdc.

Depress the start button.

As the engine is cranking, measure the voltage drop across the large solenoid terminals as follows.

SOLENOID POST		MEASUREMENT
Solenoid battery terminal	Solenoid starter terminal	0.2 Vdc max.



If voltage is above specification, replace solenoid.

LIGHTS, GAUGE AND ACCESSORIES

SERVICE TOOLS

Description	Part Number	Page
Fluke 115 multimeter	529 035 868	287, 293, 295, 297–300, 303–304, 307, 310, 313, 315

SERVICE TOOLS – OTHER SUPPLIER

Description	Part Number	Page
Fluke rigid back probes	TP88	295

SERVICE PRODUCTS

Description	Part Number	Page
dielectric grease	293 550 004	299
Super Lube	293 550 030	297

GENERAL

NOTE: For a complete overview of the vehicle electrical system, refer to *ENGINE MANAGEMENT*.

It is highly recommended to disconnect the battery when replacing any electric or electronic component.

⚠ WARNING

Always disconnect battery exactly in the specified order, BLACK (-) cable first. Do not place tools on battery.

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

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

⚠ 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.

Diagnostic

IMPORTANT: When solving an electrical system faults, the first thing to do is to check the battery condition, cables, and connections.

Also ensure the ignition switch is turned ON and the engine run/stop switch is set to RUN.

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

IMPORTANT: In many electric circuits, the battery supplies a switch which then supplies the electric component. Therefore, the switch opens and closes the positive side of the circuit.

In circuits controlled by the ECM, the battery supplies the electric component and the ECM works as a switch to complete the circuit to ground. Take this into account when troubleshooting electrical systems.

Pay close attention to ground wires. Their connection to the frame or engine may become resistive due to corrosion. The resulting voltage drop at the ground connection could cause certain systems to malfunction.

Checking for Short Circuits Between 2 Wires

When checking continuity of a wire in a circuit, wires should be checked for a short circuit between them as follows.

Isolate the circuit by disconnecting its connectors.

Let's suppose that the circuit to be checked is composed of a RED and a BLACK wire. Using an ohmmeter, measure the resistance between the RED and the BLACK wire. The resistance should be infinite (OL). Otherwise, a short circuit exists between the two wires which must be identified and corrected.

Electrical Connectors

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.

When replacing an electric or electronic component(s), 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 the problem.

Check for signs of moisture, corrosion or dullness. Clean pins properly and coat them with a silicon-based dielectric grease or other appropriate lubricant (except if otherwise specified) when reassembling them.

PROCEDURES

FUSES

If a fuse is burnt, replace it with another fuse of the same rating.

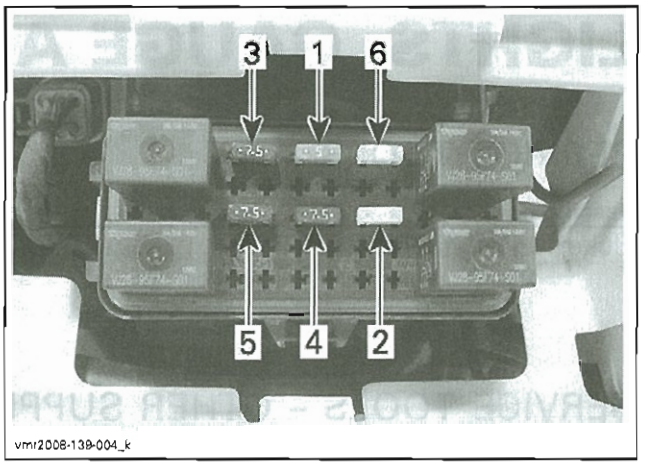
CAUTION: Do not use a higher rated fuse than recommended. Use of a higher rated fuse can lead to severe component or circuit damage, an overheat condition, and possibly an electrical fire.

Fuses are located in the front service compartment and at the rear of the vehicle near the battery. The rear fuse holder is attached to the back of the voltage regulator/rectifier unit.

Front Fuse Box (PF1)

The front fuse box contains the various system fuses, relays, and a fuse puller.

An assortment of spare fuses is stored in the fuse box cover.

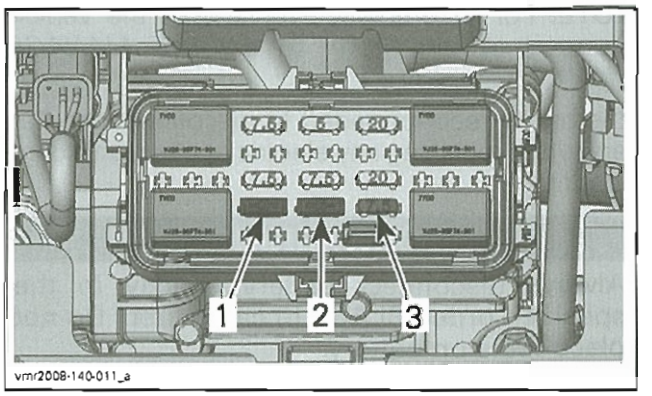


FRONT FUSE BOX (PF1)
1. *(F1) Engine control module (ECM)*
2. *(F2) Cooling fan*
3. *(F3) Fuel injector/ignition coil*
4. *(F4) Relays/speedo*
5. *(F5) Fuel pump*
6. *(F6) Accessories*

NOTE: A shorted D5 or D6 diode will cause fuse F6 to burn. Refer to *D5 AND D6 DIODES (Winch Relay)* further in this section.

CE Models

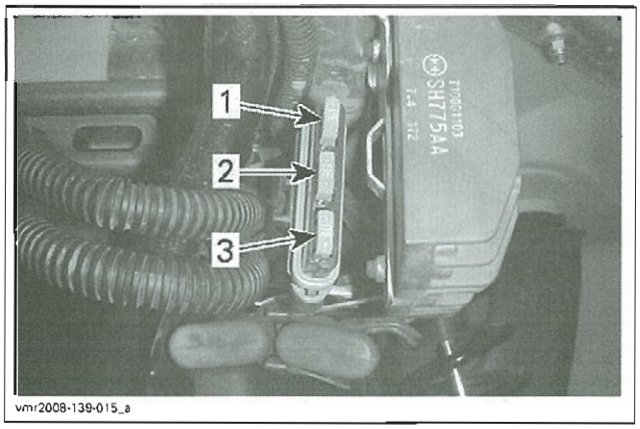
The CE modes have an additional fuse and two diodes in the front fuse box. All other fuses and relays are the same.



FUSE BOX (2008 CE MODELS)
1. *Diode D2*
2. *Diode D3*
3. *Control Euro fuse (7.5 A)*

NOTE: The 2009 CE fuse box is similar, however, diodes D2 and D3 have been removed from the fuse box and are now integrated into the wiring harness. See *TURN SIGNAL LIGHTS* further in this section.

Rear Fuse Holder (PF2)



REAR FUSE HOLDER (PF2)
1. *Main fuse 30 A (F8)*
2. *Spare fuse 30 A*
3. *Fan/accessories fuse 30 A (F9)*

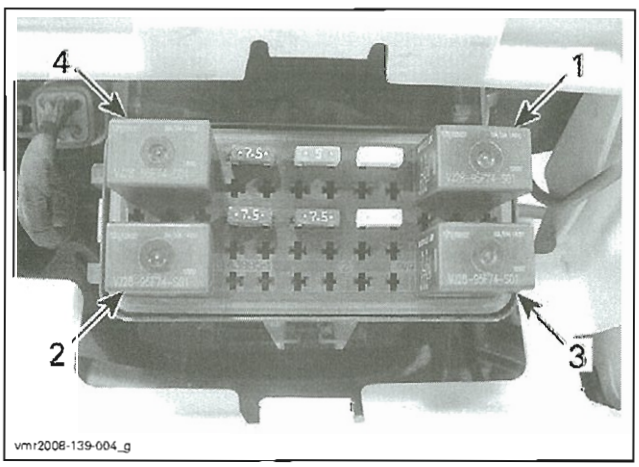
ACCESSORY RELAY (R4)

Accessory Relay General Information

The accessory relay powers a variety of accessories such as lights, a winch, 2WD/4WD actuator and controls, as well as DC power outlets.

Whenever power is on the vehicle, the accessory relay is closed. However, during engine starting, from 60 to 800 RPM, the ECM opens the ground circuit to the relay coil. The relay opens and reduces the electrical load on the battery and ensures maximum battery voltage is available to the starter and engine circuits for proper starting.

NOTE: Relay may be inverted by 180° at installation and still function correctly. Ensure relay terminals are properly aligned with fuse holder at installation.



RELAY LOCATIONS
1. *Main relay (R3)*
2. *Fuel pump relay (R2)*
3. *Accessories relay (R4)*
4. *Fan relay (R1)*

The easiest way to check a relay is to remove it and temporarily replace it with another relay not essential for immediate engine operation (e.g. accessory relay or cooling fan relay). If the applicable system then functions normally, replace the relay.

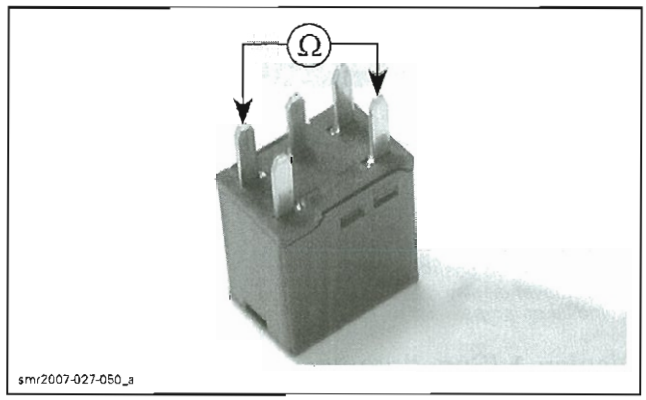
If the system does not function with the replacement relay, reinstall the relay and test the applicable system wiring/connectors.

Relay Continuity Test

Remove relay.

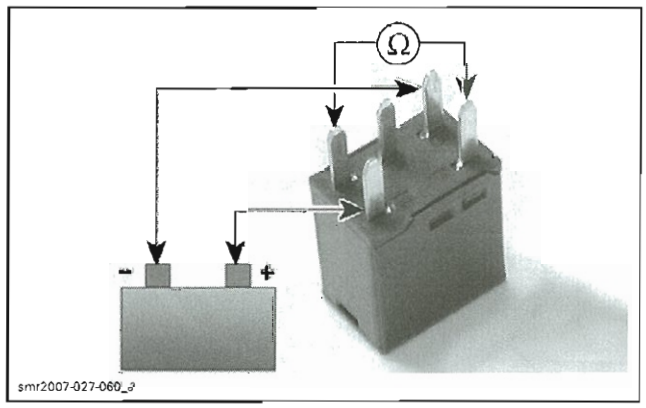
Using the Fluke 115 multimeter (P/N 529 035 868) set to the Ω position, probe relay as per following table.

TERMINAL		RESISTANCE
30	87	Open circuit (OL)



Connect battery as shown in following illustration and probe relay again as per following table.

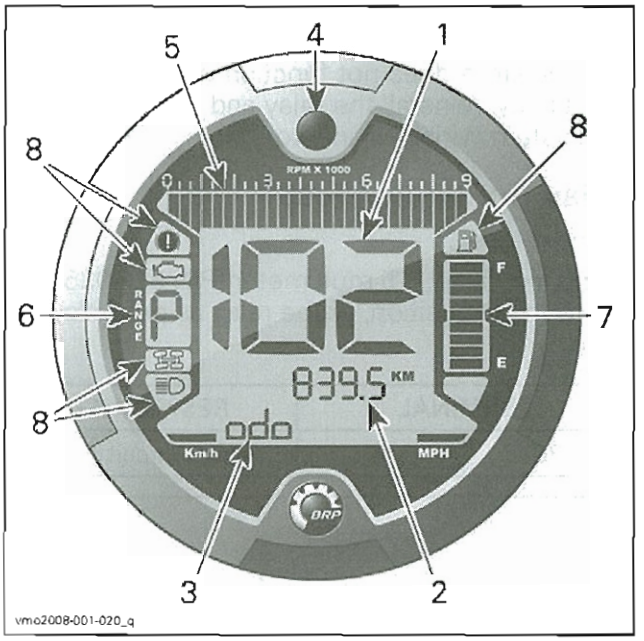
TERMINAL		RESISTANCE
30	87	0.5 Ω max. (continuity)



If relay failed either test, replace it.

MULTIFUNCTION GAUGE

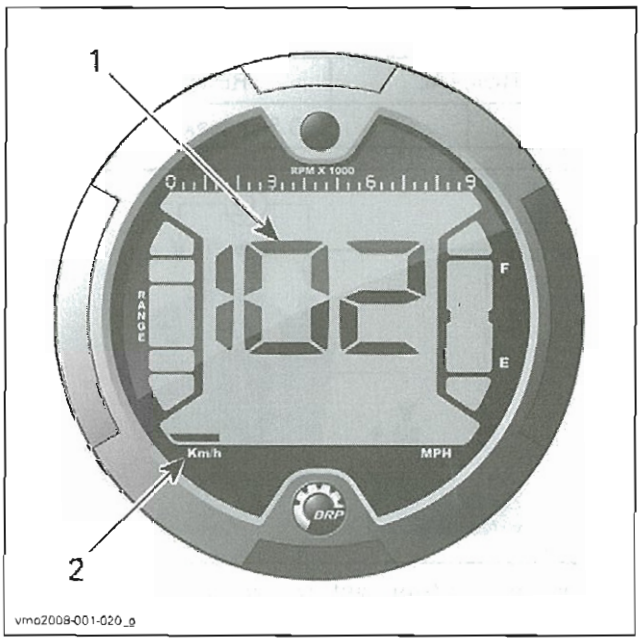
Gauge Operation



1. *Display 1 (speedometer)*
2. *Display 2 (mode)*
3. *Display 3 (mode/message)*
4. *Display selector button*
5. *Tachometer*
6. *Transmission position display*
7. *Fuel level display*
8. *Indicator lamps*

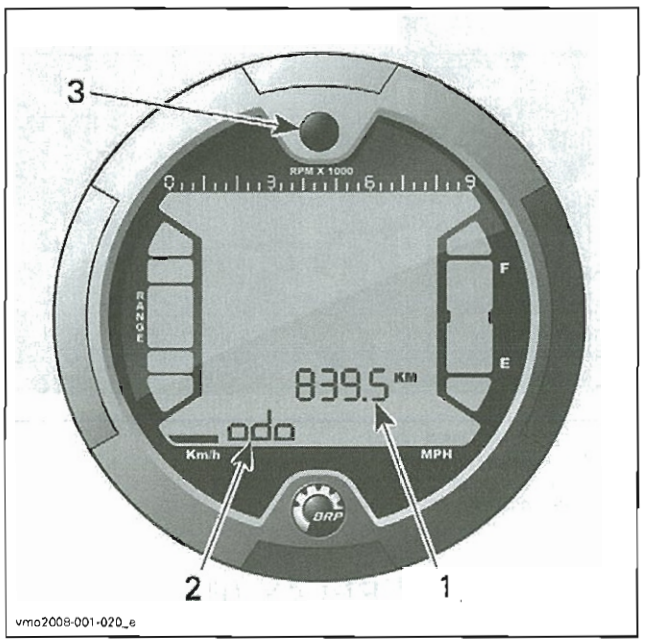
Display 1 (Speedometer)

This display will show vehicle speed.



DISPLAY 1
1. *Indicated vehicle speed*
2. *Unit of display*

Display 2 (mode)

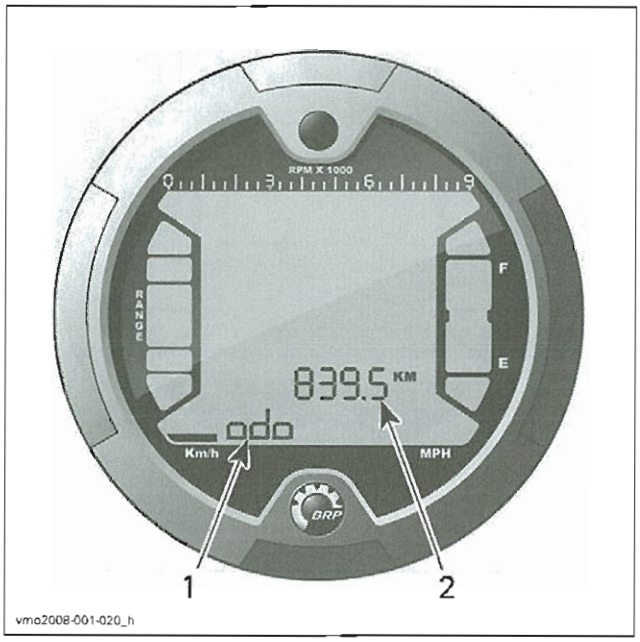


DISPLAY 2
1. *Display 2 (mode)*
2. *Display 3 (mode/message)*
3. *Selector button*

By pressing the selector button, the following modes can be selected in display 3 and viewed in display 2:

- Odometer (ODO)
- Trip meter (TRIP)
- Hour meter (TRIP TIME)
- Vehicle hour meter (ENGINE HOURS)
- Engine revolutions per minute (RPM).

Display 3 (mode/message)



1. *Display 3 (mode/message)*
2. *Display 2 (mode)*

This display will show either an abbreviation of the mode selected for viewing in display 2 or will communicate important messages to the operator if an anomaly occurs.

Abbreviation Mode:

- ODO (odometer)
- TRIP (trip meter)
- TRIP TIME (hour meter)
- ENGINE HOURS (vehicle hour meter)
- RPM (engine revolutions per minute).

Message Mode:

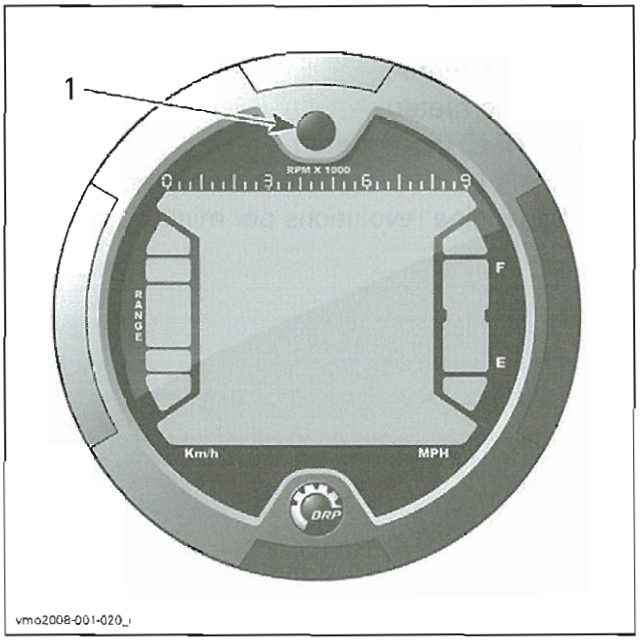
MESSAGE	PILOT LIGHT(S) ON	DESCRIPTION
PARK BRAKE	Parking brake	Is displayed when parking brake is applied for more than 15 seconds (while riding).
LO BATT	Check engine	Low battery voltage, check battery voltage and charging system.
HI BATT	Check engine	High battery voltage, check battery voltage and charging system.
LOW OIL (1)	Check engine	Engine low oil pressure, stop engine immediately.
HI TEMP (2)	Check engine	Engine is overheating, stop engine immediately.
LIMP HOME	Check engine	Serious fault detected by the engine management that can change the normal operation of the engine. Check engine indicator light will also blink, refer to *ENGINE MANAGEMENT* for more details.
CHECK ENGINE	Check engine	Engine management fault. Check engine indicator light will also be ON, refer to *ENGINE MANAGEMENT* for more details.
MAINTENANCE SOON	Check engine	Periodic maintenance required. NOTE: To reset message, use B.U.D.S. software and click Reset Service button in Vehicle tab.
NO ECM COMMUNICATION	Check engine	Communication error between multifunction gauge and engine control module (ECM). Refer to *ENGINE MANAGEMENT*.

CAUTION: (1) If the LOW OIL message and check engine light do not turn off right after engine starting, stop engine. Check engine oil level. Refill if necessary. If the oil level is good, refer to the *LUBRICATION SYSTEM* section.

CAUTION: (2) If the HIGH TEMP message and check engine light do not turn off right after engine starting, stop engine. Refer to the *COOLING SYSTEM* section.

Display Selector Button

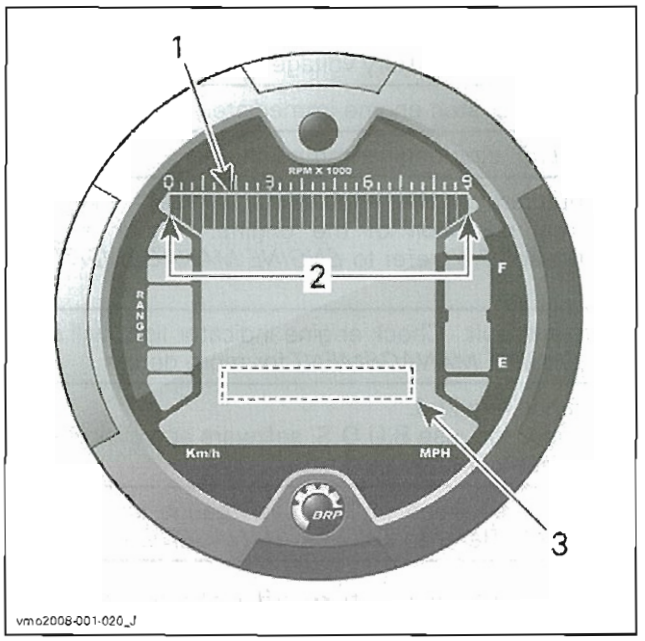
Button used to navigate between modes or to reset data depending on the feature selected.



1. Selector button

Tachometer

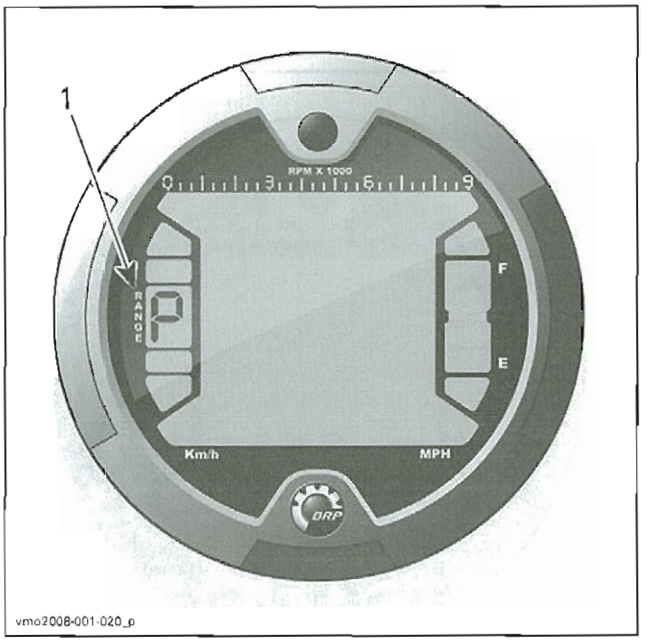
Measures engine revolutions per minute (RPM). Multiply by 1000 to obtain the actual revolutions.



1. Tachometer
2. Operating range
3. Tachometer via display 2 (mode)

Transmission Position Display

This display will show transmission gear position.



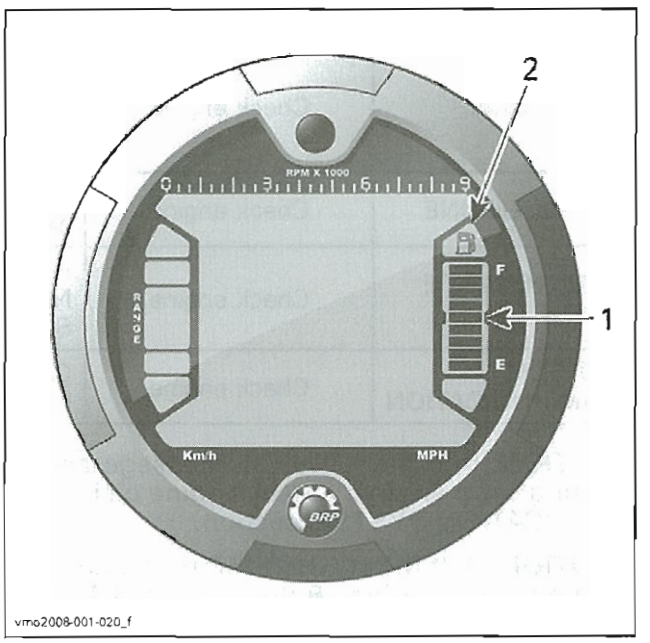
1. Transmission position

DISPLAY	FUNCTION
P	Park
R	Reverse
N	Neutral

Fuel Level Display

Bar gauge that continuously indicates the amount of fuel left in the fuel tank.

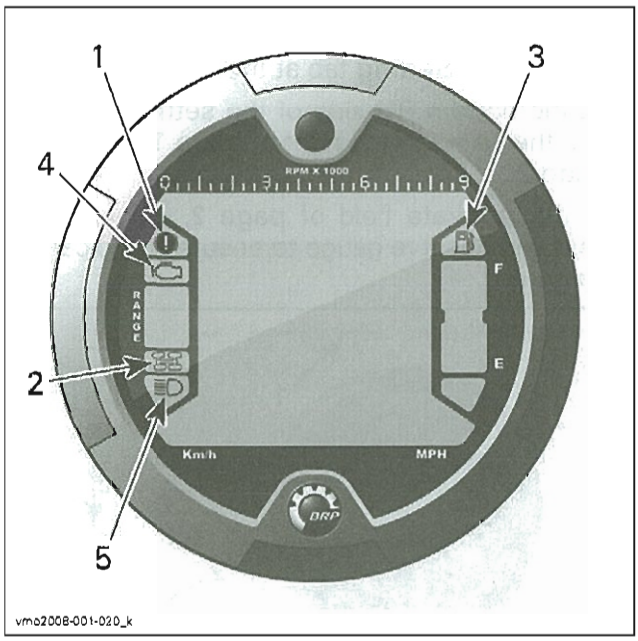
An indicator light will come on to indicate a low-fuel condition when only one bar is displayed.



1. Fuel level display
2. Low fuel indicator light

Indicator Lights

Indicator lights (LEDs) are incorporated within the LCD display. These LEDs backlight an LCD display symbol which represents an operating condition that may require your immediate attention.



1. *Parking brake indicator light*
2. *4WD indicator light*
3. *Low fuel level indicator light*
4. *Check engine indicator light*
5. *High beam indicator light*

Parking brake is activated.

4WD system is activated.

Low fuel level. Comes on when there is approximately 25% of fuel left in fuel tank, approximately 5 L (1.3 U.S. gal).

Check engine.

Headligh switch set to high beams.

Fault Codes Display

The multifunction gauge has the ability to display recorded fault codes in the MODES/MESSAGES display without connecting the vehicle to B.U.D.S.

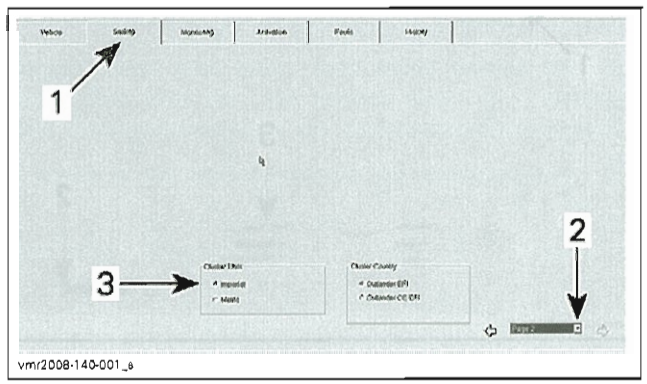
Refer to the *MONITORING SYSTEM/FAULT CODES* section for procedures.

Cluster Unit Selection (MPH vs km/h)

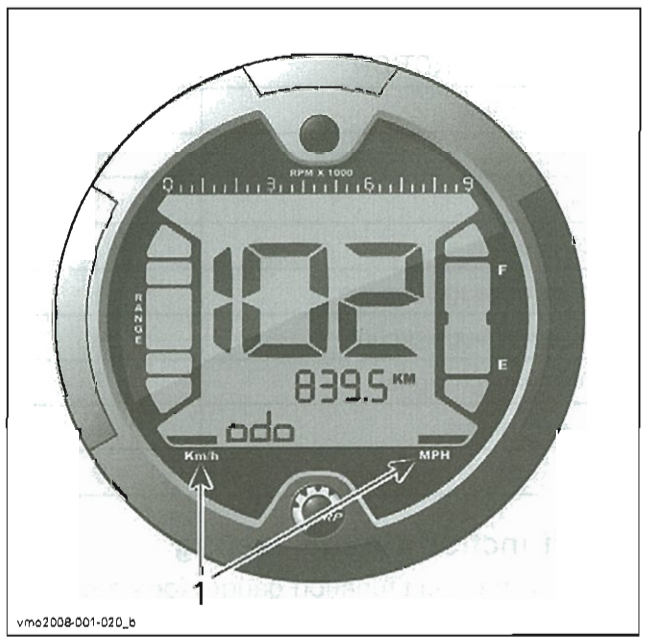
The multifunction gauge is factory preset to indicate in Imperial units but can be set to indicate in metric units.

To change the unit of measurement, carry out the following procedure.

- Connect vehicle to the latest applicable B.U.D.S. software, refer to the *COMMUNICATION TOOLS/B.U.D.S. SOFTWARE* section.
- Select the **Read Data** button.
- Choose the **Setting** tab at the top of the page.
- At the bottom RH side of the setting page, select the arrow to the right of **page 1** and choose **page 2**.
- In the **Cluster Scale** field, choose the desired unit of measurement, **Imperial** or **Metric**.



CHANGING UNITS OF MEASUREMENT
1. *Choose the Setting tab*
2. *Choose page 2*
3. *Choose the desired unit of measurement*

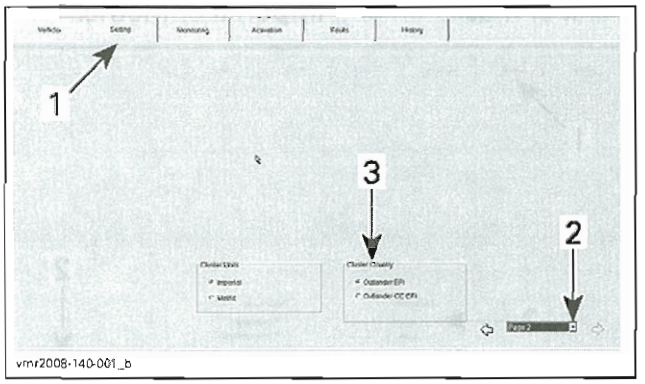


1. *Unit selection of speedometer*

Cluster Country Selection

To change the cluster country selection, carry out the following procedure.

- Connect vehicle to the latest applicable B.U.D.S. software, refer to the *COMMUNICATION TOOLS/B.U.D.S. SOFTWARE* section.
- Select the **Read Data** button.
- Choose the **Setting** tab at the top of the page.
- At the bottom RH side of the setting page, select the arrow to the right of **page 1** and choose **page 2**.
- In the **Cluster Scale** field, choose the desired country setting, **Outlander 400** or **Outlander 400 CE** (CE for European countries).



CHANGING UNITS OF MEASUREMENT
1. *Choose the Setting tab*
2. *Choose page 2*
3. *Choose the desired country setting*

Multifunction Gauge Pin-Out

FUNCTION	PIN
Power 12 Vdc	17
Ground	20
CAN line	18
CAN line	19
Fuel level gauge supply	4
Fuel level gauge ground	21
2/4WD switch signal	7
HI beam signal	5
VSS signal	9

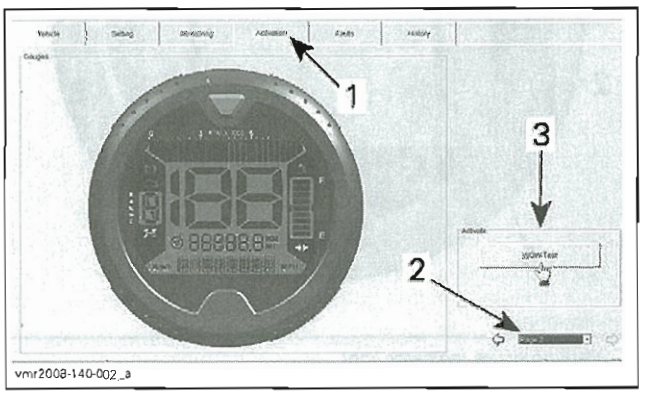
Multifunction Gauge Testing

NOTE: If the multifunction gauge does not come on when power is turned on, but the taillight comes on, refer to *MULTIFUNCTION GAUGE VOLTAGE TEST.*

Multifunction Gauge Testing with B.U.D.S.

Test multifunction gauge as per following procedure:

- Connect vehicle to the latest applicable B.U.D.S. software, refer to the *COMMUNICATION TOOLS/B.U.D.S. SOFTWARE* section.
- Set engine stop switch to RUN.
- Set ignition switch to ON.
- Select **Read Data**.
- Choose the **Setting** tab at the top of the page.
- At the bottom RH side of the setting page, select the arrow to the right of **page 1** and choose **page 2**.
- In the **Activate** field of **page 2**, select **WOW Test** and observe gauge to ensure all indications come on.



MULTIFUNCTION GAUGE WOW TEST
1. *Choose the Setting tab*
2. *Choose page 2*
3. *Select WOW test*

NOTE: The WOW test in B.U.D.S. tests the gauge internal circuits and displays. It does not test the gauge input circuits except for the CAN bus input. The MODE button on the face of the gauge is an input that is not tested during the WOW test.

If a specific function does not come on during the WOW test, replace the multifunction gauge and repeat the WOW test.

If all indications come on during the WOW test but a specific function does not come on through normal gauge inputs, the multifunction gauge is functioning normally. Refer to the section applicable to the specific function for testing procedures.

Speedometer Display

If the multifunction gauge tested good during the WOW test but there is no indication of vehicle speed or indicated speed is always zero, refer to *VEHICLE SPEED SENSOR (VSS)* in this section.

If the speedometer always reads 144 km/h, or 89 MPH, connect the vehicle to B.U.D.S. and follow the *CLUSTER COUNTRY SELECTION* procedure in this section. You should find that neither **Cluster Country** selection has been selected. Selecting the appropriate country setting should fix the problem.

NOTE: This problem will occur if the multifunction gauge has been programmed to an ATV model other than a 400 EFI. This is because the gauge is looking for a speed signal from the CAN bus instead of directly from a speed sensor. The speedometer may also always read zero instead of 144 km/h or 89 MPH for this same fault.

If applying a **Cluster Country** setting does not resolve the zero speed indication, refer to *VEHICLE SPEED SENSOR (VSS)* in this section.

Transmission Position Display

The transmission position display in the multifunction gauge is capable of displaying the "N" for neutral, "P" for park, or "R" for reverse transmission positions. It can not display "H" for high or "L" for low gear.

If the transmission position display does not match with the selected transmission lever position, check the gearbox switches. Refer to the *CRANKSHAFT/CRANKCASE* section.

If the letter "E" is displayed in the transmission position display, the multifunction gauge has detected an abnormal activation of multiple gearbox switches. Refer to *CRANKSHAFT/CRANKCASE* section for procedures.

2/4WD Indicator Light

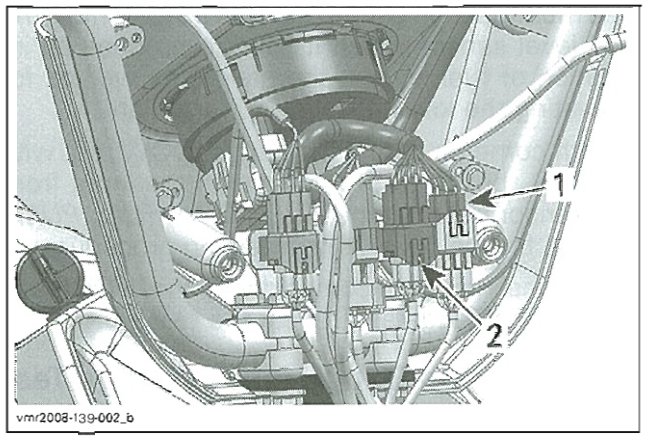
This indicator light comes on when the vehicle is in 4WD.

If the 2WD/4WD indicator light comes on during the gauge WOW test with B.U.D.S., but will not come on when the 2WD/4WD selector switch is set to 4WD, refer to the *4X4 COUPLING UNIT* section.

HI Beam Indicator Light

If the HI beam indicator light comes on during the gauge WOW test with B.U.D.S., but does not come on when the high beams are on, check wiring/connectors between multifunction gauge and the headlight switch as per following procedure.

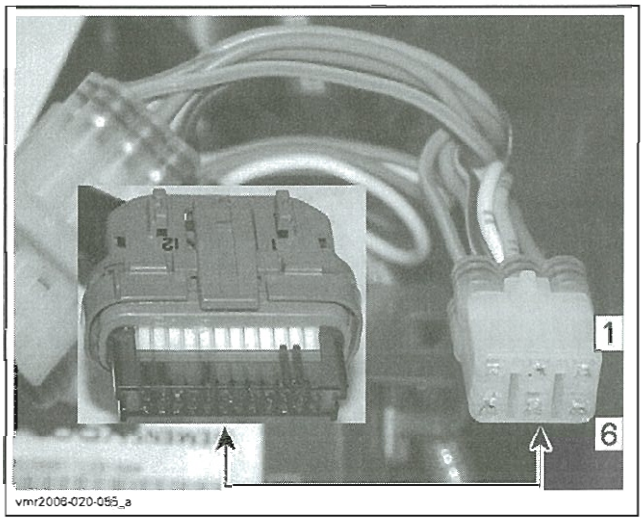
- Remove the front steering cover, refer to *BODY* section.
- Disconnect the multifunction gauge connector.
- Disconnect the LH multifunction switch connector (MG2).



TYPICAL – MULTIFUNCTION SWITCH CONNECTORS
1. Connector MG1
2. Connector MG2

- Using a Fluke 115 multimeter (P/N 529 035 868) set to Ω, measure for continuity as per following table.

GAUGE CONNECTOR	MULTIFUNCTION SWITCH CONNECTOR (MG2)	RESISTANCE
Pin 5	Pin 5	Close to 0 Ω



TYPICAL

If you do not obtain close to 0 Ω, repair or replace the faulty wiring/connector.

- Reconnect connectors and install all removed parts.

Fuel Level Indication and Low Fuel Level Indicator Light

The multifunction gauge receives a signal from the fuel level sensor which it uses to produce an indication of fuel level in the gauge, as well as for activating the low fuel level indicator light.

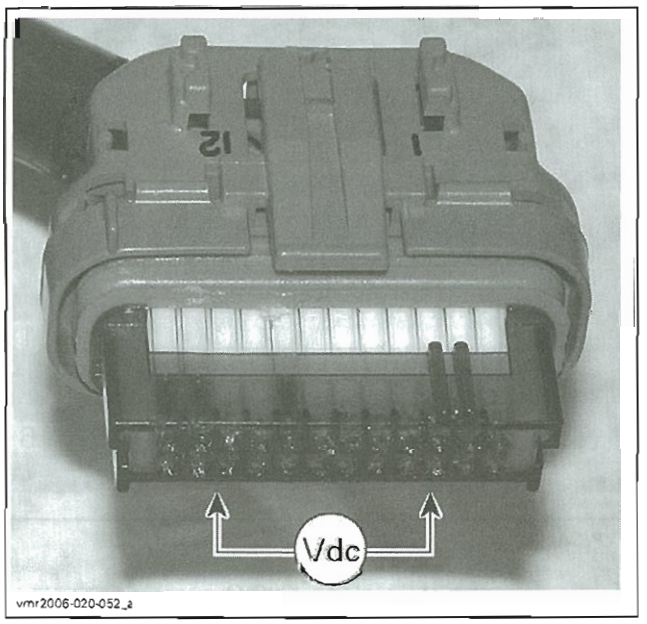
If both come on during the gauge WOW test with B.U.D.S., but do not function with the input from the sensor, refer to the *FUEL TANK/FUEL PUMP* section for fuel level sensor testing procedures.

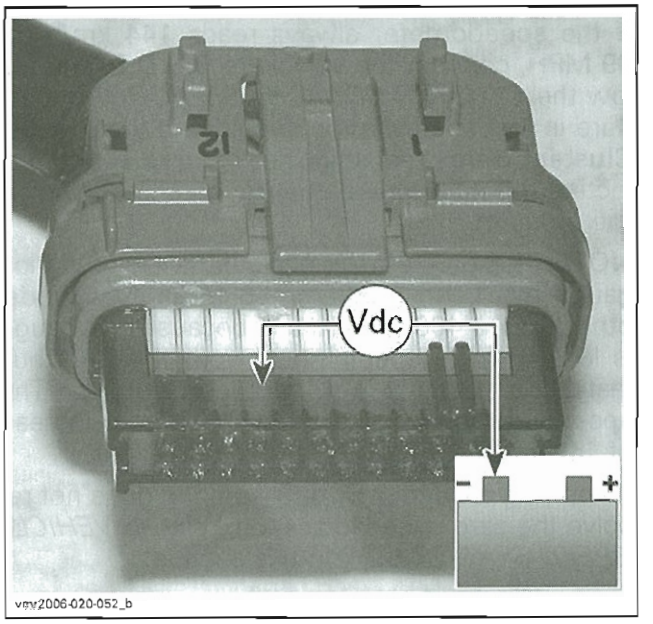
If only one indication comes during the WOW test, replace the gauge and repeat the test.

Multifunction Gauge Input Voltage Test

- Disconnect multifunction gauge connector.
- Turn ignition key ON.
- Set engine run/stop switch to RUN.
- Read voltage from vehicle harness as per following table.

MULTIFUNCTION GAUGE INPUT VOLTAGE TEST		
GAUGE CONNECTOR (HARNESS SIDE)		VOLTAGE
Pin 17	Pin 20	Battery voltage
Pin 17	Chassis ground	





If battery voltage is not read in both voltage tests, repair or replace the 12 Vdc input circuit wiring and/or connectors from the relays speedo fuse to the multifunction gauge (pin 17).

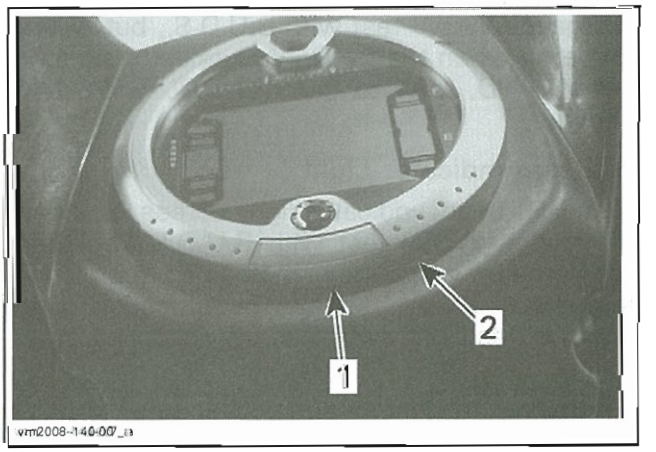
If battery voltage is measured to chassis ground but not to pin 20, carry out a continuity test of the multifunction gauge ground circuit wiring/connector (pin 20 to ground). Repair or replace wiring/connectors as required.

If 12 Vdc input (pin 17) and ground circuit (pin 20) tested good, replace multifunction gauge.

Multifunction Gauge Removal

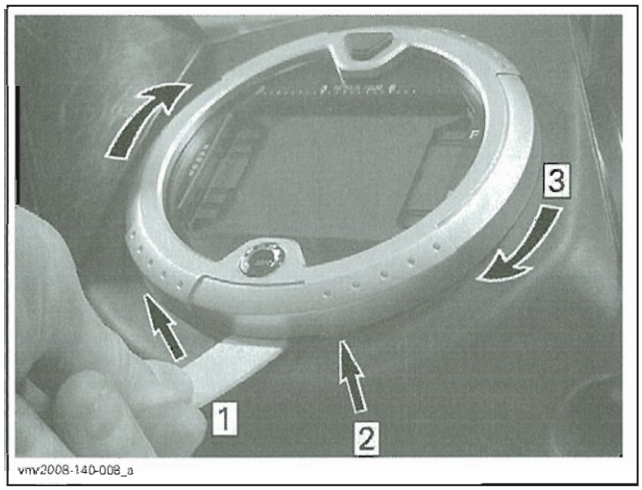
Locate the locking tab on the gauge trim ring at the 5 o'clock position.

Carefully insert a thin wooden tongue depressor (or popsicle stick) between the rear steering cover and the trim ring at the six oclock position.



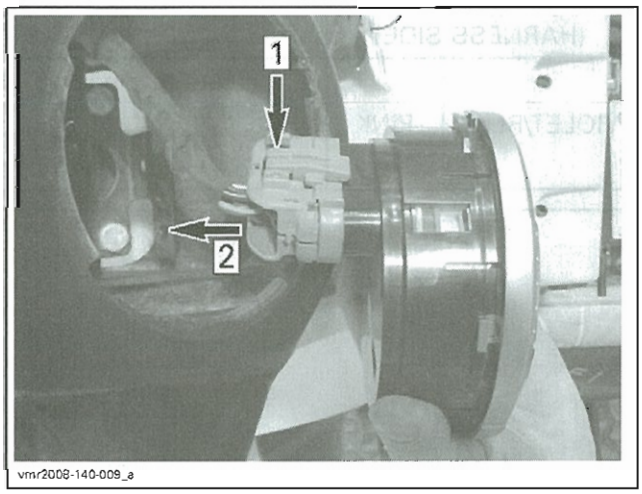
1. Insert wooden tongue depressor here
2. Locking tab position

As you gently lift up on the tongue suppressor to release ring locking tab, rotate gauge clockwise to unlock and remove it from steering cover.



Step 1: Lift up on tongue depressor
Step 2: Look for release of locking tab
Step 3: Rotate trim ring clockwise

Disconnect the multifunction gauge connector.



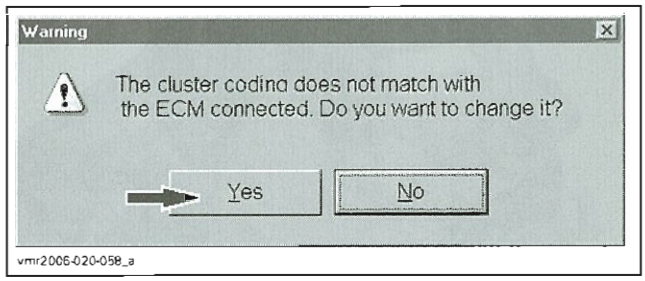
Step 1: Press to release connector
Step 2: Pull connector off gauge

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 match the gauge (cluster) coding with the ECM. Simply click Yes when the following message appears.



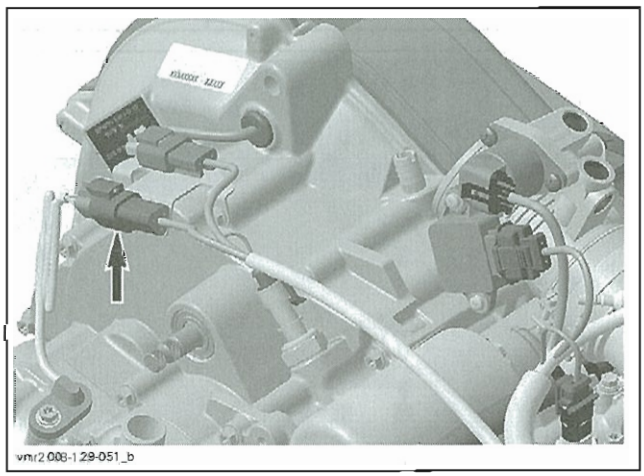
IMPORTANT: If a multifunction gauge from another vehicle model is installed and is not registered in the ECM through B.U.D.S., engine starting will not be allowed until gauge is registered with proper coding.

VEHICLE SPEED SENSOR (VSS)

VSS Input Voltage Test

Remove air filter housing. Refer to *AIR INTAKE SYSTEM.*

Locate VSS connector in gearbox area.



Turn ignition key ON.

Set engine stop switch to RUN.

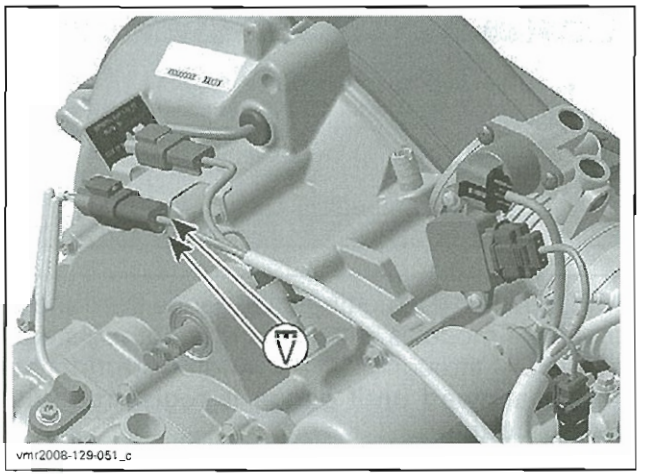
Use Fluke rigid back probes (P/N TP88) or the equivalent.

Insert the back probes onto the end of the standard probes of the Fluke 115 multimeter (P/N 529 035 868).

Set multimeter to Vdc.

Back-probe connector and read voltage as follows.

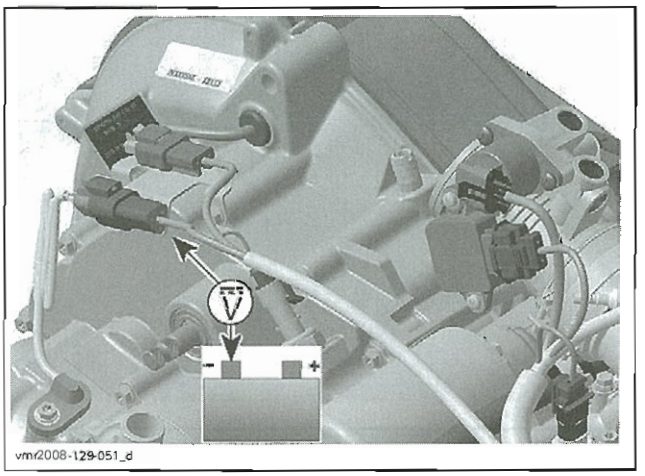
SPEED SENSOR CONNECTOR (HARNESS SIDE)		VOLTAGE
VIOLET/BLUE	BLACK/ORANGE	Battery voltage


vmr2008-129-051_c

If you read battery voltage, test the signal circuit.

If you do not read battery voltage, test for voltage as follows.

SPEED SENSOR CONNECTOR (HARNESS SIDE)		VOLTAGE
VIOLET/BLUE	Battery ground	Battery voltage


vmr2008-129-051_d

If you do not read battery voltage to ground, check/repair input wiring/connectors.

If voltage is good, check ground circuit.

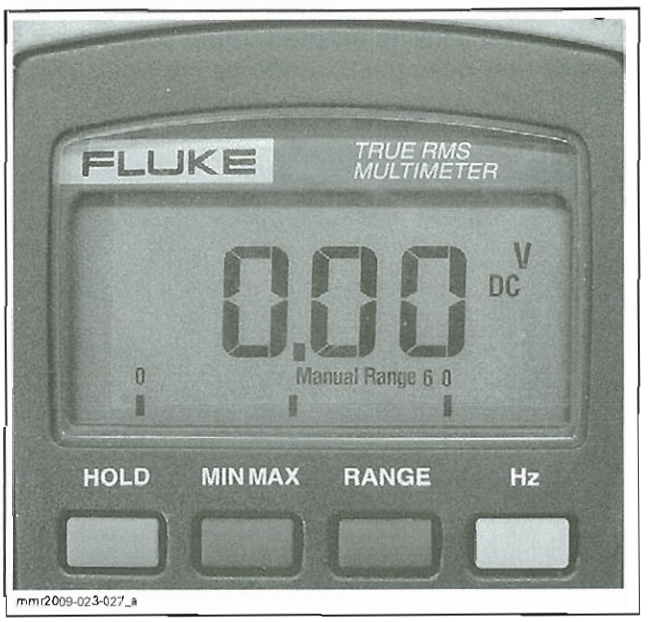
VSS Signal Circuit Test

Safely lift rear of vehicle so that rear wheels are off the ground.

Set vehicle to 2WD mode and transmission to Neutral.

Set multimeter to Vdc.

Repeatedly press the multimeter **RANGE** button until the display shows **Manual Range 6 0**.



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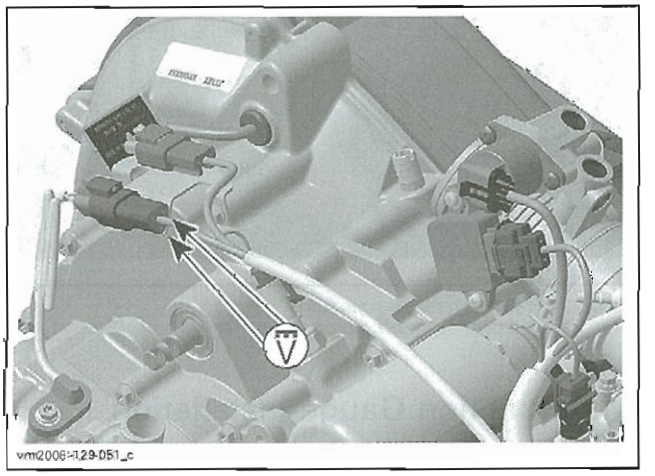
Back-probe connector and read voltage as you **slowly** rotate the rear wheels with your hands.

SPEED SENSOR CONNECTOR (HARNESS SIDE)		VOLTAGE
VIOLET/BLUE	PINK	Alternate readings of: approx. 11 Vdc, then approx. 1 Vdc and back to 11 Vdc


vmr2008-129-051_c

If voltage is as specified, sensor is good.

If voltage is not as specified, try a new sensor.

NOTE: Poor/faulty magnet in crankcase or dirty oil can affect sensor operation.

VSS Removal

NOTE: Engine removal is not necessary for access to VSS sensor.

Clean sensor area.

Remove sensor retaining screw.

Pull out sensor.

VSS Installation

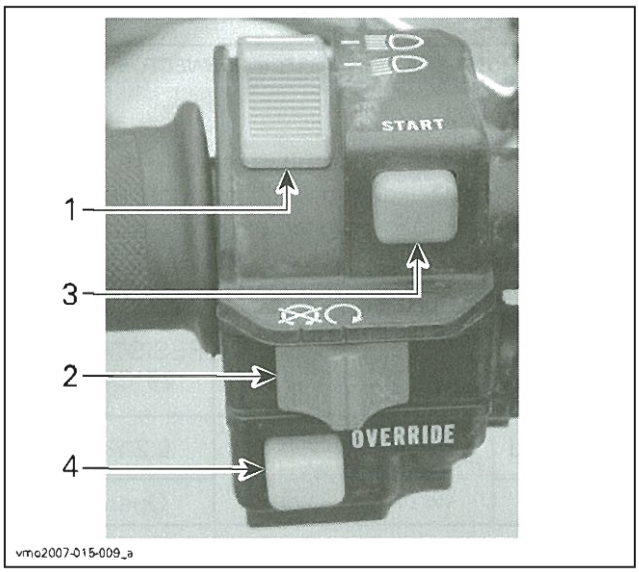
Apply some Super Lube (P/N 293 550 030) grease on sensor O-ring.

Install sensor.

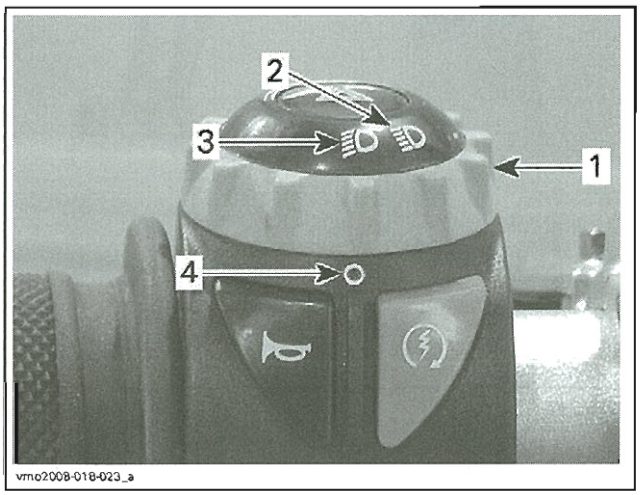
Torque retaining screw to 10 N•m (89 lbf•**in**).

Reinstall remaining removed parts.

HEADLIGHT SWITCH



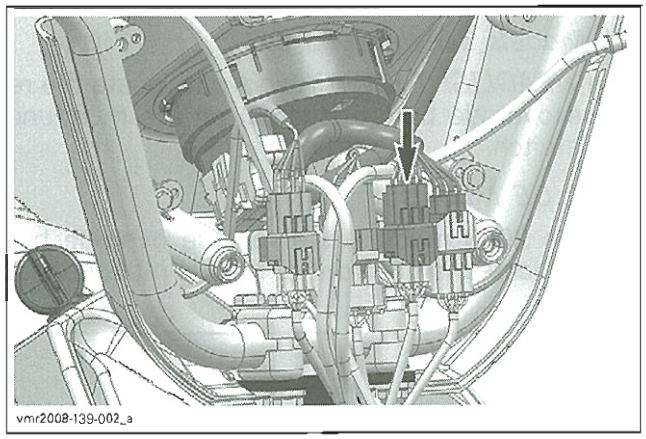
TYPICAL – (EXCEPT 2009 CE MODELS)
1. *Headlights switch*
2. *Engine stop switch*
3. *Start switch*
4. *Override switch*



TYPICAL – 2009 CE MODELS
1. *Headlights switch*
2. *High beams*
3. *Low beams*
4. *Lights selection index mark*

Headlight Switch Test

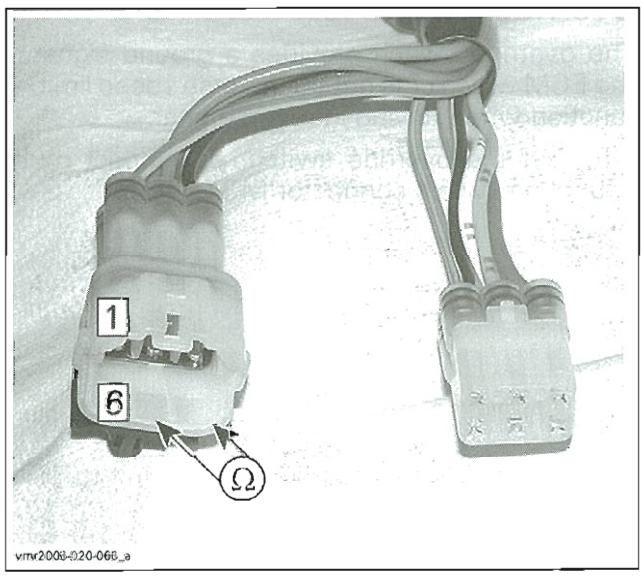
- Remove front steering cover.
- Disconnect multifunction switch connector (MG2).



TYPICAL – MULTIFUNCTION SWITCH CONNECTOR (MG2)

Using a Fluke 115 multimeter (P/N 529 035 868), measure the headlight switch resistance as per following table.

HEADLIGHT SWITCH CONTINUITY TEST			
POSITION	MULTIFUNCTION SWITCH CONNECTOR (MG2)		RESISTANCE @ 20°C (68°F)
Switch to LO	Pin 2 (GREEN wire)	Pin 4 (RED/YELLOW wire)	0.2 Ω max.
Switch to HI	Pin 5 (BLUE wire)	Pin 4 (RED/YELLOW wire)	



TYPICAL – MG2 PIN-OUT

Replace multifunction switch if the headlight switch is defective. Refer to *STEERING SYSTEM* section.

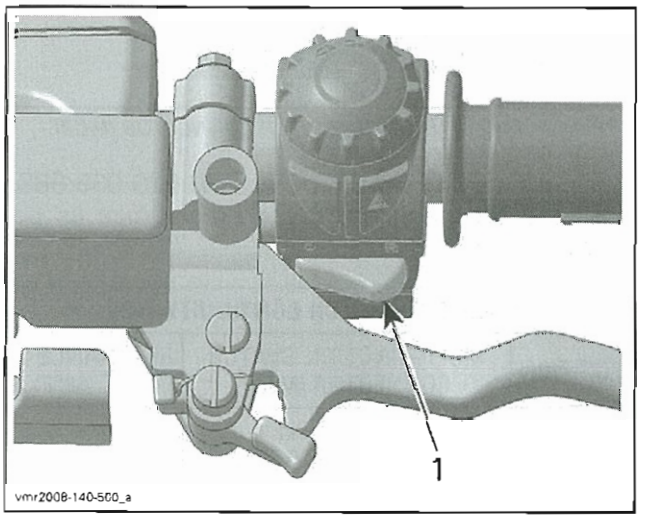
OVERRIDE SWITCH

All Models except 2009 CE

See *HEADLIGHT SWITCH* above to locate the reverse override button (switch) on the multifunction switch.

2009 CE Models

On the 2009 models, the reverse override button is located in the front of the LH multifunction switch.

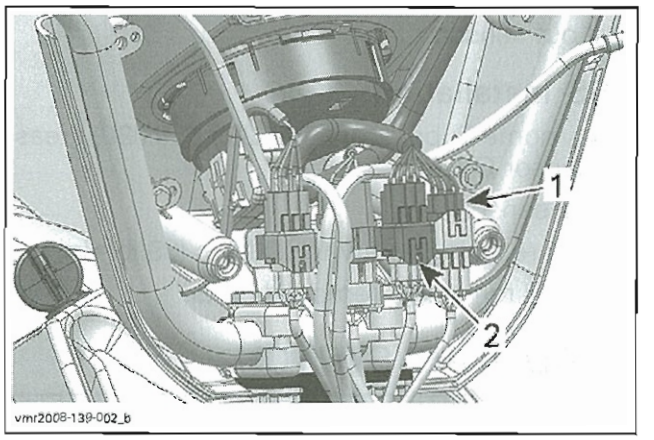


TYPICAL – 2009 MODELS
1. Reverse override button

Override Switch Test

The override switch provides a ground signal to the ECM which cuts out the reverse speed limiting function when driving in reverse gear.

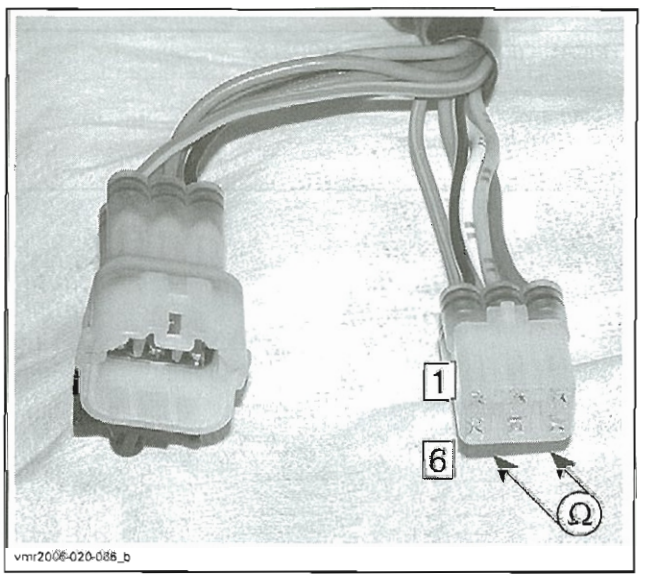
- To test the override switch, disconnect multifunction switch connector MG1.



TYPICAL – MULTIFUNCTION SWITCH CONNECTORS
1. Disconnect MG1
2. Disconnect MG2

- Using a Fluke 115 multimeter (P/N 529 035 868) set to Ω, measure the switch resistance between the following wires.

OVERRIDE SWITCH CONTINUITY TEST			
SWITCH POSITION	MULTIFUNCTION SWITCH CONNECTOR (MG1)		RESISTANCE @ 20°C (68°F)
Released	Pin 5 (ORANGE wire)	Pin 6 (WHITE wire)	0.2 Ω max.
Pushed			Open (OL)



TYPICAL

Replace multifunction switch if override switch is defective. Refer to *STEERING SYSTEM* section.

12-VOLT AUXILIARY POWER CONNECTOR

The 12-volt auxiliary power outlet allows the installation of additional accessories.

12-Volt Auxiliary Power Connector Test

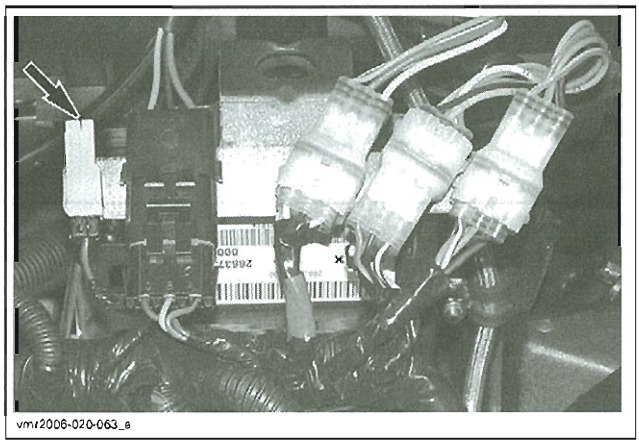
NOTE: When the auxiliary power connector is to be used on an accessory, be sure to apply a small amount of dielectric grease (P/N 293 550 004) to the connector contacts.

Remove front steering cover, refer to the *BODY* section.

Turn ignition key to ON.

Set engine stop switch to RUN.

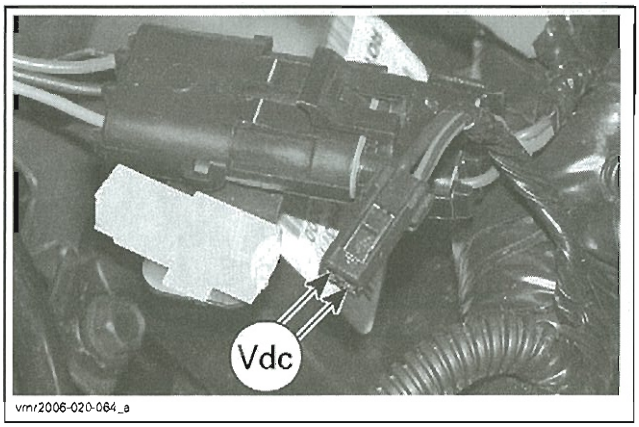
Disconnect auxiliary power outlet connector (as applicable).


vmr2006-020-063_a

TYPICAL – AUXILIARY POWER CONNECTOR

Using a Fluke 115 multimeter (P/N 529 035 868) set to Vdc, measure the voltage as per following table.

AUXILIARY POWER CONNECTOR VOLTAGE TEST		
WIRE COLOR		VOLTAGE
RED/BLACK	BLACK	Battery voltage
RED/BLACK	Chassis ground	



vmr2006-020-064_a

TYPICAL – AUXILIARY POWER CONNECTOR VOLTAGE TEST

If battery voltage is not read for both tests, check to see if headlights function.

If headlights do not function, test the following:
- Accessories fuse (F6)
- Accessories relay (R4)
- Wiring/connectors.

If headlights function, test wiring/connections to accessories fuse (F6).

If battery voltage is read to chassis ground but not to the BLACK wire, test the wire to ground continuity. Repair or replace wiring as required.

12-VOLT POWER OUTLET

12-Volt Power Outlet Test

Remove dashboard, refer to the *BODY* section.

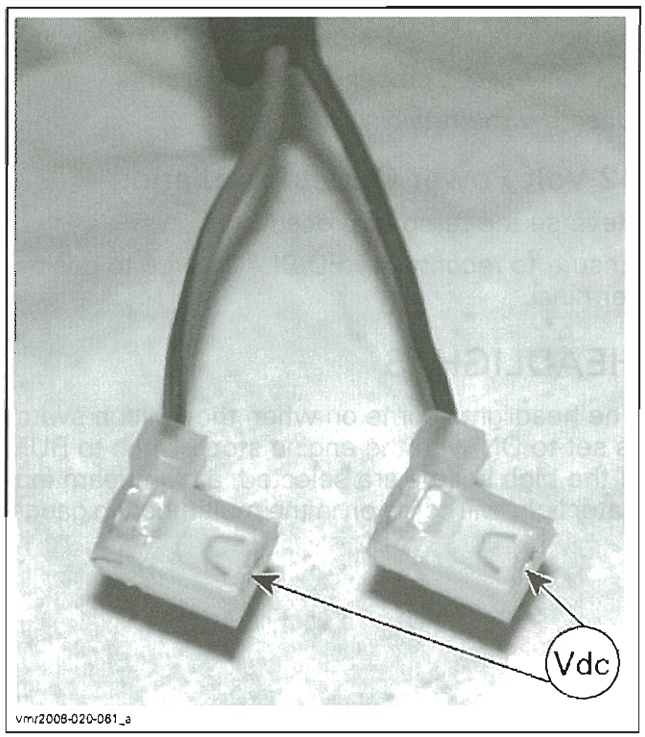
Turn ignition key to ON.

Set engine run/stop switch to RUN.

Disconnect the power outlet connectors.

Using a Fluke 115 multimeter (P/N 529 035 868) set to Vdc, measure the voltage as follows.

12-VOLT POWER OUTLET VOLTAGE TEST		
WIRE COLOR		VOLTAGE
RED/BLACK	BLACK	Battery voltage



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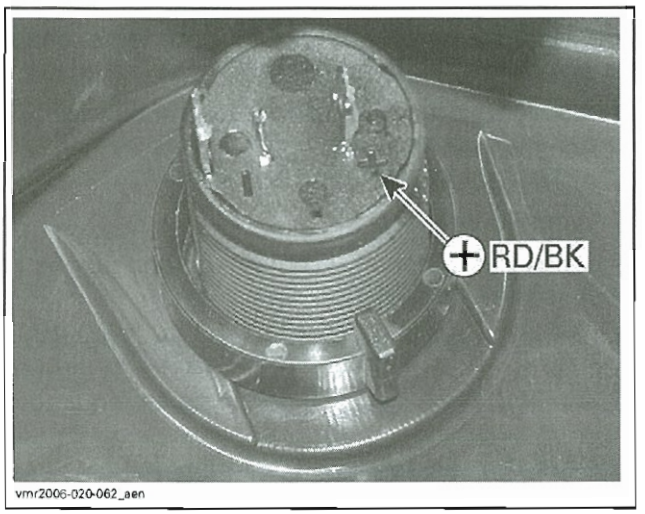
Ensure to reconnect RED/BLACK wire to positive terminal.



If battery voltage is not read for both test, check to see if headlights function.

If headlights do not function, test the following:

- Accessories fuse (F6)
- Accessories relay (R4)
- Wiring/connectors.

If headlights function, test wiring/connections to accessories fuse (F6).

If battery voltage is read to chassis ground but not to BLACK wire, test the BLACK wire to ground continuity. Repair or replace wiring as required.

12-Volt Power Outlet Removal

Remove dashboard, refer to the *BODY* section.

Disconnect the power outlet connectors.

Unscrew the retaining nut.

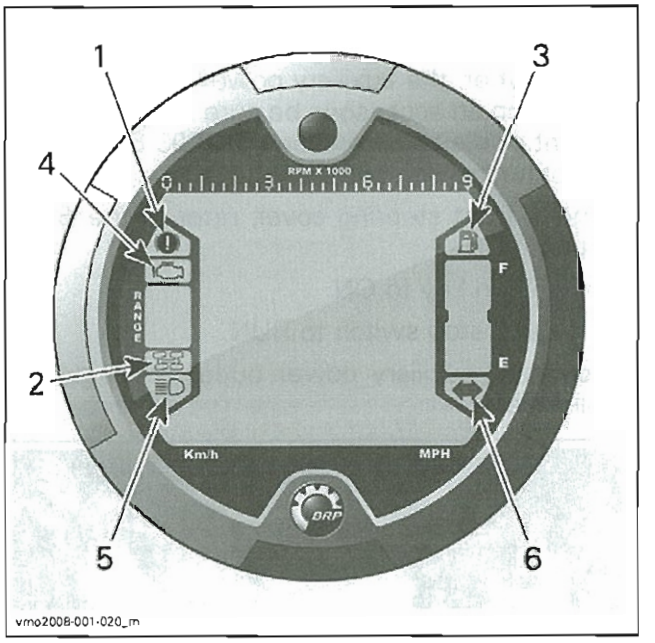
12-Volt Power Outlet Installation

Reverse the removal procedure.

Ensure to reconnect RED/BLACK wire to positive terminal.

HEADLIGHTS

The headlights come on when the ignition switch is set to ON with the engine stop switch to RUN. If the high beams are selected, a high beam indicator light will come on in the multifunction gauge.



INDICATOR LIGHTS
1. *Parking brake indicator light*
2. *4WD indicator light*
3. *Low fuel level indicator light*
4. *Check engine indicator light*
5. *High beam indicator light*
6. *Turn signal/hazard signal indicator light*

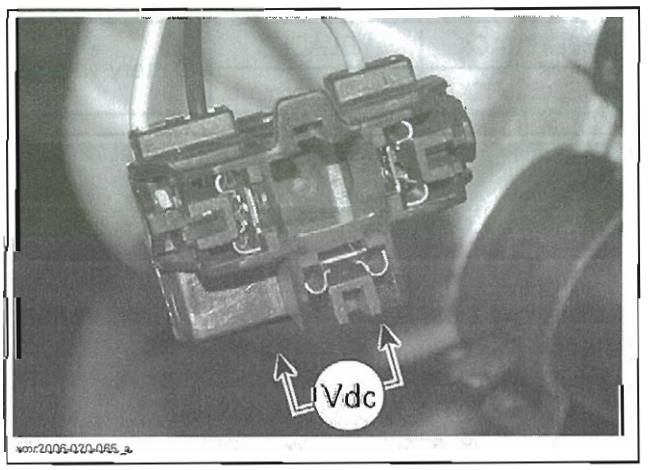
Headlight Test

Disconnect headlight connector, refer to *BULB REPLACEMENT* in this section.

Set engine stop switch to RUN.

Set ignition switch to ON.

Using a Fluke 115 multimeter (P/N 529 035 868) set to Vdc, measure the voltage at headlight connector as follows.



TYPICAL

HEADLIGHT INPUT VOLTAGE TEST			
SWITCH POSITION	WIRE COLOR		VOLTAGE
LO beam	GREEN	BLACK	Battery voltage
		Chassis ground	
HI beam	BLUE	BLACK	Battery voltage
		Chassis ground	

If battery voltage is read as specified in table, replace headlight bulb.

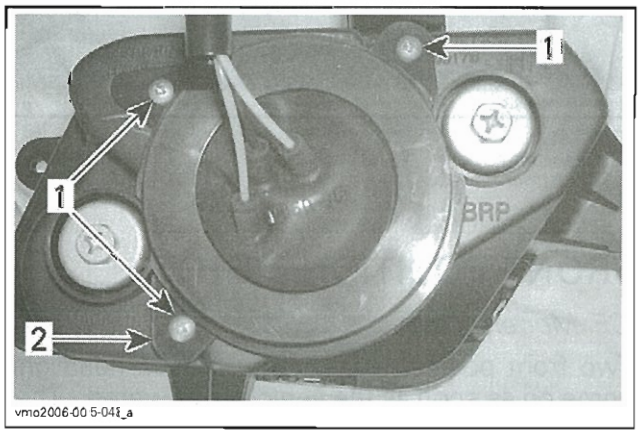
If battery voltage is not read as specified, or not at all, refer to *HEADLIGHT SWITCH* in this section.

If battery voltage is read to chassis ground but not to BLACK wire, test BLACK wire continuity. Repair or replace wiring/connectors as required.

Headlight Bulb Replacement

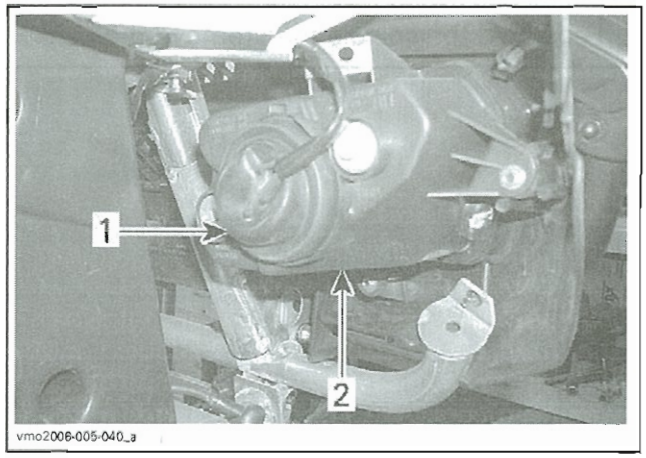
CAUTION: Never touch glass portion of a halogen bulb with bare fingers, it shortens its operating life. If glass is touched, clean it with isopropyl alcohol which will not leave a film on the bulb.

Remove cover screws.



1. *Screws*
2. *Cover*

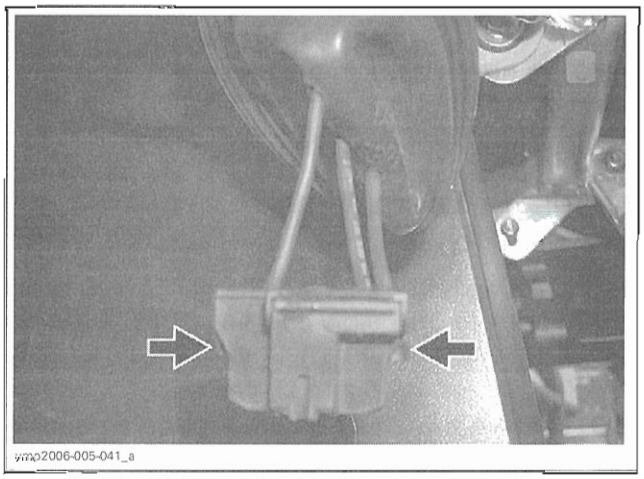
Remove rubber protector covering headlight housing.



1. *Rubber protector*
2. *Headlight housing*

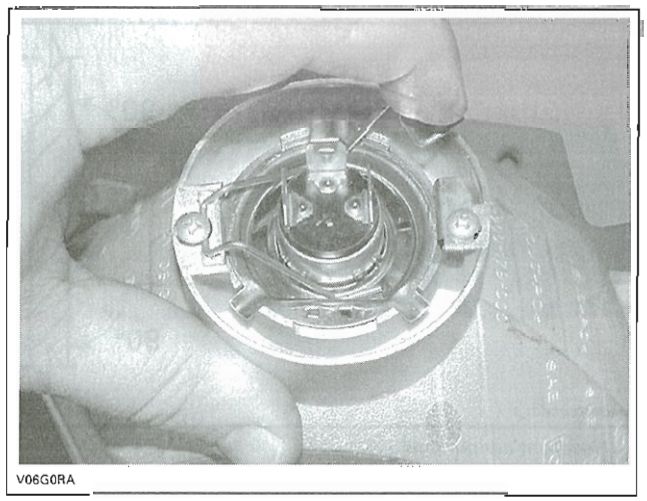
Disconnect the headlight connector.

NOTE: Press inwards on small locking tabs to unlock connector then pull on connector.



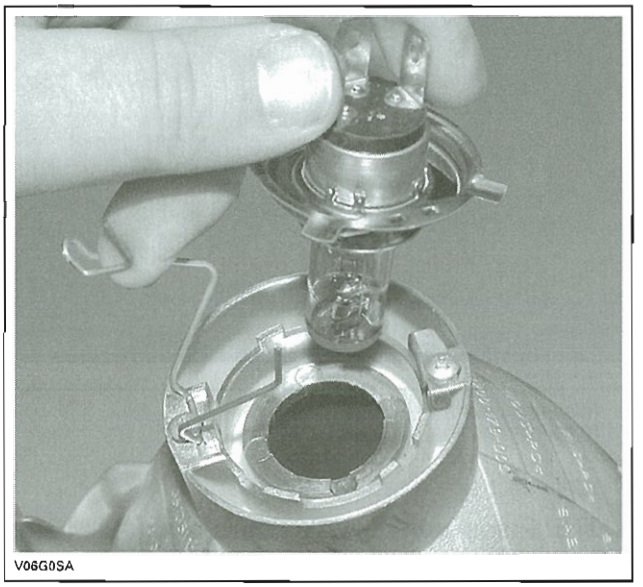
PRESS ON LOCKING TABS TO UNLOCK CONNECTOR

Press spindle inwards towards bulb contacts, then outwards and to the side to unlock headlight bulb.



TYPICAL

Lift and hold the spindle then remove the bulb.



TYPICAL

Install removed parts in the reverse order of their removal.

Validate headlight operation.

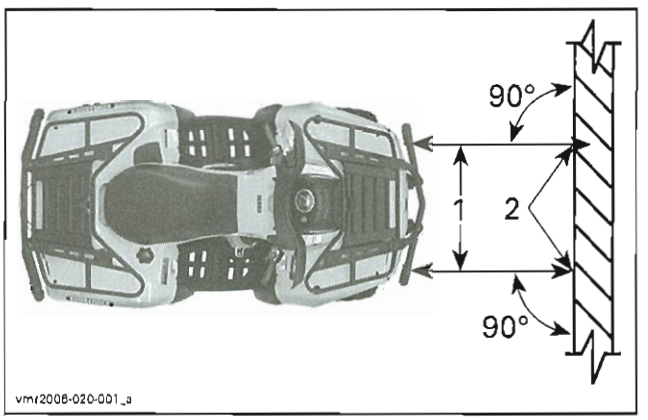
Headlight Beam Aiming

Select high intensity.

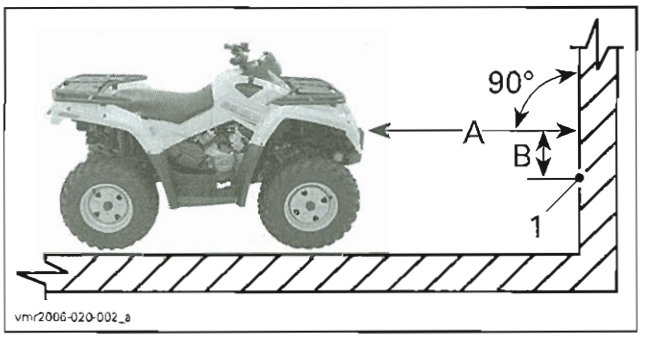
Beam aiming is correct when center of high beam is 131 mm (5 in) below the headlight horizontal center line, scribed on a test surface, 5 m (17 ft) away.

NOTE: Have the driver sit on or place an equivalent weight on the vehicle.

Measure headlight center distance from ground. Scribe a line at this height on test surface (wall or screen). Light beam center should be 131 mm (5 in) below scribed line.



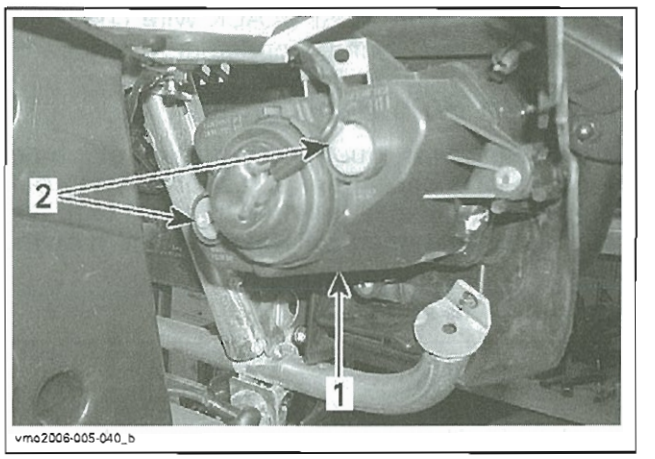
1. *Headlight center lines*
2. *Light beam center*



1. *Light beam center*
A. 5 m (17 ft)
B. 131 mm (5 in)

Headlight Beam Adjustment

Turn adjustment screws to adjust beam height and side orientation as described below. Adjust both headlights evenly.



TYPICAL
1. *Headlight cover*
2. *Adjustment screws*

FRONT POSITION LIGHTS

CE Models Only

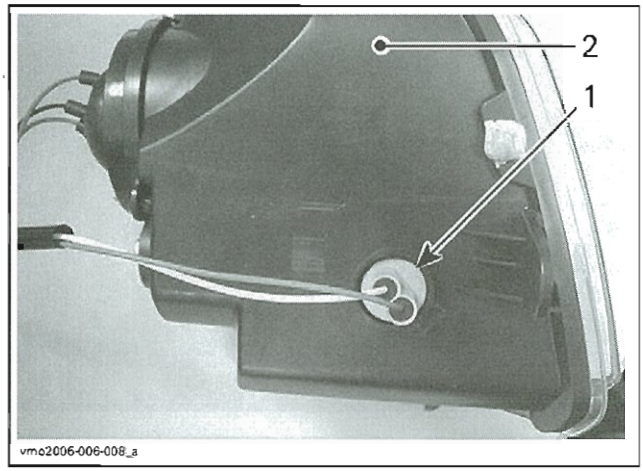
Two front position lights, one in each headlight, come on as soon as the vehicle is powered. They receive battery power through the relays/speedo fuse when the main relay closes its contacts.

Front Position Light Bulb Replacement

To replace a front position light, proceed as follows.

Locate the position light bulb holder under the headlight housing.

Rotate bulb holder counterclockwise to release it from the headlight housing.



1. Position light socket
2. Headlight housing

Carefully pull bulb straight out of bulb holder contacts to remove it.

Install the new bulb by pushing it into the bulb holder contacts.

Insert the bulb holder into the headlight housing and turn it clockwise to lock it into the headlight housing.

Position Light Testing

The position lights receive power from the accessories fuse when the vehicle electric power is turned ON.

To test the lights, first test or replace light bulb.

If bulb is not the cause, carry out the following procedure:

- Remove position light connector.
- Set engine stop switch to RUN.
- Set ignition switch to ON.
- Test for battery power at RED/YELLOW wire.

POSITION LIGHT INPUT VOLTAGE TEST		
RED/YELLOW wire	BLACK wire	Battery voltage
	Chassis ground	

If there is no input voltage to light, repair or replace wire from accessories relay fuse to light.

If there is voltage to chassis ground but not to BLACK wire, repair or replace the BLACK wire.

TAILLIGHT/BRAKE LIGHT

Taillight/Brake Light Operation

The taillight automatically comes on when the ignition switch is turned ON with the engine stop switch set to RUN.

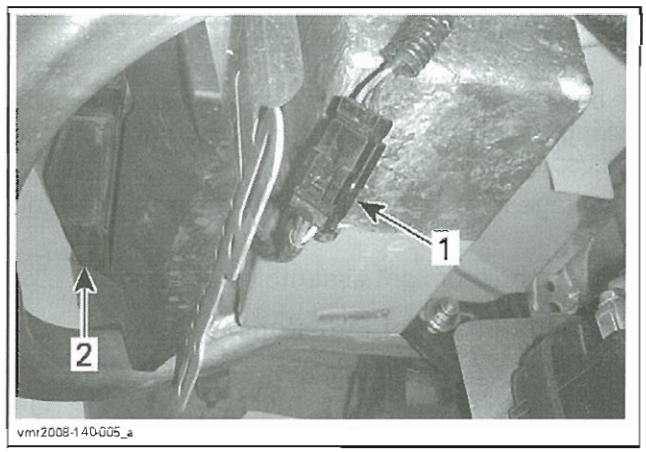
The brake light comes on when either the brake lever or brake pedal is depressed.

NOTE: When testing the brake light, always test it using both controls to make ensure both switches can turn on the brake light.

Taillight/Brake Light Circuit Test

No Taillight or Brake Light

If neither taillight or brake light come on, disconnect the taillight/brake light connector located behind the taillight assembly



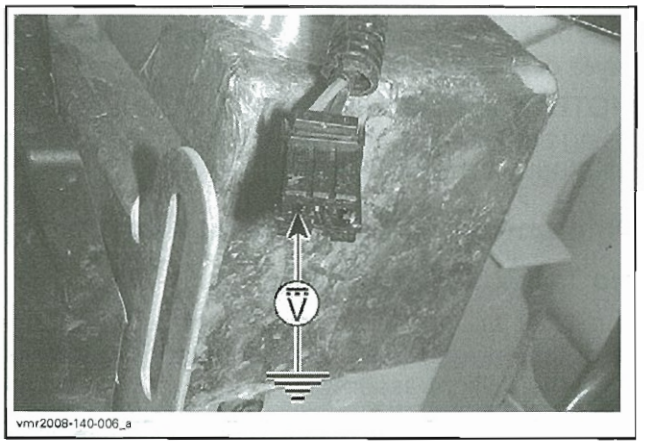
1. Taillight/brake light connector
2. Taillight assembly

Set engine stop switch to RUN.

Set ignition switch to ON.

Using a Fluke 115 multimeter (P/N 529 035 868) set to Vdc, test for input voltage at the taillight/brake light connector between pin 3 (ORANGE/GREEN wire) and chassis ground.

TAILLIGHT/BRAKE LIGHT INPUT VOLTAGE TEST		
PROBE		VOLTAGE READING
Taillight connector pin 3 (ORANGE/GREEN wire)	Chassis ground	Battery voltage



TAILLIGHT/BRAKE LIGHT INPUT VOLTAGE TEST

If battery voltage is not read, repair or replace wiring/connectors from light assembly to relays/speedo fuse.

If voltage is read, test the light assembly continuity.

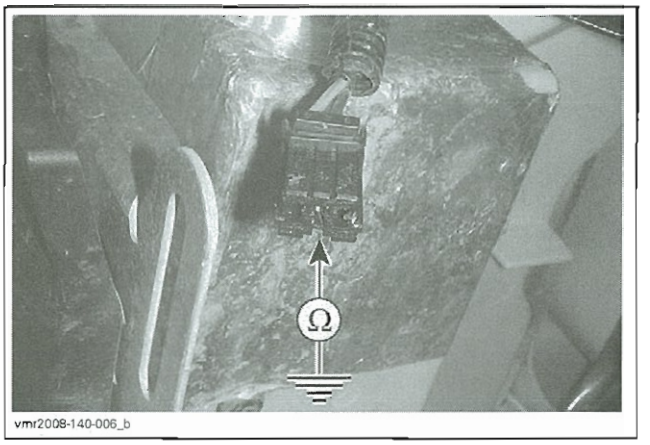
Replace bulb or light assembly as required.

Only one Filament Functions

If only one filament functions and replacing the bulb does not solve the problem, test the light ground circuits as follows.

- Turn ignition switch to the OFF position.
- Using a Fluke 115 multimeter (P/N 529 035 868) set to Ω, measure continuity to ground at light connector as per following table.

CONTINUITY TEST TAILLIGHT/BRAKE LIGHT GROUND CIRCUIT		
CONTROL TO ACTUATE	TAILLIGHT/ BRAKE LIGHT CONNECTOR	RESISTANCE @ 20°C (68°F)
None (taillight)	Pin 2 (BLACK wire)	Close to 0 Ω
Brake lever	Pin 1 (BLACK/GREY wire)	
Brake pedal		



CONTINUITY TEST OF TAILLIGHT/BRAKE LIGHT WIRING

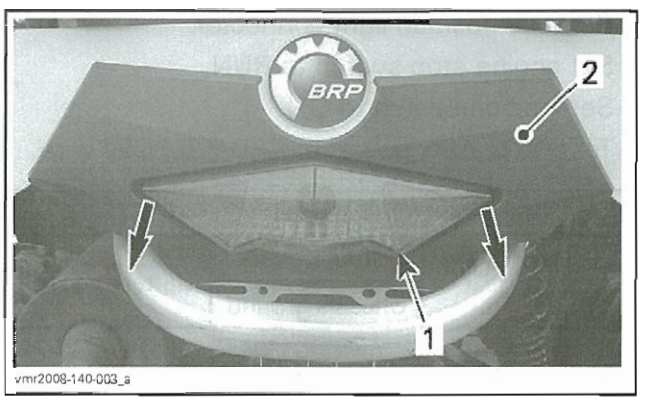
If you do not obtain close to 0 Ω through the taillight circuit, repair or replace wiring.

If you do not obtain close to 0 Ω through one of the brake light circuits, refer to the *BRAKES* section for brake lever and brake pedal switch testing and replacement.

Taillight/Brake Light Bulb Replacement

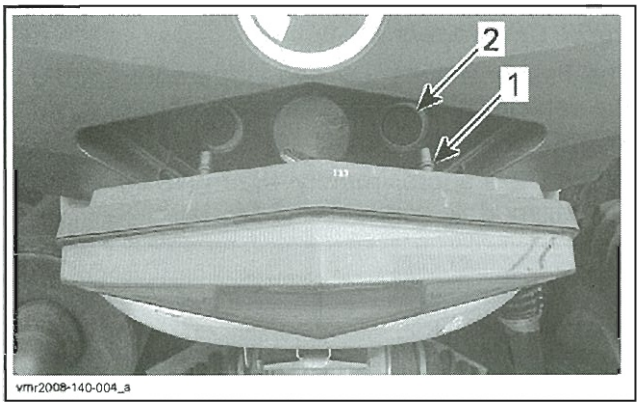
Pull lens out at both outside corners to release it from the grommets that secure it in the rear fascia panel.

NOTE: If lens is difficult to pull out of grommets, reach in behind light assembly and push on the lens retaining pins protruding through the grommets. Do not pry lens out of fascia panel using a tool such as a screwdriver or component damage may occur.

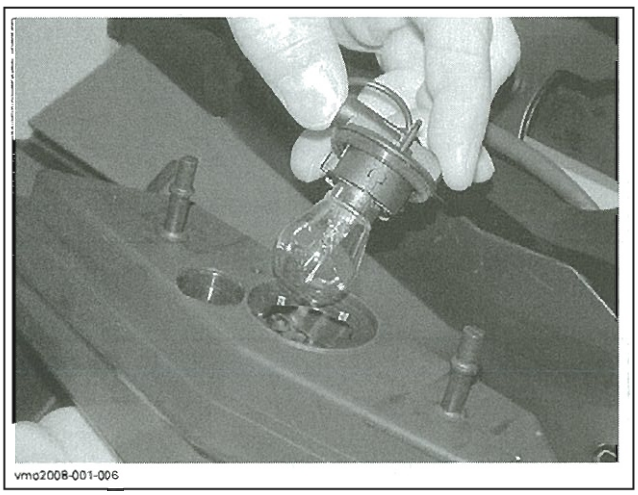


TYPICAL – TAILLIGHT LENS REMOVAL
1. Lens
2. Fascia panel

Rotate bulb holder counterclockwise to release it from the light assembly.



1. Lens retaining pin (x2)
2. Retaining grommet (x2)



Push bulb in and hold while turning counterclockwise to release from bulb holder.

Install the new bulb by first pushing in then turning clockwise.

Install remaining parts in the reverse order of removal.

Turn on vehicle electrical power and test taillight/brake light operation.

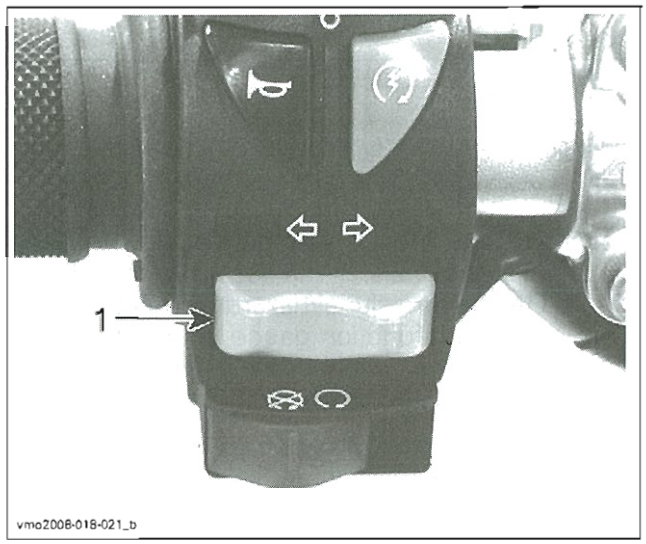
TURN SIGNAL LIGHTS

CE Models Only

Turn Signal Lights Operation

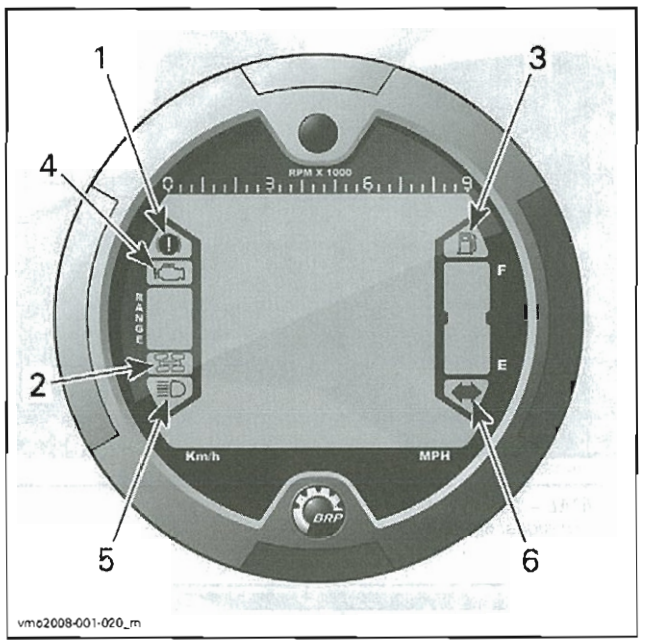
A turn signal switch is located on the left side of handlebar.

TYPICAL – 2008 CE MODEL
1. Turn signal lights switch



TYPICAL – 2009 CE MODELS
1. Turn signal lights switch

To activate the turn signal lights, move the switch button to the right or left side, depending on the direction of the intended turn. Reposition the switch to the center position when the maneuver is completed.



1. *Parking brake indicator light*
2. *4WD indicator light*
3. *Low fuel level indicator light*
4. *Check engine indicator light*
5. *High beam indicator light*
6. *Turn signal/hazard signal indicator light*

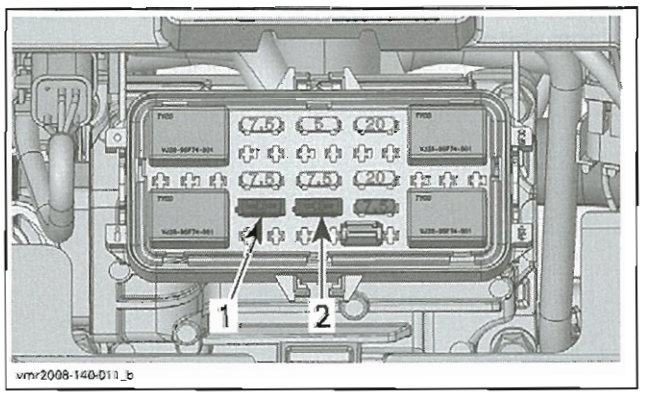
Flasher diodes allow a voltage signal from either LH or RH turn signals, or the hazard warning lights, to turn ON the turn signal/hazard warning indicator light in the multifunction gauge, and at the same time isolating the circuits from each other.

If all the turn signals come on when only one side is selected, a flasher diode may be shorted.

If the turn signal/hazard warning indicator light in the multifunction gauge does not come on when a turn signal is selected, that diode may be open circuit.

2008 CE Models

The flasher diodes (D2 and D3) are located in the front fuse box.

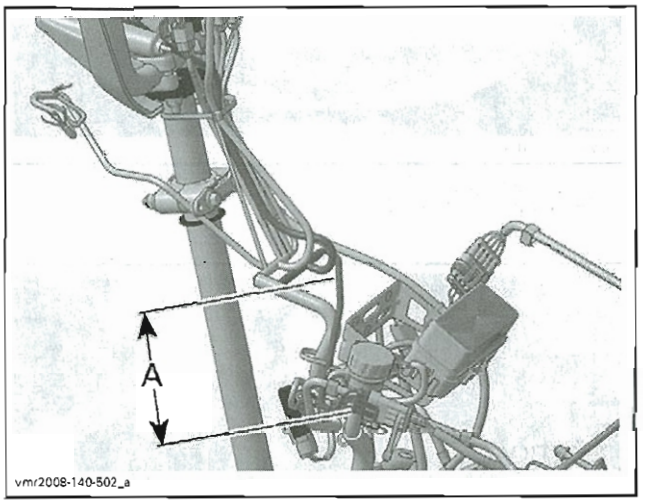


FUSE BOX (2008 CE MODELS)
1. *Diode D2*
2. *Diode D3*

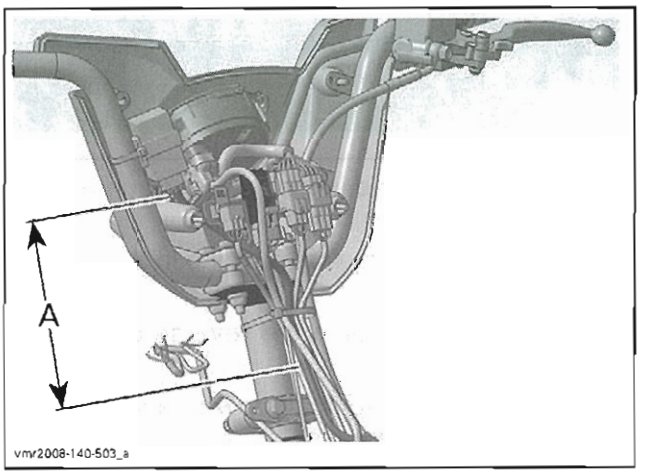
2009 CE Models

The flasher diodes (D2 and D3) are integrated in the vehicle harness near the electronic flasher unit located in the steering cover.

Diode D2 is approximately 48 cm (19 in) from the flasher module connector (3-MC1).



APPROXIMATE D2 DIODE LOCATION
A. 48 cm (19 in) from the front harness connector



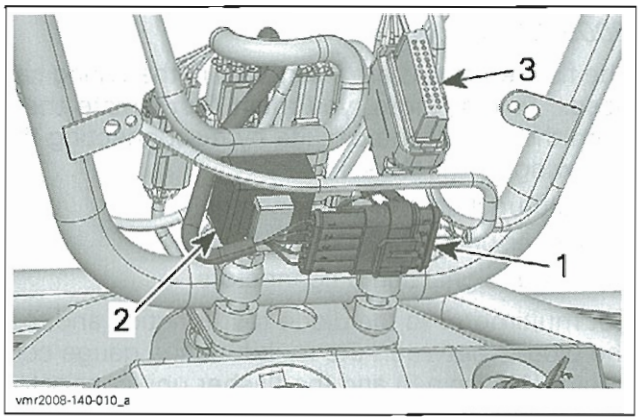
APPROXIMATE D3 DIODE LOCATION
A. 50 cm (20 in) from the flasher module connector

Diode D3 is approximately 50 cm (20 in) from the front harness connector (3-CAKX).

Turn Signal Lights Testing

2008 CE Models

- Remove the front steering cover.
- Disconnect the turn signal switch connector.



REAR VIEW – BOTH STEERING COVERS REMOVED
1. *Turn signal switch connector*
2. *Flasher module*
3. *Multifunction gauge connector*

- Measure the switch resistance as follows.

TURN SIGNAL SWITCH CONTINUITY TEST			
SWITCH POSITION	CONNECTOR PINS		RESISTANCE @ 20°C (68°F)
Left	Pin 4 (BLACK/ RED wire)	Pin 3 (GREY/ BLACK wire)	Close to 0 Ω
Right	Pin 4 (BLACK/ RED wire)	Pin 4 (WHITE/ BLACK wire)	

If switch does not test as specified, replace switch.

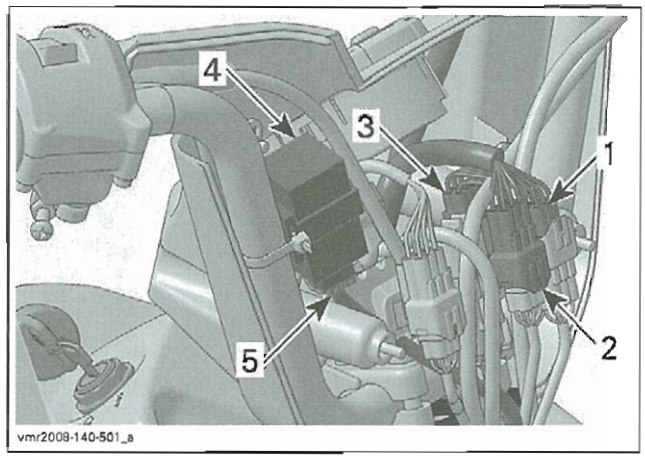
2009 CE Models

NOTE: Refer to the *WIRING DIAGRAM* for circuit details when carrying out the following checks.

Remove the front steering cover.

Disconnect the GREEN multifunction switch connector (3-MG3).

Disconnect the flasher unit connector (3-MC1).



1. *Connector 3-MG1*
2. *Connector 3-MG2*
3. *Connector 3-MG3 (green)*
4. *Flasher unit*
5. *Flasher unit connector 3-MC1*

Set the Fluke 115 multimeter (P/N 529 035 868) to Ω setting.

Test for continuity of the flasher unit ground at connector 3-MC1 pin 9 (BLACK wire) to chassis ground.

Set engine RUN/STOP switch to RUN and turn ignition key to ON.

Set multimeter to Vdc.

Test for 12 Vdc at connector 3-MC1 pin 8 (RED/BLACK wire), accessories power to flasher unit.

Test for 12 Vdc at connector 3-MG3 pin 3 (RED/BLACK wire), accessories power to signal lights control switch.

If you have a good ground at 3-MC1 pin 9, 12 Vdc at 3-MC1 pin , and 3-MG3 pin 3, carry out a continuity test of the signal lights control switch.

Also test continuity of wire harness between flasher unit and the signal lights control switch connector. Refer to *WIRING DIAGRAM* for circuit details.

If wiring circuits test good, replace the flasher unit.

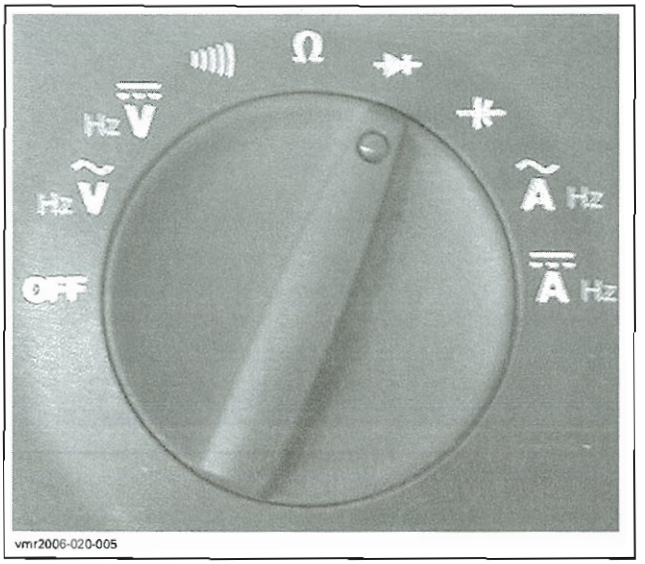
Flasher Diodes Test

2008 CE Models

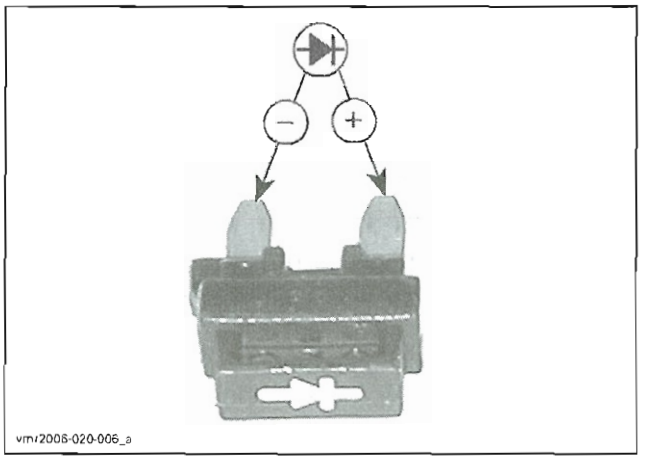
- Remove the front storage cover and the fuse box cover.
- Remove each diode separately from the fuse box.

NOTE: Pay attention to diode orientation (polarity) for installation.

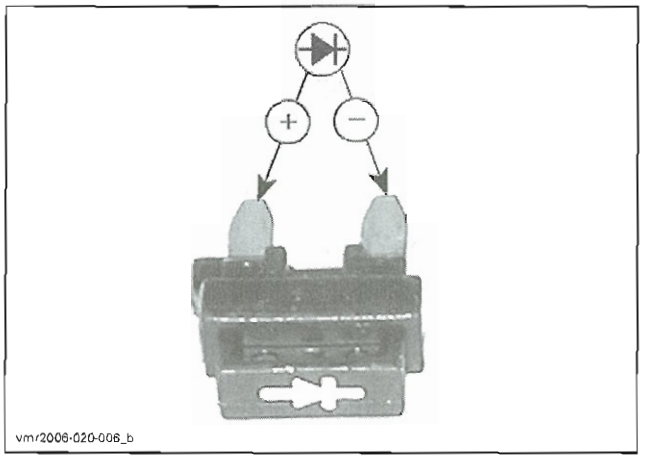
- Use the Fluke 115 multimeter (P/N 529 035 868) and set it to the diode symbol as shown.



- Probe diodes in each direction while paying attention to the diode polarity.



MUST BE OPEN CIRCUIT



MUST BE APPROXIMATELY 0.5 V

2009 CE Models

The flasher diodes are integrated in the wiring harness. To test them, you must first isolate them from the rest of the circuits by disconnecting the following connectors.

- Multifunction gauge connector
- Flasher unit connector
- All four signal lights connectors.

Set multimeter to the diode test function and test the diodes between the multifunction gauge connector (1-C1 pin 8) and the flasher unit connector, 3-MC1 pin 10 for diode D3, and 3-MC1 pin 11 for diode D2. Refer to the wiring diagram for details.

NOTE: Pay attention to diode polarity when carrying out the test. See previous 2008 model procedure for details.

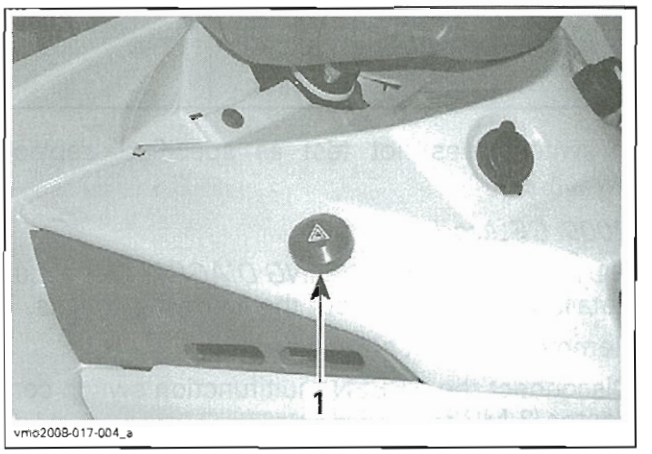
HAZARD WARNING LIGHTS

CE Models Only

Hazard Warning Lights Operation

2008 CE Models

The hazard warning lights button is located on the left side of the console.



TYPICAL – 2008 MODEL ILLUSTRATED
1. Hazard warning button

When the button is pushed in, it activates the four turn signal lights (hazard warning function) which takes precedence over the turn signal function.

When the hazard warning lights button is pressed in, it completes a circuit through the flasher module to the turn signal lights causing simultaneous flashing of all four turn signal lights as well as the turn signal indicator light in the multifunction gauge.

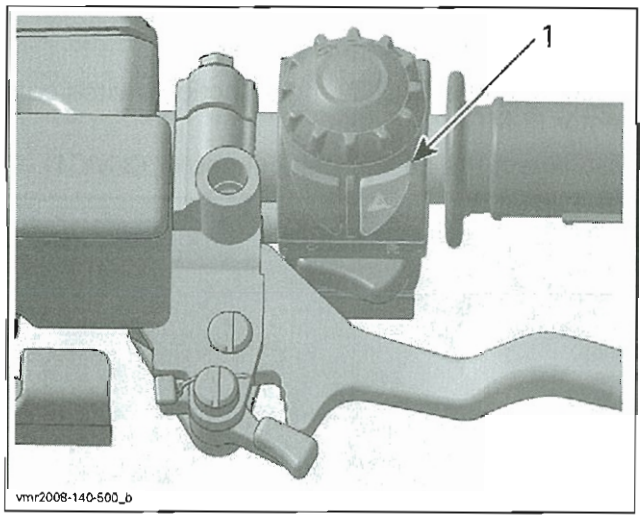
The switch has a mechanical detent which, locks the switch in the activation position. Press the hazard warning lights button once to activate, press once again to deactivate.

The hazard warning lights can be activated even when the vehicle electrical system is shut down. They receive battery power through the fan/accessories fuse and the control Euro fuse directly to the hazard lights control switch.

When electrical power is applied to the vehicle, power is applied to the hazard warning lights button for internal lighting (dim lighting) to make locating the button easier in the dark.

2009 CE Models

The hazard warning lights control button is located in the front of the LH multifunction switch.



1. Hazard warning lights button

It is a momentary contact type and must be held in for approximately half a second to ensure activation or deactivation of the circuits in the electronic flasher unit.

The hazard warning lights cannot be activated on battery power only. Vehicle electrical power must be turned ON. This will energize the accessories relay which will power the FLASHER, HAZARD and HORN control switches through the accessories fuse.

Once the HAZARD lights are activated, the vehicle power may be turned OFF. The hazard lights will remain active until electrical power is turned ON again, and the hazard warning lights are selected OFF.

NOTE: The flasher unit requires electrical power from both the accessories and the control Euro fuses for hazard warning lights operation, but only from the accessories fuse for flasher operation.

The hazard warning lights button on 2009 models is not internally lit. However, a red indicator light on top of the LH multifunction switch will flash when the hazard warning lights are selected ON.

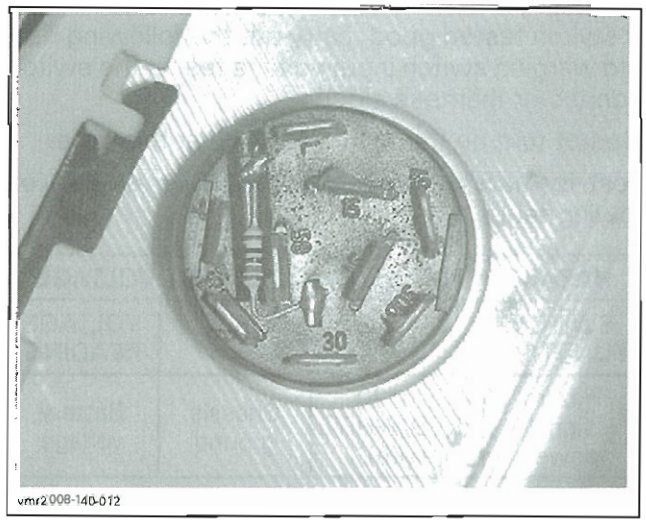
This light receives the same 12 Vdc as the signal/hazard warning lights. The ground for the hazard indicator light is supplied by the electronic flasher unit only when the "Hazard lights" function is activated.

Hazard Warning Switch Testing

2008 CE Models

If the lights will not flash in turn signal or hazard warning functions, try a known good flasher module. If it still does not function, carry out the following tests.

- Remove the console panel, refer to the *BODY* section.
- Disconnect the hazard warning switch connector.



HAZARD WARNING SWITCH CONTACTS

- Test hazard warning switch as per following tables.

HAZARD WARNING SWITCH TESTING				
WITCH POSITION	WITCH FUNCTION	CONTACTS		RESISTANCE @ 20°C (68°F)
Out	Light (dim)	Pin 31	Pin 58	Close to 0 Ω (Continuity)
	Turn signal power	Pin 15	Pin 49	
In	Light (dim)	Pin 31	Pin 58	Close to 0 Ω (Continuity)
	Hazard signal power	Pin 30	Pin 30b	
	Turn signal power	Pin 15	Pin 49	OL (open)
	LH lights power	Pin 49a	Pin L	Close to 0 Ω (Continuity)
	RH lights power	Pin 49a	Pin R	

If switch does not test as specified, replace switch.

If switch tested good, carry out the following hazard warning switch input voltage test at the switch connector (harness side).

Do not turn on the ignition switch at this time.

Test for hazard warning signal power as per following table.

HAZARD WARNING SWITCH INPUT VOLTAGE			
SWITCH FUNCTION	CONTACTS		VOLTAGE READING
Hazard signal power	Pin 30 (RED/WHITE wire)	Chassis ground	Battery voltage

If you do not have battery power, test the control Euro fuse, wiring and connectors.

NOTE: If the control Euro fuse is burnt, the horn will not function either.

If hazard switch input voltage and hazard switch tested good, and a replacement flasher module did not function, test continuity of wiring/connectors.

Also test the following.

- Set engine stop switch to RUN.
- Set ignition switch to ON.
- Carry out the following test as per table.

HAZARD WARNING SWITCH INPUT VOLTAGE			
SWITCH FUNCTION	CONTACTS		VOLTAGE READING
Turn signal power	Pin 49	Chassis ground	Battery voltage
Light (dim)	Pin 58 (ORANGE/GREEN wire)	Pin 31 (BLACK)	
		Chassis ground	

If you do not measure battery voltage in either of the above tests, repair or replace applicable wiring/connectors.

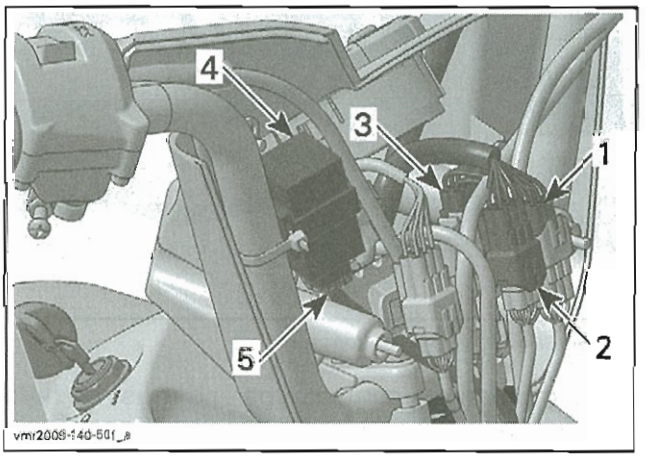
2009 CE Models

NOTE: Refer to the *WIRING DIAGRAM* for circuit details when carrying out the following checks.

Remove the front steering cover.

Disconnect the GREEN multifunction switch connector (3-MG3).

Disconnect the flasher unit connector (3-MC1).



1. *Connector 3-MG1*
2. *Connector 3-MG2*
3. *Connector 3-MG3 (green)*
4. *Flasher unit*
5. *Flasher unit connector 3-MC1*

Set the Fluke 115 multimeter (P/N 529 035 868) to Ω setting.

Test for continuity of the flasher unit ground at connector 3-MC1 pin 9 (BLACK wire) to chassis ground.

Set engine RUN/STOP switch to RUN and turn ignition key to ON.

Set multimeter to Vdc.

Test for 12 Vdc at connector 3-MC1 pin 8 (RED/BLACK wire), accessories power to flasher unit.

Test for 12 Vdc at connector 3-MC1 pin 6 (RED/BLACK wire), battery power to flasher unit.

Test for 12 Vdc at connector 3-MG3 pin 3 (RED/BLACK wire), accessories power to hazard lights control switch.

If you have a good ground at 3-MC1 pin 9, 12 Vdc at 3-MC1 pins 8 and 6, and 12 Vdc at 3-MG3 pin 3, carry out a continuity test of the hazard warning lights control switch.

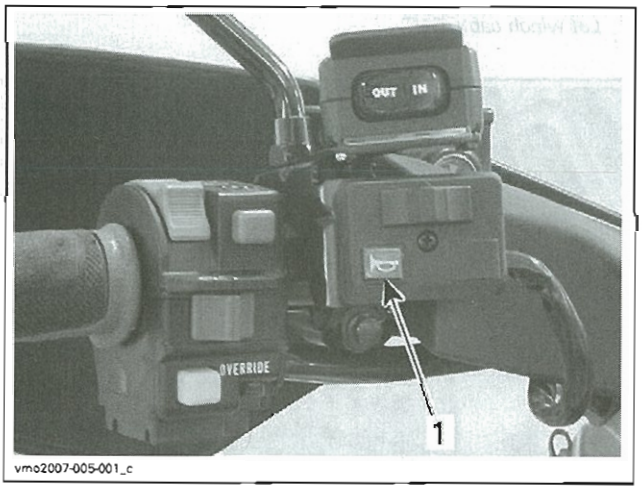
Also test continuity of wire harness between the flasher unit and warning lights switch connector. Refer to *WIRING DIAGRAM* for circuit details.

If wiring circuits test good, replace the flasher unit.

HORN

2008 CE Models Only

The horn activation button is located on the left side of handlebar.



TYPICAL – 2008 CE MODELS
1. Horn button

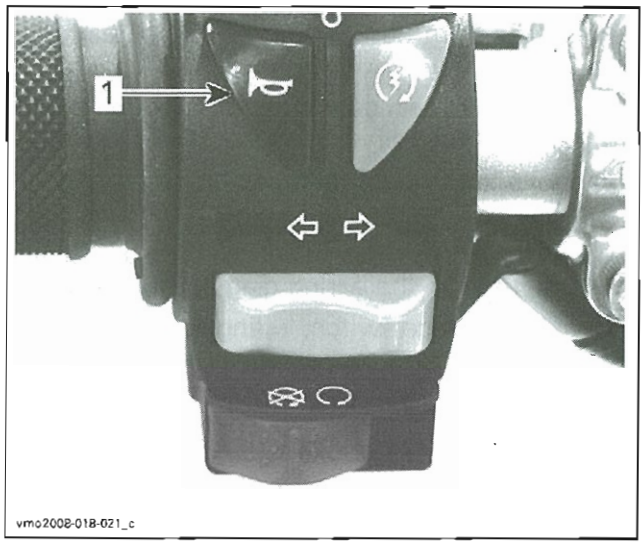
The horn **can** be activated without power being applied to the vehicle on 2008 models.

It receives battery power through the fan/accessories fuse (F9) and the control Euro fuse (F10) directly to the horn. The horn button supplies the ground to the horn when pressed in.

NOTE: If the control Euro fuse is burnt, the hazard warning lights will not function either.

2009 CE Models

The horn activation button is located on the LH multifunction switch assembly.



TYPICAL – 2009 MODEL ILLUSTRATED
1. Horn button

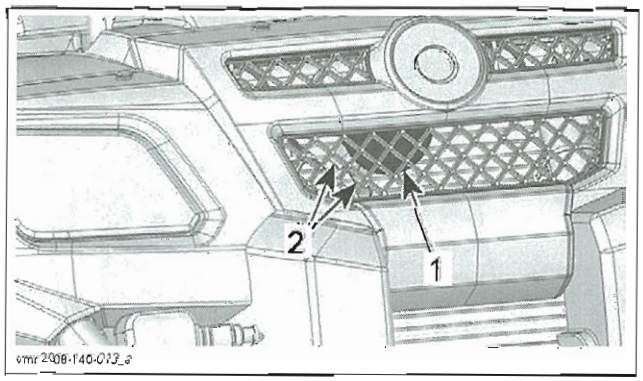
The horn **cannot be activated** without power being applied to the vehicle on 2009 models.

It receives 12 Vdc power from the accessories fuse (F7), through the horn button.

Horn Testing

2008 CE Models

- If the horn does not function, disconnect horn connectors and test for input voltage at the RED/WHITE wire terminal. You should measure battery voltage.



1. Horn location
2. Horn connectors

- If horn input voltage is good, reconnect the RED/WHITE wire to the horn and momentarily ground the other horn terminal to the chassis with a jumper.

If the horn does not function with the jumper, replace it.

- If the horn functioned with a jumper to ground, set multimeter to Ω and connect between chassis ground and the BEIGE/BLACK horn wire terminal.

- Press the horn button, you should obtain close to 0 Ω (continuity).

If you do not obtain continuity through the switch from the horn terminal, carry out the following.

- Remove the front steering cover, refer to *BODY* section.
- Carry out a continuity test of the horn switch and wiring, refer to the wiring diagram for details.
- Repair or replace switch, wiring or connectors as applicable.

2009 CE Models

If the horn does not function, disconnect horn connectors.

Test for continuity to ground at the black wire terminal (3-KX1).

Turn on the vehicle power.

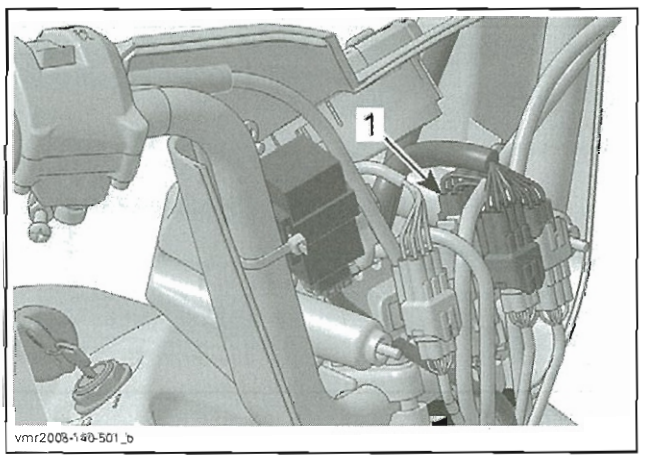
While depressing the horn button, test for 12 Vdc between the horn BEIGE/BLACK wire and chassis ground.

If you measure a good ground and a good 12 Vdc, replace the horn.

If you do not measure 12 Vdc, Turn OFF vehicle power.

Remove the front steering cover.

Disconnect the green multifunction switch connector 3-MG3.



1. Multifunction switch connector 3-MG3 (GREEN)

As you press the horn button, test for continuity through the horn switch, pins 3 and 4.

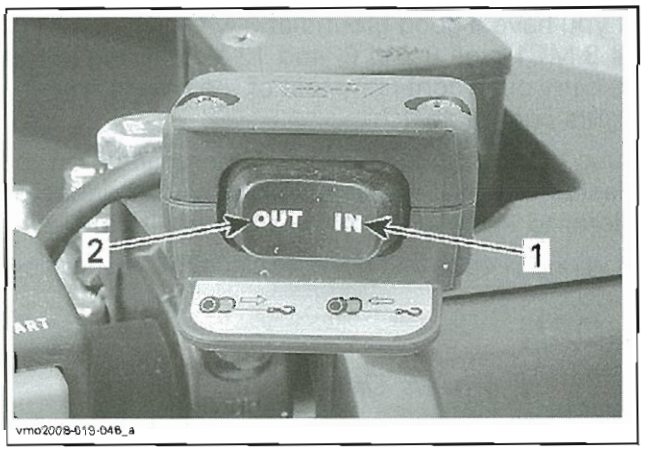
Also test for continuity of the harness wiring between the horn connector and the multifunction switch connector. Refer to the *WIRING DIAGRAM* for details.

Repair or replace wiring/connectors, or horn as required.

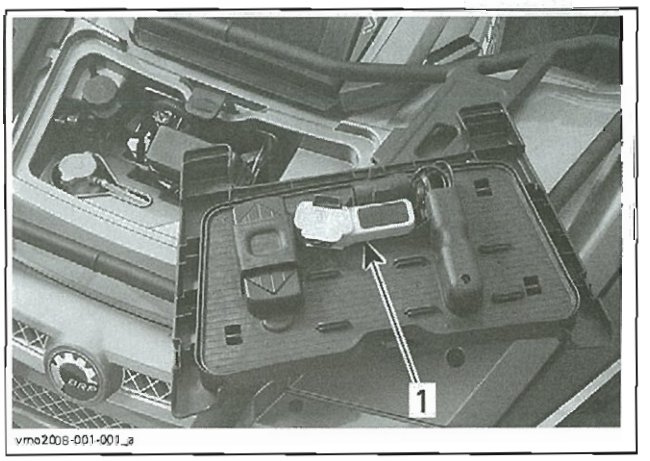
WINCH

XT Models Only

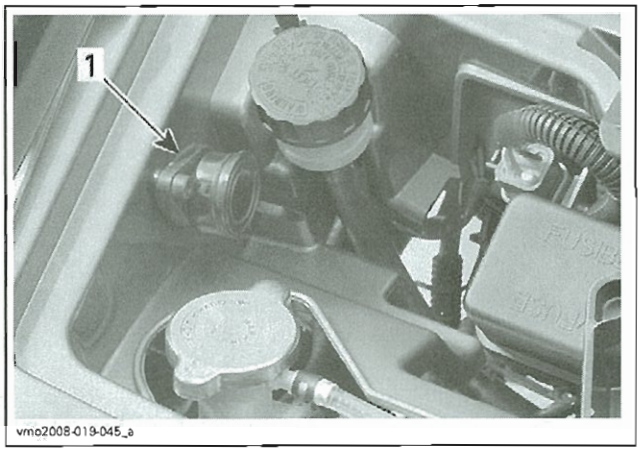
Test winch using the control switch on the LH handle bar and the remote control in the front service compartment.



TYPICAL
1. Reel winch cable IN
2. Let winch cable OUT



FRONT SERVICE COMPARTMENT PANEL
1. Winch remote control

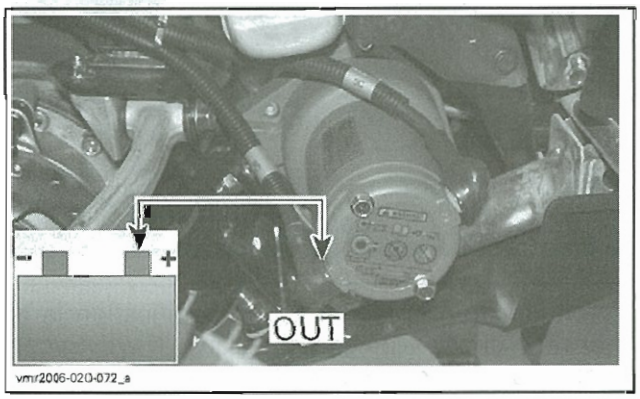


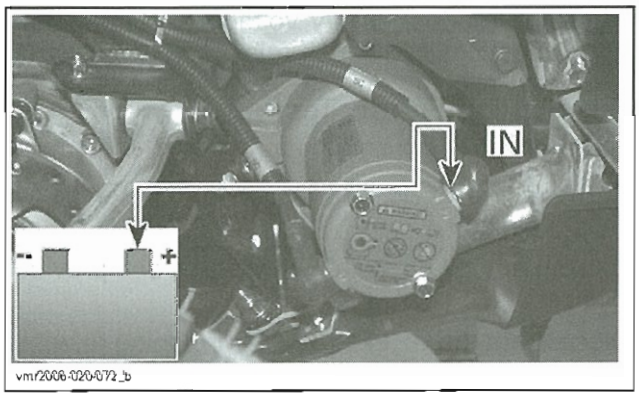
FRONT SERVICE COMPARTMENT
1. Winch remote control connector

Winch Test

Winch Motor

- Using booster cables, connect one end of the red cable to the (-) battery post and touch the other end to the out post on the winch motor. The winch should run to let out the cable.
- Repeat the test touching the cable to the IN post on the winch motor. The winch should run to reel in its cable.



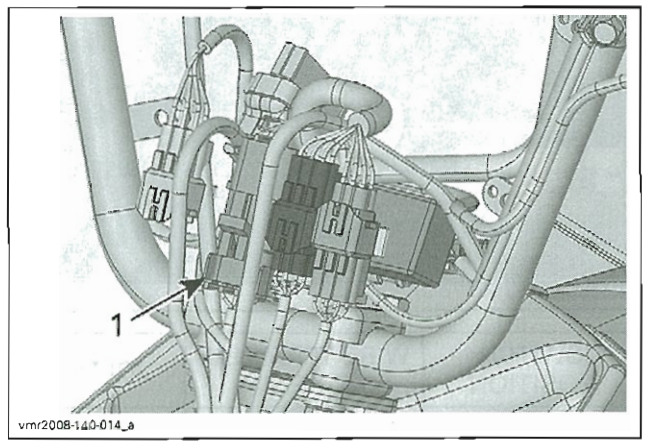


If motor does not turn in either test, replace motor. If it works, continue testing.

Winch Control Switch Input Voltage Test

Remove the front steering cover. Refer to *BODY*.

Disconnect the winch control switch connector.



TYPICAL
1. Winch control switch connector

Set engine stop switch to RUN.

Set ignition switch to ON.

Using a Fluke 115 multimeter (P/N 529 035 868) set to Vdc, measure the resistance as follows.

WINCH CONTROL SWITCH INPUT VOLTAGE TEST		
WINCH SWITCH CONNECTOR (HARNESS SIDE)		VOLTAGE
Pin A	Battery ground	Battery voltage

If there is no voltage, check fuses F9, F6, relay R4 (accessories relay) and wiring condition.

If there is voltage, test switch as follows.

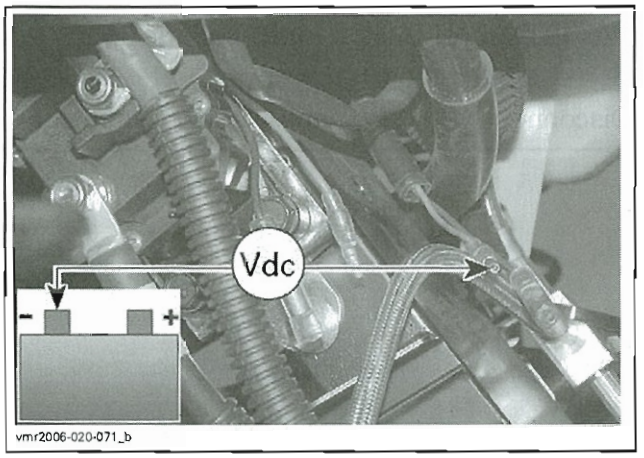
Winch Relay Control Signal Voltage

Turn OFF vehicle electrical power and wait for it to shut off.

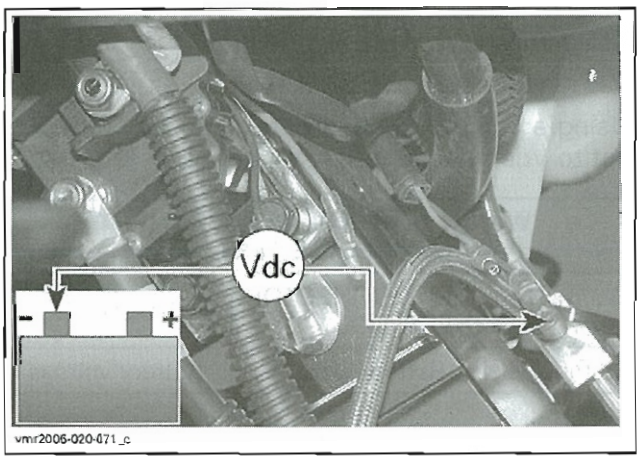
Disconnect terminals at winch relay.

Measure control signal voltage from switch as follows.

WINCH RELAY CONTROL SIGNAL VOLTAGE			
SWITCH POSITION	WIRE TERMINALS AT RELAY		VOLTAGE
Switch pressed to IN and held	GREEN/ BLUE	Chassis ground	Battery voltage



SWITCH POSITION	WIRE TERMINAL AT RELAY		VOLTAGE
Switch pressed to OUT and held	BLUE/ GREEN	Chassis ground	Battery voltage



If voltage is not read in either test, carry out a continuity test of the winch control switch further in this section.

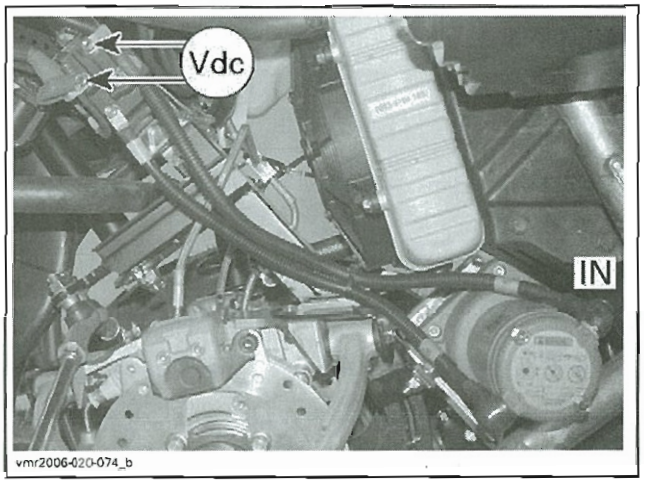
If voltage is read in both tests, test winch relay as follows.

Winch Relay Voltage Drop

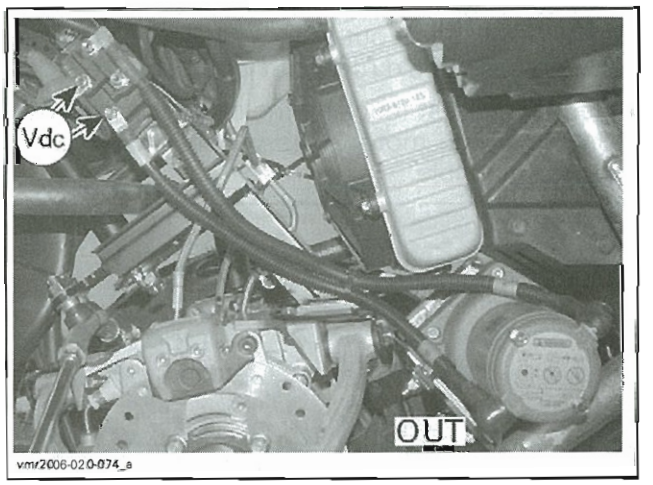
Reconnect terminals at winch relay.

Measure voltage drop across relay contacts as follows.

WINCH RELAY VOLTAGE DROP			
SWITCH POSITION	RELAY TERMINALS		VOLTAGE DROP
Switch pressed to IN and held	Battery post (RED cable)	IN cable to winch motor	0.2 Vdc max.



POSITION	RELAY TERMINAL		VOLTAGE DROP
Switch pressed to OUT and held	Battery post (RED cable)	OUT cable to winch motor	0.2 Vdc max.



If voltage drop is higher than specification in either test, check wiring/connectors. If wiring/connectors are good, replace winch relay.

If voltage read is battery voltage, the relay does not close. Replace winch relay.

D5 and D6 Diode Test

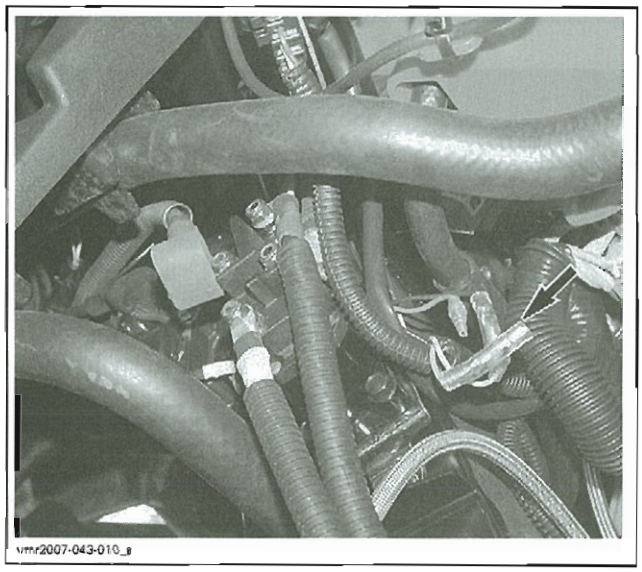
NOTE: Refer to *WIRING DIAGRAM*.

Remove the front steering cover. Refer to the *BODY* section.

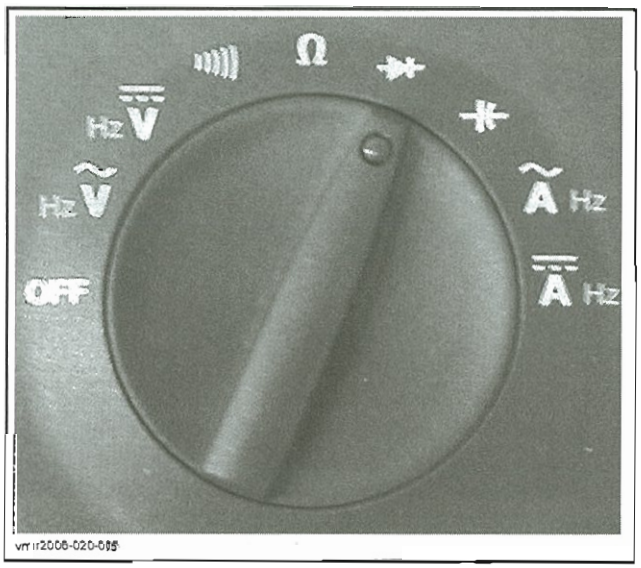
Disconnect winch switch connector, see previous illustration.

Disconnect the GREEN/BLUE wire going to winch relay (GREEN on relay).

Disconnect the BLUE/GREEN wire going to winch relay (BLACK on relay).



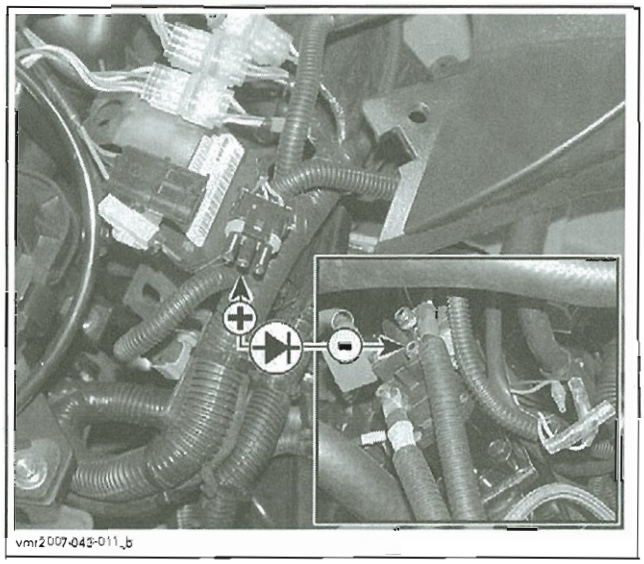
Use the Fluke 115 multimeter (P/N 529 035 868) and set it to the diode symbol as shown.



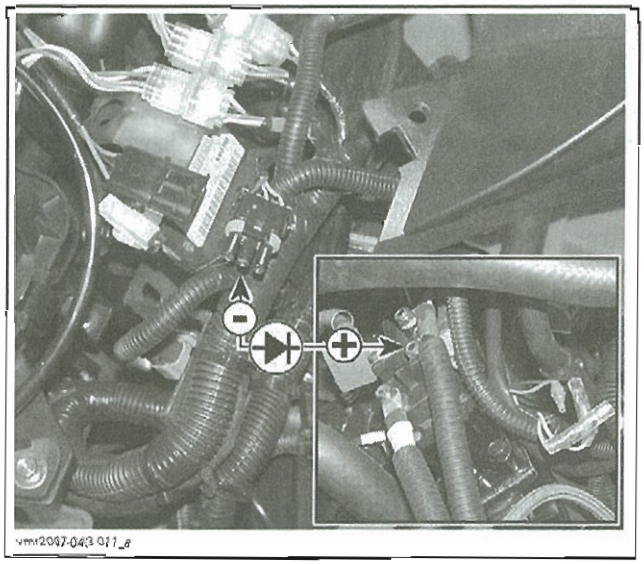
Probe wires while paying attention to the diode polarity.

DIODE	WIRES TO PROBE (HARNESS SIDE)	
	WINCH SWITCH CONNECTOR	WINCH RELAY POST
D5	GREEN/BLUE	Ground
D6	BLUE/GREEN	

Probe diodes in both forward and backwards polarity for proper testing. See illustrations.



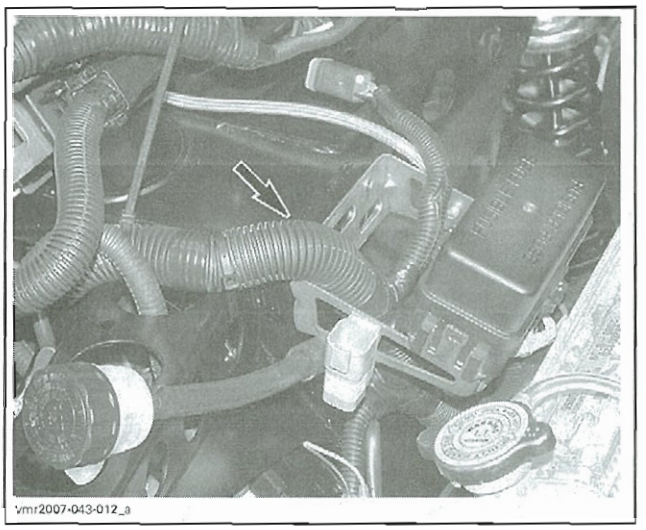
REVERSE POLARITY (MUST BE OPEN CIRCUIT)



FORWARD POLARITY (MUST BE AROUND 0.5 V)

If a diode fails the test, replace the diode.

NOTE: Diodes are located in wiring harness approximately where shown in following illustration.



DIODE LOCATION

Properly reinstall removed parts.

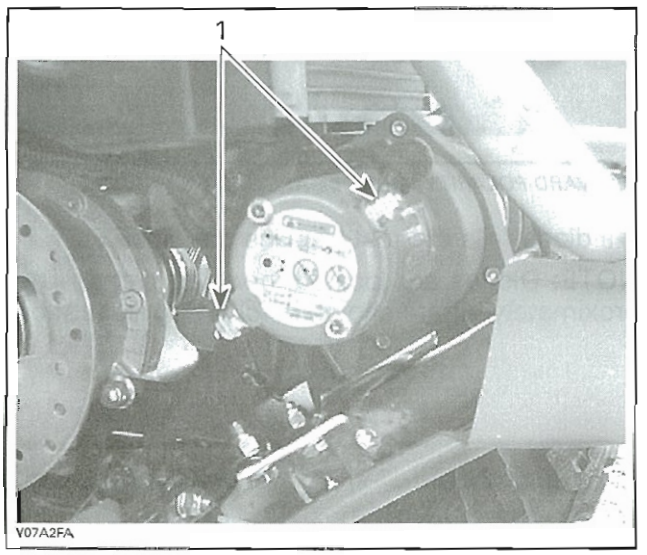
Winch Removal

Disconnect, the BLACK (-) battery cable, then the RED (+) cable.

⚠ WARNING

Always disconnect BLACK (-) battery cable first. Electrolyte or fuel vapors can be present in engine compartment and a spark may ignite them possibly causing severe injuries.

Disconnect winch power cables.

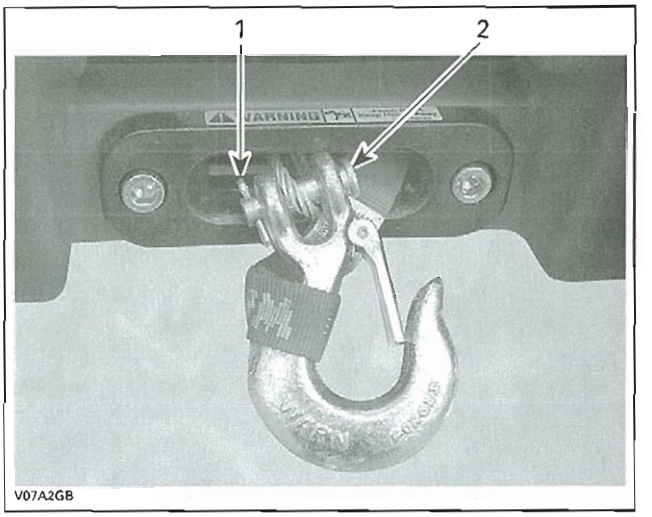


1. Winch power cable connections

NOTE: Note the position of the power cables for reinstallation.

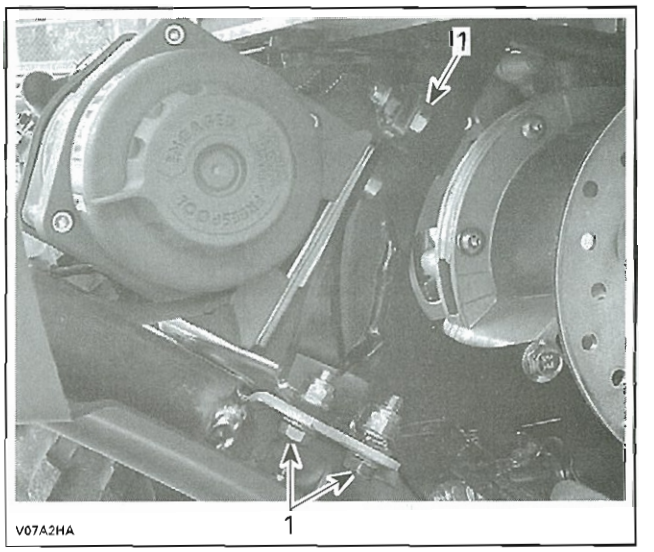
Remove the cotter pin from the winch hook retaining pin.

Remove the hook retaining pin, and hook.



1. Cotter pin
2. Hook retaining pin

Remove the winch retaining screws, and winch.



1. Winch retaining screws

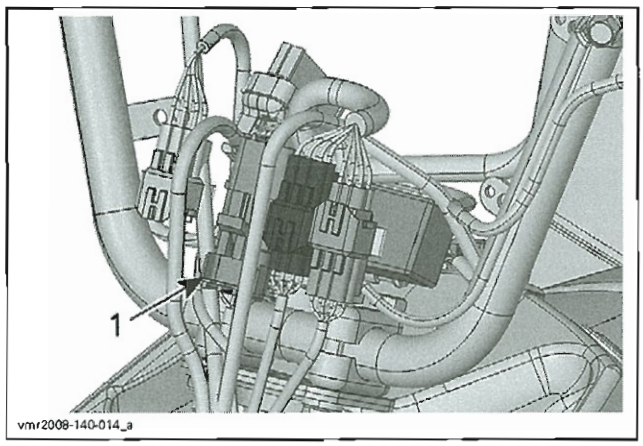
Winch Installation

For the installation, reverse the removal procedure.

WINCH CONTROL SWITCH

Winch Control Switch Continuity Test

- Disconnect winch control switch connector.



TYPICAL
1. Winch control switch connector

- Set multimeter to Ω and test switch as per following table.

WINCH CONTROL SWITCH CONTINUITY TEST		
SWITCH POSITION	SWITCH CONNECTOR PINS	
Out	Pin A	Pin B
In	Pin A	Pin C

If switch does not pass continuity test, replace winch control switch.

If all readings were good, test wiring/connectors between switch and winch relay. Repair or replace as required.

Winch Control Switch Removal

Remove screws retaining winch control switch to handlebar.

Remove front steering cover, refer to *BODY*.

Disconnect the winch control switch connector.

Winch Control Switch Installation

For the installation, reverse the removal procedure.

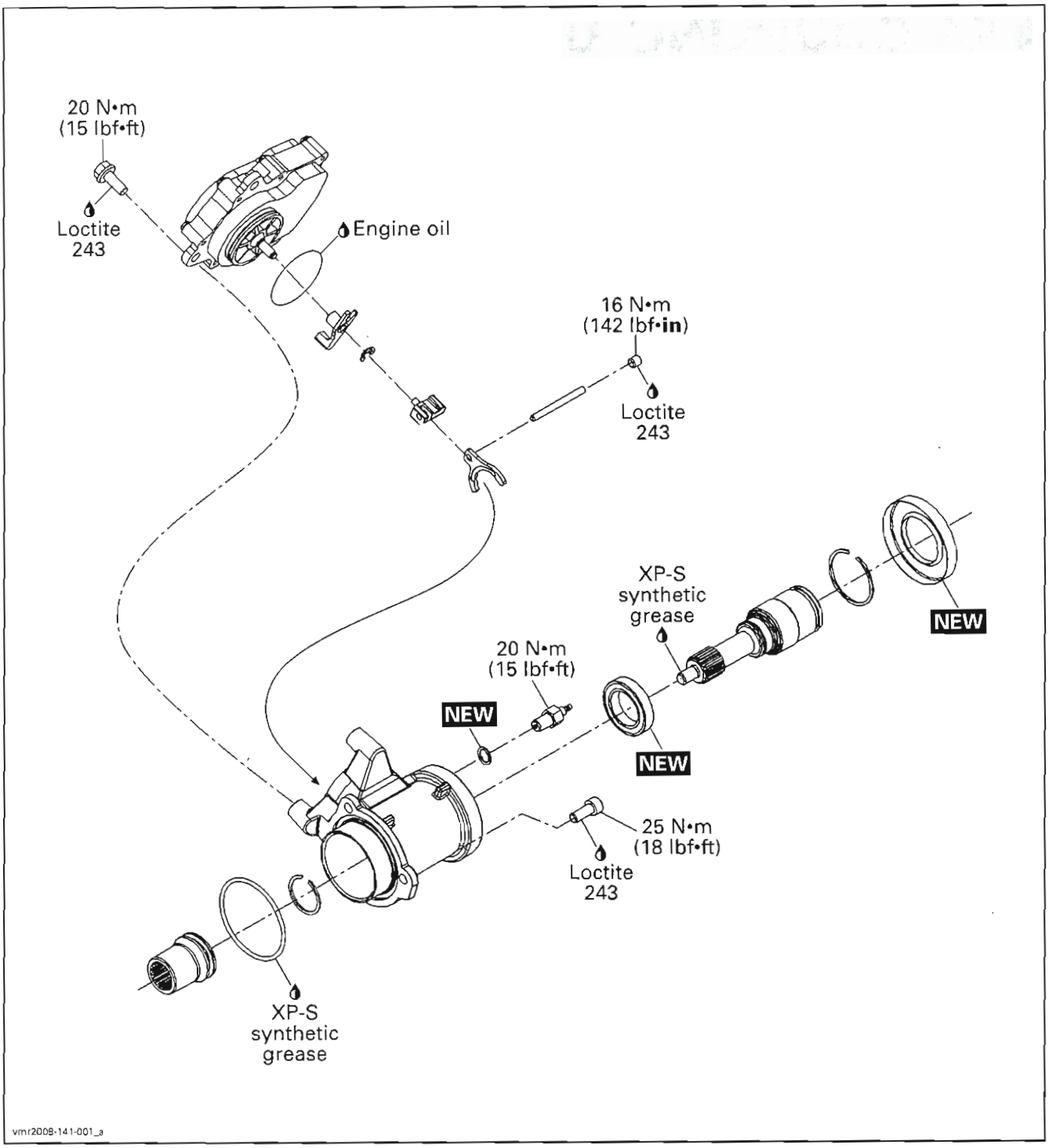
4X4 COUPLING UNIT

SERVICE TOOLS

Description	Part Number	Page
Fluke 115 multimeter	529 035 868	321, 323
blind hole bearing puller set	529 036 117	326

SERVICE PRODUCTS

Description	Part Number	Page
XP-S synthetic grease	293 550 010	329
Loctite 243 (blue)	293 800 060	323, 328–329



GENERAL

During assembly/installation, use the torque values and services products as in the exploded view.

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

⚠ WARNING

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

Hoses or cables removed or disconnected must be installed and routed at the same place.

CAUTION: Locking ties removed during a procedure must be replaced and installed at the same location.

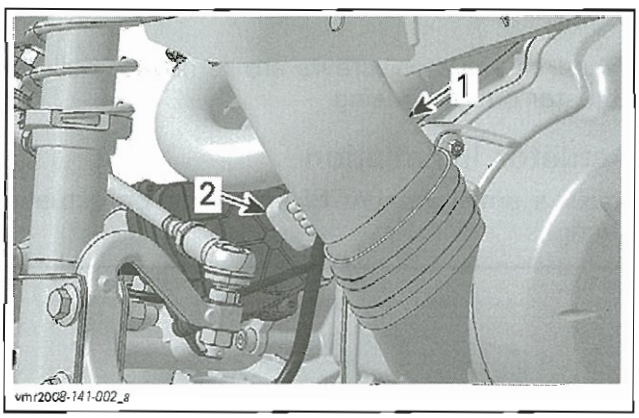
PROCEDURES

2WD/4WD SELECTOR

2WD/4WD Selector Test

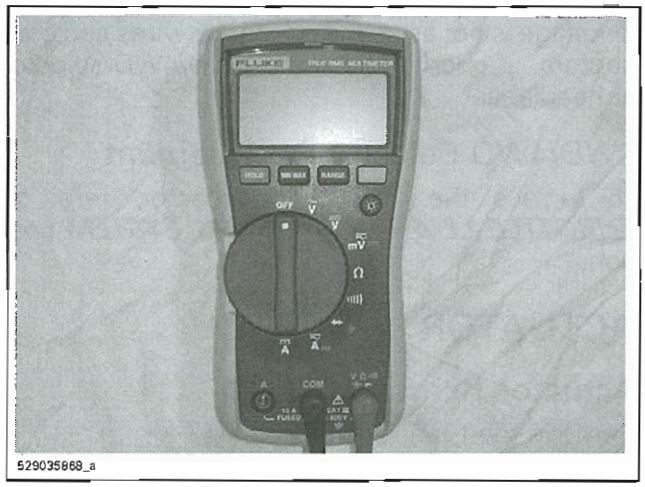
Remove LH footrest. Refer to *BODY* section.

Unplug connector from coupling unit.



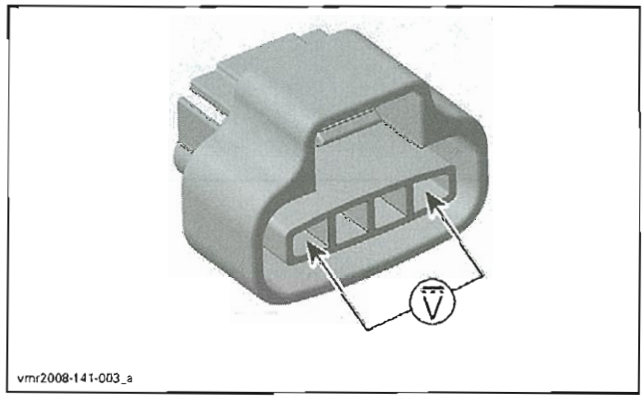
1. *CVT air inlet duct*
2. *Connector*

Using the Fluke 115 multimeter (P/N 529 035 868), check if the 2WD/4WD selector at handlebar works properly.



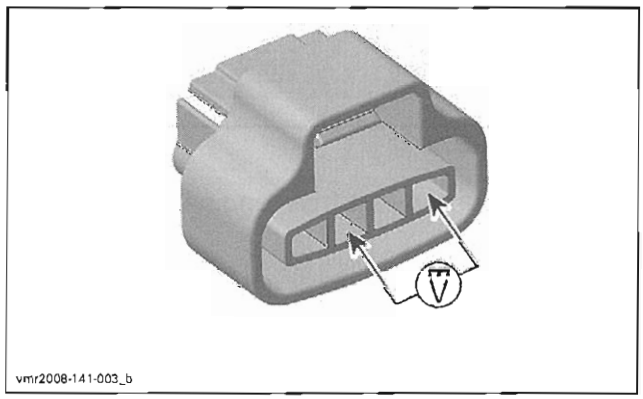
- Turn ignition key ON.
- Select 2WD position.
- Install the RED probe to the WHITE wire connector and the BLACK probe to the WHITE/BLACK wire connector.

The obtained value should be 12 Vdc.



- Select 4WD position.
- Install the RED probe to the WHITE/BLUE wire connector and the BLACK probe to the WHITE wire connector.

The obtained value should be 12 Vdc.



If voltage is not as specified, check wires and connectors. If good, replace the 2WD/4WD selector at handlebar.

2WD/4WD Selector Replacement

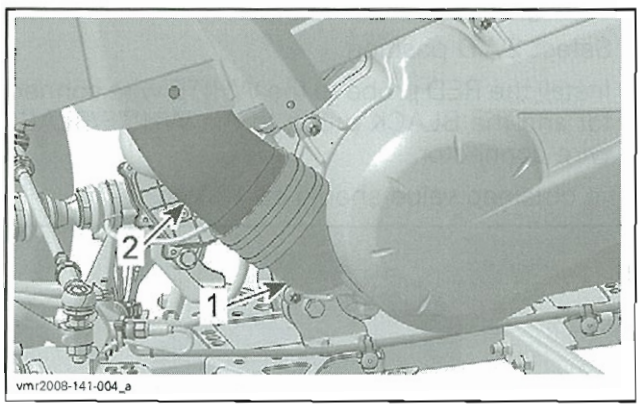
To replace the 2WD/4WD selector, refer to *THROTTLE LEVER* in *STEERING SYSTEM* section.

ACTUATOR

Actuator Removal

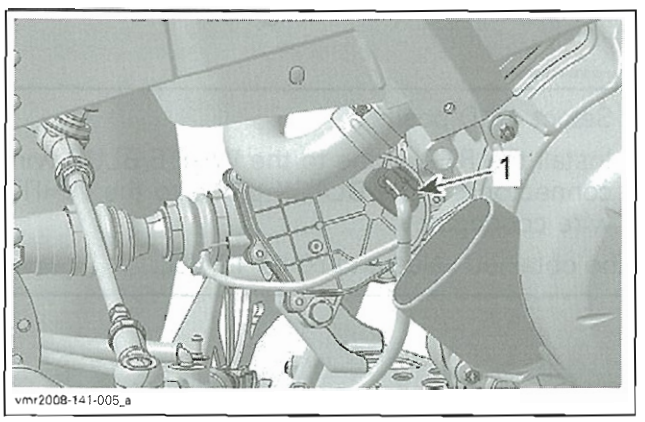
Remove the LH and RH footrests.

Remove CVT air inlet duct from CVT housing.



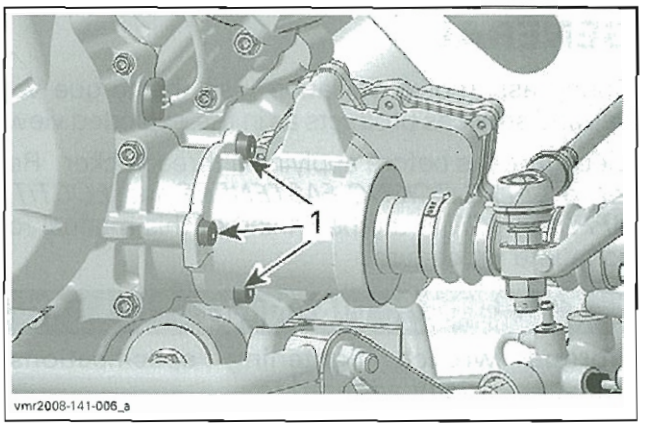
1. *CVT housing*
2. *CVT air inlet duct*

Unplug actuator connector.



1. *Actuator connector*

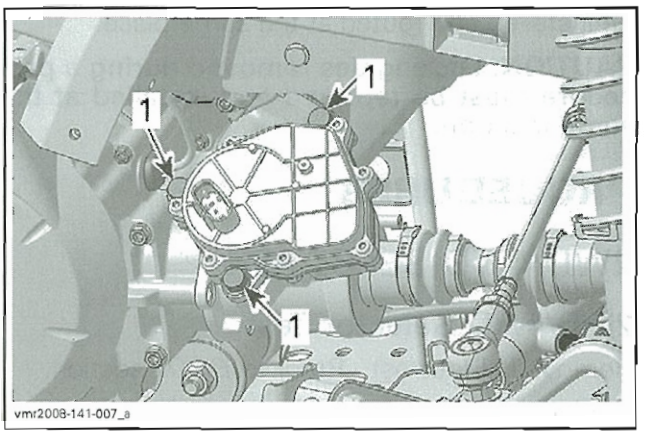
Unscrew coupling unit from engine.



1. *Coupling unit screws*

Rotate the coupling unit to reach actuator screws.

Remove actuator screws.

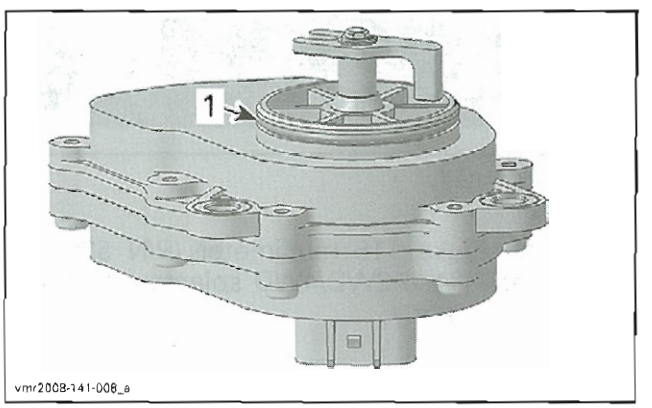


1. *Actuator screws*

When all actuator screws are removed, pull the actuator out of housing.

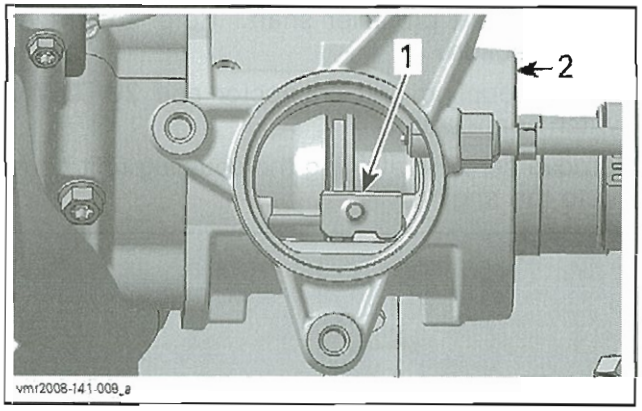
Actuator Installation

Apply a small amount of engine oil on actuator O-ring.



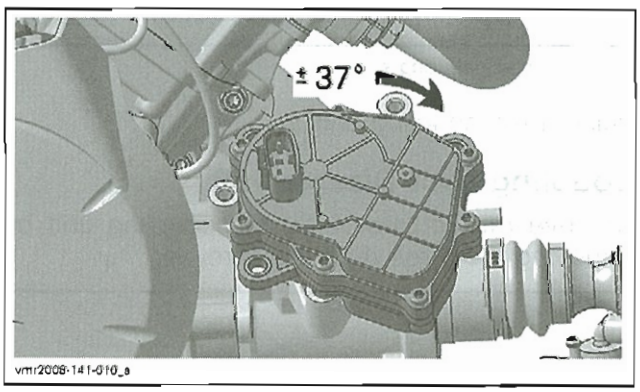
1. *Actuator O-ring*

Verify if sliding sleeve is in 2WD position. The sliding sleeve should be pointed toward the front of vehicle.



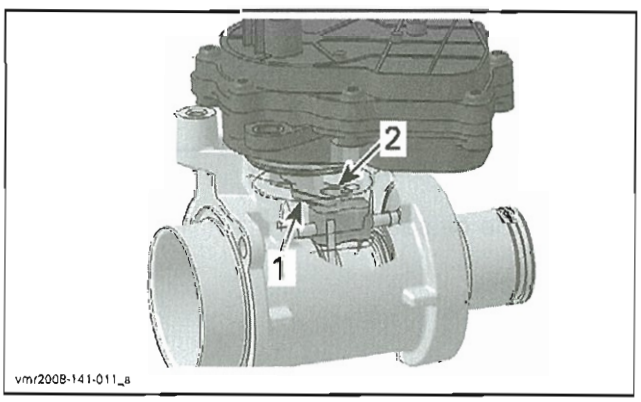
1. *Sliding sleeve*
2. *Coupling unit housing*

Turn the actuator 37 degrees clockwise from the mounting position.



FROM RH SIDE — ACTUATOR POSITIONS AT 37 DEGREES

Align the actuator fork with the dog on sliding sleeve then push the actuator in the housing.



1. *Actuator fork*
2. *Sliding sleeve dog*

Rotate the actuator counterclockwise until it orients itself to mounting position.

CAUTION: Do not cut or break the actuator O-ring.

Apply Loctite 243 (blue) (P/N 293 800 060) on threads of actuator screws.

Tighten actuator screws.

Apply Loctite 243 (blue) (P/N 293 800 060) on threads of coupling unit screws.

Tighten coupling unit screws.

Connect actuator.

Lift the front of vehicle until front wheels turn freely.

Try to turn the front propeller shaft. The shaft should turn easily.

Place ignition switch to ON position and select the 4WD position.

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.

Install all other removed parts.

2WD/4WD SWITCH

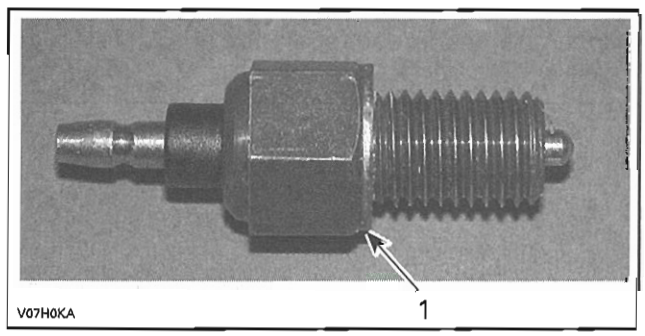
Switch Removal

Remove RH footrest.

Unplug the 2WD/4WD switch connector.

Unscrew the switch from coupling unit housing.

Discard the sealing washer.

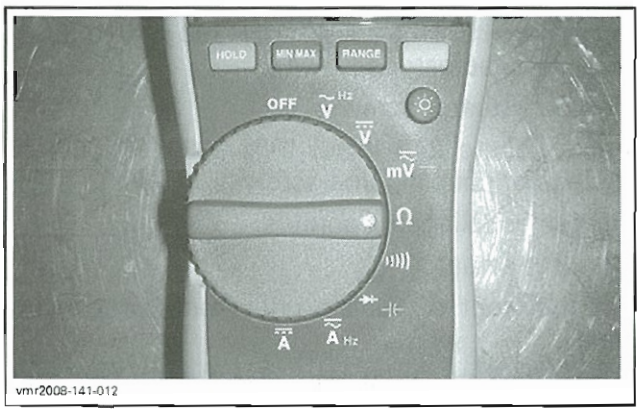


1. *Sealing washer*

Switch Test

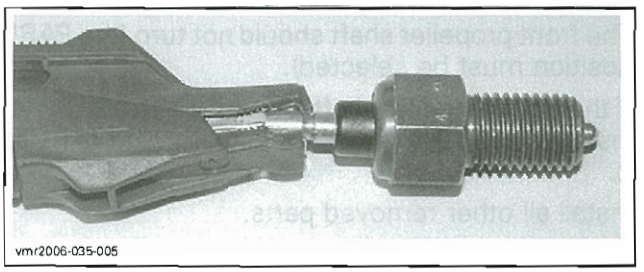
Using the Fluke 115 multimeter (P/N 529 035 868), do the following to check the switch.

- Place the multimeter selector on Ω.

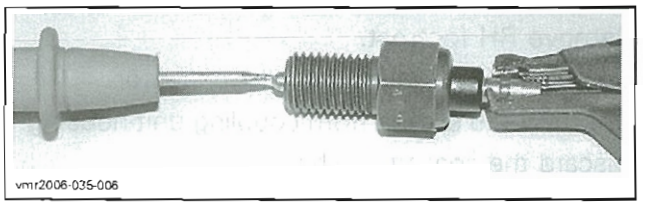


vmr2008-141-012

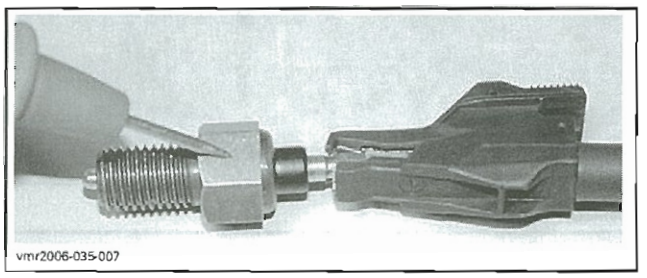
- Using an alligator clip, place the BLACK probe on the external pin.


vmr2006-035-005

- Touch the contact pin with the RED probe. The multimeter should indicate ± 1 Ω.


vmr2006-035-006

- Apply the RED probe on switch body. The measure should be OL.


vmr2006-035-007

If switch is out of specifications, replace it.

Switch Installation

The installation is the reverse of the removal procedure.

Use a NEW sealing washer when installing the switch.

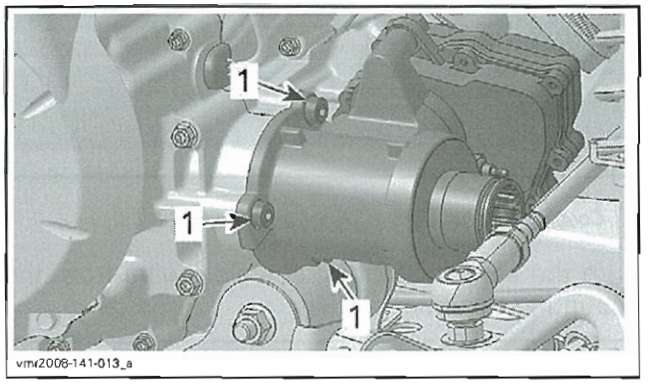
COUPLING UNIT

Coupling Unit Removal

Remove front propeller shaft. Refer to *FRONT DRIVE* section.

Unplug coupling unit connector and 2WD/4WD switch connector.

Remove screws retaining the coupling unit housing to the engine.



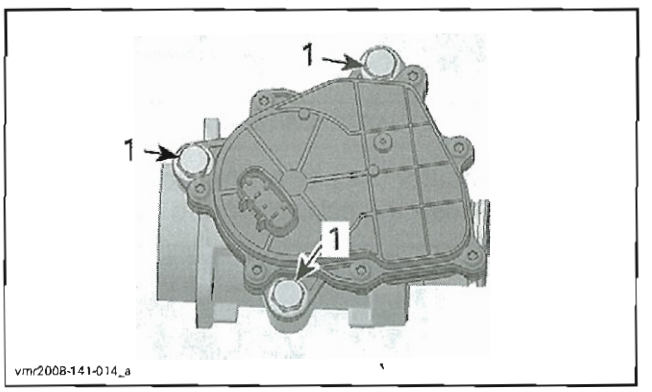
vmr2008-141-013_a

1. Coupling unit housing screws

Pull out the coupling unit.

Coupling Unit Disassembly

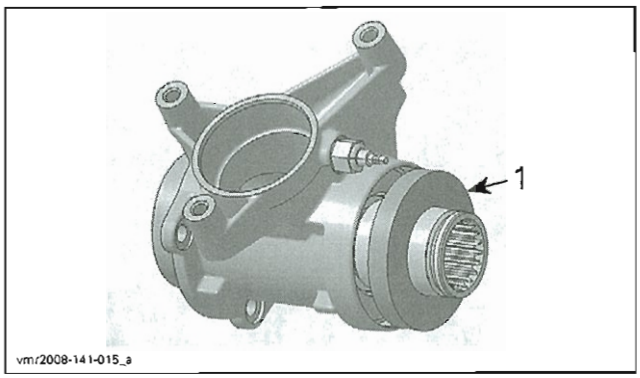
Remove the actuator from the coupling unit by removing the three retaining screws.



vmr2008-141-014_a

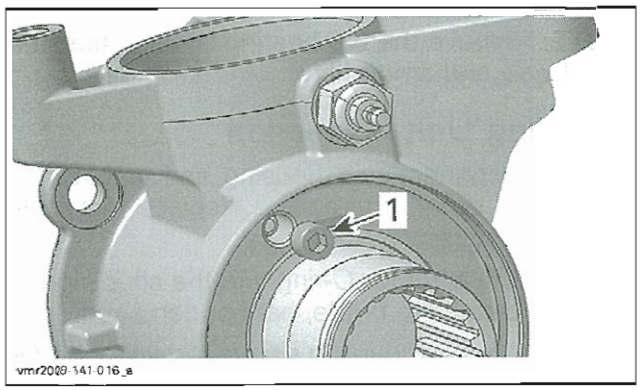
1. Actuator screws

Remove the oil seal.



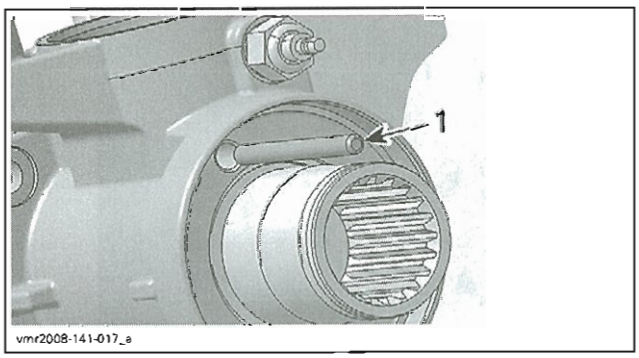
1. Oil seal

Remove the Allen set screw.



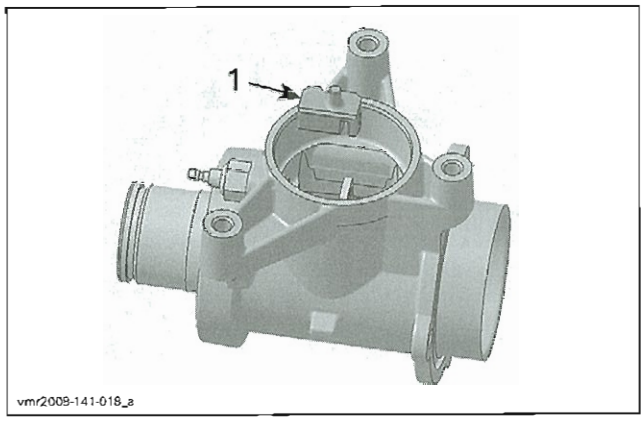
1. Allen set screw

Pull out the sliding sleeve pin.



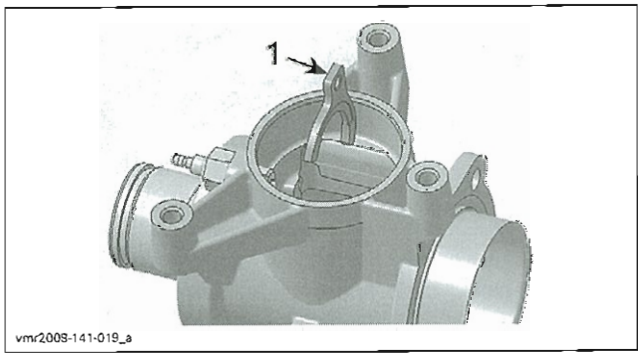
1. Sliding sleeve pin

Remove sliding sleeve.



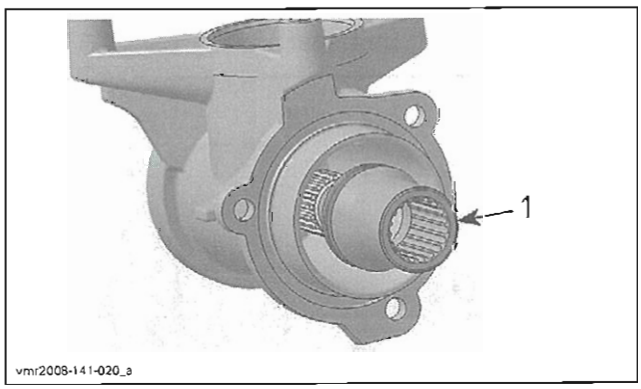
1. Sliding sleeve

Remove the shifter fork.



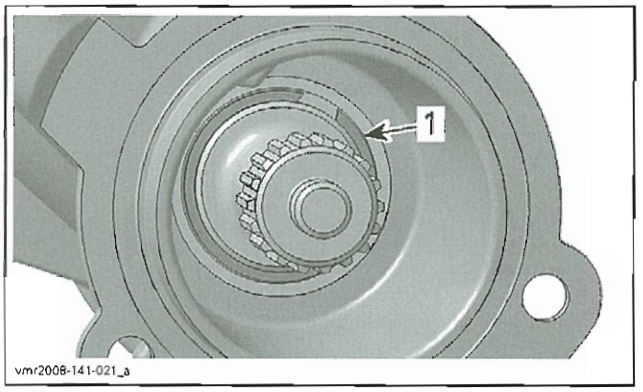
1. Shifter fork

Pull out the coupling sleeve.



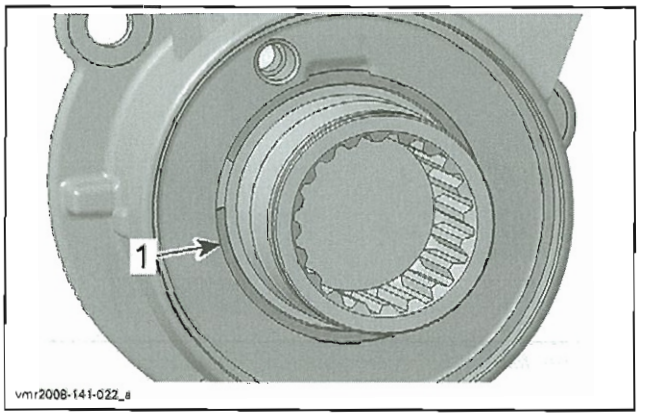
1. Coupling sleeve

Remove the inner circlip.



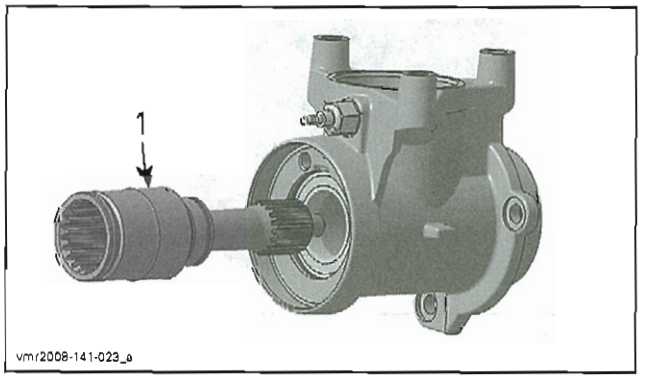
1. Inner circlilp

Turn the coupling unit housing and remove the outer circlip.



1. Outer circlip

Remove coupling unit shaft.



1. Coupling unit shaft

Using the blind hole bearing puller set (P/N 529 036 117), remove the ball bearing.

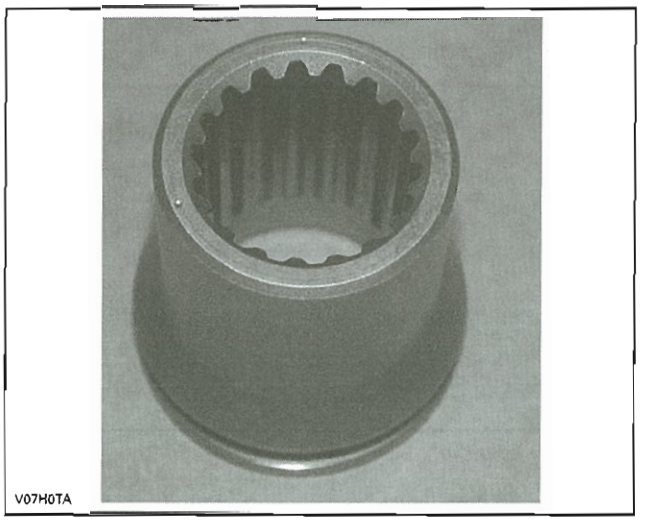
NOTE: Remove the ball bearing only if it does not turn freely and smoothly.

Coupling Unit Inspection

Check disconnect unit housing and actuator for cracks or other damages. Replace defective part(s) if necessary.

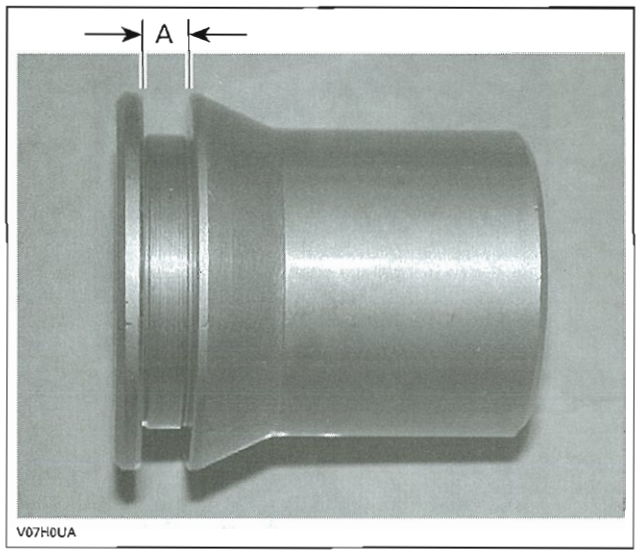
Check if the actuator O-ring and the coupling unit housing O-ring are brittle, hard or damaged.

Check splines of coupling sleeve for wear or other damages. Replace if splines are damaged.



Measure the coupling sleeve groove. If the width of groove is out of specification replace the coupling sleeve.

COUPLING SLEEVE GROOVE WIDTH	
SERVICE LIMIT	5.00 mm (.197 in)



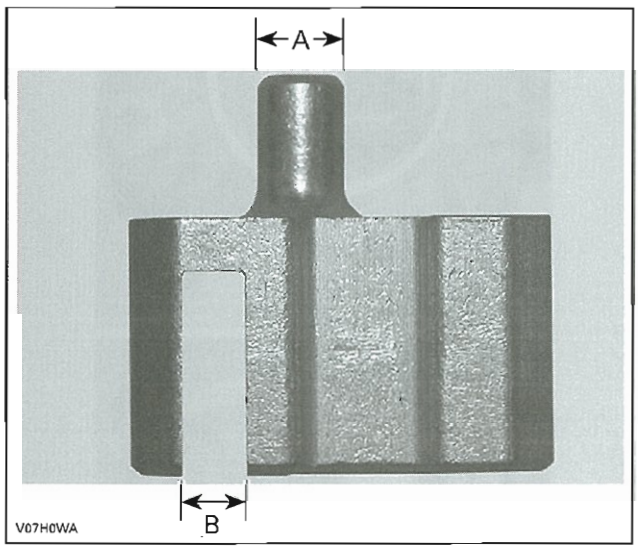
A. Groove width

Check sliding sleeve dog for bend and measure it.

SLIDING SLEEVE DOG THICKNESS	
SERVICE LIMIT	4.80 mm (.189 in)

Measure the sliding sleeve groove.

SLIDING SLEEVE GROOVE WIDTH	
SERVICE LIMIT	3.60 mm (.142 in)

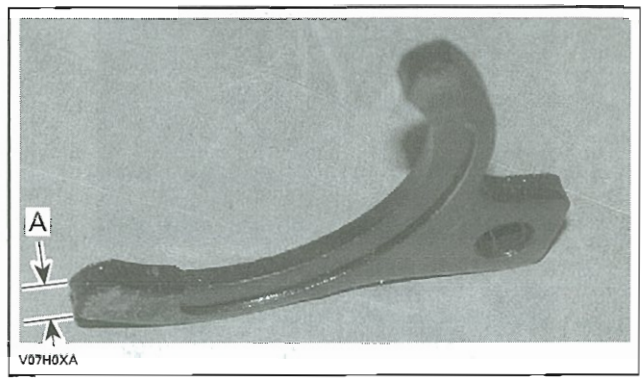


A. Sliding sleeve dog thickness
B. Sliding sleeve groove width

Check shifter fork for visible damage, wear or bent claws.

Measure the shifter fork claw thicknesses.

SHIFTER FORK CLAWS THICKNESS	
SERVICE LIMIT	2.93 mm (.115 in)

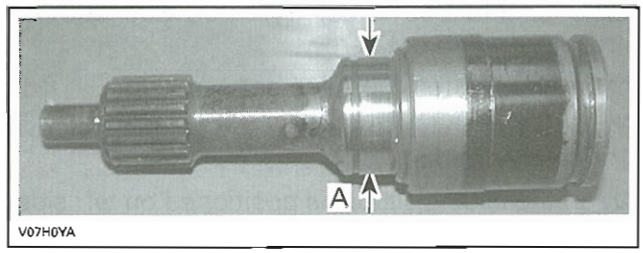


A. Shifter fork claw thickness

Check inner and outer shaft splines for wear or other damages. Replace shaft if necessary.

Measure the coupling unit shaft for wear limit.

COUPLING UNIT SHAFT	
SERVICE LIMIT	29.995 mm (1.181 in)



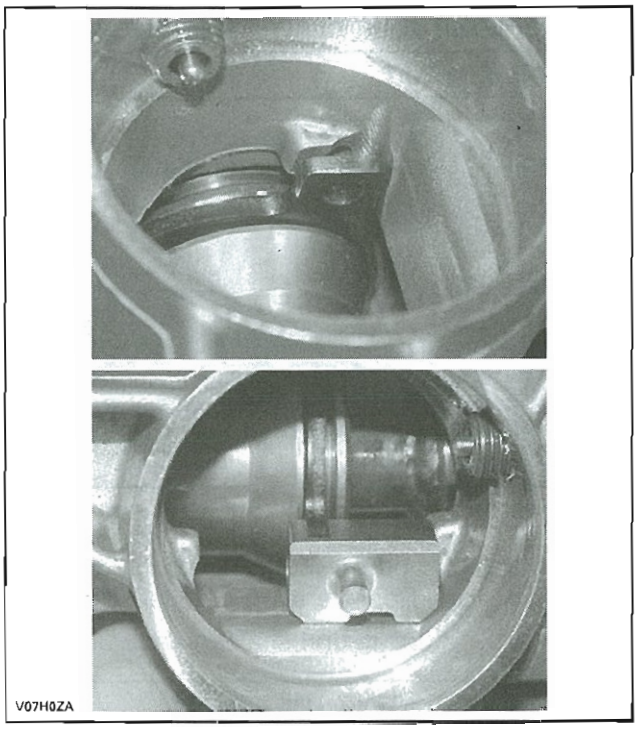
A. Shaft diameter in the area of bearing

Coupling Unit Assembly

The assembly is the reverse of the disassembly procedure. Pay attention to the following details.

Apply engine oil on moving parts.

Install the shifter fork and coupling sleeve as per the following illustrations.



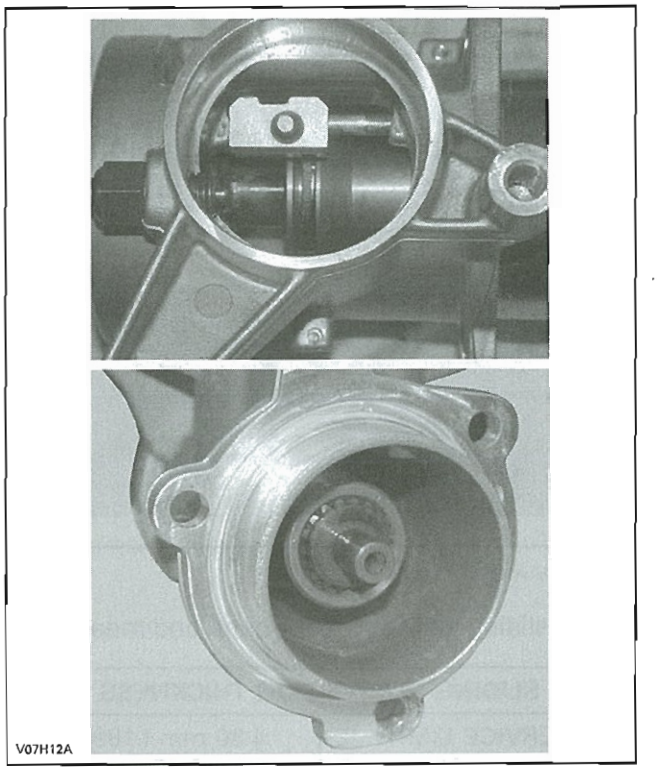
Insert pin and install Allen set screw.

Apply Loctite 243 (blue) (P/N 293 800 060) on threads of Allen set screw.

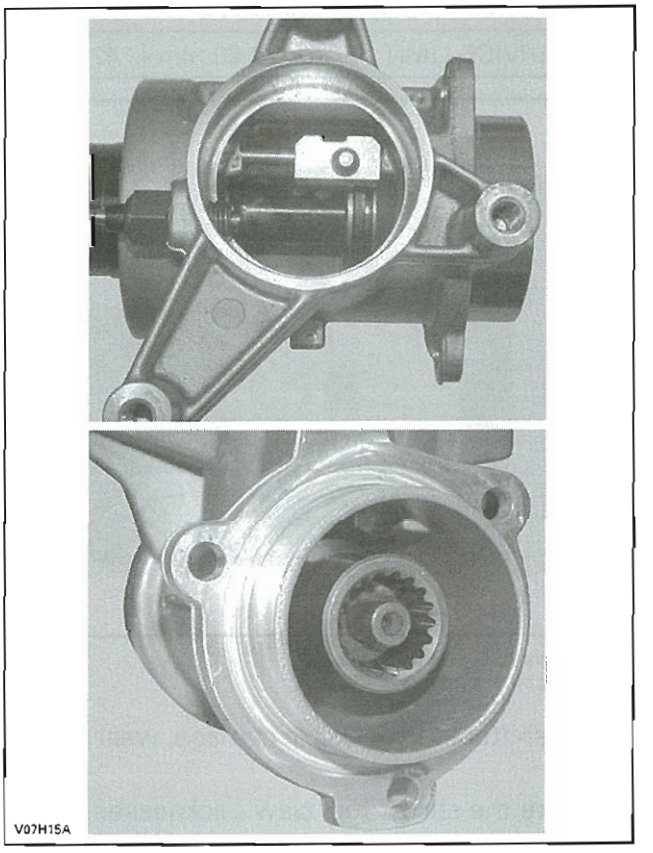
Install and tighten the Allen set screw.

Check if the shifter plate and the coupling sleeve are installed properly.

When the sliding sleeve is positioned on left side, the coupling sleeve is equal with the end of the shaft splines.



Move the sliding sleeve on right side and check if the coupling sleeve is flush with the end of shaft.



Install the actuator onto the coupling unit. Refer to *ACTUATOR INSTALLATION* in this section.

Coupling Unit Installation

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

Apply XP-S synthetic grease (P/N 293 550 010) on coupling unit housing O-ring.

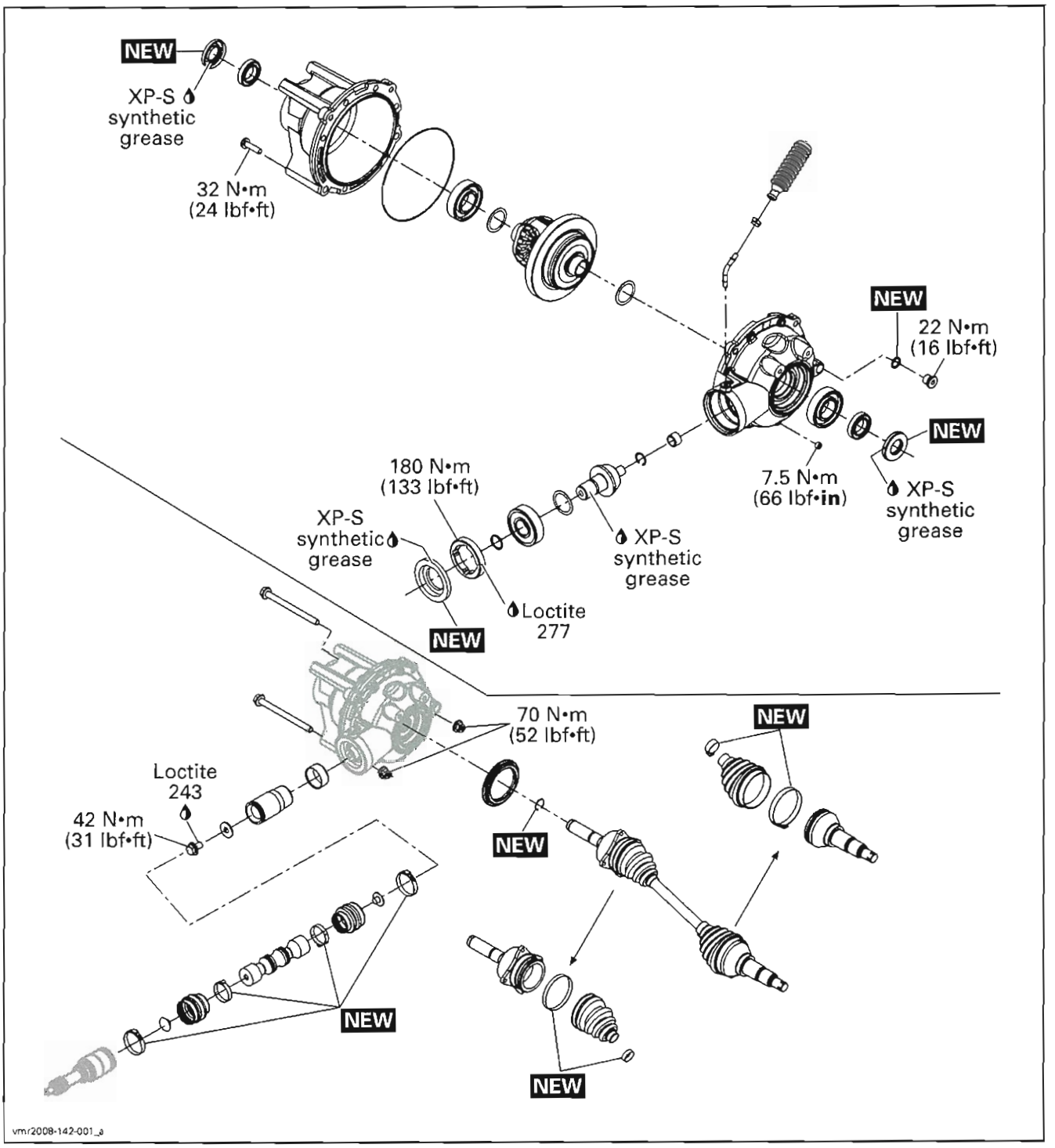
Apply Loctite 243 (blue) (P/N 293 800 060) on threads of coupling unit screws.

Install all other removed parts and check if the actuator is operational. See the procedure in *ACTUATOR INSTALLATION* in this section.

FRONT DRIVE

SERVICE TOOLS

SERVICE PRODUCTS



GENERAL

The procedure explains below is the same for the RH and LH sides unless otherwise instructed.

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

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

⚠ WARNING

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

MAINTENANCE

DIFFERENTIAL OIL

Recommended Oil

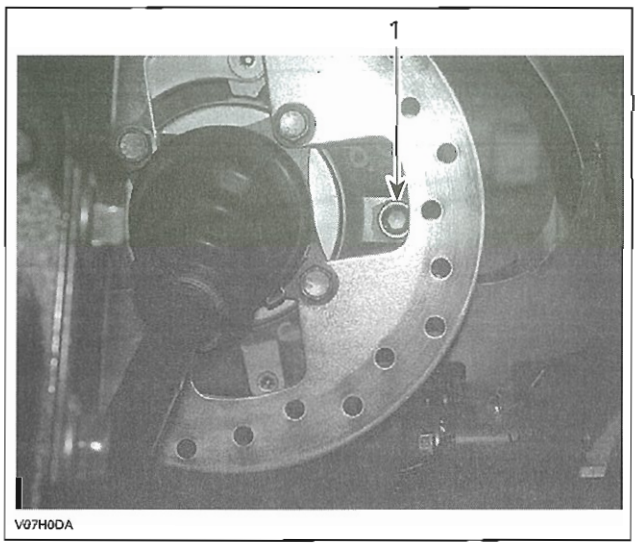
The BRP differential oil (P/N 293 600 043) is highly recommended.

If the BRP differential oil is not available, use a 75W90 synthetic oil (API GL-5).

Oil Level Verification

Place the vehicle on a level surface and set transmission in park position.

Clean filler plug area.



1. Filler plug

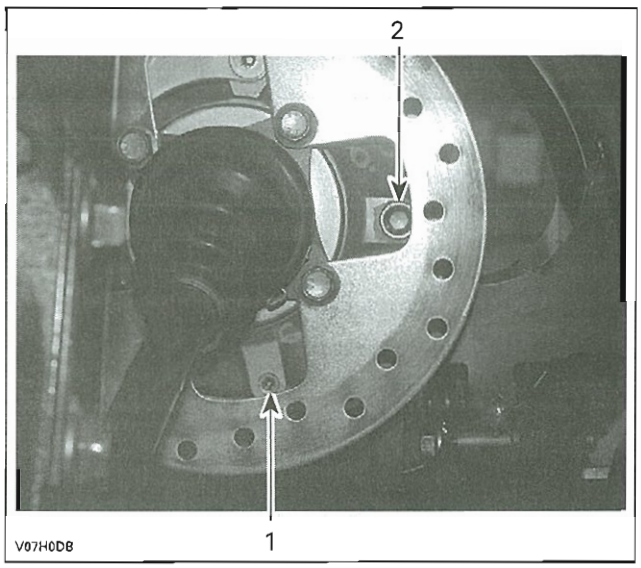
Remove the filler plug. Oil must reach the lower edge.

Add recommended oil if necessary.

Oil Change

Place vehicle on a level surface. Set transmission in park position.

Clean drain plug and filler plug areas.



1. Drain plug
2. Filler plug

Place a drain pan under differential drain plug area.

Remove drain plug.

Lift LH side of vehicle to drain the lower portion of the differential.

Allow enough time for oil to flow out.

Lower the vehicle on the ground.

Clean drain plug area then reinstall plug.

Unscrew filler plug.

Use a funnel and refill front differential with 500 ml (17 oz. US) of recommended oil

Reinstall filler plug.

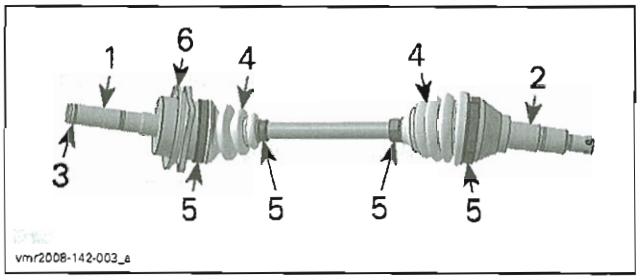
Ensure there are no leaks.

Using pulley flange cleaner (P/N 413 711 809), clean brake disc before using the vehicle.

Dispose oil as per your local environmental regulations.

PROCEDURES

DRIVE SHAFT

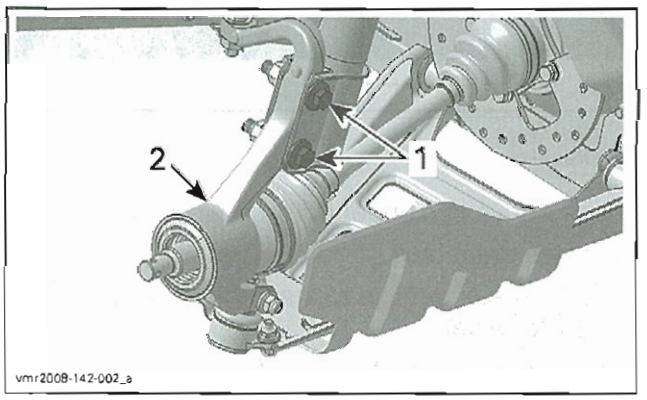


1. *Plunging Joint*
2. *CV joint*
3. *Stop ring*
4. *Drive shaft boots*
5. *Oetiker clamps*
6. *Wear ring*

Drive Shaft Removal

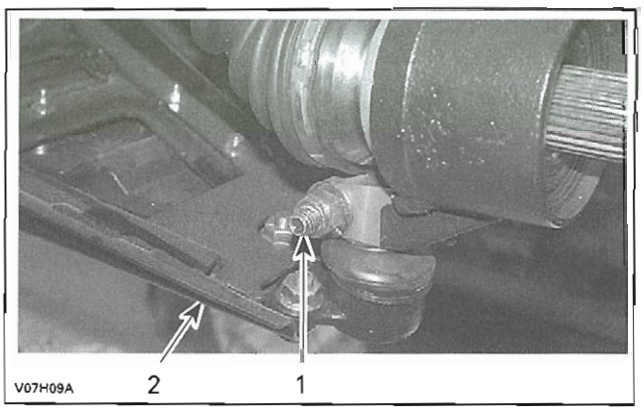
Remove the appropriate wheel hub. Refer to *WHEELS/TIRES* section.

Unscrew bolts holding strut to knuckle.



1. *Strut bolts*
2. *Knuckle*

Remove ball joint retaining bolt.



1. *Ball joint retaining bolt*
2. *Lower suspension arm*

Separate knuckle from lower suspension arm.

Extract CV joint from the knuckle.

Move the knuckle and the tie-rod aside to make room.

Remove caliper. Refer to *BRAKES* section.

Pull drive shaft out of differential.

NOTE: Pull drive shaft strongly.

Drive Shaft Inspection

Inspect the condition of drive shaft boots. If there is any damage or evidence of leaking lubricant, replace them. Refer to *DRIVE SHAFT DISASSEMBLY* further in this section.

Check splines for excessive wear. Replace if necessary.

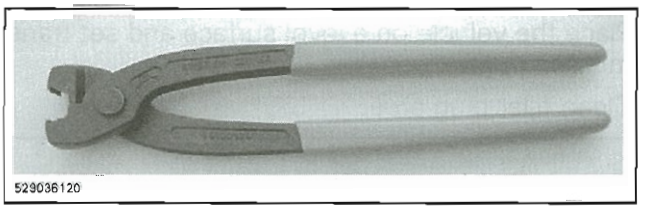
NOTE: If the splines on plunging joint are worn, a check of differential inner splines should be done.

Check the stop ring at the end of drive shaft. If wear is apparent, replace the wear ring located on the plunging joint.

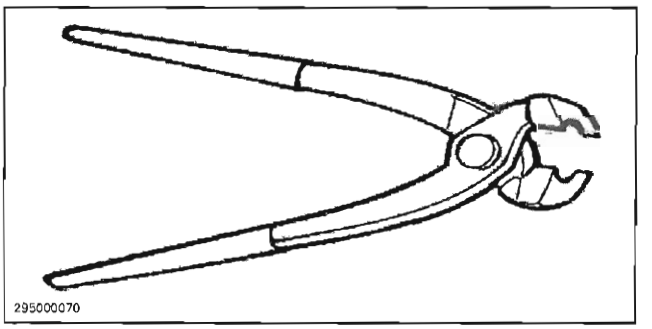
Check if the wheel bearing in knuckle move freely and smoothly. If not, replace it. Refer to *STEERING SYSTEM* section.

Drive Shaft Disassembly

Remove and discard Oetiker clamps securing drive shaft boots. Use the CV boot clamp pliers (P/N 529 036 120) and pliers Oetiker 1099 (P/N 295 000 070).



CV BOOT CLAMP PLIERS



PLIERS OETIKER 1099

Remove the large end of the drive shaft boot from the joint (plunging joint or CV joint).

Two procedures can be used to separate joint from shaft.

Without the Joint Extractor Tool

Clamp joint housing in a vise.

Align shaft with joint.

Pull hard on shaft to remove from joint.

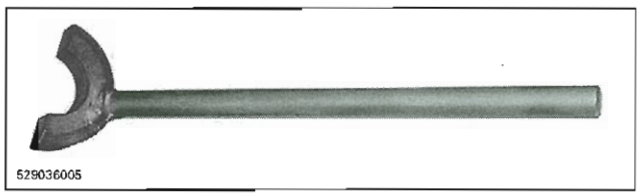
Remove boot from drive shaft.

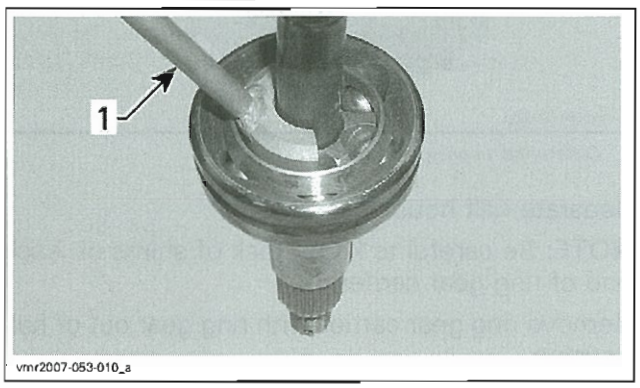
Remove and discard the circlip. A new one is included in the boot kit.

With the Joint Extractor Tool

Place drive shaft in vice with the joint downward.

Install the joint extractor tool (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.

Remove boot from drive shaft.

Remove and discard the circlip. A new one is included in the boot kit.

Check bearing in plunging joint or CV joint. If bearing is hard to move, change plunging joint or CV joint.

Drive Shaft Assembly

Insert the small clamp and the small end of boot on shaft.

Install the **NEW** circlip included in the new boot kit.

Clamp joint in a vise with joint facing up.

Center circlip on shaft.

Carefully insert shaft into joint.

Push hard to engage clip.

Pack bearing area with the grease included in the new boot kit.

NOTE: Do not use or add other grease.

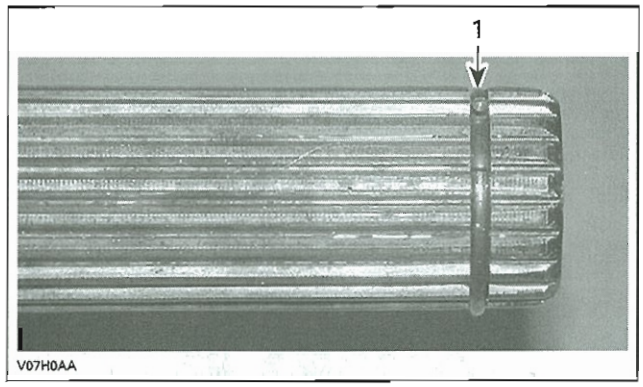
Drive Shaft Installation

NOTE: LH and RH drive shafts are not the same length. The LH drive shaft is shorter than the RH.

Apply XP-S synthetic grease (P/N 293 550 010) to the splines.

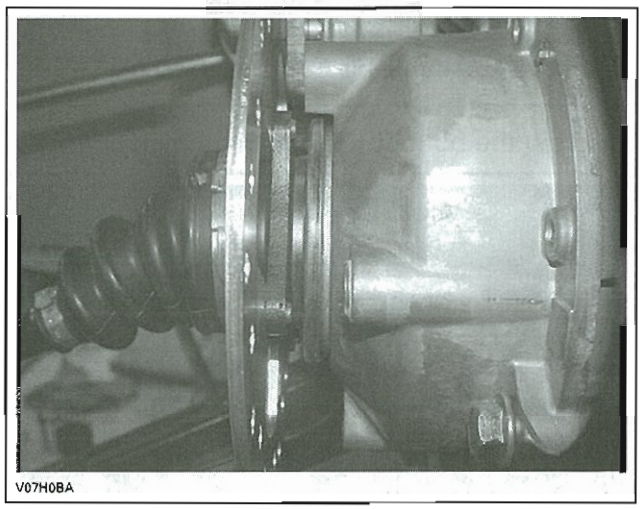
Insert the end of drive shaft in differential.

Pull to make sure that the stop ring is locked in differential side gear groove.



1. Stop ring

The wear ring should be close to the differential when drive shaft is well inserted.



TYPICAL

Insert the other end of drive shaft in the knuckle.

Install the knuckle to the lower suspension arm.

Install and torque the ball joint retaining bolt to 48 N•m (35 lbf•ft).

Install all other removed parts.

DIFFERENTIAL

Differential Removal

Drain the differential. See *DIFFERENTIAL OIL* at the beginning of this section.

Loosen lug nuts.

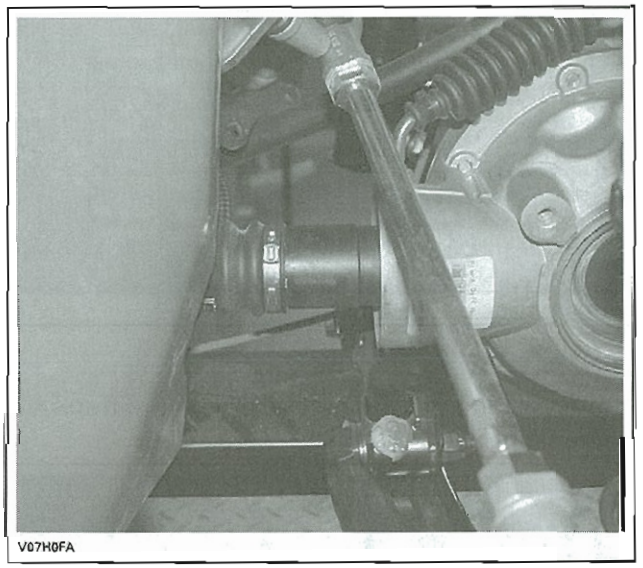
Raise front of vehicle.

Support the vehicle securely using jack stands.

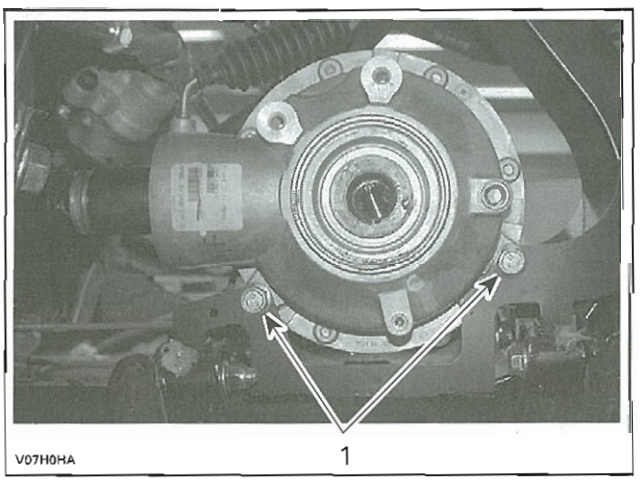
Remove front wheels.

On both sides, remove the *DRIVE SHAFTS*. See procedure above in this section.

Remove and discard the propeller shaft boot clamp located near differential.



Unscrew the both differential mounting bolts.



1. Differential mounting bolts

Move the differential forward to disconnect the propeller shaft.

Remove the differential from the RH side.

Differential Inspection

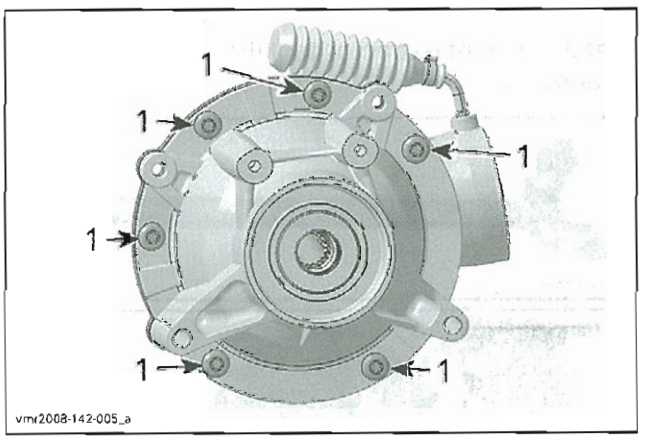
Check backlash and preload, see *DIFFERENTIAL ADJUSTMENT* further in this section.

Check if oil seals are brittle, hard or damaged. Replace if necessary.

Differential Disassembly

Ring Gear Carrier/Ring Gear

Remove differential housing screws.



1. Differential housing screws

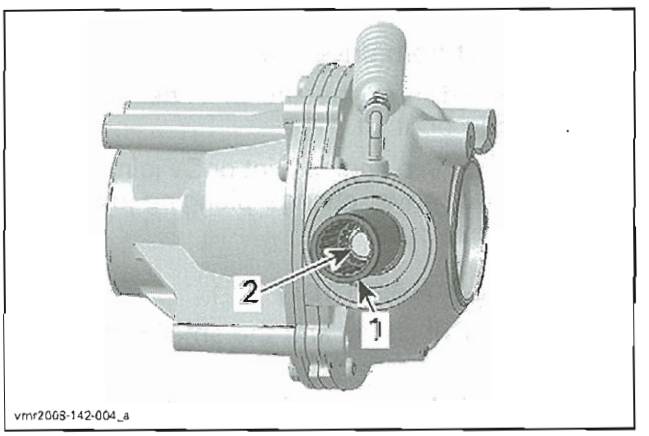
Separate half housings.

NOTE: Be careful to keep track of shims on each end of ring gear carrier.

Remove ring gear carrier with ring gear out of half housing.

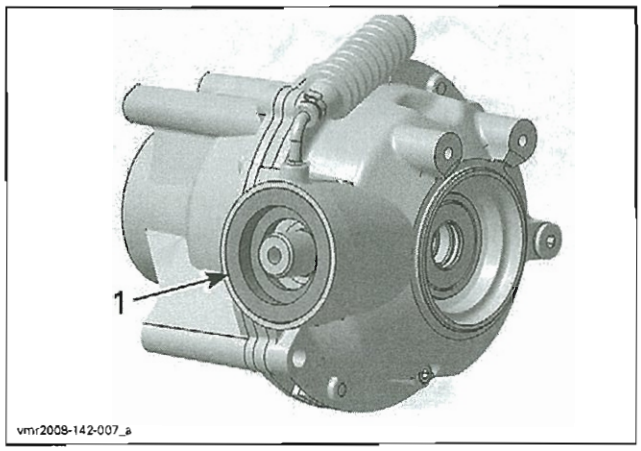
Pinion Gear

Remove screw retaining the propeller shaft adaptor.



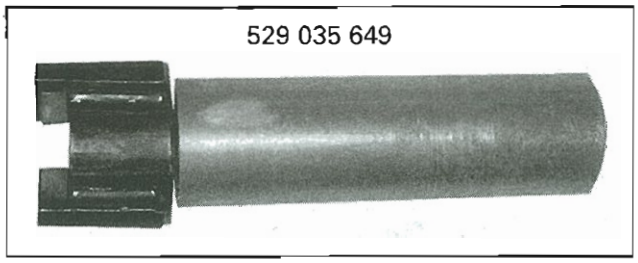
1. Propeller shaft adaptor
2. Propeller shaft adaptor screw

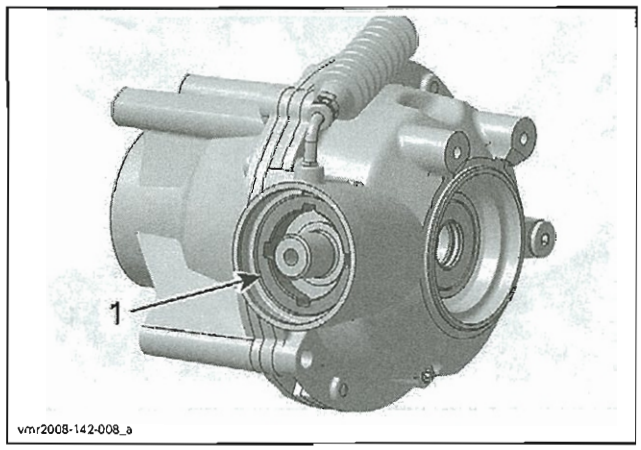
Remove and discard oil seal.



1. Oil seal

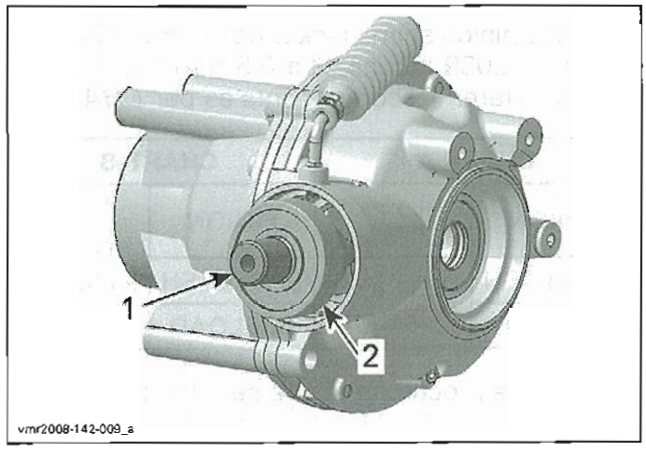
Unscrew the pinion nut. Use the differential spanner socket (P/N 529 035 649).





1. Pinion nut

Remove the bearing at the same time as the pinion gear. Be careful to keep track of shims.

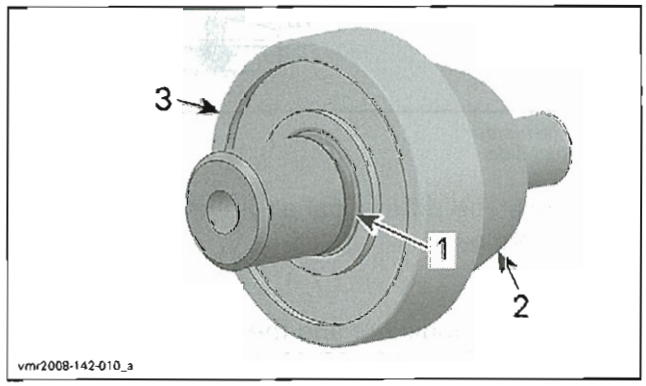


1. Pinion gear
2. Bearing

NOTE: The pinion gear and bearing can be easily removed using the following suggested tool:

- Pipe 3-1/2 in diameter x 5 in (1)
- Screwed rod M10 x 1.25, 7 in length (1)
- Nut M10 x 1.25 (3)
- Flat bar (1).

Remove and discard the O-ring retaining the bearing.



1. O-ring
2. Pinion gear
3. Bearing

Remove bearing from pinion gear.

Differential Adjustment

A shimming procedure must be done when one of these components is changed.

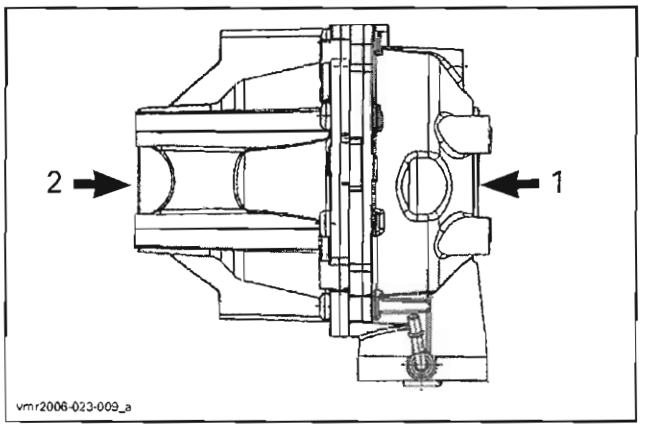
- Ring gear carrier
- Pinion gear
- Ring gear
- Housing.

Measure the old pinion shim stack. If the shims measure over 1.00 mm (.039 in), install shim stacks on the differential components as per *CHART A*.

If the old pinion shim stack measurement is under 1.00 mm (.039 in), install a 0.5 mm (.02 in) shim on the differential components as per *CHART B*.

CHART A		CHART B	
PINION	1.85 mm (.073 in)	PINION	0.5 mm (.02 in)
BACKLASH	1.00 mm (.039 in)	BACKLASH	
PRELOAD		PRELOAD	

NOTE: The procedure above sets the pinion shim thickness and should not be modified thereafter. Any changes should be done on the preload and/or backlash side(s).

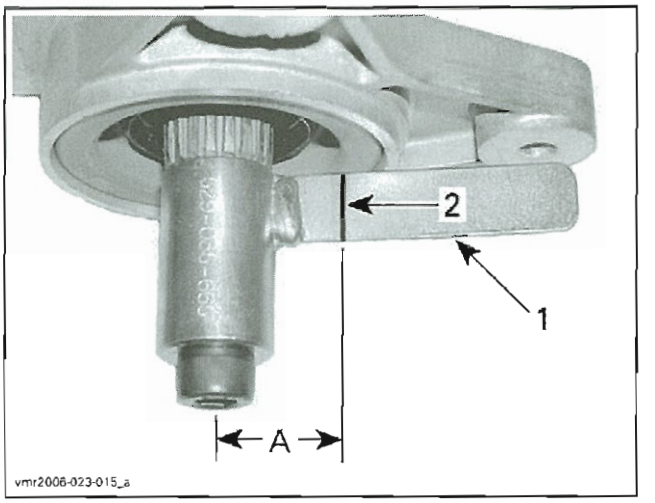


1. Backlash side
2. Preload side

Assemble the differential and check backlash as well as preload.

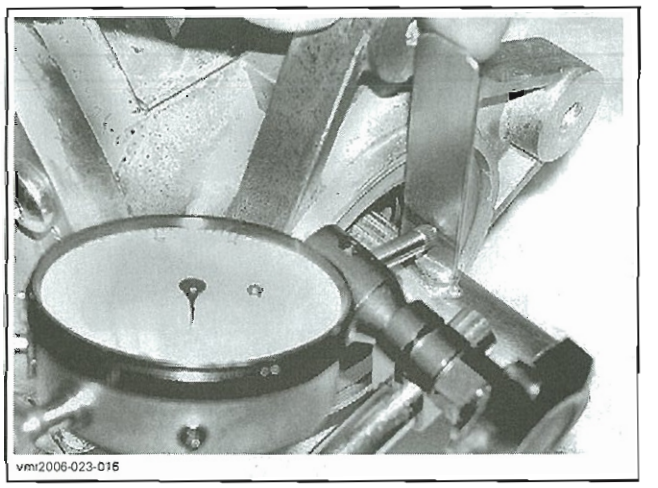
Backlash

- 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 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 tab back and forth. Note the result.



- Rotate pinion gear 1/2 turn and check backlash again. Note the result.
- Rotate pinion gear 1 turn and check backlash again.

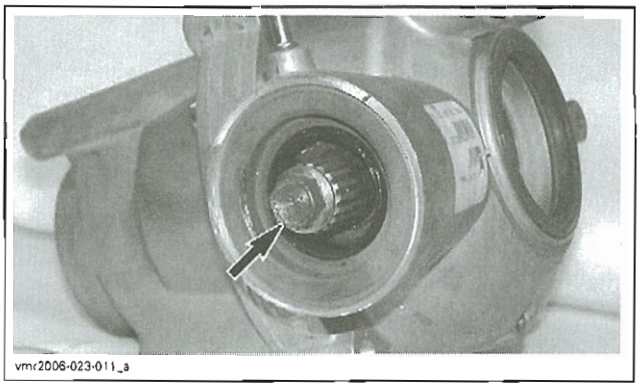
If backlash is below 0.05 mm (.002 in), increase backlash shim by 0.05 mm (.002 in) and check the backlash again.

If backlash is greater than 0.356 mm (.014 in), decrease backlash shim by 0.05 mm (.002 in) and check the backlash again.

Measure preload.

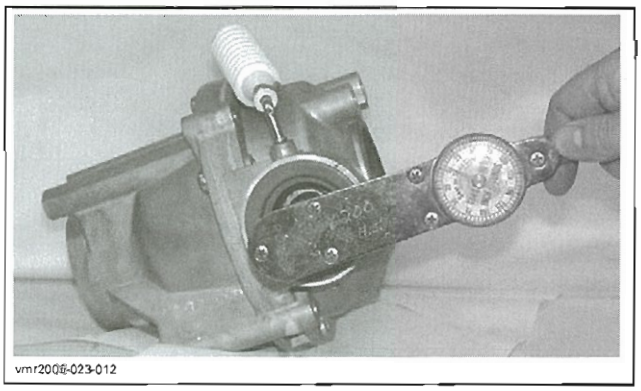
Preload

Screw the propeller shaft adaptor screw in pinion gear.



TYPICAL

Using a needle torque wrench, measure the drag torque.



TYPICAL

If the drag torque is greater than 0.7 N•m (6 lbf•**in**), reduce preload shim by 0.05 mm (.002 in) and check drag torque again.

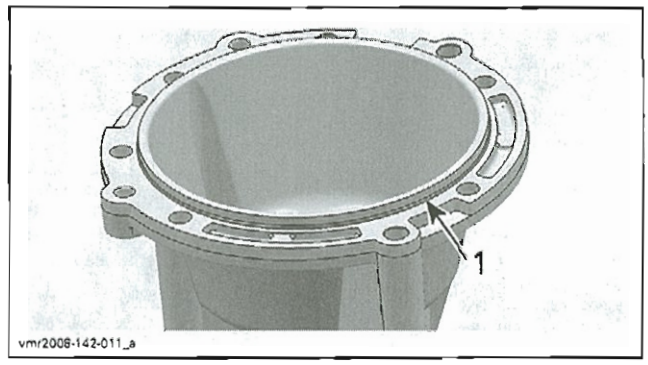
If the drag torque is less than 0.06 N•m (.5 lbf•**in**), increase preload shim by 0.05 mm (.002 in) and check drag torque again.

Differential Assembly

Ring Gear Carrier/Ring Gear

To assemble, reverse the removal procedure. Pay attention to the following details.

Verify condition of half housing seal. Change seal if necessary.



1. Half housing seal

Check all bearings and all oil seals. Change them if necessary.

Pinion Gear

To install, reverse the removal procedure. Pay attention to the following details.

Install the shim(s) then the ball bearing.

Install a NEW O-ring.

Apply Loctite 277 (P/N 293 800 073) on threads of pinion nut.

Install pinion nut then torque it to 180 N•m (133 lbf•ft).

Apply XP-S synthetic grease (P/N 293 550 010) in the lips of the NEW oil seal and install it.

Differential Installation

The installation is the reverse of the removal procedure.

PROPELLER SHAFT

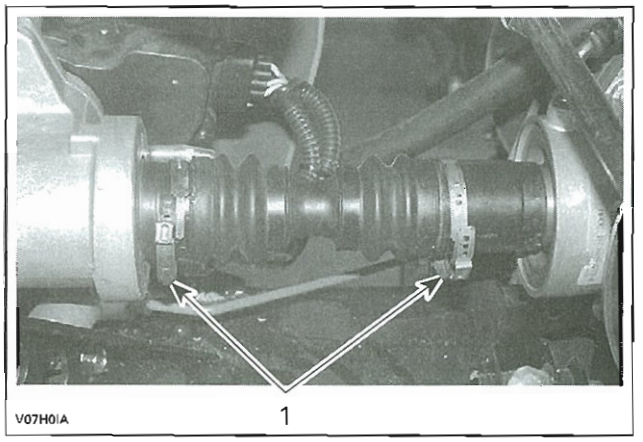
Propeller Shaft Removal

Refer to *BODY* section to remove the following parts:

- RH footrest
- RH inner fender.

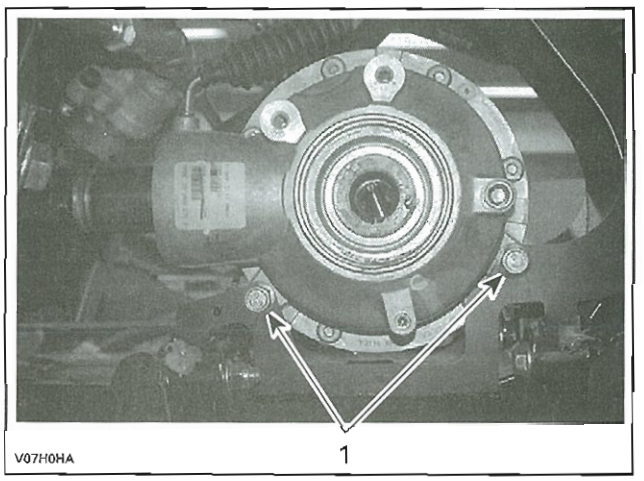
On RH side of vehicle, remove the *DRIVE SHAFT*. See procedure above in this section.

Remove and discard both large Oetiker clamps securing propeller shaft boots.



1. Remove these clamps

Remove the differential mounting bolts.



1. Differential mounting bolts

Move differential forward to separate propeller shaft from differential and disconnect unit.

Propeller Shaft Inspection

Check propeller shaft splines for wear or other damages.

Check propeller shaft boots for holes or brittleness.

Propeller Shaft Installation

Installation is the reverse of removal procedure.

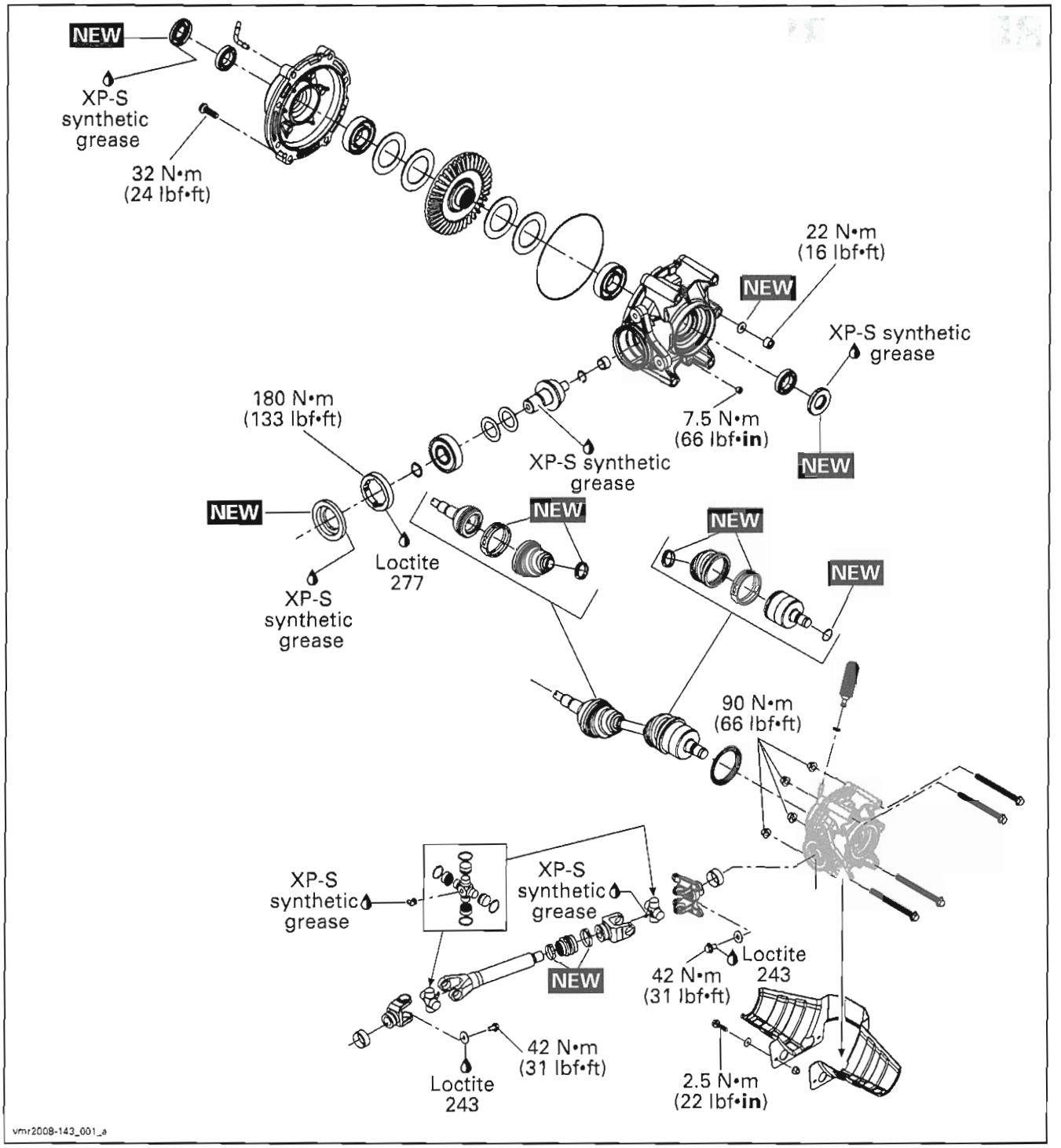
REAR DRIVE

SERVICE TOOLS

Description	Part Number	Page
differential spanner socket	529 035 649	349
backlash measurement tool	529 035 665	350
CV boot clamp pliers	529 036 120	344–345

SERVICE PRODUCTS

Description	Part Number	Page
XP-S synthetic grease	293 550 010	347–348, 351
BRP differential oil	293 600 043	343
Loctite 243 (blue)	293 800 060	347
Loctite 277	293 800 073	351



GENERAL

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

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

⚠ WARNING

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

MAINTENANCE

DIFFERENTIAL OIL

Recommended Oil

The BRP differential oil (P/N 293 600 043) is highly recommended.

If the BRP differential oil is not available, use a 75W90 synthetic oil (API GL-5).

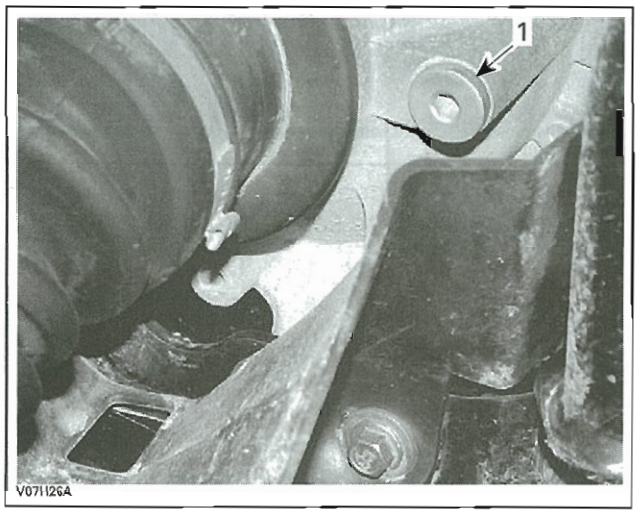
Oil Level Verification

Place the vehicle on a level surface and set transmission in park position.

Place bottom of frame horizontally.

Clean filler plug area.

Remove filler plug.



1. Filler plug

The rear differential oil is not level with the filler plug threads. It is possible to verify the oil level by inserting a wire with a 90° bend through the oil filler hole.

Oil level is between 25 to 32 mm (1 to 1-1/4 in) from the bottom of filler plug threads when the vehicle is level on ground.

Using a funnel, add recommended oil if necessary.

Oil Replacement

Place the vehicle on a level surface and set transmission in park position.

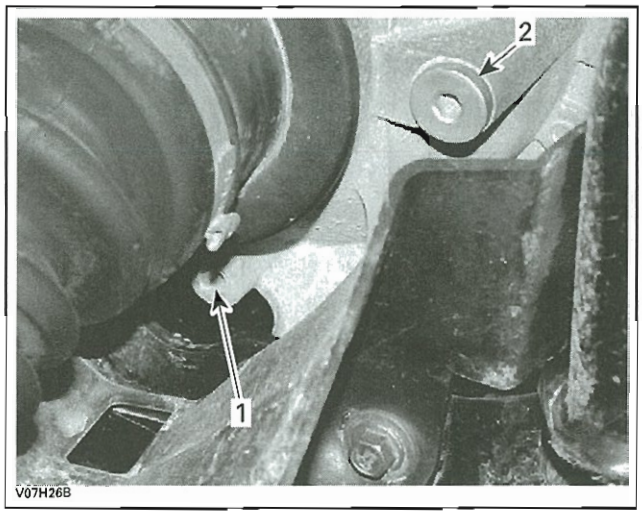
Remove the *DIFFERENTIAL PROTECTOR*, see procedure further in this section.

Clean drain plug area.

Place a drain pan under rear differential drain plug area.

Remove drain plug.

Remove filler plug to help oil flowing out of differential.



1. Drain plug
2. Filler plug

Clean drain plug area then reinstall drain plug.

Use a funnel and refill differential at the proper level with recommended oil.

REAR DIFFERENTIAL OIL CAPACITY
250 ml (8.5 U.S. oz)

Reinstall filler plug.

Ensure there are no leaks.

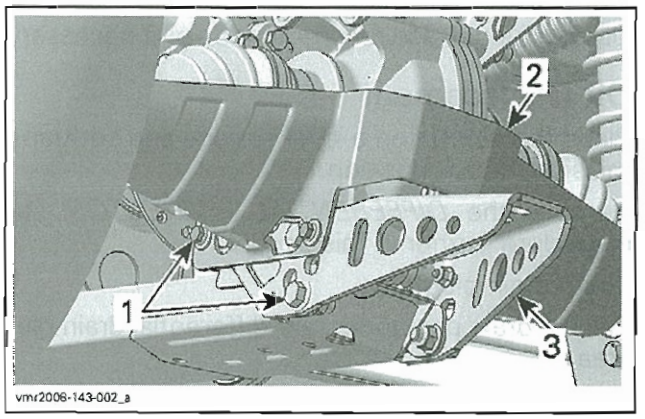
Dispose oil as per your local environmental regulations.

PROCEDURES

DIFFERENTIAL PROTECTOR

Differential Protector Removal

Remove bolts retaining the protector to the frame.

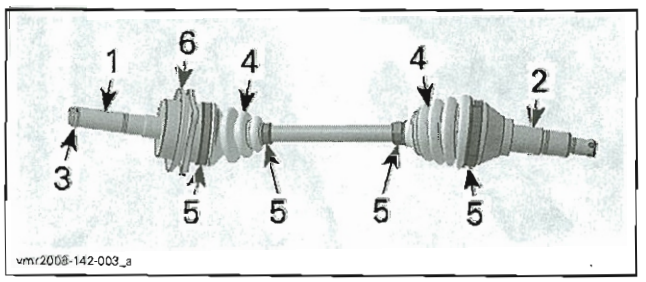


1. *Protector bolts*
2. *Differential protector*
3. *Hitch*

Differential Protector Installation

The installation is the reverse of removal procedure.

DRIVE SHAFT



1. *Plunging Joint*
2. *CV joint*
3. *Stop ring*
4. *Drive shaft boots*
5. *Oetiker clamps*
6. *Wear ring*

Drive Shaft Removal

Remove the appropriate trailing arm. Refer to *REAR SUSPENSION* section.

Pull drive shaft out of differential.

NOTE: Pull drive shaft strongly.

Drive Shaft Inspection

Inspect the condition of drive shaft boots. If there is any damage or evidence of leaking lubricant, replace them. Refer to *DRIVE SHAFT DISASSEMBLY* further in this section.

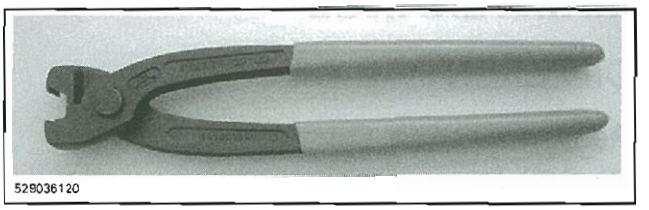
Check shaft splines. Replace drive shaft if necessary.

NOTE: If the splines on plunging joint are worn, a check of differential inner splines should be done.

Check wear ring located on the plunging joint. Replace if necessary.

Drive Shaft Disassembly

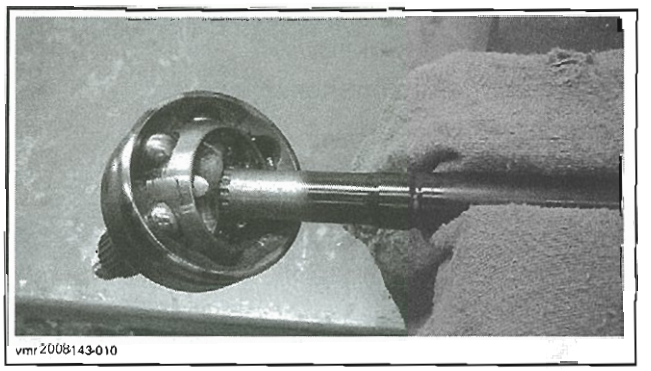
Remove and discard Oetiker clamps securing drive shaft boots. Use the CV boot clamp pliers (P/N 529 036 120).



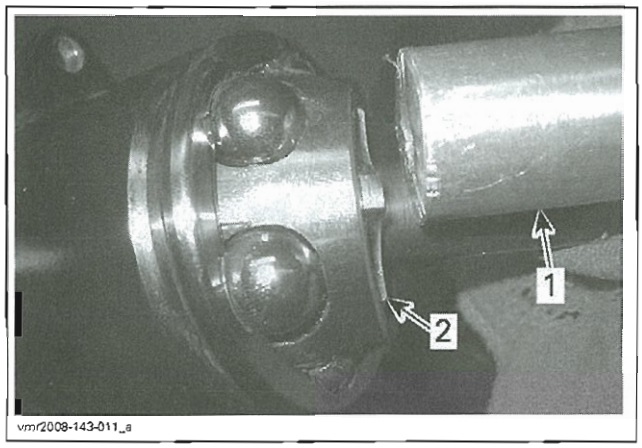
CV BOOT CLAMP PLIERS

Remove the large end of the drive shaft boot from the joint (plunging joint or CV joint).

Install drive shaft in a vise.



Using an aluminum or a brass tube, hit against the inner race forcefully to separate the joint from the shaft.



1. *Aluminum tube*
2. *Inner race*

NOTE: In some case, you may have to hit one side, then move the drive shaft 180 degrees in the vise and hit the other side until joint is off.

Remove boot from drive shaft.

Check bearing in plunging joint or CV joint. If bearing is hard to move, change plunging joint or CV joint.

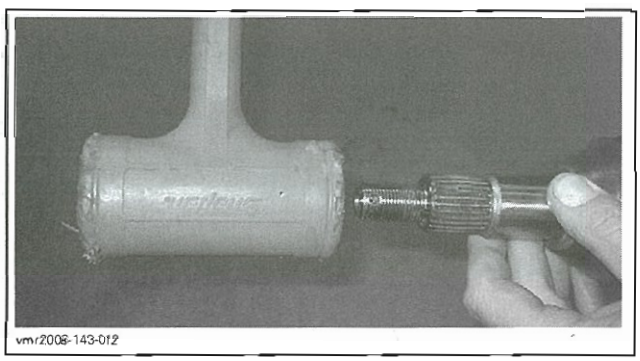
Check circlip for damage, change as necessary.

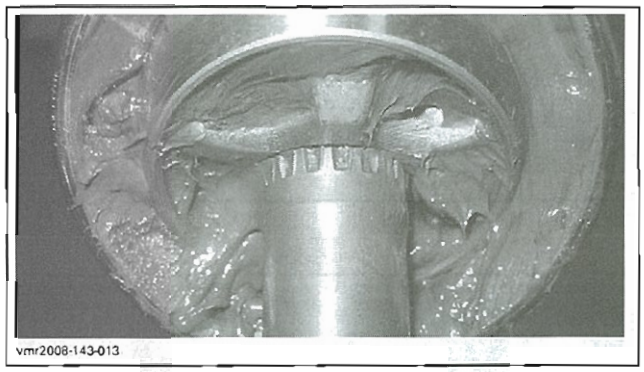
Drive Shaft Assembly

Insert the small clamp and the small end of boot on shaft.

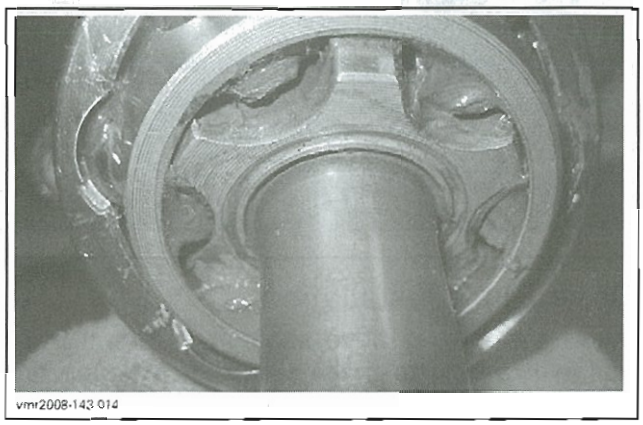
With the circlip in place, align the inner race squarely with the shaft splines.

Using a plastic hammer, hit the end of the joint. The joint should slip over the shaft until it bottom out.



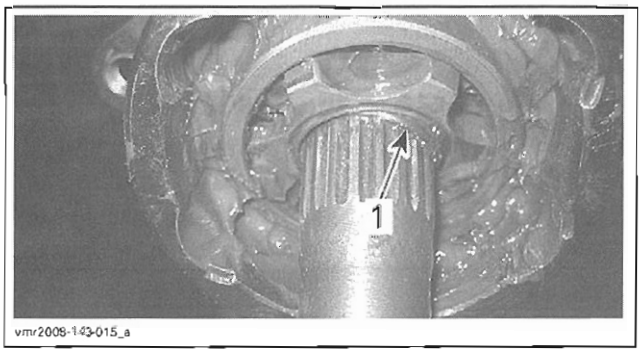


CV JOINT PROPERLY SEATED



PLUNGING JOINT PROPERLY SEATED

If the joint doesn't slide on, there is a good chance that the circlip came out of its groove. Check and try again with a new circlip.

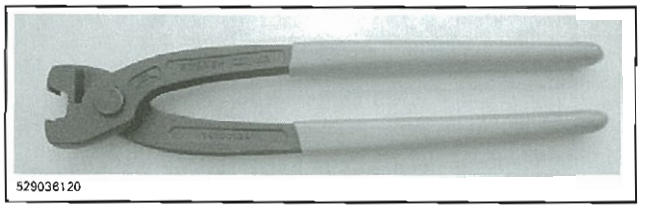


1. *Circlip out of groove*

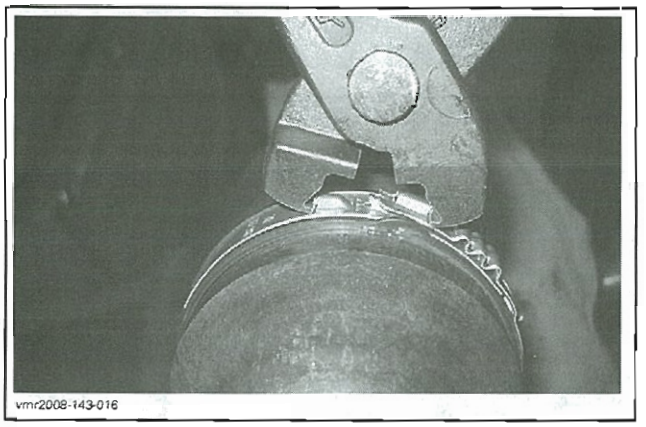
Pack bearing area with grease included in the new boot kit.

NOTE: Do not use any other grease.

Fit the boot in place and install the clamps on the boot using the CV boot clamp pliers (P/N 529 036 120).

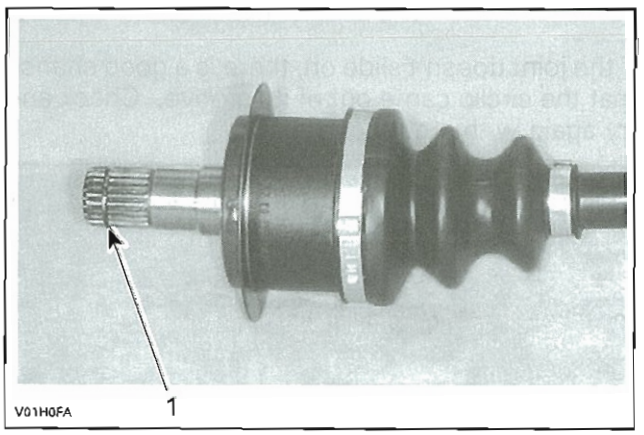


CV BOOT CLAMP PLIERS



Drive Shaft Installation

Insert the end of drive shaft in differential and pull joint a little to make sure that the stop ring is locked in differential gear groove.



1. Stop ring

NOTE: Make sure do not interchange LH and RH drive shafts. The shafts are different lengths.

Install the other parts in the reverse order of removal procedure. Refer to the appropriate sections to apply the proper torque.

PROPELLER SHAFT

Propeller Shaft Removal

Place the vehicle on a level surface and set transmission in park position.

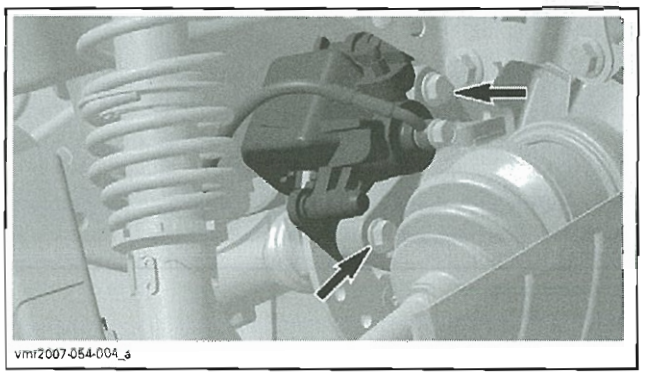
Loosen rear wheel lug nuts.

Raise rear of vehicle.

Support the vehicle securely using jack stands.

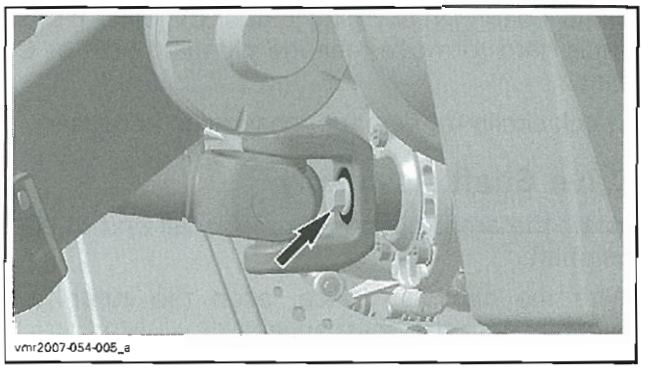
Remove rear wheels.

Remove caliper screws then suspend the caliper aside.

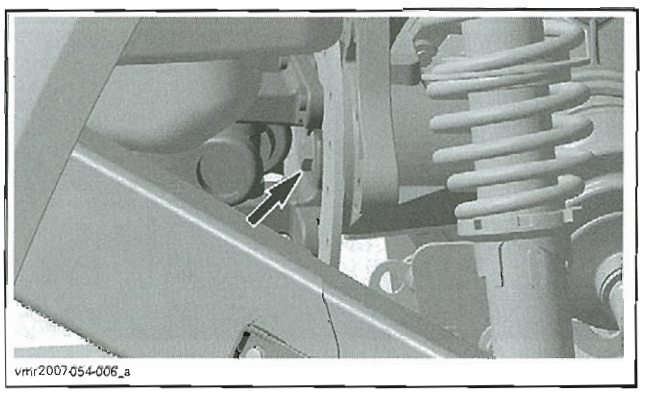


CAUTION: Do not let caliper hang by the hose and do not stretch or twist hose.

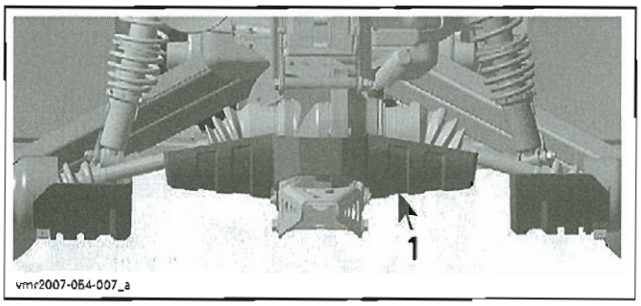
Remove screw securing propeller shaft to engine.



Remove screw securing propeller shaft to differential.

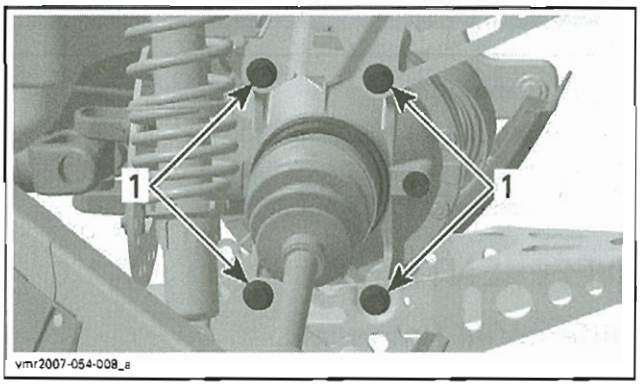


Remove *DIFFERENTIAL PROTECTOR*, see procedure above in this section.



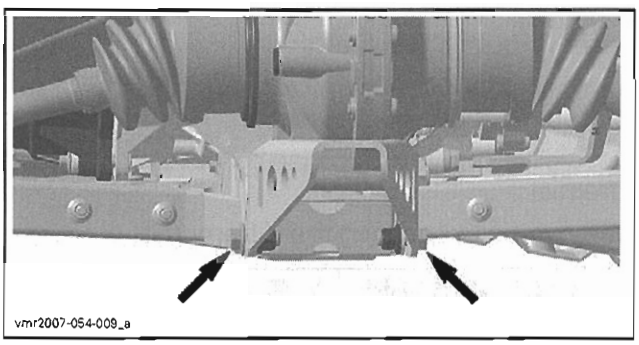
1. Differential protector

Unscrew lower and upper differential bolts.



1. Differential bolts

Loosen hitch plate bolts.



Move the differential backward.

Unplug the propeller shaft from the differential then remove it from vehicle.

Propeller Shaft Inspection

Check yokes and U-joints for wear, backlash or axial play, replace if necessary.

Inspect engine seal for damage or leaks. Replace if necessary.

Inspect brake disc (refer to *BRAKES* section).

Propeller Shaft Installation

Installation is essentially the reverse of removal procedure. Pay attention to the following details.

Apply XP-S synthetic grease (P/N 293 550 010) on splines of engine drive shaft and differential pinion.

Apply Loctite 243 (blue) (P/N 293 800 060) on the threads of both propeller shaft screws.

Install screws and washers.

Tighten screws to 42 N•m (31 lbf•ft).

Reinstall all other removed parts.

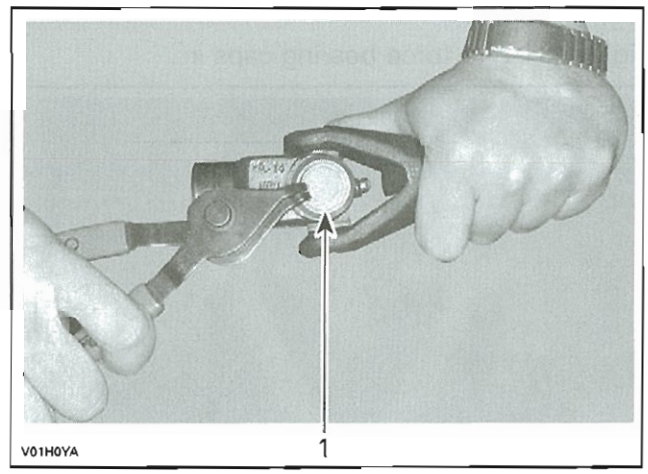
Grease U-joints from rear propeller shaft. Use a grease gun with XP-S synthetic grease (P/N 293 550 010).

REAR PROPELLER SHAFTU-JOINT

Remove the brake disc before working on differential side of propeller shaft.

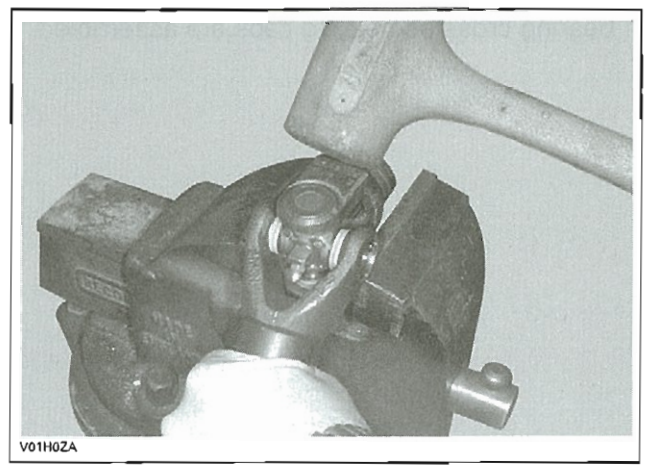
U-joint Removal

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.

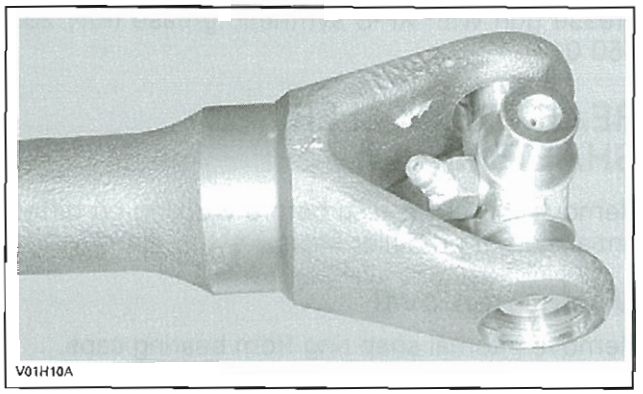
Remove U-joint cross.

U-joint Installation

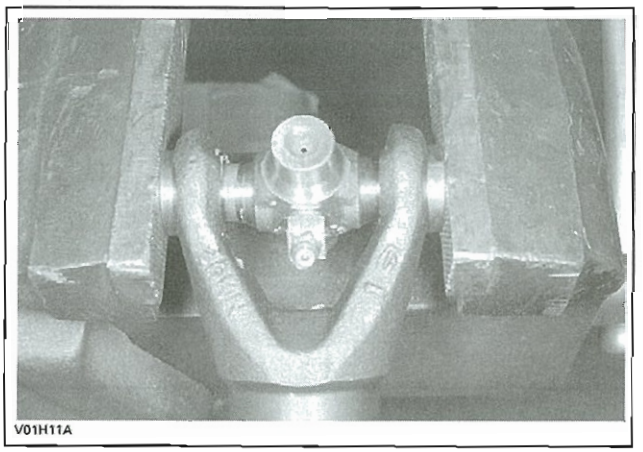
Install new U-joint cross in inner yoke.

Install new bearing cap by hand.

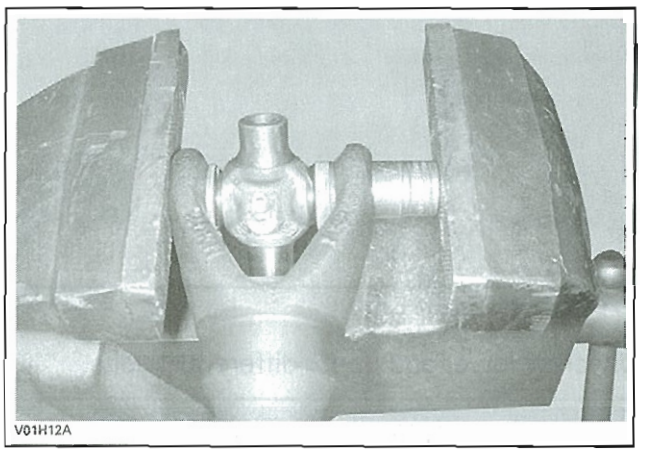
NOTE: Carefully install U-joint cross with grease fitting properly positioned.


V01H10A

Tighten vise to force bearing caps in.


V01H11A

Using a suitable tappet, fully seat bearing cap in one side. Continually, check for free movement of bearing cross as bearing caps are assembled.


V01H12A

Install snap ring.

Repeat procedure for other sides.

Grease U-joint, using a grease gun with XP-S synthetic grease (P/N 293 550 010).

DIFFERENTIAL

Differential Removal

Install a jack stand under differential to support the vehicle during the following procedure.

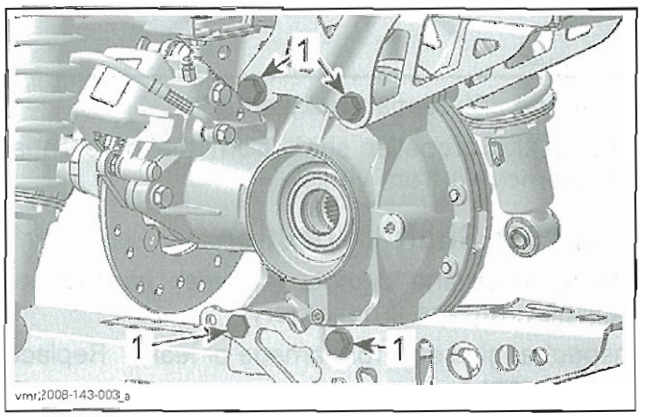
Remove both trailing arms. Refer to *REAR SUSPENSION* section.

Remove both drive shafts.

Remove the *DIFFERENTIAL PROTECTOR*, see procedure above in this section.

Unscrew the screw securing propeller shaft to differential.

Remove bolts securing the differential.



vmr;2008-143-003_a

1. Differential bolts

Remove the differential from vehicle.

Differential Inspection

Turn differential gear with a finger; it should turn smoothly. Replace if necessary.

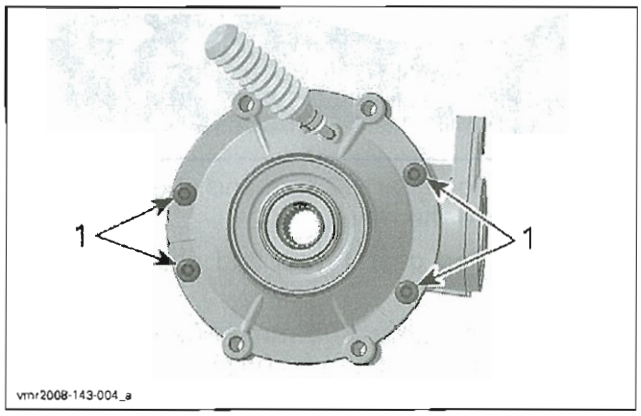
Check backlash and drag torque, see *DIFFERENTIAL ADJUSTMENT* further in this section.

Check if oil seals are brittle, hard or damaged. Replace if necessary.

Differential Disassembly

Ring Gear

Remove differential housing screws.



1. Differential housing screws

Separate half housings.

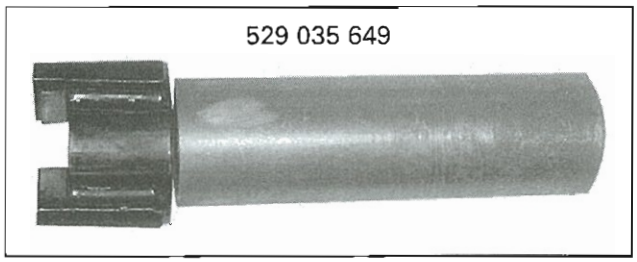
NOTE: Be careful to keep track of shims on each end of ring gear carrier.

Remove ring gear from half housing.

Pinion Gear

Remove and discard oil seal.

Using the differential spanner socket (P/N 529 035 649), unscrew the pinion nut by turning it CLOCKWISE.



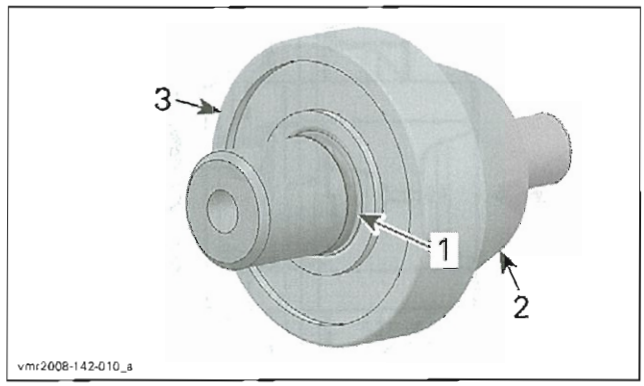
CAUTION: The pinion nut is left hand threaded. Unscrew by turning clockwise.

Remove the bearing at the same time as the pinion gear.

NOTE: The pinion gear and bearing can be easily removed using the following suggested tool:

- Pipe 3-1/2 in diameter x 5 in (1)
- Screwed rod M10 x 1.25, 7 in length (1)
- Nut M10 x 1.25 (3)
- Flat bar (1).

Remove and discard the O-ring retaining the bearing.



1. O-ring
2. Pinion gear
3. Bearing

Remove bearing from pinion gear. Be careful to keep track of shims.

Differential Adjustment

A shimming procedure must be done when one of these components is changed.

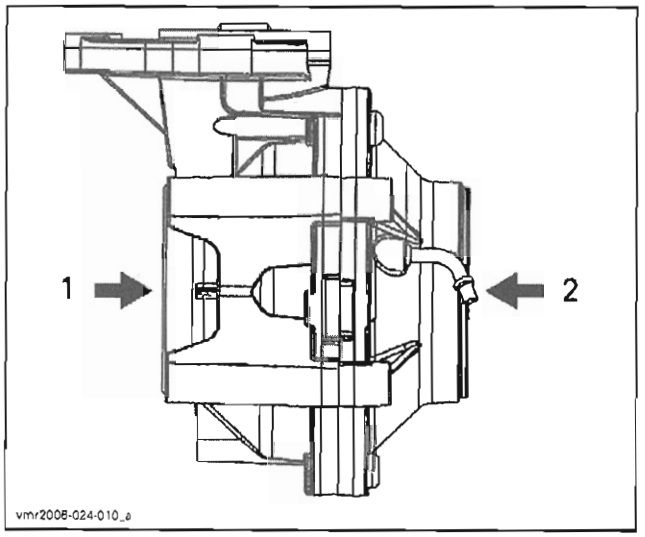
- Pinion gear
- Ring gear
- Housing.

Measure the old pinion shim stack. If the shims measure over 1.00 mm (.039 in), install shim stacks on the differential components as per *CHART A*.

If the old pinion shim stack measurement is under 1.00 mm (.039 in), install a 0.5 mm (.02 in) shim on the differential components as per *CHART B*.

CHART A		CHART B	
PINION	2.18 mm (.086 in)	PINION	0.5 mm (.02 in)
BACKLASH	0.94 mm (.037 in)	BACKLASH	
PRELOAD	1.37 mm (.054 in)	PRELOAD	

NOTE: The procedure above sets the pinion shim thickness and should not be modified thereafter. Any changes should be done on preload and/or backlash side(s).



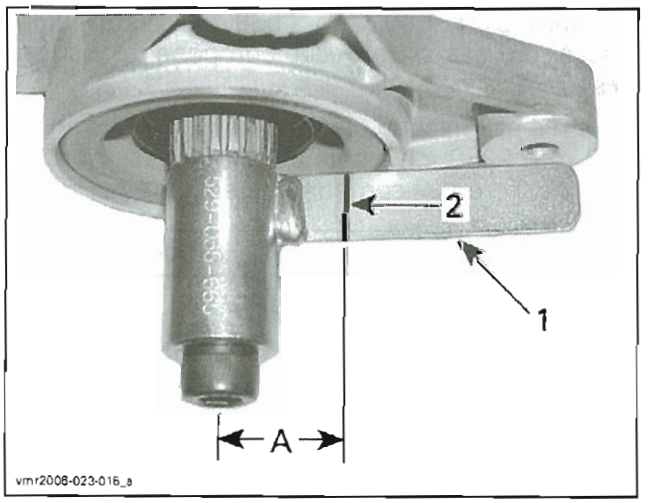
1. Backlash side
2. Preload side

Assemble the differential.

Backlash

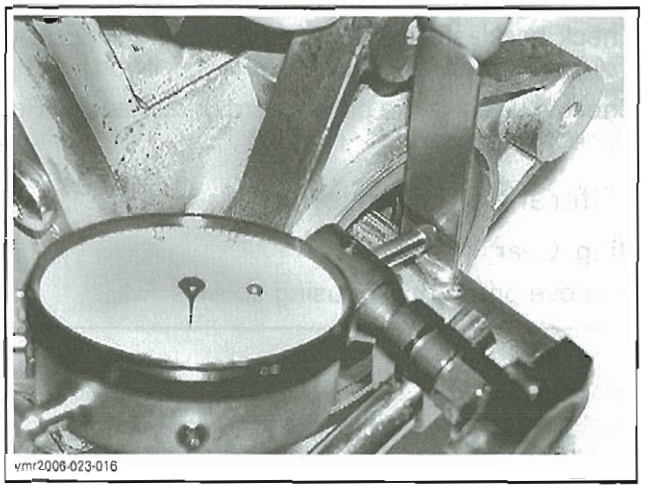
Measure the backlash using a dial indicator and the backlash measurement tool (P/N 529 035 665).

- Place the backlash measurement tool at the end of pinion gear.
- From center of 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 tab back and forth. Note the result.



- Rotate pinion gear 1/2 turn and check backlash again. Note the result.
- Rotate pinion gear 1 turn and check backlash again.

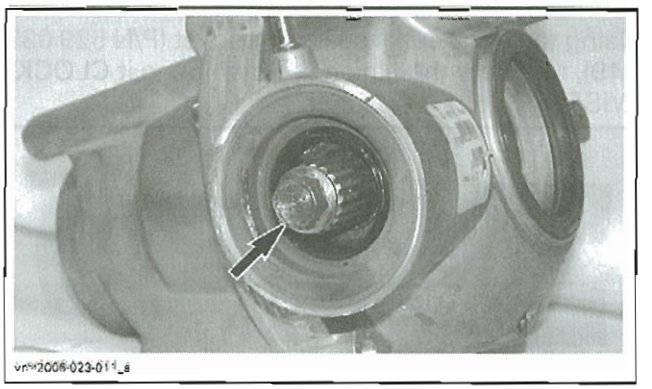
If backlash is below 0.05 mm (.002 in), increase backlash shim by 0.05 mm (.002 in) and check the backlash again.

If backlash is greater than 0.356 mm (.014 in), decrease backlash shim by 0.05 mm (.002 in) and check the backlash again.

Measure preload.

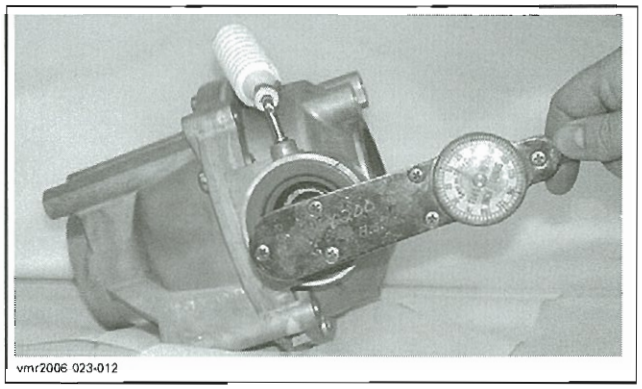
Preload

Screw the propeller shaft adaptor screw in pinion gear.



TYPICAL — FRONT DIFFERENTIAL SHOWN

Using a needle torque wrench, measure the drag torque.



TYPICAL — FRONT DIFFERENTIAL SHOWN

If the drag torque is greater than 0.7 N•m (6 lbf•**in**), reduce preload shim by 0.05 mm (.002 in) and check drag torque again.

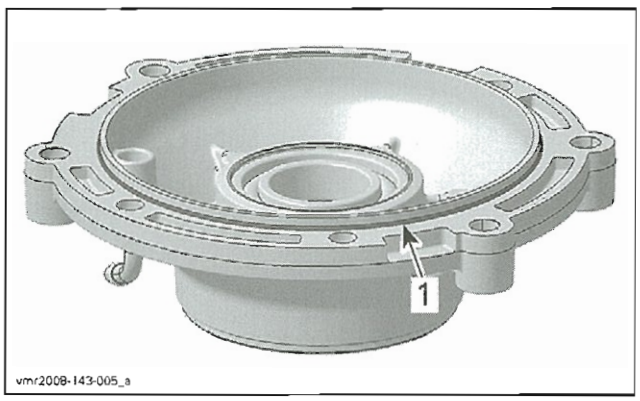
If the drag torque is less than 0.06 N•m (.5 lbf•**in**), increase preload shim by 0.05 mm (.002 in) and check drag torque again.

Differential Assembly

Ring Gear

To assemble, reverse the removal procedure. Pay attention to the following details.

Verify condition of half housing seal. Change seal if necessary.



1. Half housing seal

Check all bearings and all oil seals. Change them if necessary.

Pinion Gear

To install, reverse the removal procedure. Pay attention to the following details.

Install shim(s) then the ball bearing.

Install a NEW O-ring.

Apply Loctite 277 (P/N 293 800 073) on threads of pinion nut.

Install pinion nut then torque it to 180 N•m (133 lbf•ft).

Apply XP-S synthetic grease (P/N 293 550 010) in the lips of the NEW oil seal and install it.

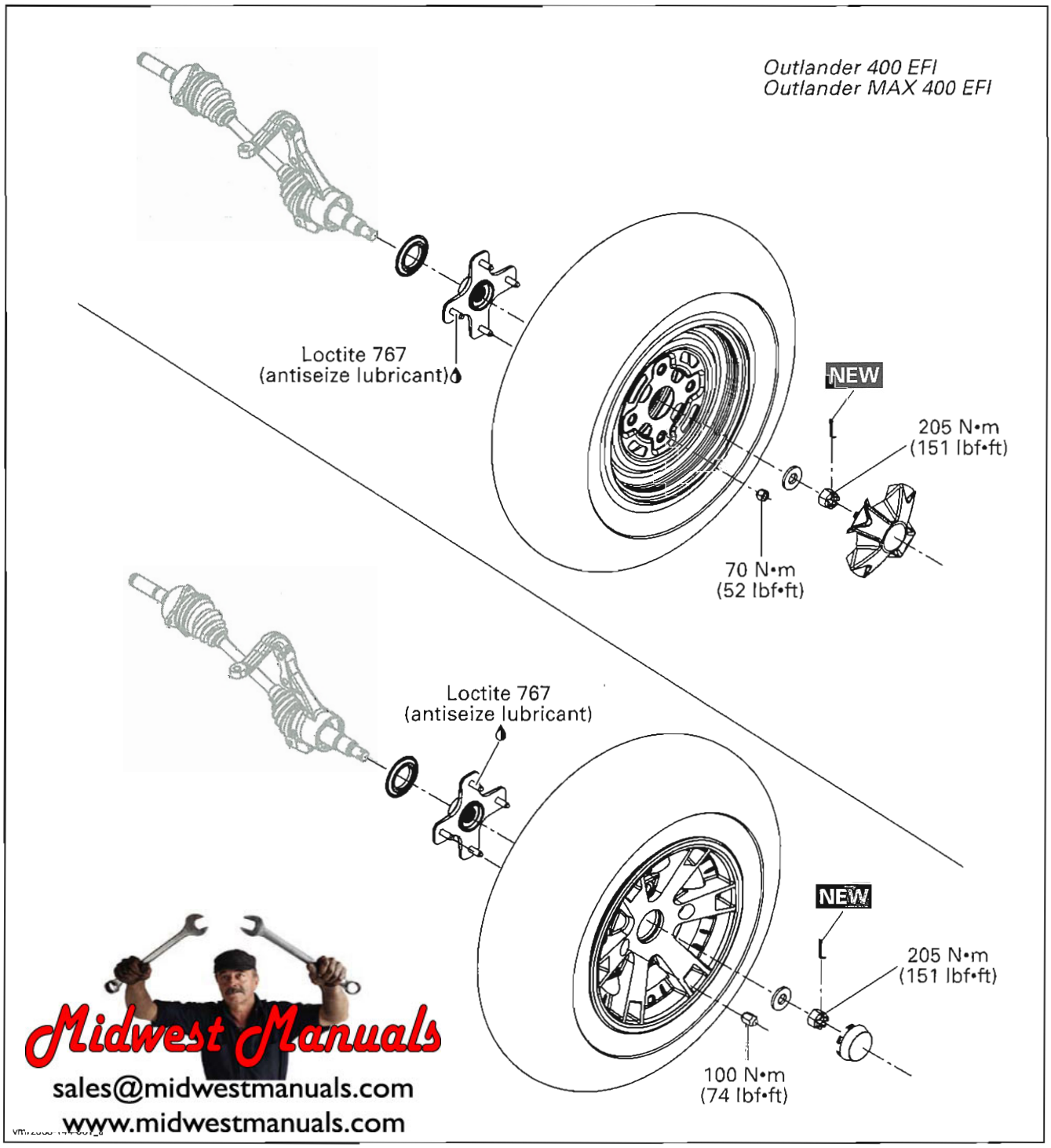
Differential Installation

The installation is the reverse of the removal procedure.

WHEELS/TIRES

SERVICE PRODUCTS

Description	Part Number	Page
Loctite 767 (antiseize lubricant)	293 800 070	355



GENERAL

⚠ WARNING

Severe injury or death can result if these instructions are not followed.

- When the tires are replaced, never install a bias tire with a radial tire. Such a combination could create handling and/or stability problems.
- Do not rotate tires. The front and rear tires are of different sizes.
- Do not mix tires of different size and/or design on the same axle.
- Front and rear tire pairs must be of identical model and manufacturer.
- For unidirectional tread pattern, ensure that the tires are installed in the correct direction of rotation.
- The radial tires must be installed as a complete set.

MAINTENANCE

TIRE PRESSURE

⚠ WARNING

Tire pressure greatly affects vehicle handling and stability. Underpressure may cause tire to deflate and rotate on wheel. Overpressure may burst the tire. Always follow recommended pressure. Since tires are low-pressure types, a manual pump should be used.

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			
OUTLANDER 400 EFI and OUTLANDER MAX 400 EFI			
		FRONT	REAR
UP to 227 kg (500 lb)	MAX.	34.5 kPa (5 PSI)	34.5 kPa (5 PSI)
	MIN.	31 kPa (4.5 PSI)	31 kPa (4.5 PSI)
OUTLANDER 400 EFI XT and OUTLANDER MAX 400 EFI XT			
		FRONT	REAR
UP to 235 kg (517 lb)	MAX.	34.5 kPa (5 PSI)	34.5 kPa (5 PSI)
	MIN.	31 kPa (4.5 PSI)	31 kPa (4.5 PSI)

PROCEDURES

WHEEL

Wheel Removal

Place the vehicle on a level surface.

Apply parking brake.

Loosen wheel lug nuts.

Lift the front of vehicle.

Secure vehicle on jack stands. Position jack stands under lower suspension arms.

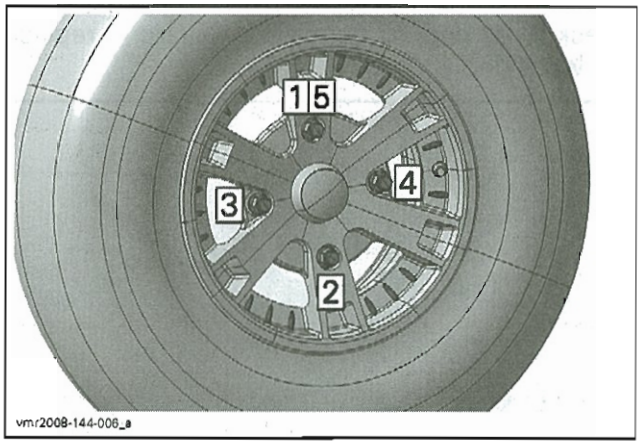
Remove wheel.

Wheel Installation

The installation is the reverse of the removal procedure.

The tires are directional and their rotation must be kept in a specific direction for proper operation.

Using the next table, torque wheel lug nuts in accordance with the following illustration.



CAUTION: Always use the recommended wheel lug nuts. Using a different nut could cause damages to the rim.

WHEEL TORQUE		
MODELS	TORQUE	
	FRONT	REAR
Outlander 400 EFI Outlander MAX 400 EFI	70 N•m (52 lbf•ft)	
Outlander 400 EFI XT Outlander MAX 400 EFI XT	100 N•m (74 lbf•ft)	

NOTE: Occasionally, wheel lug nuts should be removed to apply Loctite 767 (antiseize lubricant) (P/N 293 800 070) on studs to ease future removal. This is particularly important when vehicle is used in salt water environment or in mud. Remove one nut at a time, lubricate then retorque.

TIRE

Tire Inspection

Check for air leaks (hissing sound) caused by an ill-fitting rim or a faulty tire valve.

Check tire for:
- Cuts
- Slits
- Cracks.

Check sides of tire for:
- Bumps
- Bulges
- Nails
- Other foreign objects.

Check minimum tread depth by using a tread depth gauge. Check in three locations across the tire's tread:
- Outer edge
- Center
- Inside edge.

It is normal to see uneven wear on tires depending on how the vehicle is driven and road conditions. The front tires external or internal edges tread will wear unevenly depending on if the vehicle is driven smoothly or aggressively.

Tire Replacement

To replace a tire, do the following:

- Remove *WHEEL* from vehicle, see procedure in this section.
- Using an automotive tire changer (rim clamp type), remove the old tire.

NOTE: Refer to manufacturer's instructions for tire changer operation.

- Install the new tire.
- Remove the old balancing masses from rim.
- Clean inner side of wheel with alcohol to remove grease and dust.
- Balance wheel using a wheel balancer.

NOTE: Refer to manufacturer's instructions for wheel balancer operation.

- Install new balancing masses inside wheel. Position them in the center of the flat inner surface of the rim.
- Reinstall wheel.

WHEEL HUB

Wheel Hub Removal

Place the vehicle on a level surface.

Apply parking brake or select 4WD position and place transmission lever on P.

Loosen wheel lug nuts.

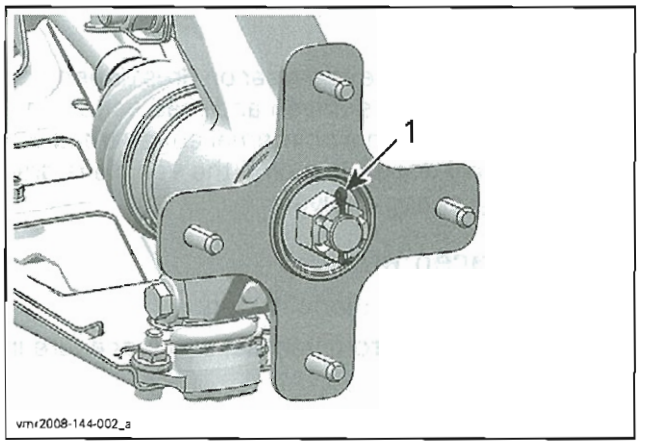
Raise the front or the rear of vehicle.

Support it securely on jack stands.

Remove wheel.

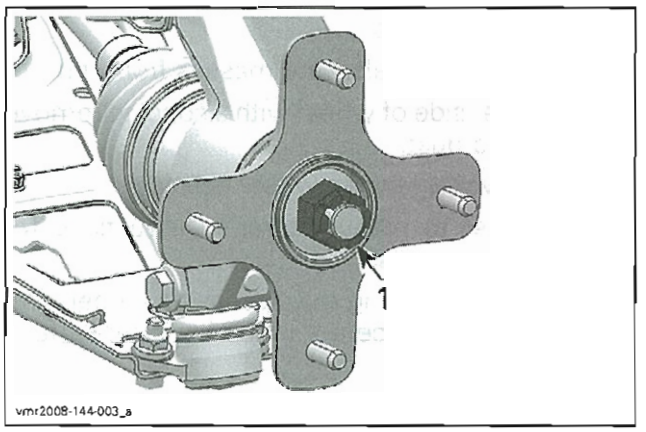
Remove the hub cap.

Remove and discard the cotter pin.



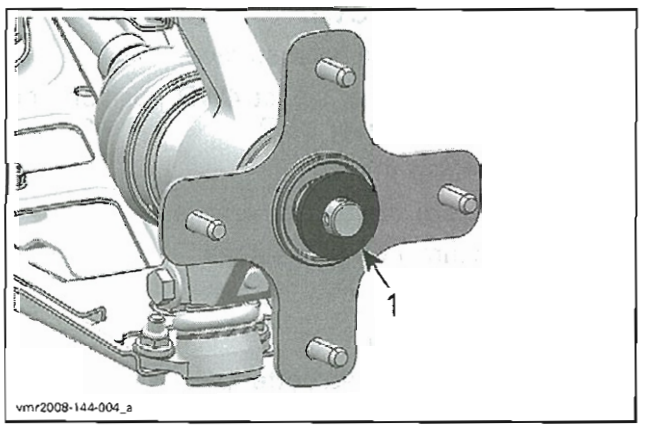
1. Cotter pin

Unscrew the castellated nut.



1. Castellated nut

Remove the Belleville washer.



1. Belleville washer

Pull wheel hub to remove it.

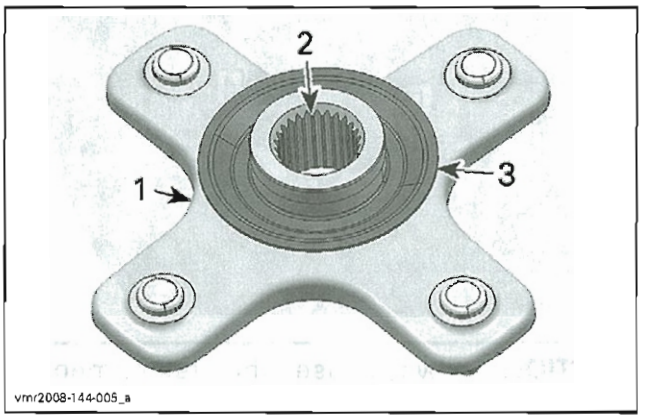
Wheel Hub Inspection

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.

Check wear ring. If damage is apparent, replace the wear ring.



1. Wheel hub
2. Wheel hub splines
3. Wear ring

Wheel Hub Installation

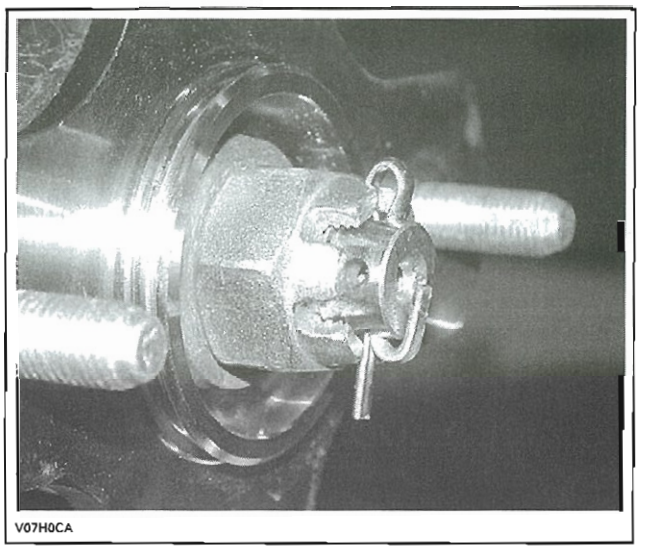
The installation is the reverse of removal procedure.

Install Belleville washer so that the inside diameter protrudes outward and contacts the nut.

Tighten the castellated nut on the drive shaft end to 205 N•m (151 lbf•ft) and further tighten until one of its grooves is aligned with a cotter pin hole.

NOTE: Do not unscrew the castellated nut to reach a cotter pin hole.

Install a NEW cotter pin. Fold one pin of cotter pin over drive shaft end.



Install the hub cap.

Install *WHEEL*, see procedure above in this section for proper torque.

STEERING SYSTEM

SERVICE TOOLS

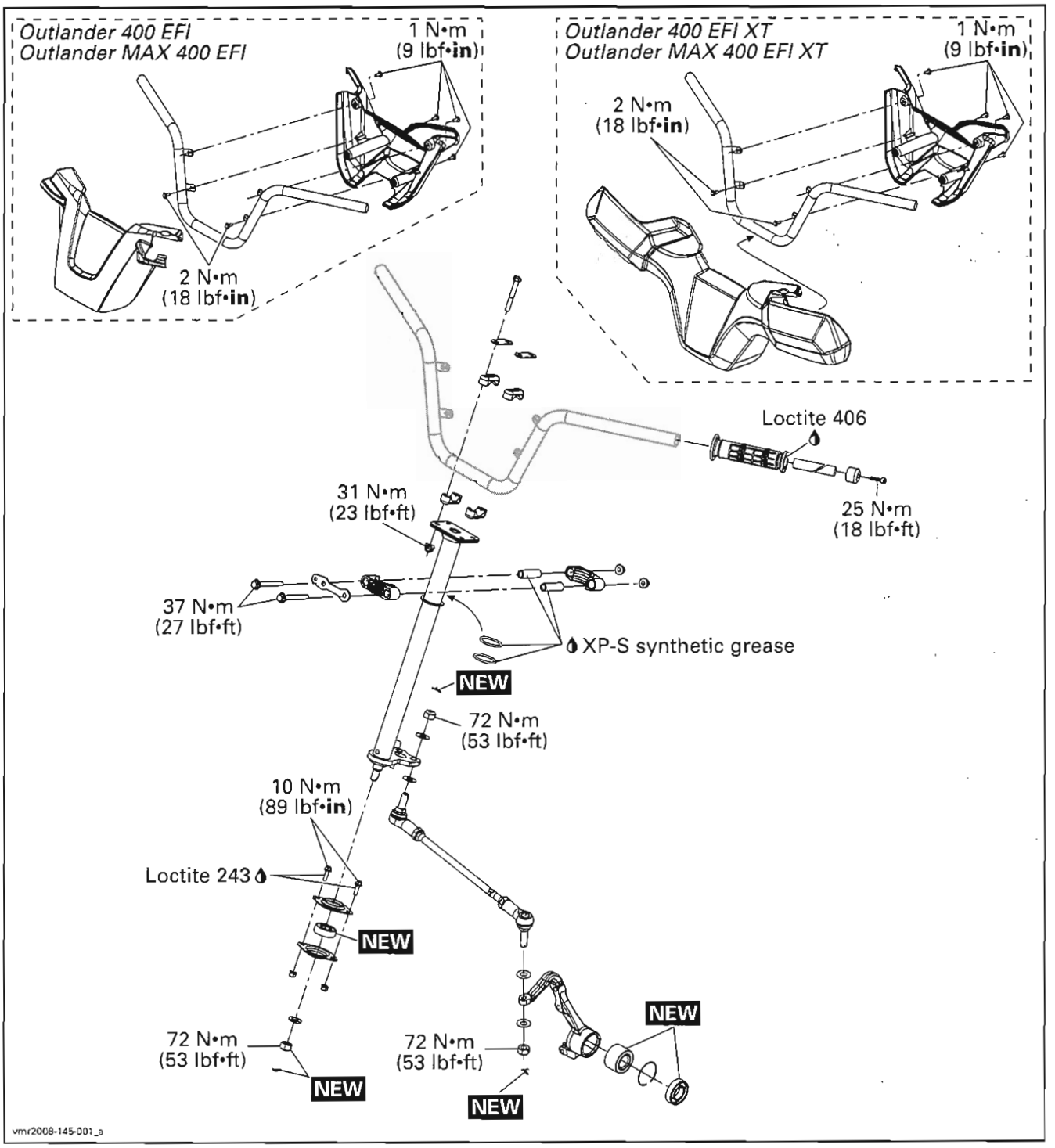
Description	Part Number	Page
steering alignment tool	529 036 059	359

SERVICE TOOLS – OTHER SUPPLIER

Description	Part Number	Page
Smoothflow™ tapered tip	16 ga #511 rtt-b	360

SERVICE PRODUCTS

Description	Part Number	Page
Loctite 243 (blue)	293 800 060	365
Loctite 406 (glue)	293 800 100	360
pulley flange cleaner	413 711 809	360
XP-S synthetic grease	529 550 010	366



GENERAL

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

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

⚠ WARNING

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

Hoses or cables removed or disconnected must be installed and routed at the same place.

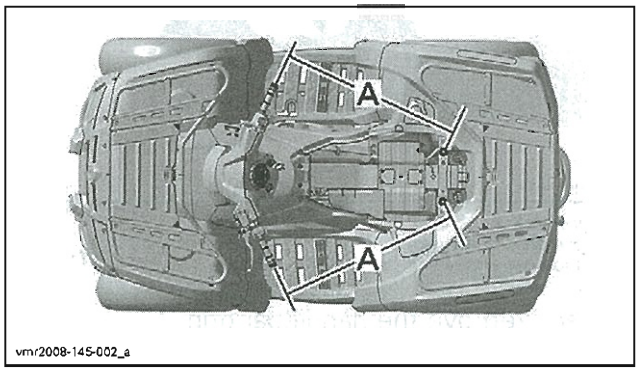
CAUTION: Locking ties removed during a procedure must be replaced and installed at the same location.

ADJUSTMENT

STEERING ALIGNMENT

Place vehicle on level surface.

Position handlebar so that it is in straight ahead position by measuring from the extremities of the handlebar to a rear fixed point.



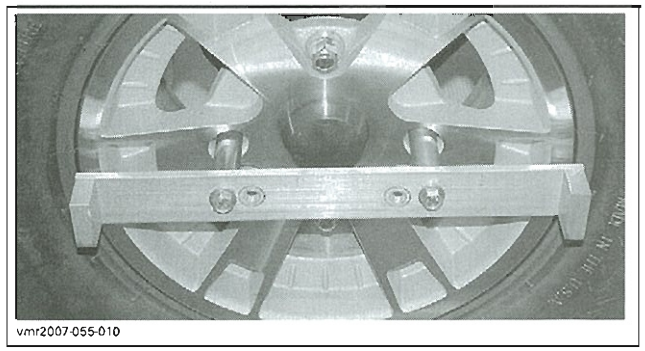
A. Same length

NOTE: The reference point must be the same to each side.

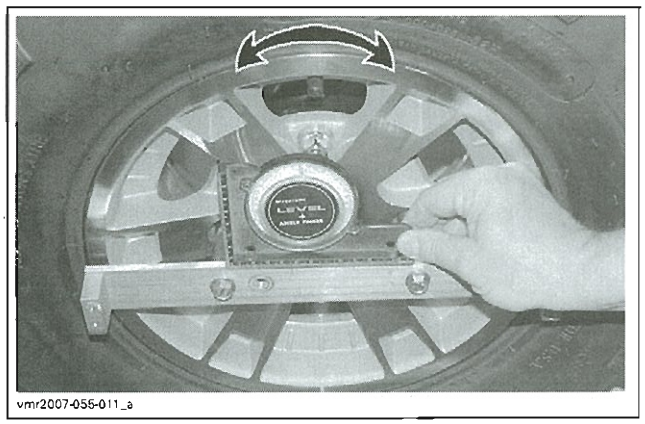
Tie handlebar to prevent movements during alignment.

Check pressure in each tires. Always follow recommended pressure.

Remove two wheel nuts and install the steering alignment tool (P/N 529 036 059).



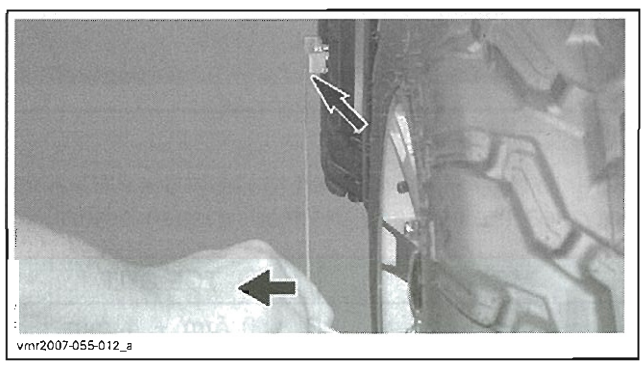
Move the vehicle to place the tool on a level with the ground.



Place a rope around the vehicle and using an elastic, link both ends together.

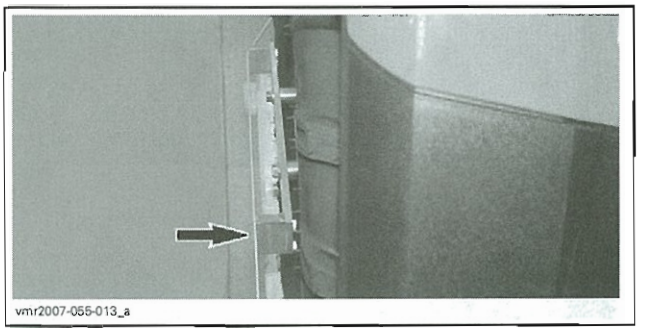
The rope must be place at the center of the wheels.

From the front of vehicle, near the front of rim, move rope so that it does not touch the first spacer of tool.



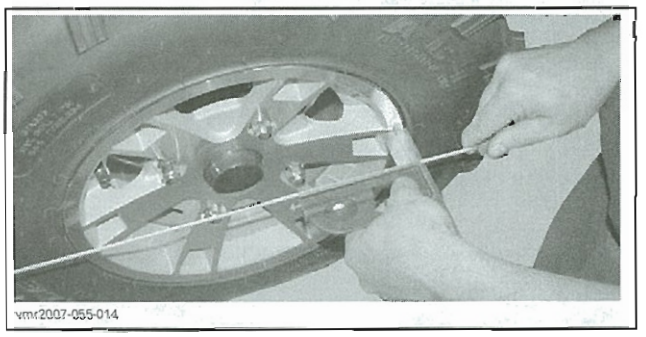
TYPICAL

Then, bring the rope back until it touches the spacer.

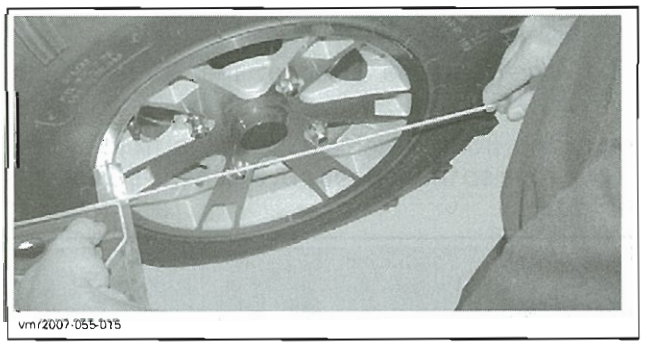


TYPICAL

Keep this position and measure the distance between the rope and the rim, to the front and to the rear of wheel.



TYPICAL — FRONT OF WHEEL



TYPICAL — REAR OF WHEEL

Refer to the following chart to know the difference between the rear and the front measurement.

MODELS	TOE-OUT
All Outlander 400 EFI	0 mm ± 4 mm (0 in ± .157 in)

Set alignment of wheel by adjusting tie-rod.

Recheck the measurement after torquing tie-rod lock nuts.

Repeat the procedure for the other side of vehicle.

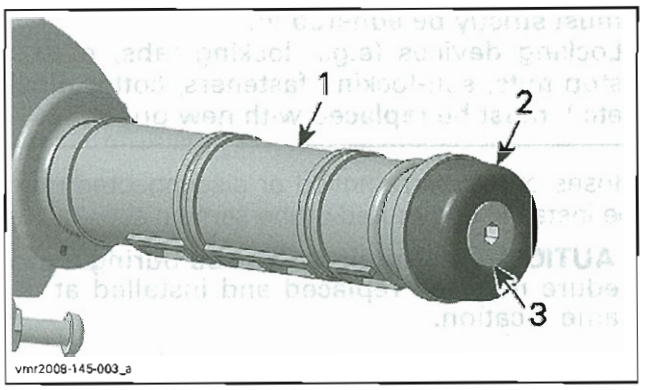
PROCEDURES

HANDLEBAR GRIP

Handlebar Grip Removal

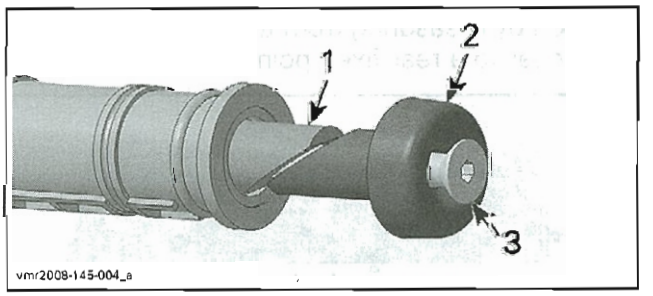
Loosen (2–3 turns only) the screw at the end of handlebar grip.

NOTE: If the screw is removed completely, the threaded insert will stay inside handlebar and its removal could be difficult.



1. *Handlebar grip*
2. *Handlebar end weight*
3. *Handlebar end weight screw*

Slide the handlebar end weight with its threaded insert out of handlebar.



1. *Threaded insert*
2. *Handlebar end weight*
3. *Handlebar end weight screw*

Cut and remove the handlebar grip.

Handlebar Grip Installation

Remove all rubber residues of the old grip before installing the new.

Clean the handlebar with pulley flange cleaner (P/N 413 711 809) or alcohol to remove any greasy matter on it.

Install handlebar grip by blowing compressed air between handle grip and handlebar.

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).

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.

Apply pressure on the grip for approximately 30 seconds to set the glue.

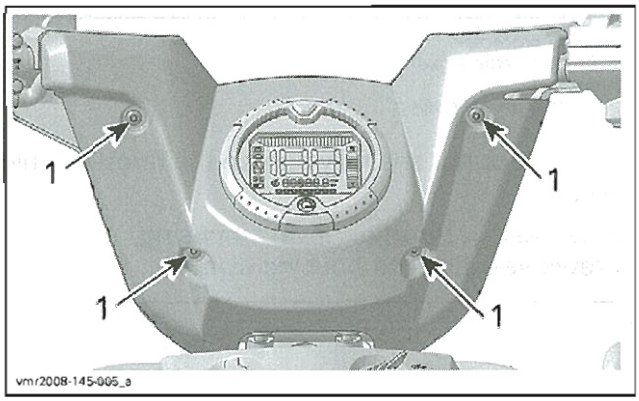
Install the handlebar end weight and torque screw to 25 N•m (18 lbf•ft).

HANDLEBAR COVERS

Handlebar Covers Removal

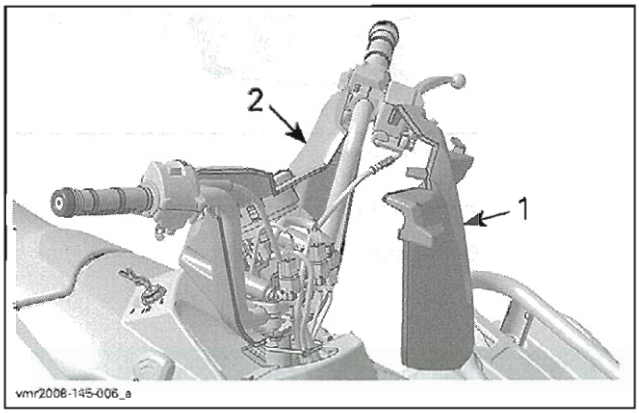
Front Handlebar Cover

Remove handlebar cover screws.



1. Handlebar cover screws

Remove the front handlebar cover.

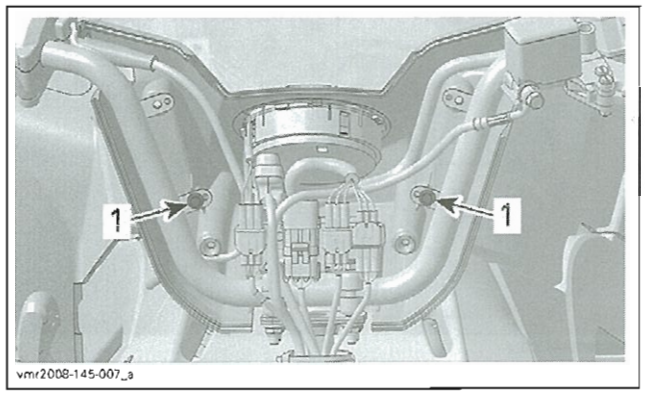


1. Front handlebar cover
2. Rear handlebar cover

Rear Handlebar Cover

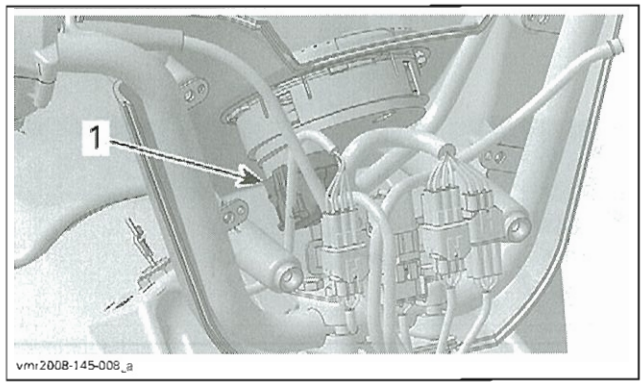
Remove the *FRONT HANDLEBAR COVER*, see procedure above.

Remove screws securing the rear handlebar cover to handlebar.



1. Rear handlebar cover screws

Unplug the speedometer.



1. Speedometer connector

Remove rear handlebar cover from vehicle.

Handlebar Covers Inspection

Check covers for cracks or other damages. Replace if necessary.

Handlebar Covers Installation

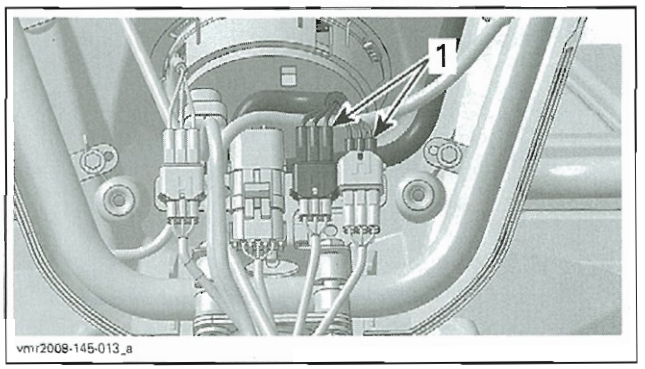
The installation is the reverse of removal procedure.

MULTIFUNCTION SWITCH

Multifunction Switch Removal

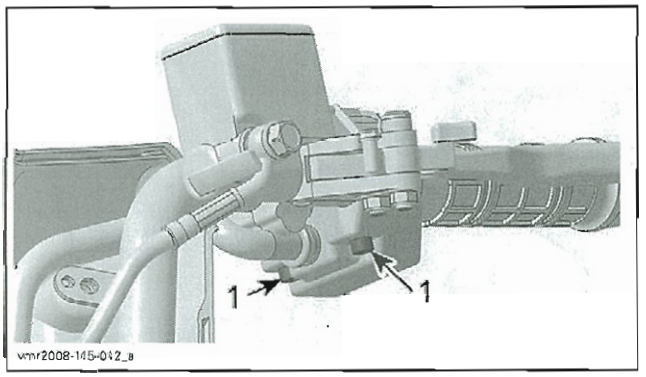
Remove the front handlebar cover. See *HANDLEBAR COVERS* above in this section.

Unplug multifunction switch connectors.



1. Multifunction switch connectors

Remove screws securing multifunction switch.



1. Multifunction switch screws

Separate multifunction switch from handlebar.

Multifunction Switch Installation

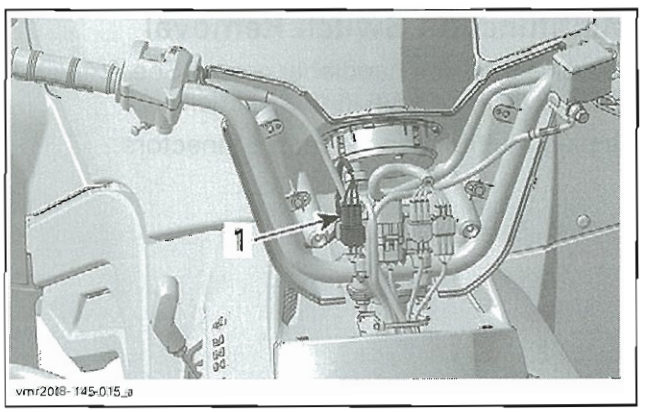
The installation is the reverse of the removal procedure.

THROTTLE LEVER

Throttle Lever Removal

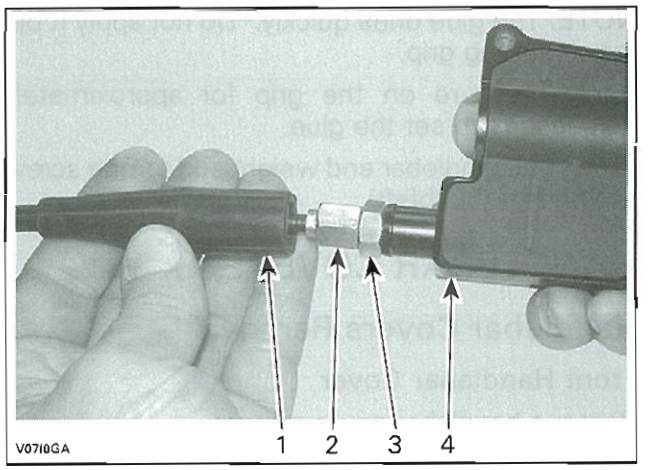
Remove the front handlebar cover. See *HANDLEBAR COVERS* above in this section.

Unplug 2/4WD switch connector.



1. 2/4WD switch connector

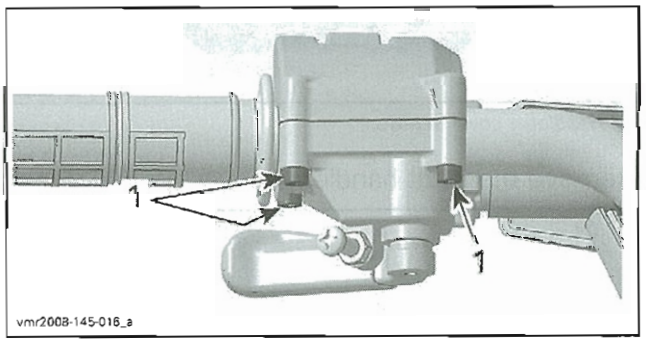
Slide rubber protector back to expose throttle cable adjuster.



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

Loosen lock nut and fully tighten the throttle cable adjuster.

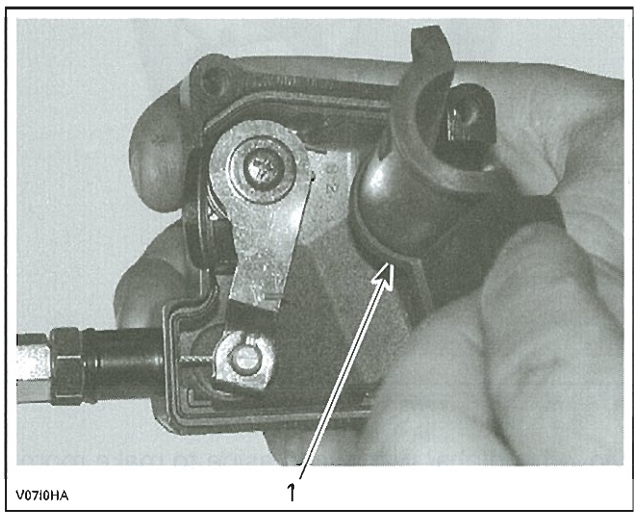
Underneath throttle lever housing, remove screws securing the housing clamp.



1. Throttle lever housing screws

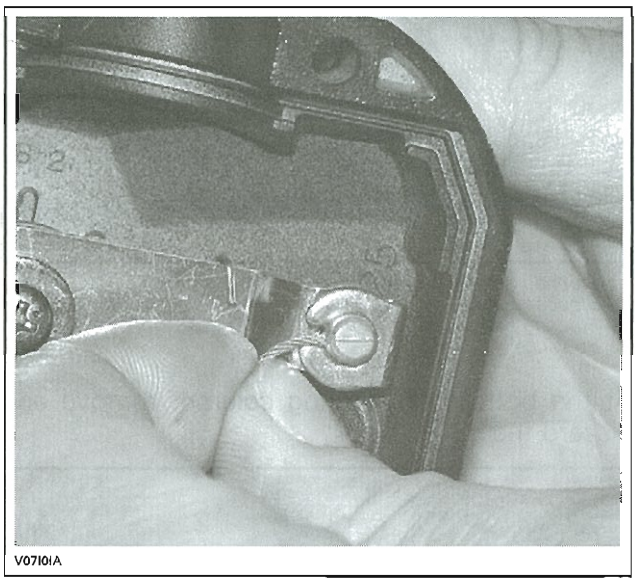
Separate throttle handle from handlebar.

Remove inner housing protector.



1. Inner housing protector

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



Remove throttle cable from housing.

Throttle Lever Installation

For installation, reverse the removal procedure.

Adjust throttle cable. Refer to *ELECTRONIC FUEL INJECTION* section.

HANDLEBAR

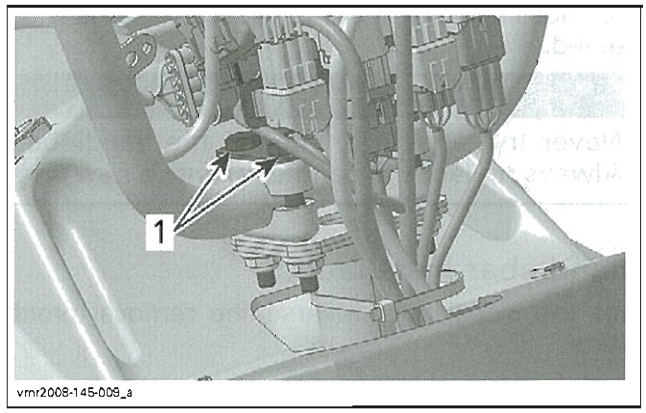
Handlebar Removal

If the handlebar must be changed, remove all following components before removing it from vehicle.

- Handlebar end weights
- Throttle lever (see procedure in this section)
- Multifunction switch (see procedure in this section)
- Brake lever (see procedure in *BRAKES* section).

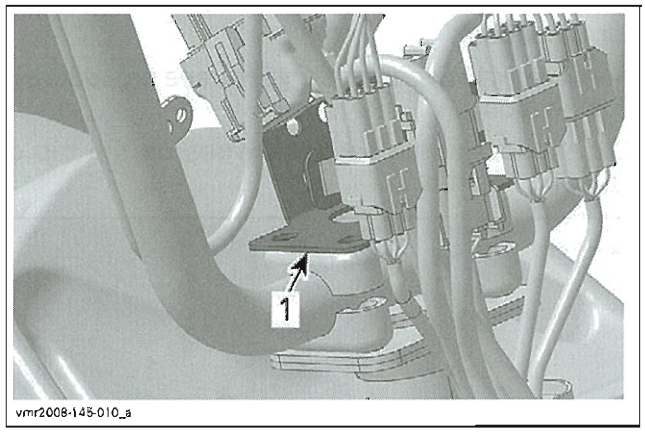
Remove both *HANDLEBAR COVERS*, see procedure above in this section.

Unscrew 4 bolts securing handlebar to steering column.



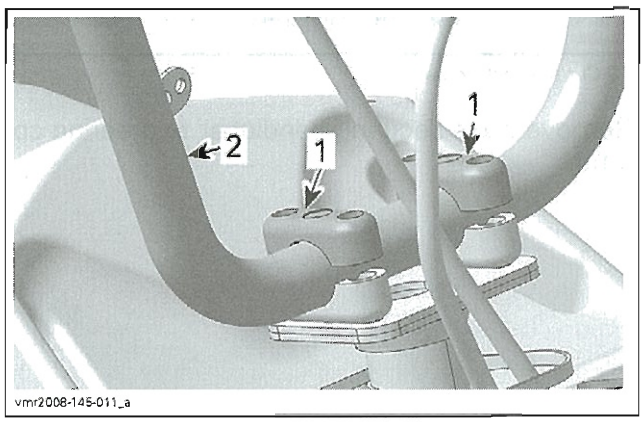
1. RH handlebar bolts

Move the connector plate with connectors aside.



1. Connector plate

Remove the handlebar clamps.



1. Handlebar clamps
2. Handlebar

Remove the handlebar.

Handlebar Inspection

Check handlebar for:
- Wear
- Cracks
- Bending.

Replace handlebar if any of these problems is detected.

⚠ WARNING

Never try to weld or modify the handlebar. Always replace the handlebar with a new one.

Handlebar Installation

For the installation, reverse the removal procedure.

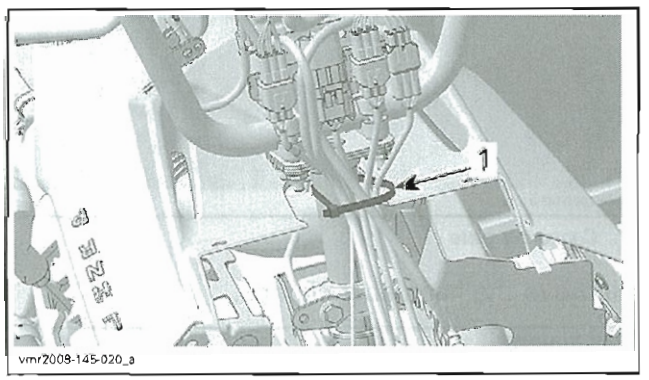
STEERING COLUMN

Steering Column Removal

Remove the front fender. Refer to *BODY* section for procedure.

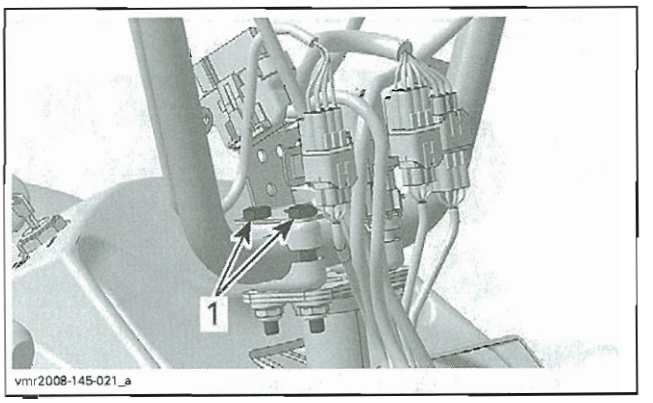
Remove *HANDLEBAR COVERS*, see procedure in this section.

Cut the locking tie securing wires on the top of steering column.



1. Cut this locking tie

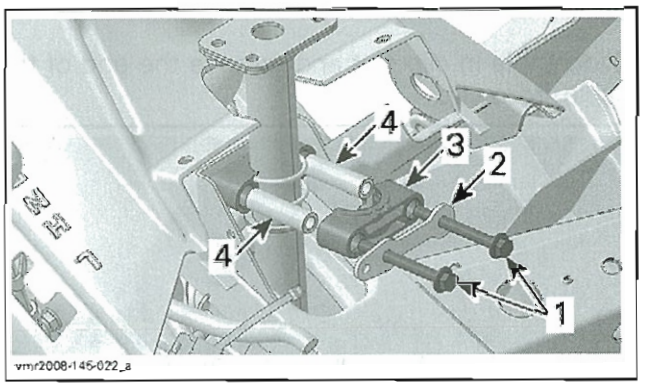
Remove bolts securing handlebar to steering column.



1. RH handlebar screws

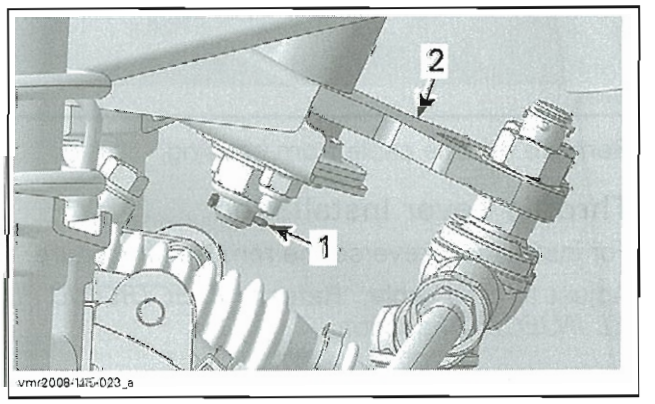
Move handlebar with wires aside to make room.

Unscrew bolts securing the steering half supports.



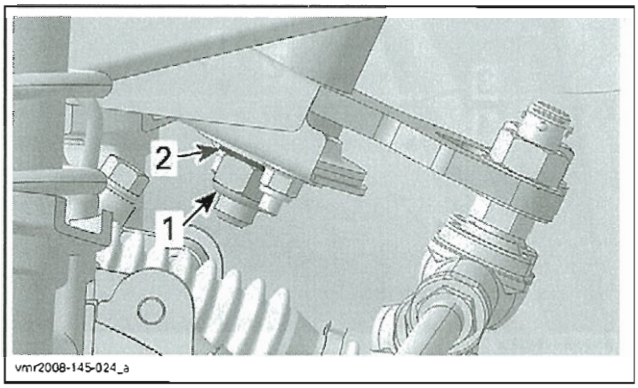
1. Steering half supports bolts
2. Stopper plate
3. Steering half supports
4. Bushings

At the bottom of steering column, remove and discard the cotter pin.



1. Cotter pin
2. Steering column

Remove the elastic stop nut and the washer. Discard nut.



1. Elastic nut
2. Washer

Separate steering column and tie-rods. Refer to *TIE-ROD*, further in this section.

Pull out steering column.

Steering Column Inspection

Check steering column for:
- Wear
- Cracks
- Bending.

Replace if any of these problems is detected.

⚠ WARNING

Never try to weld or modify the steering column. Always replace the column with a new one.

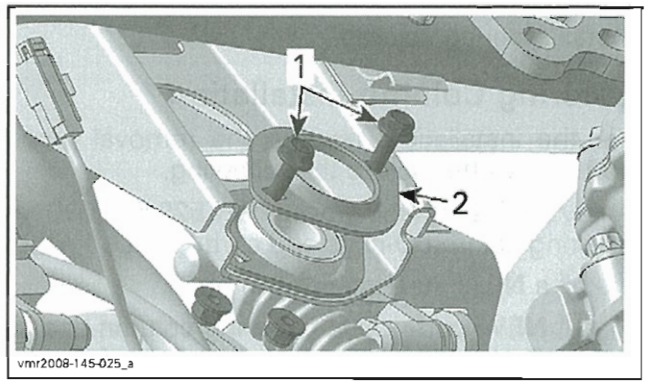
Check if steering column O-rings are:
- Brittle
- Hard
- Otherwise damaged.

Replace them if necessary.

At the same time, check steering column bearing condition. It must turn smoothly and freely. If not, replace it.

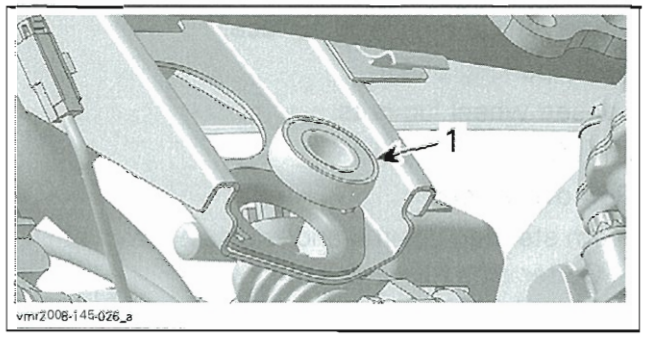
Steering Column Bearing Replacement

While steering column is raised, unscrew bolts securing bearing flanges to frame.



1. Bearing flange bolts
2. Upper bearing flange

Remove bearing.



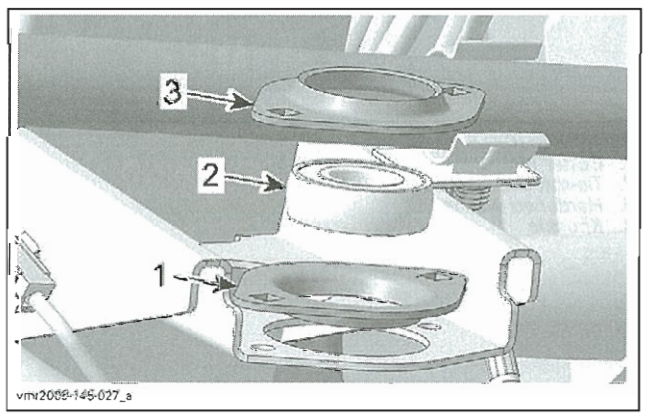
1. Steering column bearing

Check bearing flanges condition. Replace them if wear is find.

Install the first bearing flange with the collar into frame opening.

Install the bearing.

Place the second bearing flange with the collar upward.



1. First bearing flange (collar downward)
2. Steering column bearing
3. Second bearing flange (collar upward)

Apply Loctite 243 (blue) (P/N 293 800 060) on threads of bearing flange bolts.

Tighten them to 10 N•m (89 lbf•**in**).

Install steering column.

Steering Column Installation

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

Apply XP-S synthetic grease (P/N 529 550 010) on steering column O-rings and on bushings.

Install a NEW steering column nut.

Install NEW cotter pins (steering column and tie rods). Both ends of cotter pins must be folded.

TIE-ROD

Tie-Rod Removal

Place vehicle on a level surface.

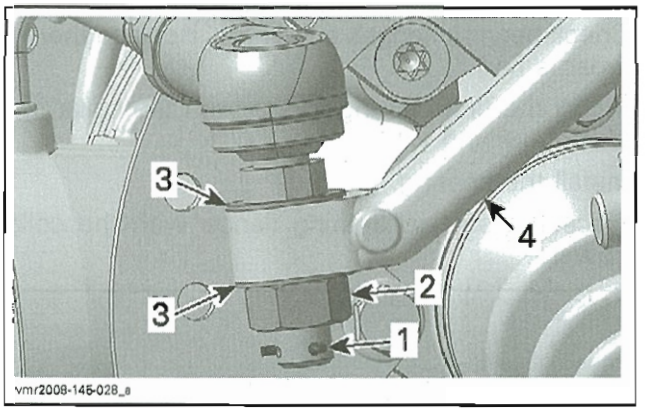
Apply parking brake.

Loosen wheel lug nuts.

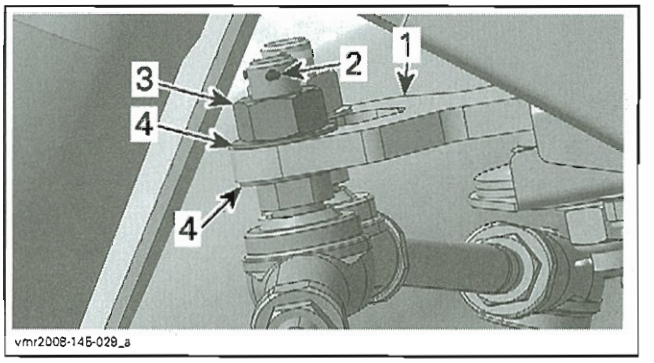
Lift the front of vehicle.

Remove wheel.

From steering column and knuckle, remove:
- Cotter pins (discard)
- Tie-rod end nuts
- Hardened washers.



FROM KNUCKLE
1. *Cotter pin*
2. *Tie-rod end nut*
3. *Hardened washer*
4. *Knuckle*



FROM STEERING COLUMN
1. *Steering column lever*
2. *Cotter pin*
3. *Tie-rod nut*
4. *Hardened washers*

Remove tie-rod from vehicle.

Tie-Rod Inspection

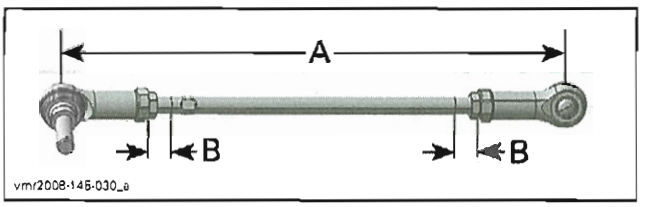
Inspect tie-rod ends for wear or looseness, if excessive, replace.

Tie-Rod Installation

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

Adjust the tie-rod length to 354 mm (13-15/16 in).

Check the both unengaged threaded portion of tie-rod.



A. Preliminary adjustment
B. Unengaged threads

TIE-ROD	
Preliminary length adjustment — dimension "A"	354 mm (13–15/16 in)
Maximum unengaged threads — dimension "B" *	17.5 ± 5 mm (11/16 ± 3/16 in)
* Dimension "B" to be approximately equal upon assembly.	

Tighten tie-rod lock nuts.

Install NEW cotter pins. Both ends of cotter pins must be folded.

Perform steering alignment. Refer to *ADJUSTMENT* at the beginning of this section.

KNUCKLE

Knuckle Removal

Place vehicle on a level surface.

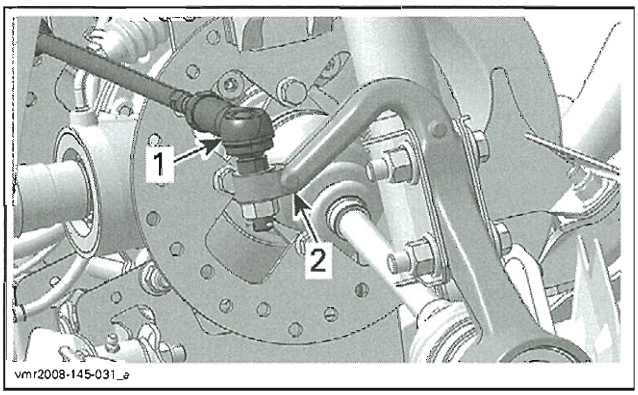
Loosen wheel lug nuts.

Lift the front of vehicle.

Remove wheel.

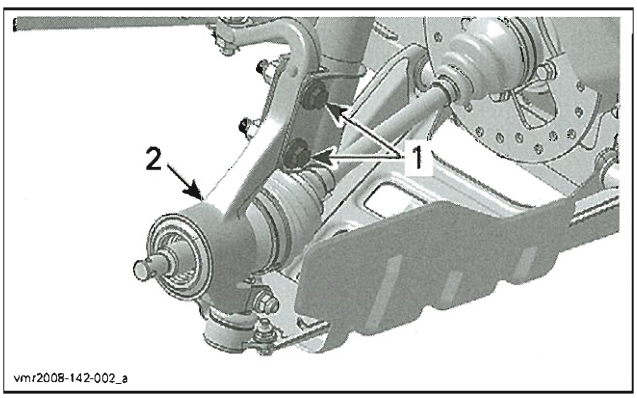
Remove wheel hub. Refer to *WHEELS/TIRES* section.

Detach tie-rod end from knuckle.



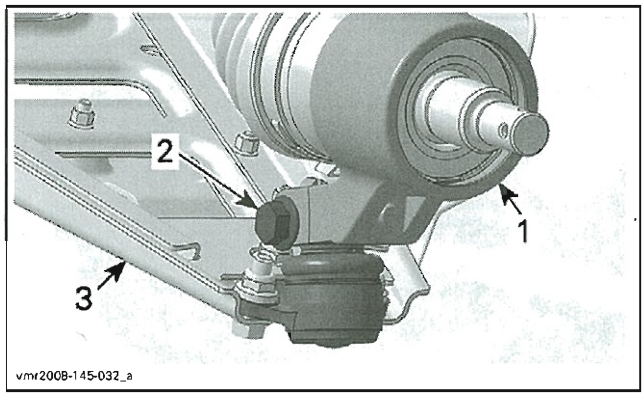
1. *Tie-rod end*
2. *Knuckle*

Unscrew bolts holding strut to knuckle.



1. *Strut bolts*
2. *Knuckle*

Remove bolt that attaches lower ball joint to knuckle.



1. *Knuckle*
2. *Lower ball joint bolt*
3. *Lower suspension arm*

Remove the knuckle.

Knuckle Inspection

Check knuckle for cracks or other damages. Replace if necessary.

Check if wheel bearing turns freely and smoothly. See *WHEEL BEARING* below if the replacement is necessary.

Knuckle Installation

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

Install NEW cotter pins. Both ends of cotter pins must be folded.

Verify steering alignment. Refer to *ADJUSTMENT* at the beginning of this section.

WHEEL BEARING

Wheel Bearing Inspection

Raise the front of vehicle.

Hold the wheel by the top and the bottom and move it. Check for lateral play.

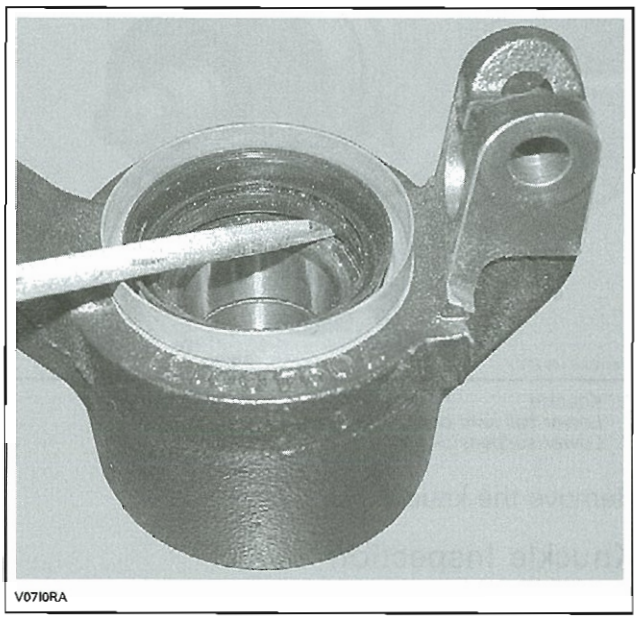
If there is any loose, replace the wheel bearing.

NOTE: First, check if ball joint is loose. If necessary repair all defective parts before checking the wheel bearing condition. Be careful not to misjudge loose in the ball joint and loose in the wheel bearing.

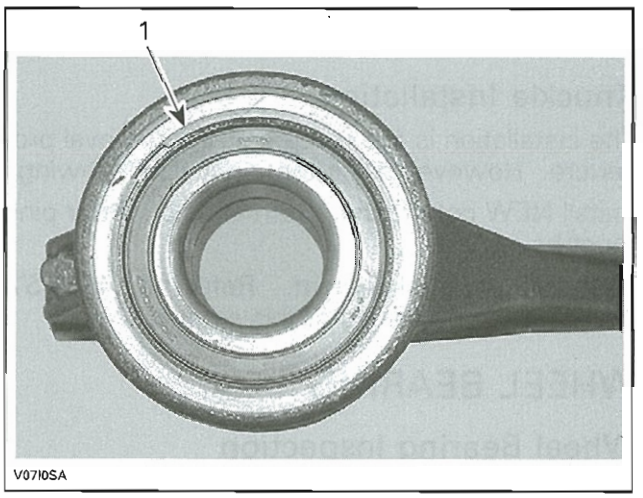
Wheel Bearing Removal

Remove the *KNUCKLE*, see procedure in this section.

Using a flat screwdriver, remove and discard the wheel bearing seal.


V07I0RA

Remove the circlip securing the bearing into the knuckle.



V07I0SA

1. Circlip

Using a press machine, push the bearing out of knuckle.

NOTE: It may be necessary to heat the knuckle to remove the bearing.

⚠ WARNING

Clean all grease, outside and inside, from knuckle before heating it.

Wheel Bearing Installation

Place the bearing in a freezer for 10 minutes before installing.

Place the knuckle in oven to 100°C (212°F) for 30 minutes maximum to ease bearing installation.

When knuckle is cold, install the circlip.

Install a NEW seal.

Install the other parts in the reverse order of removal procedure.

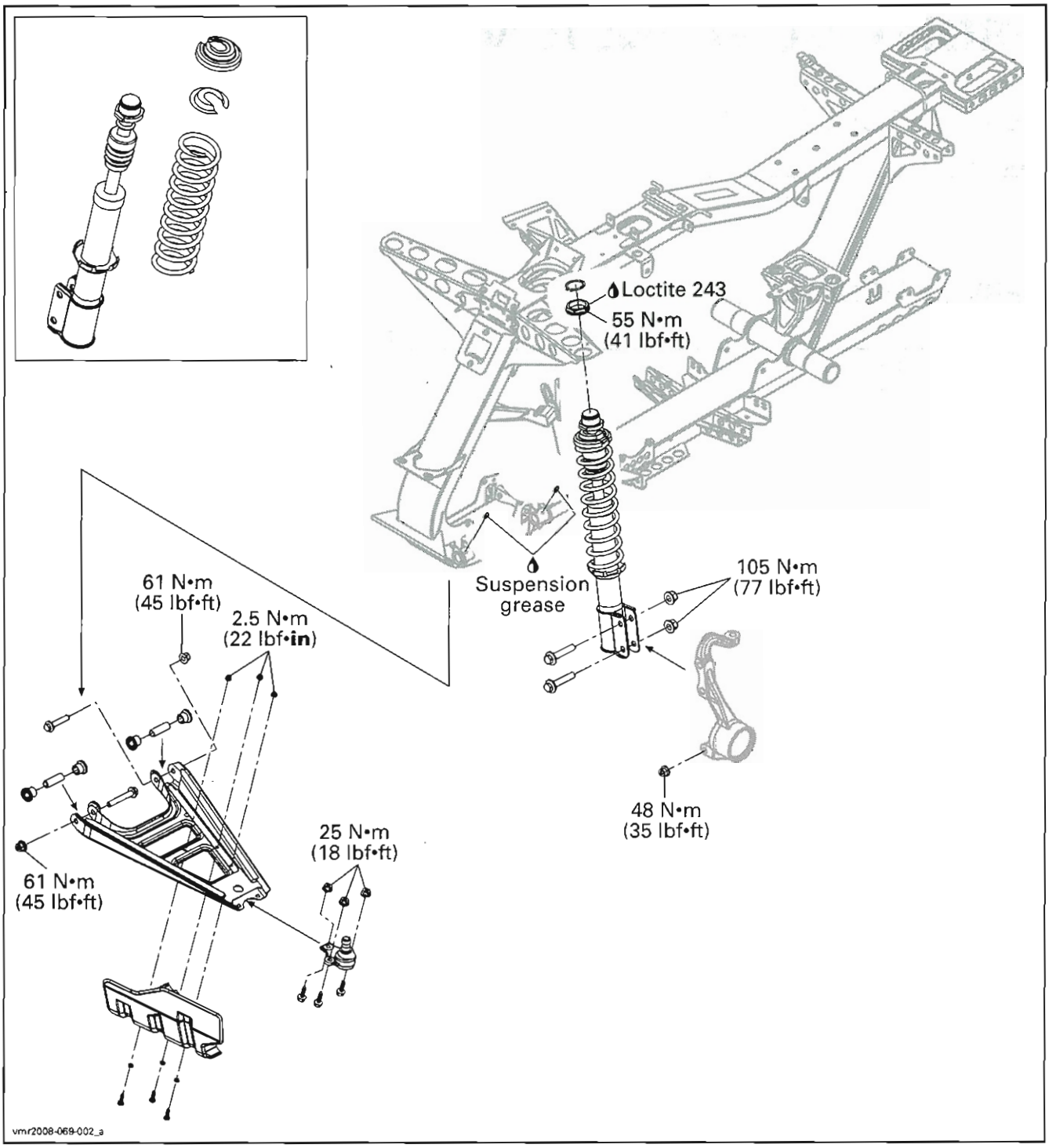
FRONT SUSPENSION

SERVICE TOOLS

Description	Part Number	Page
spring remover	529 036 007	371

SERVICE PRODUCTS

Description	Part Number	Page
suspension grease	293 550 033	374
Loctite 243 (blue)	293 800 060	372



GENERAL

The procedure explained below is the same for the RH and LH sides unless otherwise noted.

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

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

⚠ WARNING

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

Hoses or cables removed or disconnected must be installed and routed at the same place.

CAUTION: Locking ties removed during a procedure must be replaced and installed at the same location.

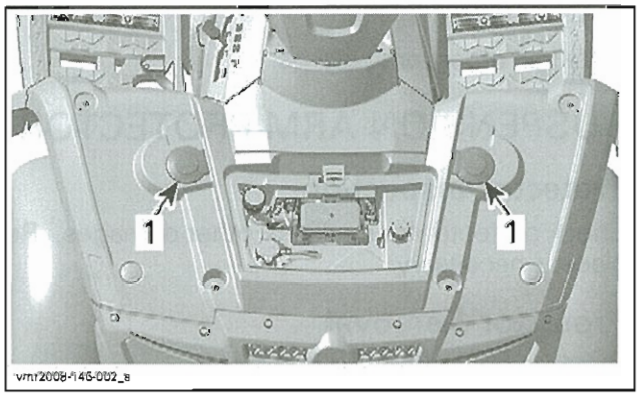
PROCEDURES

STRUT

Strut Removal

Remove the front rack. Refer to *BODY* section.

Remove the appropriate strut nut cap on the top of the front fender.



1. Strut nut caps

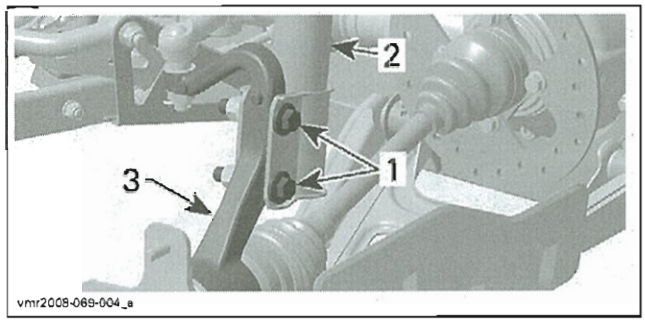
Loosen wheel lug nuts of the appropriate wheel.

Lift front of vehicle until front struts are fully extended.

Install a jack stand under the frame to support the vehicle off the ground.

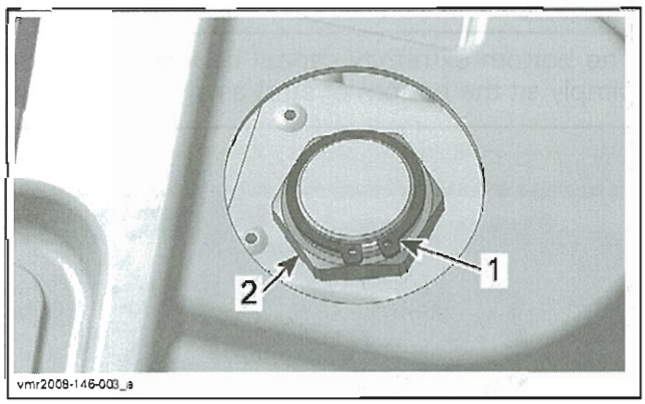
Remove wheel.

Unscrew bolts retaining strut to the knuckle.



1. Strut bolts
2. Strut
3. Knuckle

Remove the circlip and unscrew the strut nut.

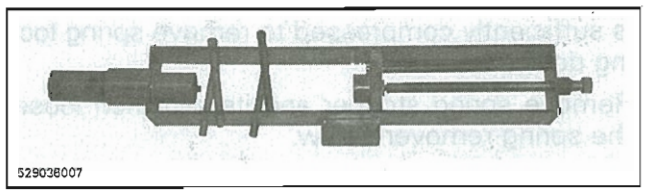


1. Circlip
2. Strut nut

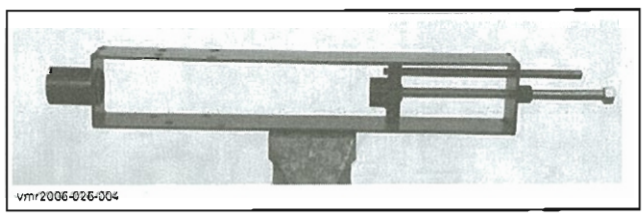
Remove strut from vehicle.

Strut Disassembly

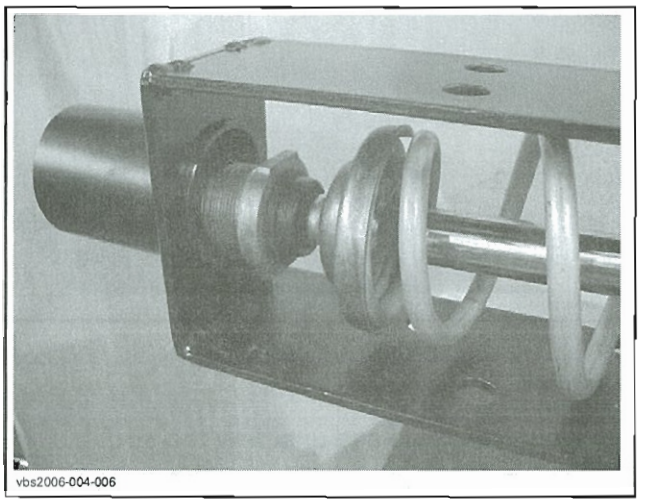
To remove spring from the strut, use the spring remover (P/N 529 036 007).



Place the tool in a vise.



Position the top of the strut in the tool.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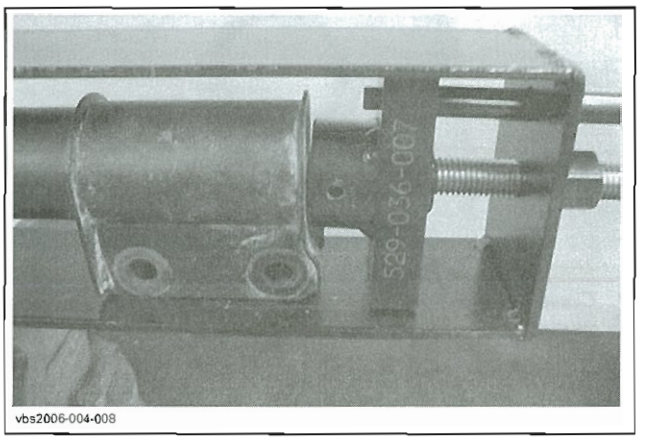
The bottom extremity cannot be locked in place; simply sit the bottom of strut as shown.



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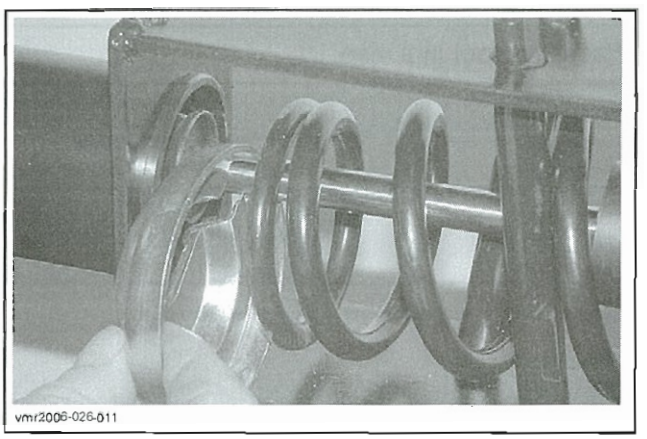
Install the spring compressor pins to retain the strut spring.

Tighten the spring remover screw until the spring is sufficiently compressed to remove spring locking devices.

Remove spring stopper and its cap then loosen the spring remover screw.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Strut Inspection

Inspect the spring for damage. Replace if necessary.

Inspect strut as following:

- Examine the strut for leaks.
- Extend and compress the strut shaft several times over its entire stroke.
- Check that the strut shaft moves smoothly and with uniform resistance with rod up.

Any of the following conditions will denote a defective strut:

- A skip or hang up when reversing stroke at mid travel.
- Seizing or binding conditions except at extreme end of either stroke.
- A gurgling noise after completing one full compression and extension stroke.

Replace strut if any of these conditions are found.

Strut Assembly

For assembly, reverse the disassembly procedures.

Strut Installation

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

Apply Loctite 243 (blue) (P/N 293 800 060) on threads of strut nut.

Tighten strut nut to 55 N•m (41 lbf•ft).

Install circlip. If the circlip appears loose, replace it with a new one.

Install all other removed parts.

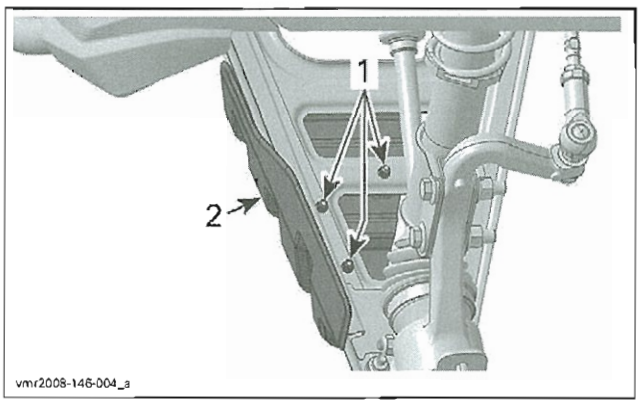
SUSPENSION ARM PROTECTOR

Protector Inspection

Check protector for cracks or other damages. Replace if necessary.

Protector Removal

Remove bolts then the protector.



1. Bolts
2. Protector

Remove the protector.

Protector Installation

The installation is the reverse of removal procedure.

SUSPENSION ARM

Suspension Arm Inspection

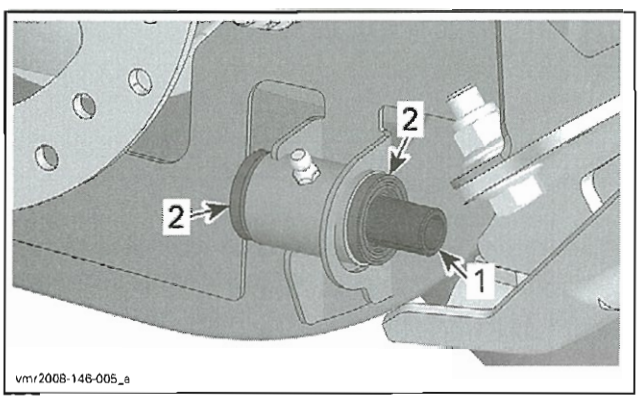
Check suspension arms for distortion or damage. Replace suspension arms if necessary.

Move suspension arm from side to side. There should be no noticeable loose. Replace bushings if necessary.

Move suspension arm up and down. There should be no noticeable loose. Replace bushings if necessary.

The following items are performed when the suspension arm is removed.

Inspect pivot bushings and cushions for wear or damages. Replace bushings and/or cushions if necessary.



1. Pivot bushing
2. Cushions

Check ball joint bellows on suspension arm for cracks or any other damage. Inspect ball joint end for damage. Ensure it's moving freely. Replace ball joints as required, see below for procedure.

Suspension Arm Removal

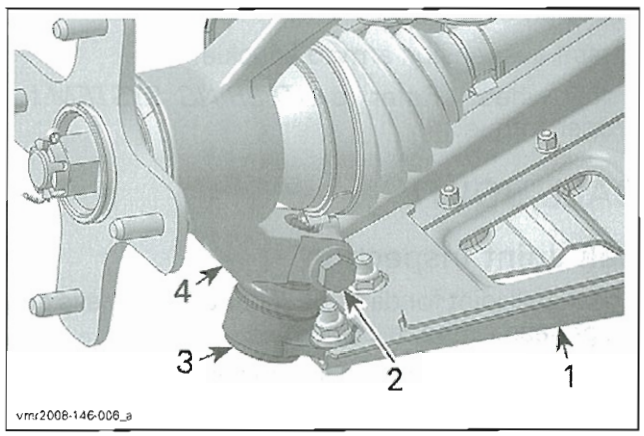
Loosen wheel lug nuts of the appropriate wheel.

Lift front of vehicle until front struts are fully extended.

Install a jack stand under the frame to support the vehicle off the ground.

Remove wheel.

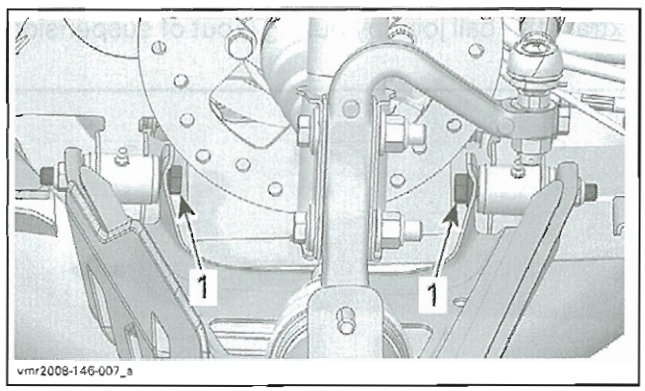
Remove bolt retaining ball joint to the knuckle.



1. Suspension arm
2. Ball joint bolt
3. Ball joint
4. Knuckle

Separate suspension arm from knuckle.

Remove bolts retaining suspension arm to frame.



1. LH suspension arm bolts

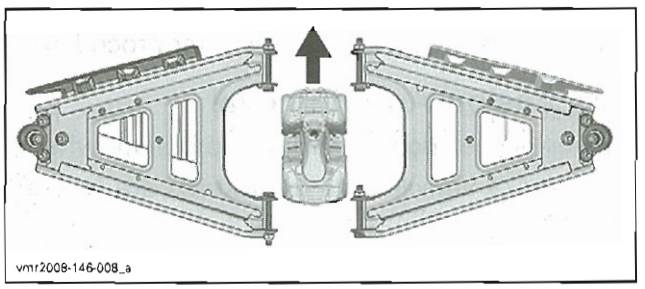
Remove suspension arm from vehicle.

Suspension Arm Installation

For assembly, reverse the disassembly procedure. However, pay attention to the following.

Install suspension arm to frame.

Install suspension arm bolts as per following illustration.



Torque suspension arm bolts to 61 N•m (45 lbf•ft).

Use suspension grease (P/N 293 550 033) to lubricate both suspension arms. There are two grease fitting on each arm.

Attach suspension arm to knuckle.

Install wheel. Refer to *STEERING SYSTEM* for proper torque.

BALL JOINT

Ball Joint Inspection

Check ball joint for damage, pitting, looseness and roughness. If so, replace it.

Check ball joint bellows for cracks. Change if necessary.

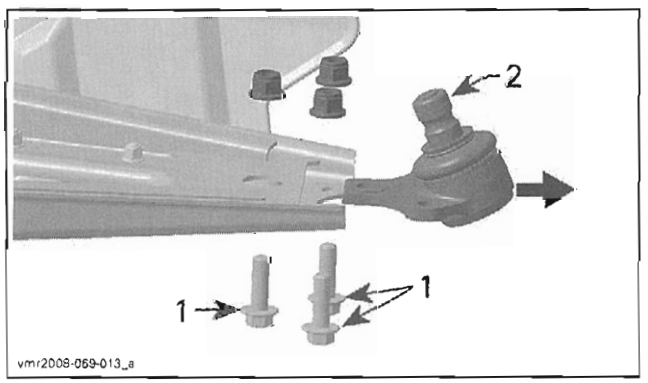
Ball Joint Removal

Remove appropriate wheel.

Remove bolt securing ball joint to knuckle.

Unscrew bolts retaining ball joint to suspension arm.

Extract the ball joint by pulling it out of suspension arm.



1. *Bolts securing ball joint*
2. *Ball joint*

Ball Joint Installation

The installation is the reverse of removal procedure.

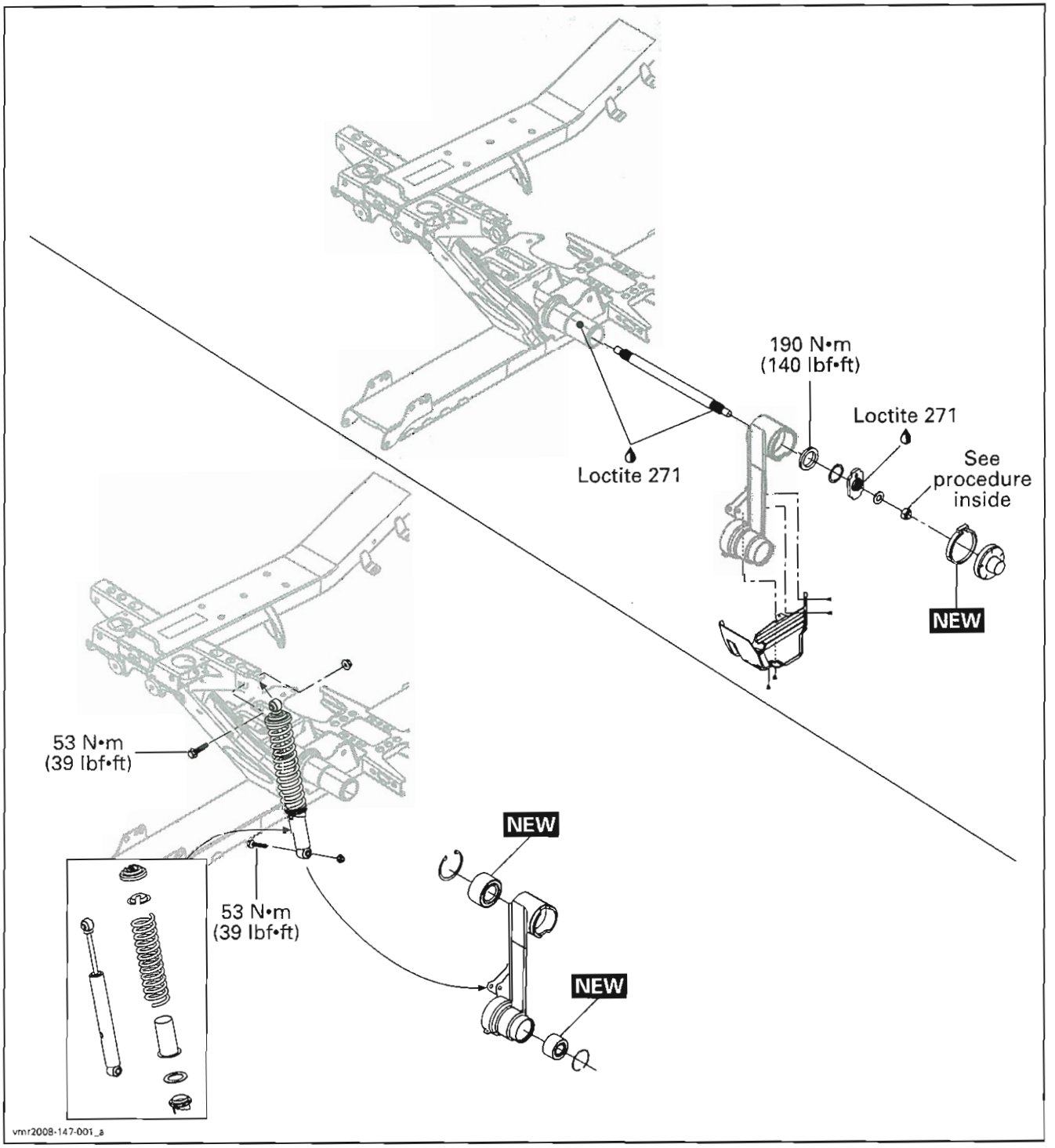
REAR SUSPENSION

SERVICE TOOLS

Description	Part Number	Page
Bearing extractor/installer	529 035 918	383
Bearing extractor/installer	529 035 920	383
trailing arm support	529 035 922	382
trailing arm nut socket	529 035 925	381, 384
spring remover	529 036 007	378

SERVICE PRODUCTS

Description	Part Number	Page
Loctite 271 (red)	293 800 005	380, 384



GENERAL

The procedure described below is the same for the RH and LH sides, unless otherwise instructed.

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

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

⚠ WARNING

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

Hoses or cables removed or disconnected must be installed and routed at the same place.

CAUTION: Locking ties removed during a procedure must be replaced and installed at the same location.

ADJUSTMENT

SPRING PRELOAD

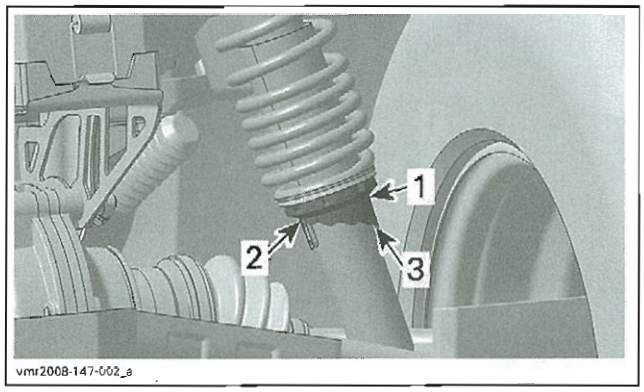
⚠ WARNING

Left and right adjustment cams must always be set to the same position. Never adjust one adjusting cam only. Uneven adjustment can cause poor handling and loss of stability, which could lead to an accident.

Adjust spring preload by turning adjusting cam accordingly, with the adjusting wrench in vehicle tool kit.

Turn the adjusting cams clockwise for a firmer ride and rough road condition or when carrying cargo or pulling a trailer.

Turn the adjusting cams counterclockwise for a light load and a smooth road condition.



1. Adjusting cams
2. Smooth adjustment
3. Hard adjustment

PROCEDURES

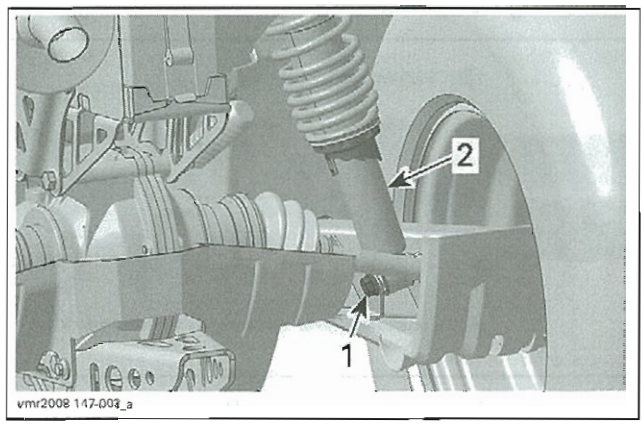
SHOCK ABSORBER

Shock Absorber Removal

Lift rear of vehicle until rear shock absorbers are fully extended.

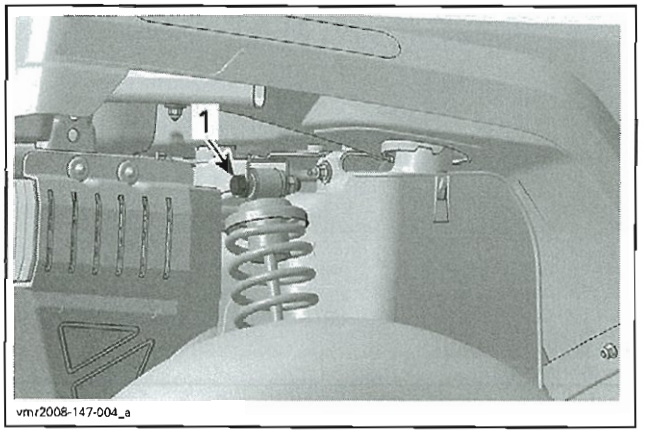
Install jack stands or blocks under the frame to support the vehicle.

Remove the shock absorber lower bolt.



1. Shock absorber lower bolt
2. RH shock absorber

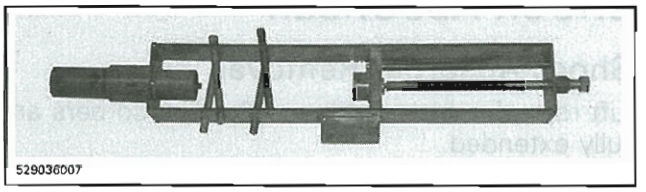
Remove the shock absorber after removing the shock absorber upper bolt.



1. Shock absorber upper bolt

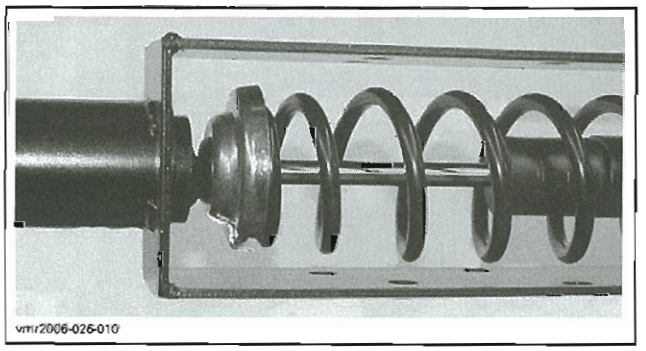
Shock Absorber Disassembly

Use the spring remover (P/N 529 036 007).



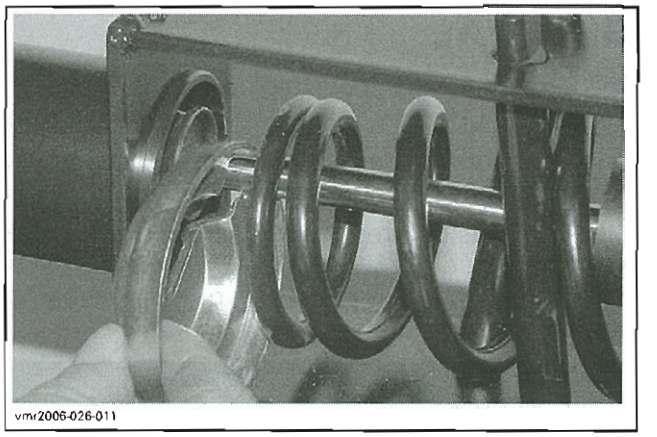
Place the tool in a vise.

Position the shock absorber in the tool and install the spring compressor pins.



Tighten the spring remover screw until the spring is sufficiently compressed to remove spring locking devices.

Remove spring stopper and its cap then loosen the spring remover screw.

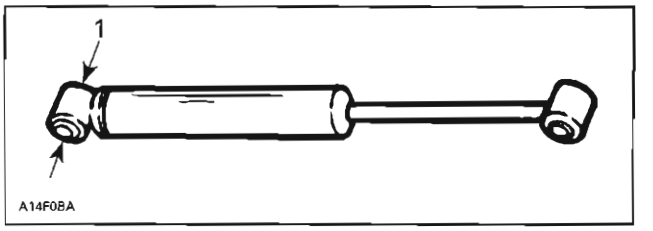


Remove spring from shock.

Shock Absorber Inspection

Inspect the spring for damage. Replace if necessary.

Secure the end of shock body in a vise with its rod upward.



TYPICAL
1. Clamp here

CAUTION: Do not clamp directly on shock body.

Inspect shock absorber as following:

- Examine the shock absorber for leaks.
- Extend and compress the shock absorber shaft several times over its entire stroke.
- Check that the shock absorber shaft moves smoothly and with uniform resistance with its rod upward.

Any of the following conditions will denote a defective shock absorber:

– A skip or a hang back when reversing stroke at mid travel.
– Seizing or binding condition except at extreme end of either stroke.
– A gurgling noise, after completing one full compression and extension stroke.

Replace shock absorber if any faults are present.

Shock Absorber Assembly and Installation

Assembly and installation are essentially the reverse of disassembly and removal procedures.

NOTE: Install cap opening at 180° from spring stopper opening.

TORSION BAR

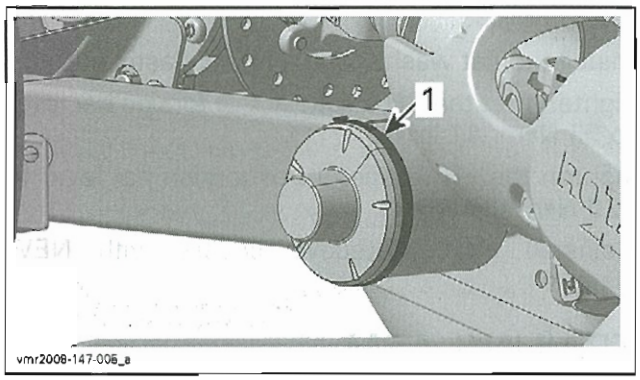
Torsion Bar Removal

Apply parking brake and lift rear of vehicle until rear shock absorbers are fully extended.

Install a jack stand or blocks under the frame to safely support the vehicle.

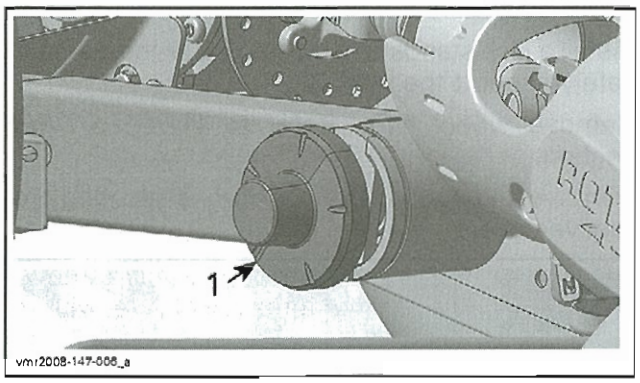
Remove both footrests. Refer to *BODY* section.

Remove and discard Oetiker clamps securing protective covers.



1. Protective cover clamp

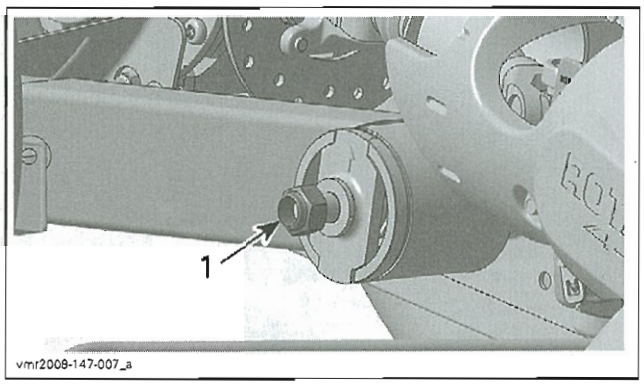
Remove protective covers.



1. Protective cover

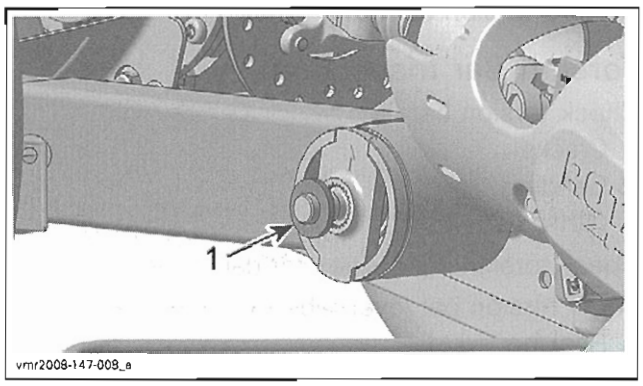
Unscrew and discard a torsion bar nut.

CAUTION: Unscrew nut slowly to avoid damaging threads and jamming nut on torsion bar.



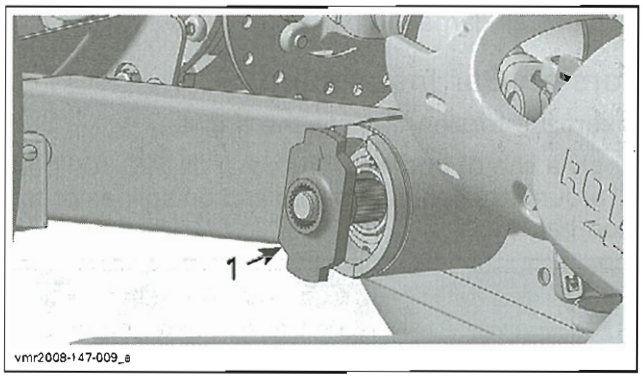
1. Torsion bar nut

Remove the flat washer.



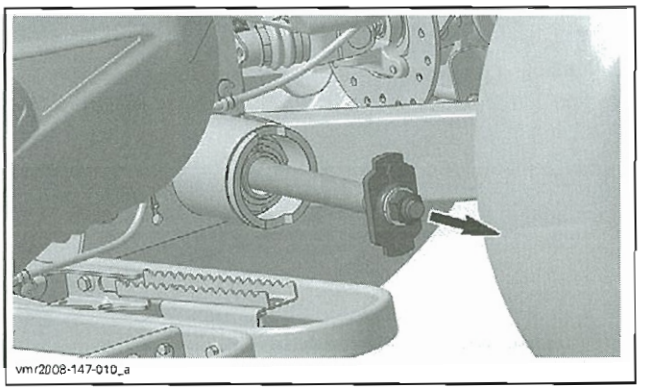
1. Flat washer

Heat the torsion bar lever to break the threadlocker. Pull and remove the torsion bar lever.



1. Torsion bar lever

From the other side of vehicle, remove the torsion bar.



Remove torsion bar nut, washer and torsion bar lever.

Discard torsion bar nut.

Torsion Bar Inspection

Check torsion bar for:
- Cracks
- Bending
- Other damages.

Check torsion bar splines for damages.

Verify torsion bar lever tabs for:
- Racking
- Cracks
- Other damages.

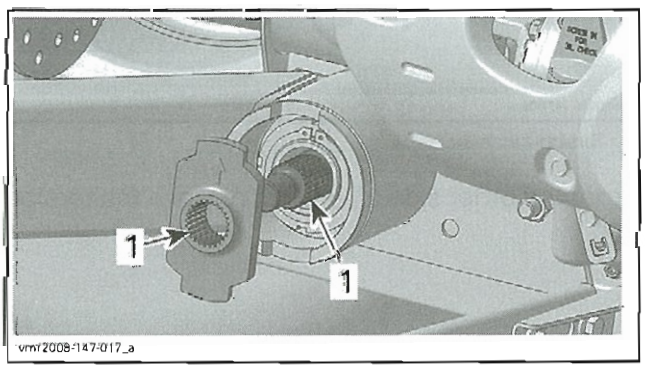
NOTE: If a tab is damaged, check the trailing arm for damages.

Replace all damaged parts.

Torsion Bar Installation

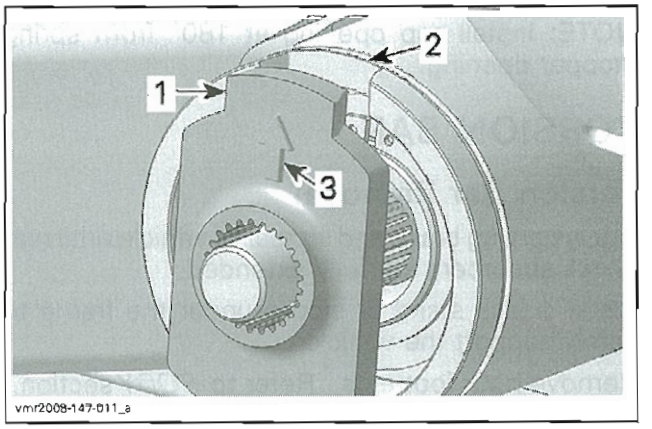
Insert the torsion bar into the frame.

Apply a line of Loctite 271 (red) (P/N 293 800 005) all around torsion bar splines and on splines of torsion bar lever.



1. Apply Loctite 271 here

Install both torsion bar levers with the arrows upward. Align lever tabs with trailing arm slots.



1. Torsion bar lever tab
2. Trailing arm slot
3. Arrow upward

Install the flat washer and a NEW elastic nut.

Tighten first the RH elastic nut of torsion bar lever to 55 N•m (41 lbf•ft).

Tighten the LH elastic nut of torsion bar lever to 120 N•m (89 lbf•ft).

Reinstall both protective covers with NEW clamps.

TRAILING ARM

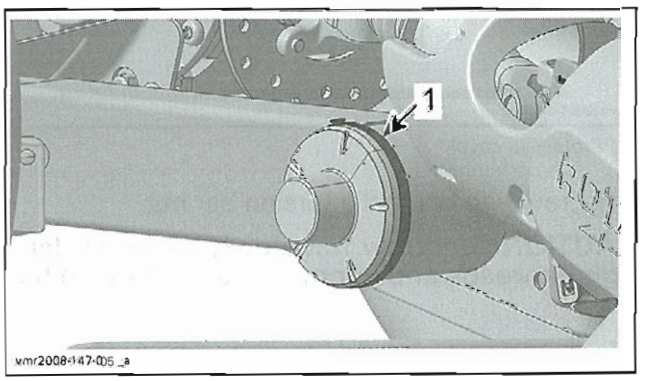
Trailing Arm Removal

Apply parking brake and lift rear of vehicle until rear shock absorbers are fully extended.

Install a jack stands or a blocks under the frame to safely support the vehicle.

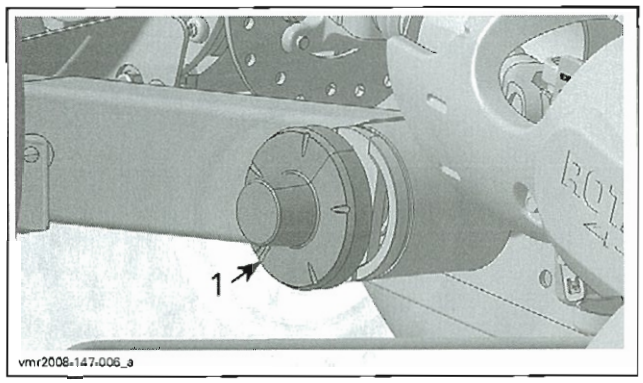
Remove wheel hub. Refer to *WHEELS/TIRES* section.

Remove and discard Oetiker clamps securing protective covers.



1. Protective cover clamp

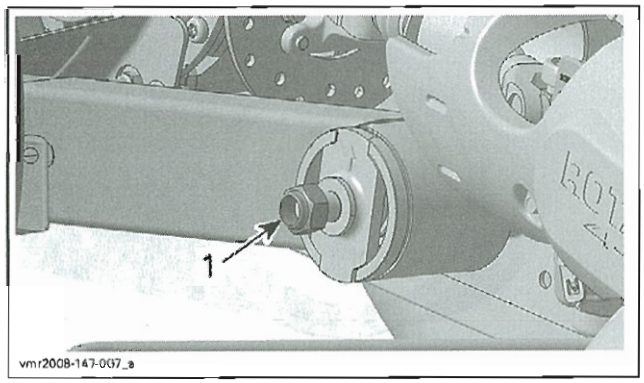
Remove protective covers.



1. Protective cover

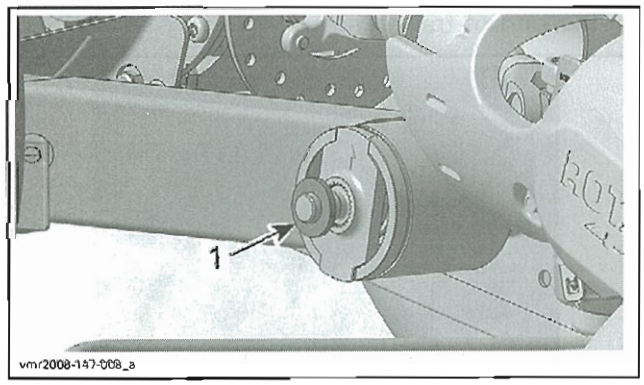
Unscrew and discard a torsion bar nut.

CAUTION: Unscrew nut slowly to avoid damaging threads and jamming nut on torsion bar.



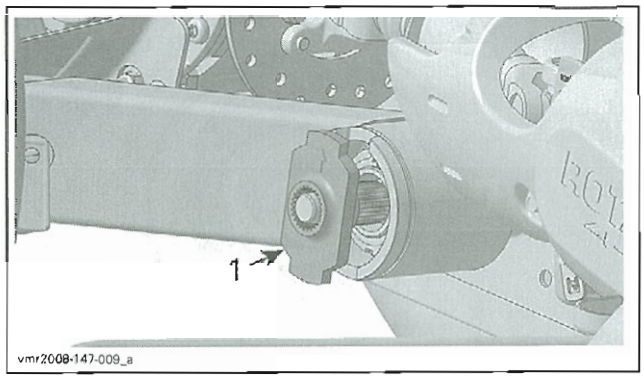
1. Torsion bar nut

Remove the flat washer.



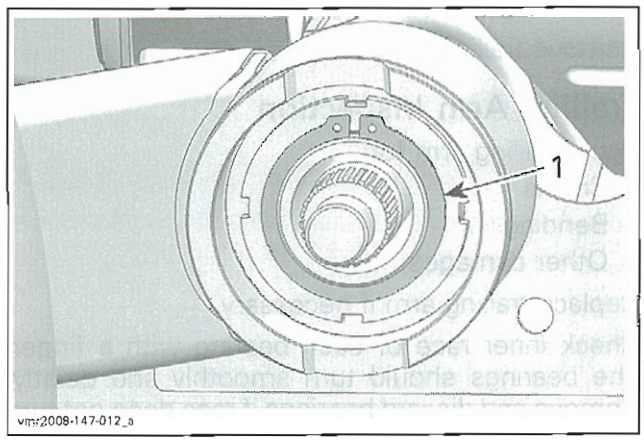
1. Flat washer

Heat the torsion bar lever to break the threadlocker. Pull and remove the torsion bar lever.



1. Torsion bar lever

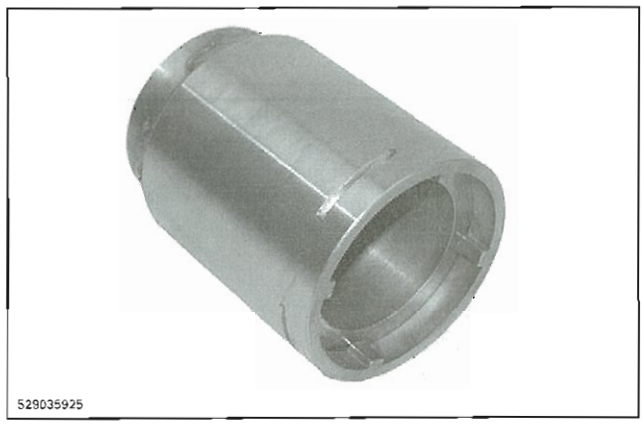
Remove the circlip retaining the trailing arm nut.

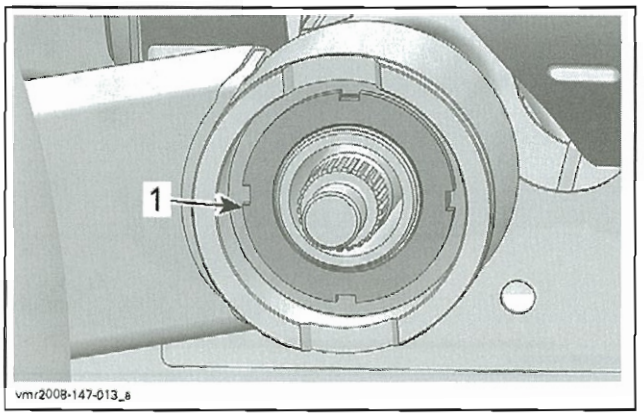


1. Circlip

Heat the trailing arm nut to break the threadlocker.

Using the trailing arm nut socket (P/N 529 035 925), unscrew the trailing arm nut.





1. Trailing arm nut

Unscrew lower bolt of shock absorber.

Remove trailing arm.

Trailing Arm Inspection

Verify trailing arm for:
- Cracks
- Bending
- Other damages.

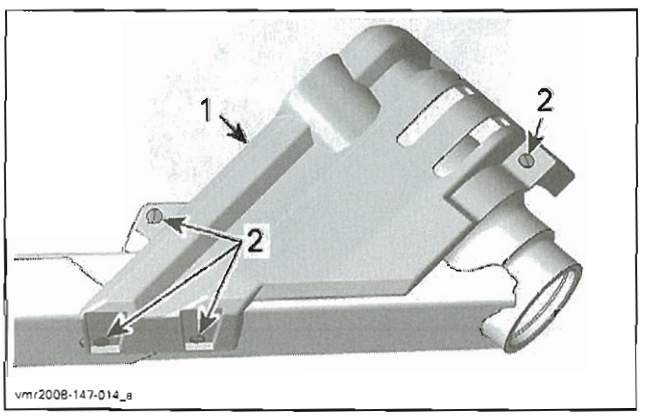
Replace trailing arm if necessary.

Check inner race of each bearing with a finger. The bearings should turn smoothly and quietly. Remove and discard bearings if race does not turn smoothly or quietly.

Trailing Arm Bearing Replacement

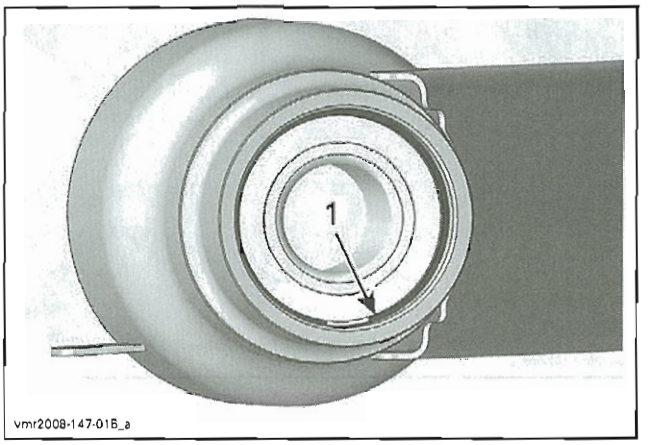
The same procedure can be used for both bearings.

Before extracting the bearing on wheel side, remove the trailing arm protector by drilling the pop rivets with a 3/16" drill.

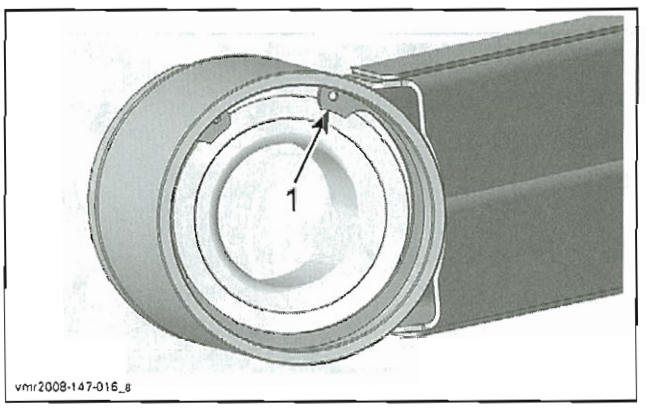


1. Trailing arm protector
2. Rivets

Remove the circlip.

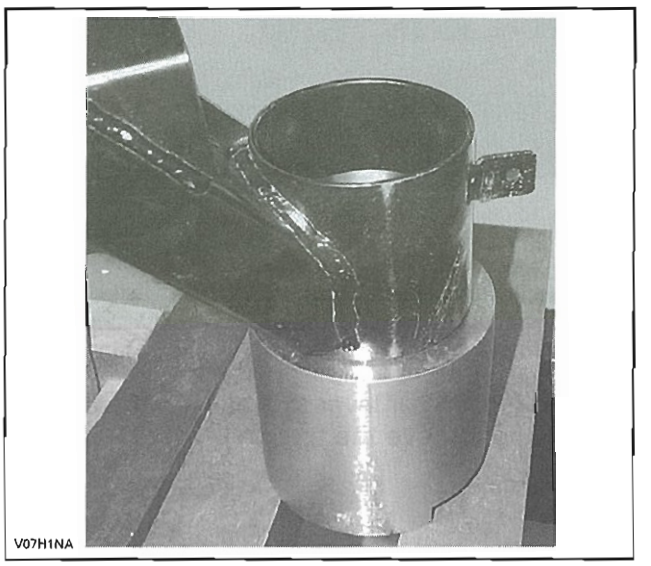


WHEEL SIDE
1. Circlip

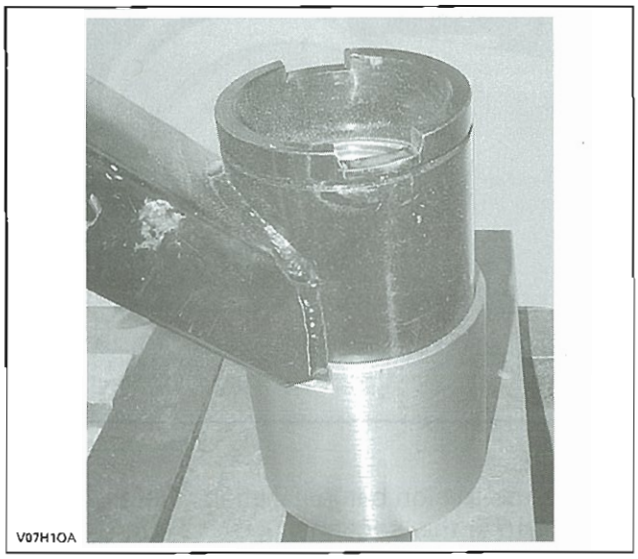


FRAME SIDE
1. Circlip

Place the trailing arm support (P/N 529 035 922) on the end of trailing arm.



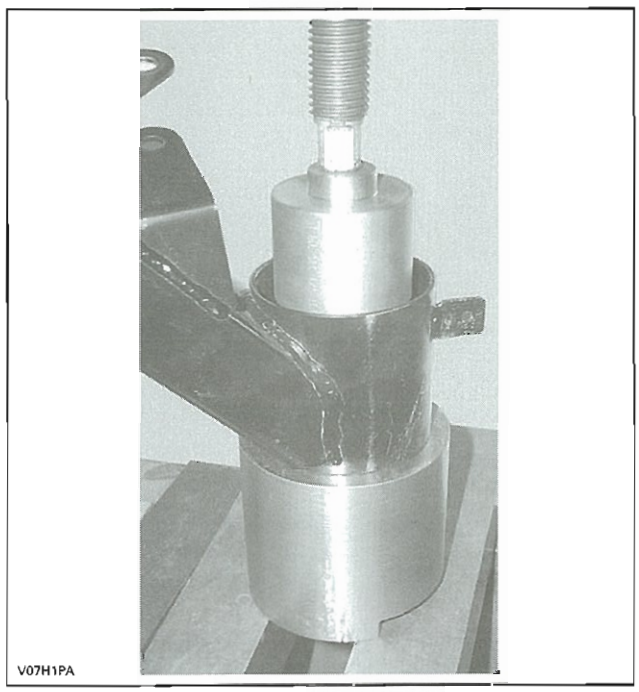
WHEEL SIDE



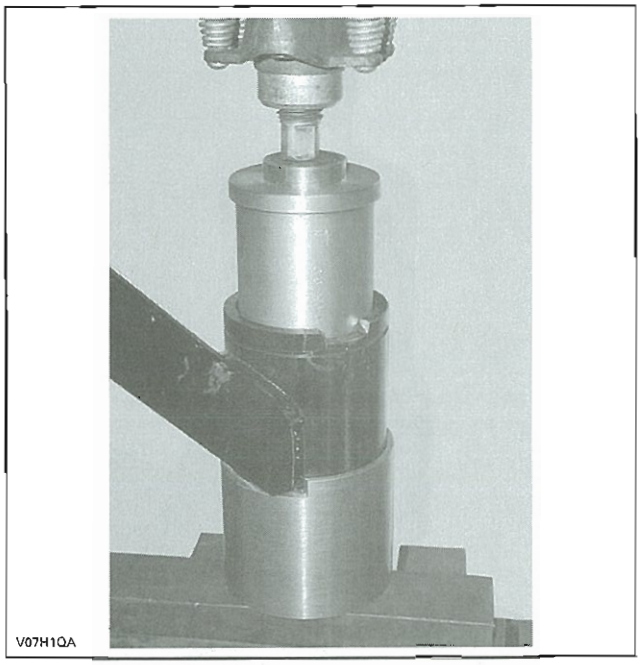
FRAME SIDE

Using a press and the proper bearing extractor/installer, remove the bearing.

LOCATION	TOOL
Wheel side	Bearing extractor/installer (P/N 529 035 918)
Frame side	Bearing extractor/installer (P/N 529 035 920)



WHEEL SIDE

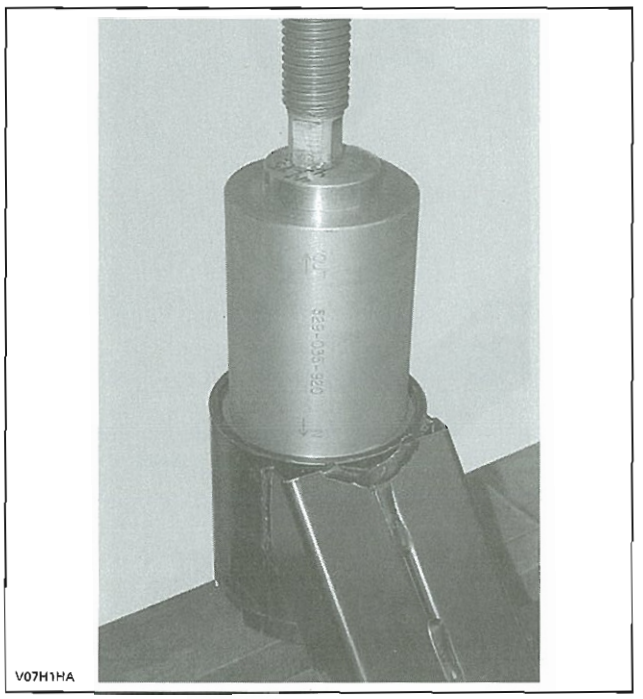


FRAME SIDE

Clean the bearing housing.

To install the bearing in its location, use the same tool as per removal procedure.

WHEEL SIDE



FRAME SIDE

Install the circlip. If the circlip is slacked, replace it with a new.

Install all other removed parts.

Trailing Arm Installation

Insert drive shaft end into trailing arm.

Install the trailing arm on frame.

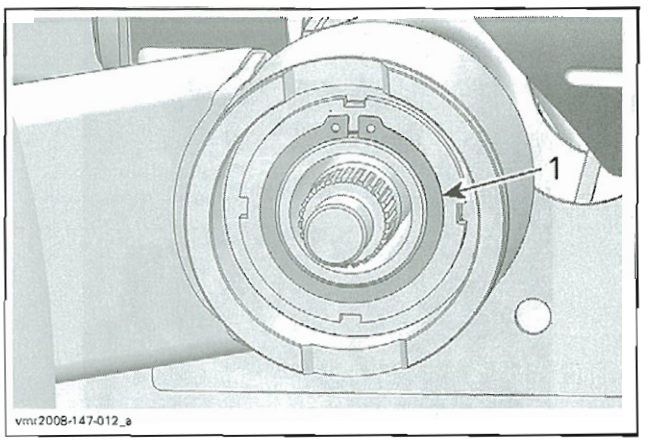
Install the shock absorber lower bolt to support the trailing arm. Do not torque yet.

Frame Side

Apply Loctite 271 (red) (P/N 293 800 005) on threads of frame extensions.

Install the trailing arm nut and torque it to 190 N•m (140 lbf•ft) using the trailing arm nut socket (P/N 529 035 925).

Install the circlip retaining the trailing arm nut.



1. Circlip

Finalize the torsion bar installation. Refer to *TORSION BAR* in this section.

Tighten shock absorber lower bolt.

Wheel Side

Install wheel hub. Refer to *WHEELS/TIRES* section for complete procedure.

BRAKES

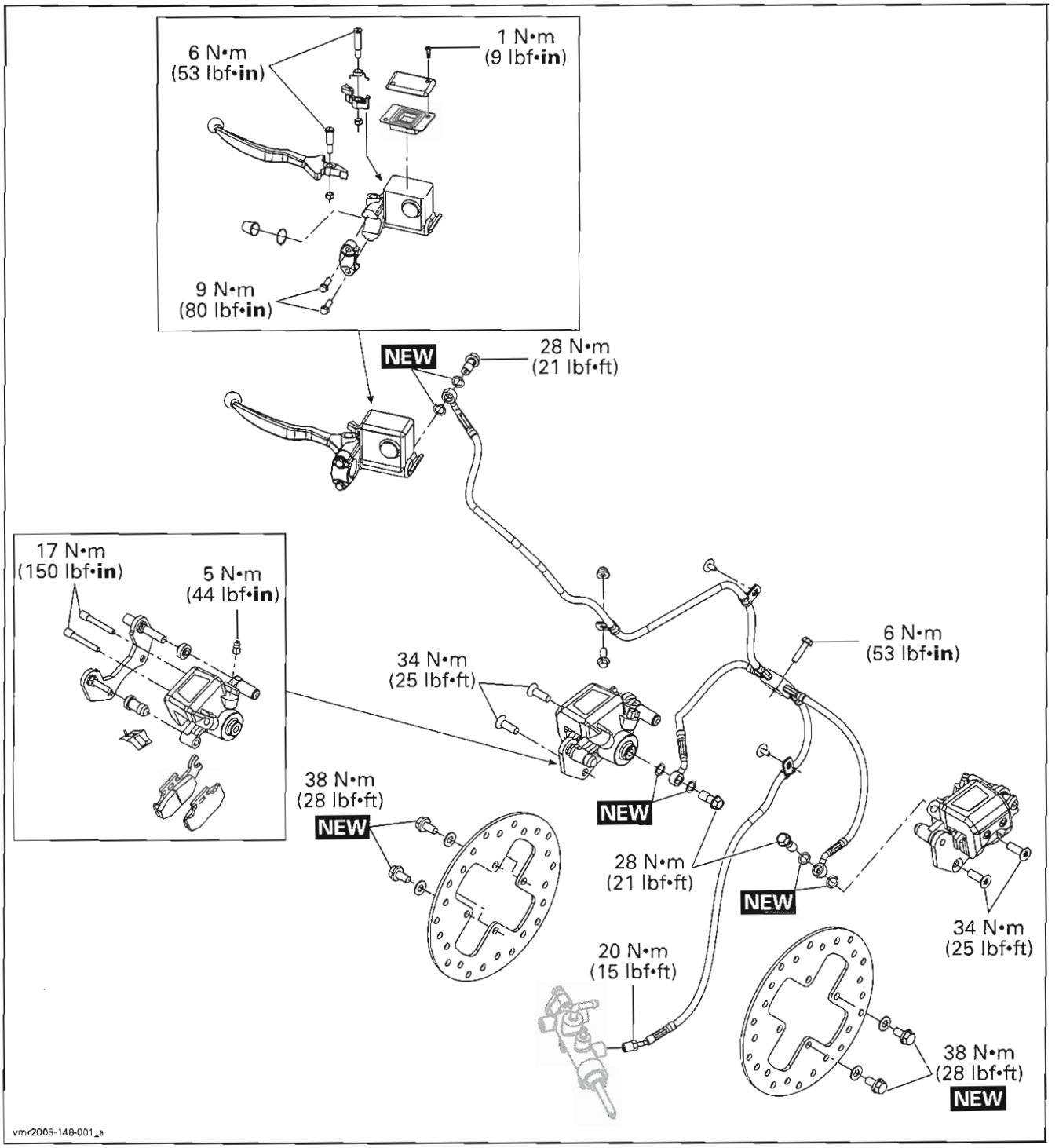
SERVICE TOOLS

Description	Part Number	Page
vacuum/pressure pump	529 021 800	390

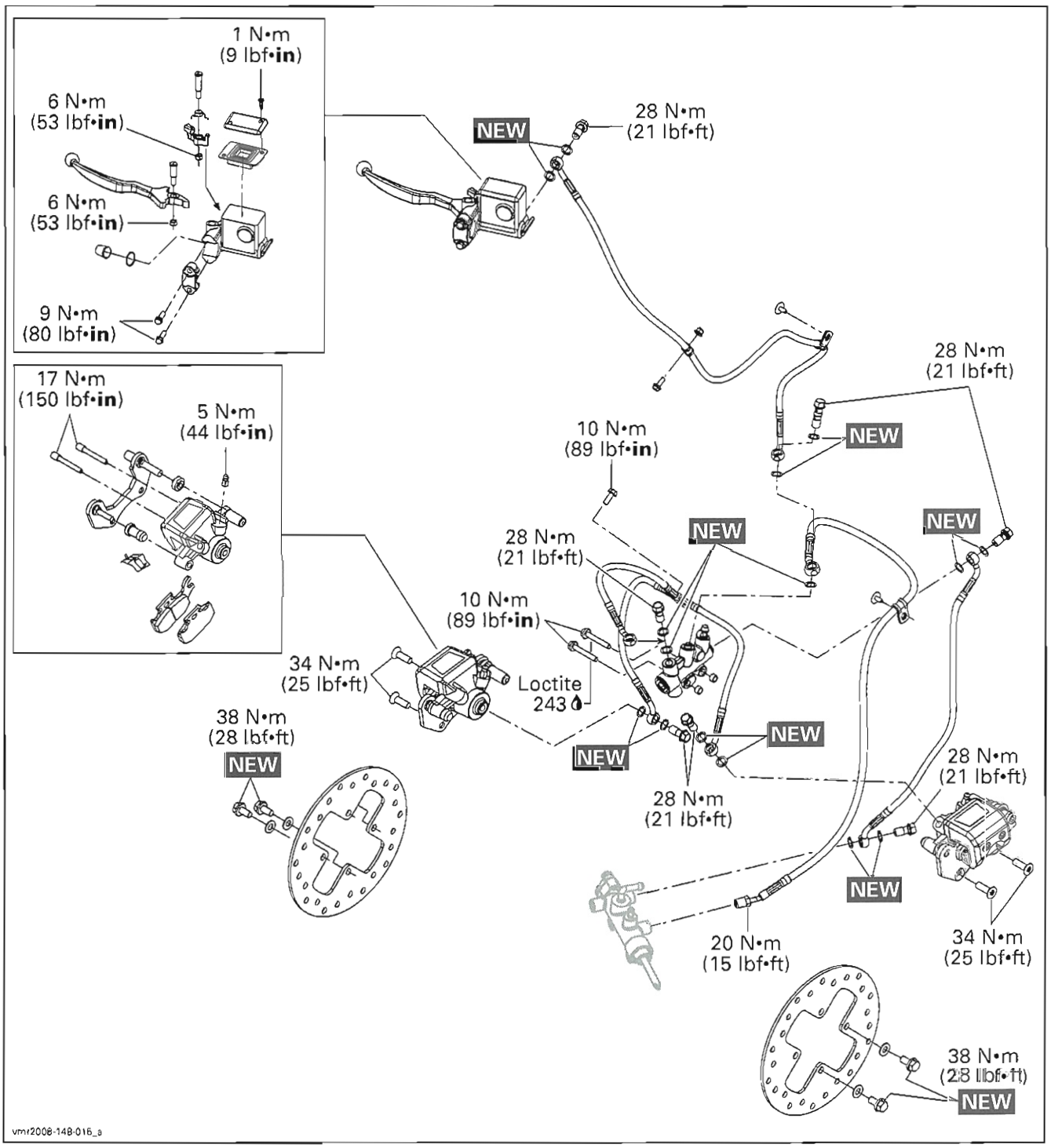
SERVICE PRODUCTS

Description	Part Number	Page
dielectric grease	293 550 004	393
XP-S synthetic grease	293 550 010	395, 399
brake fluid GTLMA (DOT 4)	293 600 062	389
Loctite 243 (blue)	293 800 060	400

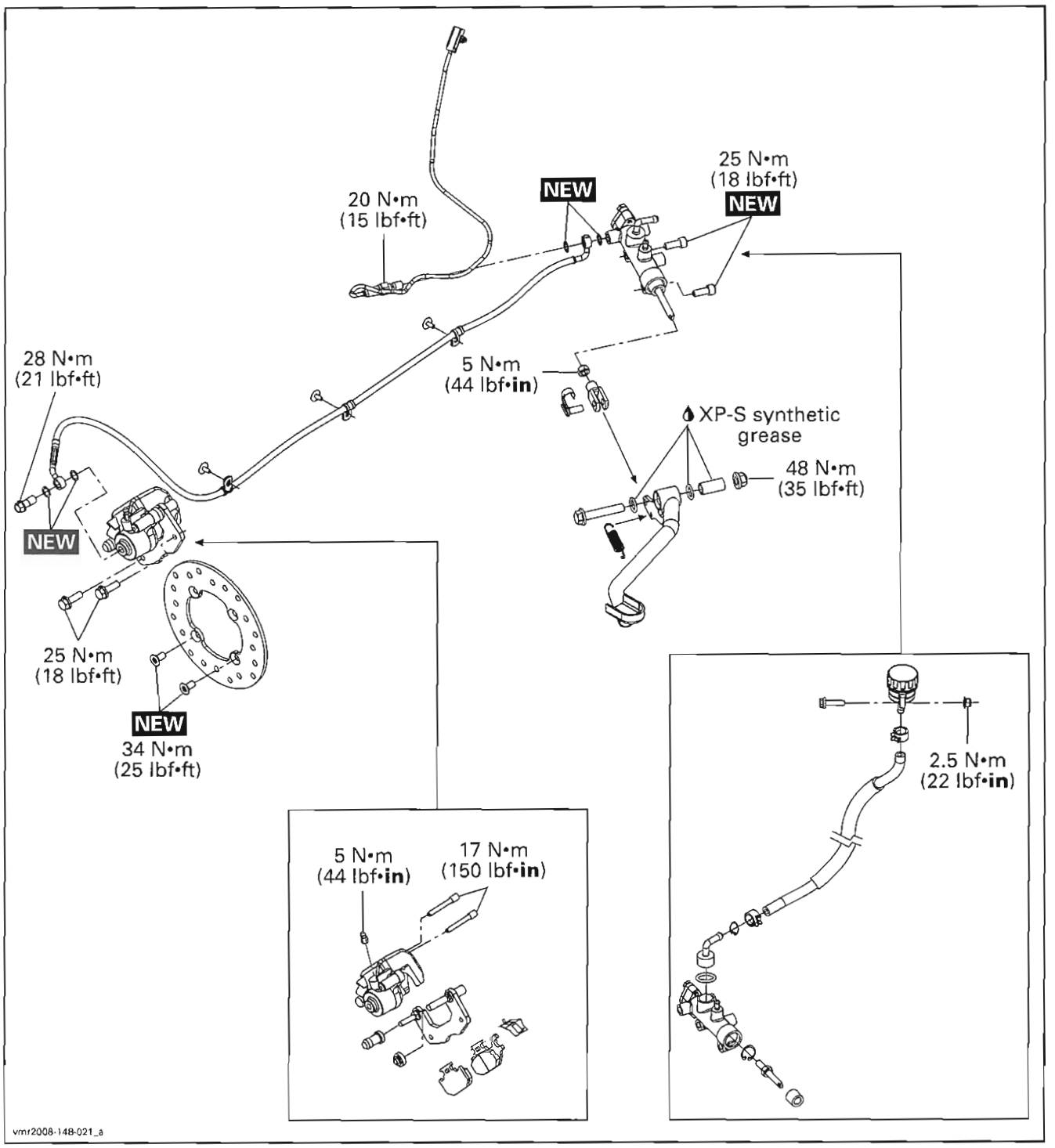
FRONT BRAKE CIRCUIT (EXCEPT 2009 CE MODELS)



FRONT BRAKE CIRCUIT (2009 CE MODELS)



REAR BRAKE CIRCUIT



GENERAL

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

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

⚠ WARNING

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

Hoses or cables removed or disconnected must be installed and routed at the same place.

CAUTION: Locking ties removed during a procedure must be replaced and installed at the same location.

⚠ WARNING

Never apply anything to brake fittings, The use of threads sealant or Teflon tape could cause brake system failure. Severe injury or death can occur.

CAUTION: Avoid spilling brake fluid on plastic, rubber or painted parts. Protect these parts with a rag when servicing brake system.

CAUTION: To avoid serious damage to the brake system, use only DOT 4 brake fluid from a sealed container. Do not use brake fluid taken from old or already opened containers, nor mix different fluids for topping off.

CAUTION: Sealing washers must be discarded and replaced with new ones every time a Banjo fitting is loosen.

CAUTION: Before opening or working near bleeders, reservoirs or fittings, clean the part and its area to avoid system contamination.

Dispose brake fluid as per your local environmental regulation.

SYSTEM DESCRIPTION

The brake system consists of two circuits. Each system has its own master cylinder and reservoir.

Both front and rear brakes are disc type.

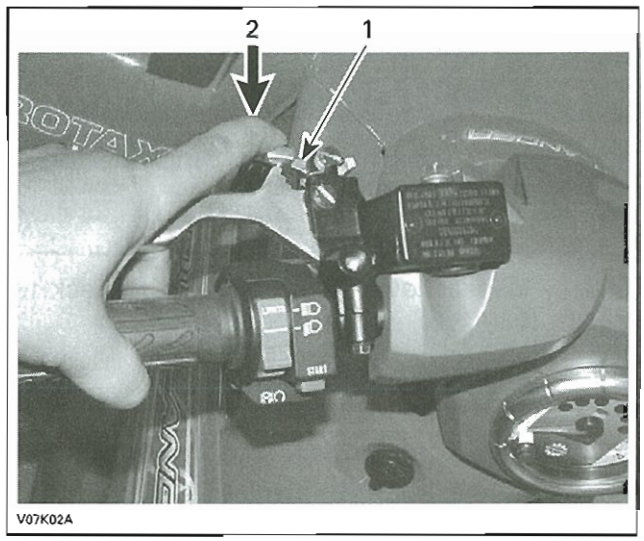
⚠ WARNING

Periodically check the brake hoses for damages or leaks. Repair any damage before operating the vehicle.

Parking Brake

To engage mechanism: Squeeze the brake lever and maintain while moving locking lever. The brake lever is now compressed and applying all brakes.

NOTE: The locking lever can be adjusted in several positions.



1. *Parking brake lever*
2. *Press to apply parking brake*

To release mechanism: Squeeze brake lever. Locking lever and brake lever should automatically returns to their original position.

CAUTION: Always release parking brake before riding.

MAINTENANCE

BRAKE FLUID

Recommended Brake Fluid

Always use brake fluid meeting the specification DOT 4 only such as brake fluid GTLMA (DOT 4) (P/N 293 600 062).

Brake Fluid Level Verification

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

Clean reservoir cover before removing.

Add fluid as required. Do not overfill.

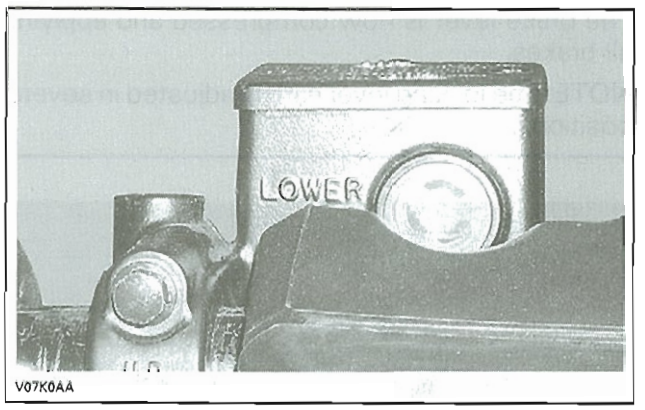
NOTE: A low level may indicate leaks or worn brake pads.

Brake Lever Fluid Reservoir

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

Squeeze and release the brake lever.

Check the fluid level. The reservoir is full when the fluid reaches the top of windows.

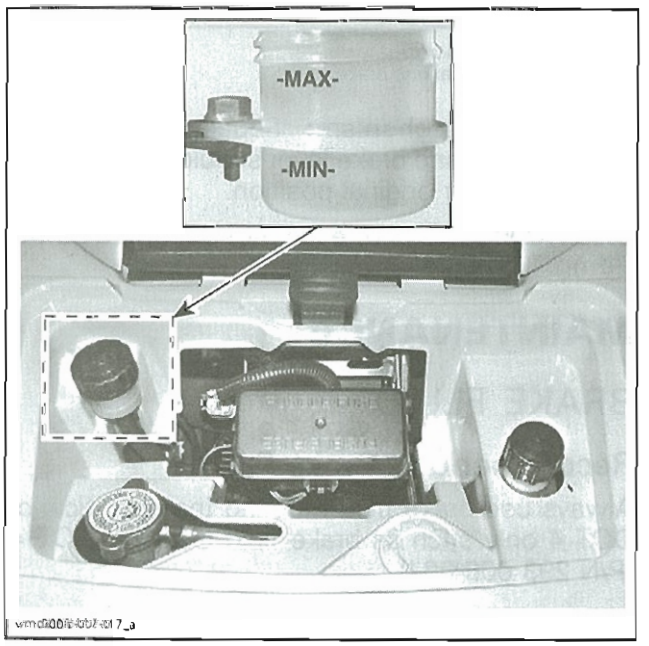


Visually inspect lever boot condition. Check for cracks, tears, etc. Replace if damaged.

Brake Pedal Fluid Reservoir

Place the vehicle on a level surface.

Check brake fluid in reservoir. The brake fluid must be above the MIN. mark.



INSIDE SERVICE COMPARTMENT

Brake Fluid Replacement

To replace brake fluid, follow the brake bleeding procedure and replenish system with new brake fluid.

Brake Fluid Draining

Clean and remove reservoir cover.

Remove the diaphragm.

Connect a clear hose to bleeder.

Loosen bleeder and pump brake lever or brake pedal until no more fluid flows out through the clear hose.

Brake Bleeding

General Recommendations

Fill reservoirs to recommended level using recommended brake fluid only.

Check brake fluid level regularly during the bleeding procedure to prevent air from being pumped into the system.

For the front brakes bleed alternately the LH and RH calipers. Turn handlebar to full RH side when bleeding right caliper and turn to the LH side for the left caliper. This helps to bleed the air.

Preparation

Place vehicle on a level surface.

Loosen front wheel lug nuts.

Secure front of vehicle on jack stands.

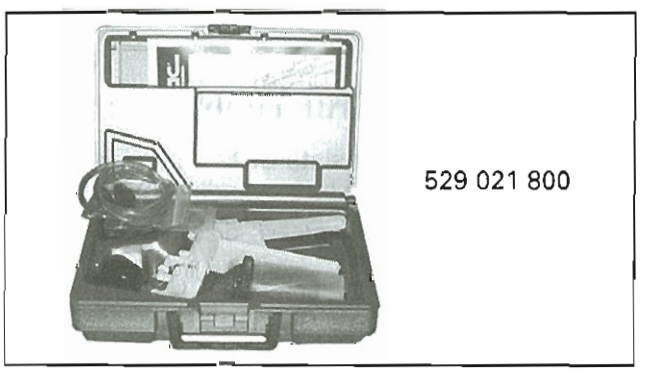
Remove front wheels.

NOTICE **Never use any type of impact wrench for lug nut removal and installation. The use of impact wrench could damage the wheel stud threads or lug nuts.**

Bleed system as per one of the following procedures.

Bleeding Procedure Using a Vacuum Pump

Install the vacuum/pressure pump (P/N 529 021 800) on a bleeder.



Pump vacuum pump then loosen bleeder.

Pump until no more air bubbles appear in clear hose.

Close bleeder.

Operate brake lever or brake pedal (except for CE models, continue bleeding procedure. Refer to *BRAKE BLEEDING (ADDITIONAL STEPS FOR CE MODELS)*. If it still feels spongy, bleed system again.

If necessary, repeat the previous procedures until air bubbles do not appear in hose and lever or pedal is stiff.

Top up reservoirs to the appropriate level.

Install diaphragms and covers on reservoirs.

Wipe any brake fluid spillage.

Check brakes operation before riding the vehicle.

Manual Bleeding Procedure

Install a clear hose on a bleeder.

Place the other end of hose in a small container partially filled with clean brake fluid.

Carefully pump the brake lever or the brake pedal few times and hold it while opening the bleeder.

NOTE: When bleeder is opened, brake fluid flows out of caliper and the brake lever moves toward the handlebar or the brake pedal moves down.

Retighten the bleeder, then release brake lever or brake pedal gradually.

Repeat the procedure until no more air bubbles appear in hose and lever or pedal is stiff (except for CE models, continue bleeding procedure. Refer to *BRAKE BLEEDING (ADDITIONAL STEPS FOR CE MODELS)*.

Top up reservoirs to the appropriate level.

Install diaphragm and cover on reservoirs.

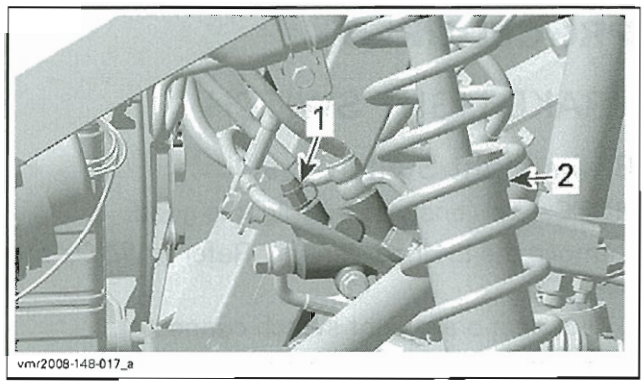
Wipe any brake fluid spillage.

Check brakes operation carefully before riding the vehicle.

Brake Bleeding (Additional Steps for CE Models)

Procedure Using a Vacuum Pump

Install the vacuum/pressure pump on the bleeder of the brake circuit splitter.



1. Splitter bleeder
2. LH front shock absorber

Pump vacuum pump then loosen bleeder.

Repeat the procedure until no more air bubbles appear in hose and lever is stiff.

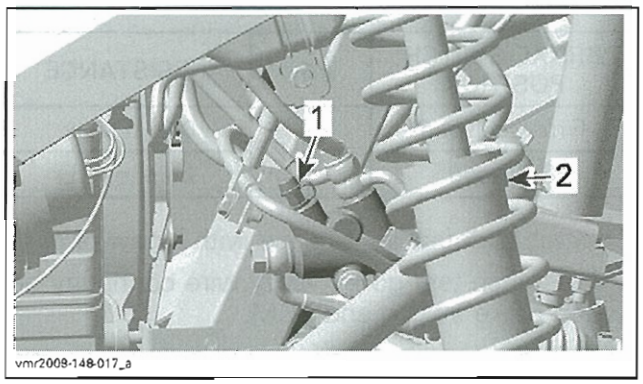
Close bleeder.

NOTE: Do not release brake lever until bleeder has been closed.

Check brakes operation before riding the vehicle.

Manual Bleeding Procedure

Pump the brake lever again and hold it while opening the bleeder on the brake circuit splitter.



1. Splitter bleeder
2. LH front shock absorber

When lever is down, close the bleeder and release the brake lever gradually.

Repeat the procedure until no more air bubbles appear in hose and lever is stiff.

Close bleeder.

NOTE: Do not release brake lever until bleeder has been closed.

Top up reservoirs to the appropriate level.

Install diaphragm and cover on reservoirs.

Wipe any brake fluid spillage.

Check brakes operation before riding the vehicle.

PROCEDURES

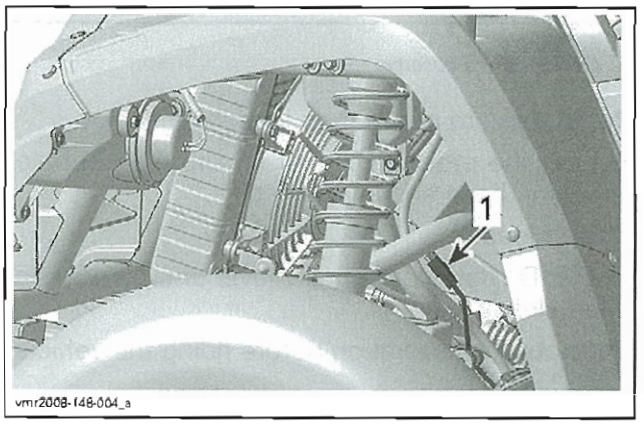
BRAKE LIGHT SWITCH

Brake Light Switch Test

NOTE: First, ensure brake light is good.

Remove the LH inner fender. Refer to *BODY* section.

Disconnect brake light switch connector.



1. Brake light switch connector

Check switch operation as follows.

BRAKE SWITCH POSITION	PIN		RESISTANCE
Firmly pushed	1	2	0.2 Ω max.
Released			Infinite (OL)

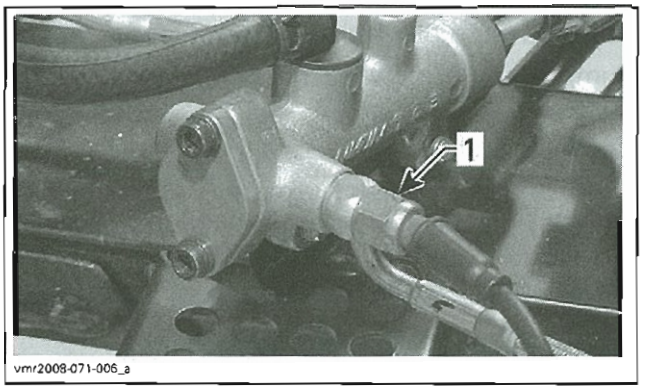
If switch is defective, replace with a new one.

If the switch test good, verify wire continuity between brake switch and ECM.

ECM CONNECTOR PIN	BRAKE SWITCH PIN	RESISTANCE
B-23	RED	Close to 0 Ω

Brake Light Switch Removal

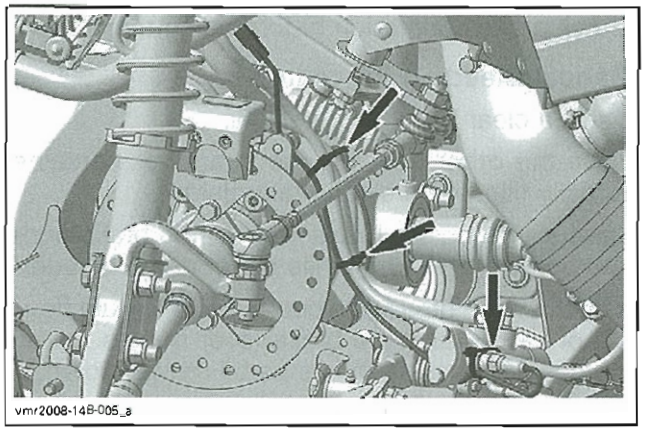
The brake switch is located on the rear master cylinder and cannot be adjusted.



1. Brake light switch

Remove LH and RH footwells. Refer to *BODY* section.

Cut locking ties securing brake light switch wires.



Disconnect brake light switch connector.

Place a container under brake light switch area to catch brake fluid.

Unscrew brake light switch from master cylinder.

CAUTION: When brake light switch is removed, cleanliness must be observed. Clean area before disassembly.

Discard the sealing washers.

Brake Light Switch Installation

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

Install the brake light switch using two **NEW** sealing washers.

Fill and bleed the brake system. Refer to *BRAKE BLEEDING* in this section.

Check for leaks and make sure the brakes operate normally before driving.

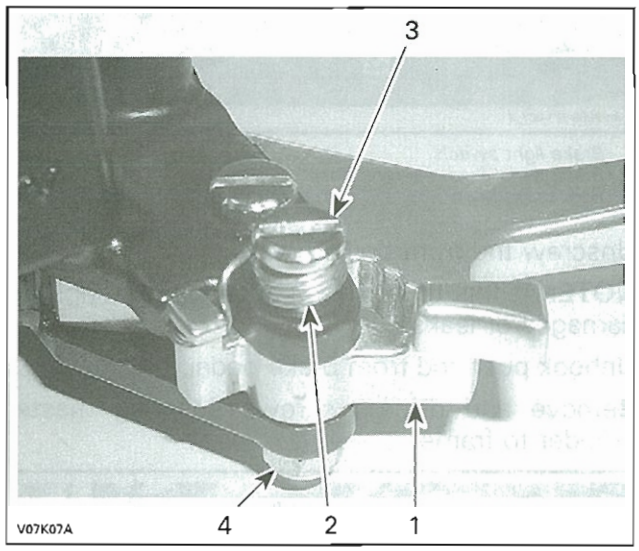
PARKING BRAKE MECHANISM

Parking Brake Mechanism Removal

Unscrew the nut underneath the brake lever.

Remove the parking lever lock pivot and the spring.

Remove the parking lever lock.

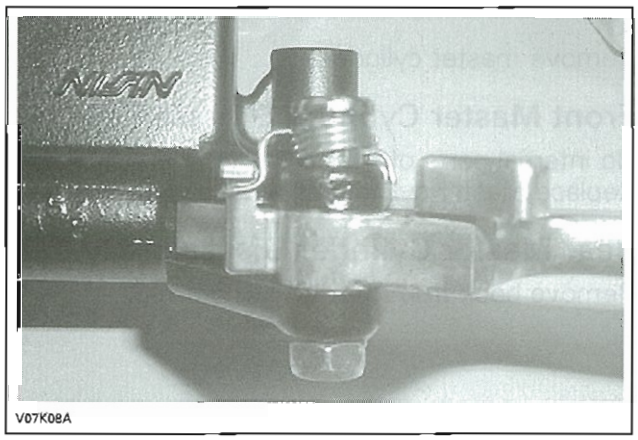


1. *Parking lever lock*
2. *Spring*
3. *Parking lever lock pivot*
4. *Nut*

Parking Brake Mechanism Installation

For installation, reverse the removal procedure.

See the following illustration to install the spring properly.

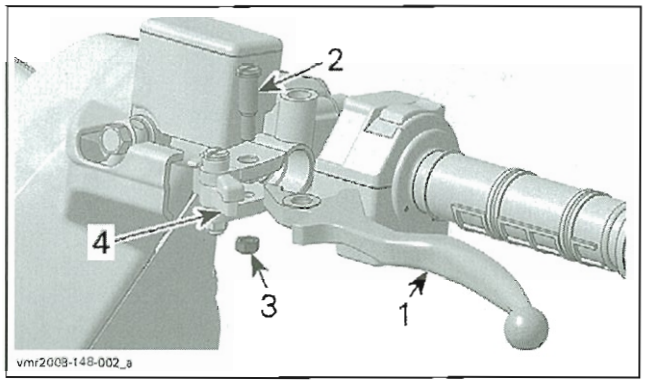


BRAKE LEVER

Brake Lever Removal

Unscrew nut securing the brake lever pivot.

Unscrew the brake lever pivot.



1. *Brake lever*
2. *Brake lever pivot*
3. *Brake lever pivot nut*
4. *Parking brake lever*

Brake Lever Inspection

Check brake lever for bending, cracks or other damages. Replace if necessary.

Brake Lever Installation

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

Apply dielectric grease (P/N 293 550 004) to the brake lever contacting surface of the piston.

Apply dielectric grease (P/N 293 550 004) on brake lever pivot.

MASTER CYLINDERS

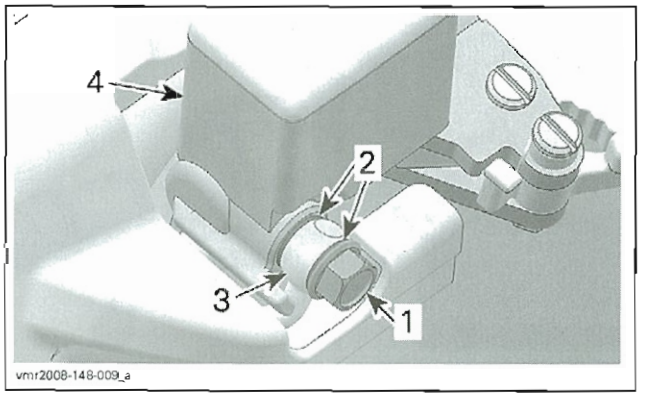
Front Master Cylinder Removal

NOTE: If the master cylinder is not replaced, omit the next steps concerning the brake fluid draining as well as brake hose and brake lever removal.

CAUTION: When hoses are disconnected, cleanliness must be observed. Clean all parts before disassembly.

Drain brake fluid, see *BRAKE FLUID DRAINING* at the beginning of this section.

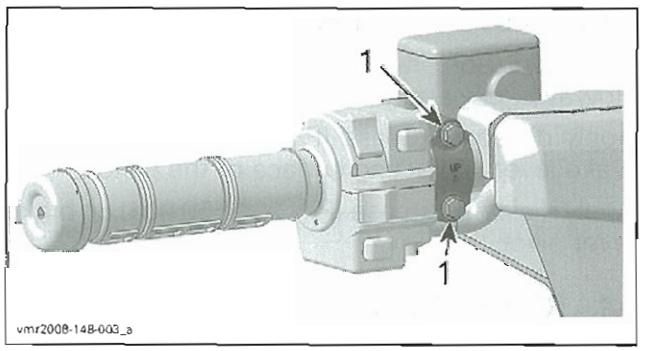
Remove Banjo fitting and sealing washers retaining brake hose to front master cylinder. Discard sealing washers.



1. *Banjo fitting*
2. *Sealing washers*
3. *Brake hose*
4. *Front master cylinder reservoir*

Remove *BRAKE LEVER* from master cylinder, see procedure above in this section.

Remove screws securing master cylinder to handlebar.



1. *Master cylinder screws*

Remove the master cylinder.

Rear Master Cylinder Removal

NOTE: If the master cylinder is not replaced, omit the next steps concerning the brake fluid draining as well as brake light switch and brake hoses removal.

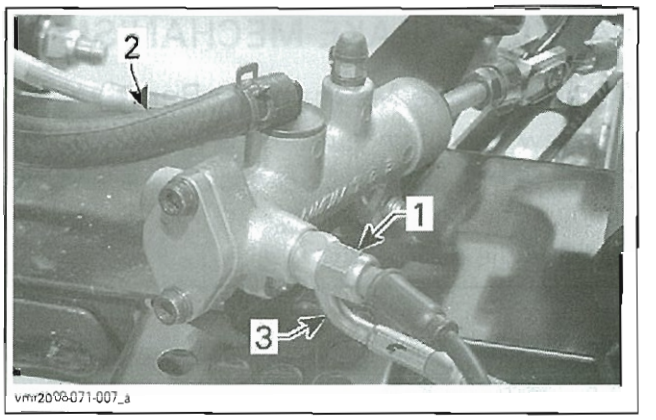
CAUTION: When hoses are disconnected, cleanliness must be observed. Clean all parts before disassembly.

Remove the LH and RH footwells. Refer to *BODY* section.

Drain brake fluid, see *BRAKE FLUID DRAINING* at the beginning of this section.

Remove *BRAKE LIGHT SWITCH*, see procedure above in this section.

Disconnect the brake pedal fluid reservoir hose from the top of master cylinder.



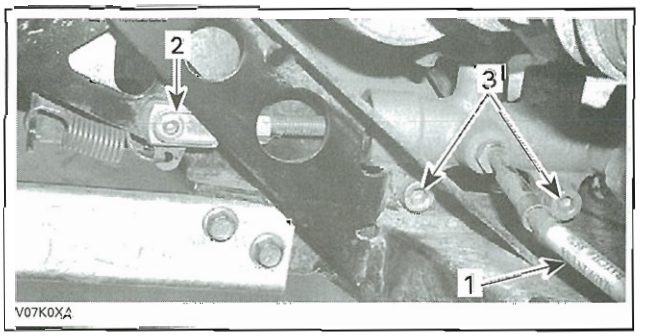
1. *Brake light switch*
2. *Brake pedal fluid reservoir hose*
3. *Rear brake hose*

Unscrew the front brake hose.

NOTE: At this time, check hoses and fittings for damages or leaks.

Unhook push rod from brake pedal.

Remove and discard screws securing master cylinder to frame.



1. *Front hose*
2. *Push rod lock*
3. *Master cylinder screws*

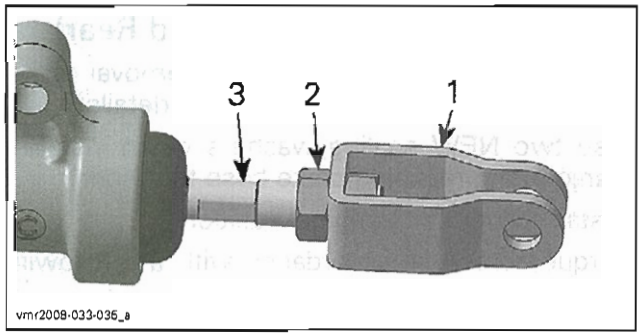
Remove master cylinder.

Front Master Cylinder Disassembly

No internal parts of master cylinder are available. Replace master cylinder as an assembly.

Rear Master Cylinder Disassembly

Remove hook from master cylinder rod.



1. *Hook*
2. *Locking nut*
3. *Master cylinder rod*

Remove boot, snap ring and push rod.

Master Cylinder Inspection (Front and Rear)

Check boot for crack.

Check spring for damage.

Check push rod for wear or bending.

Change part(s) if necessary.

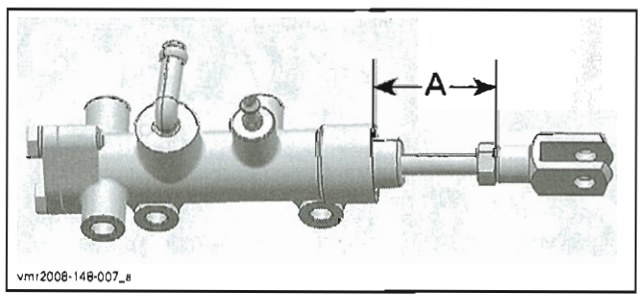
NOTE: If master cylinder housing is damaged or leaking, replace as an assembly.

Rear Master Cylinder Assembly

The assembly is the reverse of the disassembly procedure. However, pay attention to the following.

Apply XP-S synthetic grease (P/N 293 550 010) on both end of push rod.

Install the push rod then adjust push rod length.



A. 44 ± 1 mm (1.732 ± .039 in)

Front Master Cylinder Installation

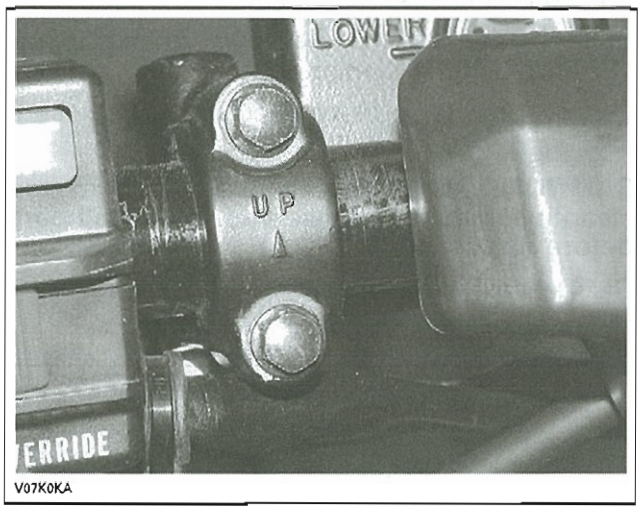
For the installation, reverse the removal procedure, pay attention to the following details.

Place the brake lever assembly on the handlebar.

Position master cylinder bracket with the UP mark upward.

Install master cylinder screws and tighten loosely.

With the handlebar in straight ahead position, position master cylinder reservoir parallel to the ground. Tighten upper screw first.



Connect brake hose to master cylinder with Banjo fitting and two NEW sealing washers.

Fill and bleed brake system. Refer to *BRAKE BLEEDING* in this section.

Check for leaks and make sure the brakes operate normally before driving.

Rear Master Cylinder Installation

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

Secure master cylinder to frame using NEW screws.

Hook push rod on brake pedal.

Connect front brake hoses on master cylinder.

Connect brake pedal fluid reservoir hose on the top of master cylinder.

Fill up reservoir with clean brake fluid.

Bleed brake system, see procedure in *BRAKE BLEEDING* at the beginning of this section.

Check for leaks and make sure the brakes operate normally before driving.

CALIPERS

Caliper Removal (Front and Rear)

Park vehicle on a firm level surface.

Loosen wheel lug nuts.

Raise vehicle and support it securely.

Remove appropriate wheel.

NOTE: If the caliper is not replaced, omit the next steps concerning the brake system draining and brake hose removal.

CAUTION: Do not let caliper hangs by the hose and do not stretch or twist the hose. Simply hang it with a piece of wire to take the weight off the brake hose.

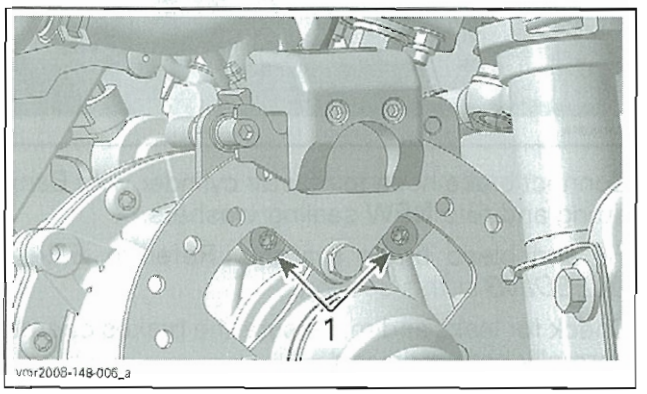
Drain brake system. Refer to *BRAKE FLUID DRAINING* in this section.

Remove the Banjo fitting securing brake hose to caliper.

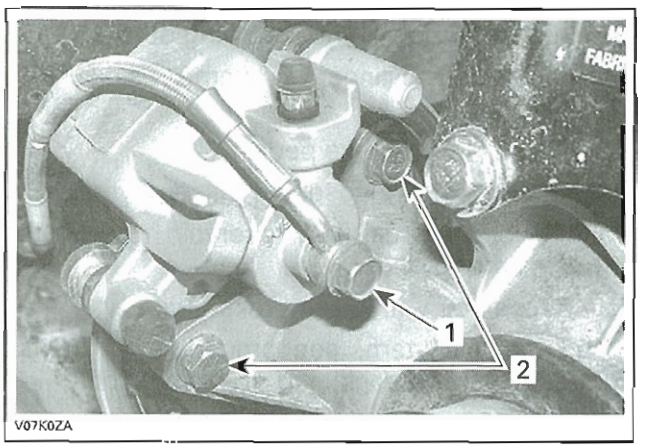
CAUTION: When hoses are disconnected, cleanliness must be observed. Clean all parts before disassembly.

Discard sealing washers.

Remove caliper screws.



FRONT CALIPER
1. Caliper screw



REAR CALIPER
1. Banjo fitting and sealing washers
2. Caliper screws

Catch spilled fluid with a rag.

Caliper Inspection (Front and Rear)

Check piston for:
- Rust
- Scratches
- Leaks.

Replace caliper if necessary.

Caliper Installation (Front and Rear)

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

Use two NEW sealing washers when installing Banjo fitting retaining brake hose to caliper.

Install caliper in its original position.

Torque screws in accordance with the following table.

CALIPER SCREWS	TORQUE
Front caliper	34 N•m (25 lbf•ft)
Rear caliper	25 N•m (18 lbf•ft)

Fill and bleed the brake system. Refer to *BRAKE BLEEDING* at the beginning of this section.

Check for leaks and make sure the brakes operate normally before driving.

BRAKE PADS

Brake Pad Removal

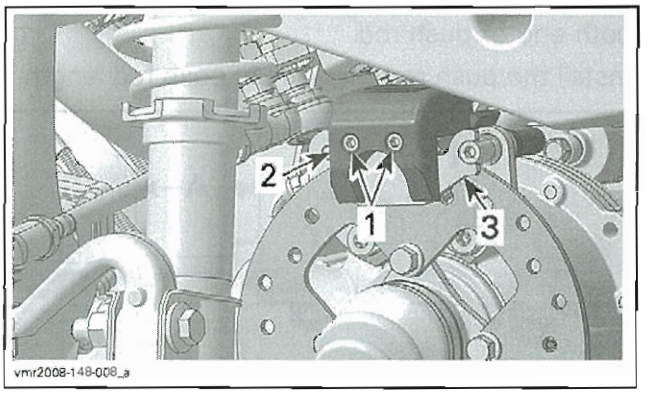
Place vehicle on a firm level surface.

Loosen wheel lug nuts.

Raise vehicle and support it securely.

Remove appropriate wheel.

Loosen pad pins.



1. Pad pins
2. Caliper
3. Pad

Remove *CALIPER*, see procedure above in this section.

Unscrew pad pins then remove pads.

CAUTION: Do not let the caliper hang by the hose and do not stretch or twist the hose.

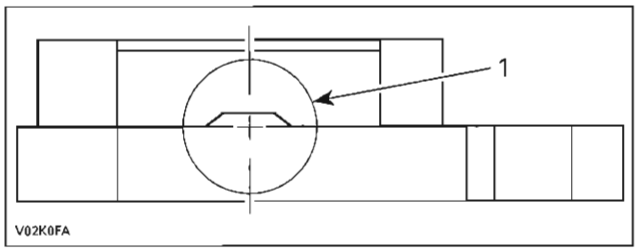
Brake Pad Inspection

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

Measure brake pad lining thickness or look at the hollow places on both sides on the pad lining.

SERVICE LIMIT	
Brake pad thickness	1 mm (1/32 in)

There are four hollow places on one set of brake pads. When the pad wear reaches one of the hollow places, the pad must be changed even if the pad wear does not reach another hollow place.



1. Hollow place

⚠ WARNING

Avoid getting oil or grease on brake pads. Contaminated brake pads can affect stopping capacities.

CAUTION: Brake pads must always be replaced in pairs.

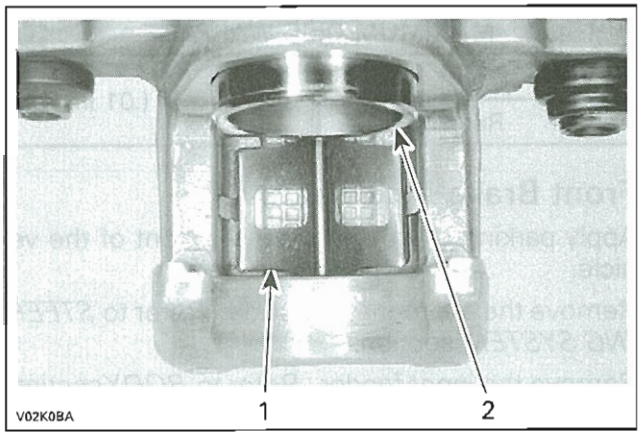
Brake Pad Installation

Clean the visible portion of piston with clean brake fluid.

Push caliper pistons inward before installing brake pads.

NOTE: Use a C-clamp or another suitable tool. To avoid damaging the piston, use an old pad to push it into the caliper.

Make sure that pad spring is in position.



1. Pad spring
2. Piston

Install new brake pads.

Install pad pins by pushing in the pads against pad spring to align pad slots in the pads and caliper body.

Install brake caliper so the disc is positioned between pads.

NOTE: Be careful not to damage pads and make sure pads are correctly inserted in their location.

Check fluid level in master cylinder reservoirs and top up if necessary.

After the job is completed, firmly depress the brake lever a few times to bring the pads in contact with the disc.

Check for leaks and make sure the brakes operate normally before driving. The pads must rest flat on the disk.

BRAKE DISCS

Brake Disc Inspection (Front and Rear)

Brake discs can be inspected without removing them from the vehicle.

Raise vehicle and support it securely. Remove wheels and visually inspect disc surfaces for scratches or grooves. Make sure to check both sides of disc.

Measure thickness of the disc.

DISC MINIMUM THICKNESS	
Front	3.5 mm (.138 in)
Rear	4.3 mm (.170 in)

Replace disc if not within specifications.

CAUTION: Brake discs should never be machined.

Turn the disc by hand and check warpage.

MAXIMUM DISC WARPAGE	
Front	0.2 mm (.01 in)
Rear	

Front Brake Disc Removal

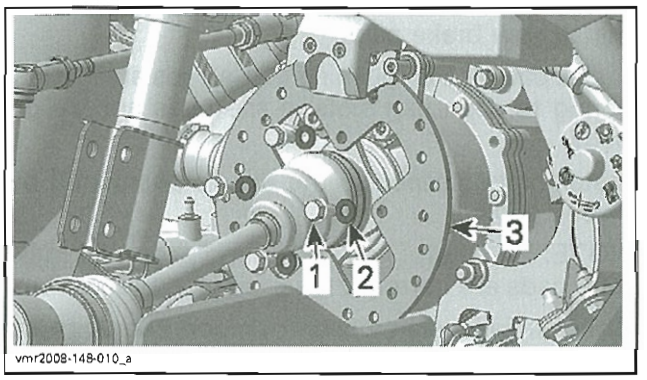
Apply parking brake and raise the front of the vehicle.

Remove the appropriate knuckle. Refer to *STEERING SYSTEM* section.

Remove the inner fender. Refer to *BODY* section.

Unscrew and discard brake disc screws.

Keep the Belleville washers.



1. Brake disc screw
2. Belleville washer
3. Brake disc

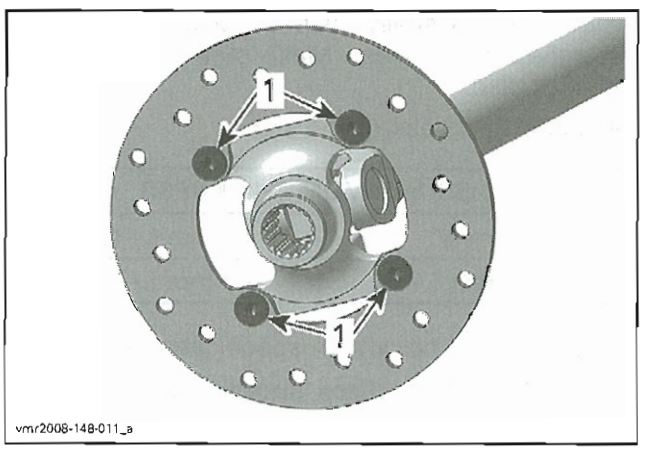
Release parking brake and remove *CALIPER*. See procedure above in this section.

Remove brake disc. Pay attention not to cut the CV boot.

Rear Brake Disc Removal

Remove the rear propeller shaft. Refer to *REAR DRIVE* section.

Unscrew and discard brake disc screws. Heat up brake disc around screws to facilitate removal.



1. Brake disc screws

Front Brake Disc Installation

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

The Belleville washers must be installed with theirs concave side toward the brake disc.

Install NEW brake disc screws.

⚠ WARNING

Never substitute Belleville washer with another type of washer (flat, lock, etc.).

Rear Brake Disc Installation

Secure brake disc on propeller shaft using NEW screws.

Brake disc screws must be tighten in a crisscross sequence.

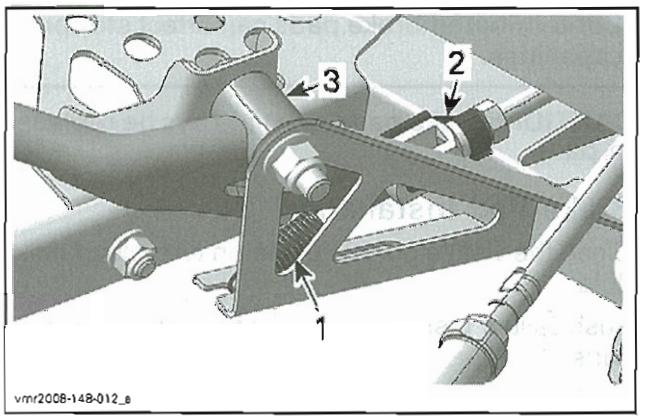
BRAKE PEDAL

Brake Pedal Removal

Remove RH footwell. Refer to *BODY* section.

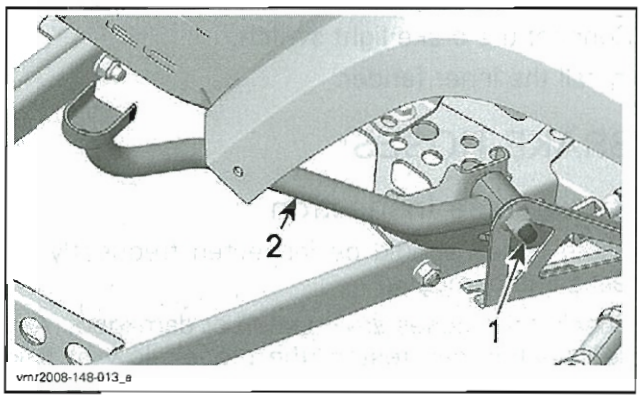
Remove the return spring.

Remove the push rod hook.



1. Return spring
2. Push rod hook
3. Brake pedal

Remove bolt retaining the brake pedal to frame.



1. *Retaining bolt*
2. *Brake pedal*

Brake Pedal Inspection

Check brake pedal for:
- Cracks
- Distortion.

Check if O-rings are: brittle, hard or otherwise damaged.
- Brittle
- Hard
- Otherwise damaged.

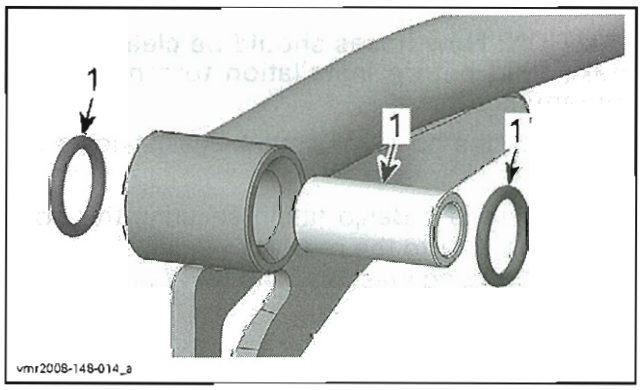
Check inner bushing for wear.

Replace any defective parts.

Brake Pedal Installation

For installation, reverse the removal procedure.

Apply XP-S synthetic grease (P/N 293 550 010) on both O-rings and on external diameter of bushing.



1. *Apply grease here*

BRAKE CIRCUIT SPLITTER

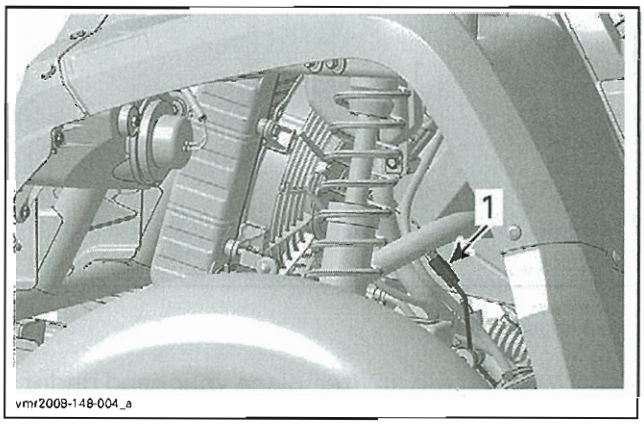
2009 CE Models

Brake Circuit Splitter Removal

Remove the LH inner fender. Refer to *BODY* section.

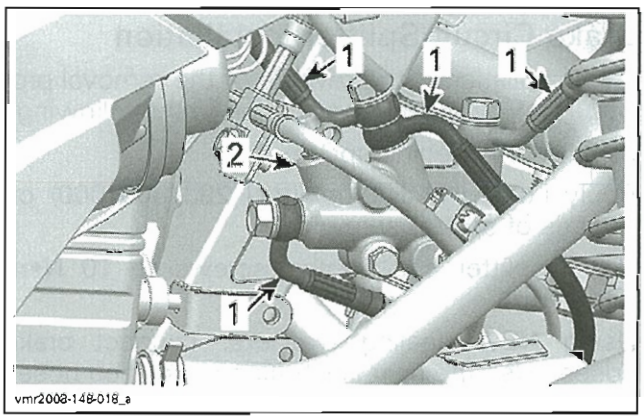
Drain brake fluid. Refer to *BRAKE FLUID DRAINING* at the beginning of this section.

Disconnect brake light switch connector.



1. *Brake light switch connector*

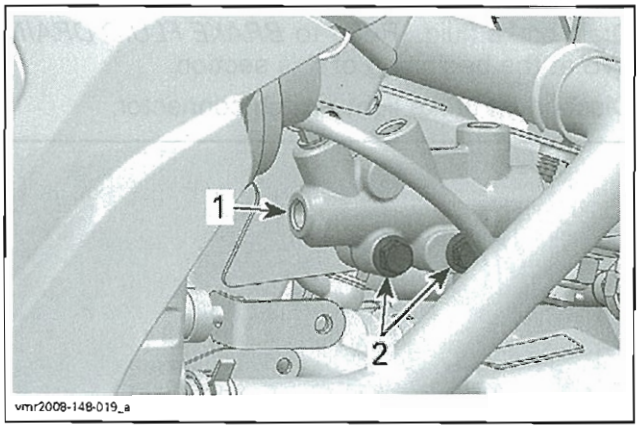
Remove all brake hoses from the splitter and discard the sealing washers.



1. *Brake hoses*
2. *Splitter*

CAUTION: When hoses are disconnected, cleanliness must be observed. Clean all parts before disassembly.

Unscrew splitter retaining screws. Do not remove screws yet.



1. Splitter
2. Retaining screws

Before pulling the splitter, place your hand under it to catch both shims. Shims are located between splitter and frame.

Pull the splitter to remove it.

Wipe brake fluid spillages.

Brake Circuit Splitter Installation

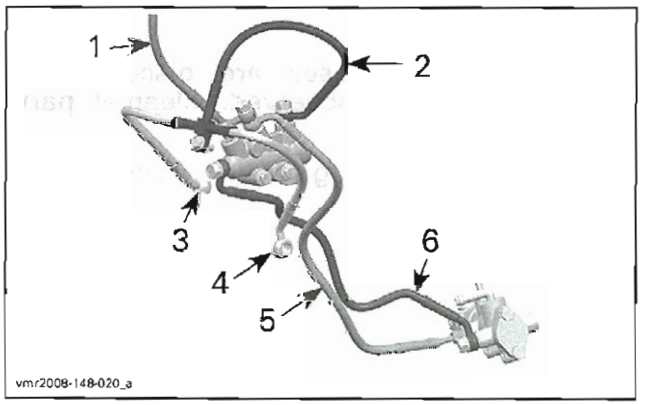
The installation is the reverse of the removal procedure. However, pay attention to the following.

Install shims behind splitter.

Apply Loctite 243 (blue) (P/N 293 800 060) on threads of splitter screws. .

Install splitter and tighten screws to 10 N•m (89 lbf•**in**).

Using NEW sealing washers, connect brake hoses. Use the next illustration to position hoses correctly.



1. From front master cylinder
2. From front brakes
3. Toward RH front caliper
4. Toward LH front caliper
5. Toward front master cylinder
6. Toward front brakes

Tighten all Banjo fittings to 28 N•m (21 lbf•ft).

Refill and bleed the system. Refer to *BRAKE BLEEDING* at the beginning of this section.

Connect the brake light switch.

Install the inner fender.

BRAKE HOSES

Brake Hose Inspection

Brake hoses should be inspected frequently for leaks and damages.

Check if the hoses are crushed or damaged. Any deformation can restrict the proper flow of fluid and cause braking problems.

Check hoses for cracking or scrapes. This damage can cause hose failure under pressure.

Replace any defective parts.

Brake Hose Removal

CAUTION: When hoses are removed or disconnected, cleanliness must be observed. Clean all joints and connections before disassembly.

NOTE: Before removing any hoses, drain brake system.

Remove all necessary parts to reach the hoses.

Thoroughly clean the area around the joints that will be disconnected.

Place a drain pan under the joint that will be disconnected.

Disconnect any retaining clips or brackets holding the hose and remove the defective part(s).

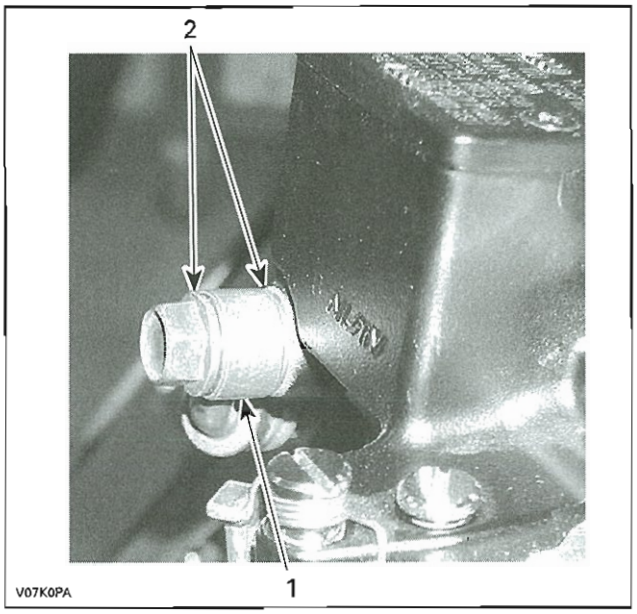
Brake Hose Installation

Install the hose.

CAUTION: New hoses should be cleaned with brake fluid before installation to remove any contamination.

Make sure the hose will not rub against any other part.

When there is a Banjo fitting securing the hose to the caliper or to the master cylinder, always replace the sealing washers with NEW ones.



FRONT MASTER CYLINDER SHOWN
1. *Banjo fitting*
2. *Sealing washers*

Install any retaining clips or brackets.

Refill and bleed the system. Refer to *BRAKE BLEEDING* at the beginning of this section.

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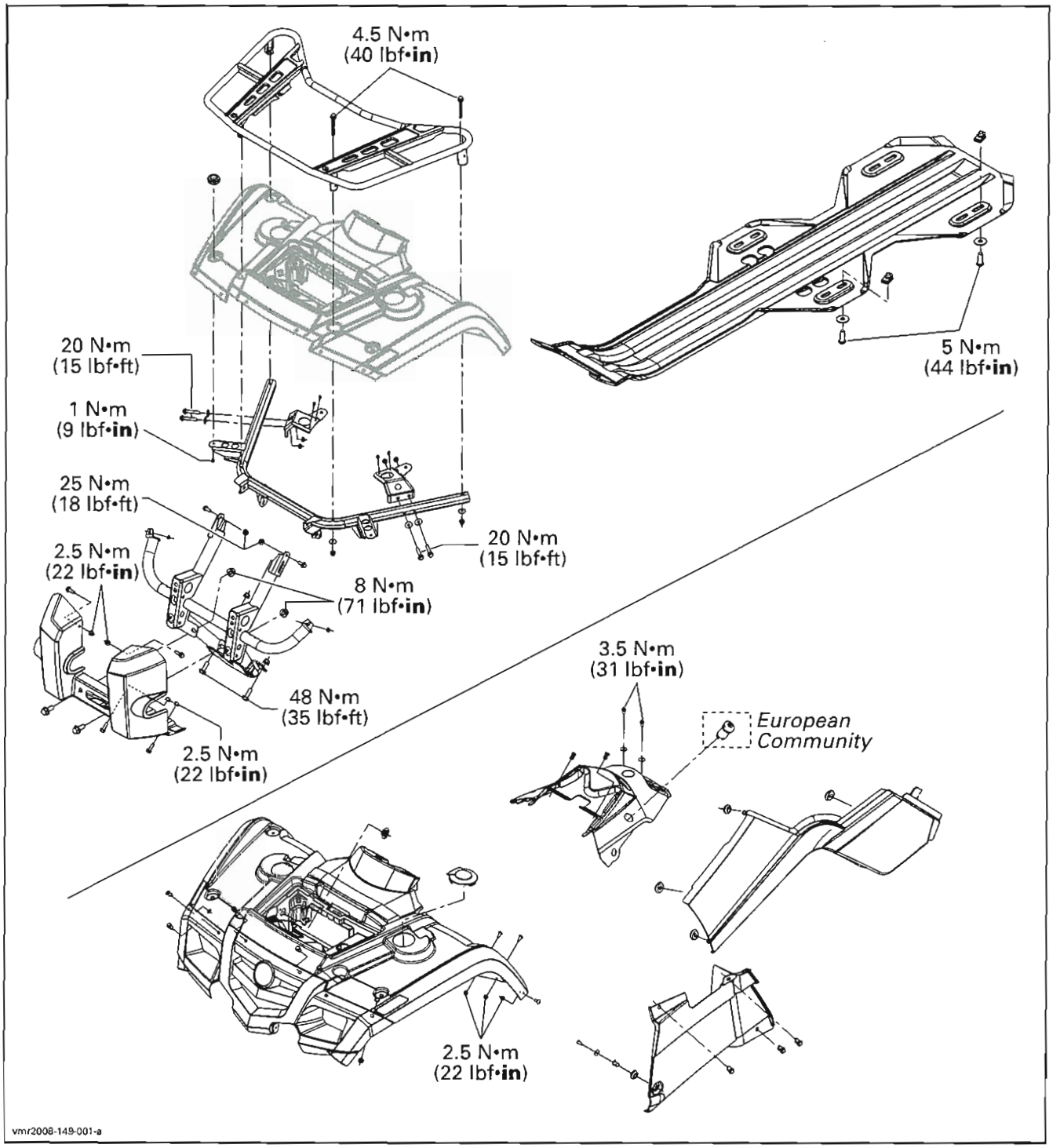
BODY

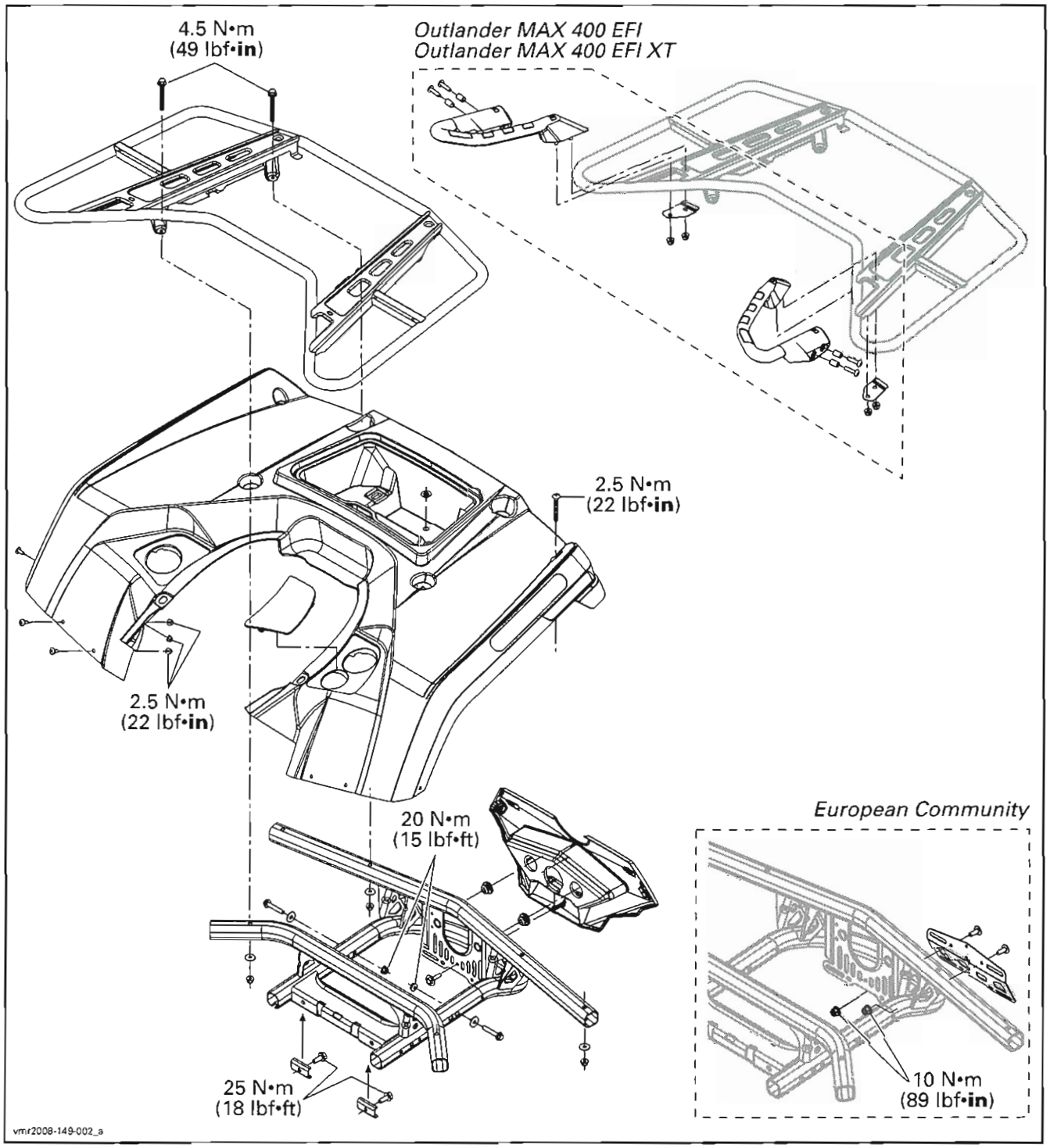
SERVICE TOOLS

Description	Part Number	Page
pliers Oetiker 1099	295 000 070	409

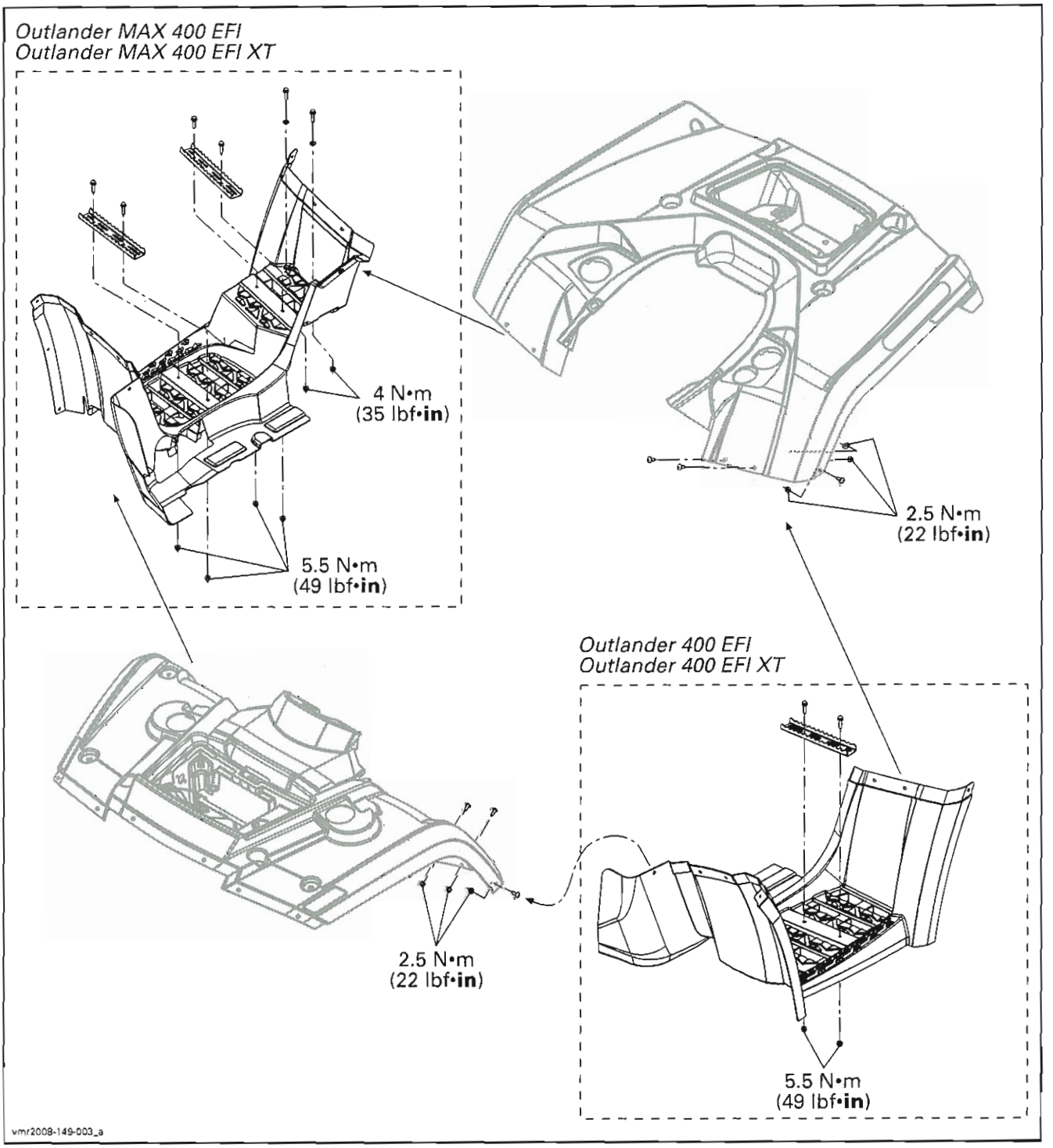
BODY PARTS (FRONT)



BODY PARTS (REAR)

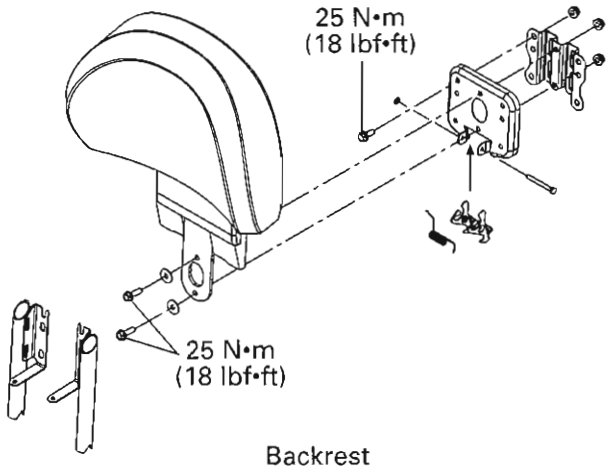


BODY PARTS (SIDE)



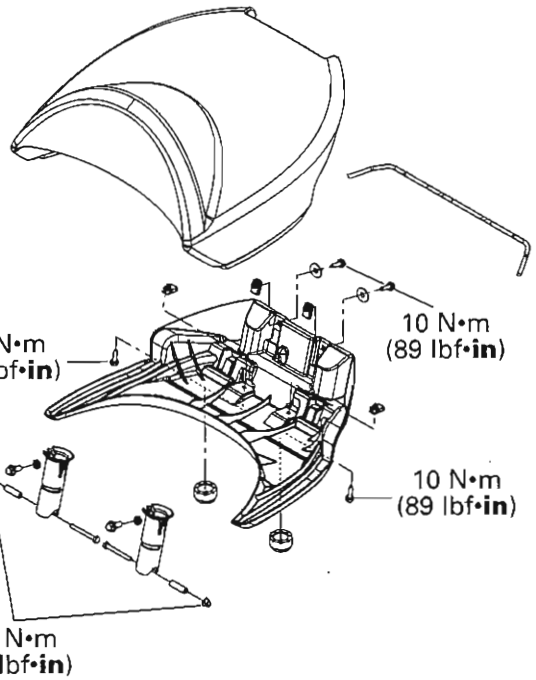
SEAT

Outlander MAX 400 EFI
Outlander MAX 400 EFI XT

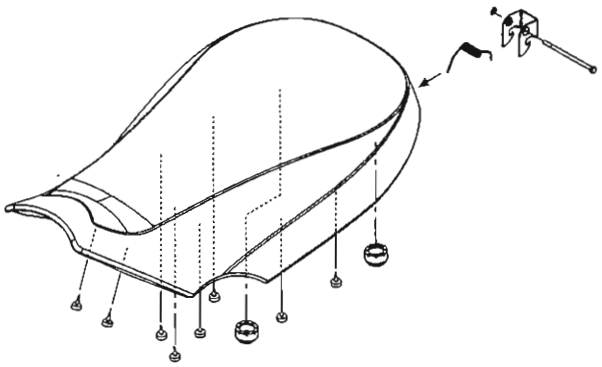


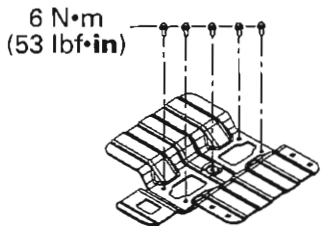
Backrest

Passenger's Seat



Operator's Seat





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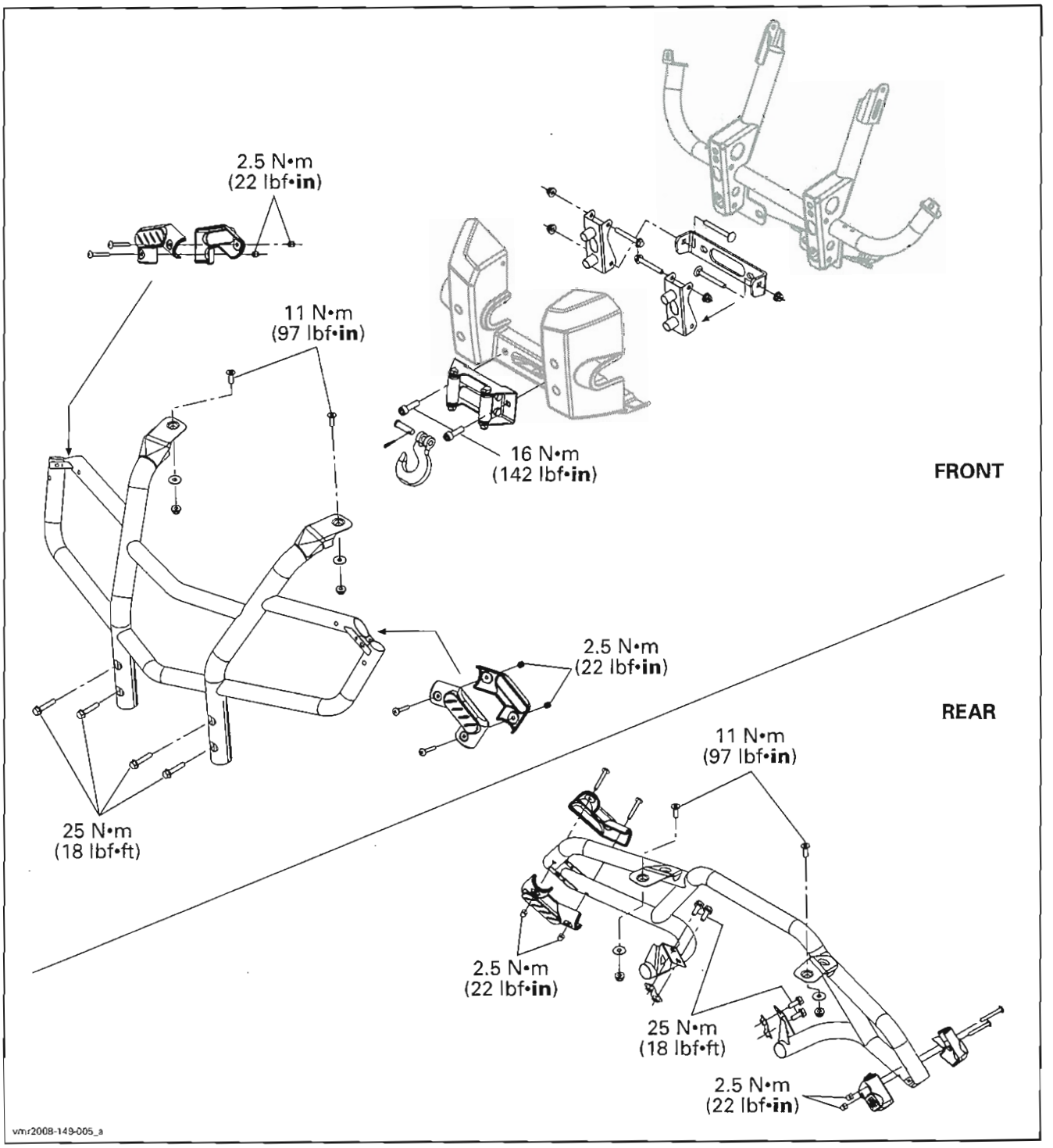
BUMPERS

XT Package



GENERAL

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

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

⚠ WARNING

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

Hoses or cables removed or disconnected must be installed and routed at the same place.

CAUTION: Locking ties removed during a procedure must be replaced and installed at the same location.

Vehicle Care

Clean the vehicle thoroughly, removing all dirt and grease accumulation.

To clean use a soft clean cloth and either soapy water or isopropyl alcohol.

To remove grease, oil or glue use isopropyl alcohol.

CAUTION: Do not apply isopropyl alcohol or acetone directly on decals.

The following products must not be used to clean or wax any of the plastic components used on the vehicles:

- Gasoline
- Brake fluid
- Kerosene
- Diesel fuel
- Lighter fluid
- Varsol
- Naphtha
- Acetone
- Strong detergents
- Abrasive cleaners
- Waxes containing an abrasive or a cleaning agent in their formula.

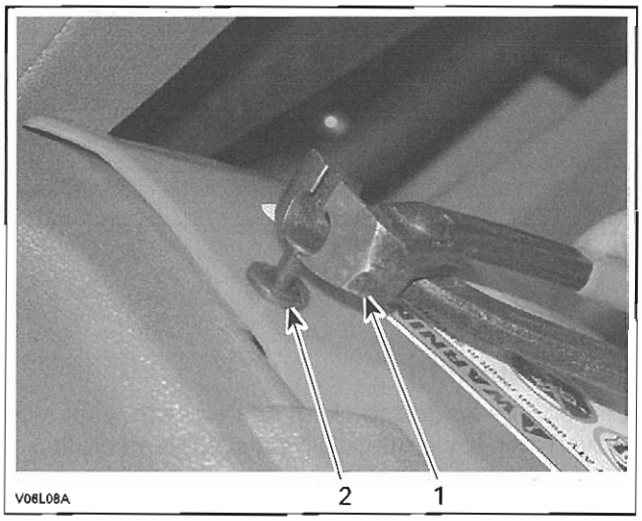
PROCEDURES

REUSABLE PLASTIC RIVETS

Rivets Removal

Reusable plastic rivets are used in the riveting of the various body parts. Plastic rivets can be removed carefully with pliers Oetiker 1099 (P/N 295 000 070).

NOTE: Reuse the plastic rivets.



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.

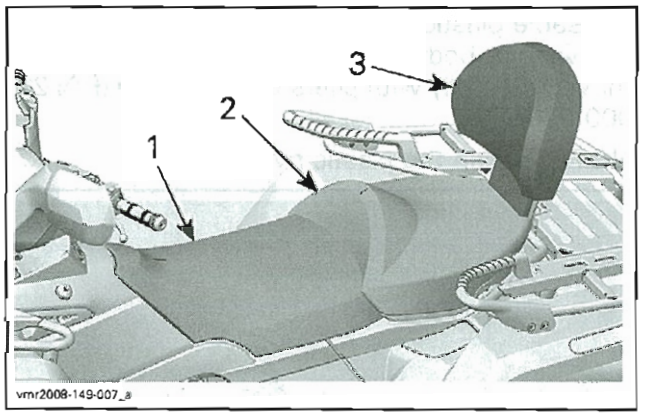
Decal Installation

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.

CAUTION: Do not apply isopropyl alcohol or solvent directly on decals. Use these products in a well ventilated area.

SEAT



1. *Operator's seat*
2. *Passenger's seat*
3. *Backrest*

Seat Cleaning

It is recommended to clean seat(s) with a solution of warm soapy water, using a soft clean cloth.

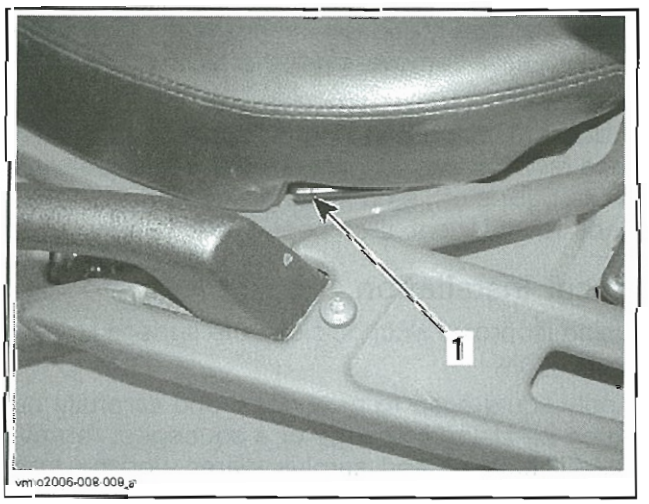
CAUTION: Avoid use of harsh detergents such as strong soaps, degreasing solvents, abrasive cleaners, paint thinners, etc. that may cause damage to the seat cover.

Seat Removal

Passenger's Seat

Outlander MAX/MAX XT Models

Pull one of the passengers seat latch levers. Those levers are located underneath the RH or LH rear end of seat.



TYPICAL — LH SIDE
1. *Seat latch lever*

Gently lift the rear of seat.

Pull seat rearwards.

Continue lifting movement until you can release the front retaining device then completely remove passengers seat.

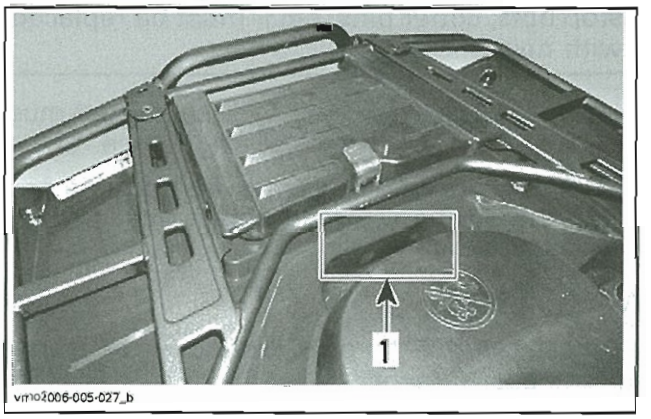
Operator's Seat

Outlander MAX/MAX XT Models

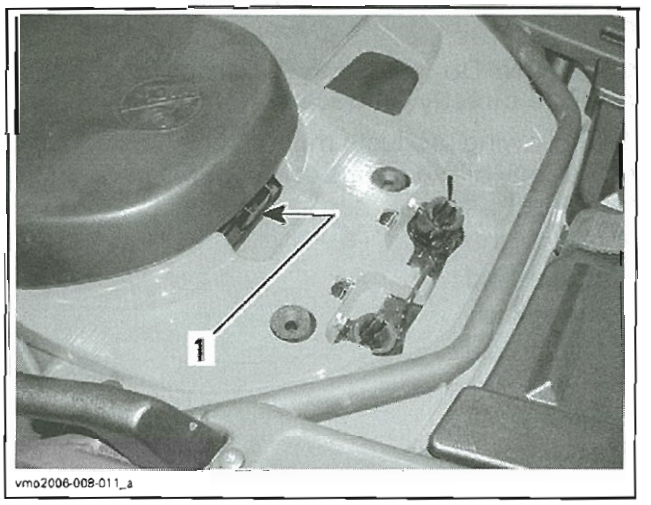
Remove passengers seat as mentioned above.

All Models

To remove seat, move latch lever downward while gently lifting rear of seat.



OUTLANDER/OUTLANDER XT
1. *Seat latch*

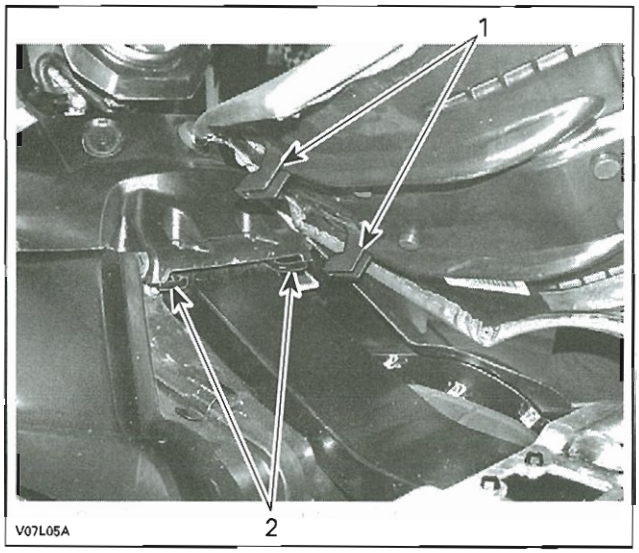


OUTLANDER MAX/OUTLANDER MAX XT
1. *Seat latch*

Pull seat rearward. Continue lifting movement until you can release the front retaining device then completely remove seat.

Seat Installation

Insert front tabs of seat into frame hooks. When seat rests in its position, firmly push seat down to latch.



1. Insert these tabs in hooks
2. Hooks

NOTE: A distinctive snap will be felt. Double check that the seat is secure by giving it a tug to confirm proper latching.

⚠ WARNING

Make sure seat is securely latched before riding.

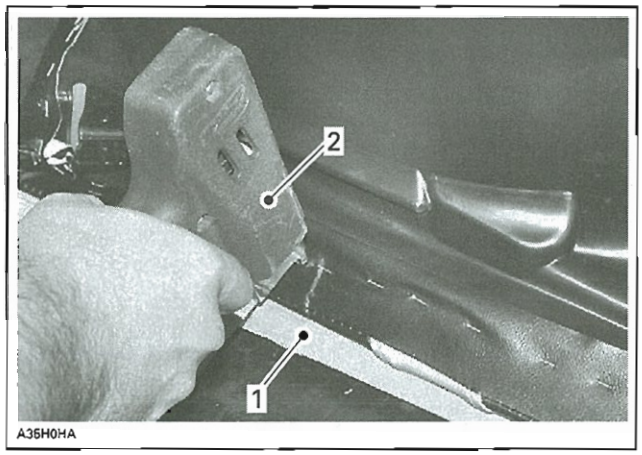
Seat Cover Replacement

Remove the old seat cover. Check the foam and replace if necessary.

Install staples with an electric tacker such as Arrow tacker no. ETN-50 or with a manual tacker such as Arrow tacker no. T-50.

NOTE: For an easier installation, it is highly recommended to use an electric tacker.

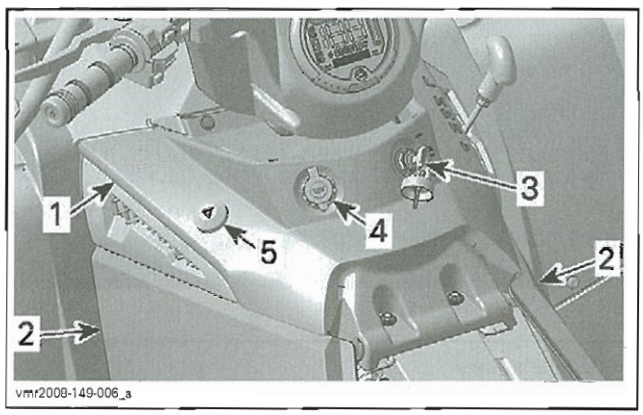
Ensure that the seat rest firmly against a hard surface such as a piece of wood. This is done to get the staples completely pushed in place.



TYPICAL
1. Piece of wood
2. ETN-50 (electric)

After cover installation cut all around the excess of material.

CONSOLE



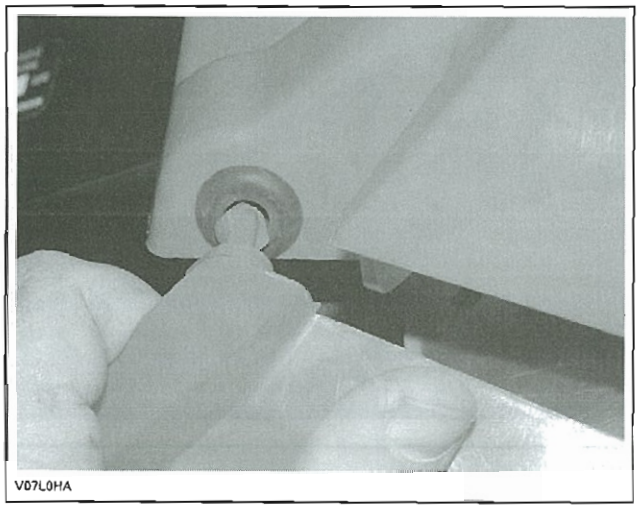
TYPICAL
1. Console
2. Side panels
3. Ignition switch
4. 12-volt power outlet
5. Hazard warning button (CE models)

NOTE: On 2009 CE models, the hazard warning lights button is located on the LH multifunction switch.

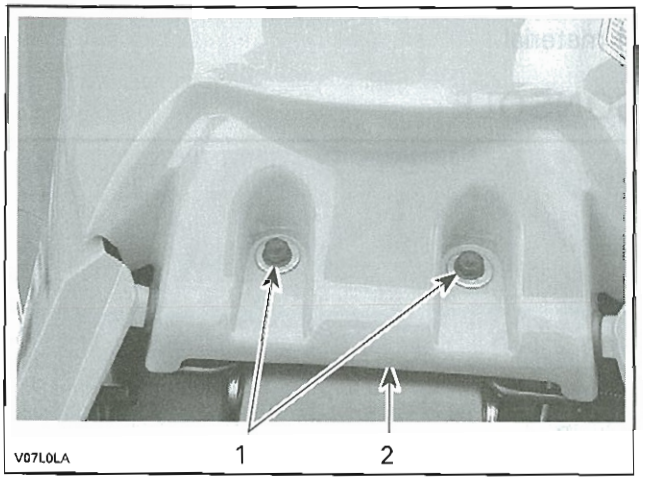
Console Removal

Remove seat(s).

On each side, come off side panel studs from console grommets.

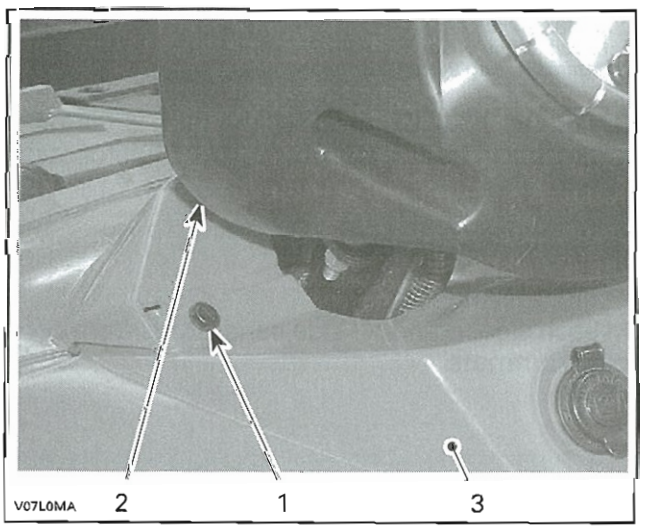


Remove screws retaining console.



1. *Console screws*
2. *Console*

Remove plastic rivets near handlebar cover.



1. *LH plastic rivet*
2. *Handlebar cover*
3. *Console*

Lift the console.

Disconnect the following components:
- Ignition switch
- 12-volt power outlet
- Hazard warning button (2008 CE models).

Remove the console.

Console Installation

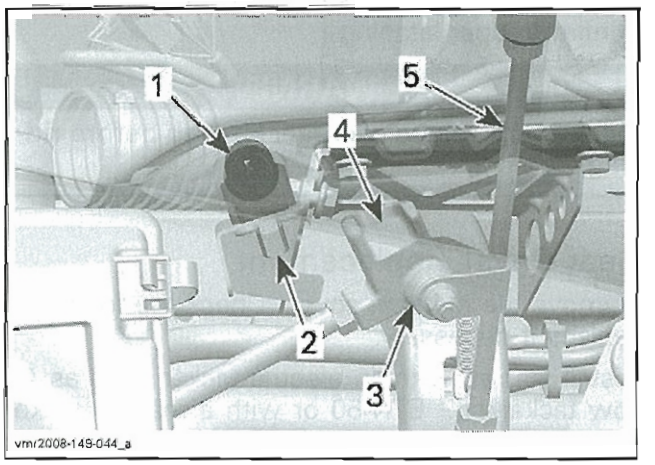
The installation is the reverse of removal procedure.

VEHICLE LOCK

2009 CE Models

The vehicle lock is located next to the park position of the shift lever, on the right hand side of the console.

Its purpose is to lock the transmission shift lever in the park position.



VEHICLE LOCK MECHANISM
1. *Vehicle lock*
2. *Lock pin*
3. *Shift lever pivot*
4. *Lock pin receiver*
5. *Shift lever shown in neutral position*

Vehicle Lock Removal

Set vehicle parking brake.

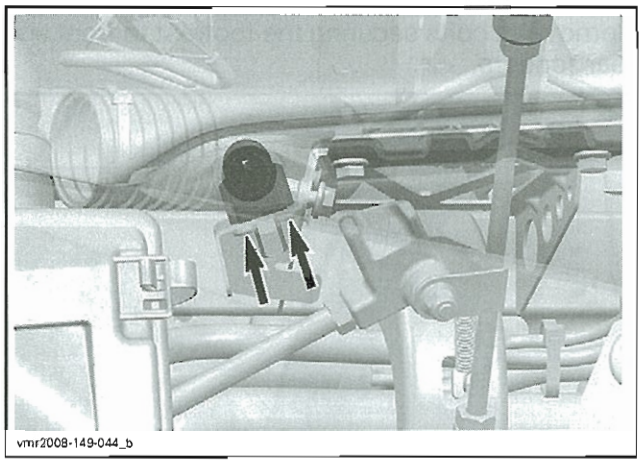
Unsure vehicle lock is not engaged.

Move shift lever out of park position for access to lock mounting screws.

Remove the RH side panel as detailed further in this section.

From under the RH side of the console, remove the lock mounting screws.

NOTE: For clarity purpose, the console and RH side panels are transparent in the following illustration.



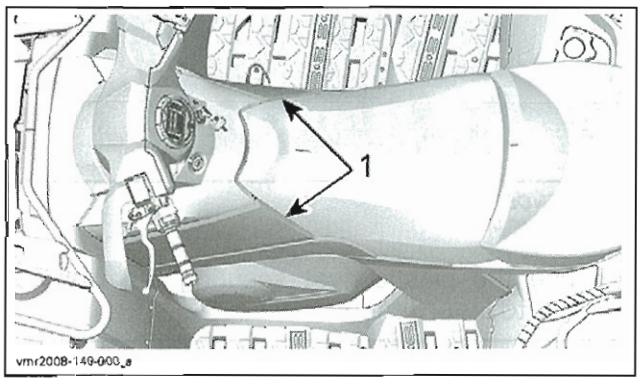
VEHICLE LOCK MOUNTING SCREWS

Remove the lock from its mounting bracket.

Vehicle Lock Installation

For lock installation, reverse the removal procedure.

SIDE PANEL



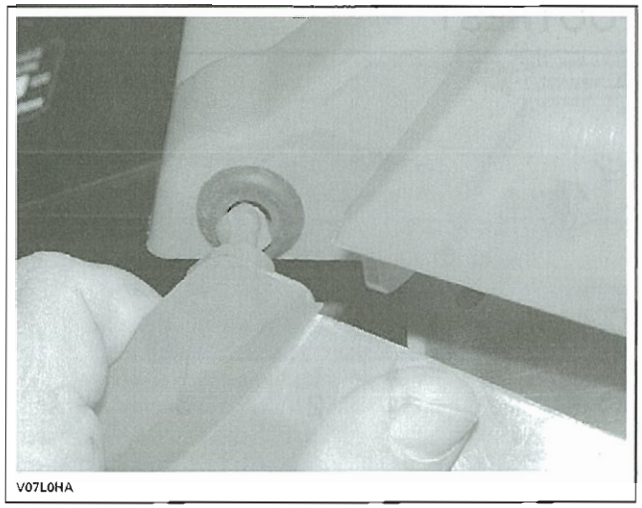
1. Side panels

Side Panel Removal

NOTE: Use the same procedure for the LH and RH side panels.

Remove seat(s).

On each side, come off all side panel studs from console and front fender grommets.



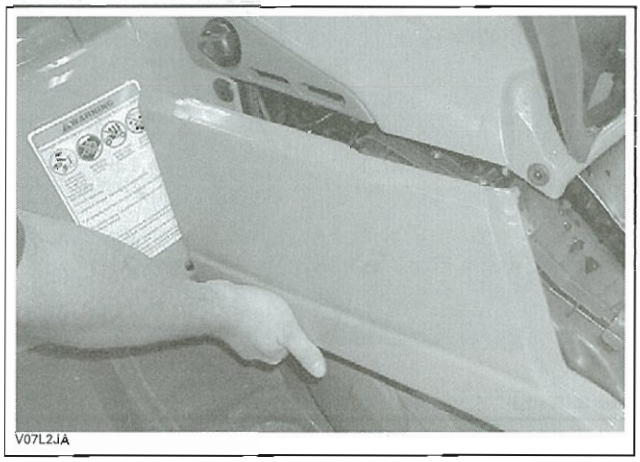
Outlander/Outlander XT Models

Remove plastic rivets retaining the front tabs of side panels.

All Models

Move the front tabs out of their slots.

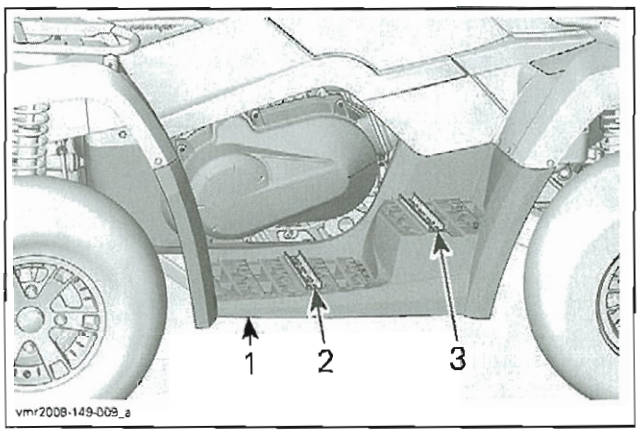
Remove side panel from vehicle.



Side Panel Installation

The installation is the reverse of removal procedure.

FOOTREST

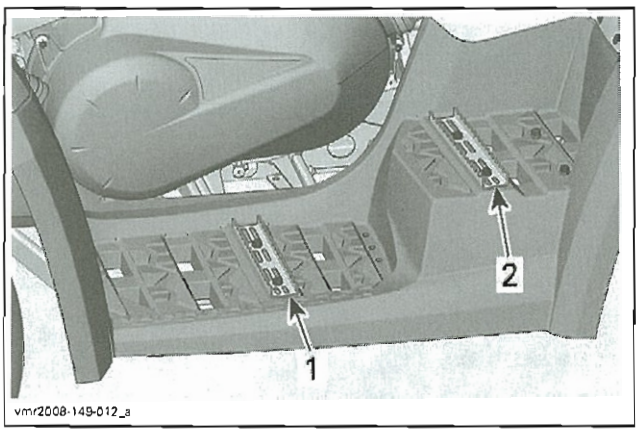


1. LH footrest
2. Operator's footpeg
3. Passenger's footpeg

Footrest Removal

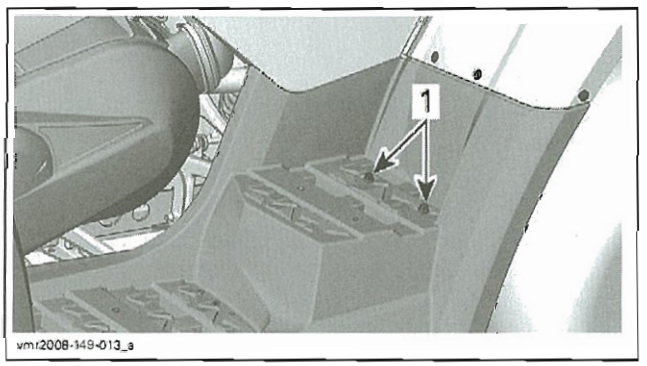
Remove *SIDE PANEL*, see procedure above in this section.

Unscrew footpeg(s).



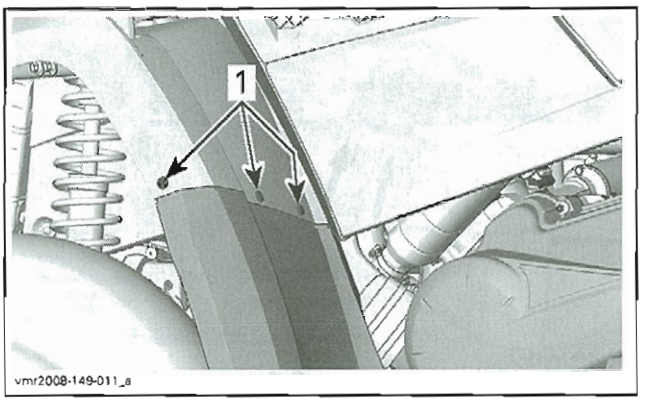
OUTLANDER MAX SHOWN
1. Operator's footpeg
2. Passenger's footpeg

On **Outlander MAX series**, remove bolts securing footrest to footrest supports.

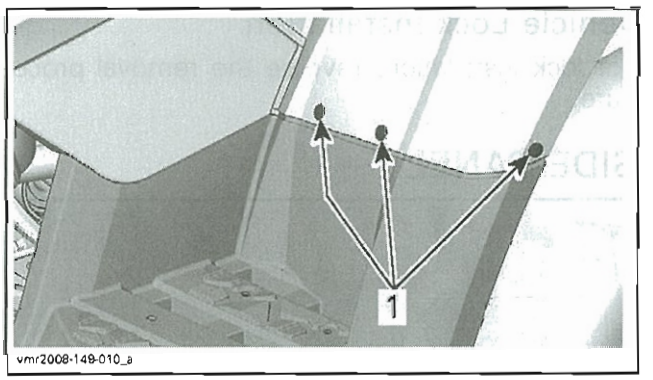


1. Passenger's footrest bolts

Remove all bolts securing the footrest to front and rear fenders.

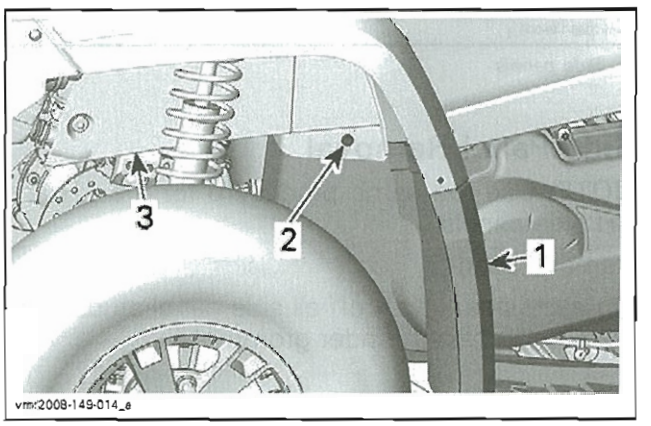


FRONT FENDER
1. LH fender bolts



REAR FENDER
1. LH fender bolts

Remove the plastic rivet securing the front of footrest to inner fender.



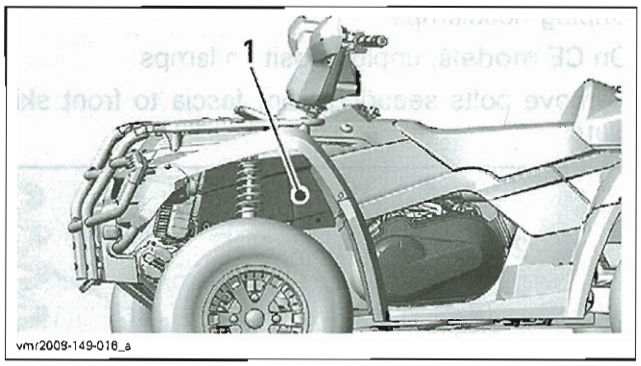
1. LH footrest
2. Plastic rivet
3. Inner fender

Remove footrest from vehicle.

Footrest Installation

The installation is the reverse of removal procedure.

INNER FENDER



1. Inner fender

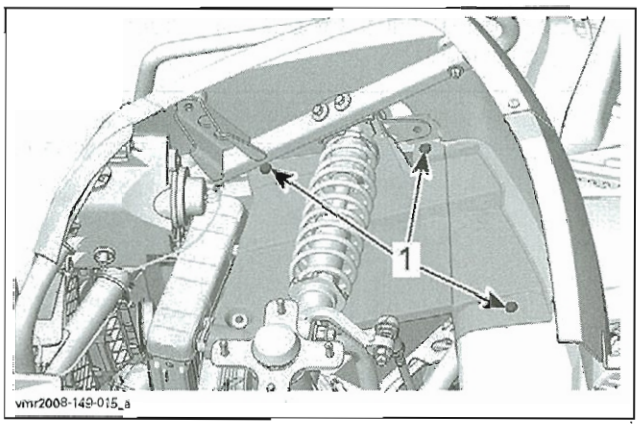
Inner Fender Removal

Loosen wheel lug nuts from appropriate wheel.

Lift the front of vehicle and support it securely.

Remove wheel.

Remove plastic rivets securing inner fender.



1. Plastic rivets

Pull the front bottom corner of inner fender to remove it.

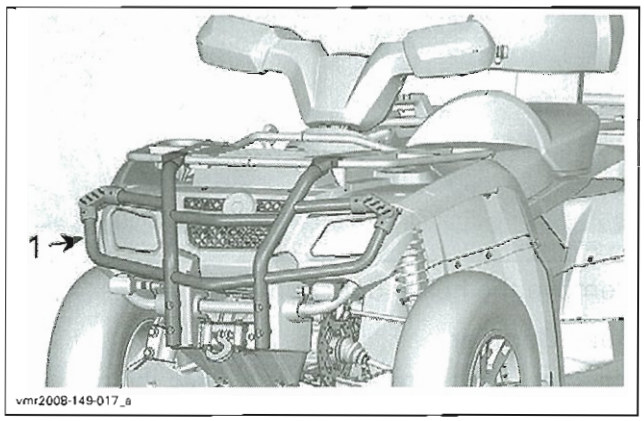
NOTE: On RH side, unclip the radiator hose.

Inner Fender Installation

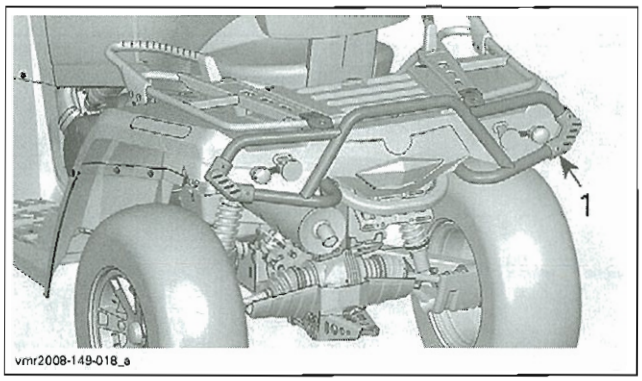
The installation is the reverse of removal procedure.

HEAVY DUTY BUMPER

Outlander XT Package



1. Front heavy duty bumper

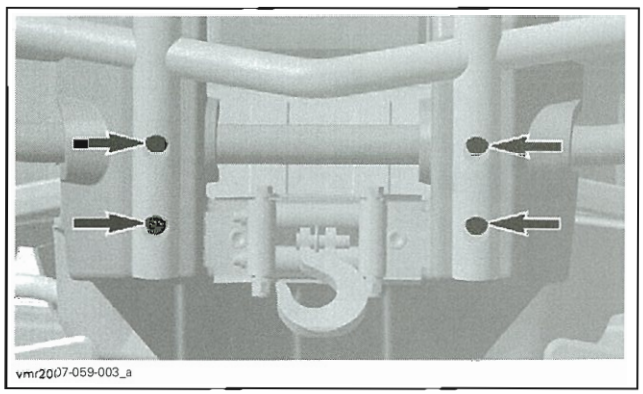


1. Rear heavy duty bumper

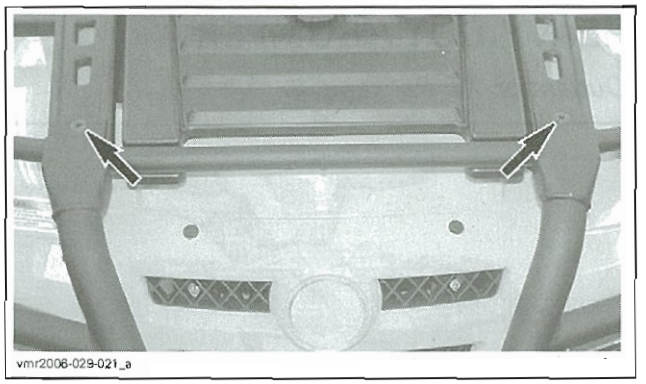
Bumper Removal

Front Bumper

Remove bolts retaining the heavy duty bumper to the front bumper.



Remove screws that attach the heavy duty bumper to the rack.

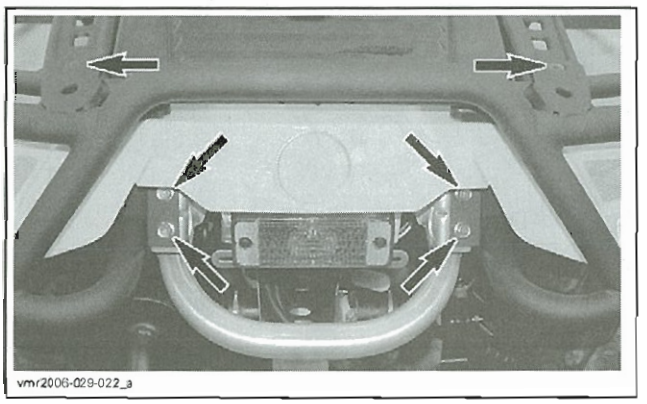


Remove the heavy duty bumper.

Rear Bumper

Unscrew bolts retaining the rear heavy duty bumper to the rear bumper.

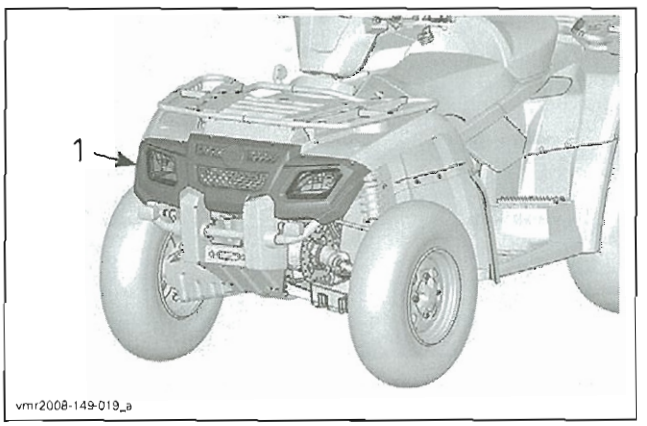
Remove screws that attach the heavy duty bumper to the rack.



Bumper Installation

The installation is the reverse of the removal procedure.

FRONT FASCIA



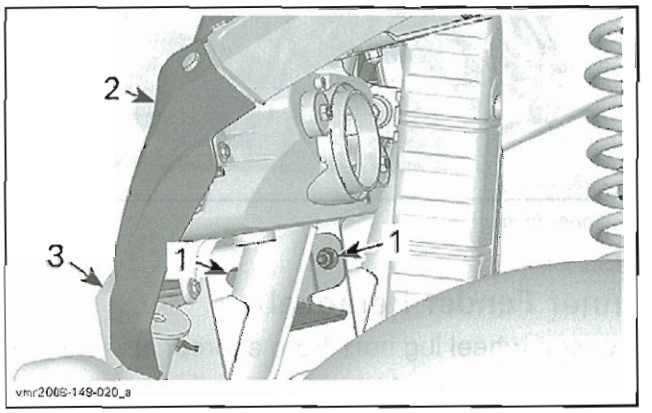
1. Front fascia

Front Fascia Removal

Unplug headlamps.

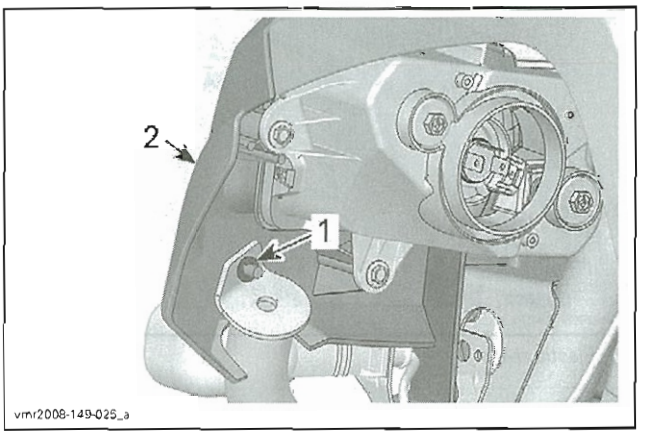
On CE models, unplug position lamps.

Remove bolts securing front fascia to front skid plate.



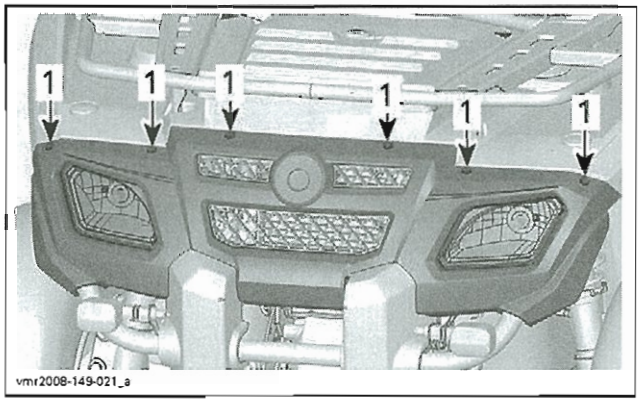
1. Remove these bolts
2. Front fascia
3. Front skid plate

Remove and discard the push nut securing front fascia to bumper.



1. Push nut
2. Fascia

Remove plastic rivets securing front fascia to front fender.



1. Plastic rivets

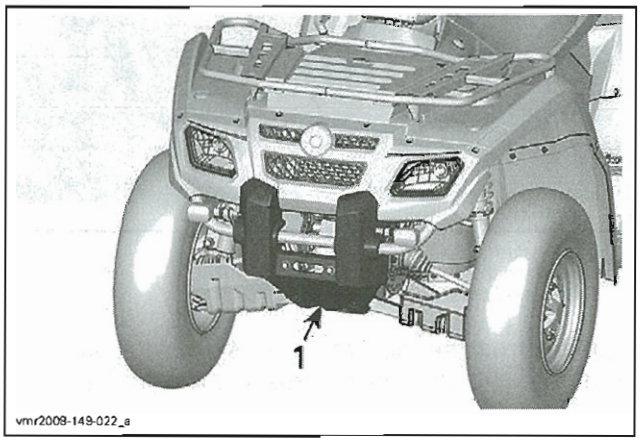
Remove front fascia.

Front Fascia Installation

The installation is the reverse of the removal procedure.

FRONT SKID PLATE

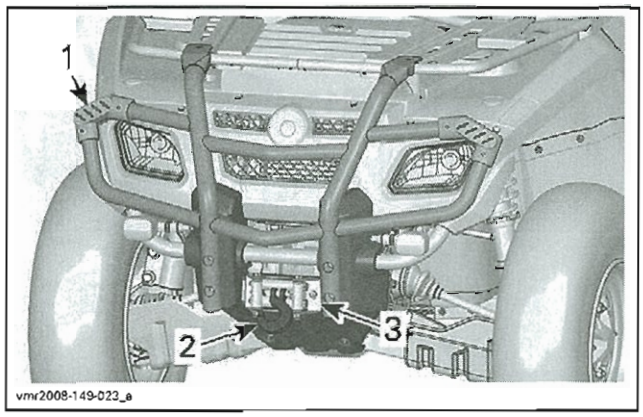
2009 Models Only



1. Front skid plate

Front Skid Plate Removal

On **XT models**, remove hook, fairlead and the front heavy duty bumper.

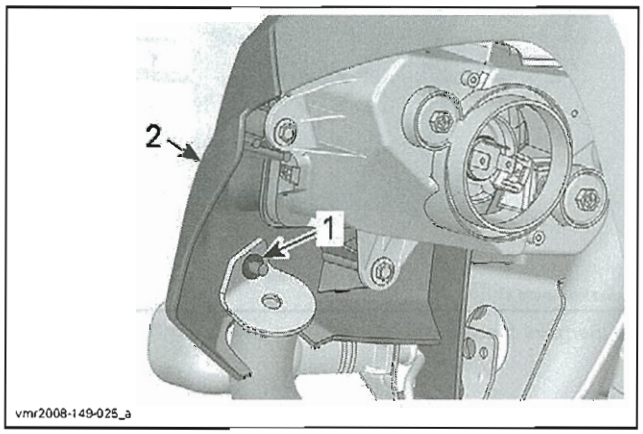


1. Front heavy duty bumper
2. Hook
3. Fairlead

Disconnect headlights.

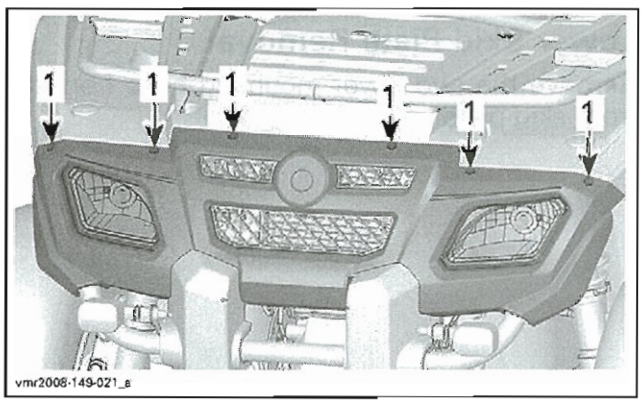
On **CE models**, disconnect position lamps.

Remove and discard the push nut securing front fascia to bumper.



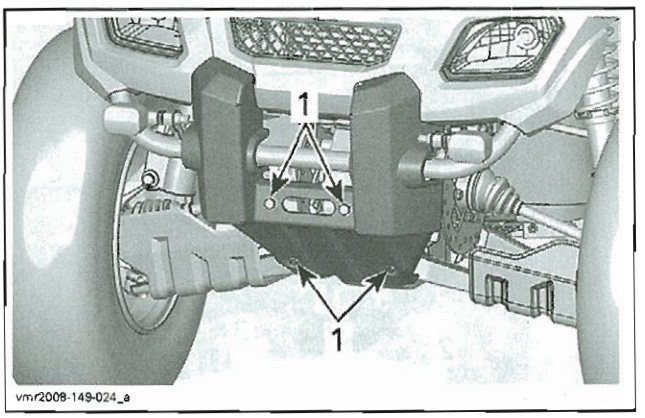
1. Push nut
2. Fascia

Remove plastic rivets securing front fascia to front fender.



1. Plastic rivets

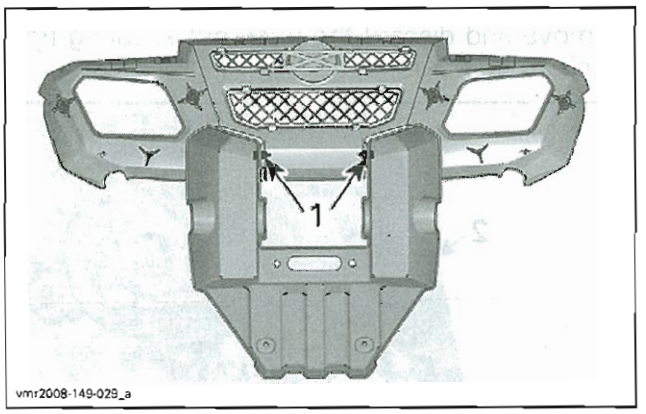
Unscrew the bolts securing the front skid plate.



OUTLANDER CE SHOWN
1. Skid plate bolts

Remove skid plate and front fascia assembly.

Remove bolts retaining skid plate and front fascia.



1. Remove these bolts

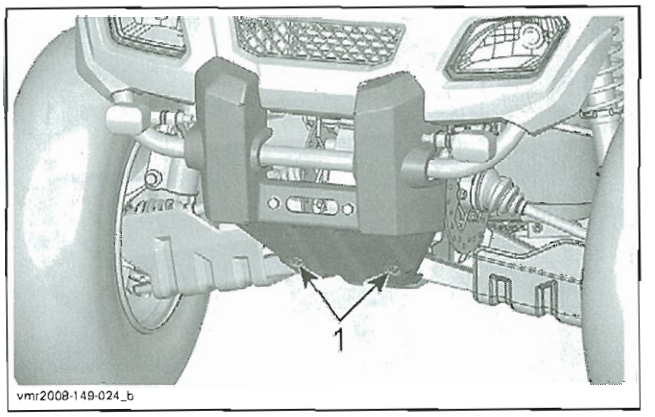
Front Skid Plate Installation

The installation is the reverse of the removal procedure.

LOWER SKID PLATE

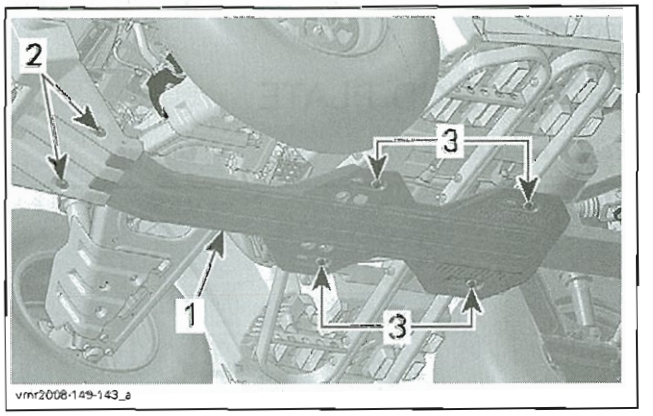
Lower Skid Plate Removal

Remove the two lower mounting bolts from the front skid plate.



1. Lower mounting bolts on front skid plate

Remove the two center mounting screws from lower skid plate, then the two rear mounting screws as you support the skid plate.



1. Lower skid plate
2. Lower mounting bolts on front skid plate
3. Lower skid plate mounting screws

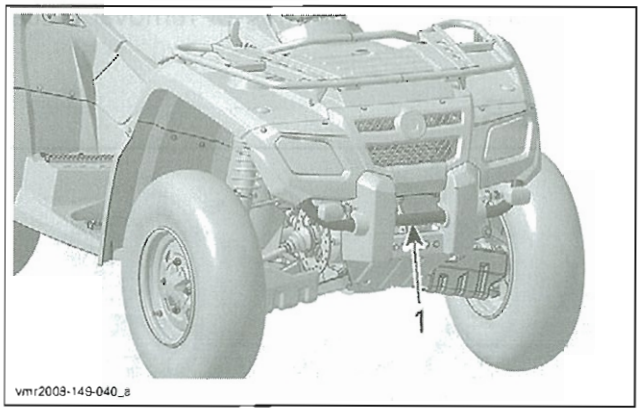
Pull the front section of lower skid plate out from between the front skid plate and the frame.

Lower Skid Plate Installation

Installation is the reverse of removal.

Torque the mounting screws on the front and lower skid plates as specified in the exploded views.

FRONT BUMPER



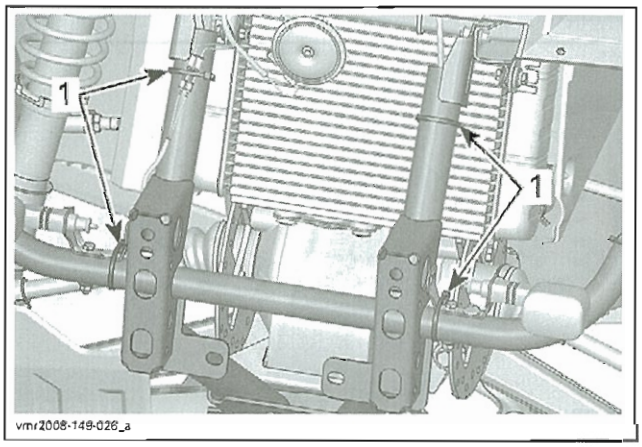
1. Front bumper

Front Bumper Removal

Using removal instructions described in this section, remove the following parts:

- Heavy duty bumper (XT models)
- Front fascia
- Front skid plate.

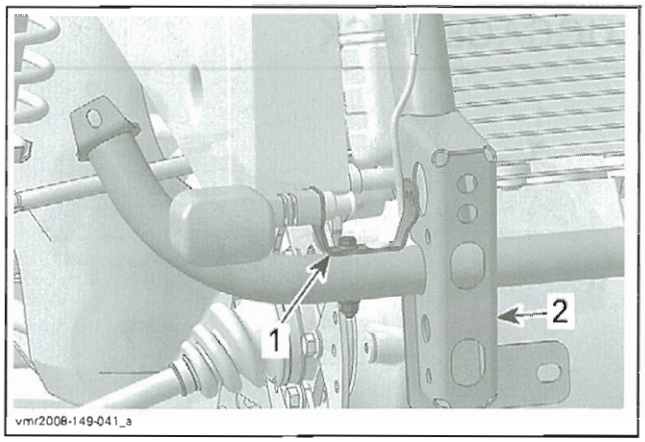
On CE models, cut locking ties securing direction indicator harnesses.



1. Cut these locking ties

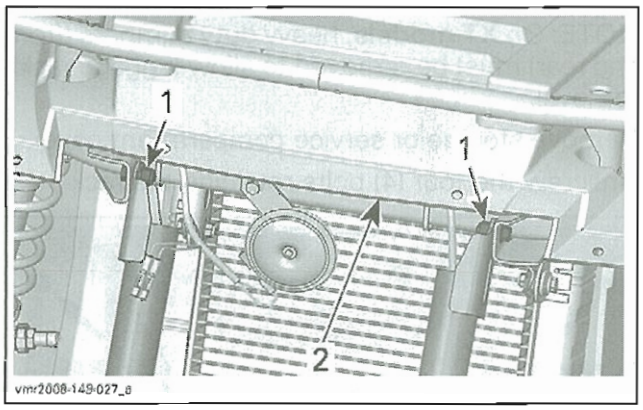
Unplug both direction indicator lamps.

If front bumper is removed for replacement, unscrew direction indicator lamp supports from the bumper.



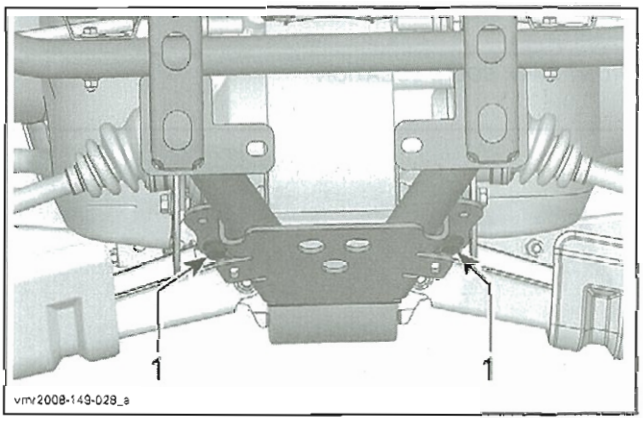
1. RH direction indicator lamp support
2. Bumper

Remove upper bolts securing front bumper to fender support.



1. Front bumper upper bolts
2. Front fender

At the bottom of bumper, remove the 2 last bolts.



1. Front bumper lower bolts

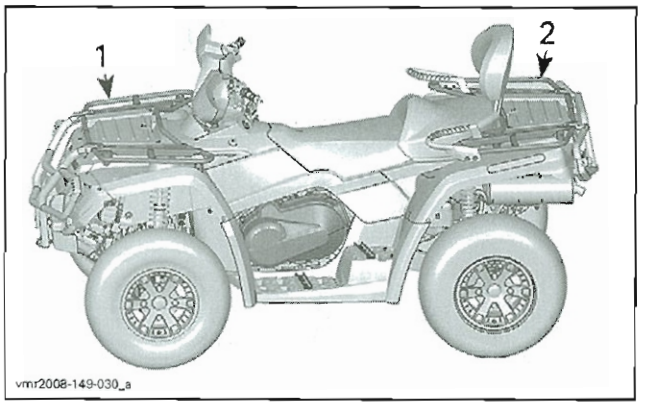
Remove the front bumper.

Front Bumper Installation

The installation is the reverse of the removal procedure.

NOTE: Install all bolts before torquing them.

LUGGAGE RACK



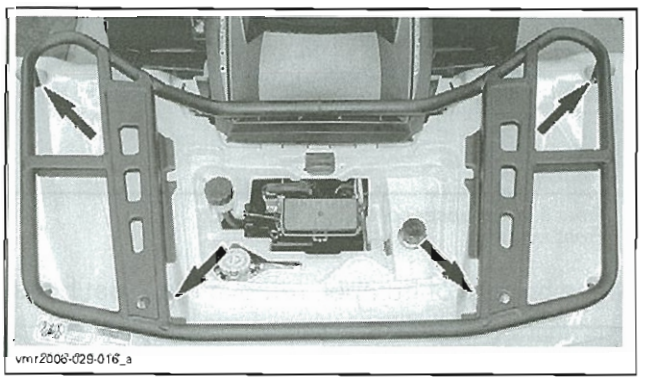
1. *Front rack*
2. *Rear rack*

Rack Removal

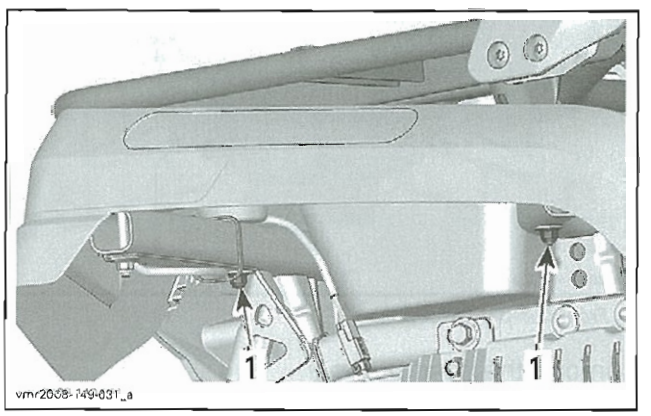
NOTE: On XT models, heavy duty bumpers (front and rear) must be removed to allow luggage racks removal.

Remove storage or service compartment cover.

Unscrew the four (4) bolts retaining the rack.



FRONT RACK BOLTS LOCATION



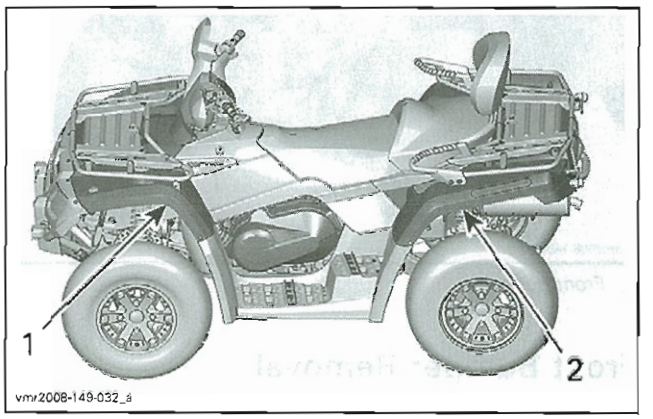
UNDERNEATH REAR FENDER
1. *Rear rack bolts*

Remove luggage rack.

Rack Installation

The installation is the reverse of removal procedure.

FENDER

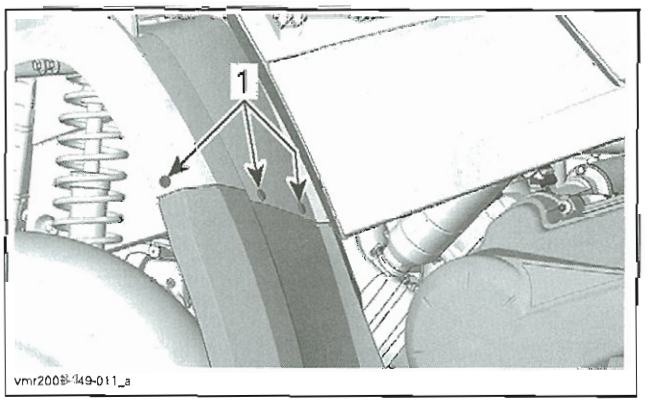


1. *Front fender*
2. *Rear fender*

Fender Removal

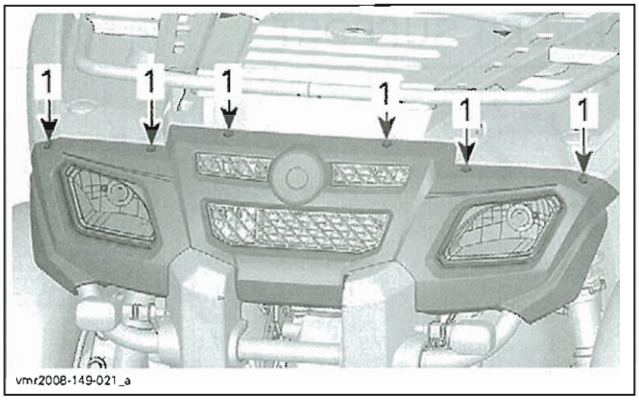
Front Fender

Remove bolts that attach both footrests to the fender.



LH SIDE SHOWN
1. *Fender bolts*

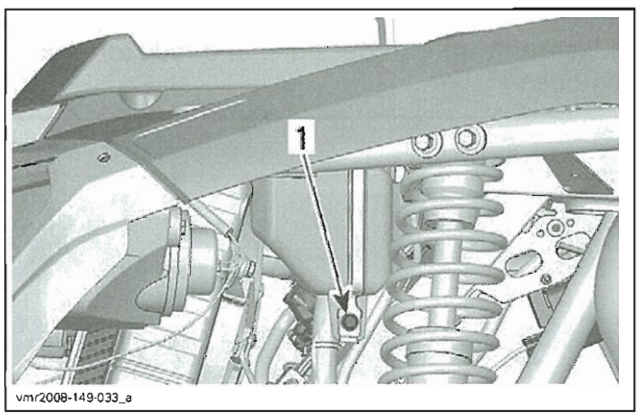
Remove plastic rivets retaining front fender to front fascia.



1. Plastic rivets

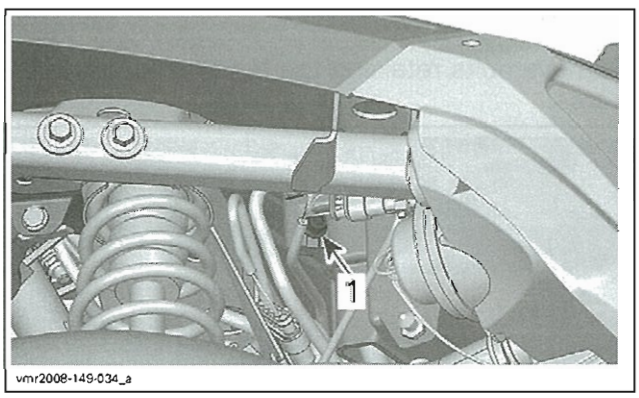
Using removal instructions described in this section, remove the following parts:
- Side panels
- Inner fenders
- Front rack.

From the LH side, unscrew the coolant reservoir support bolt.



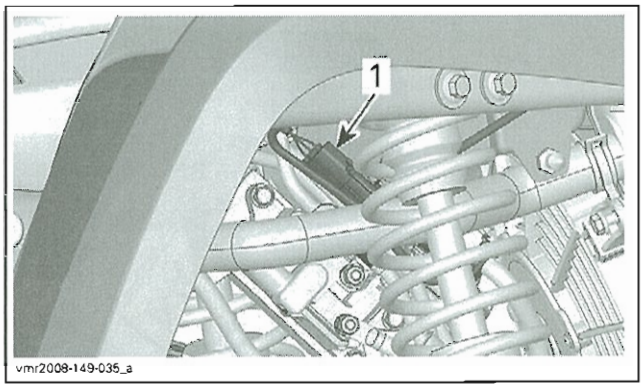
1. Coolant reservoir support bolt

On RH side, remove bolt securing the brake pedal fluid reservoir.



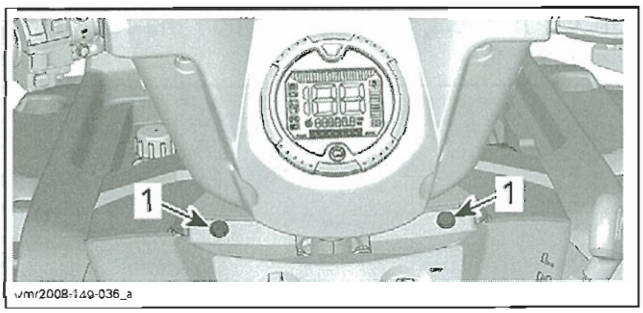
1. Brake pedal fluid reservoir bolt

Unplug the winch remote control connection connector located behind the RH strut.



1. Winch remote control connection connector

Remove plastic rivets retaining front fender to console.



1. Plastic rivets to remove

Lift up fender and place it in a safe place to avoid scratches.

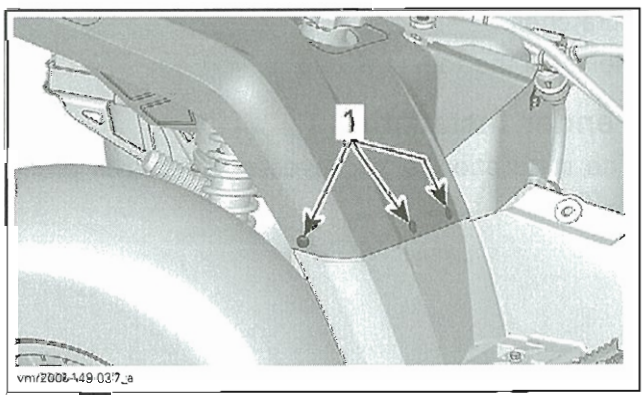
Rear Fender

Remove seat(s).

Remove both side panels.

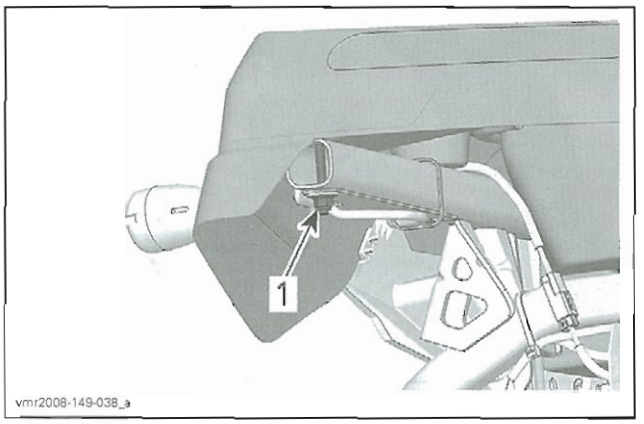
Remove *LUGGAGE RACK*, see procedure above in this section.

Remove all screws retaining the footrests to rear fender.



1. RH fender bolts

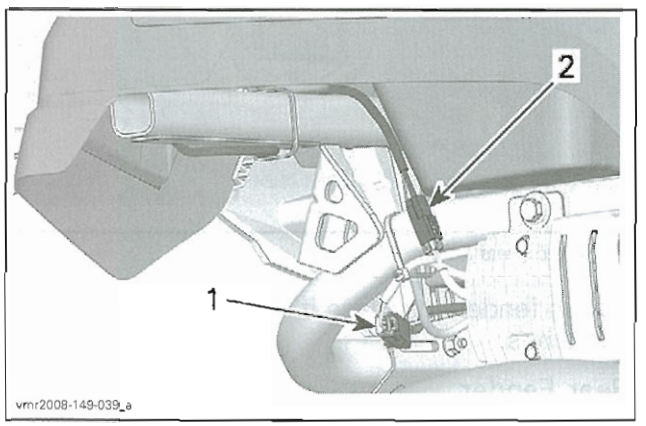
Remove bolts securing rear fender on fender support.



1. RH rear fender bolt

Unplug brake light connector.

On CE models, unplug direction indicator lamp connectors.



1. Brake light connector
2. RH position lamp connector

Cut locking ties retaining brake light and position lamp harnesses on fender support.

Unscrew the fuel tank cap.

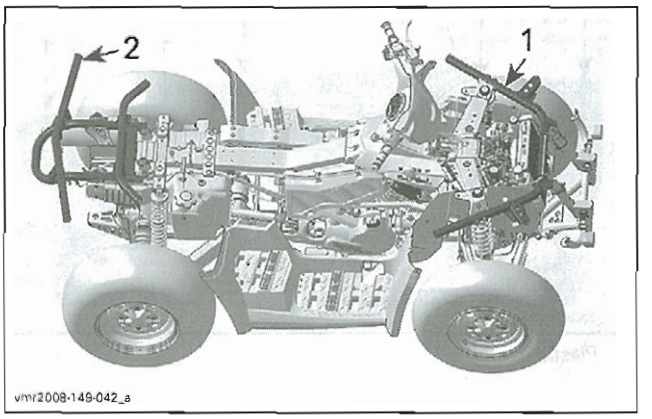
Lift and remove fender. Place it in a place to avoid scratches.

Reinstall the fuel tank cap.

Fender Installation

The installation is the reverse of removal procedure.

FENDER SUPPORT



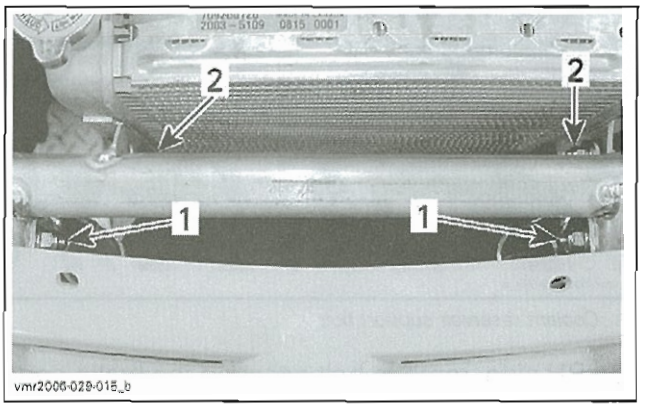
1. Front fender support
2. Rear fender support

Fender Support Removal

Front Fender Support

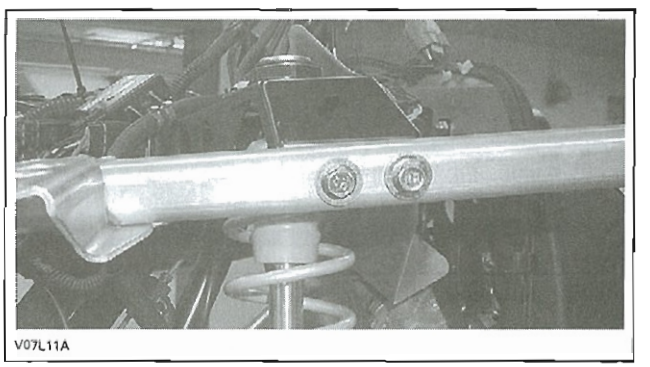
Remove *FRONT FENDER*, see procedure in this section.

Unscrew front bumper bolts and radiator mounting bolts.



1. Bumper bolts
2. Radiator bolts

Remove bolts retaining the fender support to the frame.

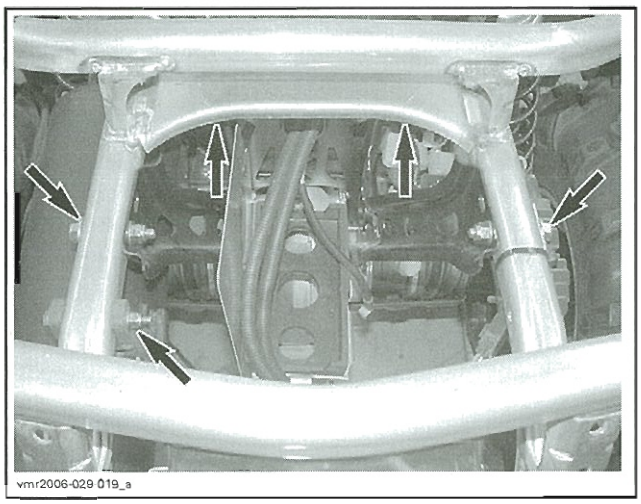


Rear Fender Support

Remove *REAR FENDER*, see procedure in this section.

Remove bolts that attach fender support to frame.

Unscrew the exhaust support bolt.

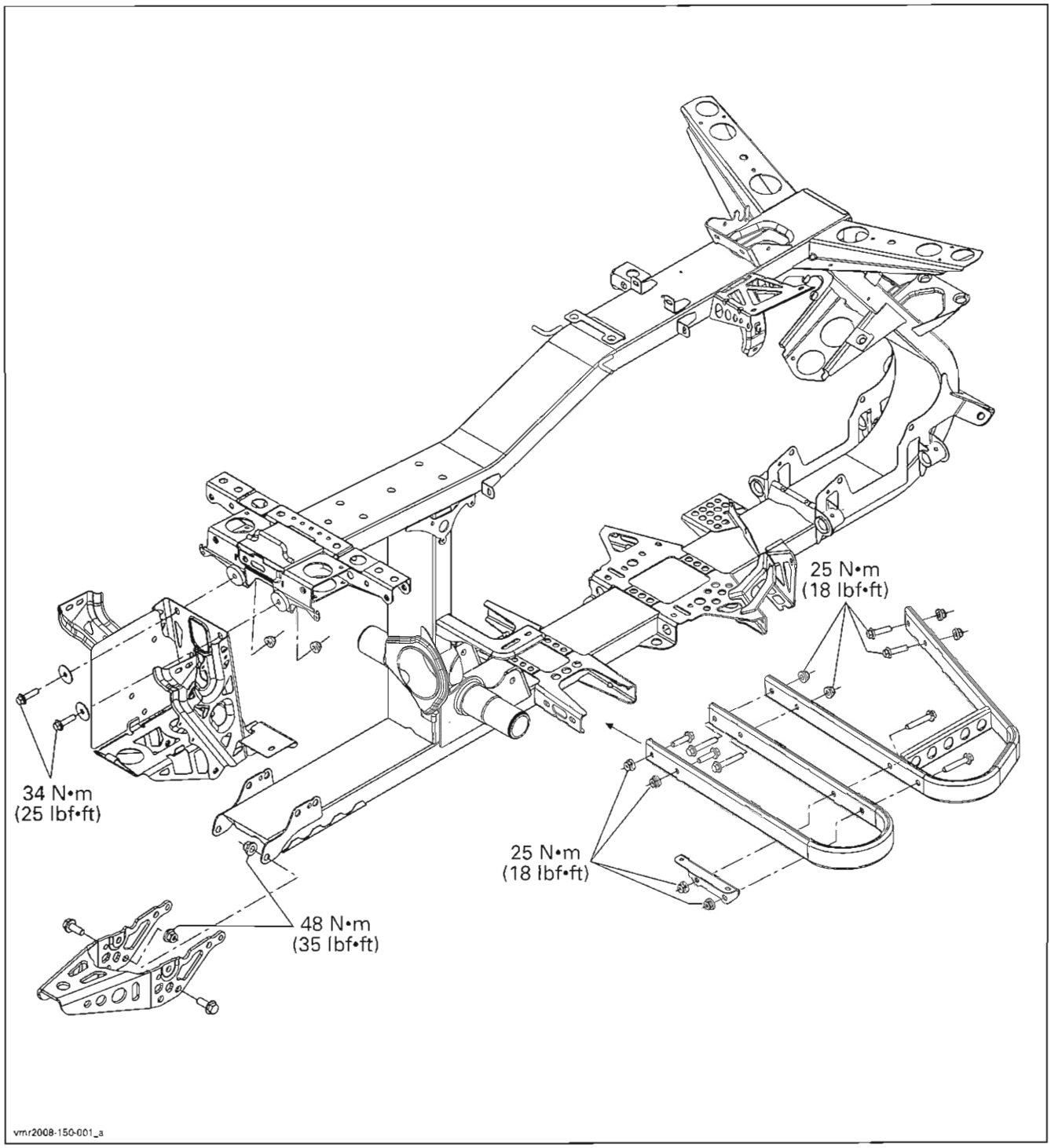


Fender Support Installation

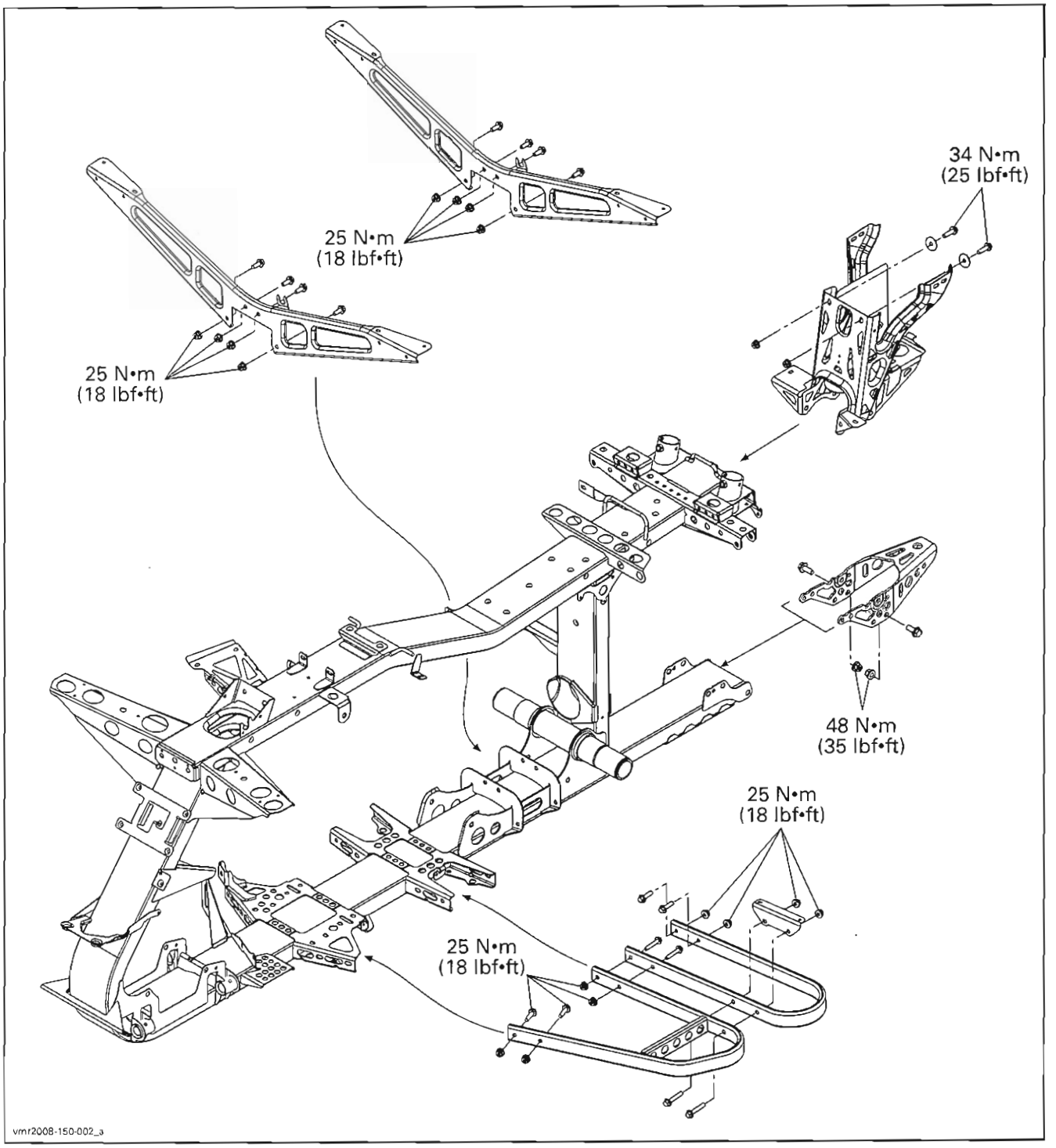
The installation is the reverse of removal procedure.

FRAME

Outlander 400 EFI and Outlander 400 EFI XT Models



Outlander MAX 400 EFI and Outlander MAX 400 EFI XT Models



GENERAL

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

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

⚠ WARNING

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

Hoses or cables removed or disconnected must be installed and routed at the same place.

PROCEDURES

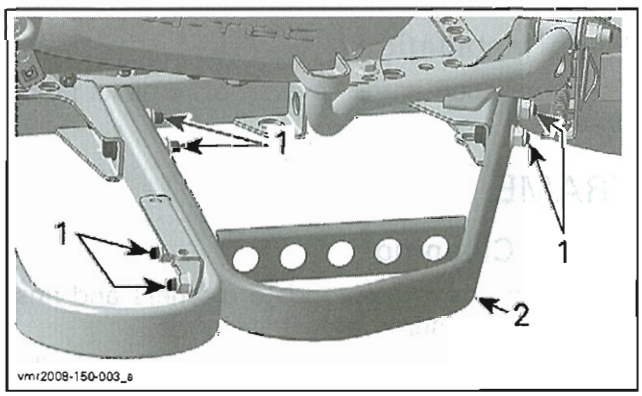
FOOTREST SUPPORTS

NOTE: Use the same procedure for RH or LH footrest supports.

Front Footrest Support Removal

Remove the appropriate footrest. Refer to *BODY* section.

Unscrew bolts securing front footrest support to frame and rear footrest support.



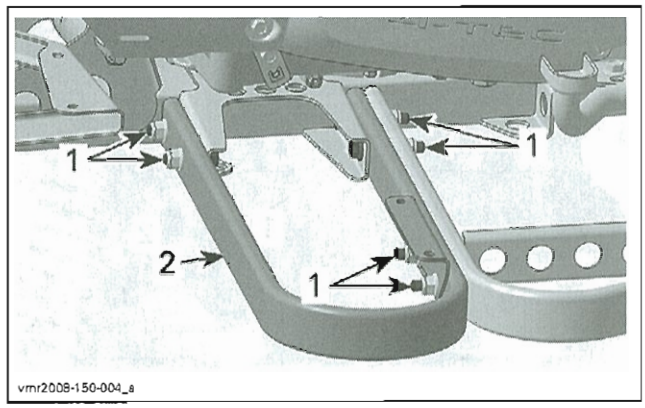
1. *Front footrest support bolts*
2. *RH front footrest support*

Remove the front footrest support.

Rear Footrest Support Removal

Remove the appropriate footrest. Refer to *BODY* section.

Unscrew the following bolts securing the rear footrest support to frame and front footrest support.



1. *Rear footrest support bolts*
2. *RH rear footrest support*

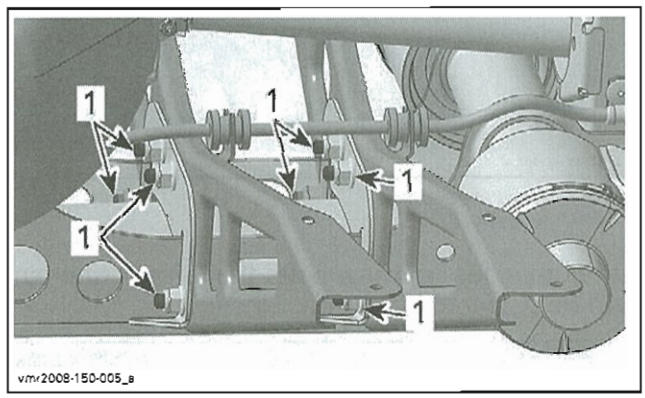
Passenger Footrest Support Removal

All MAX/MAX XT Models

Remove both footrests.

Detach rear brake hose from passenger footrest supports.

Unscrew passenger footrest support bolts.



1. *Passenger footrest support bolts*

Footrest Supports Inspection

Check footrest support(s) for cracks, bending or other damages. Replace if necessary.

Footrest Supports Installation

The installation is the reverse of removal procedure.

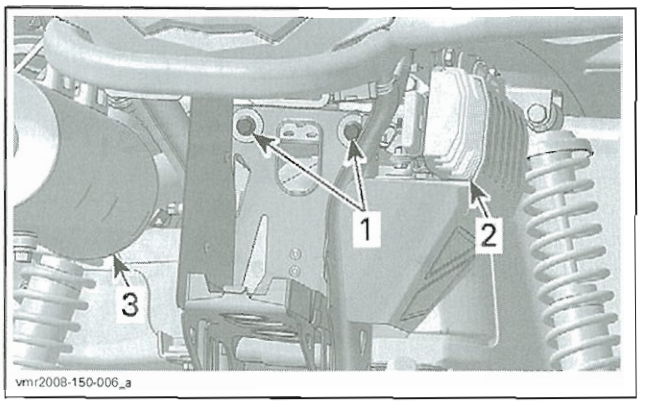
NOTE: Install all bolts before tightening.

BATTERY SUPPORT

Battery Support Removal

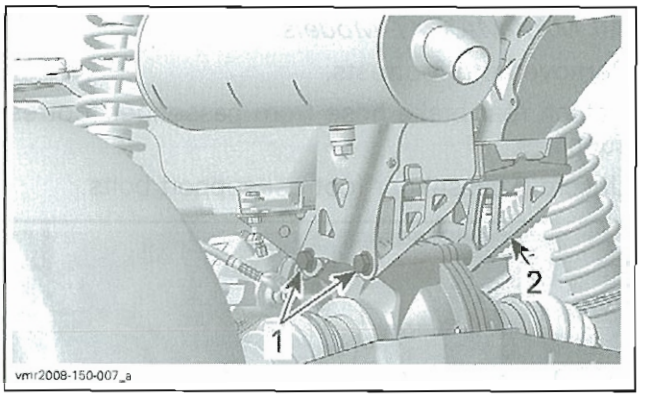
Remove battery (refer to *STARTING SYSTEM*).

Remove bolts retaining the top of battery support to frame.



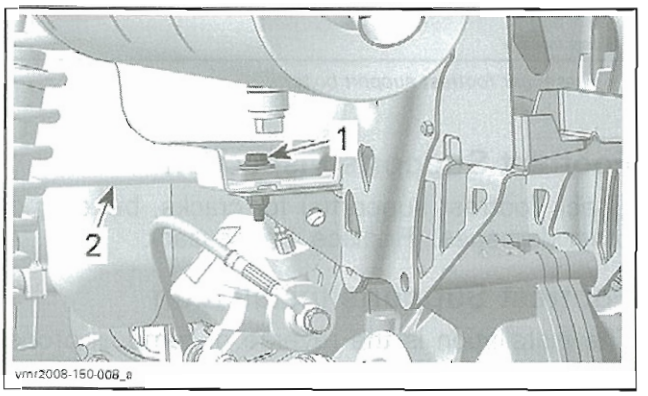
1. *Battery support upper bolts*
2. *Voltage regulator*
3. *Muffler*

Remove differential upper bolts.



1. *Differential upper bolts*
2. *Battery support*

On both sides, remove bolts that attach fuel tank and its protector to frame.



1. *LH fuel tank rear bolt*
2. *Protector*

Remove battery support from vehicle.

Battery Support Inspection

Check battery support for cracks or other damages. Replace if necessary.

Battery Support Installation

The installation is the reverse of removal procedure.

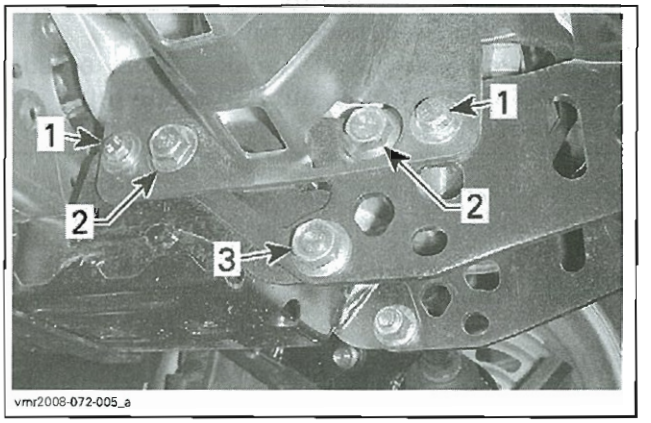
HITCH

Hitch Removal

Remove the differential protector.

Unscrew bolts retaining the hitch to frame.

Remove lower differential bolts.



1. *Differential protector bolts*
2. *Lower differential bolts*
3. *Hitch bolt*

Remove hitch from vehicle.

Hitch Inspection

Check hitch for cracks, bending or other damages. Replace if necessary.

Hitch Installation

The installation is the reverse of removal procedure.

FRAME

Frame Cleaning

Clean frame with appropriate cleaners and rinse with high pressure hose.

NOTE: Clean the draining holes under frame. The drain holes are located at the rear of bottom side of frame.

Touch up all metal spots where paint has been scratched off. Spray all bare metal parts of vehicle with metal protector.

Frame Welding

CAUTION: Before performing electrical welding anywhere on the vehicle, unplug the multiple connector at the electronic module connector. Also unplug the negative cable and the voltage regulator. This will protect the electronic module and battery against damage caused by flowing current when welding.

Use the following specifications for electric welding:

- Amperage: 70 - 110 A
- Voltage: 20 - 24 V
- Rod: E-7014 (3/32 in).

NOTE: Install the ground as close as possible from the reparation area.

CAUTION: If welding is to be done near plastic material, it is recommended to either remove the part from the area or to protect it with aluminum foil to prevent damage.

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OUTLANDER 400 EFI

MODEL				OUTLANDER™ 400 EFI			
				STANDARD	XT	MAX	MAX XT
ENGINE							
Engine type				ROTAX 400, 4-stroke, Single Over Head Camshaft (SOHC), liquid cooled			
Number of cylinder				1			
Number of valves				4 valves (mechanical adjustment)			
Bore			mm (in)	91 (3.58)			
Stroke			mm (in)	61.5 (2.42)			
Displacement			cm^3 (in^3)	400 (24.41)			
Compression ratio				10.3:1			
Decompressor type				Automatic			
Maximum HP RPM			RPM	7500			
Lubrication	Type			Wet sump with replaceable oil filter			
	Oil filter			BRP ROTAX paper type, replaceable			
	Engine oil pressure	Minimum	kPa (PSI)	350 (51) at 6000 RPM			
	Engine oil	Capacity (oil change with filter)	L (quarts)	3 (3.17) (engine/transmission)			
		Recommended		SAE 5W30 API classification SM, SL or SJ see *OIL VISCOSITY CHART* in the *OPERATOR'S GUIDE*			
Intake valve opening				15.00° BTDC			
Intake valve closing				45.00° ABDC			
Exhaust valve opening				50.00° BBDC			
Exhaust valve closing				10.00° ATDC			
Chain tensioner plunger protrusion		Service limit	mm (in)	20.0 (.7874)			
Valve clearance	Intake		mm (in)	0.06 to 0.14 (.0024 to .0055)			
	Exhaust		mm (in)	0.11 to 0.19 (.0043 to .0075)			
Valve stem diameter	Intake	New	mm (in)	4.966 to 4.980 (.1955 to .1960)			
		Service limit	mm (in)	4.930 (.1940)			
	Exhaust	New	mm (in)	4.956 to 4.970 (.1951 to .1957)			
		Service limit	mm (in)	4.930 (.1940)			
Valve guide diameter		New	mm (in)	4.998 to 5.018 (.1968 to .1976)			
		Service limit	mm (in)	5.050 (.1988)			
Valve spring free length		New	mm (in)	40.81 (1.607)			
		Service limit	mm (in)	39.00 (1.535)			
Valve seat contact width	Intake	New	mm (in)	1.05 to 1.35 (.041 to .053)			
		Service limit	mm (in)	1.8 (.07)			
	Exhaust	New	mm (in)	1.25 to 1.55 (.049 to .061)			
		Service limit	mm (in)	2 (.078)			
Piston measurement		New	mm (in)	90.950 to 90.966 (3.580 to 3.581)			
		Service limit	mm (in)	90.850 (3.577)			
Piston/cylinder clearance		New	mm (in)	0.027 to 0.057 (.0011 to .0022)			
		Service limit	mm (in)	0.1 (.004)			

MODEL				OUTLANDER™ 400 EFI			
				STANDARD	XT	MAX	MAX XT
ENGINE (cont'd)							
Piston ring type		1st		Upper compression ring, rectangular			
		2nd		Lower compression ring, taper-face			
		3rd		Oil scraper ring, standard			
Piston ring end gap	Upper compression ring	New	mm (in)	0.20 to 0.40 (.008 to .016)			
	Lower compression ring	New	mm (in)	0.20 to 0.40 (.008 to .016)			
	Oil scraper ring	New	mm (in)	0.20 to 0.70 (.008 to .028)			
	All	Service limit	mm (in)	1.5 (.06)			
Ring/piston groove clearance	Upper compression ring	New	mm (in)	0.030 to 0.070 (.0012 to .0028)			
	Lower compression ring	New	mm (in)	0.020 to 0.060 (.0008 to .0024)			
	Oil scraper ring	New	mm (in)	0.010 to 0.180 (.0004 to .0071)			
	Upper compression ring	Service limit	mm (in)	0.15 (.006)			
	Lower compression ring	Service limit	mm (in)	0.15 (.006)			
	Oil scraper ring	Service limit	mm (in)	0.25 (.0098)			
Rocker arm bore diameter		New	mm (in)	12.036 to 12.050 (.4739 to .4744)			
		Service limit	mm (in)	12.060 (.4748)			
Rocker arm shaft diameter		New	mm (in)	12.000 to 12.018 (.4724 to .4732)			
		Service limit	mm (in)	11.990 (.4720)			
Cylinder bore		Nominal new	mm (in)	90.993 to 91.007 (3.582 to 3.583)			
Cylinder taper		Maximum new	mm (in)	0.038 (.0015)			
		Service limit	mm (in)	0.090 (.0035)			
Cylinder out of round		Maximum new	mm (in)	0.015 (.0006)			
		Service limit	mm (in)	0.020 (.0008)			
Camshaft main bearing journal	PTO side	New	mm (in)	21.959 to 21.980 (.8645 to .8654)			
		Service limit	mm (in)	21.950 (.8642)			
	MAG side	New	mm (in)	34.959 to 34.975 (1.3763 to 1.3770)			
		Service limit	mm (in)	34.950 (1.3760)			
Camshaft main bearing journal bore	PTO side	New	mm (in)	22.000 to 22.021 (.8661 to .8670)			
		Service limit	mm (in)	22.040 (.8677)			
	MAG side	New	mm (in)	35.000 to 35.025 (1.3780 to 1.3789)			
		Service limit	mm (in)	35.040 (1.3795)			
Camshaft lobe	Intake	New	mm (in)	32.253 to 32.453 (1.2698 to 1.2777)			
		Service limit	mm (in)	32.235 (1.2691)			
	Exhaust	New	mm (in)	31.937 to 32.137 (1.2574 to 1.2652)			
		Service limit	mm (in)	31.920 (1.2567)			
Crankshaft axial clearance		New	mm (in)	0.1 to 0.4 (.0039 to .0157)			
Crankshaft deflection	MAG/PTO side	New	mm (in)	0.05 (.0020)			
Crankshaft pin diameter		New	mm (in)	40.009 to 40.025 (1.5752 to 1.5758)			
		Service limit	mm (in)	39.980 (1.5740)			

MODEL				OUTLANDER™ 400 EFI			
				STANDARD	XT	MAX	MAX XT
ENGINE (cont'd)							
Crankshaft main journal diameter	MAG/PTO side	New	mm (in)	42.024 to 42.040 (1.6545 to 1.6551)			
		Service limit	mm (in)	42.000 (1.6535)			
Crankcase plain bearing	MAG/PTO side	Service limit	mm (in)	42.070 (1.6563)			
Crankshaft radial play	MAG/PTO side	Service limit	mm (in)	0.070 (.0028)			
Connecting rod big end diameter		New	mm (in)	40.020 to 40.051 (1.5756 to 1.5768)			
		Service limit	mm (in)	40.100 (1.5787)			
Connecting rod big end radial play		Service limit	mm (in)	0.090 (.0035)			
Connecting rod big end axial play		New	mm (in)	0.100 to 0.352 (.004 to .014)			
		Service limit	mm (in)	0.500 (.020)			
Connecting rod small end diameter		New	mm (in)	20.010 to 20.020 (.7878 to .7882)			
		Service limit	mm (in)	20.060 (.7898)			
Piston pin diameter		New	mm (in)	19.996 to 20.000 (.7872 to .7874)			
		Service limit	mm (in)	19.980 (.7866)			
Connecting rod small end radial clearance		Service limit	mm (in)	0.080 (.0035)			
GEARBOX							
Type				Dual range (HI-LO) with park, neutral and reverse			
Output shaft axial clearance		Service limit	mm (in)	0.300 (.0120)			
Bevel gear axial clearance		New	mm (in)	0.020 to 0.110 (.0008 to .0043)			
		Service limit	mm (in)	0.150 (.0059)			
Gear groove width		New	mm (in)	5.000 to 5.100 (.1968 to .2008)			
		Service limit	mm (in)	5.200 (.2047)			
Main shaft	MAG side	Service limit	mm (in)	17.990 (.7083)			
	PTO side			24.950 (.9823)			
Bevel gear shaft	PTO side	Service limit	mm (in)	24.990 (.9839)			
Shift fork claw thickness		New	mm (in)	4.800 to 4.860 (.1890 to .1913)			
		Service limit	mm (in)	4.750 (.1870)			
COOLING SYSTEM							
Type				Liquid cooled, single radiator with cooling fan			
Coolant	Type			Ethyl glycol/water mix (50% coolant, 50% water). Use premixed coolant sold by BRP (P/N 219 700 362) or coolant specifically designed for aluminum engines			
	Capacity		L (quarts)	2.9 (3.06)			
Thermostat	Opening temperature		°C (°F)	65 (149)			
Radiator cap opening pressure			kPa (PSI)	110 (16)			

MODEL				OUTLANDER™ 400 EFI			
				STANDARD	XT	MAX	MAX XT
ELECTRICAL SYSTEM							
Magneto generator output				400 W @ 6000 RPM			
Ignition system type				IDI (Inductive Discharge Ignition)			
Ignition timing				Not adjustable			
Spark plug	Quantity			1			
	Make and type			NGK DCPR8E			
	Gap		mm (in)	0.7 to 0.8 (.028 to .032)			
Crankshaft position sensor (CPS)			Ω	774 to 946 @ 20°C (68°F)			
Engine RPM limiter setting	Forward		RPM	8000			
	Reverse		RPM	4250			
Battery	Type			Maintenance free			
	Model			YTX20HL-BS			
	Voltage			12 volts			
	Nominal rating			18 A•h			
Headlight			W	2 x 35			
Taillight/brake light			W	8/27			
Turn signal lights (CE models)			W	10			
Fuses	Accessories		A	20			
	Fan		A	20			
	Main 1		A	30			
	Main 2		A	30			
	Fuel system		A	7.5			
	Ignition system		A	7.5			
	Solenoids/Gauges		A	7.5			
	ECM		A	5			
FUEL SYSTEM							
Fuel delivery				Electronic Fuel Injection (EFI)			
Throttle body				Dell'Orto 46 mm			
Fuel pump	Type			Electric fuel pump in fuel tank			
	Operating pressure		kPa (PSI)	350 (51)			
Idle speed			RPM ± 50	1300 (not adjustable)			
Fuel	Type			Regular unleaded gasoline			
	Octane rating	Inside North America	(R+M)/2	87 or higher			
		Outside North America	RON	92 or higher			
Fuel tank capacity			L (U.S. gal)	20 (5.3)			
Fuel tank reserve			L (U.S. gal)	2 (0.6)			

MODEL				OUTLANDER™ 400 EFI			
				STANDARD	XT	MAX	MAX XT
DRIVE SYSTEM							
Engagement RPM			± 100 RPM	2000			
Front differential				Shaft driven/single Auto-lock differential (pump driven)			
Front differential ratio				3.6:1			
Rear axle				Shaft driven/single differential			
Rear axle ratio				3.6:1			
Differential oil	Capacity	Front	ml (U.S. oz)	500 (17)			
		Rear	ml (U.S. oz)	250 (8.5)			
	Recommended			BRP differential oil (P/N 293 600 043) or synthetic oil 75W90 (API GL5)			
CV joint grease				CV joint grease (P/N 293 550 019)			
Propeller shaft grease				XP-S synthetic grease (P/N 293 550 010)			
TRANSMISSION							
Transmission type				CVT (Continuously Variable Transmission)			
Engagement RPM			± 100 RPM	1450			
Drive belt width		New	mm (in)	32.00 (1.260)			
		Service limit	mm (in)	30.00 (1.181)			
Governor cup roller outer diameter		New	mm (in)	13.70 to 13.90 (.539 to .547)			
		Service limit	mm (in)	13.20 (.519)			
One-way clutch bushing diameter		New	mm (in)	39.990 to 40.085 (1.574 to 1.578)			
		Service limit	mm (in)	40.100 (1.579)			
Centrifugal lever pivot bolt diameter		New	mm (in)	6.078 to 6.100 (.239 to .240)			
		Service limit	mm (in)	6.000 (.236)			
Centrifugal lever bore diameter		Service limit	mm (in)	6.200 (.244)			
Centrifugal lever pivot bolt bore diameter		New	mm (in)	6.113 to 6.171 (.241 to .243)			
		Service limit	mm (in)	6.300 (.248)			
Drive pulley sliding sheave large bushing		New	mm (in)	55.000 to 55.020 (2.165 to 2.166)			
		Service limit	mm (in)	55.200 (2.173)			
Drive pulley sliding sheave small bushing		New	mm (in)	30.000 to 30.040 (1.181 to 1.183)			
		Service limit	mm (in)	30.200 (1.189)			
Driven pulley sliding sheave bushing		New	mm (in)	30.060 to 30.100 (1.183 to 1.185)			
		Service limit	mm (in)	30.200 (1.189)			
Driven pulley fixed sheave bushing		New	mm (in)	30.060 to 30.100 (1.183 to 1.185)			
		Service limit	mm (in)	30.200 (1.189)			
Torque gear on driven pulley		Service limit	mm (in)	7.500 (.295)			

MODEL			OUTLANDER™ 400 EFI			
			STANDARD	XT	MAX	MAX XT
STEERING						
Turning radius		m (ft)	1.83 (6)		2.0 (6 ft – 7 in)	
Total toe (vehicle on ground)		mm (in)	0 ± 4 (0 ± .157)			
Camber angle			0°			
Tie-rod maximum length unengaged threads		mm (in)	17.5 ± 5 (11/16 ± 3/16)			
FRONT SUSPENSION						
Suspension type			MacPherson struts			
Suspension travel		mm (in)	178 (7)			
Shock absorber	Quantity		2			
	Type		Oil			
Spring free length		mm (in)	354 (13-15/16)		375 (14-3/4)	
Spring color code			Red/Yellow/Red		Silver/Yellow/Gold	
Front preload adjustment			N.A.			
REAR SUSPENSION						
Suspension type			TTI™ independent			
Suspension travel		mm (in)	203 (8)			
Shock absorber	Quantity		2			
	Type		Oil			
Spring free length		mm (in)	371 (14-3/8)		413 (16-1/4)	
Spring color code			Blue/White/Blue		Silver/Blue/Yellow	
Rear preload adjustment			5 settings			
BRAKES						
Front brake	Quantity		2			
	Type		Hydraulic, discs			
Rear brake	Quantity		1			
	Type		Hydraulic, disc			
Brake fluid	Capacity	ml (U.S. oz)	125 (4.3)			
	Type		DOT 4			
Parking brake			Hydraulic lock-4 wheels			
Caliper			Floating			
Brake pad material	Front		Organic			
	Rear		Metallic			
Minimum pad thickness		mm (in)	1 (.04)			
Minimum brake disc thickness	Front	mm (in)	3.5 (.138)			
	Rear	mm (in)	4.3 (.17)			
Maximum brake disc warpage		mm (in)	0.2 (.01)			

MODEL				OUTLANDER™ 400 EFI			
				STANDARD	XT	MAX	MAX XT
TIRES AND WHEELS							
TIRES							
Pressure	Front		Maximum	34 kPa (5 PSI)		34 kPa (5 PSI)	
			Minimum	31 kPa (4.5 PSI)		31 kPa (4.5 PSI)	
	Rear		Maximum	34 kPa (5 PSI)		34 kPa (5 PSI)	
			Minimum	31 kPa (4.5 PSI)		31 kPa (4.5 PSI)	
Minimum tire thread depth			mm (in)	3 (1/8)			
Size			Front	25 x 8 x 12			
			Rear	25 x 10 x 12	25 x 11 x 12	25 x 10 x 12	25 x 11 x 12
WHEELS							
Size			Front	12 x 6			
			Rear	12 x 7.5			
DIMENSION							
Overall length			m (in)	2.18 (86)		2.39 (94)	
Overall width			m (in)	1.17 (46)			
Overall height			m (in)	1.14 (45)			
DIMENSION (cont'd)							
Wheelbase			m (in)	1.24 (49)		1.45 (57)	
Wheel track	Front		mm (in)	965 (38)			
	Rear		mm (in)	914 (36)			
Ground clearance			mm (in)	236 (9.3)			
WEIGHT AND LOADING CAPACITY							
Dry weight			kg (lb)	279 (615)		302 (665)	
Weight distribution (front/rear)			%	49/51	48/52	46/54	
Rear storage box (included with rear rack weight)			kg (lb)	10 (22)			
Rack	Front		kg (lb)	45 (100)			
	Rear (including rear storage box and tongue weight)		kg (lb)	90 (200)			
Total vehicle load allowed (including driver, all other loads and added accessories)			kg (lb)	227 (500)		235 (517)	
Gross vehicle weight rating			kg (lb)	460 (1014)		554 (1219)	
Towing capacity			kg (lb)	500 (1100)			
Tongue capacity (included with rear rack weight)			kg (lb)	14 (30)			
MATERIAL							
Frame	Material			Steel			
	Color			Black			
Wheel	Material			Steel	Aluminum	Steel	Aluminum
	Color			Silver	Aluminum	Silver	Aluminum
Front/rear rack	Material			Steel			
	Color			Black			
Front bumper	Material			Aluminum			
	Color			Aluminum			

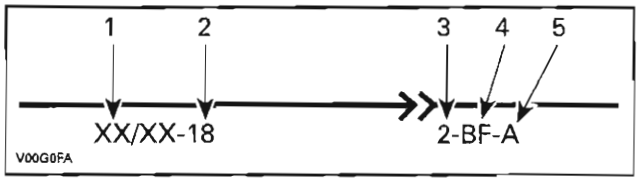
MODEL		OUTLANDER™ 400 EFI			
		STANDARD	XT	MAX	MAX XT
MATERIAL (cont'd)					
Front/rear fender	Material	High density polyethylene			
	Color	Yellow/Laurentian green/Viper red			
Inner fender	Material	High density polyethylene			
	Color	Black			
Fuel tank	Material	High density polyethylene			
	Color	Black			
CVT cover	Material	High density polyethylene			
	Color	Black			
Fuel tank protector(s)	Material	High density polyethylene			
	Color	Black			
Steering cover	Material	Polypropylene			
	Color	Black			
Storage compartment cover	Material	Polypropylene (glass fiber-reinforced)			
	Color	Black			
Front fascia	Material	High density polyethylene			
	Color	Yellow/Laurentian green/Viper red			
Front skid plate	Material	High density polyethylene			
	Color	Black			
Side panel	Material	High density polyethylene			
	Color	Yellow/Laurentian green/Viper red			
Foot rest	Material	High density polyethylene			
	Color	Black			
Console	Material	High density polyethylene			
	Color	Yellow/Laurentian green/Viper red			
Air filter housing cover	Material	Polypropylene (glass fiber-reinforced)			
	Color	Black			
Air filter housing	Material	Polypropylene (glass fiber-reinforced)			
	Color	Black			
Transmission lever locator	Material	Polypropylene (glass fiber-reinforced)			
	Color	Black			
Suspension arm protector	Material	Polypropylene			
	Color	Black			
Engine cover	Material	High density polyethylene			
	Color	Black			
Seat base	Material	Polypropylene			
	Color	Black			
Seat cover	Material	Thermoformed vinyl			
	Color	Black			

OUTLANDER 400 EFI

WIRING DIAGRAM INFORMATION

NOTE: The wiring diagrams are in the manual back cover pocket.

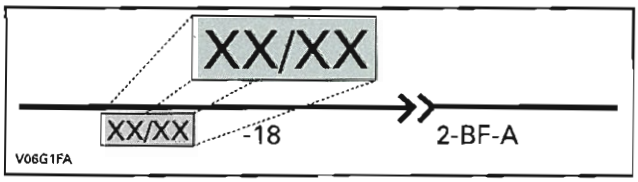
The wiring diagrams use the following codes.



1. *Wire colors*
2. *Wire gauge*
3. *Connector location area*
4. *Connector identification*
5. *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.

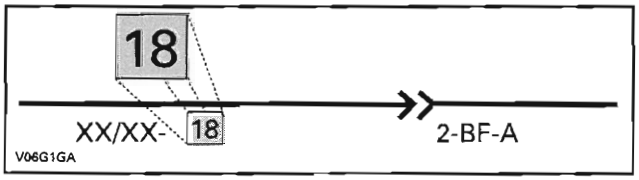


THE SHADED PART INDICATES THE WIRE COLOR

Example: YL/BK is a YELLOW wire with a BLACK stripe.

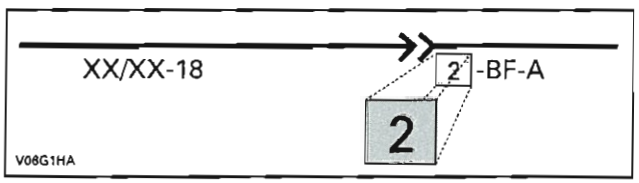
Wire Gauge

The number after wire color indicates the gauge of a wire.

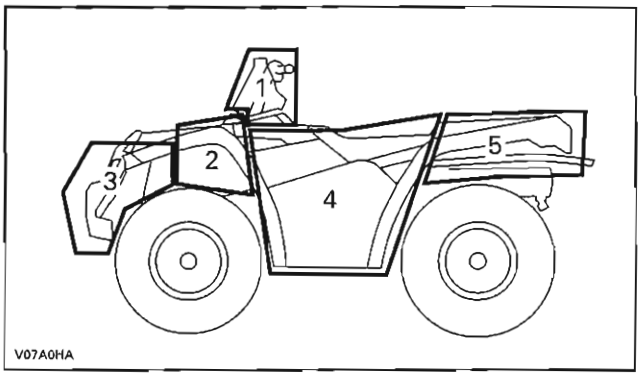


THE SHADED PART INDICATES THE WIRE GAUGE

Connector Location Area



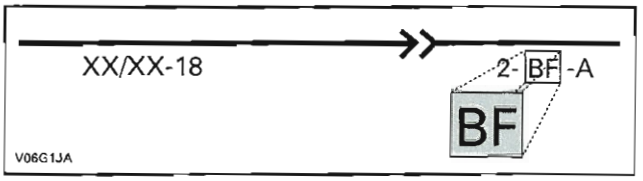
THE SHADED PART INDICATES THE CONNECTOR LOCATION AREA



AREA	LOCATION
1	Steering area
2	ECM area
3	Front of vehicle
4	Engine area
5	Rear of vehicle

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.

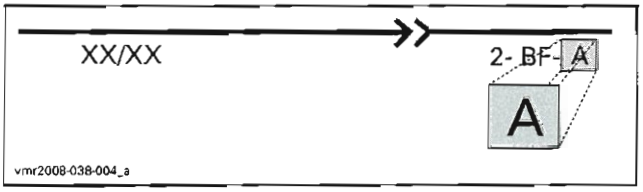


THE SHADED PART INDICATES A CONNECTOR IDENTIFICATION

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.

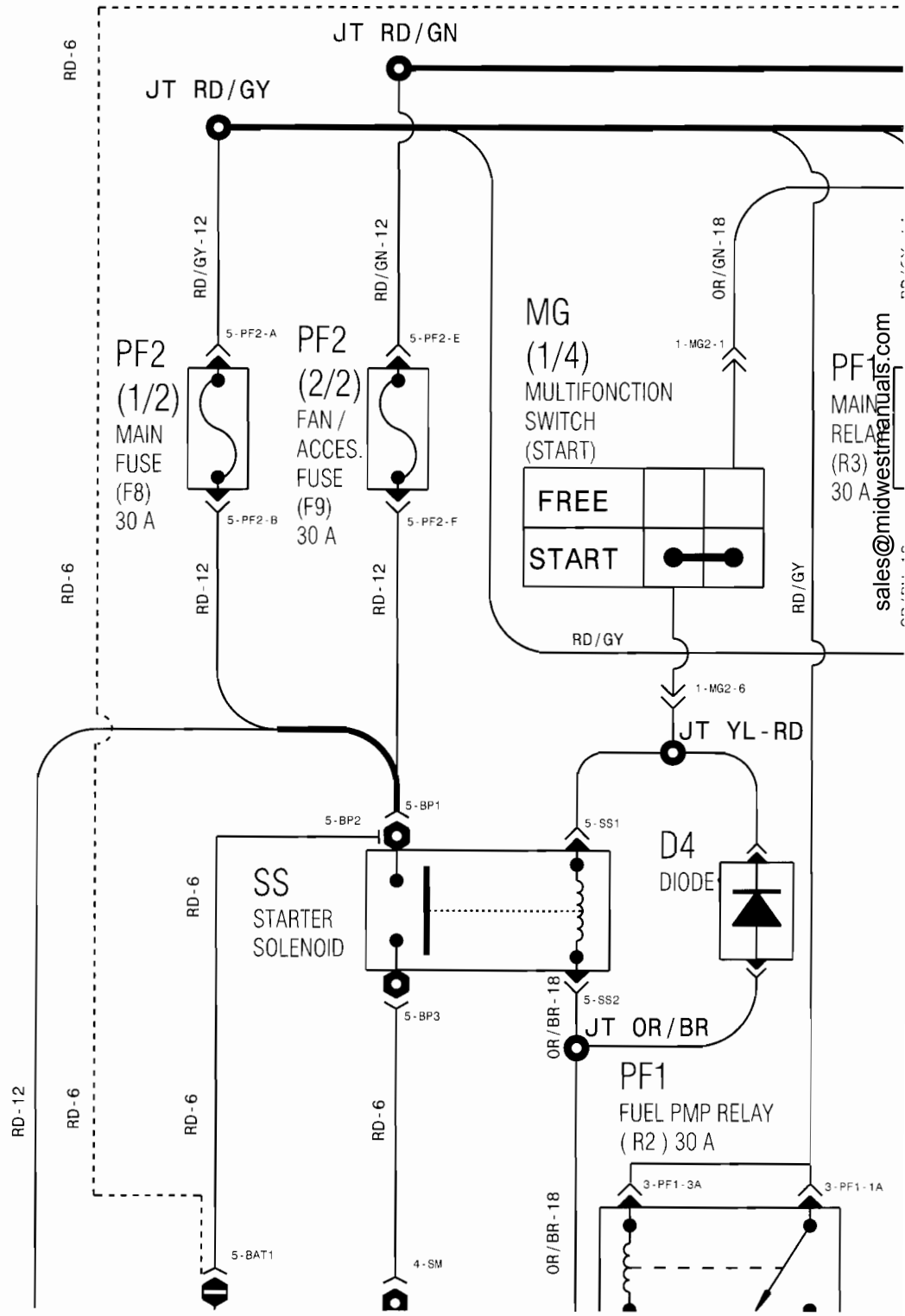
NOTE: If no letter or number is indicated on the connector, they are indicated where there is a specific test using this connector.

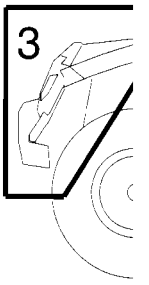


THE SHADED PART INDICATES THE TERMINAL LOCATION IN CONNECTOR

2008 OUTLANDER 400 EFI

GENERAL SYSTEM





JT OR/GN

RD/GY-14

OR/GN-14

RD/GN-14

3-PF1-12D

3-PF1-10D

3-PF1-6C

3-PF1-3D

PF1
RELAYS
SPEEDO
FUSE
(F4)
7.5 A

PF1
FAN
RELAY
(R1)
30 A

3-PF1-10E

3-PF1-12E

3-PF1-7C

3-PF1-1E

RD/BE-14

RD/BE-14

JT RD/BE

3-PF1-6E

PF1
ECM
FUSE
(F1)
5 A

3-PF1-7E

IGNITION SWITCH
(1/2)

OFF

ON

1-CC-C

1-CC-D

BE

OR/YL

1-MG1-1

BE-18

MULTIFONCTION
SWITCH
(3/4)

STOP

RUN

BK

BK/WH

1-MG1-2

2-HIC2-B

RD/BE-14

3-PF1-5E

PF1
IGN. &
INJ.
FUSE
(F3)
7.5 A

3-PF1-4E

2-HIC2-C

VI/BU-16

VI/BU

4-BA-2

IGNITION
COIL

4-BA-1

BR/OR-16

BK

3-PF1-9

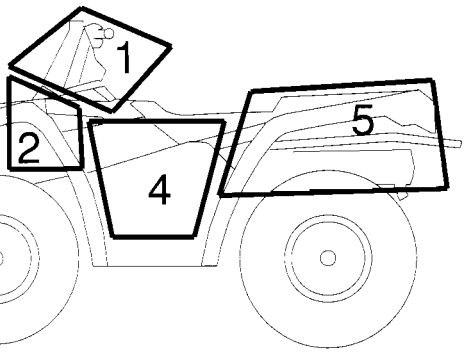
PF1
COOLING
FAN
FUSE
(F2)
20 A

3-FT-B

BU-16

FT
COOLING
FAN

M



TERMINAL IDENTIFICATION

	NAME	ZONE-CONNECTOR NAME-TERMINAL #
EX:	CI	1 - CI - 15
EX:	CV	4 - CV - A
EX:	ME	2 - ME

CI
MULTIFUNCTION
GAUGE

RD/GY-16
1-CI-9
OR/GN-18
1-CI-17
P
RD
FUEL
YL
ENGINE
YL
4WD
BU
HI
BEAM
1-CI-21
1-CI-4
1-CI-19
1-CI-18
1-CI-7
1-CI-5
1-CI-20
VI/PK-18
BR/PK-18
WH/BE-18
BE/GN-18
BK/BE-18
BU-18
BK-18

BD
2WD/4WD
SWITCH
1-BD-5
1-BD-6
1-BD-3
1-BD-1
BK-18
WH/BK-18
WH-18
WH/BU-18
RD/BK-18
4-MD-1
4-MD-4
4-MD-2
M
MD
2WD/4WD
ACTUATOR
RD/BK-18

SD
2WD/4WD
ACTUATOR
SWITCH
4-SD

5-FP-1
5-FP-2
FP (2/2)
FUEL
LEVEL
SENSOR

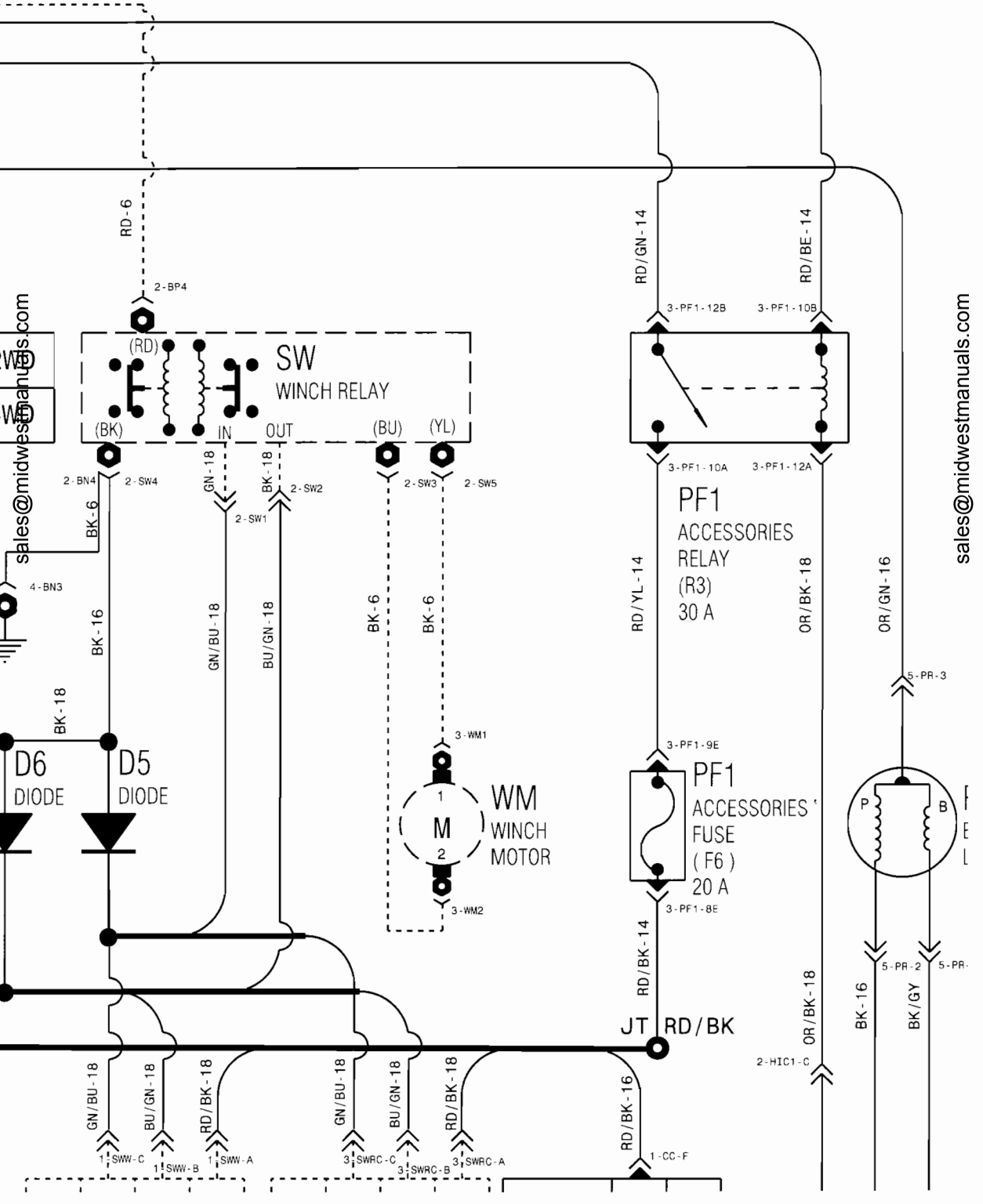
JT BE/GN

RD/GY-16
BE/GN-18
WH/BE-18
BE/GN-18
RD/BK-16
3-DB-5
3-DB-4
3-DB-2
1-DC3-2

18	19	20	21	22	23	

AWG	MAX. CURRENT	MAX. FUSE CURRENT	MAX. WATT
# 6	100 amps	125 amps	1450 watts
# 8	65 amps	80 amps	930 watts
# 10	40 amps	50 amps	580 watts
# 12	25 amps	30 amps	365 watts
# 14	16 amps	20 amps	230 watts
# 16	10 amps	15 amps	145 watts
# 18	6 amps	7.5 amps	85 watts
* AT	50°C MAX		

ZONE #	ZONE DESCRIPTION
1	STEERING AREA
2	MODULE AREA
3	FRONT OF VEHICLE
4	ENGINE AREA
5	REAR OF VEHICLE



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24	25	26	27	28

●	WELDED JOINT
	SHRINKED JOINT
	CROSSED WIRE
	WIRE BUS
	SIMPLE CONDUCTOR WIRE
	FEMALE TERMINAL
	MALE TERMINAL
	STEEL LINK (FRAME)
	TERMINAL

	FRAME GROUND
	EGINE GROUND
	PHILLIPS SCREW
	NUT CONNECTION
	SPLICE CONNECTION
	COMPONENT CONNECTION
	SECTION OF MODULE
	SLOTTED SCREW
– –	OPTIONAL

COLOR CODE	
BE	BEIGE
BK	BLACK
BU	BLUE
BR	BROWN
GN	GREEN
GY	GREY
OR	ORANGE
RD	RED
VI	VIOLET
WH	WHITE
YL	YELLOW
PK	PINK
LT BU	LIGHT BLUE

P

N

M

L

K

J

H

PR
RAKE
GHT

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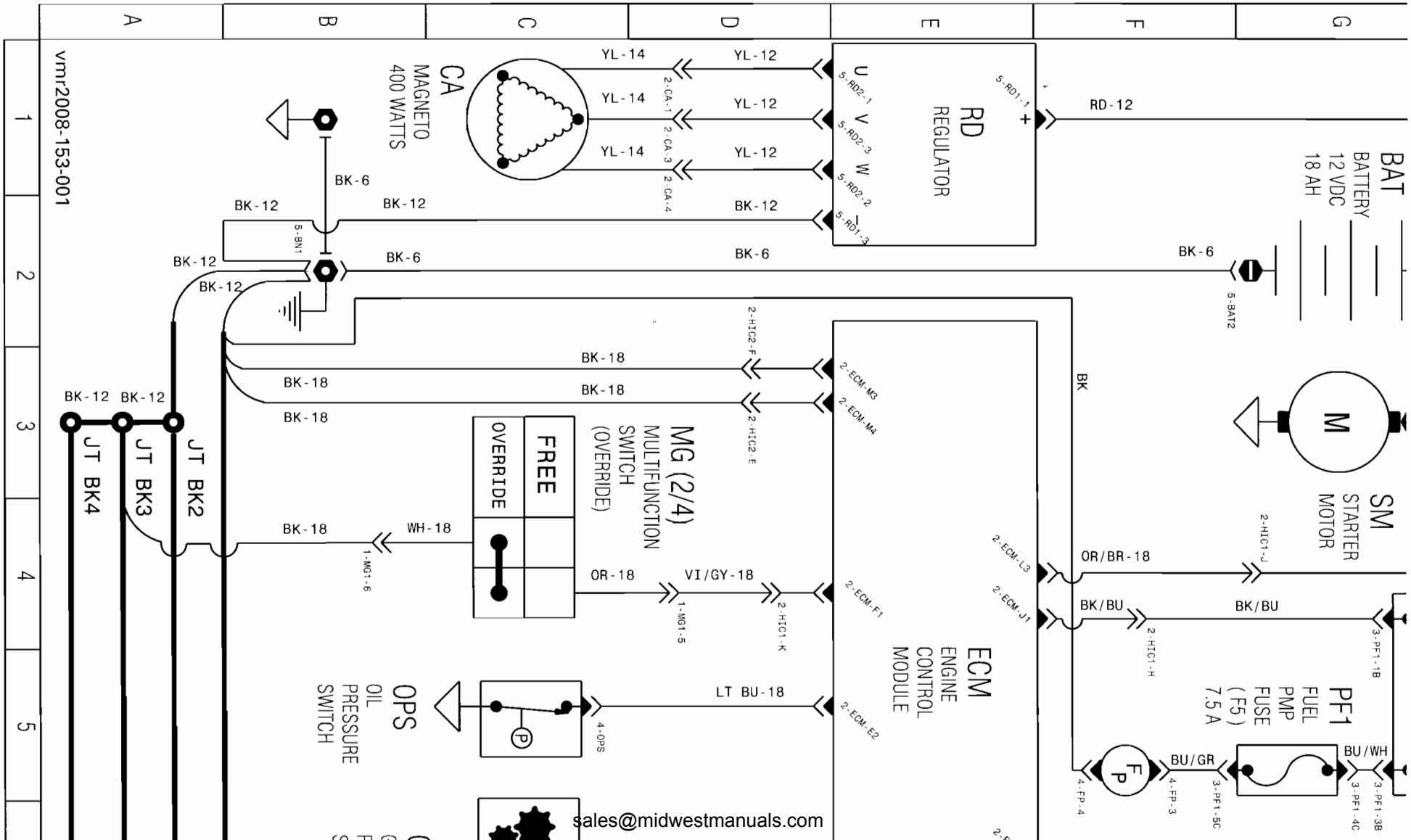

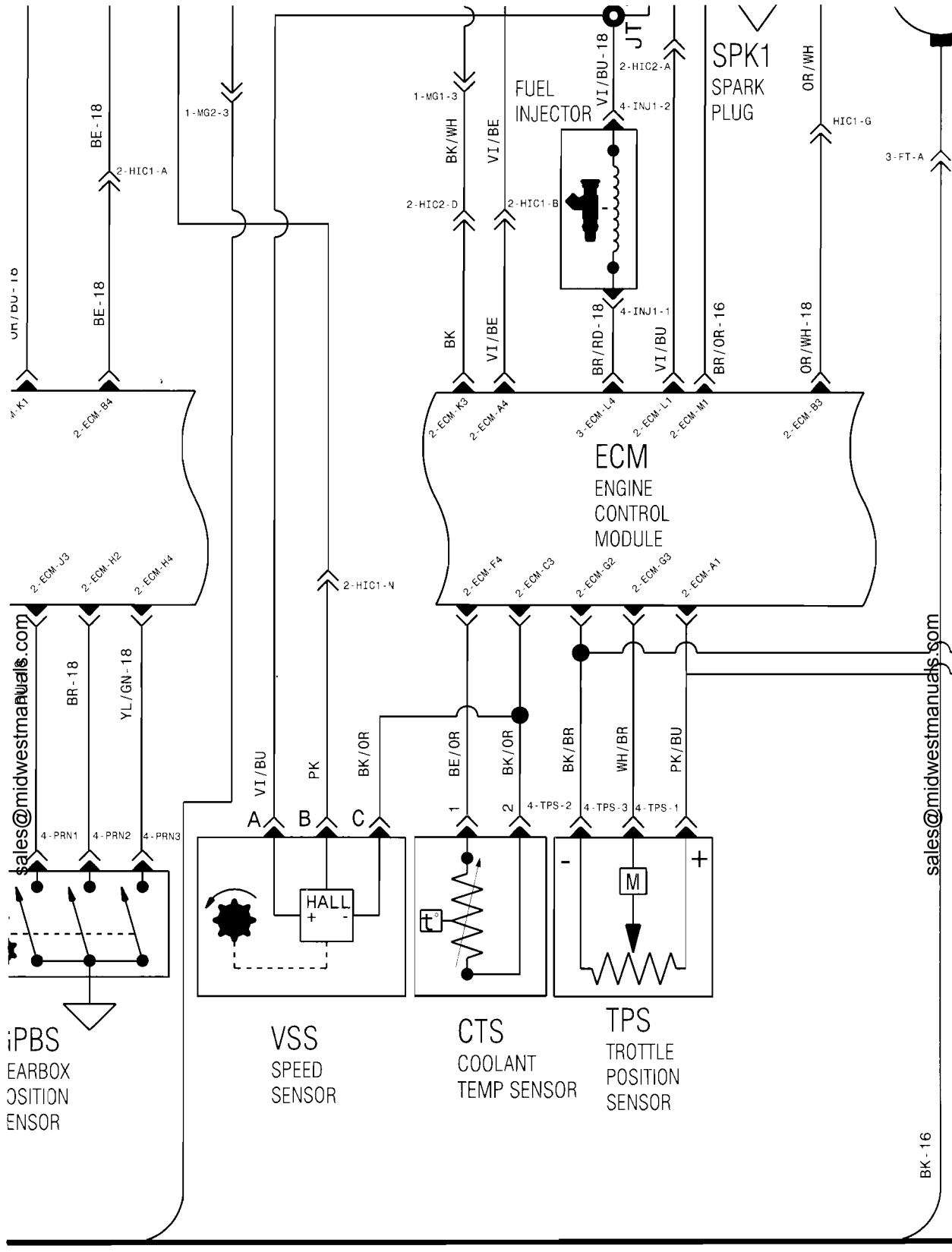
FUEL INJECTOR
SPK1
SPARK PLUG
ECM
ENGINE CONTROL MODULE
VSS
SPEED SENSOR
CTS
COOLANT TEMP SENSOR
TPS
THROTTLE POSITION SENSOR
iPBS
EARBOX
OSITION
ENSOR
HALL
M
1-MG1-3
1-MG2-3
2-HIC1-A
2-HIC1-B
2-HIC1-G
2-HIC1-N
2-HIC2-A
2-HIC2-D
3-FT-A
4-INJ1-1
4-INJ1-2
2-ECM-K3
2-ECM-A4
3-ECM-L4
2-ECM-L1
2-ECM-M1
2-ECM-B3
2-ECM-F4
2-ECM-C3
2-ECM-G2
2-ECM-G3
2-ECM-A1
2-ECM-J3
2-ECM-H2
2-ECM-H4
2-ECM-B4
4-PRN1
4-PRN2
4-PRN3
4-TPS-2
4-TPS-3
4-TPS-1
BE-18
BK/WH
VI/BE
BK
VI/BE
BR/RD-18
VI/BU-18
VI/BU
BR/OR-16
OR/WH
OR/WH-18
BR-18
YL/GN-18
VI/BU
PK
BK/OR
BE/OR
BK/OR
BK/BR
WH/BR
PK/BU
BK-16
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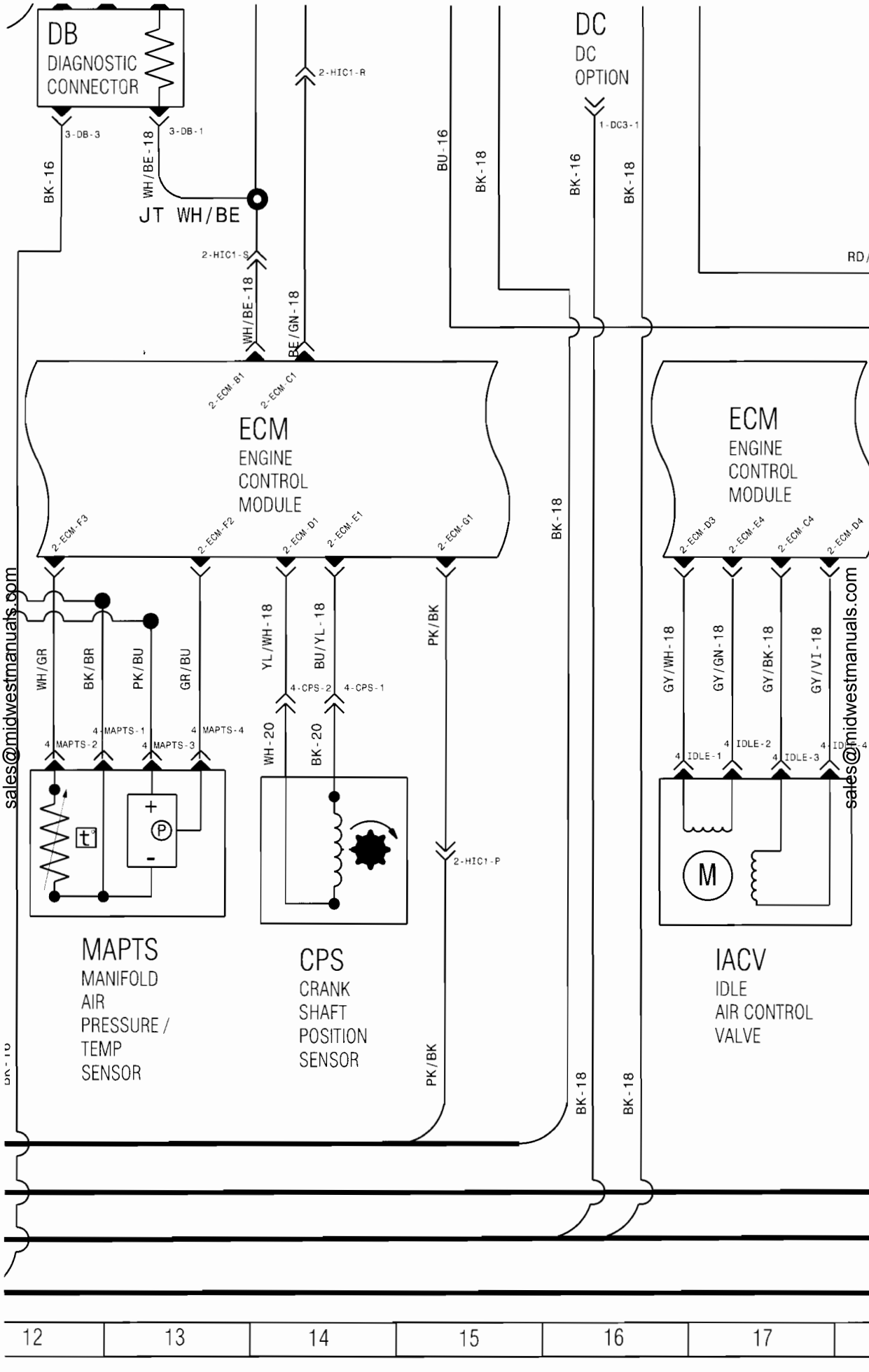
6	7	8	9	10	11	



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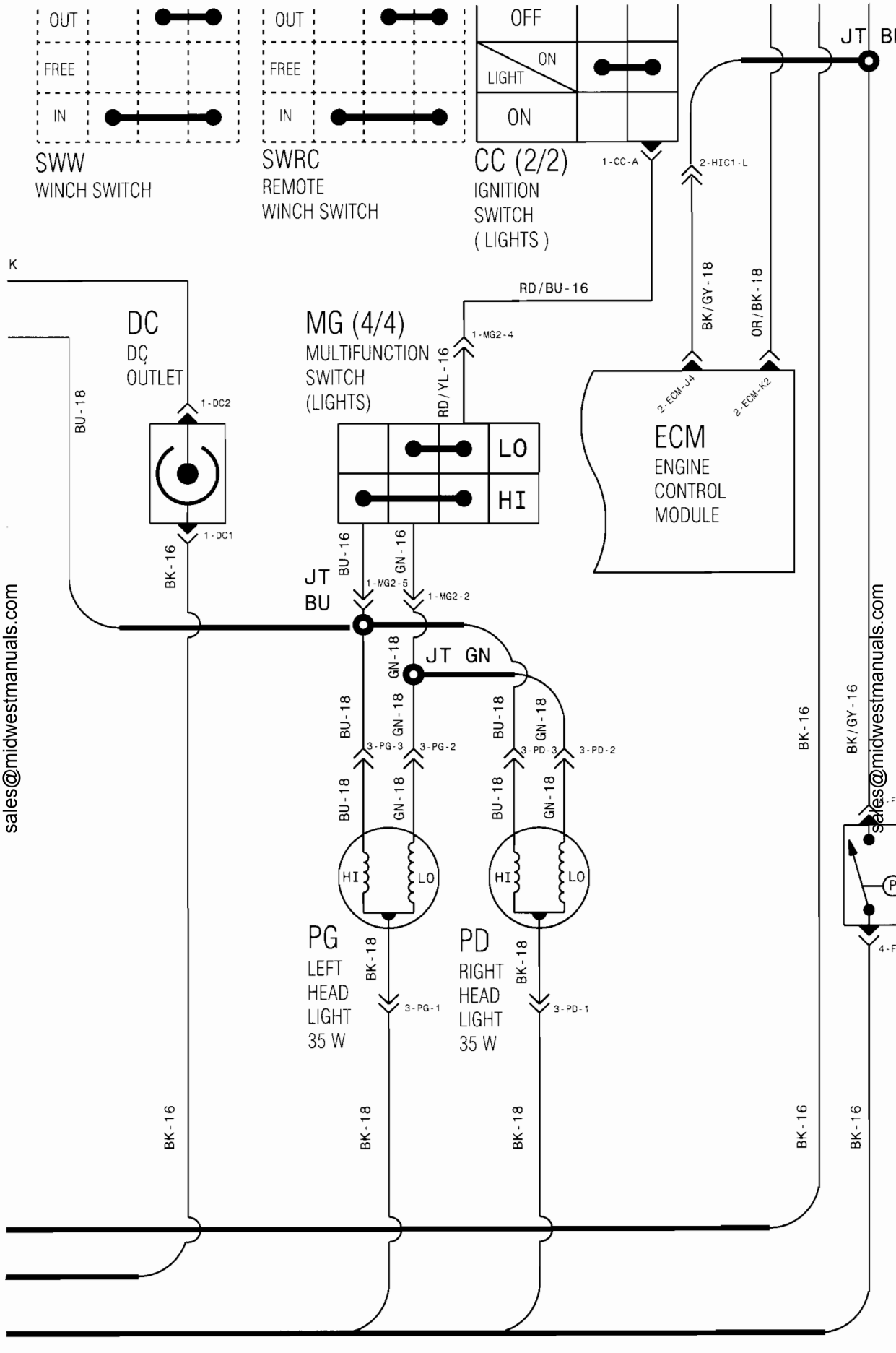
12	13	14	15	16	17	



18	19	20	21	22	23

:/GY

FRA
BRAKE
LIGHT
SWITCH

A1

710001171F1

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G F E D C B A

24 25 26 27 28

ATV
SERVICE
Bulletin

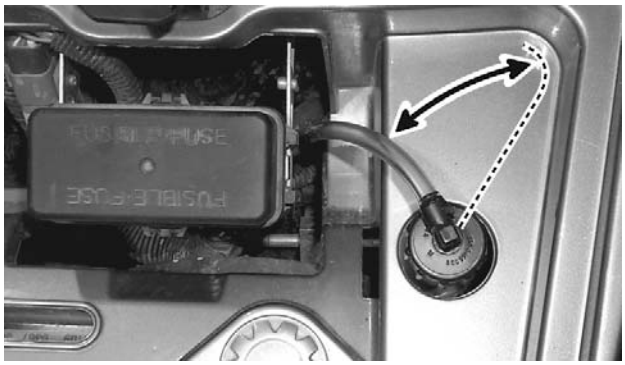
August 29, 2008 Subject: **Outlander XT and LTD** No. **2009-7**

Radiator Expansion Bottle Vent Tube Routing

YEAR	MODEL	PACKAGE	MODEL NUMBER	SERIAL NUMBER
2009	Outlander™	XT™ and LTD	All	All

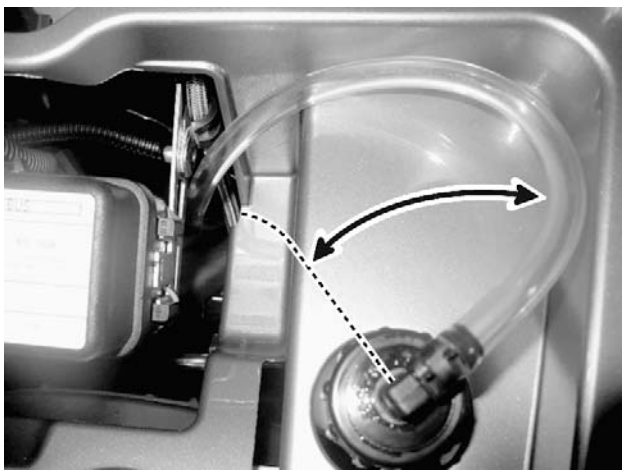
When servicing the above-mentioned vehicles, it is important to pay special attention to the radiator expansion bottle vent tube routing.

Located in the front maintenance compartment, this vent tube needs to be routed **between the routings** shown in the following pictures.



vbs2008-014 006_c

SHORT ROUTING



vbs2009-009-002_a

LONG ROUTING

This action is to avoid any interference, when closing cover, with the winch remote control storage compartment located under the cover.

vbs2009-009-001_a

NOTICE Not doing so could cause a restriction to the vent tube which may lead to over pressure in the engine cooling system.

NOTE: It is not recommended to store articles such as a rain coat, ropes or other objects in the front service compartment; such items could interfere with components normal operation.

NOTICE Make sure to keep end of tube away from any component that could be affected should antifreeze drip on it, such as brake disc, etc.

NOTE: This special attention also applies when servicing vehicles modified as per *SERVICE BULLETIN 2008-14*, dated May 5, 2008.

Please notify all involved personnel.

ATV SERVICE Bulletin

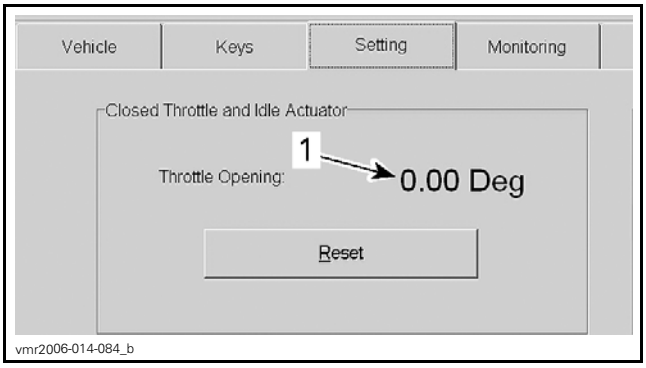
September 24, 2008 Subject: **Throttle Plate Opening (All Models Except CE)** No. **2009-8**

YEAR	MODEL	MODEL NUMBER	SERIAL NUMBER
2009	Outlander™ and Renegade™	All	All

To ensure optimum engine performance on vehicles produced before October 2008, at PDI, the throttle plate opening should be checked using B.U.D.S.

THROTTLE PLATE OPENING VERIFICATION

1. Using B.U.D.S. software, select the **Setting** tab. The display shows the actual throttle opening in degrees.



1. Throttle opening display

NOTE: Do not click on the **Reset** button.

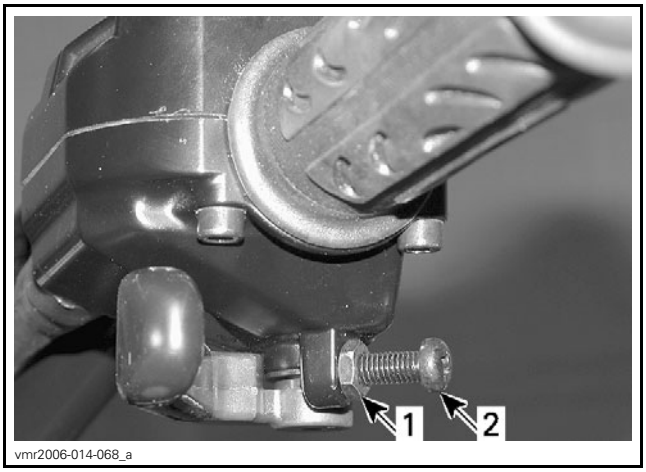
2. Fully depress throttle lever (wide open position) and hold. Read throttle opening.

THROTTLE OPENING
82° to 86°

If opening is out of specification, perform the *THROTTLE LEVER STOPPER SCREW SETTING*.

THROTTLE LEVER STOPPER SCREW SETTING

1. Loosen the stopper screw lock nut.
2. Fully depress throttle lever (wide open position) and hold.
3. Loosen stopper screw until it just releases throttle lever.



1. Lock nut
2. Stopper screw

4. Turn stopper screw clockwise until it contacts throttle lever again.
5. From this point, tighten stopper screw 1/2 turn (to remove strain on the cable).
6. Keep the stopper screw from turning and tighten lock nut.
7. Read throttle opening. If throttle opening is out of specification, perform adjustment again.

NOTE: If the proper adjustment is impossible to reach with this procedure, perform a throttle cable adjustment, refer to the appropriate Shop Manual.

Printed in Canada. (vbs2009-011 en AG)

ATV SERVICE Bulletin

August 12, 2008 Subject: **Spring Chart / Accessory Shock Absorber / Spring Kits** No. **2009-4**

YEAR	MODEL	MODEL NUMBER	SERIAL NUMBER
1999 - 2009	All (except youth models)	All	All

SECTION 1: SPRING APPLICATIONS

It is a quick reference chart which provides authorized spring application for each ATV model. It contains the standard spring part number as installed at the factory.

SECTION 2: SPRING SPECIFICATIONS

Refers to spring specifications.

NOTE: The information in this bulletin supersedes all information previously published.

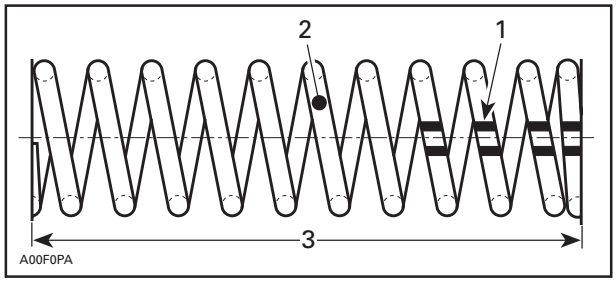
Please update involved *SHOP MANUALS* by indicating the number of this bulletin in the proper section of the manual.

COIL SPRINGS

NOTE: Read color codes when spring is upright and stripes are down.

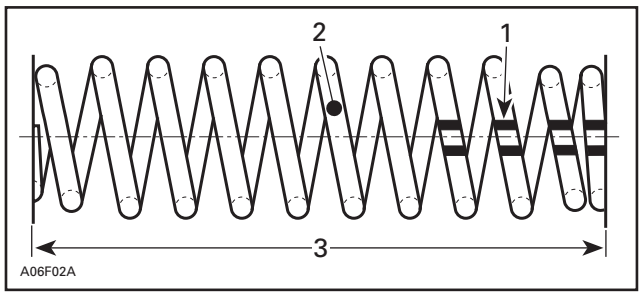
The illustrations show:
[1] color code stripes,
[2] wire diameter,
[3] free length.

Type R (straight at both ends)



Single Rate Spring

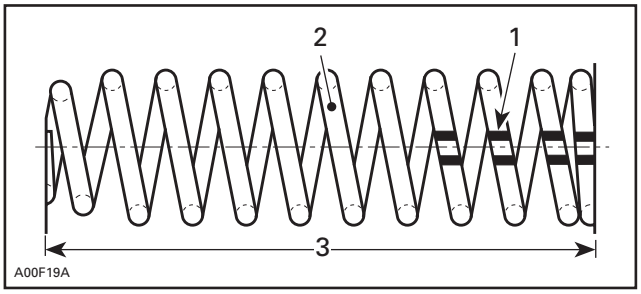
Type V (barrel shape at both ends)



Single Rate Spring

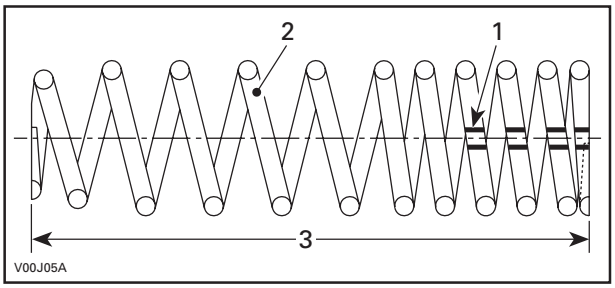
Printed in Canada (vbs2009-002 en MD)

Type W (barrel shape at one end)



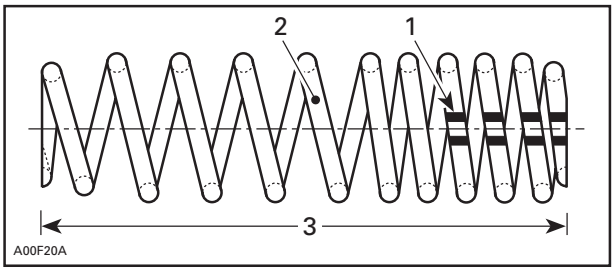
Single Rate Spring

Type 1 (barrel shape at one end)



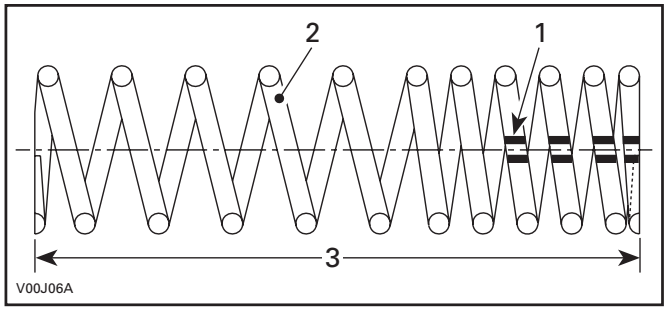
Dual Rate Spring

Type 2, 6, 7 (barrel shape at both ends)

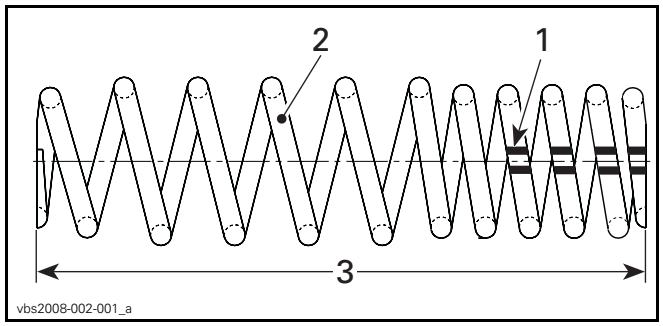


Dual Rate Spring

Type 5 (straight on both ends)



Type 8 (barrel shape at both ends)



Dual Rate Spring

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SECTION 1					
SPRING APPLICATIONS					
MODEL		MODEL YEAR	MODEL NUMBER	SPRING P/N	
				FRONT	REAR
DS 650	STD	2000 - 2002	All	706 200 348	706 000 077 (long) 706 000 059 (short)
		2003	All	706 200 296	706 000 199
		2004 - 2005	All	706 200 315	706 000 255
	Baja	2002	All	706 200 348	706 000 077
		2003	All	706 200 348	706 000 242
		2004 - 2005	All	706 200 337	706 000 270
	Baja X	2004 - 2007	All	706 200 348	706 000 292
Outlander	STD/XT	2003 - 2005	All	706 200 216	706 000 245
	CAMO/CAMO XT	2004 - 2005	All	706 200 355	706 000 289
	MAX	2004 - 2005	All	706 200 353	706 000 261
Outlander	650-800 STD	2006 - 2007	All	706 200 409	706 000 476 706 000 338
	650-800 XT		All	706 200 590 706 200 564	706 000 476 706 000 338
	650-800 MAX		All	706 200 486	706 000 476 706 000 443
	650-800 MAX XT		All	706 200 590 706 200 566	706 000 476 706 000 443
	400 STD/XT/CAMO		All	706 200 355	706 000 289
	400 MAX/MAX XT		All	706 200 516	706 000 465
	800 MAX Limited	2007	All	706 200 590 706 200 566	706 000 476 706 000 443
	500 STD		All	706 200 626	706 000 476 706 000 338
	500 XT		All	706 200 637	706 000 476 706 000 338
	500 MAX		All	706 200 626	706 000 476 706 000 443
	500 MAX XT		All	706 200 637	706 000 476 706 000 443
	650-800 STD	2008	All	706 200 409	706 000 549
	650-800 XT		All	706 200 697	706 000 549
	650-800 MAX		All	706 200 486	706 000 551
	650-800 MAX XT		All	706 200 702	706 000 551
	400 STD/XT/CAMO		All	706 200 355	706 000 289
	400 MAX/MAX XT		All	706 200 711	706 000 465
	800 MAX Limited		All	706 200 702	706 000 551
	500 STD		All	706 200 713	706 000 549
	500 XT		All	706 200 715	706 000 549
	500 MAX		All	706 200 713	706 000 551
	500 MAX XT		All	706 200 715	706 000 551

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SECTION 1					
SPRING APPLICATIONS					
MODEL		MODEL YEAR	MODEL NUMBER	SPRING P/N	
				FRONT	REAR
Outlander	400 STD / XT	2009	All	706 200 819	706 000 649
	400 MAX / MAX XT		All	706 200 818	706 000 650
	500 STD		All	706 200 825	706 000 651
	500 XT		All	706 200 824	706 000 651
	500 MAX		All	706 200 825	706 000 652
	500 MAX XT		All	706 200 824	706 000 652
	650 / 800 STD		All	706 200 820	706 000 651
	650 / 800 XT		All	706 200 823	706 000 651
	650 / 800 MAX		All	706 200 821	706 000 652
	650 / 800 MAX XT		All	706 200 822	706 000 652
	800 MAX LTD		All	706 200 822	706 000 652
Renegade	800	2007	All	706 200 632	706 000 511
	800	2008	All	706 200 632	706 000 511
	800 X		All	706 200 701	706 000 570
	500		All	706 200 632	706 000 568
	500	2009	All	706 200 829	706 000 653
	800		All	706 200 829	706 000 654
	800 X		All	706 200 827	706 000 656
DS	450	2008	All	706 200 481	706 000 505
	450	2009	All	706 200 481	706 000 677
	450 XXC		All	706 200 830	706 000 659
	450 XMX		All	706 200 833	706 000 609
Quest	STD 500	2002	All	706 200 006	706 000 172
	STD 650/XT	2002	All	706 200 006	706 000 172
	STD/XT	2003	All	706 200 006	706 000 172
	CAMO/ CAMO XT	2003	All	706 200 307	706 000 244
	STD/XT	2004	All	706 200 301	706 000 301
	CAMO	2004	All	706 200 358	706 000 304
	MAX/MAX XT	2004	All	706 200 301	706 000 306
	MAX CAMO 650/ MAX CAMO XT 650	2004	All	706 200 358	706 000 306
Rally	STD	2003 - 2004	All	706 200 240	706 000 154
		2005 - 2006 -2007	All	A51401179000	A52405179000
DS 250		2006 - 2007 - 2008 - 2009	not applicable		

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SECTION 1					
SPRING APPLICATIONS					
MODEL		MODEL YEAR	MODEL NUMBER	SPRING P/N	
				FRONT	REAR
Traxter	Autoshift	2001 - 2003	All	706 200 006	706 000 068
		2004	All	706 200 301	706 000 301
		2005	All	706 200 467	706 000 301
	Footshift	2001	All	706 200 006	706 000 068
	MAX	2003	All	706 200 301	706 000 236
		2004	All	706 200 301	706 000 306
		2005	All	706 200 467	706 000 306
	MAX XT	2005	All	706 200 470	706 000 306
	STD	1999 - 2000	7400, 7401, 7413, 7414	706 200 006	706 000 003
		1999 - 2000	7405, 7406, 7407, 7408, 7415, 7416, 7417, 7418	706 200 006	706 000 068
		2001	All	706 200 006	706 000 068
	XL	2001 - 2003	All	706 200 006	706 000 114
		2004	All	706 200 301	706 000 114
		2005	All	706 200 467	706 000 398
	XT	2001 - 2003	All	706 200 006	706 000 068
		2004	All	706 200 301	706 000 301
		2005	All	706 200 470	706 000 301
Traxter CVT	500	2005	All	706 200 467	706 000 301
	650	2005	All (except CAMO)	706 200 467	703 000 301
			CAMO	706 200 469	706 000 304
	650 XT	2005	All (except CAMO)	706 200 470	706 000 301
			CAMO	706 200 472	706 000 304
	MAX	2005	All	706 200 467	706 000 306
	MAX XT	2005	All	706 200 470	706 000 306

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SECTION 2						
SPRING SPECIFICATIONS						
COIL SPRINGS SPECIFICATIONS (REAR SHOCK ABSORBER)						
P/N	TYPE	SPRING RATE (LB/IN) ± 10 _____ (RATE 1 / RATE 2 WHERE APPLICABLE)	FREE LENGTH (MM) ± 3	WIRE DIAMETER (MM) ± .05	COLOR CODE STRIPES	COLOR OF SPRING
A52405179000	N/A	114.8	284.2	9.2	N/A	Full Moon
706 000 003	5	68 / 90	355	7.77	BL/BK/BK	Yellow
706 000 059	W	700	52.7	10.31	BL/YL/BK	Red
706 000 068	R	68	355	7.77	GN/WH/BK	Yellow
706 000 077	W	350 ±15	251.5	12.19	BL/RD/RD	Yellow
706 000 114	5	74 / 237	360.7	8.25	BK/SI/BK	Yellow
706 000 154	R	115 / 155	294	8.71	BK/BK	Full Moon
706 000 172	R	45.7 ±4.5	345	6.91	GN/BK/RD	Yellow
706 000 199	7	242 ±15	304.8	12.19	YL/GD/BK	Red
706 000 236	5	62.8	395	7.92	SI/BK/BK	Yellow
706 000 242	7	242 ±15 / 350 ±15	304.8	12.19	SI/BK	Yellow
706 000 244	R	45.7 ±4.5	345	6.91	WH/GN/YL	Deep Black
706 000 245	2	66 ±5 / 106 ±5	371	8.41	BL/BK/BL	Full Moon
706 000 255	7	228 ±5 / 416.6 ±5	320	11.89	WH/YL/BK	Red
706 000 261	2	84 / 128.5	413	8.71	BL/GN/BL	Full Moon
706 000 270	7	228 ±5 / 416.8 ±5	320	11.89	SI/YL/BK	Orange
706 000 289	2	66 ±5 / 106 ±5	371	8.41	BL/WH/BL	Deep Black
706 000 292	7	228 ±5 / 416.8 ±5	320	11.89	GD/WH/BK	Full Moon
706 000 301	R	40	429	6.65	GN/BK/BL	Yellow
706 000 304	R	40	429	6.65	GN/RD/BL	Deep Black
706 000 306	R	68.5 / 102.8	401	7.92	BL/BK/RD	Yellow
706 000 338	W	108.5	308.1	8.25	GN/GD/BL	Deep Black
706 000 398	6	65.4 / 199.5	353	8.25	GN/SI/RD	Yellow
706 000 443	W	108.5	318.1	8.41	GD/BL/BL	Deep Black
706 000 465	2	84 / 128.5	413	8.71	SI/BL/YL	Black
706 000 476	W	235.1	98.1	8.25	GD/RD/BL	Deep Black
706 000 505	S	251	272	10.3	WH/BL/WH	Yellow
706 000 511	8	74.2 / 131.3	348	8.83	GD/GD/GN	Yellow
706 000 549	8	74.2 / 108.5	354	8.83	GD/BL/GD	Deep Black
706 000 551	8	74.2 / 108.5	364	8.83	GD/GN/GD	Deep Black
706 000 568	8	74.2 / 114.2	380	8.83	SI/RD/WH	Yellow
706 000 570	8	85.6 / 131.3	383	9.19	SI/GD/BL	Yellow
706 000 609	8	187.3 / 250	311	10.3	GN/BL	Yellow
706 000 649	2	66 ±5 / 106 ±5	371	8.41	SI/YL/WH	Deep Black
706 000 650	2	84 / 128.5	413	8.71	SI/GD/GD	Deep Black

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SECTION 2						
SPRING SPECIFICATIONS						
COIL SPRINGS SPECIFICATIONS (REAR SHOCK ABSORBER)						
706 000 651	8	74.2 ±5 / 108.5 ±5	354	8.83	SI/WH/GD	Deep Black
706 000 652	8	74.2 ±5 / 108.5 ±5	364	8.83	SI/SI/GD	Deep Black
706 000 653	8	74.2 ±5 / 114.2 ±5	380.8	8.83	WH/SI/GD	Deep Black
706 000 654	8	74.2 ±5 / 131.3 ±5	348	9.19	SI/RD/SI	Yellow
706 000 656	8	85.6 ±5 / 131.3 ±5	383.7	9.19	SI/BL/SI	Yellow
706 000 659	6	187.3 / 250	286.4	9.98	RD/RD	Yellow

SPRING COLOR CODES			
BK = BLACK	BL = BLUE	GD = GOLD	GN = GREEN
OR = ORANGE	PI = PINK	RD = RED	SI = SILVER
WH = WHITE		YL = YELLOW	

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SECTION 2						
SPRING SPECIFICATIONS						
COIL SPRINGS SPECIFICATIONS (FRONT SHOCK ABSORBER)						
P/N	TYPE	SPRING RATE (LB/IN) ± 10 (RATE 1 / RATE 2 WHERE APPLICABLE)	FREE LENGTH (MM) ± 3	WIRE DIAMETER (MM) ± .05	COLOR CODE STRIPES	COLOR OF SPRING
A51401179000	N/A	99.9	232.7	8.1	N/A	Full Moon
706 200 006	V	140	270	8.25	OR/BK/BK	Yellow
706 200 082	2	90 / 140	368.3	9.53	BK/WH/BK	Yellow
706 200 216	2	60 ±5 / 100 ±5	354	8.25	BL/RD/BL	Full Moon
706 200 240	1	100 / 140	261	7.49	RD/RD	Full Moon
706 200 296	2	90 / 140	368.3	9.53	GD/GD/BK	Red
706 200 301	6	108.5 / 165.6	290	8.71	SI/RD/BK	Yellow
706 200 307	V	140	270	7.92	GN/RD/RD	Deep Black
706 200 315	2	90 / 140	368.3	9.19	GD/BL/BK	Red
706 200 337	2	90 / 140	368.3	9.19	GD/GN/BK	Orange
706 200 348	2	90 / 140	368.3	9.19	GN/GN/BK	Full Moon
706 200 353	2	60 ±5 / 114.2 ±5	375	8.71	BL/YL/BL	Full Moon
706 200 355	2	60 ±5 / 100 ±5	354	8.25	RD/YL/RD	Deep Black
706 200 358	6	108.5 / 165.6	290	8.71	GN/YL/GN	Deep Black
706 200 409	6	60 / 114.2	349	8.25	GN/GD/GN	Black
706 200 467	6	108.5 / 165.6	290	8.25	SI/BK/BL	Yellow
706 200 469	6	108.5 / 165.6	290	8.25	WH/SI/RD	Black
706 200 470	6	108.5 / 165.3	307	9.19	GN/SI/BL	Yellow
706 200 472	6	108.5 / 165.3	307	9.19	WH/WH/RD	Black
706 200 481	1	108.5 / 199.9	280	8.83	WH/RD/WH	Black / Yellow
706 200 486	6	60 / 114.2	358	8.41	GD/YL/BL	Black
706 200 516	2	60 / 114.2	375	8.71	GD/SI/RD	Black
706 200 564	W	171.3	228.7	8.25	SI/RD/BL	Black
706 200 566	W	170	238.7	8.41	SI/BL/BL	Black
706 200 590	W	92.35	117.6	6.65	SI/GD/BL	Black
706 200 626	2	54.8 / 125.6	372	8.41	SI/GD/YL	Black
706 200 637	2	54.8 / 125.6	387	8.83	SI/YL/GN	Black
706 200 697	6	60 / 159.9	359.2	8.83	WH/RD/GD	Deep Black
706 200 702	6	60 / 159.9	369.2	9.19	SI/RD/GD	Deep Black
706 200 711	8	60 / 114.2	375	8.25	SI/YL/GD	Deep Black
706 200 713	8	54.8 / 125.6	372	8.41	SI/BL/GD	Deep Black
706 200 715	8	54.8 / 125.6	387	8.41	WH/BL/GD	Deep Black
706 200 632	6	87.9 / 131.3	319	8.83	SI/WH/GN	Yellow
706 200 701	8	87.9 / 131.3	328.7	8.25	SI/GN/GD	Yellow
706 200 818	8	60 ±5 / 114.2 ±5	375	8.25	SI/GD/WH	Deep Black
706 200 819	2	60 ±5 / 100 ±5	354	8.25	SI/WH/WH	Deep Black
706 200 820	6	60 ±5 / 114.2 ±5	349	8.25	SI/YL/SI	Deep Black
706 200 821	6	60 ±5 / 114.2 ±5	358	8.41	WH/SI/WH	Deep Black

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SECTION 2						
SPRING SPECIFICATIONS						
COIL SPRINGS SPECIFICATIONS (FRONT SHOCK ABSORBER)						
706 200 822	6	60 ±5 / 159.9 ±5	369.2	9.19	GD/SI/GD	Deep Black
706 200 823	6	60 ±5 / 159.9 ±5	359.2	8.83	SI/GD/SI	Deep Black
706 200 824	8	54.8 ±5 / 125.6 ±5	387	8.41	GD/RD/GD	Deep Black
706 200 825	8	54.8 ±5 / 125.6 ±5	372	8.41	SI/SI/SI	Deep Black
706 200 827	8	87.9 ±5 / 131.3 ±5	328.67	8.25	SI/GN/SI	Yellow
706 200 829	6	87.9 ±5 / 131.3 ±5	319	8.83	SI/BL/WH	Yellow
706 200 830	6	127.9 / 222.7	226.8	8.83	RD/RD/BK	Yellow
706 200 833	8	101 ±5 / 174.7	301.6	9.19	RD/BK/BK	Yellow

SPRING COLOR CODES			
BK = BLACK	BL = BLUE	GD = GOLD	GN = GREEN
OR = ORANGE	PI = PINK	RD = RED	SI = SILVER
WH = WHITE		YL = YELLOW	

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ZiP

March 2008
Genuine Riding Gear, Parts and Accessories

For ATVers who like to go all out on their Outlander™, 4 new shock and spring kits that are up to the task!

Can-Am Outlander ATVs deliver heavy-duty offroad riding and handle some of the toughest work tasks. Thanks to these installation ready suspension system kits from Bilstein†, even the most aggressive riders can model their Outlanders to their more outgoing riding style.

HIGH PRESSURE GAS (HPG) SHOCKS FOR OUTLANDER 650 AND 800 MODELS

• Enhanced Outlander ride, handling and control • Razor sharp calibration for even the most demanding and aggressive riders • Fade-free performance

FRONT HPG SHOCK KIT
Outlander 650/800 Standard models
> 715 000 303
Sold in pairs

FRONT HPG SHOCK KIT WITH SPRINGS
Outlander 650/800 XT or 650/800 Standard models equipped with accessory winch
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Outlander 650/800 Standard and XT models
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• 100% more rigid than factory installed front springs for stiffer front suspension behavior • Ideal for snow plowing or heavy load transportation applications

FRONT HEAVY DUTY SPRING KIT
Outlander 650/800 Standard and XT models
> 715 000 306
Sold in pairs

Your customers will love the suspension enhancement these kits will add to their Outlander, and they won't be able to afford passing these up as they're better priced than most aftermarket ATV shocks and springs.

Order them on BOSSWeb™ today!

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June 01, 2008 Subject: **Can-Am™ Outlander™ and Renegade™ Predelivery Inspection** No. **2009-2**

YEAR	MODEL	MODEL NUMBER	SERIAL NUMBER
2009	Outlander 400 EFI / 500 EFI / 650 EFI / 800R EFI	Refer to table on next pages for complete listing	All
	Renegade 500 EFI / 800R EFI / 800R EFI X™		

TABLE OF CONTENTS

Printed in Canada (vbl2009-002 en DM)

IMPORTANT NOTICE

This bulletin must be used in conjunction with the check list enclosed in the bag with the *OPERATOR'S GUIDE*. Make sure that *PREDELIVERY CHECK LIST* is completed and signed.

⚠ WARNING

To obtain warranty coverage, pre delivery procedures must be performed by an authorized BRP Can-Am ATV dealer/distributor. Apply all necessary torques as indicated.

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

Due to late changes, there might be some differences between the manufactured product and the descriptions 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.

The illustrations in this document show the typical construction of the different assemblies and may not reproduce the full detail or exact shape of the parts. However, they represent parts that have the same or similar function.

The content of this bulletin is designed as a guideline only. All mechanics performing pre delivery procedures should have attended the current model-year service training.

Further information or inquiries should be directed to your service representative and/or specific *SHOP MANUAL* sections.

Please complete the *PREDELIVERY CHECK LIST* for each vehicle and retain a customer-signed copy.

Make sure the customer receives the *OPERATOR'S GUIDE*, *PRE DELIVERY CHECK LIST* signed copy and *SAFETY DVD*.

⚠ WARNING

Torque wrench tightening specifications must be strictly adhered to. Where specified, install new locking devices (e.g. lock tabs, elastic stop nuts). If the efficiency of a locking device is impaired, it must be renewed.

MODEL LISTING

YEAR	MODEL	MODEL NUMBER	CE MODEL NUMBER	SERIAL NUMBER
2009	Outlander 400	5A9A / 5A9B / 5A9C	5A9D	All
	Outlander 400 XT	5B9A / 5B9B / 5B9C	5B9F	
	Outlander 400 MAX	5C9A / 5C9B	5C9C	
	Outlander 400 MAX XT	5D9A / 5D9B / 5D9C / 5D9D	5D9F	
	Outlander 500	2T9A / 2T9B	---	
	Outlander 500 XT	2U9A / 2U9B / 2U9C / 2U9D / 2U9E	2U9F	
	Outlander 500 MAX	2W9A	---	
	Outlander 500 MAX XT	2X9A / 2X9B / 2X9C / 2X9D / 2X9E	2X9F	
	Outlander 650	2N9A / 2N9B / 2N9C	2N9D	
	Outlander 650 XT	2P9A / 2P9B / 2P9C / 2P9D / 2P9E / 2P9G	2P9H	
	Outlander 650 MAX	2R9A / 2R9B / 2R9C	2R9D	
	Outlander 650 MAX XT	2S9A / 2S9B / 2S9C / 2S9D / 2S9E / 2S9G	2S9H	
	Outlander 800R	2H9E / 2H9F / 2H9G	---	
	Outlander 800R XT	2J9J / 2J9K / 2J9L / 2J9M / 2J9N	---	
	Outlander 800R MAX	2K9A / 2K9B / 2K9C	2K9D	
	Outlander 800R MAX XT	2L9A / 2L9B / 2L9C / 2L9D / 2L9E / 2L9F	2L9G	
	Outlander 800R MAX LTD	2M9A / 2M9B / 2M9D / 2M9E	2M9C / 2M9F	
	Renegade 500	4E9A / 4E9B / 4E9C	4E9D	
	Renegade 800R	4B9A / 4B9B / 4B9C / 4B9E	4B9D / 4B9F	
	Renegade 800R X	4C9A / 4C9B	4C9C	

UNCRATING

⚠ WARNING

Never stand at front or at rear of the vehicle while straps are being cut.

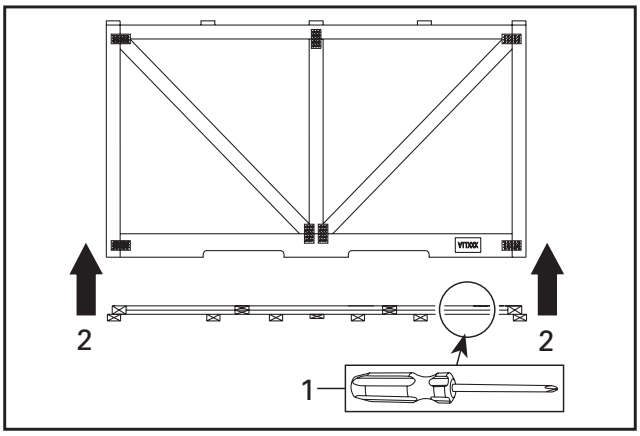
NOTICE Allowing the crate to drop may cause serious damages to vehicle.

NOTICE While manipulating to cut, take care not to damage trim components with blade.

NOTICE Never tip cover toward the front or rear of the vehicle while lifting it.

NOTE: Screws that are used are Robertson† #2 type that require the use of an appropriate bit (Scrulox #2 from Snap-on†† Tools or ECAR.1 from Facom††† Tools).

1. Carefully lay the crate on its bottom.
2. Remove all screws retaining crate cover to crate base.
3. Assisted by another person, lift up crate cover.
4. Raise cover vertically from both ends at the same time.



1. Screw
2. Lift up crate cover

5. Remove protective wrapping from the vehicle.
6. Remove boxes from crate base.
7. Remove parts and equipments from crate base.
8. Remove straps, hooks and brackets retaining vehicle to crate base.
9. Move vehicle out of the crate base.
10. Ensure that the crate includes the following items:

LTD Models

ITEM	DESCRIPTION	QTY
1	Handlebar guard with fasteners kit	1
2	Front bumper with fasteners kit	1
3	Winch kit (already installed on front bumper)	1
4	Mudguard kit	1

XT Models

ITEM	DESCRIPTION	QTY
1	Handlebar guard with fasteners kit	1
2	Front bumper with fasteners kit	1
3	Winch kit (already installed on front bumper)	1

MAX Models

ITEM	DESCRIPTION	QTY
1	Rear backrest	1

CE Models

ITEM	DESCRIPTION	QTY
1	Mirror	2
2	Locking device keys	2
3	Flag holder kit	1

X Models

ITEM	DESCRIPTION	QTY
1	Wind deflector with fasteners kit	2
2	Central skid plate with fasteners kit	1

NOTE: This vehicle comes with a hang tag and labels containing important safety information. Do not remove hang tag from vehicle, they are considered permanent parts of the vehicle.

† Robertson is a registered trademark of Robertson Inc.
†† Snap-on is a trademark of Snap-on Inc.
††† FACOM is a brand of the International tools Group, subsidiary of FIMALAC.

PARTS TO BE INSTALLED

Battery

⚠ WARNING

Always connect RED positive cable first and then BLACK negative cable.

⚠ CAUTION Never charge or boost battery while installed on vehicle.

NOTICE Always charge battery before its installation on the vehicle.

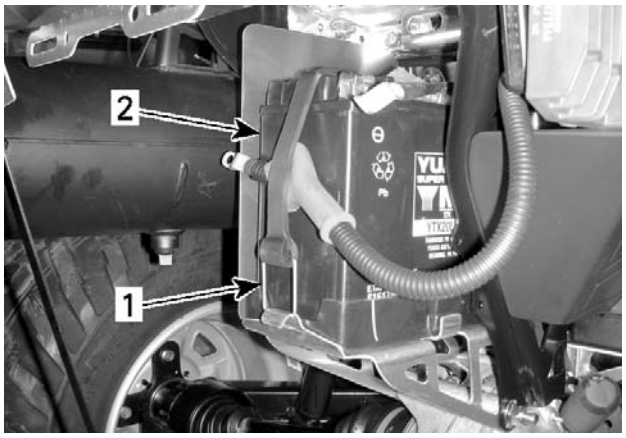
NOTICE Make sure not to squeeze battery cables between vehicle components.

Battery Installation

1. Refer to the latest edition of *CAN-AM ATV BATTERIES SERVICE BULLETIN* for proper activating, charging and maintenance procedures.

Outlander Models

2. Unhook battery retaining strap.



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1. Retaining strap
2. Battery

Renegade Models

3. Unscrew battery retaining rod.

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BATTERY RETAINING ROD

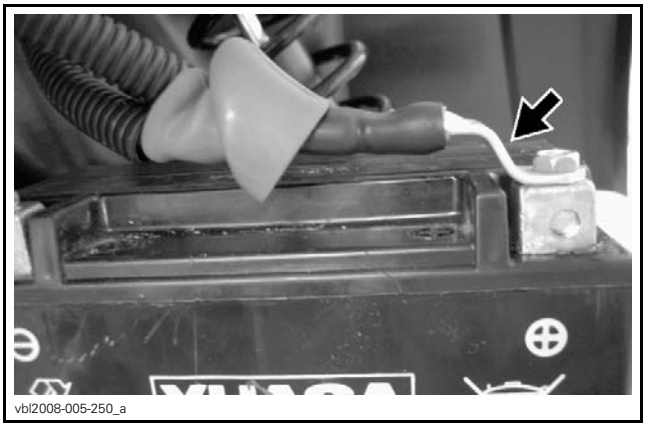
All Models

4. Remove battery from vehicle.
5. Charge battery. Refer to *CAN-AM ATV BATTERIES SERVICE BULLETIN*.
6. Install charged battery on vehicle.
7. Properly route battery cables. Refer to *BATTERY CABLE ROUTING* below.
8. Connect RED positive cable to positive battery post.
9. Connect BLACK negative cable to negative battery post.
10. Apply dielectric grease (P/N 293 550 004) on battery posts.
11. Cover positive post with rubber boot.

Battery Cable Routing

NOTICE Always respect the specific cable routing. Refer to the following illustrations.

1. Ensure that the cable end is installed as illustrated and the cable is routed over the battery.



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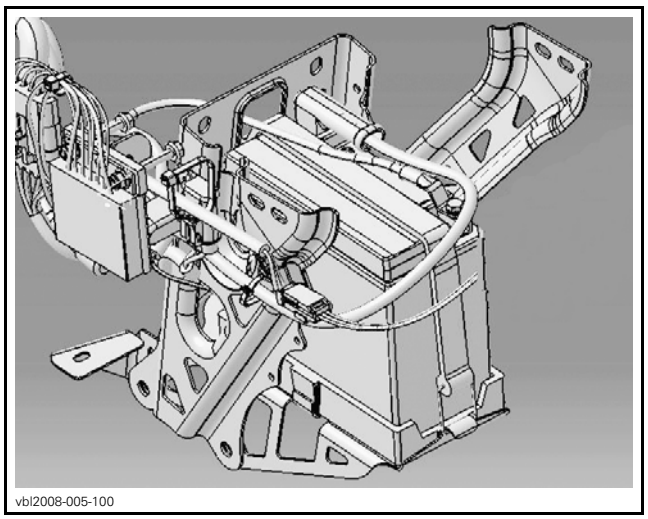
CORRECT WAY OF SECURING POSITIVE (+) POST


vbl2008-005-103

WRONG WAY OF SECURING THE POSITIVE (+) POST

2. Ensure that the cables is routed as per the following illustrations.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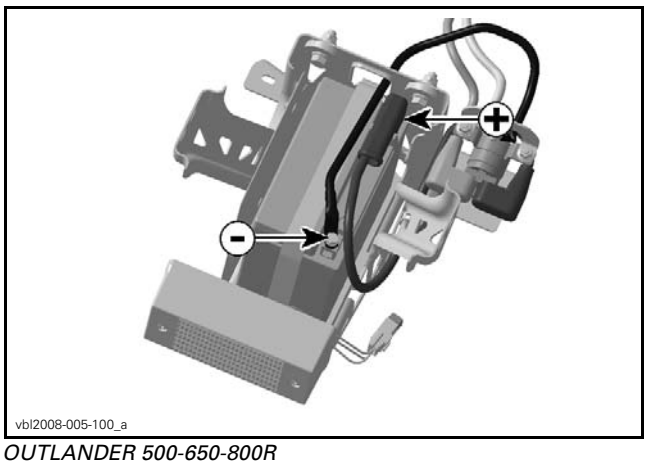
OUTLANDER 400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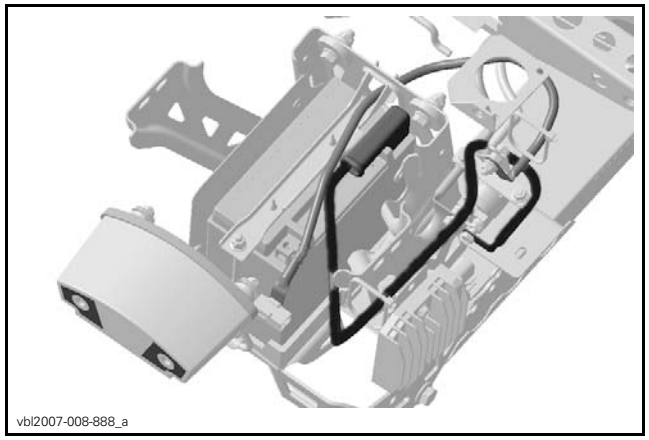
OUTLANDER 500-650-800R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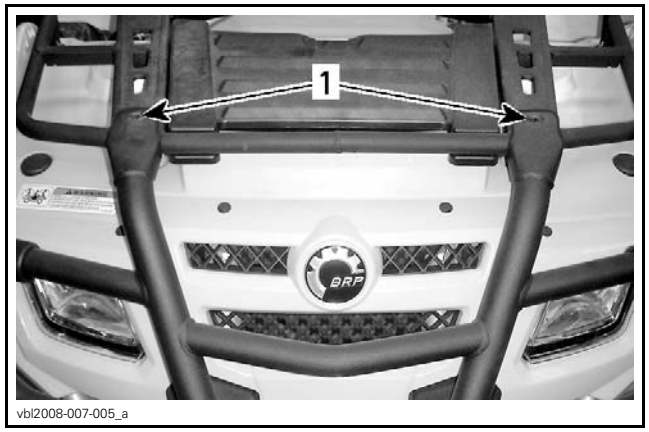
RENEGADE 500-800R

Front Bumper

Outlander XT Models

1. Install upper part of the bumper with:
   - 2x M8 x 20 bolts
   - 2x M8 flat washers
   - 2x M8 nuts



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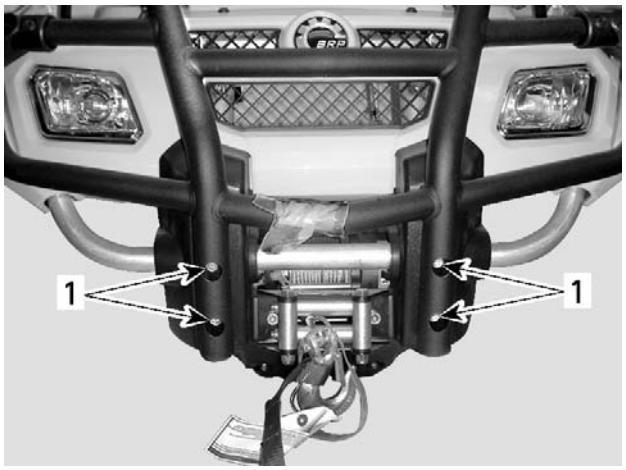
1. Upper retaining bolts

2. Do not torque upper retaining M8 nuts yet.
3. Install lower part of the bumper with :
   - 4x M8 x 40 screws



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1. Lower retaining screws

4. Secure upper retaining nuts to 11 N•m (97 lbf•**in**).
5. Secure lower retaining screws to 25 N•m (18 lbf•ft).

Mirrors

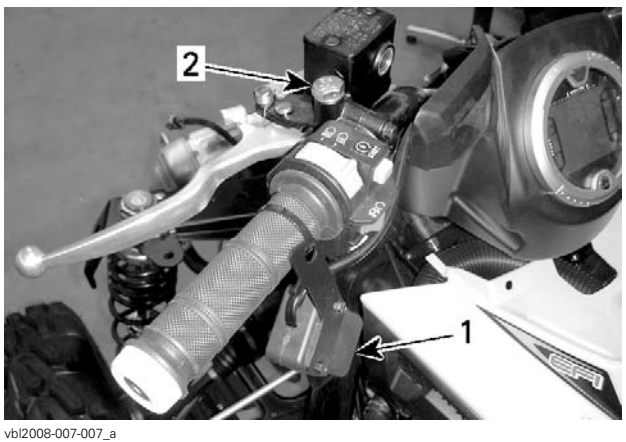
Outlander CE Models

1. Remove mirrors from the storage compartment.
2. Install mirrors on their supports.

Winch Switch

Outlander XT and LTD Models

1. Remove winch switch from vehicle by cutting retaining locking tie.
2. Remove bolt from brake housing.



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1. Winch switch
2. Brake housing bolt

3. Secure winch switch to the brake housing with the existing bolt.

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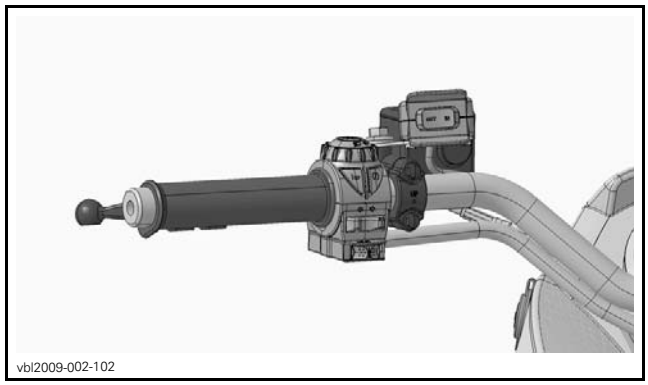
OUTLANDER XT AND LTD



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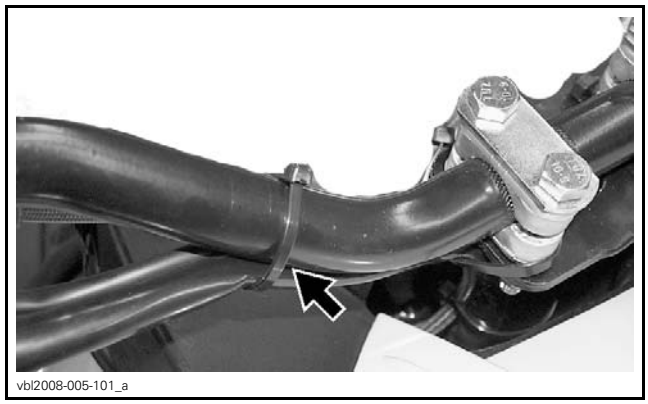
OUTLANDER XT AND LTD (CE)

4. Attach wires to handlebar, using a locking tie.



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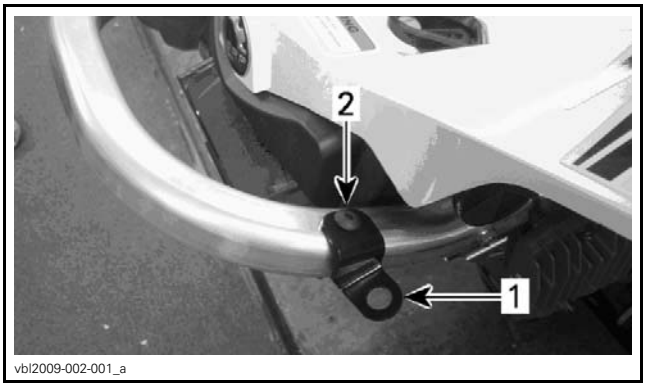
Flag Holder

Renegade CE Models

1. Position flag holder on vehicle rear support.
2. Install retaining bolt.
3. Tighten retaining nut.

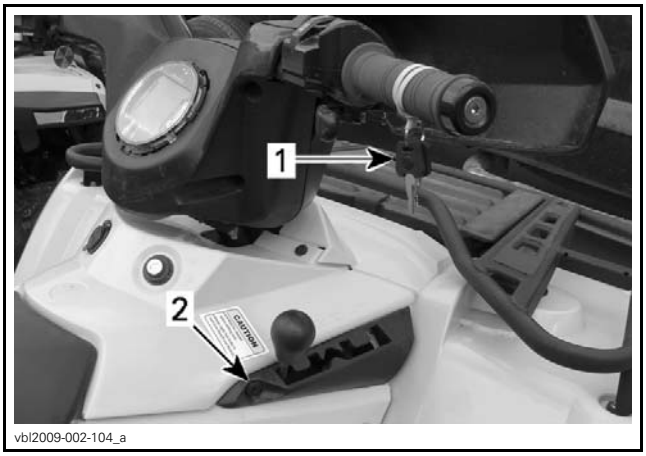


1. Flag holder
2. Retaining bolt

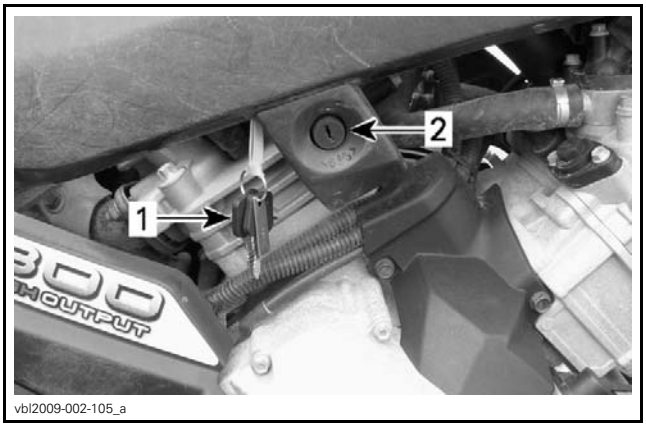
Locking Device

CE Models

For the European Community models a locking device is required to avoid vehicle from moving when needed. This locking device is located on the transmission lever. Refer to the following pictures.



OUTLANDER 400 SERIES
1. Keys
2. Locking device



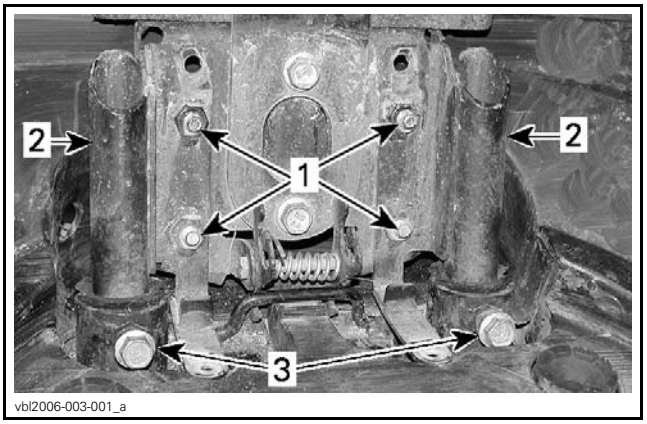
OUTLANDER AND RENEGADE 500-650-800R SERIES
1. Keys
2. Locking device

Backrest

Outlander MAX Models

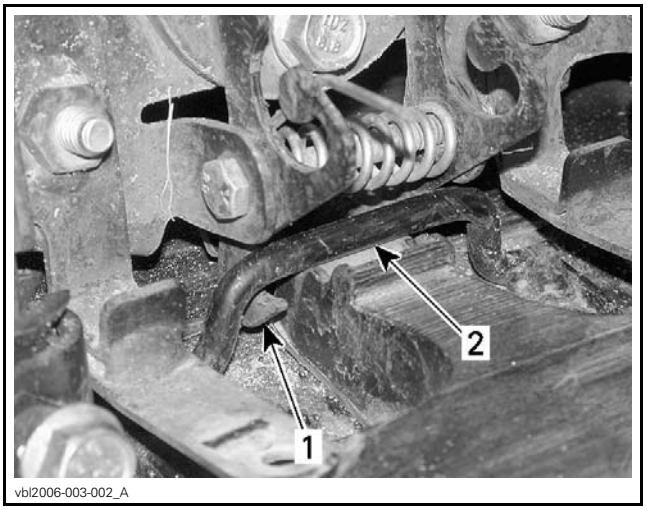
Install the backrest on passenger's seat as per the following steps :

1. Loosen bolts holding backrest plate to backrest support.
2. Install the backrest tubes into theirs locations in frame.
3. Install backrest tube bolts.
4. Do not torque bolts for the moment.



1. Backrest holding bolts
2. Backrest tubes
3. Backrest tube bolts

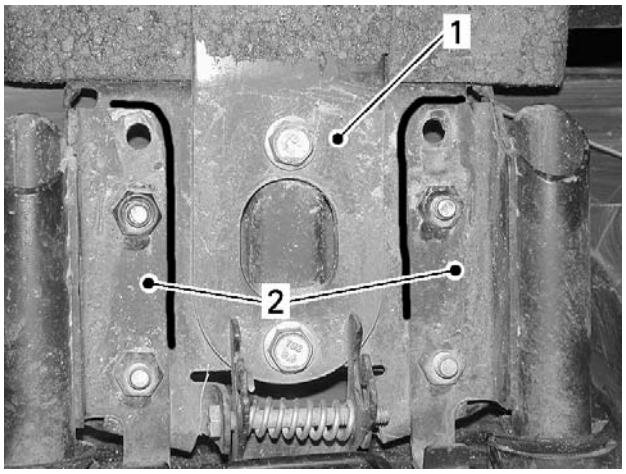
5. Check if the latch hooks are inserted under attachment rod.
6. Tighten backrest tube bolts to prevent back and forth movements.
7. Do not torque bolts for the moment.



1. Latch hooks
2. Attachment rod

8. Mark the position of backrest plate on the backrest support using a marker.
9. Remove backrest from vehicle.

10. Align backrest support with the mark on backrest plate.
11. Torque bolts to 25 N•m (18 lbf•ft).



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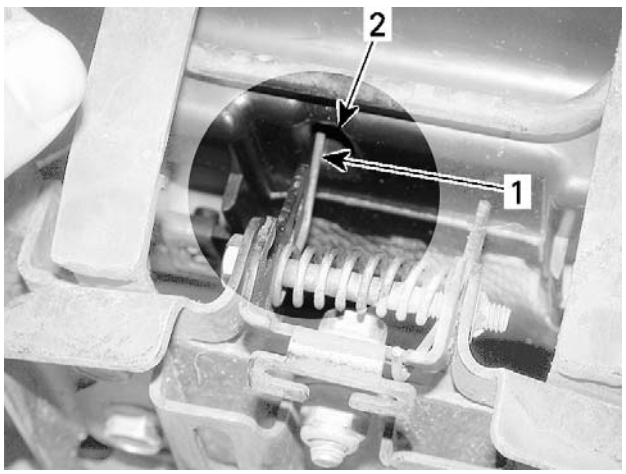
1. Backrest plate
2. Backrest support

12. Place the long end of spring in the seat recess.
13. Position the seat release rod into the backrest latch slot.



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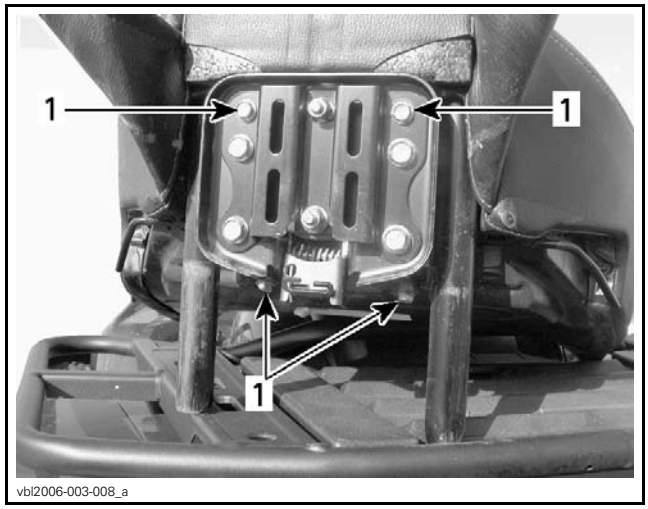
1. Long end of spring
2. Seat recess

14. Screw-in backrest to passenger's seat.
15. Torque to 5 N•m(44 lbf•**in**).

NOTE: If required, you may add a very small amount of general purpose grease on the backrest tubes insertion plastic guides to ease tubes insertion.



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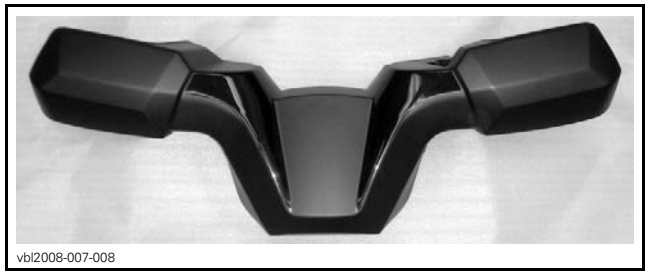
1. Screw-in backrest

Handlebar Guard

Outlander 400 XT Models

1. Remove handlebar guard from its box.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2. Install handlebar guard to the steering cover.
3. Secure handlebar guard using the 4 retaining screws.

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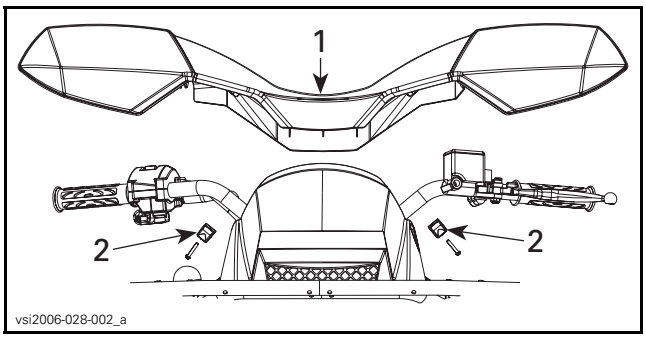
1. Retaining screws location

NOTE: The retaining screws are included in the handlebar guard box.

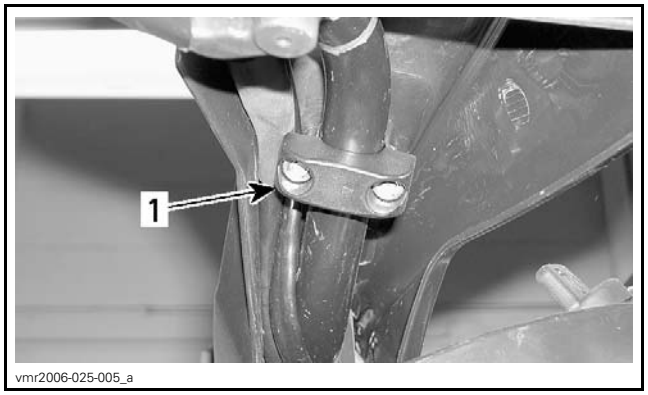
Outlander 500 XT / 650 XT / 800R XT / 800R LTD

4. Remove handlebar guard from its box.
5. Install handlebar guard to the handlebar.



1. Handlebar guard
2. U-clamps

6. Install U-clamps with the arrows pointed toward the front of vehicle.
7. Secure handlebar guard using U-clamps and retaining screws.



1. U-clamp

NOTE: The U-clamps and retaining screws are included in the handlebar guard box.

Mudguard

LTD Models

1. Install mudguard kit as per their installation instructions (included in the kit).

Accessories Installation

1. Install accessories (if any) as per their installation instructions (included in each kit).
2. Install any other equipment required by law (if any).

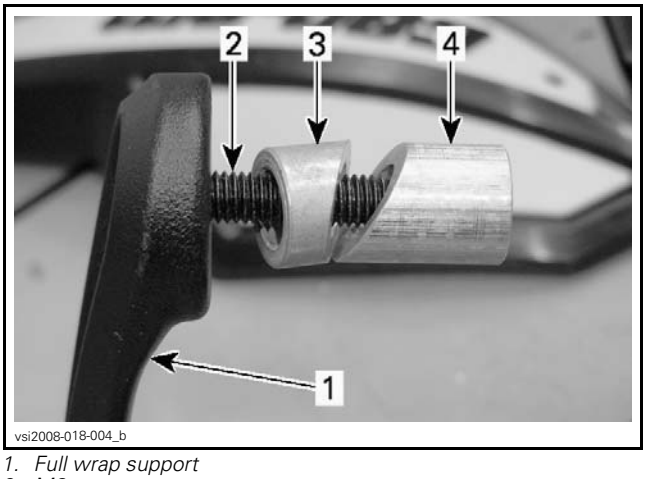
Vehicle Decals

1. Install decals on vehicle according to customer country language and local legislation.
2. Ensure that the new decals are installed at the same location and over the factory installed decals.

Wind Deflector

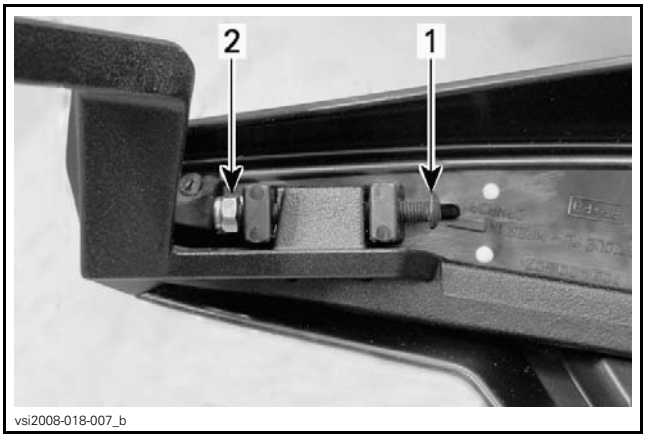
X Models

1. Install M8 screw in full wrap support.
2. Insert beveled bracket in M8 screw.
3. Screw on threaded beveled bracket into M8 screw.



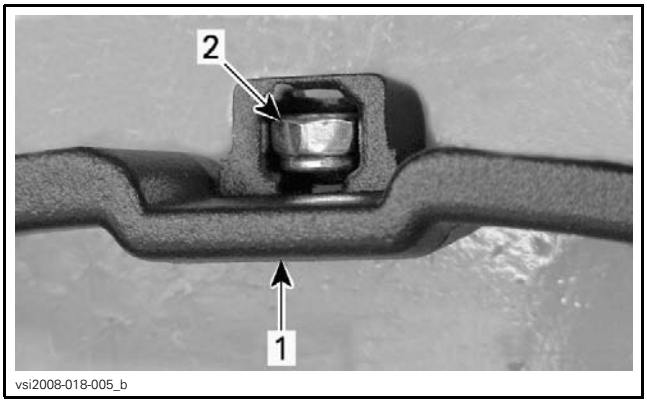
1. Full wrap support
2. M8 screw
3. Beveled bracket
4. Threaded beveled bracket

4. Align wind deflector on full wrap support
5. Install M4 bolt and M4 nut.
6. Torque M4 nut to 3 N•m (27 lbf•**in**).



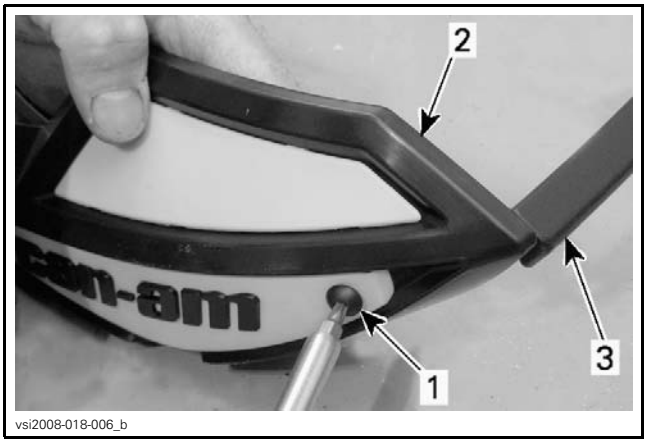
1. M4 bolt
2. M4 nut

7. Insert M5 nut in full wrap support middle housing.



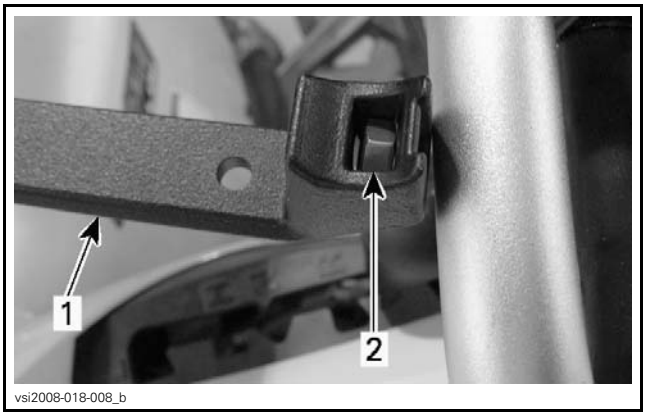
1. Full wrap support
2. M5 nut

8. Align wind deflector on full wrap support.
9. Using support as a guide, drill a ø6 mm hole through wind deflector.
10. Install and tighten M5 bolt.



1. M5 bolt
2. Wind deflector
3. Full wrap support

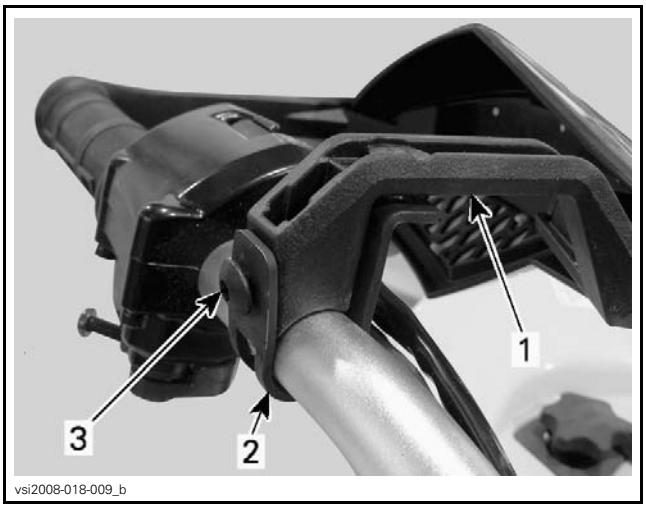
11. If necessary, loosen brake lever(s) to make sure that there is enough space to install support bolts.
12. Remove existing handlebar end caps.
13. Insert the beveled brackets inside the handlebar end.
14. Insert M6 nut in full wrap support end housing.



1. Full wrap support
2. M6 nut

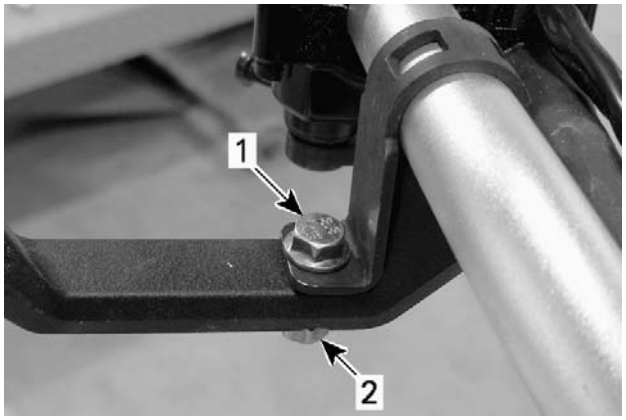
15. Install full wrap support on handlebar using U-clamp.
16. Install M6 x 16 bolt.

NOTE: For an easier installation, as per the following illustration, completely rotate support to install bolt, and then, reposition at the normal position.



1. Full wrap support
2. U-clamp
3. M6 x 16 bolt

17. Install M6 x 20 bolt and M6 nut.
18. Adjust wind deflector horizontally.
19. Torque M6 nut to 10 N•m (89 lbf•**in**).
20. Torque M8 bolt to 24 N•m (18 lbf•ft).



1. M6 x 20 bolt
2. M6 nut

21. Reposition brake lever (s) as previously set then tighten bolt.

⚠ WARNING

Make sure brake lever (s) is properly secured in place and will not rotate by pushing it downward and upward.

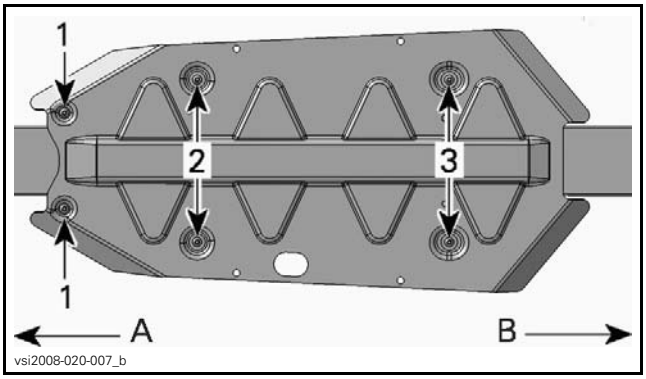
⚠ WARNING

Make sure that there is clearance at all time between the deflectors and the brake lever (s) and all other moving components.

Central Skid Plate

X Models

1. Put skid plate in place.



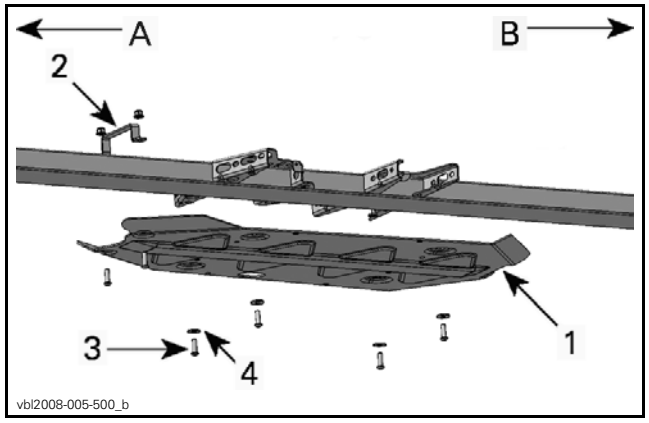
A. Front of vehicle
B. Rear of vehicle

1. Front holes
2. Middle holes
3. Rear holes

2. Place skid plate bracket on vehicle frame.
3. Align skid plate front holes with skid plate bracket holes.
4. Assemble skid plate using front M8 retaining bolts and M8 nuts.
5. Do not tighten front bolts for the moment.
6. Align M8 U-nuts with skid plate middle holes.
7. Insert M8 U-nuts on vehicle frame.
8. Assemble skid plate using middle M8 retaining bolts, M8 flat washers and M8 U-nuts.
9. Do not tighten middle bolts for the moment.
10. Align M8 U-nuts with skid plate rear holes.
11. Insert M8 U-nuts on vehicle frame.
12. Assemble skid plate using rear M8 retaining bolts, M8 flat washers and M8 U-nuts.

NOTE: Washers must be installed between retaining bolts and skid plate.

13. Torque all M8 retaining bolts to 11 N•m (97 lbf•**in**).



A. Front of vehicle
B. Rear of vehicle

1. Skid plate
2. Skid plate bracket
3. M8 retaining bolt
4. M8 flat washer

FLUIDS

General Guidelines

All fluids (except fuel) have already been filled at factory, it is only necessary to validate them. However, if refill is needed, refer to the appropriate *ATV SHOP MANUAL* for the proper procedure.

Fuel

1. Add a small amount of fuel in the fuel reservoir.

Recommended Fuel

Use regular unleaded gasoline or gasohol containing less than 10% of ethanol or methanol, available from most service stations.

Refer to the following table for recommended minimum octane number:

LOCATION	MINIMUM OCTANE NUMBER
North America	87 (RON + MON) / 2
Elsewhere	92 RON

⚠ WARNING

Always stop engine before refueling. Open cap slowly. If a differential pressure condition is noticed (whistling sound heard when loosening fuel tank cap) have vehicle inspected and/or repaired before further operation. Fuel is flammable and explosive under certain conditions. Never use an open flame to check fuel level. Never smoke or allow flame or spark in vicinity. Always work in a well-ventilated area. Never top up the fuel tank before placing the vehicle in a warm area. As temperature increases, fuel expands and may overflow. Always wipe off any fuel or oil spillage from the vehicle.

NOTICE Never place anything over fuel tank cap as this could block the vent hole, leading to engine misfire.

NOTICE Never experiment with other fuels. The use of non-recommended fuels can result in vehicle performance deterioration and damage to critical parts in the fuel system and engine components.

NOTICE Never mix oil with fuel, these vehicles are equipped with a 4-stroke engine.

Engine Oil

NOTICE Do not overfill. Operating the engine with an improper oil level may severely damage engine. Wipe off any oil spillage.

Recommended Engine Oil

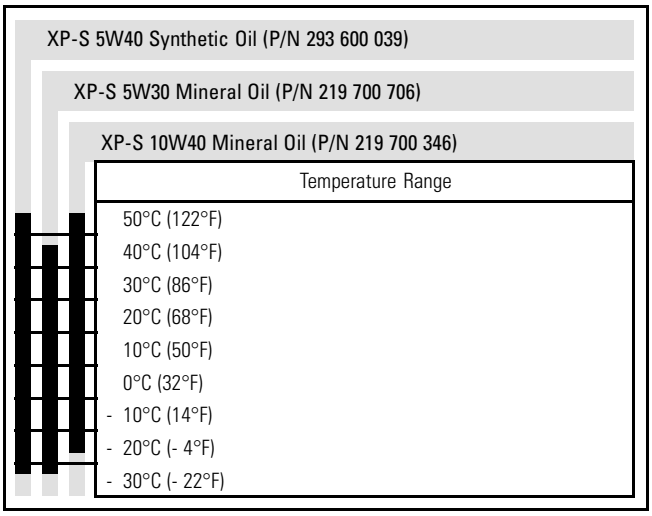
Use a 5W 30 4-stroke engine oil that meets or exceeds the requirements for API service classification SM, SL or SJ. Refer to label on the oil container.

The XP-S 5W 30 4-stroke oil (P/N 219 700 706) is recommended for all seasons.

For improved overall performance and all season application, use XP-S 5W40 synthetic oil (P/N 293 600 039).

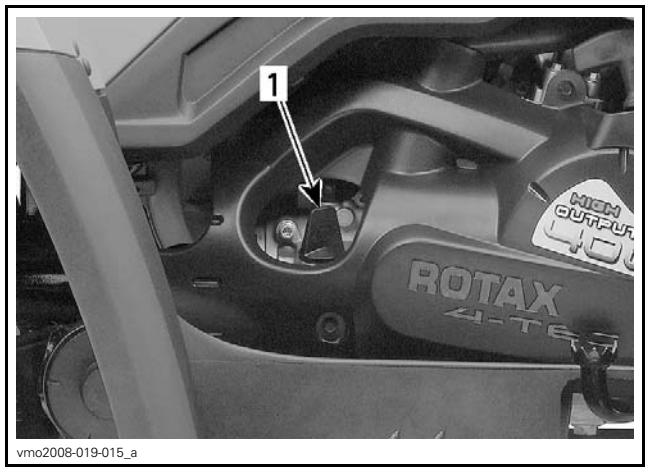
NOTE: For Outlander 400 series, the same oil lubricates both engine and transmission.

NOTE: Other viscosity should be used if the average temperature is outside the range of the recommended oil. Refer to the following table.



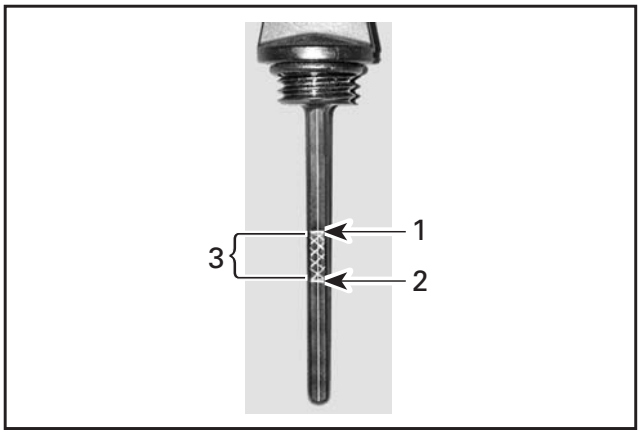
Engine Oil Level Verification

1. Ensure that engine is cold and not running.
2. Park vehicle straight on a level surface.
3. Unscrew and remove oil dipstick.



TYPICAL - RH SIDE OF ENGINE
1. Oil Dipstick

4. Wipe dipstick.
5. Reinstall and screw in the dipstick completely.
6. Unscrew and remove the dipstick.
7. Check oil level as per the following illustration.



OIL DIPSTICK
1. *Full*
2. *Add*
3. *Operating Range*

8. Ensure that oil level is between ADD and FULL marks.
9. If necessary, add recommended engine oil.
10. Reinstall and screw in the dipstick completely.

Gearbox Oil

NOTICE Do not overfill. Operating the gearbox with an improper level may severely damage gearbox. Wipe off any oil spillage.

NOTICE Do not use non recommended types of oil when servicing. Do not mix with other types of oil.

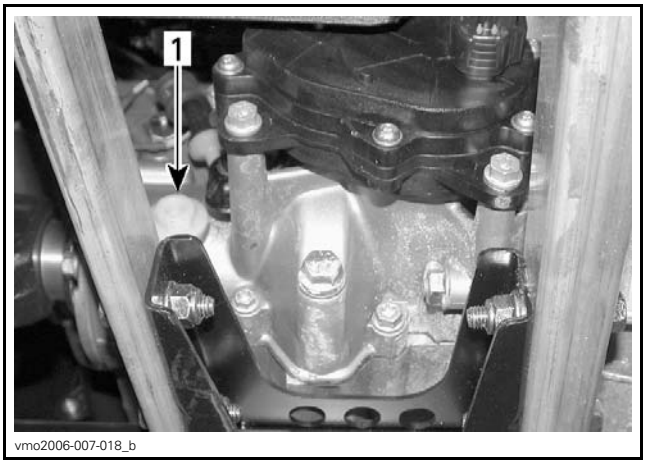
NOTE: For Outlander 400 series, the same oil lubricates both engine and transmission. Refer to *ENGINE OIL*.

Recommended Gearbox Oil

Use XP-S chaincase oil (P/N 413 801 900).

Gearbox Oil Level Verification

1. Park vehicle straight on a level surface.
2. Select transmission lever to NEUTRAL position.
3. Apply parking brake.
4. Check oil level by removing the gearbox oil level plug.



1. Oil level plug

5. Ensure that gearbox oil is level with the bottom of the oil plug hole.
6. If necessary, add recommended gearbox oil.
7. Reinstall and screw in the gearbox oil level plug.

Engine Coolant

⚠ WARNING

Check coolant level with engine cold. Never add coolant in cooling system when engine is hot.

NOTICE Do not overfill coolant reservoir.

Recommended Coolant

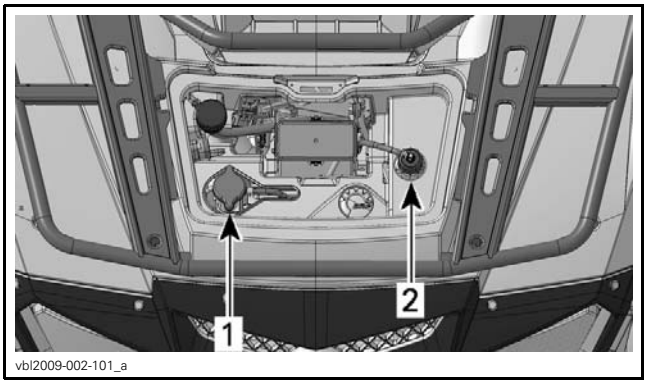
Always use ethylene-glycol antifreeze containing corrosion inhibitors specifically for internal combustion aluminum engines.

Cooling system must be filled with water and antifreeze solution (50% water, 50% antifreeze) or with BRP premixed coolant (P/N 219 700 362).

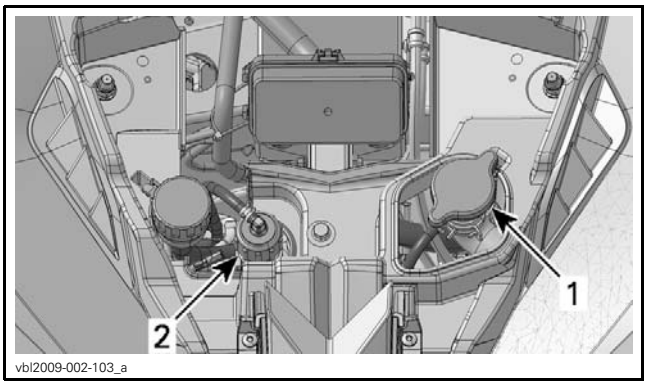
Coolant Level Verification

NOTICE Do not overfill coolant reservoir.

1. Park vehicle straight on a level surface.
2. Remove front service compartment panel.
3. Check that radiator is filled with coolant by removing the radiator cap.
4. If necessary, add recommended coolant.
5. Reinstall radiator cap.

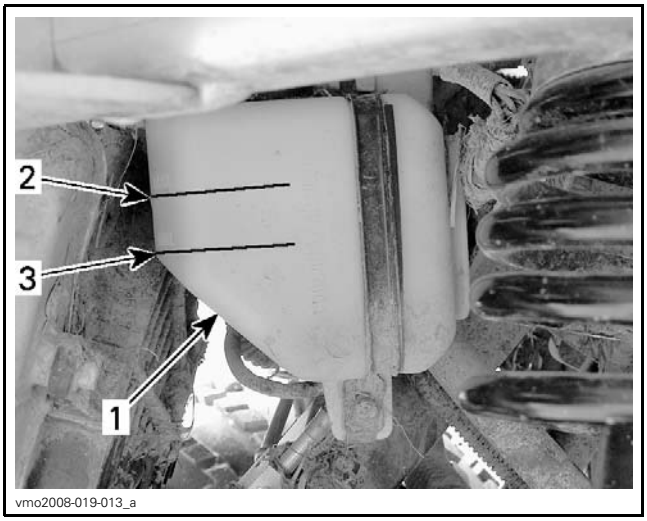


OUTLANDER SERVICE COMPARTMENT
1. *Radiator cap*
2. *Coolant reservoir cap*



RENEGADE SERVICE COMPARTMENT
1. *Radiator cap*
2. *Coolant reservoir cap*

6. From underneath LH front fender, remove plastic cover.
7. Check the coolant reservoir level.
8. Ensure that fluid is between MIN. and MAX marks.



TYPICAL - UNDERNEATH LH FRONT FENDER
1. *Coolant reservoir*
2. *MAX. level mark*
3. *MIN. level mark*

9. If necessary, add recommended coolant.
10. Reinstall plastic cover
11. Reinstall front service compartment panel.

NOTE: When checking level at temperature lower than 20°C (69°F), it may be slightly lower than MIN. mark.

Brake Fluid

NOTICE To avoid serious damage to the braking system, do not use fluids other than the recommended one, nor mix different fluids for topping up.

NOTICE Be sure to clean reservoir caps before removing it to avoid contaminating the oil.

NOTICE Be careful not to damage the diaphragm while removing and installing handlebar reservoir caps.

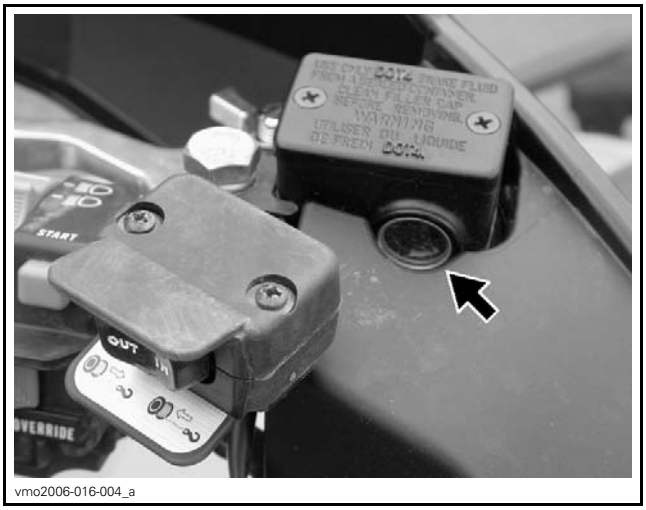
NOTICE Do not overfill brake fluid reservoir.

Recommended Fluid

Always use brake fluid meeting the specification DOT 4, from a sealed container.

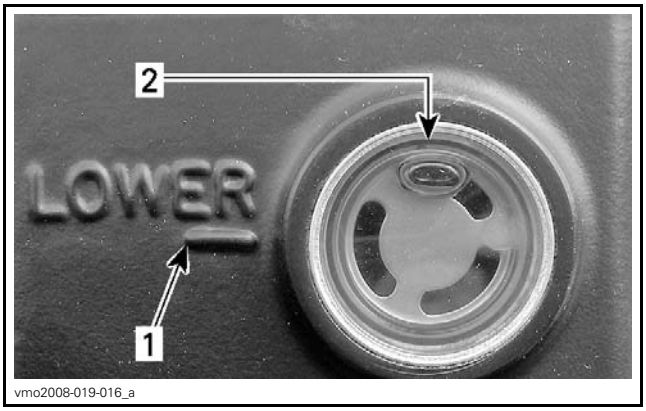
Brake Lever Fluid Level Verification

1. Park vehicle straight on a level surface.
2. Turn steering in the straight-ahead position to ensure reservoir is level.



TYPICAL

3. Check brake fluid level in reservoir.

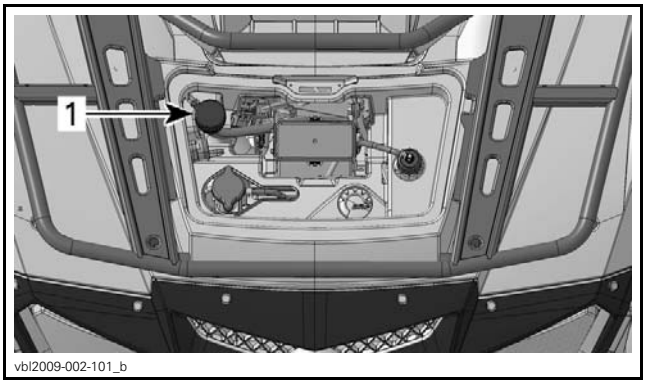


1. MIN. mark
2. MAX. mark

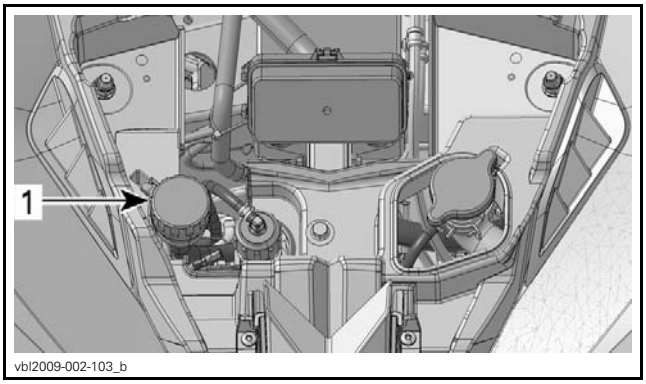
4. Ensure that fluid reaches top of window.
5. If necessary, add recommended brake fluid.

Brake Pedal Fluid Level Verification

1. Park vehicle straight on a level surface.
2. Remove front service compartment panel.

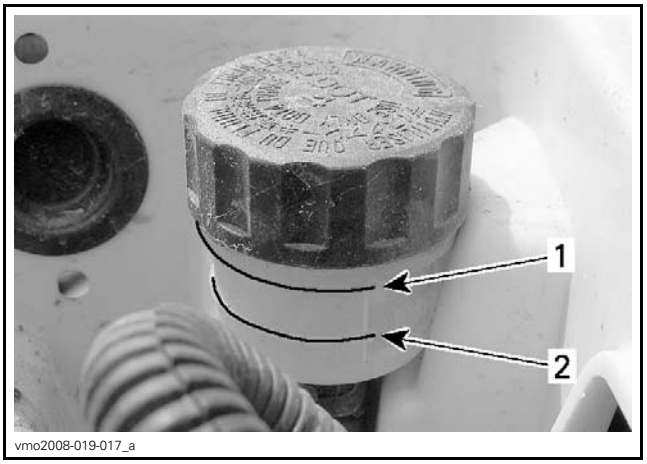


OUTLANDER SERVICE COMPARTMENT
1. Brake pedal reservoir



RENEGADE SERVICE COMPARTMENT
1. Brake pedal reservoir

3. Check the brake fluid level.



TYPICAL
1. MAX. mark
2. MIN. mark

4. Ensure that fluid is between MIN. and MAX. marks.
5. If necessary, add recommended brake fluid.
6. Reinstall front service compartment panel.

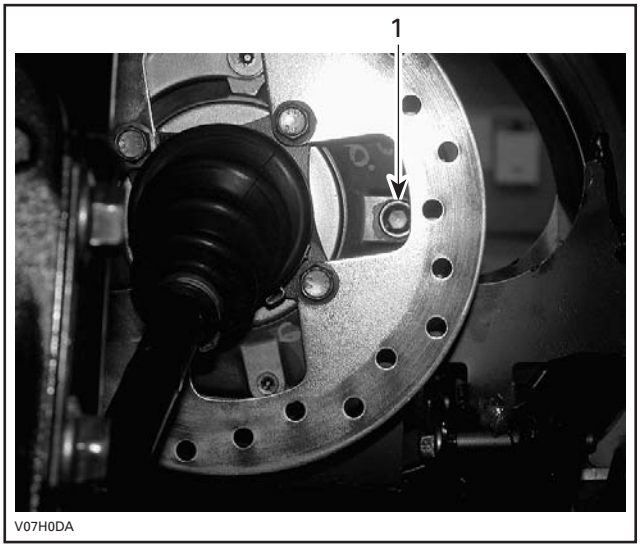
Front and Rear Differential Oil

Recommended Oil

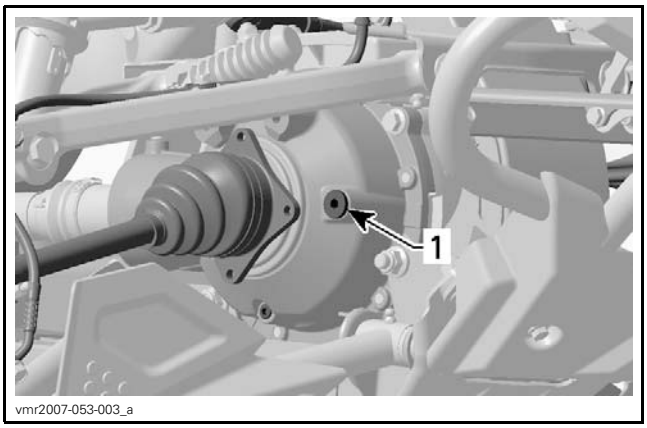
Always use XP-S synthetic gear oil (P/N 293 600 043) or a 75W90 synthetic oil (API GL-5).

Front Differential Oil Level Verification

1. Park vehicle straight on a level surface.
2. Clean filler plug.
3. Remove filler plug.
4. Check front differential oil level.
5. Ensure that oil reaches the lower edge of filler hole.
6. If necessary, add recommended oil.
7. Install filler plug then torque to 22 N•m (16 lbf•ft).



OUTLANDER SERIES
1. Filler plug

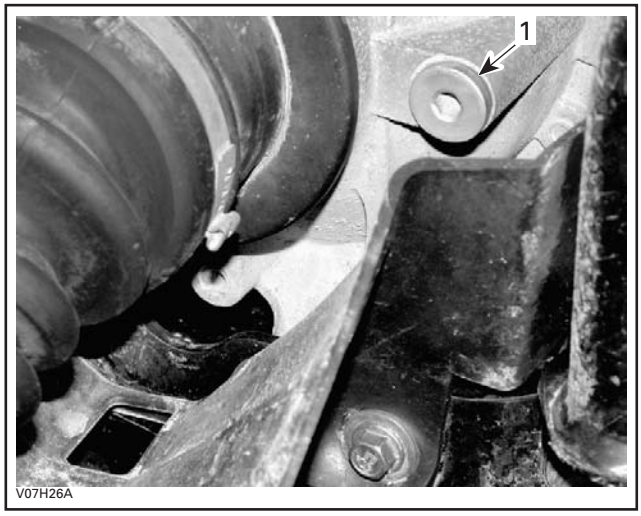


RENEGADE SERIES
1. Filler plug

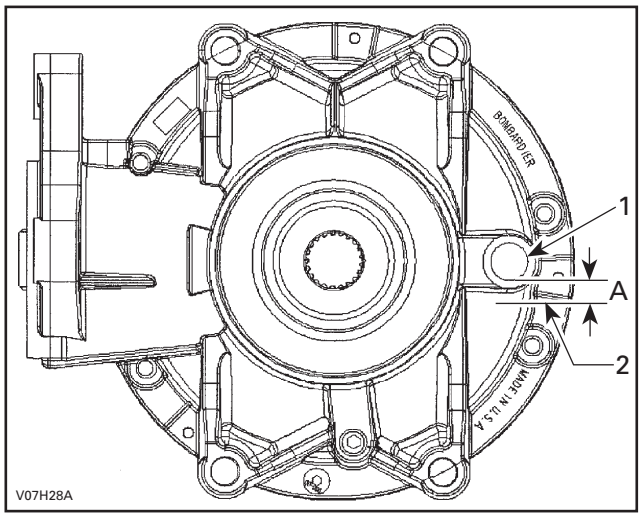
Rear Differential Oil Level Verification

NOTE: The rear differential oil is not level with the filler hole.

1. Park vehicle straight on a level surface.
2. Clean filler plug.
3. Remove filler plug.
4. Check rear differential oil level by inserting a wire with a 90° bend through oil filler hole.
5. Ensure that oil is between 25 to 32 mm (1 to 1-1/4 in) from the bottom of oil filler hole.
6. If necessary, add recommended oil.
7. Install filler plug then torque to 22 N•m (16 lbf•ft).



1. Filler plug



TYPICAL
A. 25 to 32 mm (1 to 1-1/4 in)
1. Filler plug
2. Oil level

SET-UP

Tires Pressure

NOTICE For transportation purpose, tires are deflated at the factory, make sure to inflate them at the recommended air pressure before riding the vehicle.

NOTICE Always check pressure when tires are cold.

⚠ WARNING

Low pressure may cause tire to deflate and rotate on wheel. Overpressure may burst the tire. Always follow recommended pressure. Since tires are low-pressure type, a manual pump should be used.

NOTE: Tire pressure varies with temperature and altitude.

NOTE: A pressure gauge is supplied in the tool kit.

1. Inflate tires to the specified air pressure. Refer to the following table.

RECOMMENDED AIR PRESSURE			
		FRONT	REAR
Outlander 400 Series	Maximum	34.5 kPa (5 PSI)	34.5 kPa (5 PSI)
	Minimum	31 kPa (4.5 PSI)	31 kPa (4.5 PSI)
Outlander MAX 400 Series	Maximum	34.5 kPa (5 PSI)	34.5 kPa (5 PSI)
	Minimum	31 kPa (4.5 PSI)	31 kPa (4.5 PSI)
Outlander 500 Series	Maximum	34.5 kPa (5 PSI)	34.5 kPa (5 PSI)
	Minimum	31 kPa (4.5 PSI)	31 kPa (4.5 PSI)
Outlander MAX 500 Series	Maximum	34.5 kPa (5 PSI)	34.5 kPa (5 PSI)
	Minimum	31 kPa (4.5 PSI)	31 kPa (4.5 PSI)
Outlander 650 / 800R Series	Maximum	48.3 kPa (7 PSI)	48.3 kPa (7 PSI)
	Minimum	31 kPa (4.5 PSI)	31 kPa (4.5 PSI)
Outlander MAX 650 / 800R Series	Maximum	48.3 kPa (7 PSI)	48.3 kPa (7 PSI)
	Minimum	31 kPa (4.5 PSI)	34.5 kPa (5 PSI)
Renegade Series	Maximum	48.3 kPa (7 PSI)	48.3 kPa (7 PSI)
	Minimum	34.5 kPa (5 PSI)	37.9 kPa (5.5 PSI)

Brake Disk Cleanup

1. Clean front and rear brake discs using pulley flange cleaner (P/N 413 711 809).

NOTICE A thin layer of anticorrosion product can be present on the brake disc and must be removed before using the vehicle. Not conforming to this procedure may lead to a brake chattering and the brake pads replacement would be necessary to solve the problem.

Protective Materials

1. Ensure that all protective materials are removed from vehicle.

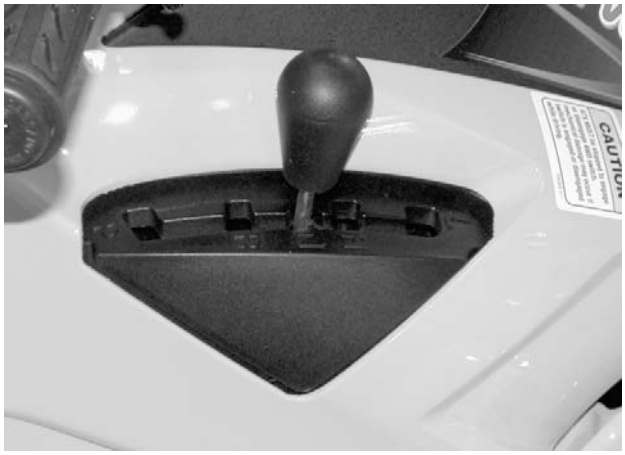
ADJUSTMENTS

General Guidelines

All adjustments have already been performed at factory, it is only necessary to validate them. However, if readjustment is needed, refer to the appropriate *ATV SHOP MANUAL* for the proper procedure.

Transmission Lever

1. Verify that transmission lever works properly and adjust if required.



TYPICAL - TRANSMISSION LEVER

Suspension

⚠ WARNING

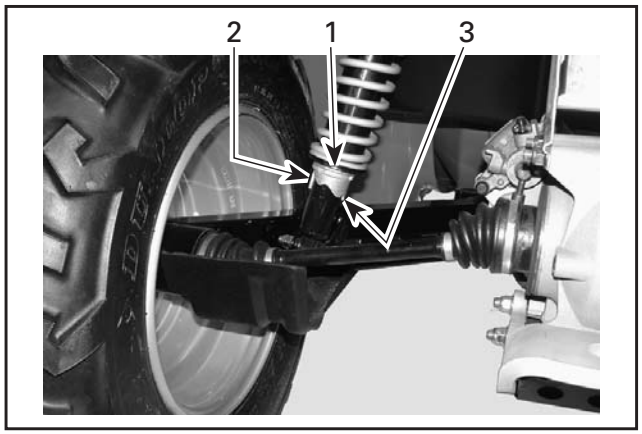
Left and right adjusting cams must always be set at the same position. Never adjust one adjusting cam only. Uneven adjustment can cause poor handling and loss of stability, which could lead to an accident.

NOTE: The front suspension of Outlander 400 series and Outlander 500 series are not adjustable.

Front and Rear Suspension

1. Adjust the spring preload as per the owner's preference.
2. Refer to the following table for proper adjustment.

ACTION	SPRING LENGTH	RIDE TYPE	ROAD CONDITION
Turn adjusting cam clockwise	Shorten the spring	Firmer ride	Rough road condition
Turn adjusting cam counterclockwise	Lengthen the spring	Softer ride	Smooth road condition
It is recommended to shorten the spring length when carrying cargo or pulling a trailer.			

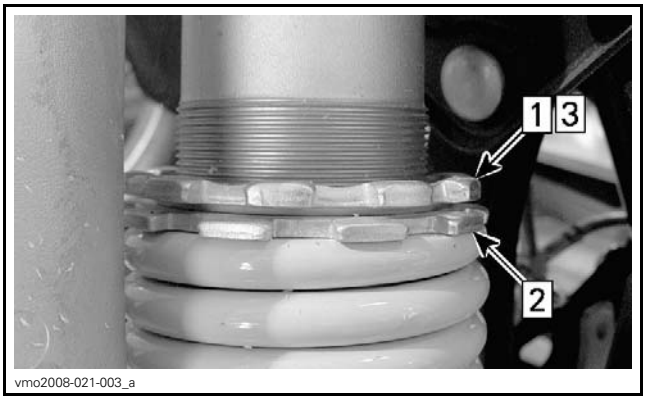


TYPICAL
1. *Adjusting cam*
2. *Lengthen the spring*
3. *Shorten the spring*

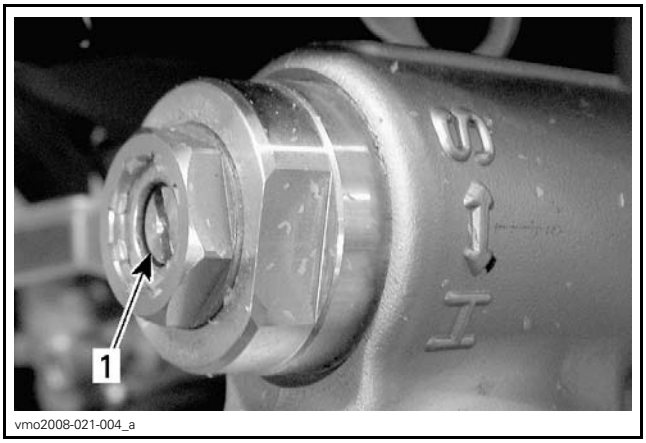
X Package Model

3. Adjust the suspension as per the owner's preference.
4. Refer to the following table for proper adjustment.

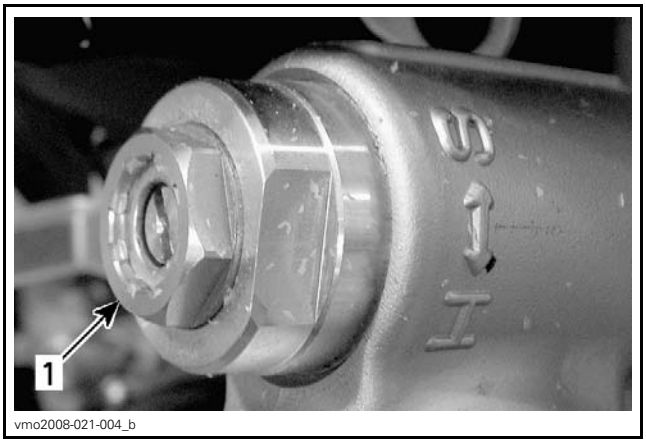
ADJUSTMENT	ACTION	RIDE TYPE
Spring Preload	Shorten the spring	Firmer ride
	Lengthen the spring	Softer ride
Low Speed Compression	Turning it clockwise (H)	Stiffer (increases shock damping action)
	Turning it counterclockwise (S)	Softer (decreases shock damping action)
High Speed Compression	Turning it clockwise (H)	Stiffer (increases shock damping action)
	Turning it counterclockwise (S)	Softer (decreases shock damping action)
Rebound	Turning it clockwise (H)	Stiffer (increases shock damping action)
	Turning it counterclockwise (S)	Softer (decreases shock damping action)



PRELOAD ADJUSTMENT
Step 1: Loosen top locking ring
Step 2: Turn adjusting ring accordingly
Step 3: Tighten top locking ring



COMPRESSION - LOW SPEED
1. *Compression adjuster (flat screwdriver)*



COMPRESSION - HIGH SPEED
1. Compression adjuster (17 mm wrench)

REBOUND
1. Rebound adjuster (flat screwdriver)

Brake Pedal and Lever

1. Ensure that brake pedal and brake lever (s) are not spongy.

B.U.D.S. Programming

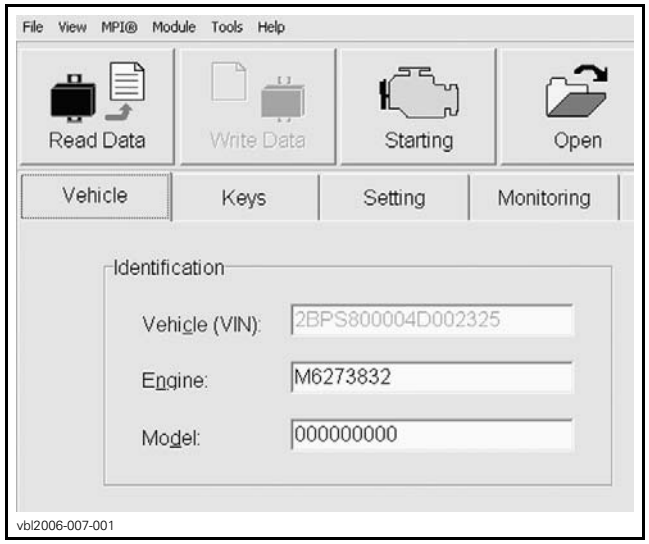
Connecting a PC to Vehicle

1. Connect the PC to vehicle. Refer to the latest edition of *CAN-AM ATV B.U.D.S. SOFTWARE AND COMMUNICATION TOOLS* for the proper connecting procedure.
2. Ensure that the status bar shows the proper protocol and the number 2 is displayed.
3. Press the READ DATA button from the tool bar to initiate communication with the vehicle.

Entering Customer's Name

NOTE: When starting the vehicle, the multifunction display will show the name of the customer; for example: "HI JOHN SMITH". If the customer's name is not programmed, only "HI" will be visible when turning the vehicle ON.

1. Click on the VEHICLE tab to open the vehicle information page.



VEHICLE TAB

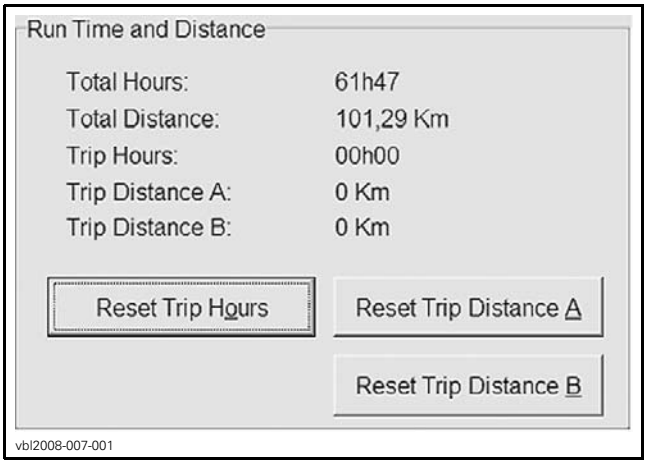
2. Type the name of the customer.

3. Click on WRITE DATA to save the information in the vehicle's ECM.

NOTE: After you are finished typing the name, B.U.D.S. automatically updates the Delivery Date on the screen.

Resetting Trip Hours and Trip Distance

1. Ensure that the VEHICLE tab is selected.
2. Click on the RESET TRIP buttons to reset the information.

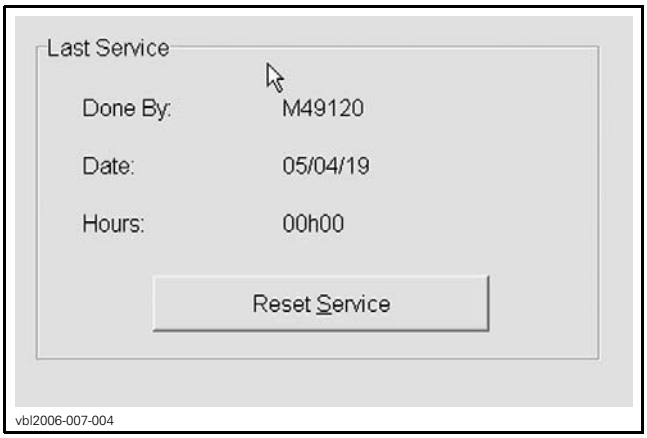


RESET TRIP BUTTONS

NOTE: It can also be done directly on the info-center, using the selector button.

Resetting Last Service

1. Click on the RESET SERVICE button to reset the informations.



RESET SERVICE BUTTON

After each maintenance service, last service should be reset to keep a good tracking of the vehicle service history.

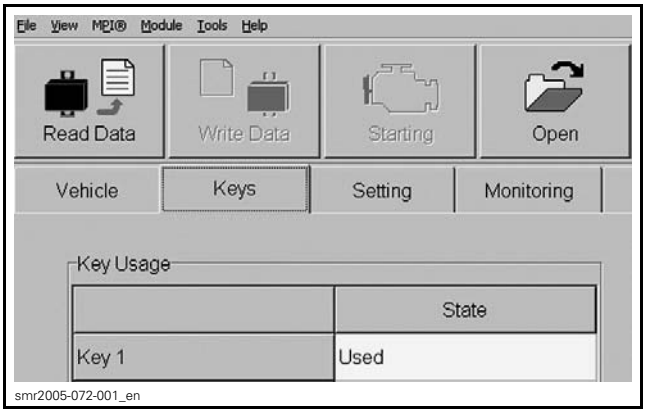
Programing Keys with B.U.D.S.

Outlander 400 series

The Outlander 400 HO EFI does not have DESS, therefore the key does not have to be programmed.

All except Outlander 400 series

1. Click on KEYS tab.

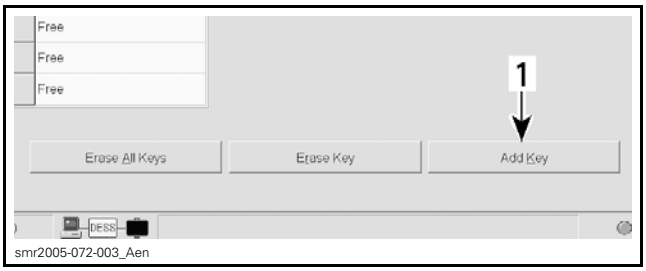


KEYS TAB

2. Click on ERASE ALL KEYS button.
3. Insert ignition key in the ignition switch.

D.E.S.S IGNITION KEY

4. Turn ignition switch to any ON position.
5. Click on ADD KEY button.



1. Add Key Button

6. Repeat to program more keys.
7. Click on WRITE DATA to save the information in the vehicle's ECM.

Speedometer Reading

The speedometer is factory preset in miles but it is possible to change it to kilometer reading. Any unit modification is applied to the speedometer, odometer and trip meter.

1. Select SETTING tab in B.U.D.S.
2. Select Miles or Kilometers from the CLUSTER SCALE section.

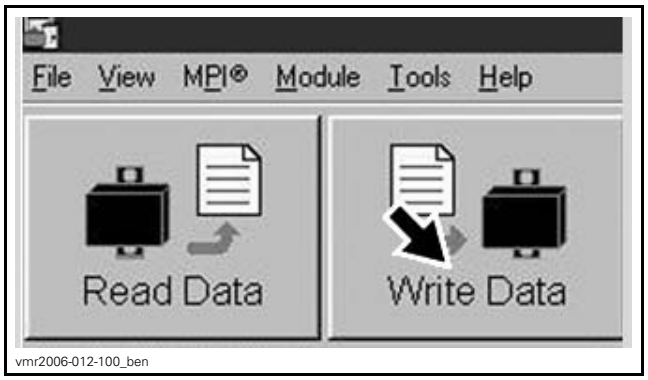
NOTE: No data will be lost when changing this setting.

Ending a B.U.D.S. Session

1. Click on FAULT tab and check if there are active faults.
   – If so, service vehicle then clear the faults in B.U.D.S.

NOTICE After a problem has been solved, ensure to clear the fault(s) in the ECM. This will properly reset the appropriate counter(s). This will also records that the problem has been fixed in the MPEM memory.

2. Click on WRITE DATA button to transfer new settings and information to the ECM.



WRITE DATA BUTTON

3. Click on EXIT button to end session.
4. Disconnect all cables and hardware from vehicle.
5. Ensure to reinstall the cap over the vehicle's communication connector.

ASSEMBLY INSPECTION

Inspect the following parts to make sure that the vehicle is properly assembled.

1. Handlebar tightness
2. Wheel nut torque
3. Tubes/hoses routing and condition
4. Steering column cotter pin
5. Suspension arm ball joint cotter pins
6. Tie rod end nuts and cotter pins
7. Wheel nuts and cotter pins
8. Complete applicable recall or factory-directed modification.

FINAL INSPECTION

Vehicle Test Run

1. Ride the vehicle to ensure proper operation of all systems and components.

Vehicle Cleaning

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

NOTICE It is necessary to use flannel clothes on plastic parts to avoid damaging surfaces. Never clean plastic parts with strong detergent, degreasing agent, paint thinner, acetone, products containing chlorine, etc.

1. Wash and dry the vehicle.
2. Remove any dirt.
3. Clean vinyl and / or plastic parts, using flannel clothes with BRP Vinyl & Plastic Cleaner (P/N 413 711 200).
4. Clean the entire vehicle, including metallic parts, with BRP Cleaner (P/N 293 110 001) (400 g).

Delivery To Customer

1. Complete the *PREDELIVERY CHECK LIST*.
2. Give *OPERATOR'S GUIDE* and *SAFETY DVD* to customer.

NOTE: The customer must read and sign the *PREDELIVERY CHECK LIST*.

NOTE: Hang tag is to be removed by the owner only.

NOTE: Any person who rides this vehicle should read and understand all the information given on hang tag and safety labels before riding.

TECHNICAL DATA

Outlander 400 series

MODEL			OUTLANDER 400 EFI
ENGINE			
Engine type			ROTAX 400, 4-stroke, Single Over Head Camshaft (SOHC), liquid cooled
Number of cylinder			1
Number of valves			4 valves (mechanical adjustment)
Bore mm (in)			91 (3.58)
Stroke mm (in)			61.5 (2.42)
Displacement			400 cm³ (24.41 in³)
Compression ratio			10.3:1
Decompressor type			Automatic
Maximum HP RPM RPM			7500
Lubrication	Type		Wet sump with replaceable oil filter
	Oil filter		BRP ROTAX paper type, replaceable
	Engine oil	Capacity (oil change with filter)	3 L (3.17 quarts) (engine/transmission)
		Recommended	SAE 5W 30 API classification SM, SL or SJ see *RECOMMENDED ENGINE OIL*
Exhaust system			Spark arrestor approved by USDA Forest Service
Air filter			Synthetic paper filter with foam
COOLING SYSTEM			
Coolant		Type	Ethyl glycol/water mix (50% coolant, 50% water). Use premixed coolant sold by BRP (P/N 219 700 362) or coolant specifically designed for aluminum engines
		Capacity	2.5 L (2.65 quarts)

MODEL				OUTLANDER 400 EFI
ELECTRICAL SYSTEM				
Magneto generator output				400 W @ 6000 RPM
Ignition system type				CDI (Capacity Discharge ignition)
Ignition timing				Not adjustable
Spark plug		Quantity		1
		Make and type		NGK DCPR8E
		Gap		0.6 to 0.7 mm (.024 to .027 in)
Engine RPM limiter setting		Forward RPM		8000
		Reverse RPM		4000 ± 100
Battery		Type		Dry battery type
		Voltage		12 volts
		Nominal rating		18 A•h
		Power starter output		0.7 KW
Headlight W				2 x 35
Taillight/Brake light W				8/27
Turn signal lights W				10
Fuses	Fuse box	Access.	Aux. supply	20 A (F6)
			Diagnostic	
			Headlight	
			Power outlet	
			Winch (XT)	
			4 x 4	
		ECM		5 A (F1) and 7.5 A (F3)
		Fuel pump		7.5 A (F5)
		Gauge		7.5 A (F4)
		Tail light		
		Diagnostic		
		Fan		20 A (F2)
	Rear fuse holder	Main		30 A
		Access.	Fan	30 A
			Acc. items in fuse box	

MODEL				OUTLANDER 400 EFI
FUEL SYSTEM				
Fuel delivery	Type			Electronic Fuel Injection (EFI), Del' Orto 46 mm throttle body, 1 injector
Fuel pump	Type			Electrical (in fuel tank)
Idle speed			RPM ± 50	1300 (Not adjustable)
Fuel	Type			Unleaded gasoline
	Octane no.	Inside North America	(R+M)/2	87 or higher
		Outside North America	RON	92 or higher
Fuel tank capacity				20 L (5.3 U.S. gal)
Fuel tank reserve				± 6 L (1.6 U.S. gal)
CVT TRANSMISSION				
Type				CVT (Continuously Variable Transmission)
Engagement RPM			± 100 RPM	1450
GEARBOX				
Type				Dual range (HI-LO) with park, neutral and reverse
DRIVE SYSTEM				
Front differential				Shaft driven/auto-lock differential (Visco-Lok)
Front differential ratio				3.6:1
Rear axle				Shaft driven/ locked differential
Rear axle ratio				3.6:1
Differential oil	Capacity	Front		500 mL (17 U.S. oz)
		Rear		250 mL (8.5 U.S. oz)
	Recommended			BRP differential oil (P/N 293 600 043) or synthetic oil 75W 90 (API GL5)
CV joint grease				CV joint grease (P/N 293 550 019)
Propeller shaft grease				XP-S synthetic grease (P/N 293 550 010)
STEERING SYSTEM				
Turning radius			m (ft)	1.83 (6)
Turning radius (MAX)			m (ft)	2.0 (6.6)
Total toe (vehicle on ground)			mm (in)	0 ± 4 (0 ± .157)
FRONT SUSPENSION				
Suspension type				MacPherson
Suspension travel			mm (in)	178 (7)
Front preload adjustment				N.A.

MODEL			OUTLANDER 400 EFI
REAR SUSPENSION			
Suspension type			TTI™ independent
Suspension travel		mm (in)	203 (8)
Shock absorber	Qty		2
	Type		Oil
Rear preload adjustment			5 settings
BRAKES			
Front brake	Type		Hydraulic, 2 discs
Rear brake	Type		Hydraulic, 1 disc
Brake fluid	Capacity		125 mL (4.3 U.S. oz)
	Type		DOT 4
Parking brake			Hydraulic lock-4 wheels
Brake pad material	Front		Organic
	Rear		Metallic
Minimum pad thickness		mm (in)	1 (.04)
Minimum brake disc thickness	Front	mm (in)	3.5 (.138)
	Rear	mm (in)	4.3 (.17)
Maximum brake disc warpage		mm (in)	0.2 (.01)
TIRES			
Pressure	Front	Max.	34.5 kPa (5 PSI)
		Min.	31 kPa (4.5 PSI)
	Rear	Max.	34.5 kPa (5 PSI)
		Min.	31 kPa (4.5 PSI)
Minimum tire thread depth		mm (in)	3 (1/8)
Size	Front		25 x 8 x 12
	Rear		25 x 10 x 12 **XT:** 25 x 11 x 12
WHEELS			
Size	Front		12 x 6
	Rear		12 x 7.5
Wheel nuts torque	Standard		70 N•m (52 lbf•ft)
	XT		100 N•m (74 lbf•ft)
DIMENSION			
Overall length		m (in)	2.18 (86)
Overall length (MAX)		m (in)	2.39 (94)
Overall width		m (in)	1.17 (46)
Overall height		m (in)	1.14 (45)
Wheelbase		m (in)	1.24 (49)
Wheelbase (MAX)		m (in)	1.45 (57)
Wheel track	Front	mm (in)	965 (38)
	Rear	mm (in)	914 (36)
Ground clearance		mm (in)	236 (9.3)

MODEL			OUTLANDER 400 EFI
LOADING CAPACITY			
Weight distribution	Front/rear	%	49/51
Weight distribution (MAX)	Front/rear	%	46/54
Rear storage box (included with rear rack weight)		kg (lb)	10 (22)
Rack	Front	kg (lb)	45 (100)
	Rear (including rear storage box and tongue weight)	kg (lb)	90 (200)
Total vehicle load allowed (including driver, all other loads and added accessories)		kg (lb)	227 (500)
	(MAX)	kg (lb)	235 (517)
Gross vehicle weight rating		kg (lb)	460 (1014)
	(MAX)	kg (lb)	554 (1219)
Towing capacity		kg (lb)	500 (1100)
Tongue capacity (included with rear rack weight)		kg (lb)	14 (30)

Outlander 500-650-800R series

MODEL			OUTLANDER 500 EFI	OUTLANDER 650 EFI	OUTLANDER 800R EFI
ENGINE					
Engine type			ROTAX® V490	ROTAX V660	ROTAX V810
			4-stroke, Single Over Head Camshaft (SOHC), liquid cooled		
Number of cylinders			2		
Number of valves			8 valves (mechanical adjustment)		
Bore		mm (in)	82.03 (3.23)		91 (3.58)
Stroke		mm (in)	47.3 (1.86)	61.5 (2.42)	
Displacement			500 cm³ (30.51 in³)	650 cm³ (39.67 in³)	800 cm³ (48.82 in³)
Compression ratio			10.7:1	10.3:1	10.3:1
Maximum HP RPM		RPM	7250		6750
Lubrication	Type		Wet sump. Replaceable oil filter		
	Oil filter		BRP Rotax paper type, replaceable		
	Engine oil	Capacity (oil change with filter)	2 L (2.11 quarts)		
		Recommended	SAE 5W30 API classification SM, SL or SJ See *OIL VISCOSITY CHART*		
Exhaust system			Spark arrestor approved by USDA Forest Service		
Air filter			Synthetic paper filter with foam		
COOLING SYSTEM					
Coolant		Type	Ethyl glycol/water mix (50% coolant, 50% water). Use premixed coolant sold by BRP (P/N 219 700 362) or coolant specifically designed for aluminum engines		
		Capacity	2.5 L (2.65 quarts)		

MODEL			OUTLANDER 500 EFI	OUTLANDER 650 EFI	OUTLANDER 800R EFI
ELECTRICAL SYSTEM					
Magneto generator output			400 W @ 6000 RPM		
Ignition system type			IDI (Inductive Discharge Ignition)		
Ignition timing			Not adjustable		
Spark plug	Quantity		2		
	Make and type		NGK DCPR8E		
	Gap		0.6 to 0.7 mm (.024 to .027 in)		
Engine RPM limiter setting	Forward	RPM	8000		
	Reverse	RPM	3200		
Battery	Type		Dry battery type		
	Voltage		12 volts		
	Nominal rating		18 A•h		
	Power starter output		0.7 KW		
Headlight		W	2 x 35		
Taillight		W	7/29		
Director indicator (European models only)		W	10		
Indicator lights			LEDS, 0.7 V approximately (each)		
Fuses	Accessories		20 A		
	Fan		20 A		
	Main (rear)		30 A		
	Ignition coils		5 A		
	Fuel injectors		5 A		
	Speedometer/speed sensor/tail light		7.5 A		
	Fuel pump		7.5 A		
	Engine control module (ECM)		5 A		
	Main accessories (rear)		30 A		

MODEL				OUTLANDER 500 EFI	OUTLANDER 650 EFI	OUTLANDER 800R EFI
FUEL SYSTEM						
Fuel delivery			Type	Electronic Fuel Injection (EFI), DeLorto 46 mm throttle body, 1 injector per cylinder		
Fuel pump			Type	Electrical (in fuel tank)		
			Model	Bosch		
Idle speed			RPM ± 50	1250 (not adjustable)		
Fuel	Type			Regular unleaded gasoline		
	Octane no.	Inside North America	(R+M)/2	87 or higher		
		Outside North America	RON	92 or higher		
Fuel tank capacity				20 L (5.3 U.S. gal)		
Remaining fuel in fuel tank when display light turns ON				± 6 L (1.6 U.S. gal)		
TRANSMISSION						
Type				CVT (Continuously Variable Transmission)		
Engagement RPM			± 100 RPM	1750		
GEARBOX						
Type				Dual range (HI-LO) with park, neutral and reverse		
Gearbox oil		Capacity		400 ml (14 U.S. oz)		
		Recommended		XP-S chaincase oil		
DRIVE SYSTEM						
Front drive				Shaft driven/Auto-lock differential (shear pump)		
Front drive ratio				3.6:1		
Rear drive				Shaft driven/locked differential		
Rear drive ratio				3.6:1		
Differential oil		Capacity	Front	500 ml (17 U.S. oz)		
			Rear	250 ml (8.5 U.S. oz)		
		Recommended		BRP differential oil (P/N 293 600 043) or synthetic oil 75W90 (API GL5)		
CV joint grease				CV joint grease (P/N 293 550 019)		
Propeller shaft grease				Suspension synthetic grease (P/N 293 550 033)		
STEERING						
Turning radius				2.16 m (7 ft)		
Turning radius (MAX)				2.4 m (7 ft 9 in)		
Total toe (vehicle on ground)			mm (in)	0 (0)		
FRONT SUSPENSION						
Suspension type				MacPherson	Double A-Arm	
Suspension travel			mm (in)	178 (7)	203 (8)	
Shock absorber			Qty	2		
			Type	Oil		
Preload adjustment				N.A.	5 settings	

MODEL			OUTLANDER 500 EFI	OUTLANDER 650 EFI	OUTLANDER 800R EFI
REAR SUSPENSION					
Suspension type			TTI™ independent		
Suspension travel		mm (in)	229 (9)		
Shock absorber		Qty	2		
		Type	Oil		
Preload adjustment			5 settings		
BRAKES					
Front brake		Qty	2		
		Type	Hydraulic, 2 discs		
Rear brake		Qty	1		
		Type	Hydraulic, single disc		
Brake fluid	Capacity		180 ml (6.1 U.S. oz)		
	Type		DOT 4		
Parking brake			Hydraulic lock-4 wheels		
Caliper			Floating		
Brake pad material		Front	Organic		
		Rear	Metallic		
Minimum brake pad thickness		mm (in)	1 (.04)		
Minimum brake disc thickness	Front	mm (in)	3.5 (.138)		
	Rear	mm (in)	4.3 (.17)		
Maximum brake disc warpage		mm (in)	0.2 (.01)		
TIRES					
Pressure	Front	Maximum	34.5 kPa (5 PSI)	48 kPa (7 PSI)	
		Minimum	31 kPa (4.5 PSI)	31 kPa (4.5 PSI)	
	Rear	Maximum	34.5 kPa (5 PSI)	48 kPa (7 PSI)	
		Minimum	31 kPa (4.5 PSI)	31 kPa (4.5 PSI)	
	Front (MAX)	Maximum	34.5 kPa (5 PSI)	48 kPa (7 PSI)	
		Minimum	31 kPa (4.5 PSI)	31 kPa (4.5 PSI)	
	Rear (MAX)	Maximum	34.5 kPa (5 PSI)	48 kPa (7 PSI)	
		Minimum	31 kPa (4.5 PSI)	34.5 kPa (5 PSI)	
Minimum tire thread depth		mm (in)	3 (0.118)		
Size		Front	25 x 8 x 12	26 x 8 x 12	
		Rear	25 x 10 x 12 XT: 25 x 11 x 12	26 x 10 x 12	
WHEELS					
Size		Front	12 x 6		
		Rear	12 x 7.5		
Wheel nuts torque		Standard	70 N•m (52 lbf•ft)		
		XT	100 N•m (74 lbf•ft)		
		CAMO XT	70 N•m (52 lbf•ft)		
		LTD	70 N•m (52 lbf•ft)		

MODEL			OUTLANDER 500 EFI	OUTLANDER 650 EFI	OUTLANDER 800R EFI
DIMENSION					
Overall length		m (in)	2.18 (86)		
Overall length (MAX)		m (in)	2.39 (94)		
Overall width		m (in)	1.17 (46)		
Overall height		m (in)	1.14 (45)		
Wheelbase		m (in)	1.30 (51)		
Wheelbase (MAX)		m (in)	1.50 (59)		
Wheel track	Front	mm (in)	965 (38)		
	Rear	mm (in)	914 (36)		
Ground clearance		mm (in)	279 (11)		
LOADING CAPACITY					
Weight distribution	Front/rear	%	51/49		
Weight distribution (MAX)	Front/rear	%	48/52		
Rear storage box (included with rear rack weight)		kg (lb)	10 (22)		
Rack	Front	kg (lb)	45 (100)		
	Rear (including rear storage box and tongue weight)		90 kg (200 lb)		
Total vehicle load allowed (including driver, all other loads and added accessories)		kg (lb)	227 (500)	235 (517)	
	MAX	kg (lb)	235 (517)	272 (600)	
Gross vehicle weight rating		kg (lb)	553 (1220) XT: 584 (1287)	584 (1287)	
	MAX	kg (lb)	558 (1228)	649 (1430)	
Towing capacity		kg (lb)	591 (1300)		
Tongue capacity (included with rear rack weight)		kg (lb)	23 (50)		

Renegade series

MODEL			RENEGADE 500	RENEGADE 800R/800R X
ENGINE				
Engine type			4-stroke, Single Over Head Camshaft (SOHC), liquid cooled	
Number of cylinders			2	
Number of valves			8 valves (mechanical adjustment)	
Bore		mm (in)	82 (3.23)	91 (3.58)
Stroke		mm (in)	47 (1.85)	61.5 (2.42)
Displacement			500 cm³ (30.51 in³)	800 cm³ (48.82 in³)
Compression ratio			10.3:1	
Maximum Horsepower RPM		RPM	7250	6750
Lubrication	Type		Wet sump. Replaceable oil filter	
	Oil filter		BRP Rotax paper type, replaceable	
	Engine oil	Capacity (oil change with filter)	2 L (2.11 quarts)	
		Recommended	SAE 5W 30 API classification SM, SL or SJ see *OIL VISCOSITY CHART*	
Exhaust system			Spark arrestor approved by USDA Forest Service	
Air filter			Synthetic paper filter with foam	

MODEL			RENEGADE 500	RENEGADE 800R/800R X
COOLING SYSTEM				
Coolant		Type	Ethyl glycol/water mix (50% coolant, 50% water). Use premixed coolant sold by BRP (P/N 219 700 362) or coolant specifically designed for aluminum engines	
		Capacity	2.5 L (2.65 quarts)	
ELECTRICAL SYSTEM				
Magneto generator output			400 W @ 6000 RPM	
Ignition system type			IDI (Inductive Discharge Ignition)	
Ignition timing			Not adjustable	
Spark plug		Quantity	2	
		Make and type	NGK DCPR8E	
		Gap	0.6 to 0.7 mm (.024 to .027 in)	
Engine RPM limiter setting		Forward RPM	8000	
		Reverse RPM	3200	
Battery		Type	Dry battery type	
		Voltage	12 volts	
		Nominal rating	18 A•h	
		Power starter output	0.7 KW	
headlights		W	4 x 60	
taillight		W	8/26	
Director indicator (European models only)		W	10	
Fuses		Accessories	20 A	
		Fan	20 A	
		Main	30 A	
		Ignition coils	5 A	
		Fuel injectors	5 A	
		Speedometer/speed sensor/taillight	7.5 A	
		Fuel pump	7.5 A	
		Engine control module (ECM)	5 A	
		Main accessories	30 A	
FUEL SYSTEM				
Fuel delivery		Type	Electronic Fuel Injection (EFI), Dell'Orto 46 mm throttle body, 1 injector per cylinder	
Fuel pump		Type	Bosch	
		Model	Electrical (in fuel tank)	
Idle speed		± 50 RPM	1250 (not adjustable)	
Fuel	Type		Regular unleaded gasoline	
	Octane no.	Inside North America (R+M)/2	87 or higher	
		Outside North America RON	92 or higher	
Fuel tank capacity			20 L (5.3 U.S. gal)	
Remaining fuel in fuel tank when display light turns ON			± 6 L (1.6 U.S. gal)	

MODEL			RENEGADE 500	RENEGADE 800R/800R X
CVT TRANSMISSION				
Type			CVT (Continuously Variable Transmission)	
Engagement RPM ± 100 RPM			1600	
GEARBOX				
Type			Dual range (HI-LO) with park, neutral and reverse	
Gearbox oil	Capacity		400 ml (14 U.S. oz)	
	Recommended		XP-S chaincase oil (P/N 413 801 900)	
DRIVE SYSTEM				
Differential oil	Capacity	Front	500 ml (17 U.S. oz)	
		Rear	250 ml (8.5 U.S. oz)	
	Recommended		BRP differential oil (P/N 293 600 043) or synthetic oil 75W 90 (API GL5)	
Front drive			Shaft driven/single Auto-lock differential (pump driven)	
Front drive ratio			3.6:1	
Rear drive			Shaft driven/single differential	
Rear drive ratio			3.6:1	
CV joint grease			CV joint grease (P/N 293 550 019)	
Propeller shaft grease			XP-S synthetic grease (P/N 293 550 010)	
STEERING				
Turning radius			2.16 m (7 ft)	
Total toe (vehicle on ground)			0 mm (0 in)	
Camber angle			0°	
SUSPENSION				
FRONT				
Suspension type			Double A-Arm	
Suspension travel mm (in)			216 (8.5)	
Shock absorber	Qty		2	
	Type		Oil 5 settings	HPG X: HPG Clicker
REAR				
Suspension type			TTI™ independent	
Suspension travel mm (in)			229 (9)	
Shock absorber	Qty		2	
	Type		Oil 5 settings	HPG X: HPG Clicker

MODEL			RENEGADE 500	RENEGADE 800R/800R X
BRAKES				
Front brake	Type		Hydraulic, 2 discs	
Rear brake	Type		Hydraulic, single disc	
Brake fluid	Capacity		125 ml (4.3 U.S. oz)	
	Type		DOT 4	
Parking brake			LH brake lever includes a lock on rear wheels	
Caliper			Floating	
Brake pad material	Front		Organic	
	Rear		Metallic	
Minimum bake pad thickness		mm (in)	1 (.04)	
Minimum brake disc thickness	Front	mm (in)	3.5 (.138)	
	Rear	mm (in)	4.3 (.17)	
Maximum brake disc warpage		mm (in)	0.2 (.01)	
TIRES AND WHEELS				
TIRES				
Pressure	Front		Maximum: 48 kPa (7 PSI) Minimum: 34.5 kPa (5 PSI)	
	Rear		Maximum: 48 kPa (7 PSI) Minimum: 38 kPa (5.5 PSI)	
Minimum tire thread depth		mm (in)	3 (0.118)	
Size	Front		25 x 8 x 12	
	Rear		25 x 10 x 12	
WHEELS				
Size	Front		12 x 6	
	Rear		12 x 7.5	
Wheel nuts torque			100 N•m (74 lbf•ft)	
WEIGHT AND DIMENSION				
Overall length		m (in)	2.18 (86)	
Overall width		m (in)	1.17 (46)	
Overall height		m (in)	1.14 (45)	
Dry weight		kg (lb)	275 (607)	
Wheel base		m (in)	1.30 (51)	
Wheel track	Front	mm (in)	965 (38)	
	Rear	mm (in)	914 (36)	
Ground clearance		mm (in)	305 (12)	
LOADING CAPACITY				
Weight distribution	Front/rear	%	51/49	
Rear storage box		L (U.S. gal)	3.7 (1)	
Rack	Rear	kg (lb)	16 (35)	
Total vehicle load allowed (including driver, all other loads and added accessories)		kg (lb)	141 (310)	
Gross vehicle weight rating		kg (lb)	476 (1050)	
Towing capacity		kg (lb)	591 (1300)	

can-am BRP

ATV
SERVICE
Bulletin

August 19, 2008 Subject: **High Altitude Use** No. **2009-6**

YEAR	MODEL NAME	MODEL NUMBER	SERIAL NUMBER
2009	All	All	All

Standard carburetor and drive pulley calibration on above-listed models were set at factory for sea level riding. Refer to appropriate *Shop Manual* for detailed specifications.

When an ATV is used at 1200 m (4000 ft) or more above sea level, modifications to carburetor and/or drive pulley settings must be performed as per tables contained in this document.

IMPORTANT: Should vehicle return to lower altitudes, carburetor and drive pulley calibration must be set back accordingly.

ATV HIGH ALTITUDE PARTS RETURN

NOTE: Do not use a warranty claim form; instead, use the *Parts Return Authorization Request* form at the end of this bulletin (of which you will make photocopies).

Purchase from BRP the necessary parts for high altitude application. Anything other than a BRP part will not be accepted.

Fax the request to the parts department using an authorization request form that has been completed.

Return the original UNUSED centrifugal levers (complete with bolts and nuts), with the *Return Authorization* and the *Parts Return Authorization Request*. Attach proof that replacement parts were purchased from BRP (invoice or packing slip).

NOTE: Centrifugal levers are sold by package with the required quantity to update a model to high altitude. The same quantity of levers must be returned for each specific model.

Credit for the original parts will be issued to dealer's account through the regular parts system, credited at 100% of parts cost (current dealer cost), no handling.

Levers will be inspected when received and, if found used, will be returned to the dealer without credit.

NOTE: Only centrifugal levers (complete with bolts and nuts) are allowed to be returned with this program; no other parts can be returned. No labor credit.

More than one ATV can be submitted on the same form; simply use one line for each vehicle.

Be sure to match and ship all centrifugal levers with the same form.

NOTE: This program is also applicable for previous model year ATVs; refer to appropriate model year High Altitude Service Bulletin.

Return to:

U.S. Dealers

Bombardier Recreational Products Inc.,
c/o Affiliated,
60 Maple Street
Derby Line, VT
05830
ATTN: HIGH ALTITUDE PARTS RETURN

Canadian Dealers

Bombardier Recreational Products Inc.,
75 J.-A.-Bombardier,
Sherbrooke, Qc
J1L 1W3
ATTN: HIGH ALTITUDE PARTS RETURN

International Dealers

All parts must be returned to the distributor or BRP regional office. Contact them for complete address and shipping information.

HIGH ALTITUDE SPECIFICATIONS

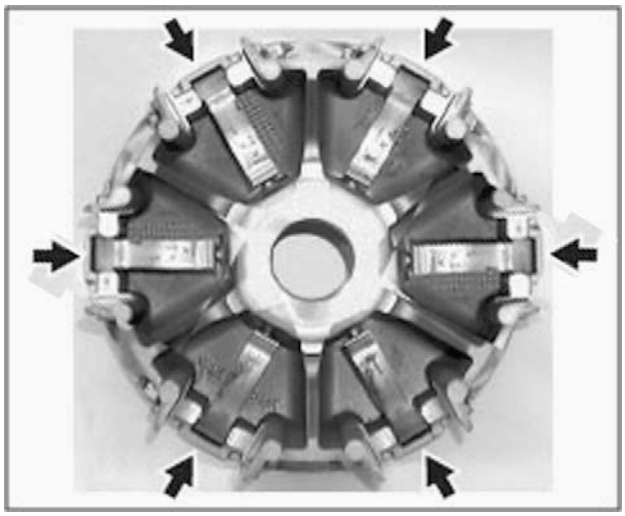
In the tables throughout this document,

– Shaded column gives factory setting,
– (*) Single asterisk refers to Centrifugal Levers Reference Chart on page 5 of this document.

Renegade™ 800 EFI

No high altitude calibration settings have to be done through B.U.D.S. The calibration features an automatic electronic fuel injection compensation allowing fuel injection mapping to be optimized at all altitudes.

DRIVE PULLEY				
Centrifugal Lever	Sea Level	1200 m (4000 ft)	2400 m (8000 ft)	Qty
	420 248 495 (set of 6) (qty 1)	10.2 mm*	9 mm*	6



Remove all 6 standard levers and replace them with 6 high altitude levers.

⚠ WARNING

Failure to perform proper installation can cause damage to the vehicle and serious personal injuries to the rider.

Outlander™ 800 EFI

No high altitude calibration settings have to be done through B.U.D.S. The calibration features an automatic electronic fuel injection compensation allowing fuel injection mapping to be optimized at all altitudes.

DRIVE PULLEY				
Centrifugal Lever	Sea Level	1200 m (4000 ft)	2400 m (8000 ft)	Qty
	420 248 495 (set of 6) (qty 1)	10.2 mm*	9 mm*	6

Remove all 6 standard levers and replace them with 6 high altitude levers.

⚠ WARNING

Failure to perform proper installation can cause damage to the vehicle and serious personal injuries to the rider.

Outlander 650 EFI

No high altitude calibration settings have to be done through B.U.D.S. The calibration features an automatic electronic fuel injection compensation allowing fuel injection mapping to be optimized at all altitudes.

DRIVE PULLEY				
Centrifugal Lever	Sea Level	1200 m (4000 ft)	2400 m (8000 ft)	Qty
	420 248 558 (set of 6) (qty 1)		8.7 mm*	6

Remove all 6 standard levers and replace them with 6 high altitude levers.

⚠ WARNING

Failure to perform proper installation can cause damage to the vehicle and serious personal injuries to the rider.

Renegade 500 EFI

No high altitude calibration settings have to be done through B.U.D.S. The calibration features an automatic electronic fuel injection compensation allowing fuel injection mapping to be optimized at all altitudes.

DRIVE PULLEY				
Centrifugal Lever	Sea Level	1200 m (4000 ft)	2400 m (8000 ft)	Qty
	420 248 555 (set of 4) (qty 1)	10.75 mm*	9.75 mm*	4

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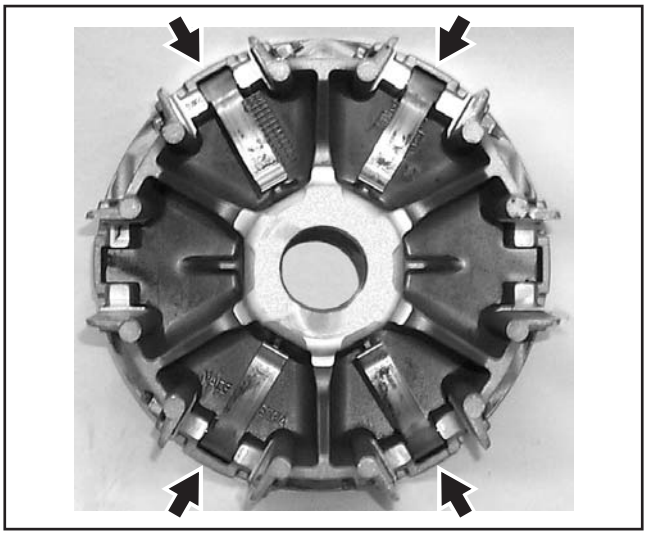

Remove all 4 standard levers and replace them with 4 high altitude levers.

⚠ WARNING

Failure to perform proper installation can cause damage to the vehicle and serious personal injuries to the rider.

Outlander 500 EFI

No high altitude calibration settings have to be done through B.U.D.S. The calibration features an automatic electronic fuel injection compensation allowing fuel injection mapping to be optimized at all altitudes.

DRIVE PULLEY				
Centrifugal Lever	Sea Level	1200 m (4000 ft)	2400 m (8000 ft)	Qty
	420 248 555 (set of 4) (qty 1)	10.75 mm*	9.75 mm*	4

Remove all 4 standard levers and replace them with 4 high altitude levers.

⚠ WARNING

Failure to perform proper installation can cause damage to the vehicle and serious personal injuries to the rider.

DS 450™ EFI

No high altitude calibration settings have to be done through B.U.D.S. The calibration features an automatic electronic fuel injection compensation allowing fuel injection mapping to be optimized at all altitudes.

There are different sprocket calibration available to fine tune vehicle.

⚠ CAUTION Changing sprocket ratio may affect performance, including maximum vehicle speed. If the vehicle is equipped with a speedometer, the speed indicated by the speedometer may be different than actual vehicle speed. Please refer to chart below. Any sprocket combination highlighted (shaded areas) in the chart below will result in a vehicle speed higher than speed indicated on speedometer.

13-tooth Sprocket Kit (P/N 715 000 519)		
707 000 612	Sprocket	1
420 245 650	Retaining Ring	1
14-tooth Sprocket Kit (P/N 715 000 591)		
420 236 061	Sprocket	1
420 245 650	Retaining Ring	1
15-tooth Sprocket Kit (P/N 715 000 518)		
420 236 062	Sprocket	1
420 245 650	Retaining Ring	1
39-tooth Sprocket Kit (P/N 715 000 527)		
705 500 872	Sprocket	1
233 201 414	Flanged Elastic Nut	4
42-tooth Sprocket Kit (P/N 715 000 592)		
705 500 930	Sprocket	1
233 201 414	Flanged Elastic Nut	4
44-tooth Sprocket Kit (P/N 715 000 515)		
705 500 946	Sprocket	1
233 201 414	Flanged Elastic Nut	4
293 900 028	Bushing	2

CORRECTION FACTOR DUE TO CHANGE OF SPROCKET RATIO				
		Rear sprocket		
		39	42	44
Front sprocket	13	100%	93%	89%
	14	**108%**	100% (1)	95%
	15	**115%**	**107%**	**102%**
(1) Factory Ratio				

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⚠ CAUTION Chain length might need to be adjusted with new sprocket sizes. See *ACCESSORY CATALOG* for replacement chain that can be installed with these kits. DO NOT ride the vehicle with a chain tension different than recommended.

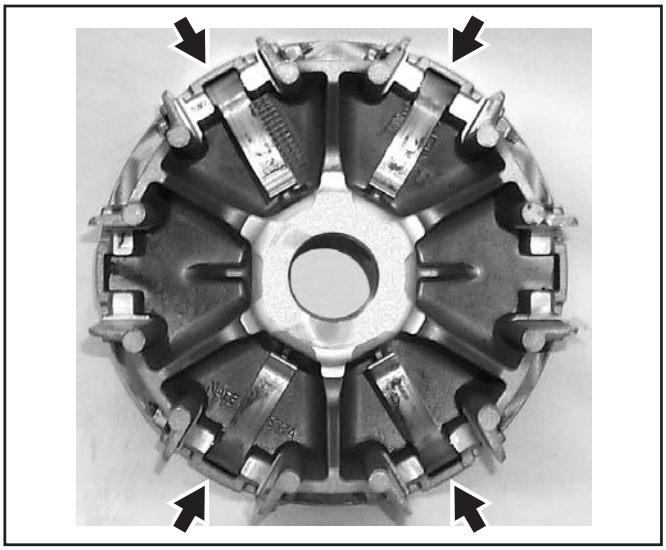
⚠ WARNING

The use of any sprocket combination highlighted (shaded areas) in the previous chart leads to a change of the maximum vehicle load allowed. To avoid exceeding the OEM tire manufacturer's recommendations, the new maximum load will be 91 kg (200 lb). The omission to comply with this request could cause tire bursting and severe injury or death could occur.

Outlander 400 EFI

No high altitude calibration settings have to be done through B.U.D.S. The calibration features an automatic electronic fuel injection compensation allowing fuel injection mapping to be optimized at all altitudes.

DRIVE PULLEY				
Centrifugal Lever	Sea Level	1200 m (4000 ft)	2400 m (8000 ft)	Qty
	420 248 424 (set of 4) (qty 1)	10.5 mm*	9.5 mm*	4



Remove all 4 standard levers and replace them with 4 high altitude levers as per illustration.

⚠ WARNING

Failure to perform proper installation can cause damage to the vehicle and serious personal injuries to the rider.

DS 250

CALIBRATION	SEA LEVEL		1200 M (4000 FT)		2400 M (8000 FT)	
Country	North America	Europe	North America	Europe	North America	Europe
Main Jet	105	110	100	105	95	100
Needle Position	4	2	3	1		
Mixture Screw	2		1.5			
Idle RPM ±100	1700		1800			

Mini DS 90 / Mini DS 70

NOTE: There is no specific high altitude calibration for the DS 90 or the DS 70.
Parts to optimize vehicle performance at high altitudes have though been made available.
Refer to table beside.

MAIN JET TYPE	P/N
68	V16104DGF000
70	V16105DGF000
72	V16106DGF000
78	V16107DGF000
80	V16108DGF000
82	V16109DGF000
85	V16110DGF000
PILOT JET TYPE	
35	V16101DGF000

Reference Chart

CENTRIFUGAL LEVER ‡		
Identification		KIT P/N
Size	Vehicle Model	
8.7 mm	Outlander 650 EFI	715 500 285
9.0 mm	Outlander 800 EFI / Renegade 800 EFI	715 500 248
9.5 mm	Outlander 400 EFI	707 000 325
9.75 mm	Outlander 500 EFI / Renegade 500 EFI	715 500 295
10.2 mm	Outlander 800 EFI / Renegade 800 EFI	715 500 249
10.5 mm	Outlander 400 EFI	707 000 324
10.75 mm	Outlander 500 EFI/ Renegade 500 EFI	715 500 294

‡ Levers are sold by package. Each package contains the required quantity of levers to update a unit to high altitude.

ATV—HIGH ALTITUDE PARTS RETURN AUTHORIZATION REQUEST

PARTS FOR USE AT HIGH ALTITUDE

DEALER NAME:
_____

DEALER NUMBER:_____

State/Province:_____

Country:_____

✓ Please submit only one request per week.

PART NO.	MODEL NO.	SERIAL NO.	QTY	BRP USE ONLY	
				REASON CODE	RECEPTION DATE

Please complete this form and fax it to obtain a RETURN AUTHORIZATION.

Fax Number (U.S.A.): 1-800-366-3880
Fax Number (Canada): 1-800-361-7143

Return parts with RETURN AUTHORIZATION and this form.

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ATV
SERVICE
Bulletin

August 11, 2008 Subject: **CAN-AM™ Outlander 400 EFI Inappropriate D.E.S.S.™ Decal** No. **2009-5**

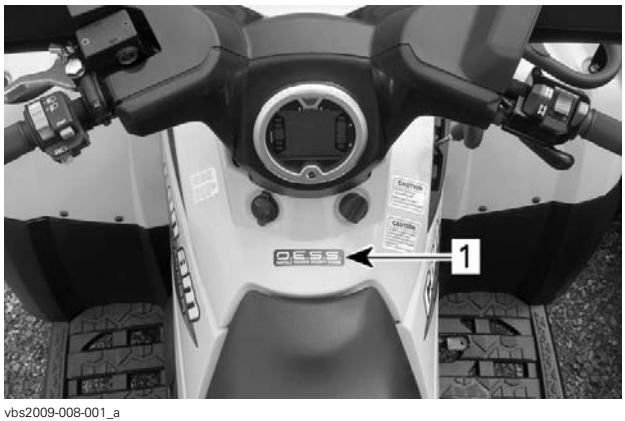
YEAR	MODEL	MODEL NUMBER	SERIAL NUMBER
2009	Outlander 400 EFI	5A9A – 5A9B – 5A9C – 5A9D - 5B9A – 5B9B – 5B9C – 5B9F – 5C9A – 5C9B - 5C9C - 5D9A – 5D9B – 5D9C – 5D9D - 5D9F	All

D.E.S.S. DECAL

On a limited quantity of the above described vehicle, an inappropriate D.E.S.S. decal has been installed. As described in BRP documentation, there is no D.E.S.S. on the MY 2009 Outlander 400 EFI. To avoid any confusion in the network, you may want to remove the inappropriate D.E.S.S. decal.

Also, some of our Operator's Guides may incorrectly talk about D.E.S.S., so please make sure to inform your customers.

Refer to the following illustration to locate the inappropriate D.E.S.S. decal.



vbs2009-008-001_a

1. Inappropriate D.E.S.S. decal

Printed in Canada (vbs2009-008 en DM)

ATV
ADMINISTRATIVE
Bulletin

Date: **August 6, 2007** Subject: **CVT Drive Belt Guidelines** No. **2008-1**

YEAR	MODEL	MODEL NUMBER	SERIAL NUMBER
2008	All	All	All

All BRP CVT belts are covered by the BRP Limited Warranty against any manufacturing defect.

BRP OEM CVT belts are premium belts that are especially designed and calibrated for BRP recreative vehicles. Non-OEM CVT belts can be the cause of poor performance, poor acceleration, over-revving, clutch slipping, high fuel consumption, etc. **BRP CVT belts are the only belts covered by the BRP Limited Warranty against any manufacturing defects. This warranty also covers contributory damages caused by a belt manufacturing defect; aftermarket belts do not.**

Beyond manufacturing defects, damage can still occur if the system is abused, adjusted incorrectly or neglected. Therefore, BRP has created a new "CVT DRIVE BELT GUIDELINES" document you can consult to determine the cause of a damaged CVT belt.

This is a two-page color document that can be inserted in your dealer binder (English on one side, French on the other).

Some conditions shown on these pages are not related to a manufacturing defect, and therefore are not covered under BRP Limited Warranty.

In case of doubt, do not hesitate to send CVT belts to the Warranty Department to confirm your diagnostic.

CVT belts are considered wear items; normal wear is not warrantable.

- English / French (P/N 484 800 456)

Do not hesitate to order more if required.

mba2007-002-001 en

Printed in Canada. (vba2008-002 DL)

ATV SERVICE Bulletin

June 01, 2008 Subject: **CAN-AM™ATV B.U.D.S. Software and Communication Tools** No. **2009-2**

YEAR	MODEL	MODEL NUMBER	SERIAL NUMBER
2009	EFI equipped vehicles	All	All

GENERAL INFORMATION

As a reference to predelivery inspection bulletin, this service publication provides instructions about B.U.D.S. software and B.U.D.S. communication tools. It contains general practices to connect B.U.D.S. to a vehicle and can be used as a reference for preparing vehicles before delivery to customers.

For additional information, refer to the following:

- Use B.U.D.S. software help menu which contains detailed information on its functions.
- BRP's Guide to Service Fundamentals and Principles, Chapter 9, (P/N 484 800 168).
- 2006 ATV Technical Update Book, Section 4B, (P/N 219 100 226).

As a reminder, always use the latest version of B.U.D.S. that can be downloaded from BOSSWeb (www.bossweb.brp.com).

Note that two different MPI (Multi-Purpose Interface) can be used with B.U.D.S. software: MPI-1 and MPI-2. Refer to the following table for proper vehicles compatibility.

MODELS	MPI-1	MPI-2
Outlander™ 400 EFI Series		✓
Outlander 500-650-800R EFI Series	✓	✓
Renegade™ 500-800R EFI Series	✓	✓
DS 450™ EFI Series		✓

For MY2008 and previous, refer to the appropriate *PREDELIVERY INSPECTION BULLETIN* for B.U.D.S software and communication tools information.

MPI-1 COMMUNICATION TOOLS

Multi-Purpose Interface (MPI-1)

PART REQUIRED
PC computer
B.U.D.S. software Use latest version available on BOSSWeb
Communication kit (P/N 529 035 981)
Optional extension cable (P/N 529 035 703)

5290359812

COMMUNICATION KIT

529035703

OPTIONAL EXTENSION CABLE

Printed in Canada (vbs2009-006 en DM)

MPI-1 Supply

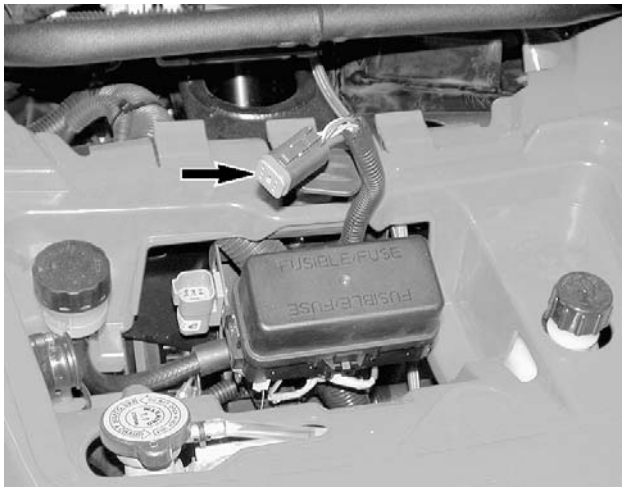
The MPI can use the vehicle power for its supply. Four AA batteries or an AC/DC power supply can also be used. Make sure to respect MPI specification if a power supply is used.

Connections with Vehicle Using MPI-1

⚠ WARNING

If the computer you are using is connected to the 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 computer.

1. Remove service compartment cover and locate communication connector.
2. Unplug communication connector.



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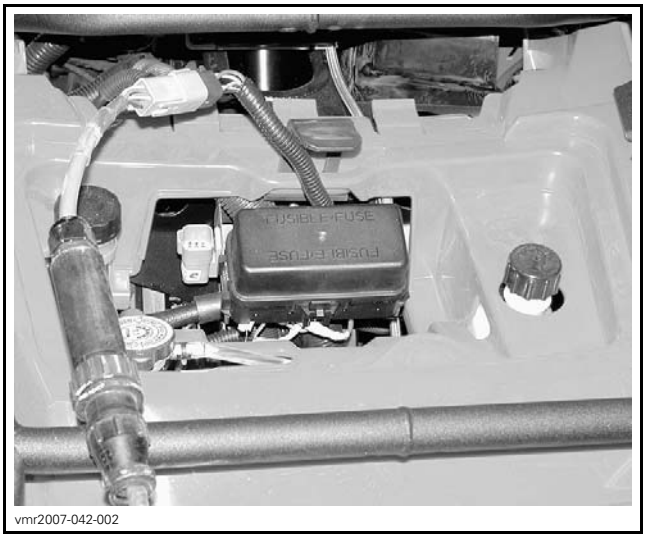
TYPICAL

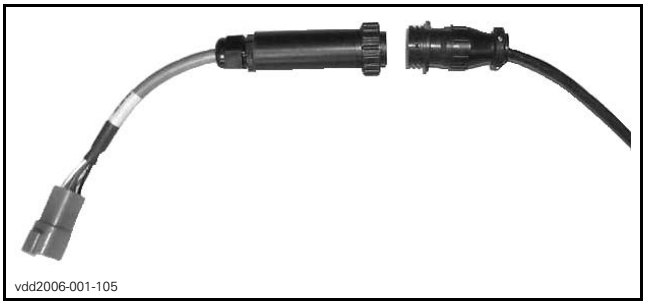
3. Connect the 6-pin adapter to the vehicle connector.



vmr2007-042-002

TYPICAL

4. Connect the diagnostic cable to the 6-pin adapter.



vdd2006-001-105

5. Connect the other diagnostic cable connector to MPI connector.
6. Connect serial cable to MPI connector.

vdd2006-001-102

7. Connect remaining serial cable connector to the serial port of a PC (personal computer).


vdd2006-001-103

8. Use B.U.D.S. software as described further in *B.U.D.S. SOFTWARE*.

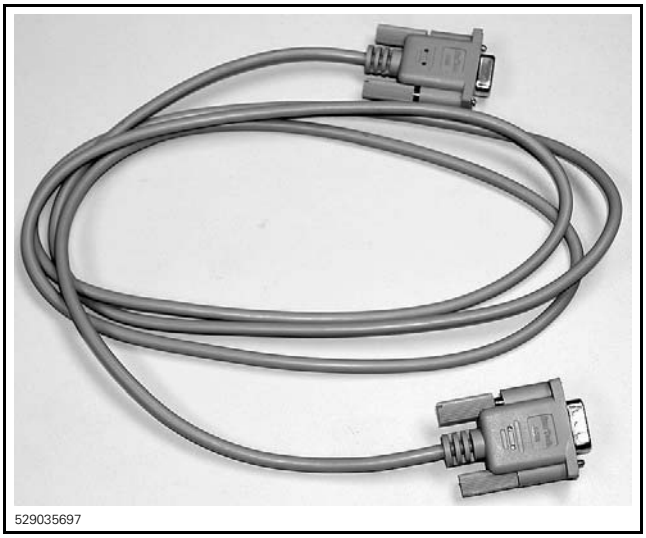
MPI-2 COMMUNICATION TOOLS

Multi-Purpose Interface-2 (MPI-2)

PART REQUIRED
PC computer
B.U.D.S. software Use latest version available on BOSSWeb
MPI-2 (P/N 529 036 018)
Optional extension cable Use DB9 male to DB9 female connector purchased at any PC store. Do not exceed 7.6 meter (25 FT) in length.
Diagnostic cable (P/N 710 000 851)

529036018

MPI-2


529035697

OPTIONAL EXTENSION CABLE


710000851

DIAGNOSTIC CABLE

MPI-2 Supply

The MPI-2 uses the USB power of the PC computer for its supply.

Connections with Vehicle Using MPI-2

⚠ WARNING

If the computer you are using is connected to the 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 computer.

1. Remove service compartment cover and locate communication connector.
2. Unplug communication connector.

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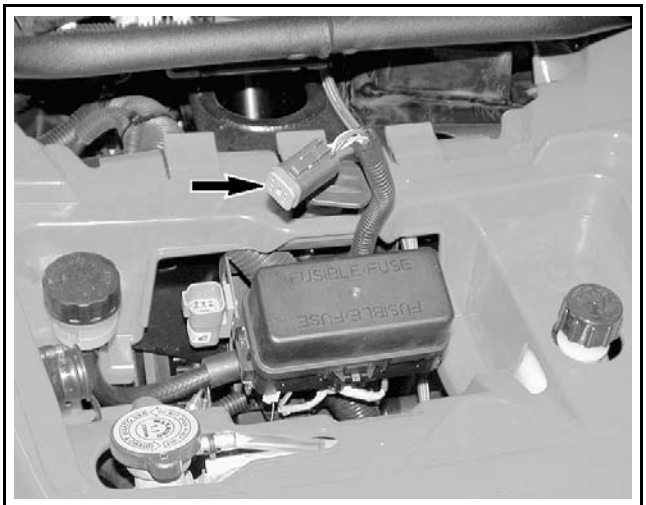

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OUTLANDER SERIES (TYPICAL)

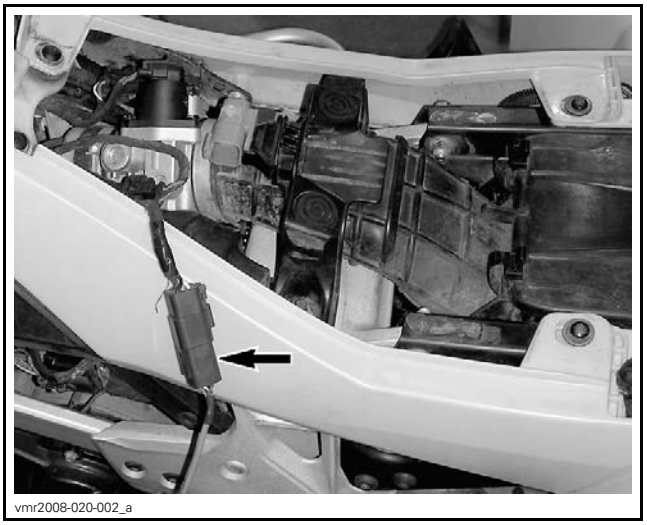
3. Connect diagnostic cable to vehicle connector.


vdd2006-001-152

OUTLANDER SERIES (TYPICAL)
Step 1: Remove front service compartment panel

vbl2007-008-008_a

RENEGADE SERIES (TYPICAL)
Step 1: Remove seat
Step 2: Remove central panel

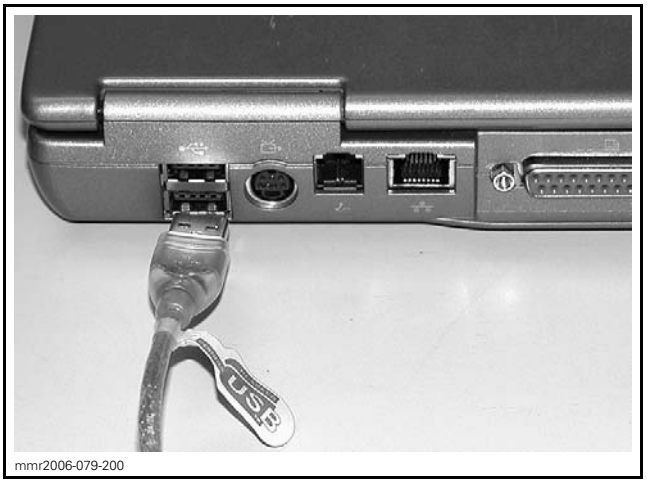

vmr2008-020-002_a

DS 450 EFI SERIES (TYPICAL)
Step 1: Remove seat

4. Connect remaining connector to MPI-2 connector.

vdd2006-001-151

5. Connect remaining MPI-2 connector to the USB port of a PC (personnal computer).



mmr2006-079-200

6. Use B.U.D.S. software as described further in *B.U.D.S. SOFTWARE*.

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B.U.D.S. SOFTWARE

B.U.D.S. (Bombardier Utility and Diagnostic Software) is designed to program key(s), to allow electrical component inspection, diagnostic options and adjustments such as the closed throttle.

The type of MPI that is being used does not have any effect on the interface and the features of B.U.D.S.

Ensure to use the latest B.U.D.S. version available on BOSSWeb.

If you are using an old PC computer with the MPI-1, it may be necessary to use a slower speed so that the communication works.

Ensure to turn ignition switch ON and set engine switch to RUN to activate the communication.

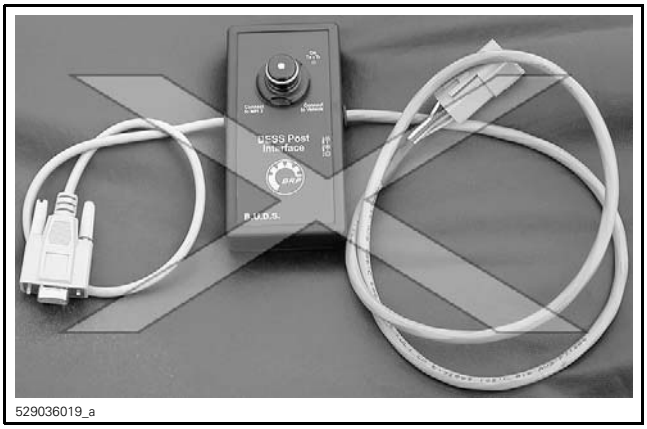
On the MPI-1, the RX/TX MPEM LED on the middle of the enclosure will blink to indicate that data is being exchanged with the vehicle.

On the MPI-2, LEDs on enclosure will blink to indicate that data is being exchanged with the vehicle.

Outlander 400 EFI series

NOTE: MPI-1 will not allow communication with these vehicles. Only the MPI-2 must be used.

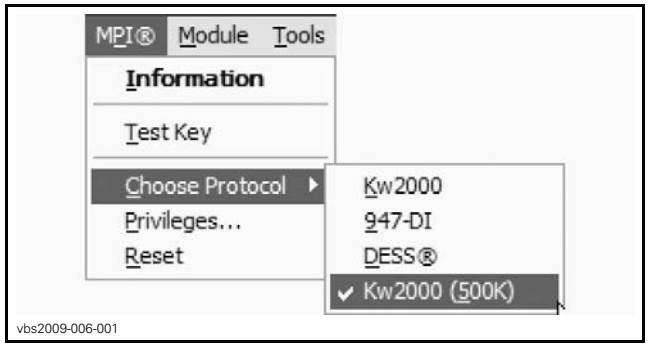
NOTE: Do not use DESS Post Interface (P/N 529 036 019) with the KW2000 (500K) protocol. DESS Post Interface will not allow communication with these vehicles.



529036019_a

DO NOT USE DESS POST INTERFACE

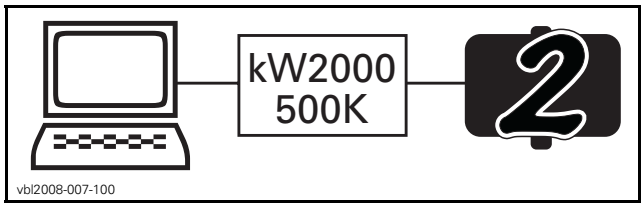
1. Select MPI from the top menu and then CHOOSE PROTOCOL.
2. Click on KW2000 (500K)



vbs2009-006-001

3. Ensure the status bar shows KW2000 (500K) with the number 2 to its right.

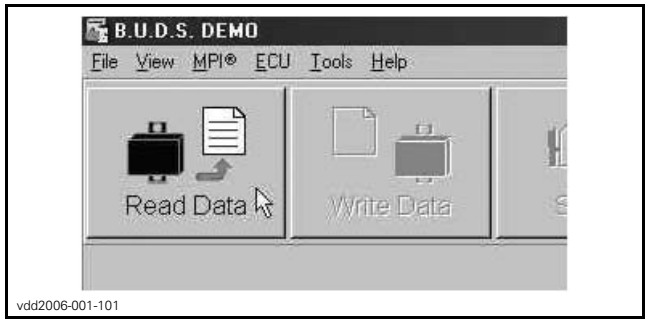
NOTE: Number 2 means that 2 "ECU" are connected (ECM and multifunction gauge).



vbl2008-007-100

CONNECTION SUCCESSFUL — ECM AND MULTIFUNCTION GAUGE ARE CONNECTED

4. If an "X" is shown, this means that no communication between MPI and ECM/multifunction gauge takes place. Possible causes are:
   - ECM is not powered-up
   - Multifunction gauge is not powered-up
   - Wrong protocol is used
   - Bad connection between MPI and module.
5. Press the READ DATA button from the tool bar to initiate communication with vehicle.



vdd2006-001-101

Outlander 500-650-800R EFI series and Renegade 500-800R EFI series

NOTE: It is recommended to use MPI-2 with these vehicles but both (MPI-1 and MPI-2) will work.

NOTE: The following procedure is for MPI-2, however, if MPI-1 protocol is used, the procedure will be the same except that it will be necessary to set the speed in the CHOOSE SPEED menu. In this case, the speed is not automatically adjusted.

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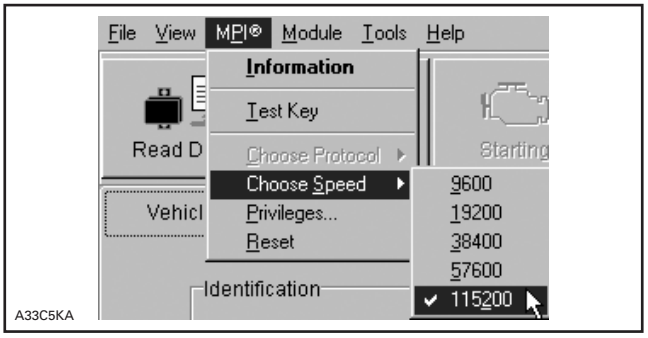
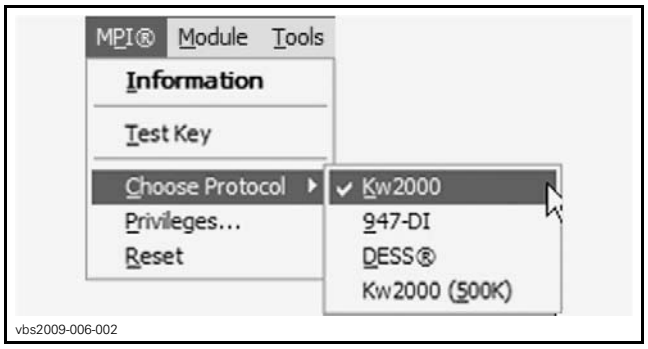


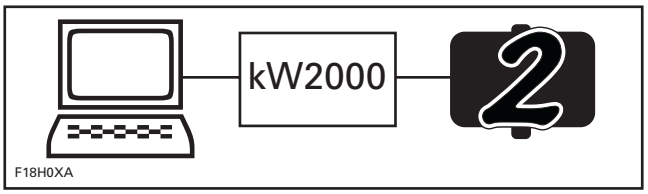
MPI-1 PROTOCOL ONLY
Step 1: Select MPI from the top menu and then CHOOSE SPEED.
Step 2: Click on 115200.

1. Select MPI from the top menu and then CHOOSE PROTOCOL.
2. Click on KW2000



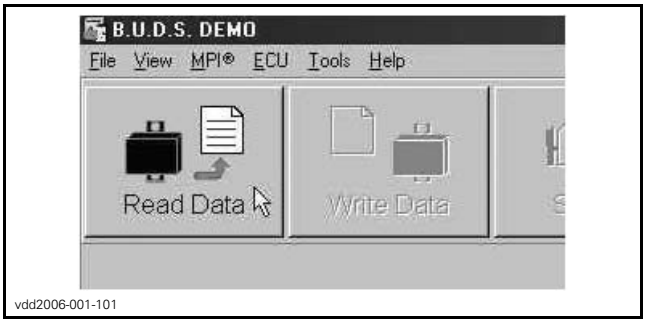
3. Ensure the status bar shows KW2000 with the number 2 to its right.

NOTE: Number 2 means that 2 "ECU" are connected (ECM and multifunction gauge).



CONNECTION SUCCESSFUL — ECM AND MULTIFUNCTION GAUGE ARE CONNECTED

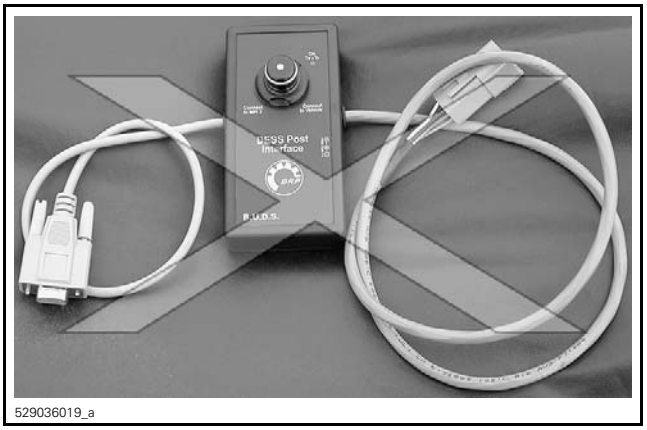
4. If an "X" is shown, this means that no communication between MPI and ECM/multifunction gauge takes place. Possible causes are:
   - ECM is not powered-up
   - Multifunction gauge is not powered-up
   - Wrong protocol is used
   - Bad connection between MPI and module.
5. Press the READ DATA button from the tool bar to initiate communication with vehicle.



DS 450 EFI series

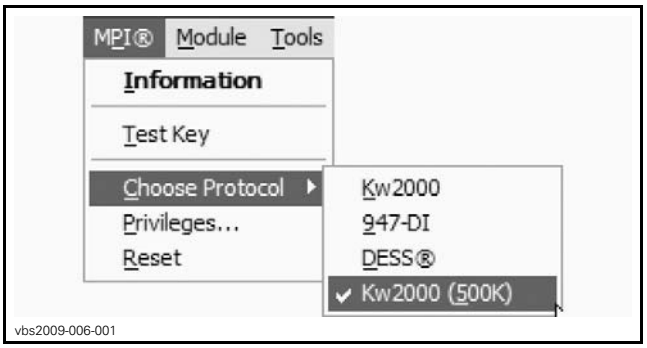
NOTE: MPI-1 will not allow communication with these vehicles. Only the MPI-2 must be used.

NOTE: Do not use DESS Post Interface (P/N 529 036 019) with the KW2000 (500K) protocol. DESS Post Interface will not allow communication with these vehicles.



DO NOT USE DESS POST INTERFACE

1. Select MPI from the top menu and then CHOOSE PROTOCOL.
2. Click on KW2000 (500K)



3. Ensure the status bar shows KW2000 (500K) with the number 1 to its right.

NOTE: Number 1 means that 1 "ECU" is connected (ECM only)

NOTE: If the vehicle is equipped with a multifunction gauge, the number 2 will appear instead of number 1.

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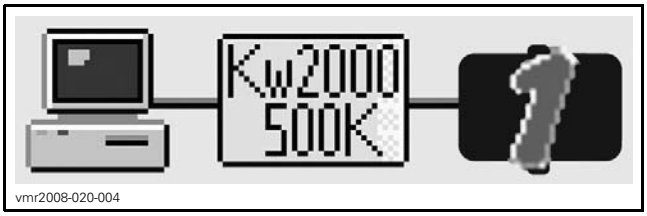
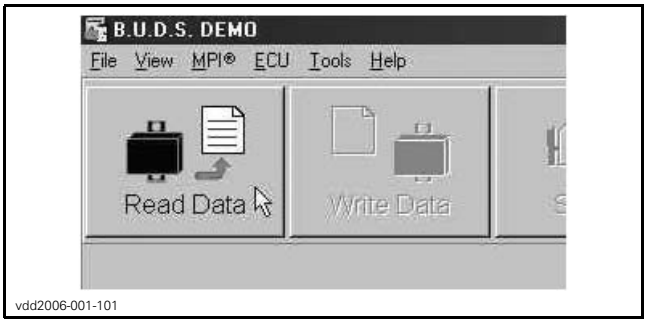


CONNECTION SUCCESSFUL — ECM IS CONNECTED

4. If an "X" is shown, this means that no communication between MPI and ECM/multifunction gauge takes place. Possible causes are:
   – ECM is not powered-up
   – Wrong protocol is used
   – Bad connection between MPI and module.
5. Press the READ DATA button from the tool bar to initiate communication with vehicle.



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ATV
SERVICE
Bulletin

June 01, 2008 Subject: **CAN-AM™ ATV Batteries Activation, Charging and Maintenance** No. **2009-1**

YEAR	MODEL	MODEL NUMBER	SERIAL NUMBER
2009	All	All	All

GENERAL INFORMATION

As a reference to predelivery inspection bulletin, this service publication provides instructions for the activation, charging and maintenance of new ATV batteries. It contains standard practices and can be used as a reference for preparing vehicles before delivery to customers.

For complete battery information and detailed procedures, refer to appropriate *ATV SHOP MANUAL* and manufacturer's instructions.

For MY2008 and previous, refer to the appropriate *PREDELIVERY INSPECTION BULLETIN* for batteries activation, charging and maintenance information.

Guidelines for MY2009

All MY2009 vehicles are equipped with factory activated VRLA batteries (Valve Regulated Lead Acid). They are a maintenance free and non-spillable type batteries.

These WET type batteries are factory filled and activated. They never need electrolyte check and readjustment.

The permanently sealed VRLA battery never needs refilling; however, it still needs periodic charging.

BATTERY ACTIVATION

Since all the MY2009 batteries are WET (factory activated), they never need to be activated using acid packs. The electrolytes are already in the batteries.

BATTERY CHARGING

Initial Charging

Sealed VRLA batteries require an initial charge.

If you are using a constant current charger, refer to the standard (STD) charging method printed on the battery.

TYPICAL
Some batteries may differ

If you are using an automatic type taper charger, check to make sure that the charger current (amps) is equal to or greater than the standard (STD) charging method listed on the battery.

These batteries are a sealed VRLA construction; **never remove the sealing strip after charging is completed.** If the battery gets very hot to the touch, cease charging and allow battery to cool down. Check voltage using a voltmeter. Reading for a charged, newly-activated battery should be

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12.8 volts or higher after the battery is charged and sits for at least 1 – 2 hours. If less, it needs additional charge.

Routine Charging

NOTICE Overcharging can harm the battery beyond recovery.

The single most important thing to maintaining a VRLA battery is to not let it sit discharged: keep it fully charged. A sealed VRLA battery should be kept to near fully charged for peak performance. In fact, it can need charging more often than a car battery because it is probably not used routinely and, therefore, not "automatically" charged.

Use the following guidelines for boost charge. Always verify battery condition before charging, and 30 minutes after charging.

A fully charged battery should read 12.8 V or higher after battery has been off the charger 1 hour.

It is not recommended to overcharge sealed VRLA batteries. Because of their characteristics, too much of a boost charge will decrease the volume of electrolyte. The longer the overcharge time, the greater the drop in electrolyte – and starting power.

Refer to the following tables for charging routine.

Note that charging times can vary depending on type of charger. Follow the charger's instructions for details.

STATE OF CHARGE : 100%		
VOLTAGE	ACTION	CHARGE TIME *
12.8 – 13.0	None Check at 3 months from date of manufacture	None required
* Using a constant current charger at standard amps specified on the battery		

STATE OF CHARGE : 75% - 100%		
VOLTAGE	ACTION	CHARGE TIME *
12.5 – 12.8	May need slight charge, if no charge given, check in 3 months	3 – 6 hours
* Using a constant current charger at standard amps specified on the battery		

STATE OF CHARGE : 50% - 75%		
VOLTAGE	ACTION	CHARGE TIME *
12.0 – 12.5	Need charge	5 – 11 hours
* Using a constant current charger at standard amps specified on the battery		

STATE OF CHARGE : 25% - 50%		
VOLTAGE	ACTION	CHARGE TIME *
11.5 – 12.0	Need charge	At least 13 hours verify state of charge
* Using a constant current charger at standard amps specified on the battery		

STATE OF CHARGE : 0% - 25%		
VOLTAGE	ACTION	CHARGE TIME *
11.5 or less (see instructions below)	Need charge	20 hours
* Using a constant current charger at standard amps specified on the battery		

Charging for Voltage of 11.5 or Less

Batteries with voltage below 11.5 V may require special equipment and procedures to recharge.

In charging an over discharged battery having a terminal voltage of 11.5 V or lower, its internal resistance may be too high to charge at a normal charge voltage.

Therefore, it may be necessary to raise the voltage of the battery initially (25 V as a maximum), and charge for approximately 5 minutes. If the ammeter shows no change in current after 5 minutes, you need a new battery.

Current flowing into the battery at high voltage can become excessive. Monitor amperage and adjust voltage as necessary to keep current at the battery's standard amp rating. Charge for approximately 20 hours.

BATTERY MAINTENANCE

A battery requires little maintenance to perform perfectly. Follow this simple check list for optimum battery performance:

– Check voltage every 3 months using a voltmeter.
– Keep a battery fully charged to 100% (12.8 V - 13.0 V after standing 1 - 2 hours).

– Check and charge battery if the voltage drops below 12.5 V.
– Keep the battery top free of grime.
– Clean terminals and connectors if necessary.
– For storage, pull battery or disconnect battery cables.

BATTERY STORAGE

Battery storage is critical for battery life, it is important to follow the above battery maintenance check list to keep an optimal condition.

Always remove battery from vehicle for storage. Keeping the battery in vehicle for storage may lead to contacts degradation/corrosion and case damage if freezing occurs. A discharged battery will freeze and break in area where freezing point is experienced. Electrolyte leakage will damage surrounding parts.

Regularly charging the battery during storage will prevent cell sulfation.

Keep in mind that higher storage temperatures cause faster self-discharge and require checking more often.

BATTERY CARE REMINDER

Through proper maintenance and care, today's modern batteries can survive long storage periods, however one must adhere to the proper maintenance procedures as specified in this bulletin.

It is a good practice to strictly follow all activated batteries and apply the maintenance procedure to keep them at a high level of performance.

All batteries which did not receive proper periodic maintenance will not be covered by the warranty.

SAFETY WARNINGS

Here are important safety things to keep in mind before working with batteries. Any person who intends to work with batteries should read and understand the information contained on the following safety warnings before doing so.

⚠ WARNING

Store the battery in a cool, dry place out of direct sunlight.

⚠ WARNING

Absolutely no smoking, sparks or open flames around batteries. Batteries can produce hydrogen and oxygen; if they ignite the battery can rupture.

⚠ WARNING

Properly connect charger to battery: positive to positive, negative to negative. Unplug the charger or turn it off before you disconnect the leads; that cuts down on the chance of sparks.

⚠ WARNING

Always wear eye protection, protective gloves and protective clothing.

⚠ WARNING

Clean up acid spills immediately, using a water and baking soda solution to neutralize.

⚠ WARNING

If sulfuric acid is swallowed or splashed in the eyes, take immediate action. While the diluted sulfuric acid used as electrolyte can burn the skin, this type of injury is generally less serious. Sulfuric acid in the eyes can cause blindness. Serious internal injuries or death can result from ingesting sulfuric acid.

⚠ WARNING

The sealed VRLA battery will not be topped off during its life. Never pry off sealing caps: it is dangerous and damaging. Water cannot be added to the sealed VRLA battery.

⚠ WARNING

Always ventilate battery charging area.

⚠ WARNING

Always stop charging if the battery becomes really warm to the touch. Let it cool down for 6 - 12 hours and resume charging. Overcharging can warp plates, making future charging difficult or impossible. Watch charging times carefully, or ideally, use a Yuasa† Automatic Charger. A battery that is too hot can rupture.

† Yuasa is a registered trademark of Yuasa Battery Inc.

⚠ WARNING

Never charge or boost battery while installed on vehicle.

⚠ WARNING

Always connect battery cables exactly in the specified order. Connect RED positive cable first, then BLACK negative ground cable.

INTRODUCTION

This publication governs all warranty labor allowances for 2009 Can-Am ATV OUTLANDER/RENEGADE models.

1. HOW DOES IT WORK

We follow the procedures detailed in the *Can-Am ATV Shop Manual*. The flat rate time is the maximum time allowed for a repair involving any given part. FLAT RATE TIME IS NOT CUMULATIVE. You must use the flat rate time given for the longest lasting operation.

NOTE: The *Flat Rate Time Schedule* was prepared by skilled mechanics using the hand tool usually found in workshops and all the special tools mentioned in the *Shop Manual*.

2. COMPILATION

The *Flat Rate Time Schedule* is compiled as follows:

The actual required time to perform the repair plus (+) 30% correction factor up to 3.0 hours or (+) 15% over 3.0 hours time to take into account, among others:

– vehicle handling
– obtaining the parts
– diagnosis
– cleaning
– special compensation (rusted bolts)

3. HOW TO USE IT

Refer to the system you need, locate part of series of parts replaced. List JOB CODE in the appropriate column on claim.

NOTE: Unless otherwise specified, dismantling order is: top to bottom, exterior to interior, front to rear.

All fractions of hours are in tenths:

0.1 = 6 minutes
0.2 = 12 minutes, and so on

LEGEND:

* REQUIRES PRIOR AUTHORIZATION BY DISTRIBUTOR.
** INDICATE LABOUR TIME ON LINE "LABOUR ONLY" OF CLAIM.
*** INDICATE $$$ AMOUNT ON "SUB-CONTRACTED LABOUR" OF CLAIM.

IMPORTANT: Always use the longuest flat rate time applicable to the repair performed.

4. JOB REQUIREMENTS

All the flat rate times mentioned in the following pages include the required operations such as: engine timing (piston clearance/ring end gap measurement, crankshaft to crankcase measurement, cylinder honing, engine leak test.

5. ILLUSTRATIONS

The illustrations contained in this manual do not necessarily show every components of a given system as *Parts Catalog* do. Their purpose is to facilitate recognition of parts related to a flat rate time. **Item numbers on illustrations correspond to the four or five digit Job Code**.

6. SUGGESTION (FORM REQUEST)

INTRODUCTION

Cette publication détermine le temps de MAIN-D'OEUVRE couvert par la garantie pour les VTT Can-Am 2009 modèle OUTLANDER/RENEGADE.

1. UTILISATION DU MANUEL

En procédant de la façon indiquée dans le *Manuel de réparation Can-Am VTT*, chaque temps donné représente le maximum permis pour une réparation portant sur cette pièce. LES TEMPS NE SONT PAS CUMULATIFS. On doit inscrire le temps donné pour l'opération qui prend le plus de temps.

REMARQUE: Le *Barème de temps à taux fixe* a été préparé par des mécaniciens compétents utilisant les outils que l'on retrouve normalement dans les ateliers de réparation, en plus de tous les outils spéciaux mentionnés dans le *Manuel de réparation*.

2. COMPILATION

Le *Barème de temps à taux fixe* a été établi en compilant le temps nécessaire pour faire la réparation plus (+) un facteur de correction de 30% lorsqu'un travail dure 3.0 heures et moins, ou (+) 15% lorsqu'un travail dure plus de 3.0 heures. Cette compilation comprends, entre autres les étapes suivantes:

– manutention du véhicule
– nettoyage
– aller chercher les pièces, essais physique
– compensation spéciale (boulons rouillés)
– diagnostic

3. UTILISATION DU BARÈME

Se reporter à la section désirée, repérer la pièce ou l'ensemble de pièces remplacées et inscrire le CODE DE TRAVAIL dans la colonne appropriée sur la formule de réclamation.

REMARQUE: Sauf indication contraire, le démontage doit s'effectuer de haut en bas, de l'extérieur vers l'intérieur, de l'avant vers l'arrière.

Toutes les fractions d'heures sont exprimées en dixièmes:

0.1 = 6 minutes
0.2 = 12 minutes, et ainsi de suite

LÉGENDE:

* AUTORISATION REQUISE AVANT LE REMPLACEMENT.
** INSCRIRE LE TEMPS À LA LIGNE «MAIN-D'OEUVRE SEULEMENT».
*** INSCRIRE LE MONTANT $$$ À LA LIGNE «OUVRAGE SOUS-CONTRACTÉE».

IMPORTANT: Toujours utiliser le temps donné à l'opération qui nécessite le plus de temps.

4. TRAVAUX REQUIS

Tous les temps mentionnés dans les pages suivantes incluent les opérations telles que: réglage du moteur (mesure du jet des pistons/jeu en bout des segments, mesure de l'écart entre le vilebrequin et le carter, rectification du cylindre, vérification de fuite du moteur.

5. ILLUSTRATIONS

Contrairement aux *Catalogues de pièces*, les illustrations de ce manuel ne montrent pas nécessairement chacune des pièces qu'elles représentent, leur raison d'être étant plutôt de faciliter la reconnaissance des pièces reliées à un barème de temps à taux fixe. Les numéros d'items sur les illustrations correspondent aux quatre ou cinq derniers chiffres du code de travail.

6. SUGGESTION (FORMULAIRE)

2008
ATV / VTT

TABLE	DESCRIPTION	MODEL/MODÈLE	ENGINE TYPE/ TYPE DE MOTEUR	CARBURETOR/ CARBURATEUR	COOLING SYSTEM/ SYSTEME DE REFROIDISSEMENT
1	OUTLANDER 4X4 400	5A9A/5A9B 5A9C/5A9D	400 CVT	Dell'Orto 46 mm	Liquid cooled/ Refroidi par liquide
	OUTLANDER XT 4X4 400	5B9A/5B9B 5B9C/5B9F			
2	OUTLANDER MAX 4X4 400	5C9A/5C9B 5C9C	400 CVT	Dell'Orto 46 mm	Liquid cooled/ Refroidi par liquide
	OUTLANDER MAX XT 4X4 400	5D9A/5D9B/5D9C 5D9D/5D9F			
3	OUTLANDER 4X4 500	2T9A/2T9B	500 CVT	Dell'Orto 46 mm	Liquid cooled/ Refroidi par liquide
	OUTLANDER XT 4X4 500	2U9A/2U9B/2U9C 2U9D/2U9E/2U9F 2U9G			
4	OUTLANDER MAX 4X4 500	2W9A	500 CVT	Dell'Orto 46 mm	Liquid cooled/ Refroidi par liquide
	OUTLANDER MAX XT 4X4 500	2X9A/2X9B/2X9C 2X9D/2X9E/2X9F 2X9G/2X9H			
5	OUTLANDER 4X4 650	2N9A/2N9B 2N9C/2N9D	650 CVT	Dell'Orto 46 mm	Liquid cooled/ Refroidi par liquide
	OUTLANDER XT 4X4 650	2P9A/2P9B/2P9C 2P9D/2P9E/2P9F 2P9G/2P9H/2P9J			
	OUTLANDER 4X4 800	2H9E/2H9F/2H9G	800 CVT		
	OUTLANDER XT 4X4 800	2J9J/2J9K/2J9L 2J9M/2J9N/2J9P			
6	OUTLANDER MAX 4X4 650	2R9A/2R9B 2R9C/2R9D	650 CVT	Dell'Orto 46 mm	Liquid cooled/ Refroidi par liquide
	OUTLANDER MAX XT 4X4 650	2S9A/2S9B/2S9C 2S9D/2S9E/2S9F 2S9G/2S9H/2S9J			
	OUTLANDER MAX 4X4 800	2K9A/2K9B 2K9C/2K9D	800 CVT		
	OUTLANDER MAX XT 4X4 800	2L9A/2L9B/2L9C 2L9D/2L9E/2L9F 2L9G/2L9H/2L9J			
	OUTLANDER MAX LTD 4X4 800	2M9A/2M9B/2M9C 2M9D/2M9E/2M9F			
7	RENEGADE 500 4X4	4E9A/4E9B/4E9C 4E9D/4E9E/4E9F	500 CVT	Dell'Orto 46 mm	Liquid cooled/ Refroidi par liquide
	RENEGADE 800 4X4	4B9A/4B9B/4B9C 4B9D/4B9E/4B9F	800 CVT		
	RENEGADE X 800 4X4	4C9A/4C9B/4C9C			

01 ENGINE MOTEUR

SYSTEM/SYSTÈME

SYSTEM SYSTÈME	CODE	DESCRIPTION	OUTLANDER 400	OUTLANDER MAX 400	OUTLANDER 500	OUTLANDER MAX 500	OUTLANDER 650/800	OUTLANDER MAX 650/800	RENEGADE 500/800
			1	2	3	4	5	6	7
01	**00**	**NO LABOR INVOLVED AUCUNE MAIN D'OEUVRE**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
01 *	01	REMOVE AND REPLACE ENGINE (ASS'Y) REMPLACEMENT DU MOTEUR (COMPLET)	3.3	3.3	4.0	4.0	4.0	4.0	4.0
01	03	OIL PRESSURE SWITCH INTERRUPTEUR DE PRESSION D'HUILE	0.3	0.3	0.3	0.3	0.3	0.3	0.3
01	04	HEAT SHIELD AND/OR RUBBER MOUNT DÉFLECTEUR DE CHALEUR ET/OU BUTÉE DE CAOUTCHOUC	0.4	0.4					
01	08	FAN AND/OR FAN SUPPORT VENTILATEUR ET/OU SUPPORT DE VENTILATEUR	0.6	0.6	0.6	0.6	0.6	0.6	0.6
01	18	SENDER TEMPERATURE (ENGINE) CAPTEUR DE TEMPÉRATURE (MOTEUR)	0.3	0.3	0.3	0.3	0.3	0.3	0.3
01	19	THERMOSTAT THERMOSTAT	0.4	0.4	0.4	0.4	0.4	0.4	0.4
01	34	DECOMPESSOR (ANY PARTS) DÉCOMPRESSEUR (TOUTES LES PIÈCES)	0.7	0.7					
01	37	RADIATOR INLET HOSE BOYAU D'ENTRÉ DU RADIATEUR	0.5	0.5	0.5	0.5	0.5	0.5	0.5
01	38	WATER PUMP SHAFT (ALL PARTS) ARBRE DE POMPE À L'EAU (TOUTES LES PIÈCES)	3.9	3.9	4.8	4.8	4.8	4.8	4.8
01	44	ENGINE RUBBER MOUNTS (3 OR 4) TAMPONS D'ANCRAGE DE CAOUTCHOUC DU MOTEUR (3 OU 4)	1.4	1.4					
01	45	ENGINE RUBBER MOUNT TAMPONS D'ANCRAGE DU MOTEUR	0.3	0.3	1.0	1.0	1.0	1.0	1.0
01	46	RADIATOR AND/OR GROMMMET RADIATEUR ET/OU PASSE-FILS	1.5	1.5	1.5	1.5	1.5	1.5	1.5
01	50	CRANKSHAFT AND/OR BEARINGS (FRONT/REAR) VILEBREQUIN ET/OU ROULEMENTS (AVANT/ARRIÈRE)			6.0	6.0	6.0	6.0	6.0
01	56	CRANKCASE COVER GASKET JOINT DE COUVERCLE DE CARTER			1.3	1.3	1.3	1.3	1.3
01	57	PTO CRANKCASE COVER COUVERCLE DE CARTER PDM			1.4	1.4	1.4	1.4	1.4
01	58	INTAKE OR EXHAUST VALVE GUIDE (1) GUIDE DE SOUPAPE D'ADMISSION OU D'ÉCHAPPEMENT (1)	2.0	2.0	2.5	2.5	2.5	2.5	2.5
01	59	INTAKE OR EXHAUST VALVE GUIDE (2) GUIDE DE SOUPAPE D'ADMISSION OU D'ÉCHAPPEMENT (2)	2.1	2.1	2.6	2.6	2.6	2.6	2.6
01	70	MUFFLER AND/OR EXHAUST GASKET AND/OR CLAMP SILENCIEUX D'ÉCHAPPEMENT ET/OU JOINT D'ÉCHAPPEMENT ET/OU BRIDE DE SERRAGE	0.3	0.3	0.3	0.3	0.3	0.3	0.3
01	72	TUNE PIPE AND/OR GASKET TUYAU D'ÉCHAPPEMENT CALIBRÉ ET/OU JOINT D'ÉTANCHÉITÉ	0.3	0.3					

SYSTEM SYSTÈME	CODE	DESCRIPTION	OUTLANDER 400	OUTLANDER MAX 400	OUTLANDER 500	OUTLANDER MAX 500	OUTLANDER 650/800	OUTLANDER MAX 650/800	RENEGADE 500/800
			1	2	3	4	5	6	7
01	73	EXHAUST MANIFOLD (REAR) CONNECTEUR D'ÉCHAPPEMENT (ARRIÈRE)			0.5	0.5	0.5	0.5	0.5
01	77	ANTI-VIBRATION RUBBER MOUNT (1 OR 2) (TOP) TAMPON D'ANCRAGE ANTI-VIBRATION (1 OU 2) (HAUT)	1.0	1.0	1.0	1.0	1.0	1.0	1.0
01	79	COOLANT HOSE (RADIATOR TO TANK) BOYAU DU SYSTÈME DE REFROIDISSEMENT (RÉSERVOIR AU RADIATEUR)	0.4	0.4	0.4	0.4	0.4	0.4	0.4
01	83	EXHAUST MANIFOLD (FRONT) CONNECTEUR D'ÉCHAPPEMENT (AVANT)			0.5	0.5	0.5	0.5	0.5
01	84	TUNE PIPE HEAT SHIELD (1) DÉFLECTEUR DE CHALEUR TUYAU D'ÉCHAPPEMENT (1)			0.3	0.3	0.3	0.3	0.3
01	85	TUNE PIPE HEAT SHIELD (2) DÉFLECTEUR DE CHALEUR TUYAU D'ÉCHAPPEMENT (2)			0.3	0.3	0.3	0.3	0.3
01	86	TUNE PIPE HEAT SHIELD (3) DÉFLECTEUR DE CHALEUR TUYAU D'ÉCHAPPEMENT (3)			0.5	0.5	0.5	0.5	0.5
01	87	MUFFLER SUPPORT SUPPORT DU SILENCIEUX	0.3	0.3	0.3	0.3	0.3	0.3	0.3
01	88	RUBBER MOUNT (MUFFLER) TAMPON D'ANCRAGE (SILENCIEUX)			0.3	0.3	0.3	0.3	0.3
01	90	ENGINE OIL FILTER FILTRE À HUILE DU MOTEUR	0.3	0.3	0.3	0.3	0.3	0.3	0.3
01	96	OIL SIEVE AND/OR O-RING AND/OR COLLECTOR AND/OR RUBBER RING AND/OR COVER CRIBLE D'HUILE ET/OU JOINT TORIQUE ET/OU COLLECTEUR ET/OU ANNEAU DE CAOUTCHOUC ET/OU COUVERCLE	2.0	2.0	6.0	6.0	6.0	6.0	6.0
01	98	COOLING RESERVOIR RÉSERVOIR D'ANTIGEL	0.4	0.4	0.4	0.4	0.4	0.4	0.4
01	100	RADIATOR OUTLET HOSE BOYAU DE SORTIE DU RADIATEUR	0.4	0.4	0.4	0.4	0.4	0.4	0.4
01	101	PISTON, PIN, CIRCLIP, RINGS (1) PISTON, GOUPILLE, CIRCLIP, SEGMENTS (1)			2.7	2.7	2.7	2.7	2.7
01	102	PISTONS, PINS, CIRCLIPS, RINGS (2) PISTONS, GOUPILLES, CIRCLIPS, SEGMENTS (2)			4.5	4.5	4.5	4.5	4.5
01	109	VALVE COVER AND/OR GASKET COUVERCLE DE SOUPAPE ET/OU JOINT D'ÉTANCHÉITÉ	0.3	0.3	0.3	0.3	0.3	0.3	0.3
01	111	TIMING GEAR PIGNON DE DISTRIBUTION	0.9	0.9	1.0	1.0	1.0	1.0	1.0
01	113	ROCKER ARM AND/OR PUSH ROD AND/OR ROCKER ARM SHAFT CULBUTEUR ET/OU TIGE POUSSOIR ET/OU ARBRE DE CULBUTEUR	1.0	1.0	1.1	1.1	1.1	1.1	1.1
01	114	CYLINDER HEAD AND/OR GASKET CULASSE ET/OU JOINT D'ÉTANCHÉITÉ	2.6	2.6	3.2	3.2	3.2	3.2	3.2

01 ENGINE MOTEUR

SYSTEM/SYSTÈME

SYSTEM SYSTÈME	CODE	DESCRIPTION	OUTLANDER 400	OUTLANDER MAX 400	OUTLANDER 500	OUTLANDER MAX 500	OUTLANDER 650/800	OUTLANDER MAX 650/800	RENEGADE 500/800
			1	2	3	4	5	6	7
01	116	EXHAUST AND/OR INLET VALVE AND/OR SPRING AND/OR SEAL VALVE ADMISSION ET/OU ÉCHAPPEMENT ET/OU RESSORT ET/OU ANNEAU D'ÉTANCHÉITÉ	1.9	1.9	2.4	2.4	2.4	2.4	2.4
01	117	CYLINDER AND/OR GASKET CYLINDRE ET/OU JOINT D'ÉTANCHÉITÉ	2.0	2.0	2.5	2.5	2.5	2.5	2.5
01	118	PISTON AND/OR PISTON PIN AND/OR CIRCLIP PISTON ET/OU GOUPILLE DE PISTON ET/OU CIRCLIP	2.1	2.1					
01	119	WATER PUMP HOUSING AND/OR IMPELLER CARTER DE LA POMPE À EAU ET/OU ROUE À AILETTES	0.4	0.4	0.4	0.4	0.4	0.4	0.4
01	122	SHIFT SHAFT (ASS'Y) ARBRE D'EMBRAYAGE (COMPLET)	4.1	4.1					
01	132	OIL PUMP GEAR ENGRENAGE DE LA POMPE À HUILE	4.0	4.0	1.4	1.4	1.4	1.4	1.4
01	134	CAMSHAFT ARBRE À CAME	1.0	1.0	2.0	2.0	2.0	2.0	2.0
01	137	OIL PUMP COVER AND/OR SHAFT AND/OR ROTOR COUVERCLE DE LA POMPE À HUILE ET/OU ARBRE ET/OU ROTOR	4.0	4.0	1.4	1.4	1.4	1.4	1.4
01	138	CRANKCASE RESEAL OR GASKET RECELLEMENT DU CARTER ET/OU JOINT D'ÉTANCHÉITÉ	4.9	4.9	5.9	5.9	5.9	5.9	5.9
01	139	CRANKCASE REPLACEMENT REMPLACEMENT DU CARTER	5.4	5.4	6.5	6.5	6.5	6.5	6.5
01	140	CRANKSHAFT AND/OR BALANCE SHAFT VILEBREQUIN ET/OU ARBRE D'ÉQUILIBRAGE	4.9	4.9					
01	152	DRIVE SHAFT AND/OR BEARINGS AND/OR SEALS ARBRE D'ENTRAÎNEMENT ET/OU ROULEMENT À BILLES ET/OU ANNEAUX D'ÉTANCHÉITÉ			5.1	5.1	5.1	5.1	5.1
01	153	GEARBOX (ALL PARTS)/MAIN SHAFT BOÎTE DE VITESSE (TOUTES LES PIÈCES)/ARBRE PRINCIPAL	5.1	5.1					
01	154	TIMING CHAIN CHAÎNE D'ENGRENAGE	4.5	4.5	2.8	2.8	2.8	2.8	2.8
01	155	OUTPUT SHAFT ARBRE DE SORTIE	5.1	5.1					
01	172	SHIFT DRUM TAMBOUR D'EMBRAYAGE	5.2	5.2					
01	173	INDEX LEVER (ASS'Y) LEVIER D'INDEXATION (COMPLET)	5.2	5.2					
01	179	CHAIN GUIDE GUIDE DE CHAÎNE	0.8	0.8	0.8	0.8	0.8	0.8	0.8
01	191	CHAIN TENSION GUIDE GUIDE DE TENSION DE CHAÎNE	1.9	1.9	2.8	2.8	2.8	2.8	2.8
01	192	CHAIN TENSIONER (ASS'Y) TENDEUR DE CHAÎNE (COMPLET)	0.3	0.3	0.3	0.3	0.3	0.3	0.3

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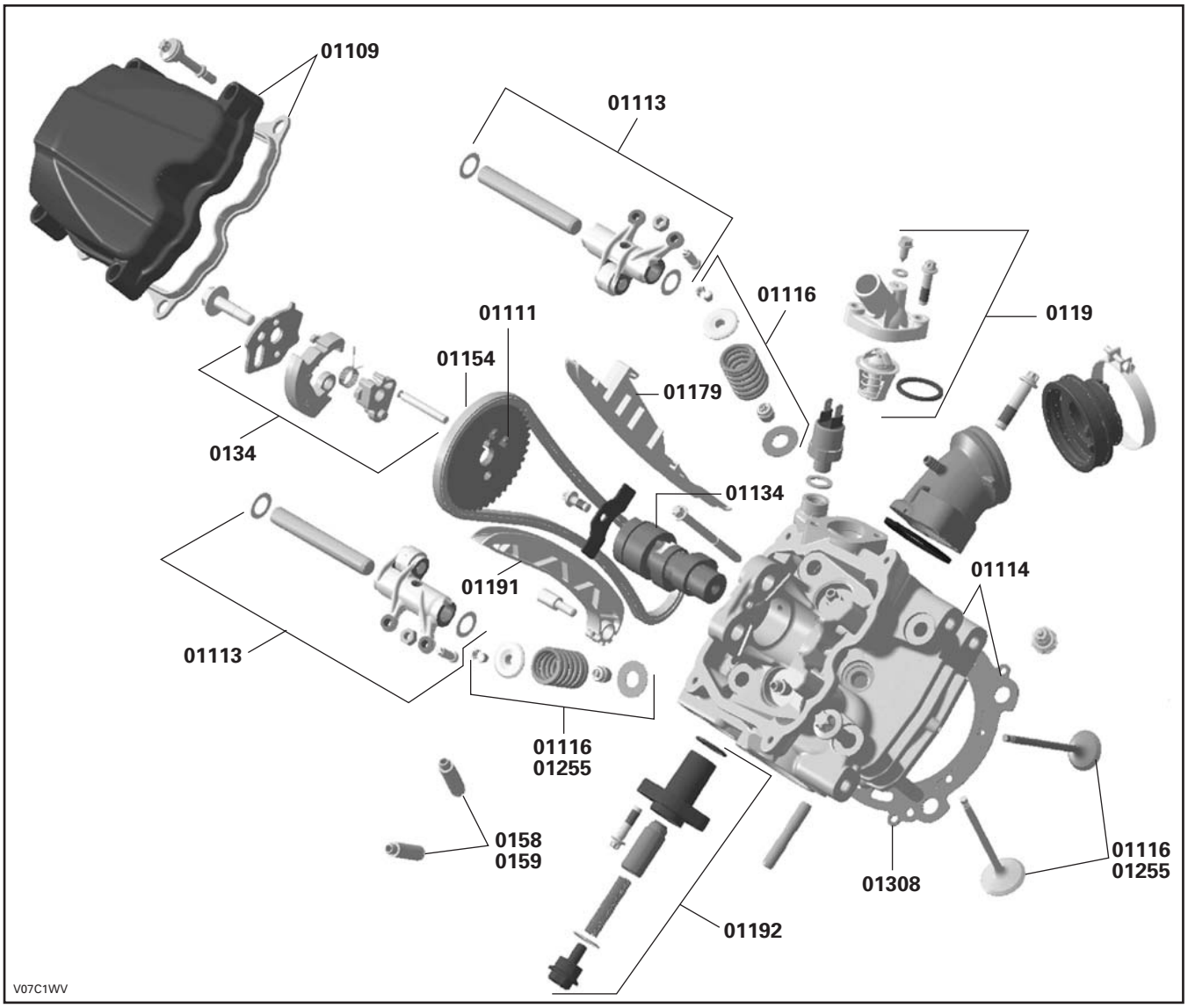
SYSTEM SYSTÈME	CODE	DESCRIPTION	OUTLANDER 400	OUTLANDER MAX 400	OUTLANDER 500	OUTLANDER MAX 500	OUTLANDER 650/800	OUTLANDER MAX 650/800	RENEGADE 500/800
			1	2	3	4	5	6	7
01	200	WATER PUMP GEAR ENGRENAGE DE LA POMPE À EAU	3.9	3.9	1.4	1.4	1.4	1.4	1.4
01	205	REAR OUTPUT SHAFT SEAL ANNEAU D'ÉTANCHÉITÉ DE L'ARBRE DE SORTIE ARRIÈRE	1.5	1.5	4.5	4.5	4.5	4.5	4.5
01	209	OUTPUT CRANKSHAFT SEAL (REWIND SIDE) ANNEAU D'ÉTANCHÉITÉ DE L'ARBRE DE SORTIE DU VILEBREQUIN (CÔTÉ DÉMARREUR À RAPPEL)	0.6	0.6					
01	210	MAIN SHAFT SEAL JOINT D'ÉTANCHÉITÉ DE L'ARBRE PRINCIPAL	0.6	0.6					
01	215	OIL DIPSTICK JAUGE À HUILE	0.3	0.3	0.3	0.3	0.3	0.3	0.3
01	216	PRESSURE CAP BOUCHON À PRESSION	0.3	0.3	0.3	0.3	0.3	0.3	0.3
01	217	ENGINE BRACKET AND/OR RUBBER MOUNT ATTACHE MOTEUR ET/OU TAMPON D'ANCRAGE	0.3	0.3	0.3	0.3	0.3	0.3	0.3
01	220	MAIN DRIVE GEAR AND/OR PIN ROUAGE D'ENTRAÎNEMENT PRINCIPALE ET/OU GOUPILLE	4.0	4.0	1.4	1.4	1.4	1.4	1.4
01	221	INTERMEDIATE GEAR AND/OR PIN AND/OR THRUST WASHER ROUAGE INTERMEDIAIRE ET/OU GOUPILLE ET/OU RONDELLE D'APPUI	4.0	4.0	1.4	1.4	1.4	1.4	1.4
01	223	FRONT OUTPUT SHAFT SEAL ANNEAU ÉTANCHÉITÉ ARBRE SORTIE AVANT			2.1	2.1	2.1	2.1	2.1
01	245	OUTPUT CRANKSHAFT SEAL (PTO SIDE) ANNEAU ÉTANCHÉITÉ SORTIE VILBREQUIN (CÔTÉ PDM)	0.6	0.6	0.6	0.6	0.6	0.6	0.6
01	246	WATER PUMP GEAR AND/OR SEAL ARBRE POMPE À EAU ET/OU JOINT ÉTANCHÉITÉ			4.8	4.8	4.8	4.8	4.8
01	247	REED VALVE AND/OR STOPPER SOUPAPE À CLAPET ET/OU BUTOIR			1.4	1.4	1.4	1.4	1.4
01	248	BREATHER GEAR AND/OR V-RING RENIFLARD ET/OU ANNEAU ÉTANCHÉITÉ EN «V»			1.3	1.3	1.3	1.3	1.3
01	249	CAMSHAFT POSITION SENSOR CAPTEUR DE POSITION DE L'ARBRE À CAME			0.3	0.3	0.3	0.3	0.3
01	255	EXHAUST AND/OR INLET VALVES AND/OR SPRINGS AND/OR SEALS (4) ÉCHAPPEMENT ET/OU VALVES ADMISSION ET/OU RESSORTS ET/OU ANNEAUX D'ÉTANCHÉITÉ (4)	2.5	2.5	3.0	3.0	3.0	3.0	3.0
01	256	EXHAUST AND/OR INLET VALVES AND/OR SPRINGS AND/OR SEALS (8) ÉCHAPPEMENT ET/OU VALVES ADMISSION ET/OU RESSORTS ET/OU ANNEAUX D'ÉTANCHÉITÉ (8)			5.7	5.7	5.7	5.7	5.7
01	258	TEMPERATURE SENSOR (RADIATOR) CAPTEUR DE TEMPÉRATURE (RADIATEUR)	0.4	0.4	0.4	0.4	0.4	0.4	0.4
01	261	TIMING CHAIN (MAG SIDE) CHAÎNE D'ENGRENAGE (CÔTÉ MAG)			2.5	2.5	2.5	2.5	2.5

SYSTEM SYSTÈME	CODE	DESCRIPTION	OUTLANDER 400	OUTLANDER MAX 400	OUTLANDER 500	OUTLANDER MAX 500	OUTLANDER 650/800	OUTLANDER MAX 650/800	RENEGADE 500/800
			1	2	3	4	5	6	7
01	301	WATER PUMP DYNAMIC SEAL AND/OR OIL SEAL ANNEAU D'ÉTANCHÉITÉ DYNAMIQUE DE LA POMPE À EAU			1.9	1.9	1.9	1.9	1.9
01	303	TIMING CHAINS (ALL) CHAÎNES D'ENGRENAGE (TOUTES)			4.8	4.8	4.8	4.8	4.8
01	304	CHAINS TENSION GUIDE (ALL) GUIDE DE TENSION DE CHAÎNES (TOUS)			4.8	4.8	4.8	4.8	4.8
01	305	CHAINS GUIDE (ALL) GUIDE DE CHAÎNES (TOUS)			1.5	1.5	1.5	1.5	1.5
01	308	CYLINDER HEAD GASKET (1) JOINT D'ÉTANCHÉITÉ DE LA CULASSE (1)	1.1	1.1	1.2	1.2	1.2	1.2	1.2
01	309	CYLINDER HEAD GASKETS (2) JOINTS D'ÉTANCHÉITÉ DE LA CULASSE (2)			2.0	2.0	2.0	2.0	2.0

Outlander 400



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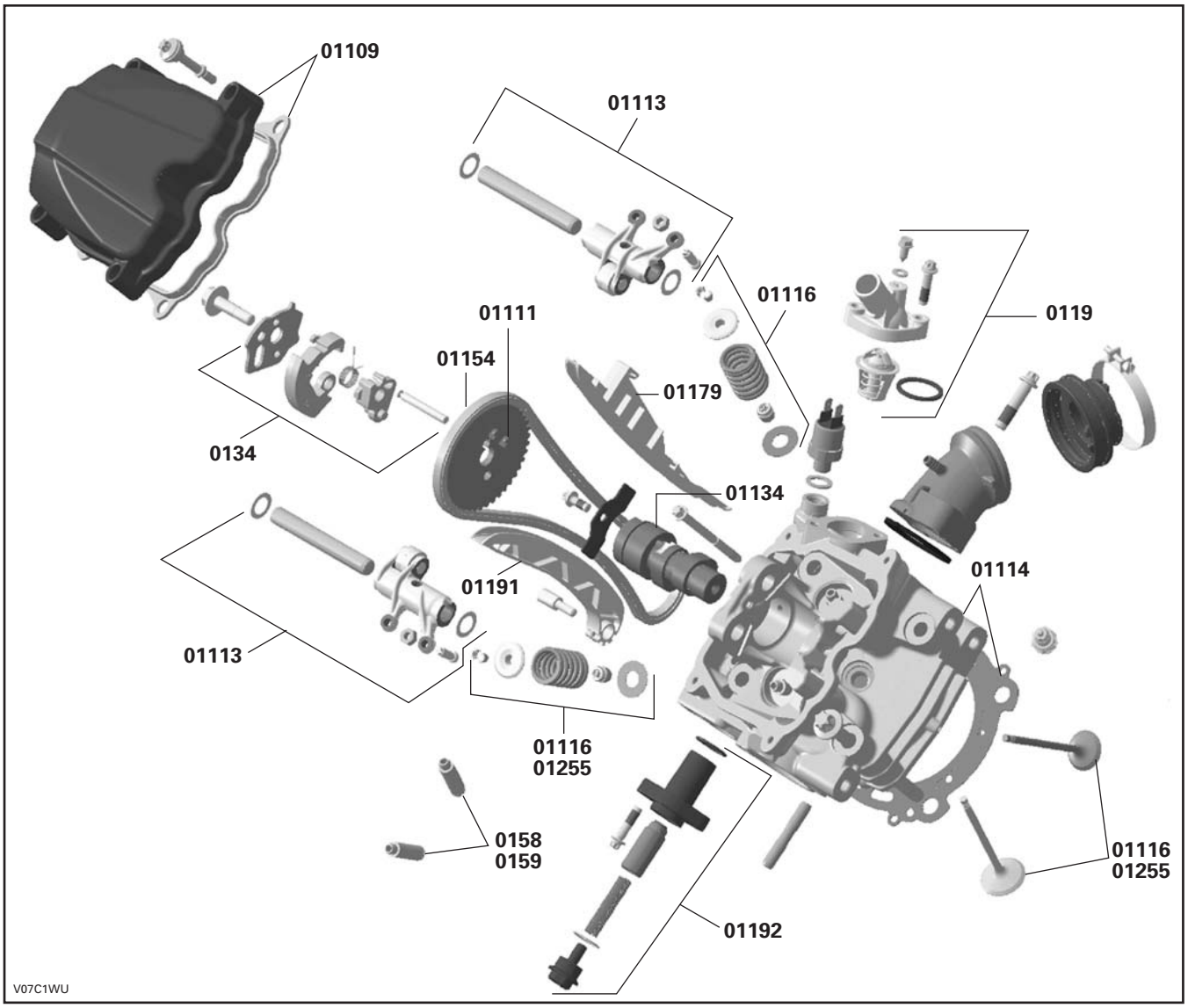

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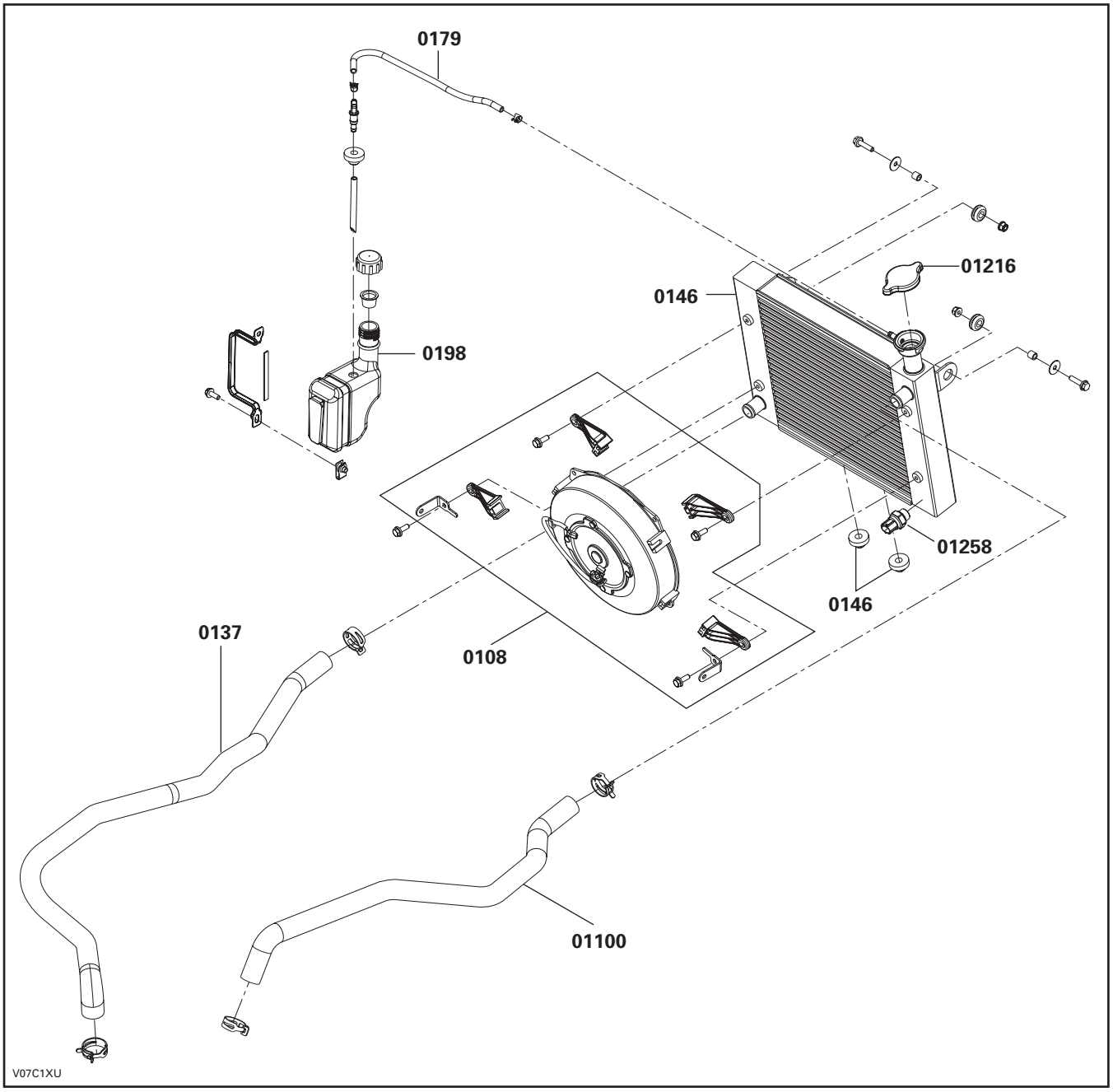

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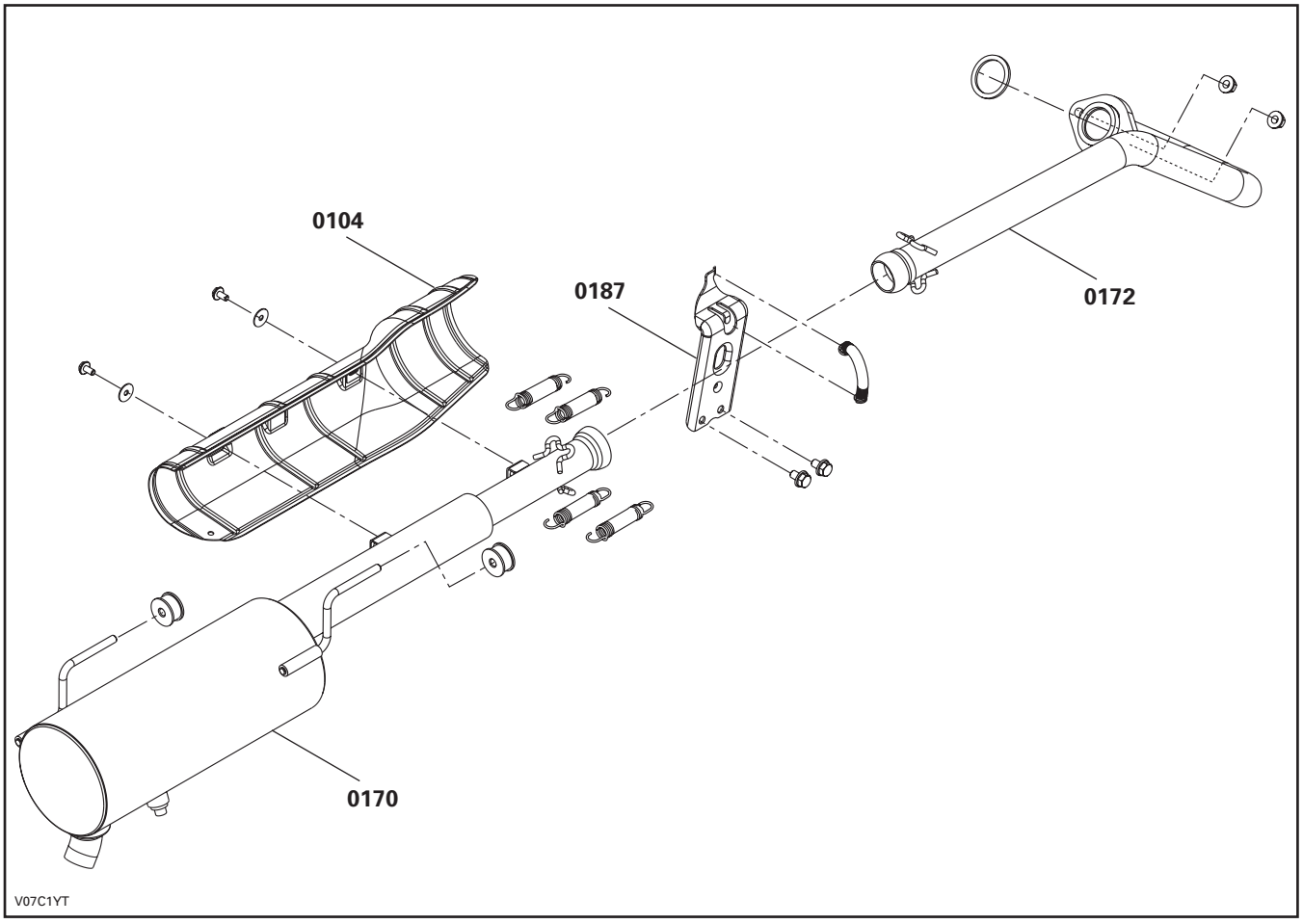

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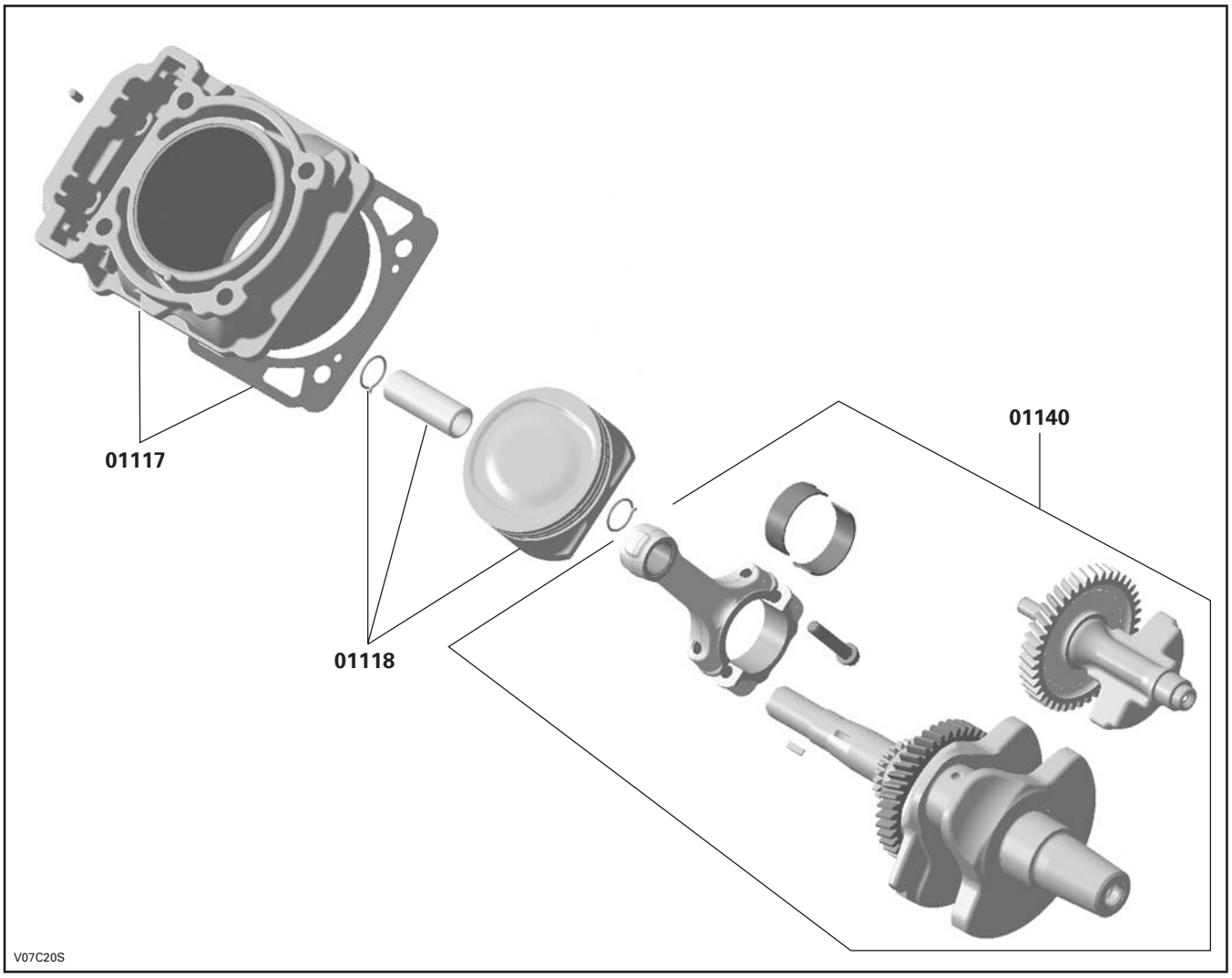
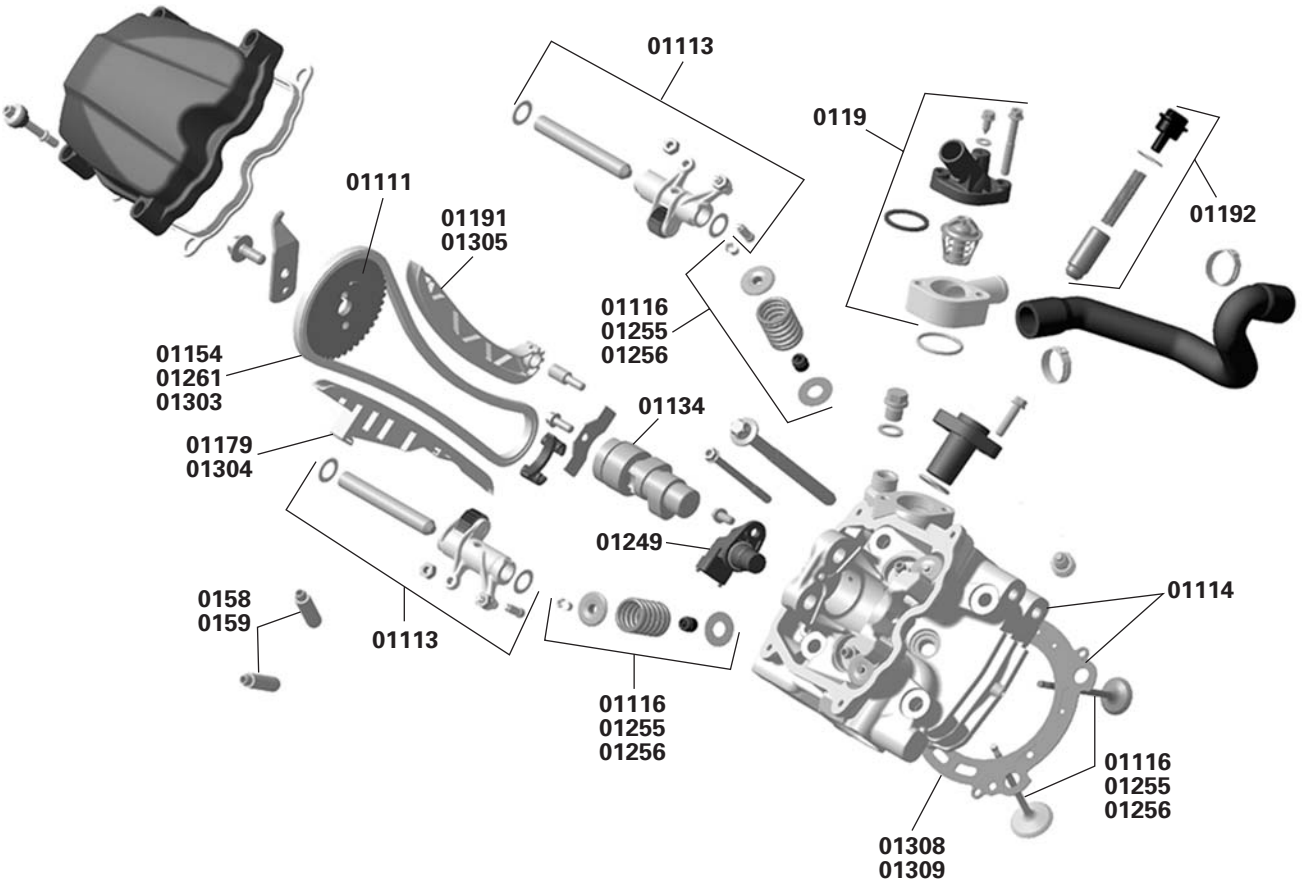


V500/650/800

FRONT/REAR
AVANT/ARRIÈRE



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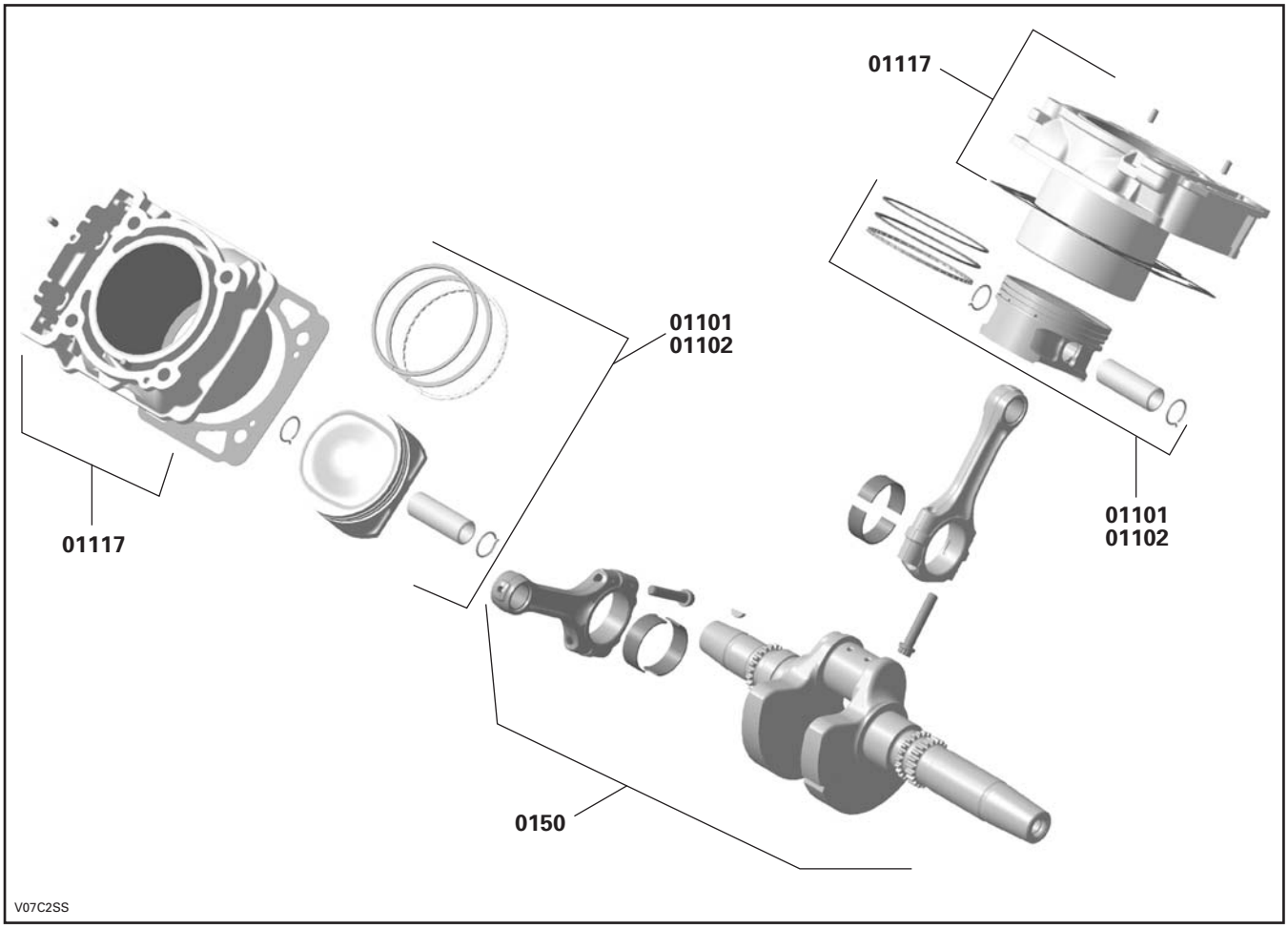

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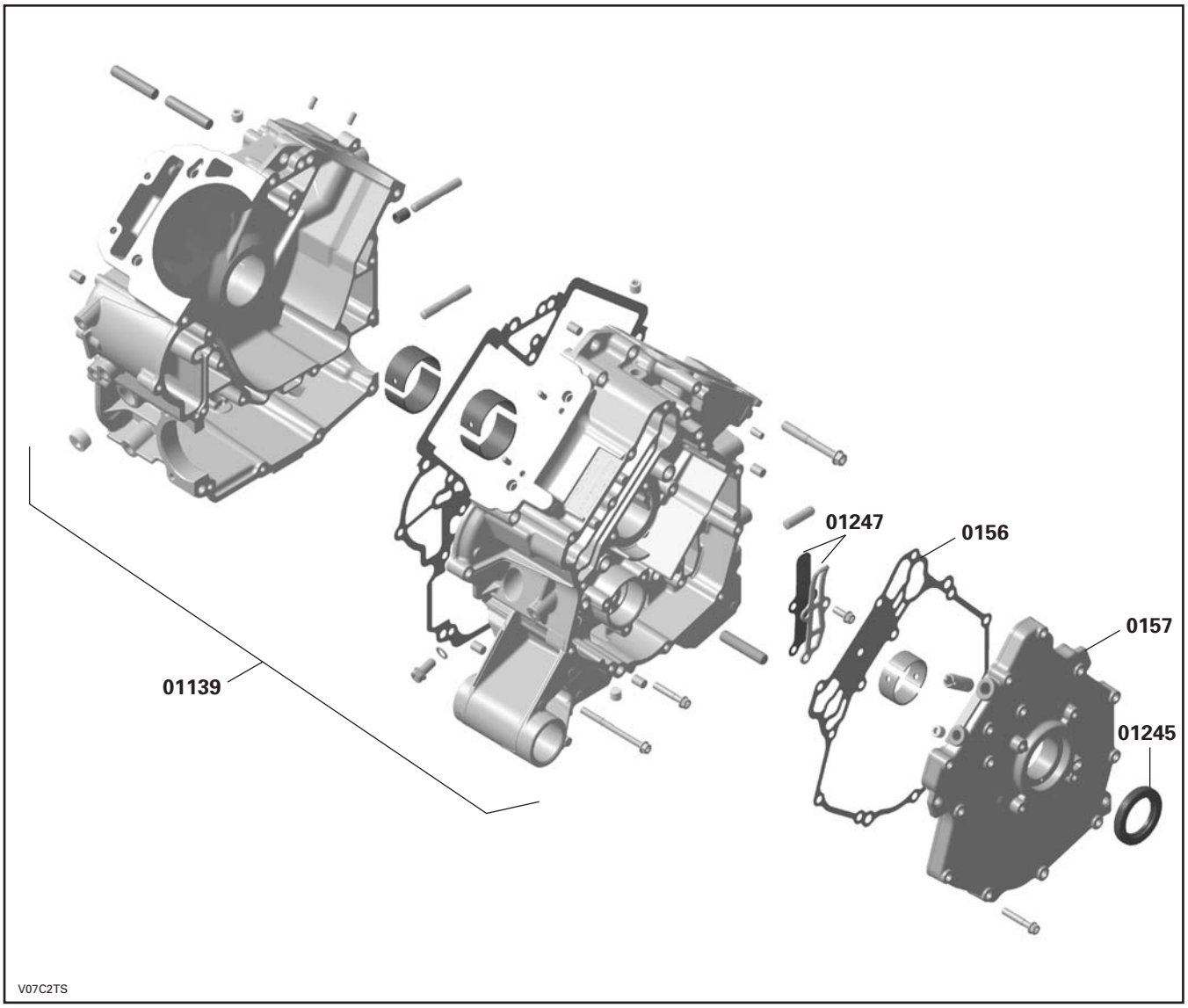

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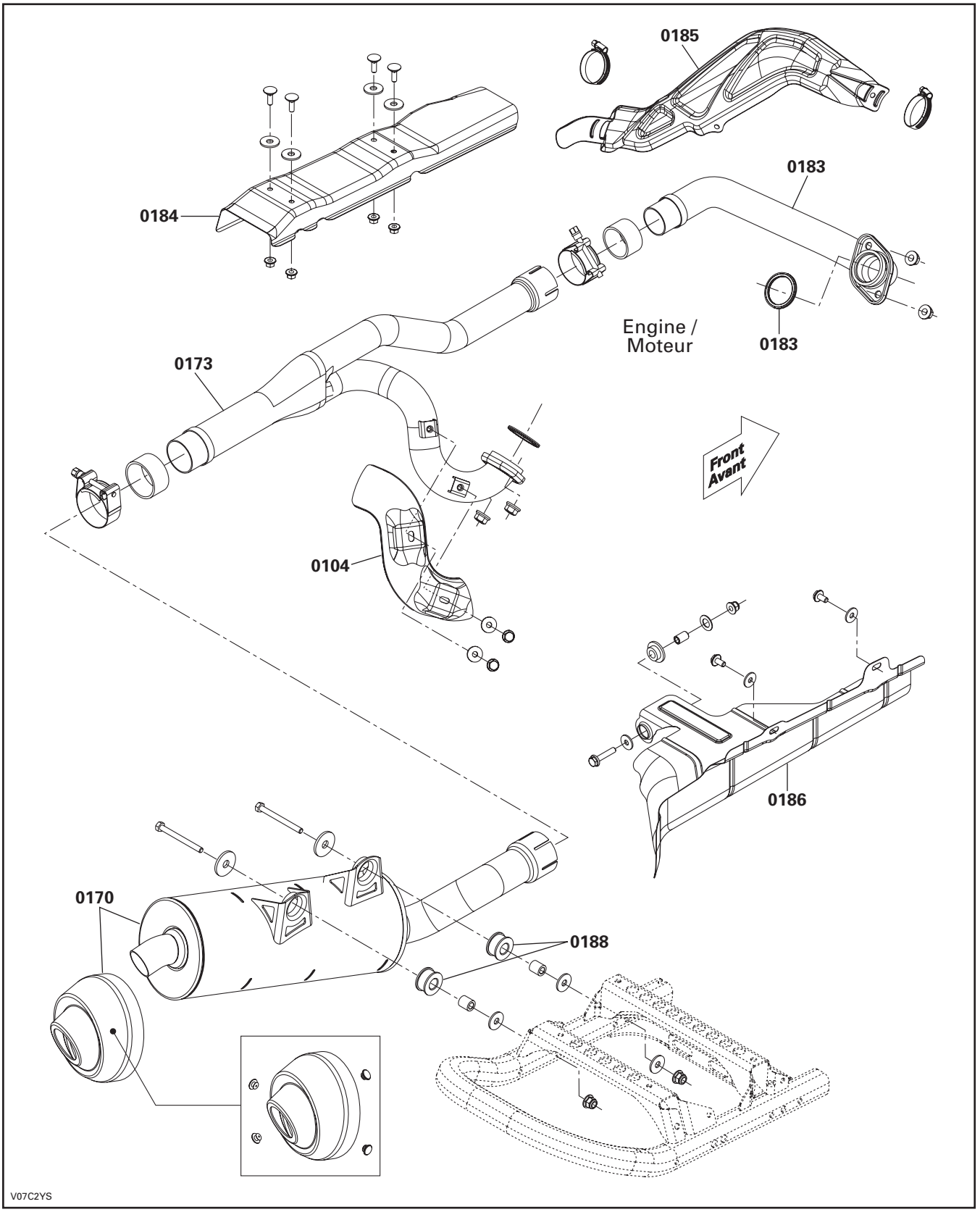

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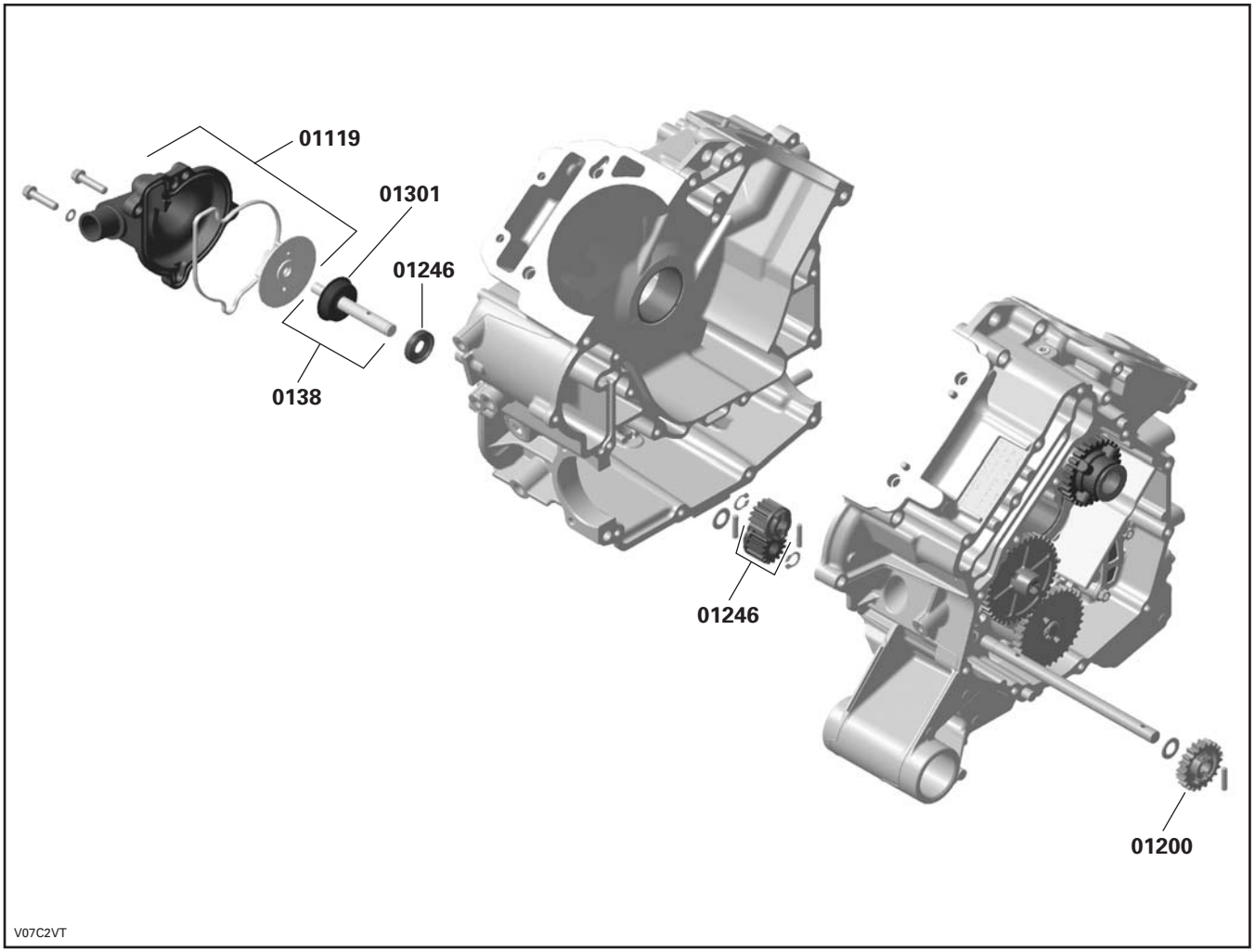

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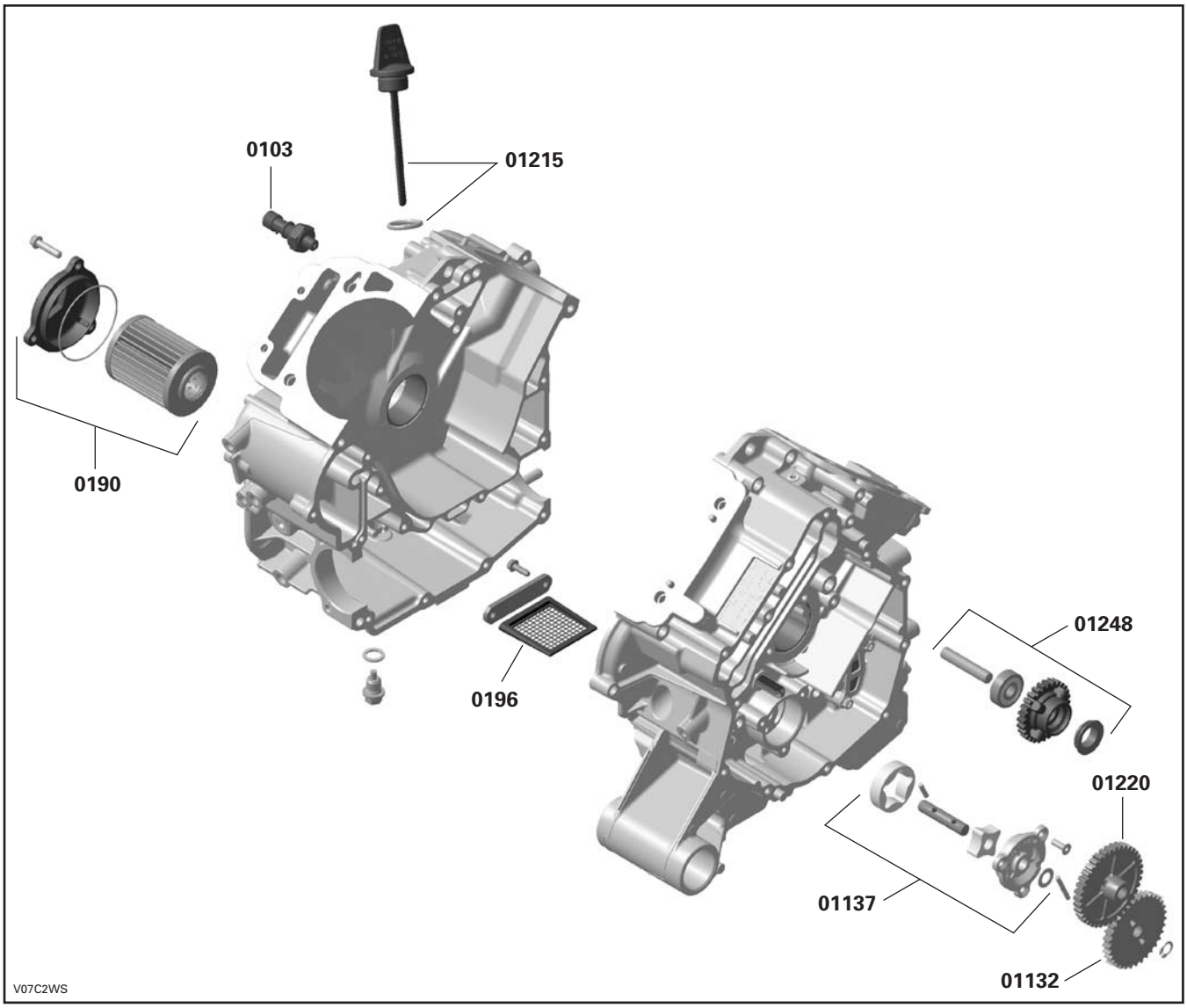

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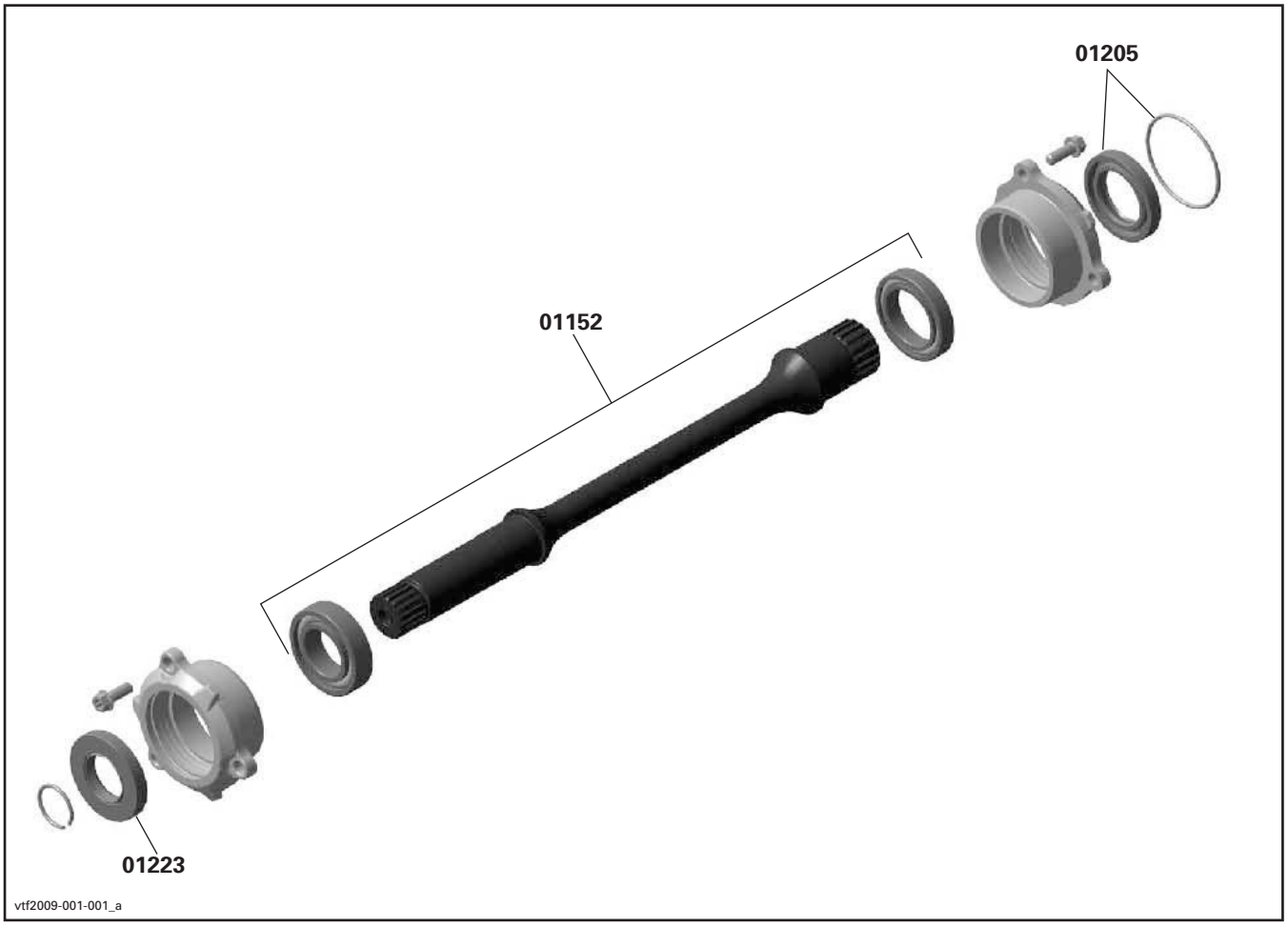
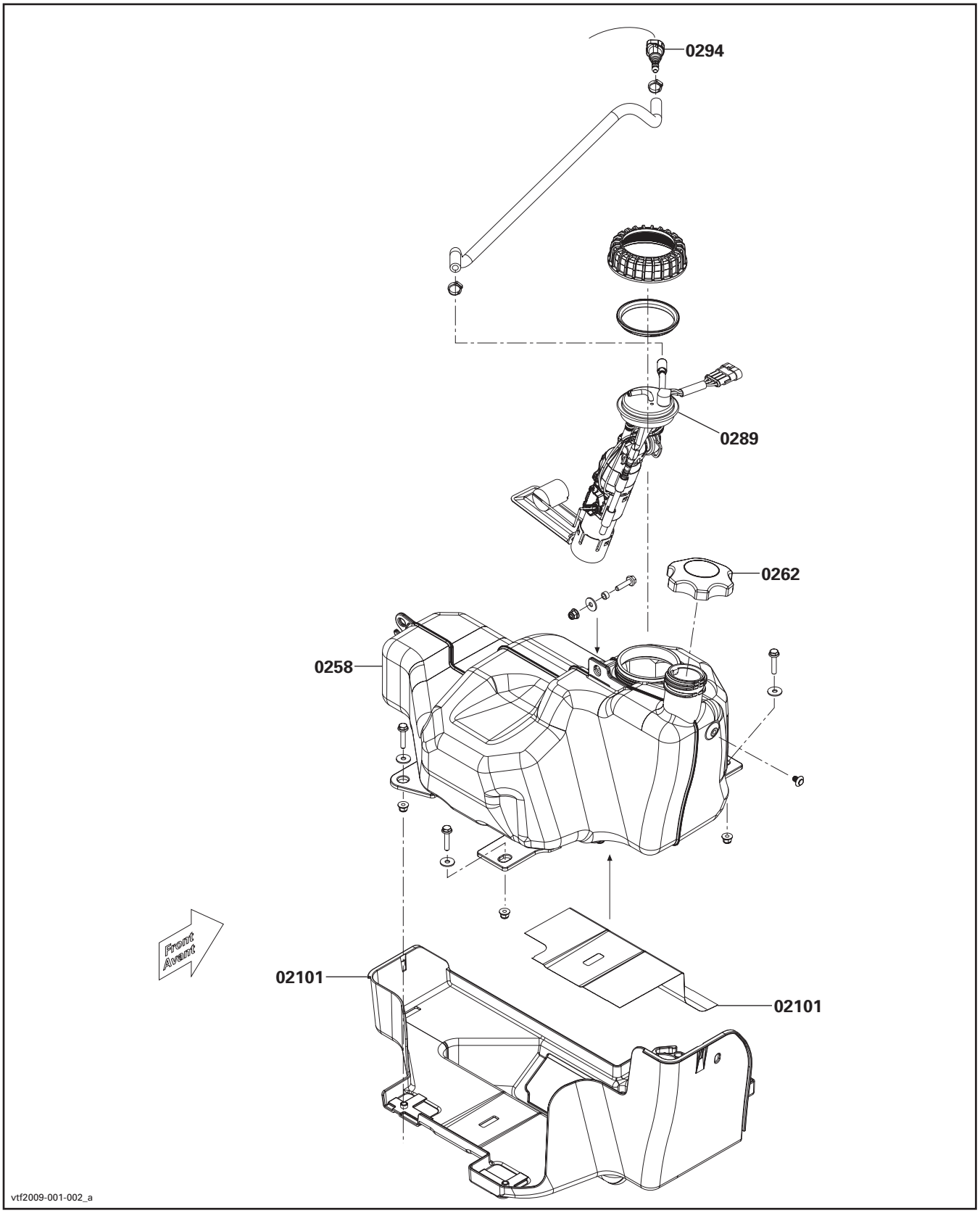


SYSTEM SYSTÈME	CODE	DESCRIPTION	OUTLANDER 400	OUTLANDER MAX 400	OUTLANDER 500	OUTLANDER MAX 500	OUTLANDER 650/800	OUTLANDER MAX 650/800	RENEGADE 500/800
			1	2	3	4	5	6	7
02	00	**NO LABOR INVOLVED AUCUNE MAIN D'OEUVRE**	0	0	0	0	0	0	0
02	01	AIR INTAKE SILENCER (ASS'Y) SILENCIEUX D'ADMISSION D'AIR (COMPLET)	0.4	0.4	0.4	0.4	0.4	0.4	0.4
02	06	THROTTLE CABLE CÂBLE D'ACCÉLÉRATEUR	0.6	0.6	0.6	0.6	0.6	0.6	0.6
02	16	INTAKE ADAPTOR ADAPTATEUR D'ADMISSION	0.4	0.4	0.4	0.4	0.4	0.4	0.4
02	19	AIR INTAKE TUBE TUYAU D'ADMISSION D'AIR	0.4	0.4	0.4	0.4	0.4	0.4	0.4
02	23	REAR AIR INTAKE TUBE AND/OR SLEEVE TUYAU D'ADMISSION D'AIR ARRIÈRE ET/OU DOUILLE	0.4	0.4	0.4	0.4	0.4	0.4	0.4
02	46	AIR TEMPERATURE SENSOR CAPTEUR DE TEMPÉRATURE D'AIR	0.3	0.3	0.3	0.3	0.3	0.3	0.3
02	57	FUEL FILTER FILTRE À ESSENCE			0.4	0.4	0.4	0.4	0.4
02	58	FUEL TANK RÉSERVOIR D'ESSENCE	1.5	1.5	1.5	1.5	1.5	1.5	1.5
02	59	INTAKE COVER AND/OR SEAL COUVERCLE D'ADMISSION ET/OU JOINT D'ÉTANCHÉITÉ	0.3	0.3	0.3	0.3	0.3	0.3	0.3
02	60	FUEL CAP BOUCHON DU RÉSERVOIR À ESSENCE	0.3	0.3	0.3	0.3	0.3	0.3	0.3
02	69	AIR FILTER FILTRE À AIR	0.3	0.3	0.3	0.3	0.3	0.3	0.3
02	72	INTAKE MANIFOLD CONNECTEUR D'ADMISSION	0.7	0.7	0.6	0.6	0.6	0.6	0.6
02	79	FUEL RAIL (1 OR 2) RAMPE D'ESSENCE (1 OU 2)	0.5	0.5	0.3	0.3	0.3	0.3	0.3
02	80	INJECTOR (ALL) INJECTEUR (TOUS)	0.6	0.6	0.4	0.4	0.4	0.4	0.4
02	81	THROTTLE BODY (ASS'Y) CARTER ACCÉLÉRATEUR (COMPLET)	0.5	0.5	0.5	0.5	0.5	0.5	0.5
02	82	THROTTLE SENSOR CAPTEUR POSITION D'ACCÉLÉRATEUR	0.3	0.3	0.3	0.3	0.3	0.3	0.3
02	84	IDLE BY-PASS VALVE VALVE DU RALENTI	0.4	0.4	0.3	0.3	0.3	0.3	0.3
02	89	FUEL PUMP MODULE MODULE POMPE À ESSENCE	0.5	0.5	0.5	0.5	0.5	0.5	0.5
02	94	FEMALE QUICK FITTING CONNECTEUR RAPIDE FEMELLE	0.4	0.4	0.4	0.4	0.4	0.4	0.4

CARBURETOR AND FUEL SYSTEM
CARBURATEUR ET SYSTÈME D'ALIMENTATION D'ESSENCE

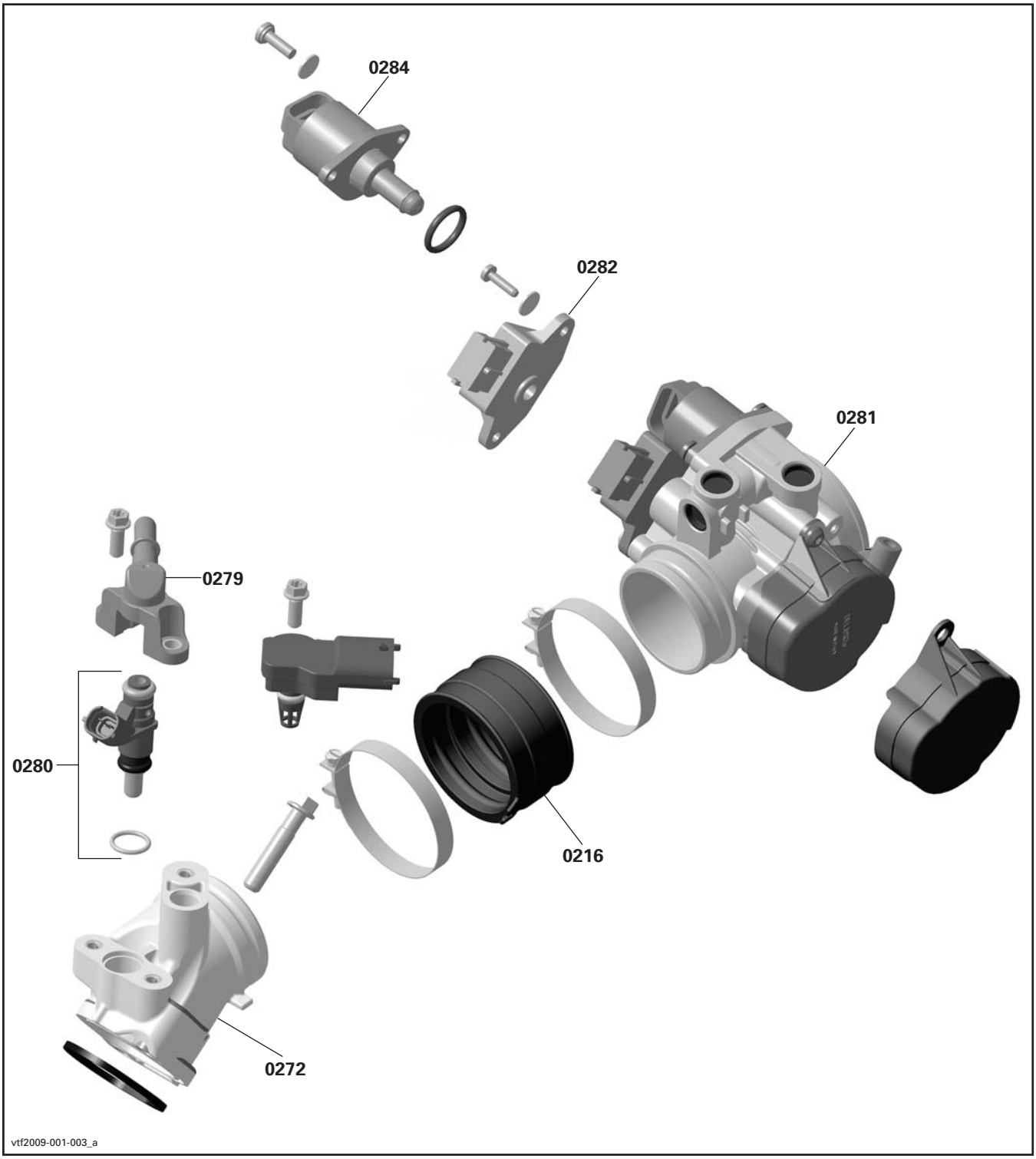
SYSTEM SYSTÈME	CODE	DESCRIPTION	OUTLANDER 400	OUTLANDER MAX 400	OUTLANDER 500	OUTLANDER MAX 500	OUTLANDER 650/800	OUTLANDER MAX 650/800	RENEGADE 500/800
			1	2	3	4	5	6	7
02	99	FUEL INJECTION HOSE (ASS'Y) BOYAU À INJECTION D'ESSENCE (COMPLET)	0.4	0.4	0.3	0.3	0.3	0.3	0.3
02	101	FUEL TANK PROTECTOR PROTECTEUR DU RÉSERVOIR À ESSENCE	1.2	1.2	1.2	1.2	1.2	1.2	1.2

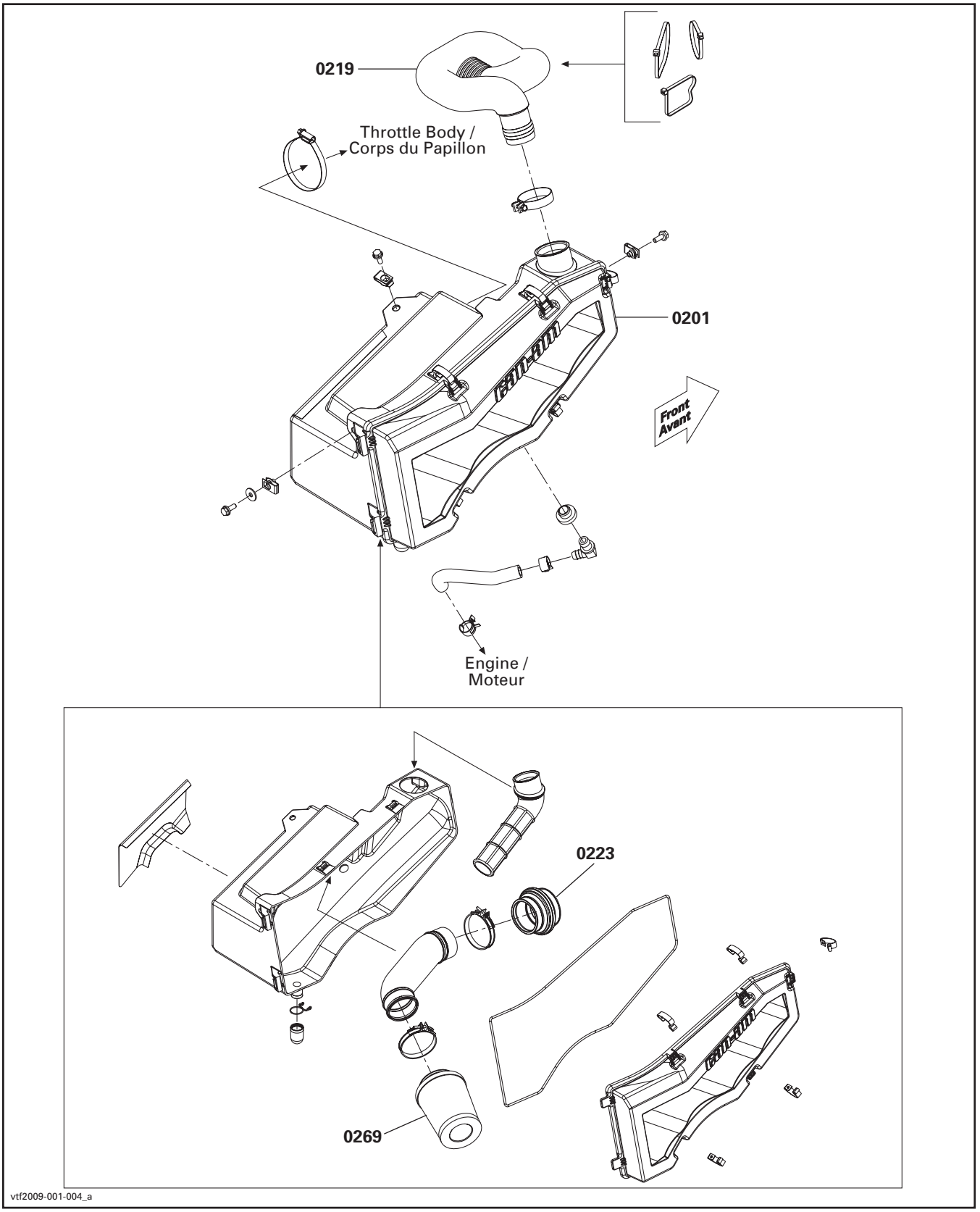
Outlander Renegade



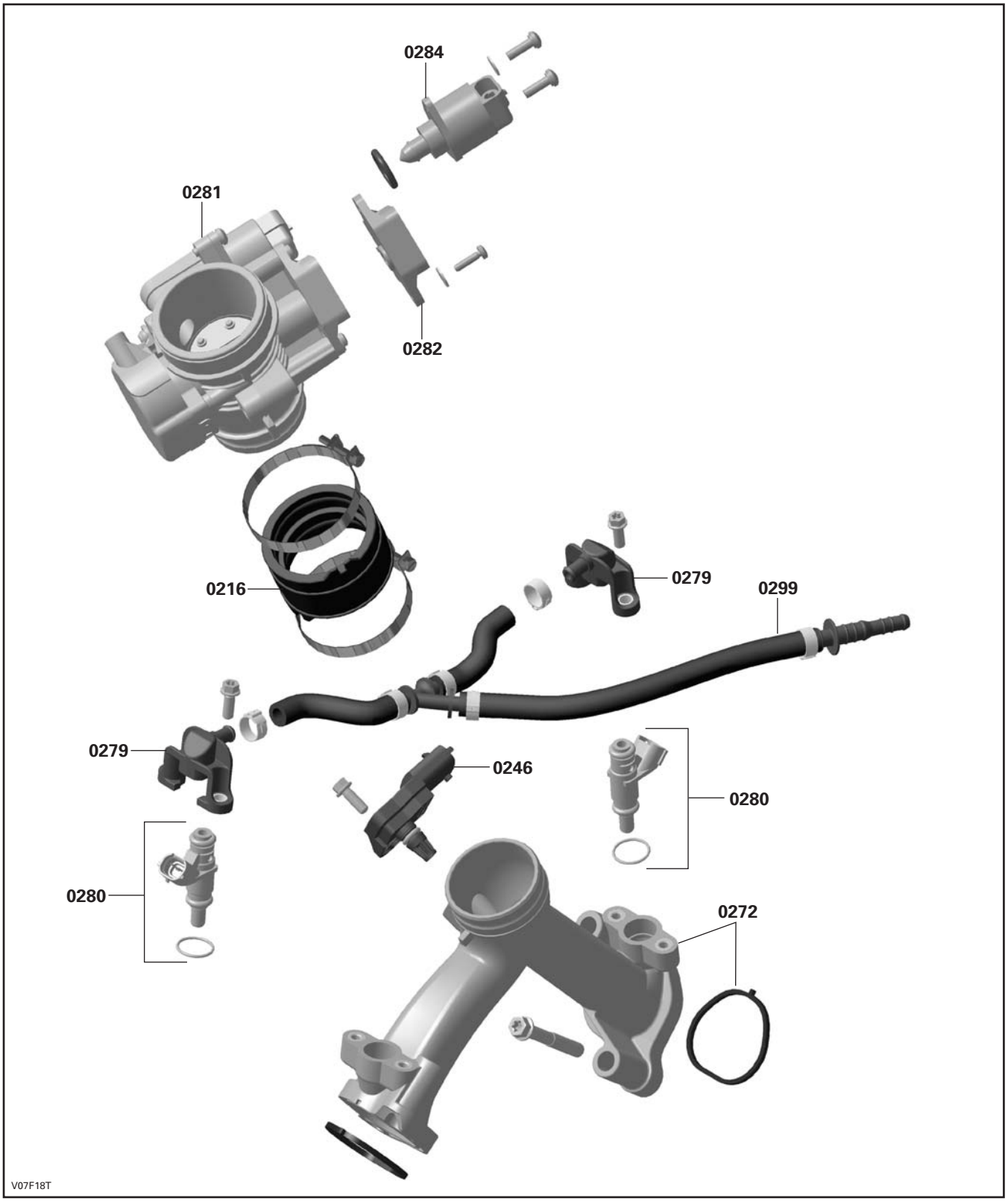
CARBURETOR AND FUEL SYSTEM
CARBURATEUR ET SYSTÈME D'ALIMENTATION D'ESSENCE

400 EFI

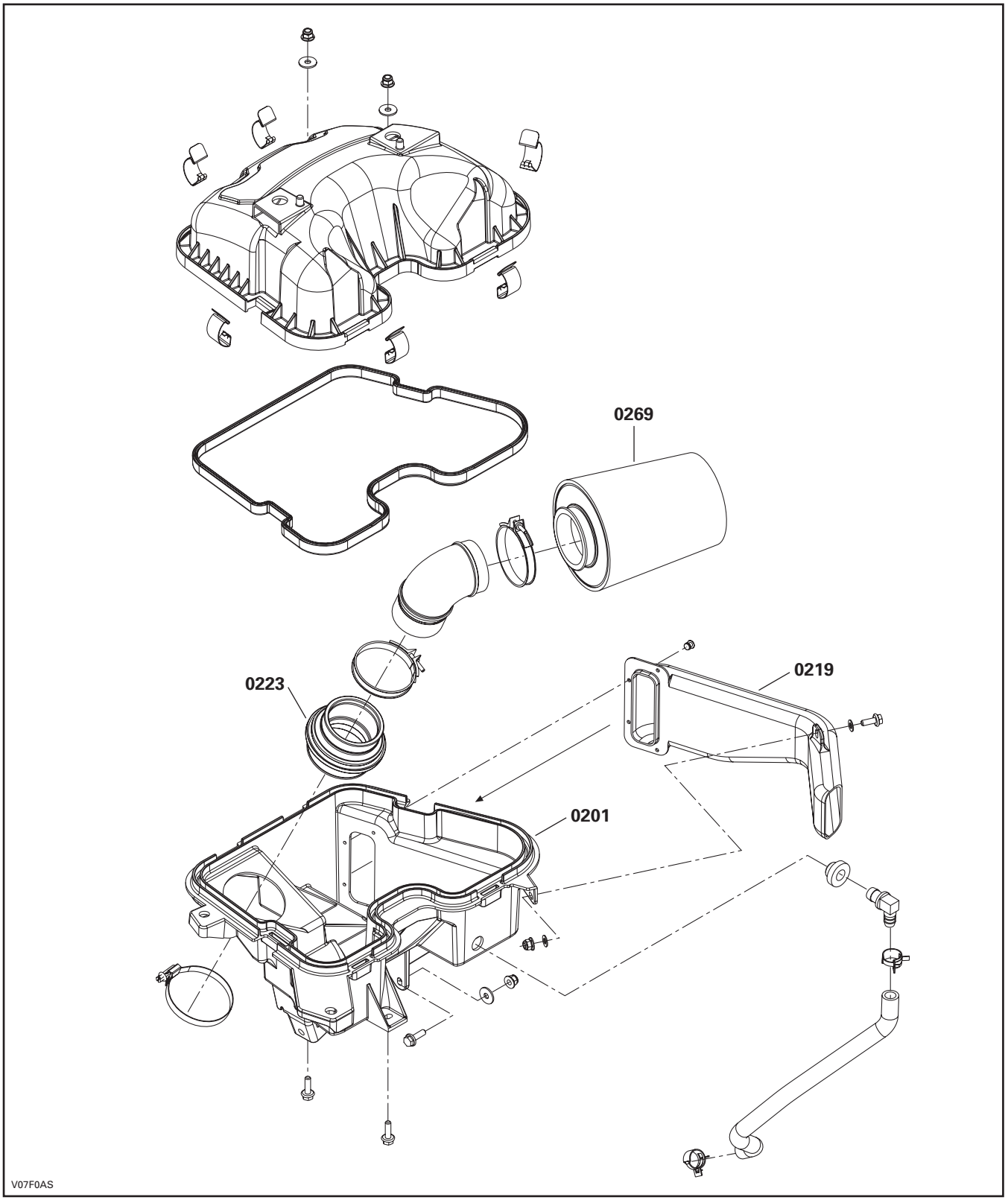




CARBURETOR AND FUEL SYSTEM
CARBURATEUR ET SYSTÈME D'ALIMENTATION D'ESSENCE

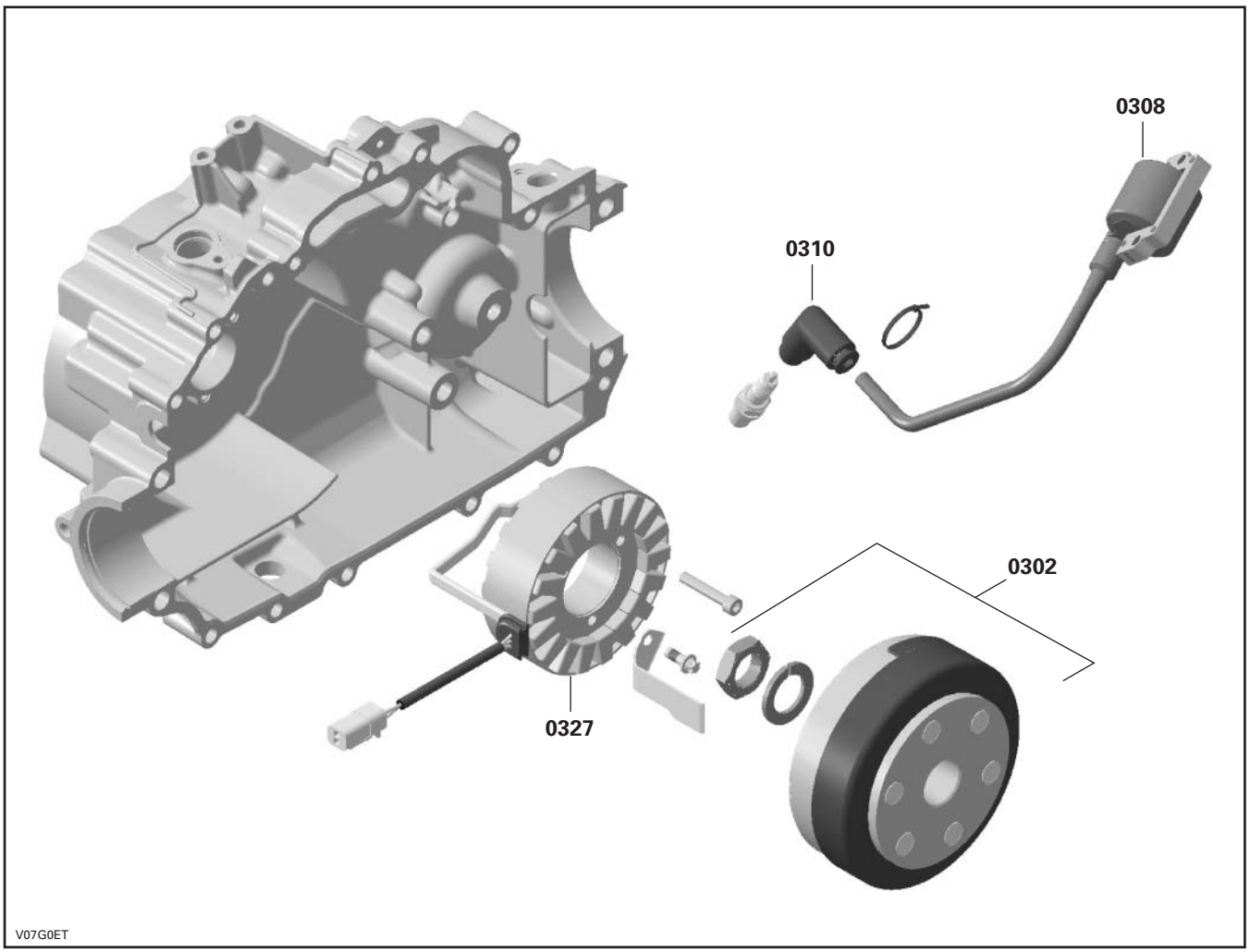


V500/650/800

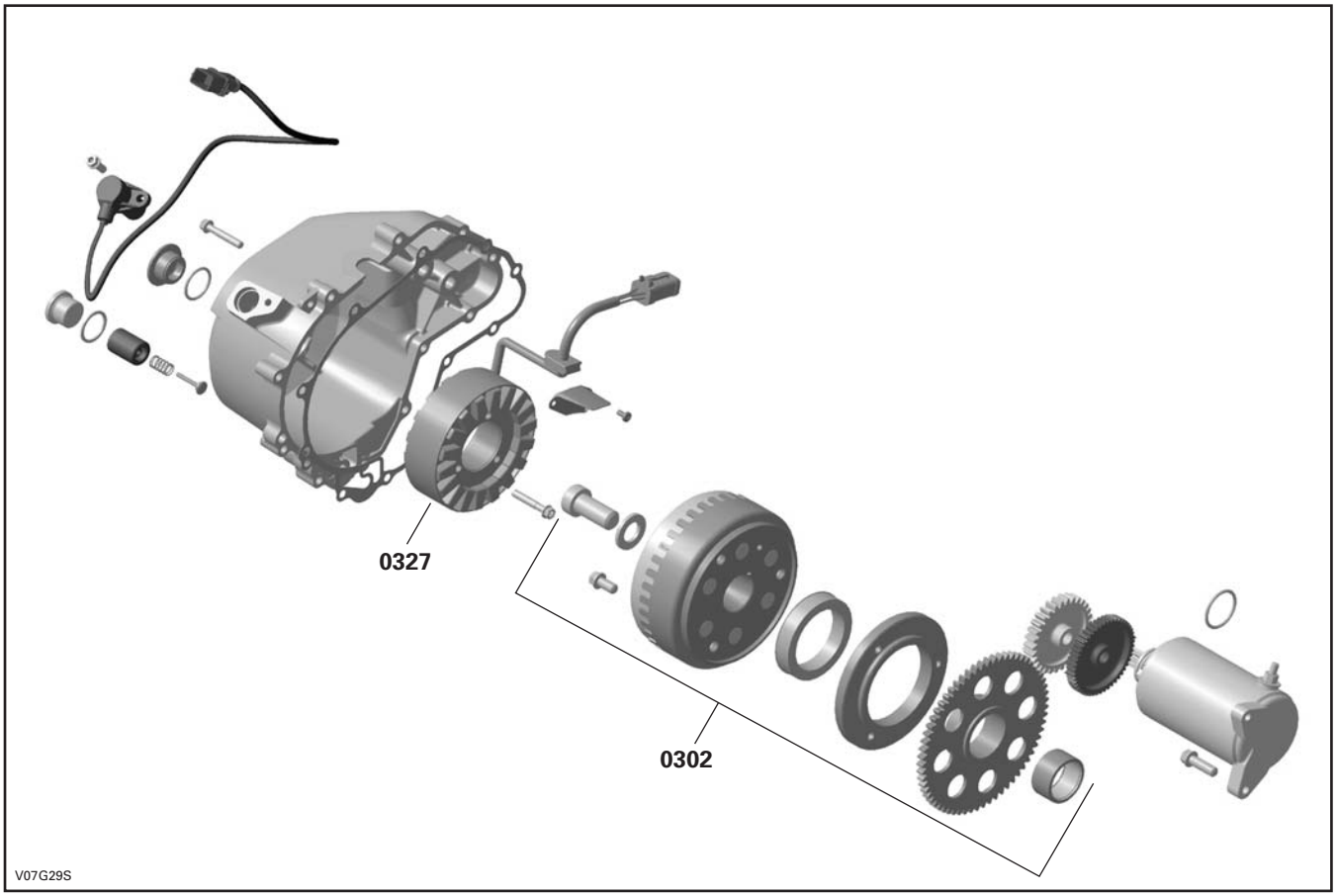


SYSTEM SYSTÈME	CODE	DESCRIPTION	OUTLANDER 400	OUTLANDER MAX 400	OUTLANDER 500	OUTLANDER MAX 500	OUTLANDER 650/800	OUTLANDER MAX 650/800	RENEGADE 500/800
			1	2	3	4	5	6	7
03	**00**	**NO LABOR INVOLVED AUCUNE MAIN D'OEUVRE**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
03	02	MAGNETO (ASS'Y) MAGNÉTO (COMPLET)	3.9	3.9	1.6	1.6	1.6	1.6	1.6
03	08	IGNITION COIL (EACH) BOBINE D'ALLUMAGE (CHAQUE)	0.3	0.3	0.3	0.3	0.3	0.3	0.3
03	10	IGNITION CABLE CÂBLE D'ALLUMAGE	0.3	0.3	0.3	0.3	0.3	0.3	0.3
03	27	STATOR (ASS'Y) STATOR (COMPLET)	3.7	3.7	1.5	1.5	1.5	1.5	1.5

Outlander 400

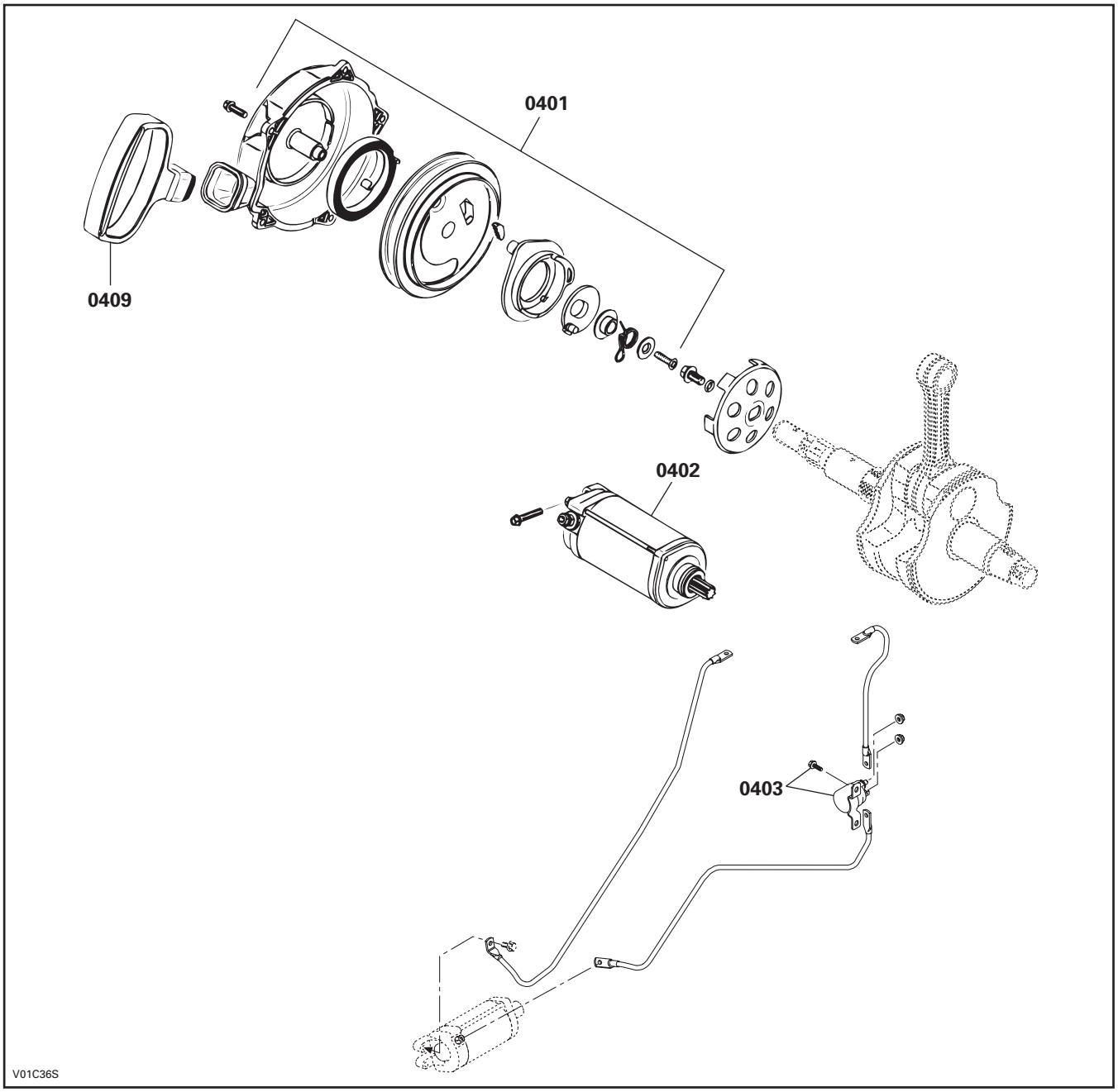


V500/650/800



SYSTEM SYSTÈME	CODE	DESCRIPTION	OUTLANDER 400	OUTLANDER MAX 400	OUTLANDER 500	OUTLANDER MAX 500	OUTLANDER 650/800	OUTLANDER MAX 650/800	RENEGADE 500/800
			1	2	3	4	5	6	7
04	**00**	**NO LABOUR INVOLVED AUCUNE MAIN-D'OEUVRE**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
04	01	REWIND STARTER (ALL PARTS EXCEPT HANDLE) DÉMARREUR À RAPPEL (TOUTES LES PIÈCES SAUF POIGNÉE)	0.3	0.3					
04	02	ELECTRIC STARTER (ASS'Y) DÉMARREUR (COMPLET)	0.3	0.3	0.3	0.3	0.3	0.3	0.3
04	03	STARTER RELAY SOLÉNOÏDE DE DÉMARRAGE	0.3	0.3	0.3	0.3	0.3	0.3	0.3
04	09	REWIND STARTER HANDLE POIGNÉE DU DÉMARREUR	0.3	0.3					
04	19	STARTER DRIVE LANCEUR DÉMARREUR	0.7	0.7	1.4	1.4	1.4	1.4	1.4

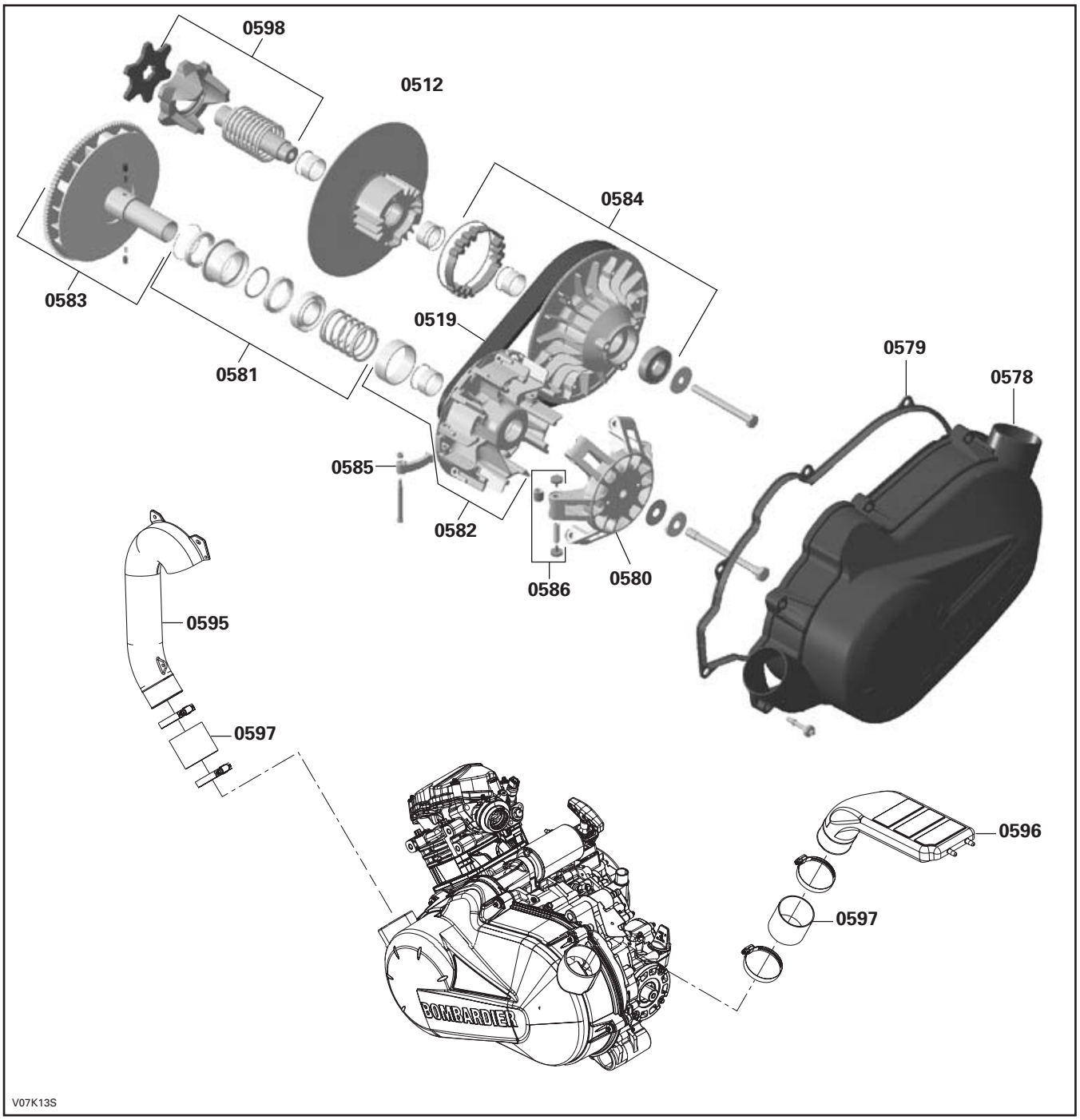
Outlander



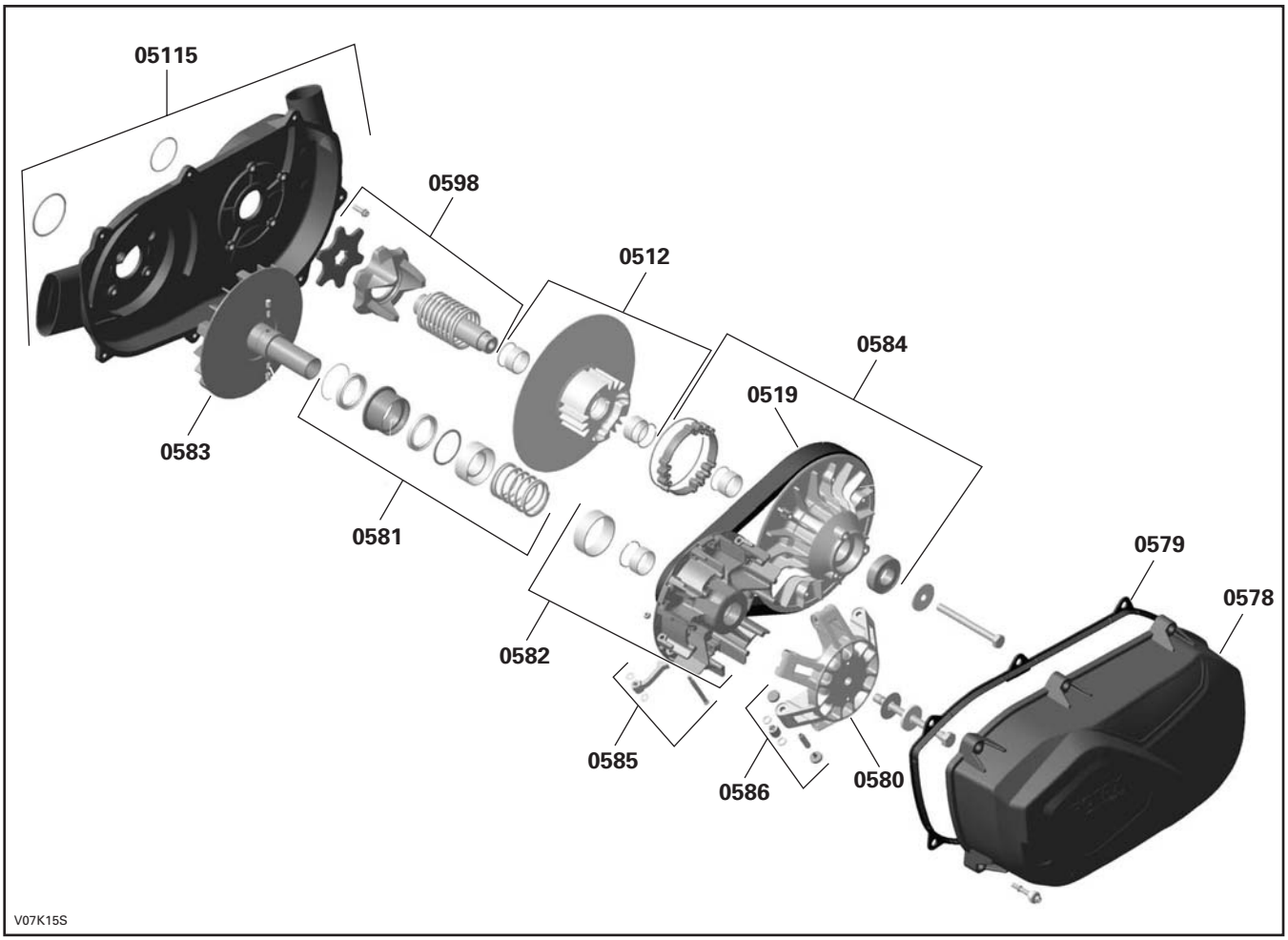
SYSTEM SYSTÈME	CODE	DESCRIPTION	OUTLANDER 400	OUTLANDER MAX 400	OUTLANDER 500	OUTLANDER MAX 500	OUTLANDER 650/800	OUTLANDER MAX 650/800	RENEGADE 500/800
			1	2	3	4	5	6	7
05	**00**	**NO LABOR INVOLVED AUCUNE MAIN-D'OEUVRE IMPLIQUÉE**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
05	12	DRIVEN PULLEY SLIDING HALF DEMI-POULIE MENÉE COULISSANTE	0.5	0.5	0.5	0.5	0.5	0.5	0.5
05	19	BELT COURROIE	0.4	0.4	0.4	0.4	0.4	0.4	0.4
05	55	LEVER BUTTON BOUTON DE LEVIER	0.3	0.3	0.3	0.3	0.3	0.3	0.3
05	56	LEVER (ASS'Y) AND/OR LEVER SPRING LEVIER (COMPLET) ET/OU RESSORT DE LEVIER	0.3	0.3	0.3	0.3	0.3	0.3	0.3
05	59	SPEED SENSOR CAPTEUR DE VITESSE	0.3	0.3	0.3	0.3	0.3	0.3	0.3
05	78	CVT COVER COUVERCLE CVC	0.3	0.3	0.3	0.3	0.3	0.3	0.3
05	79	GASKET JOINT D'ÉTANCHÉITÉ	0.3	0.3	0.3	0.3	0.3	0.3	0.3
05	80	GOVERNOR CUP COUPOLE RÉGULATEUR	0.6	0.6	0.6	0.6	0.6	0.6	0.6
05	81	ONE WAY CLUTCH, FLANGE, RING, SPRING EMBRAYAGE À ROUE LIBRE, FLASQUE, ANNEAU, RESSORT	0.6	0.6	0.6	0.6	0.6	0.6	0.6
05	82	DRIVE PULLEY (ASS'Y) POULIE MOTRICE (COMPLET)	0.7	0.7	0.7	0.7	0.7	0.7	0.7
05	83	DRIVE PULLEY FIXED HALF POULIE MOTRICE FIXE	0.7	0.7	0.7	0.7	0.7	0.7	0.7
05	84	DRIVEN PULLEY OUTER CAM AND/OR SPRING CAME DE POULIE MENÉE EXTERNE ET/OU RESSORT	0.5	0.5	0.5	0.5	0.5	0.5	0.5
05	85	CENTRIFUGAL LEVER LEVIER CENTRIFUGE	0.8	0.8	0.8	0.8	0.8	0.8	0.8
05	86	SLIDER SHOES GLISSIÈRES	0.7	0.7	0.7	0.7	0.7	0.7	0.7
05	87	LEVER SPRING LEVIER À RESSORT	0.3	0.3	0.3	0.3	0.3	0.3	0.3
05	91	MAIN SHAFT (ASS'Y) ARBRE DE RENVOI (COMPLET)			5.1	5.1	5.1	5.1	5.1
05	95	AIR INTAKE (CVT) ENTRÉE D'AIR (CVT)	0.3	0.3	0.3	0.3	0.3	0.3	0.3
05	96	AIR OUTLET (CVT) SORTIE D'AIR (CVT)	0.3	0.3	0.3	0.3	0.3	0.3	0.3
05	97	FLEXIBLE ADAPTOR ADAPTATEUR FLEXIBLE	0.3	0.3	0.3	0.3	0.3	0.3	0.3
05	98	CAM, PLATE, DRIVEN SHAFT, SPRING CAME, PLAQUE, ARBRE POULIE MENÉE, RESSORT	0.5	0.5	0.5	0.5	0.5	0.5	0.5

SYSTEM SYSTÈME	CODE	DESCRIPTION	OUTLANDER 400	OUTLANDER MAX 400	OUTLANDER 500	OUTLANDER MAX 500	OUTLANDER 650/800	OUTLANDER MAX 650/800	RENEGADE 500/800
			1	2	3	4	5	6	7
05	99	OUTPUT SHAFT ARBRE DE SORTIE			5.0	5.0	5.0	5.0	5.0
05	100	REAR OUTPUT SHAFT SEALS ANNEAUX ÉTANCHÉITÉ DE L'ARBRE DE SORTIE ARRIÈRE			3.1	3.1	3.1	3.1	3.1
05	101	GEARS BOX (ASS'Y)/MAIN SHAFT BOÎTE D'ENGRENAGE (COMPLET)/ARBRE PRINCIPAL			5.1	5.1	5.1	5.1	5.1
05	102	SHIFT SHAFT (ASS'Y) ARBRE D'EMBRAYAGE (COMPLET)			5.1	5.1	5.1	5.1	5.1
05	103	SHIFT DRUM TAMBOUR D'EMBRAYAGE			5.1	5.1	5.1	5.1	5.1
05	104	INDEX LEVER (ASS'Y) LEVIER D'INDEXATION (COMPLET)			5.1	5.1	5.1	5.1	5.1
05	105	MAIN SHAFT SEAL JOINT D'ÉTANCHÉITÉ DE L'ARBRE PRINCIPAL			0.7	0.7	0.7	0.7	0.7
05	106	LH HOUSING GEAR AND/OR BEARINGS AND/OR GEAR LOGEMENT DE TRANSMISSION GAUCHE ET/OU ROULEMENT À BILLE ET/OU ENGRENAGE			5.1	5.1	5.1	5.1	5.1
05	107	SPACER AND/OR O-RING ENTRETOISE ET/OU JOINT TORIQUE			0.5	0.5	0.5	0.5	0.5
05	108	ACTUATOR AND/OR FORK AND/OR SEAL ACTUATEUR ET/OU FOURCHETTE ET/OU JOINT D'ÉTANCHÉITÉ			0.5	0.5	0.5	0.5	0.5
05	109	FORK AND/OR PIN FOURCHETTE ET/OU GOUPILLE			0.7	0.7	0.7	0.7	0.7
05	110	CENTER HOUSING GEAR AND/OR BEARING LOGEMENT DE TRANSMISSION CENTRE ET/OU ROULEMENT			5.1	5.1	5.1	5.1	5.1
05	111	RH HOUSING GEAR AND/OR BEARING LOGEMENT DE TRANSMISSION DROIT ET/OU ROULEMENT			5.0	5.0	5.0	5.0	5.0
05	112	TRANSMISSION SWITCHES INTERRUPTEUR DE TRANSMISSION	0.6	0.6	0.3	0.3	0.3	0.3	0.3
05	113	SHIFTING SWITCH INTERRUPTEUR D'EMBRAYAGE			0.3	0.3	0.3	0.3	0.3
05	114	SHIFT SHAFT SEAL ANNEAU D'ÉTANCHÉITÉ DE L'ARBRE D'EMBRAYAGE			0.3	0.3	0.3	0.3	0.3
05	115	CVT AIR GUIDE AND/OR O-RINGS GUIDE D'AÉRATION ET/OU JOINT D'ÉTANCHÉITÉ			0.8	0.8	0.8	0.8	0.8

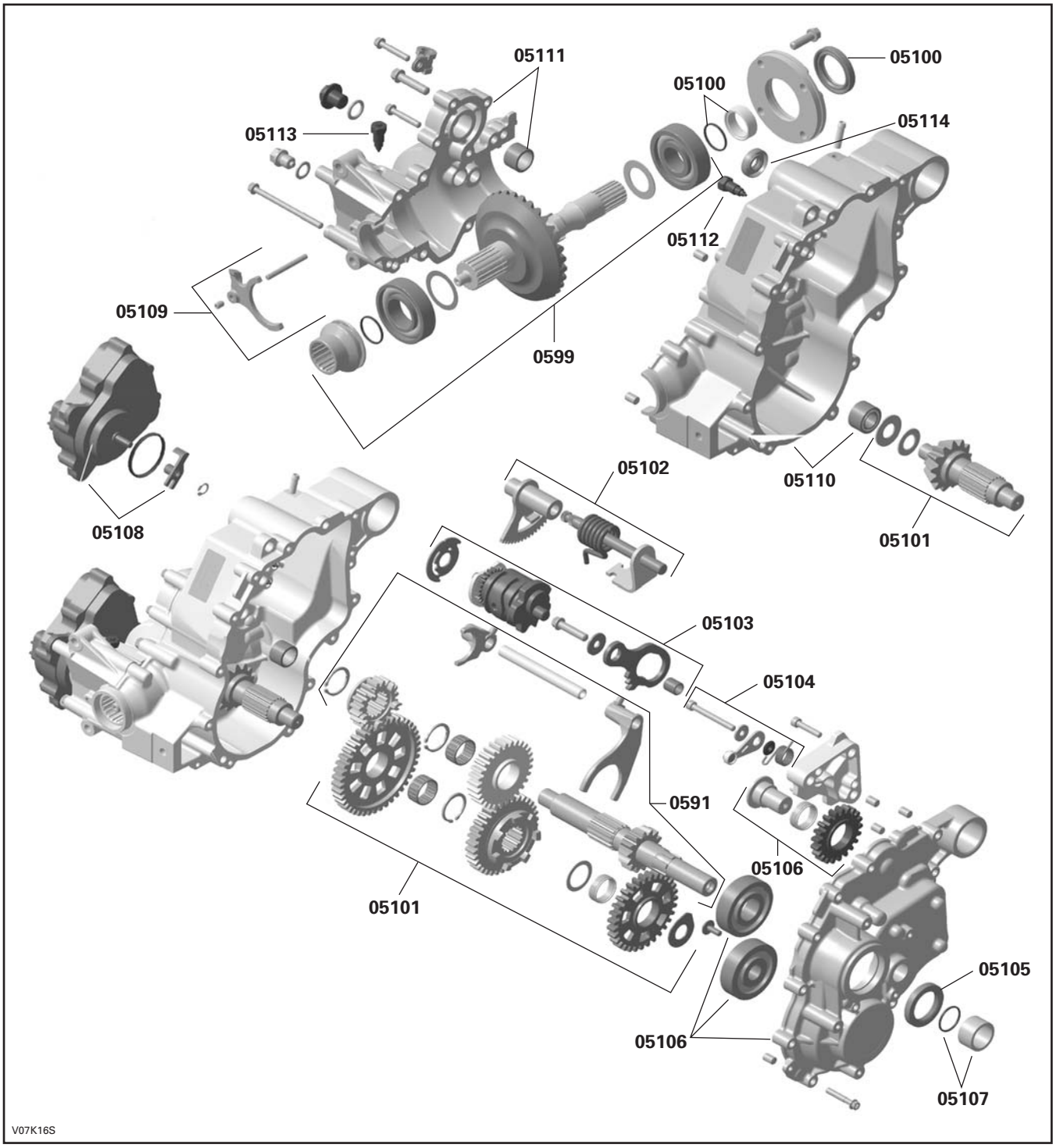
Outlander 400



V500/650/800



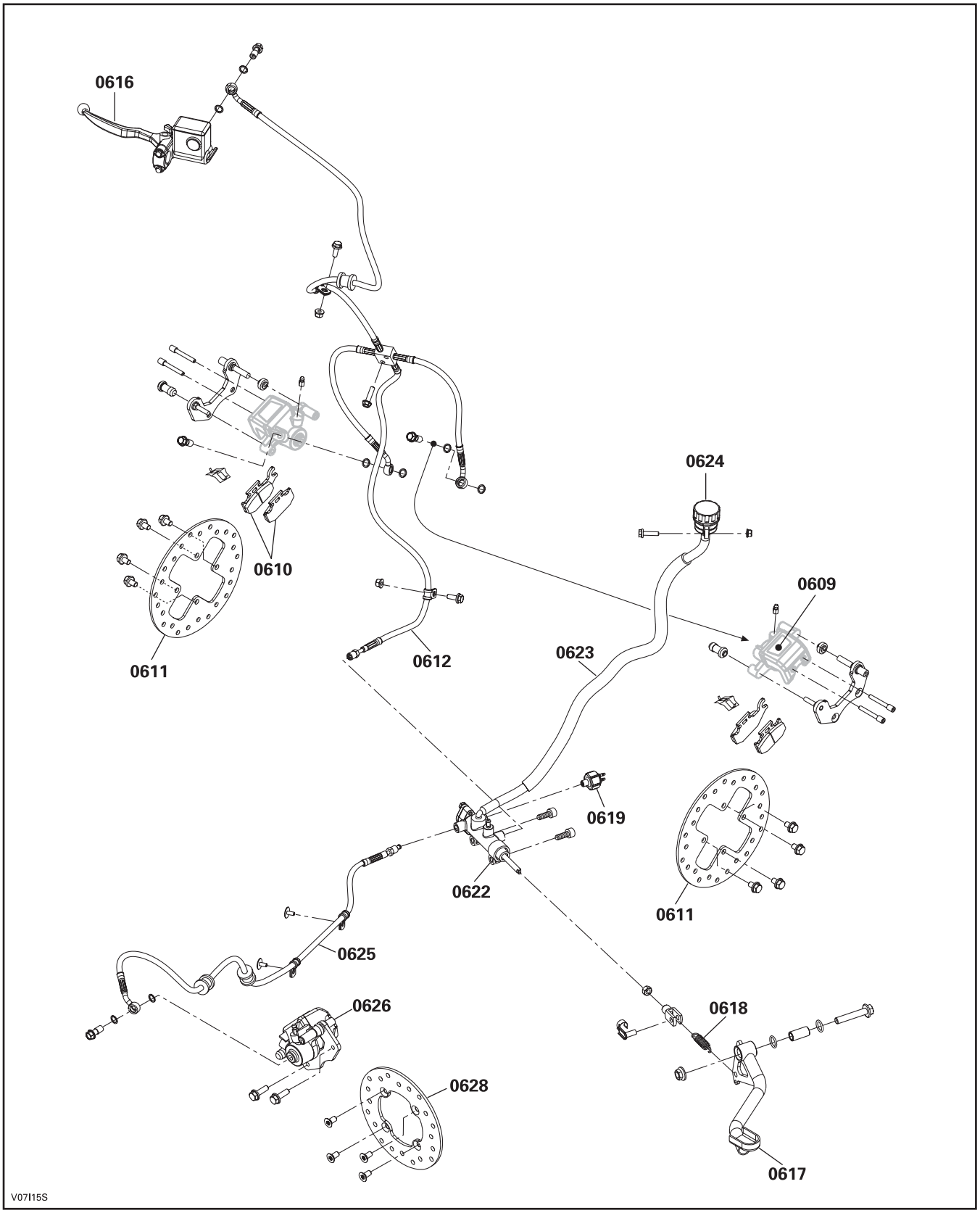
V500/650/800



BRAKE SYSTEM
SYSTÈME DE FREIN

SYSTEM SYSTÈME	CODE	DESCRIPTION	OUTLANDER 400	OUTLANDER MAX 400	OUTLANDER 500	OUTLANDER MAX 500	OUTLANDER 650/800	OUTLANDER MAX 650/800	RENEGADE 500/800
			1	2	3	4	5	6	7
06	**00**	**NO LABOR INVOLVED AUCUNE MAIN-D'OEUVRE**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
06	09	FRONT CALIPER (RH OR LH) ÉTRIER AVANT (DROIT OU GAUCHE)	0.4	0.4	0.4	0.4	0.4	0.4	0.4
06	10	FRONT BRAKE PAD (RH OR LH) PLAQUETTE DE FREIN AVANT (DROIT OU GAUCHE)	0.3	0.3	0.3	0.3	0.3	0.3	0.3
06	11	FRONT BRAKE DISC (RH OR LH) DISQUE DE FREIN AVANT (DROIT OU GAUCHE)	0.7	0.7	0.7	0.7	0.9	0.9	0.5
06	12	FRONT FLEXIBLE BRAKE HOSE BOYAU FLEXIBLE DE FREIN AVANT	0.9	0.9	0.9	0.9	0.9	0.9	0.9
06	16	FRONT MASTER CYLINDER MAÎTRE-CYLINDRE AVANT	0.4	0.4	0.4	0.4	0.4	0.4	0.4
06	17	REAR BRAKE PEDAL PÉDALE DE FREIN ARRIÈRE	0.4	0.4	0.4	0.4	0.4	0.4	0.4
06	18	REAR BRAKE PEDAL SPRING RESSORT DE LA PÉDALE DE FREIN ARRIÈRE	0.3	0.3	0.3	0.3	0.3	0.3	0.3
06	19	BRAKE SWITCH INTERRUPTEUR DE FREIN	0.3	0.3	0.3	0.3	0.3	0.3	0.3
06	22	REAR MASTER CYLINDER MAÎTRE-CYLINDRE ARRIÈRE	0.8	0.8	0.8	0.8	0.8	0.8	0.8
06	23	REAR OIL HOUSING HOSE BOYAU CARTER D'HUILE ARRIÈRE	0.6	0.6	0.6	0.6	0.6	0.6	0.6
06	24	REAR OIL HOUSING CARTER D'HUILE ARRIÈRE	0.3	0.3	0.3	0.3	0.3	0.3	0.3
06	25	REAR BRAKE HOSE BOYAU DE FREIN ARRIÈRE	0.6	0.6	0.6	0.6	0.6	0.6	0.6
06	26	REAR CALIPER ÉTRIER ARRIÈRE	0.4	0.4	0.4	0.4	0.4	0.4	0.4
06	27	REAR BRAKE PAD PLAQUETTE DE FREIN ARRIÈRE	0.3	0.3	0.3	0.3	0.3	0.3	0.3
06	28	REAR BRAKE DISC AND/OR HUB DISQUE DE FREIN ARRIÈRE ET/OU MOYEU	0.9	0.9	0.9	0.9	0.9	0.9	0.9

Outlander/Renegade



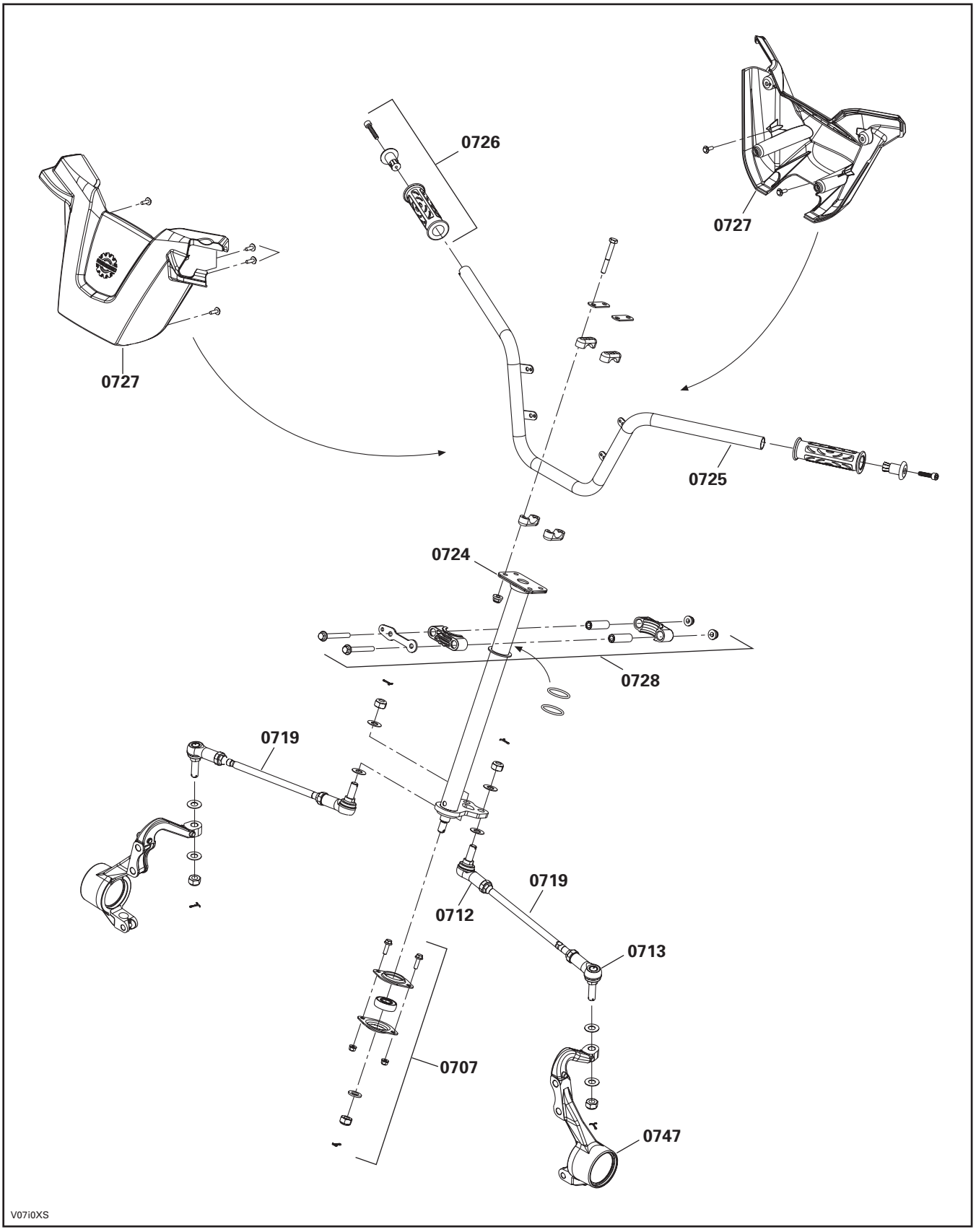
STEERING/FRONT DRIVE SYSTEM AND SUSPENSION
DIRECTION/SYSTÈEME D'ENTRAÎNEMENT AVANT ET SUSPENSION

SYSTEM SYSTÈME	CODE	DESCRIPTION	OUTLANDER 400	OUTLANDER MAX 400	OUTLANDER 500	OUTLANDER MAX 500	OUTLANDER 650/800	OUTLANDER MAX 650/800	RENEGADE 500/800
			1	2	3	4	5	6	7
07	**00**	**NO LABOR INVOLVED AUCUNE MAIN-D'OEUVRE**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
07	04	ARM PROTECTOR (RH OR LH) PROTECTEUR DE BRAS (DROIT OU GAUCHE)	0.3	0.3	0.3	0.3	0.3	0.3	0.3
07	05	STEERING CLAMP AND/OR STEERING COVER SUPPORT BRIDE DE DIRECTION ET/OU SUPPORT DU COUVRE-GUIDON	0.4	0.4	0.4	0.4	0.4	0.4	0.4
07	07	THRUST BEARING PALIER DE BUTÉE	1.6	1.6	1.6	1.6	1.6	1.6	1.6
07	12	INTERNAL BALL JOINT (RH OR LH) JOINT À ROTULE INTERNE (DROIT AU GAUCHE)	0.9	0.9	0.9	0.9	0.9	0.9	0.9
07	13	EXTERNAL BALL JOINT (RH OR LH) JOINT À ROTULE EXTERNE (DROIT OU GAUCHE)	0.8	0.8	0.8	0.8	0.8	0.8	0.8
07	19	TIE ROD (RH OR LH) BARRE D'ACCOUPLEMENT (DROIT OU GAUCHE)	0.9	0.9	0.9	0.9	0.9	0.9	0.9
07	24	MAIN TUBE TUBE PRINCIPAL	2.0	2.0	2.0	2.0	2.0	2.0	2.0
07	25	HANDLEBAR GUIDON	1.1	1.1	1.1	1.1	1.1	1.1	1.1
07	26	HANDLEBAR GRIP KIT (RH AND/OR LH) ENSEMBLE DE GAINE DE GUIDON (DROIT ET/OU GAUCHE)	0.3	0.3	0.3	0.3	0.3	0.3	0.3
07	27	STEERING COVER COUVRE-GUIDON	0.4	0.4	0.3	0.3	0.3	0.3	
07	28	HALF HOUSING AND HOUSING BUSHING DEMI-LOGEMENT ET DOUILLE DE LOGEMENT	0.7	0.7	0.7	0.7	0.7	0.7	0.7
07	32	LOWER ARM AND/OR BALL JOINT (RH OR LH) BRAS INFÉRIEUR ET/OU JOINT À ROTULE (DROIT OU GAUCHE)	0.7	0.7	0.7	0.7	0.7	0.7	0.7
07	33	UPPER ARM (RH OR LH) BRAS DE SUSPENSION SUPÉRIEUR (DROIT OU GAUCHE)					0.8	0.8	0.8
07	37	FRONT SHOCK AND/OR SPRING AND/OR STOPPER AND/OR PROTECTOR AND/OR SEAT (RH OR LH) AMORTISSEUR AVANT ET/OU RESSORT ET/OU BUTÉE ET/OU SIÈGE ET/OU PROTECTEUR (DROIT OU GAUCHE)	0.7	0.7	0.7	0.7	0.7	0.7	0.7
07	40	FRONT DIFFERENTIEL (ASS'Y) DIFFÉRENTIEL AVANT (COMPLET)	2.3	2.3	2.3	2.3	2.6	2.6	2.6
07	42	FRONT PROPELLER SHAFT (ASS'Y) ARBRE DE PROPULSION AVANT (COMPLET)	1.4	1.4	1.7	1.7	2.0	2.0	2.0
07	45	CV JOINT (RH OR LH) JOINT HOMOCINÉTIQUE (DROIT OU GAUCHE)	0.7	0.7	0.7	0.7	0.7	0.7	0.7
07	46	FRONT WHEEL HUB (SEAL AND/OR BEARING) (RH OR LH) MOYEU DE ROUE AVANT (JOINT ET/OU ROULEMENT) (DROIT OU GAUCHE)	0.3	0.3	0.3	0.3	0.3	0.3	0.4
07	47	KNUCKLE (RH OR LH) PORTE-FUSÉE (DROIT OU GAUCHE)	0.4	0.4	0.4	0.4	0.4	0.4	0.4

SYSTEM SYSTÈME	CODE	DESCRIPTION	OUTLANDER 400	OUTLANDER MAX 400	OUTLANDER 500	OUTLANDER MAX 500	OUTLANDER 650/800	OUTLANDER MAX 650/800	RENEGADE 500/800
			1	2	3	4	5	6	7
07	50	FRONT RIM AND/OR TIRE JANTE AVANT ET/OU PNEU	0.4	0.4	0.4	0.4	0.4	0.4	0.4
07	56	THROTTLE HANDLE MANETTE D'ACCÉLÉRATEUR	0.3	0.3	0.3	0.3	0.3	0.3	0.3
07	72	INTERNAL BUSHING AND/OR CUSHION (LOWER AND/OR UPPER ARM) (RH OR LH) DOUILLE INTERNE ET/OU COUSSIN (BRAS INFÉRIEUR ET/OU SUPÉRIEUR) (DROIT OU GAUCHE)	0.4	0.4	0.4	0.4	0.4	0.4	0.4
07	80	FRONT RIM JANTE AVANT	0.4	0.4	0.4	0.4	0.4	0.4	0.4
07	82	RADIAL BALL BEARINGS ROULEMENTS À BILLE RADIALES	0.5	0.5	0.5	0.5	0.5	0.5	0.5
07	85	RING GEAR AND/OR CARRIER AND/OR SHIM COURONNE DE LANCEMENT ET/OU SUPPORT ET/OU CALE	2.7	2.7	2.7	2.7	2.7	2.7	2.7
07	86	DISCONNECT UNIT AND/OR ALL PARTS UNITÉ D'EMBRAYAGE ET/OU TOUTES LES PIÈCES	2.0	2.0					
07	87	ACTUATOR AND/OR SHIFTING AND/OR FORK AND/OR SLIDDING ACTUATEUR ET/OU EMBRAYAGE ET/OU FOURCHETTE ET/OU GLISSIÈRE	0.9	0.9					
07	88	RING GEAR DRIVE GEAR AND/OR BEARING AND/OR SHIM PIGNON DE COMMANDE DE LA COURONNE ET/OU ROULEMENT À BILLE ET/OU CALE	2.7	2.7	2.7	2.7	2.9	2.9	2.9
07	89	COVER AND/OR PINION COVER AND/OR SEAL AND/OR BEARING COUVERCLE ET/OU COUVERCLE DE PIGNON ET/OU JOINT D'ÉTANCHÉITÉ ET/OU ROULEMENT À BILLE	3.0	3.0	3.0	3.0	3.2	3.2	3.2
07	90	BOOT WHEEL KIT AND/OR CV JOINT (RH OR LH) ENSEMBLE DE SOUFFLET DE ROUE ET/OU JOINT CV (DROIT OU GAUCHE)	0.8	0.8	0.8	0.8	0.8	0.8	0.8
07	91	BOOT DIFFERENTIAL KIT AND/OR PLUNGING JOINT (RH OR LH) ENSEMBLE DE SOUFFLET DE DIFFÉRENCIEL ET/OU JOINT PLONGEANT (DROIT OU GAUCHE)	0.8	0.8	0.8	0.8	0.8	0.8	0.8
07	92	SLEEVE AND/OR WEARRING MANCHON ET/OU BAGUE D'USURE	1.6	1.6	1.6	1.6	1.6	1.6	1.6
07	93	O-RING (DISCONNECT UNIT) JOINT TORIQUE (UNITÉ D'EMBRAYAGE)	1.8	1.8					
07	94	UNIT PACK KIT ENSEMBLE JOINT CARDAN	2.3	2.3	2.3	2.3	2.3	2.3	2.3
07	96	UPPER ARM BRACKET ATTACHE BRAS SUPÉRIEUR							2.2
07	103	DIFFERENTIAL SEAL (1) JOINT D'ÉTANCHÉITÉ DU DIFFÉRENTIEL (1)	0.7	0.7	0.7	0.7	0.7	0.7	0.7
07	104	DIFFERENTIAL SEALS (2) JOINTS D'ÉTANCHÉITÉ DU DIFFÉRENTIEL (2)	1.4	1.4	1.4	1.4	1.4	1.4	1.4

07 SYSTEM/SYSTÈME
STEERING/FRONT DRIVE SYSTEM AND SUSPENSION
DIRECTION/SYSTÈEME D'ENTRAÎNEMENT AVANT ET SUSPENSION

Outlander 400



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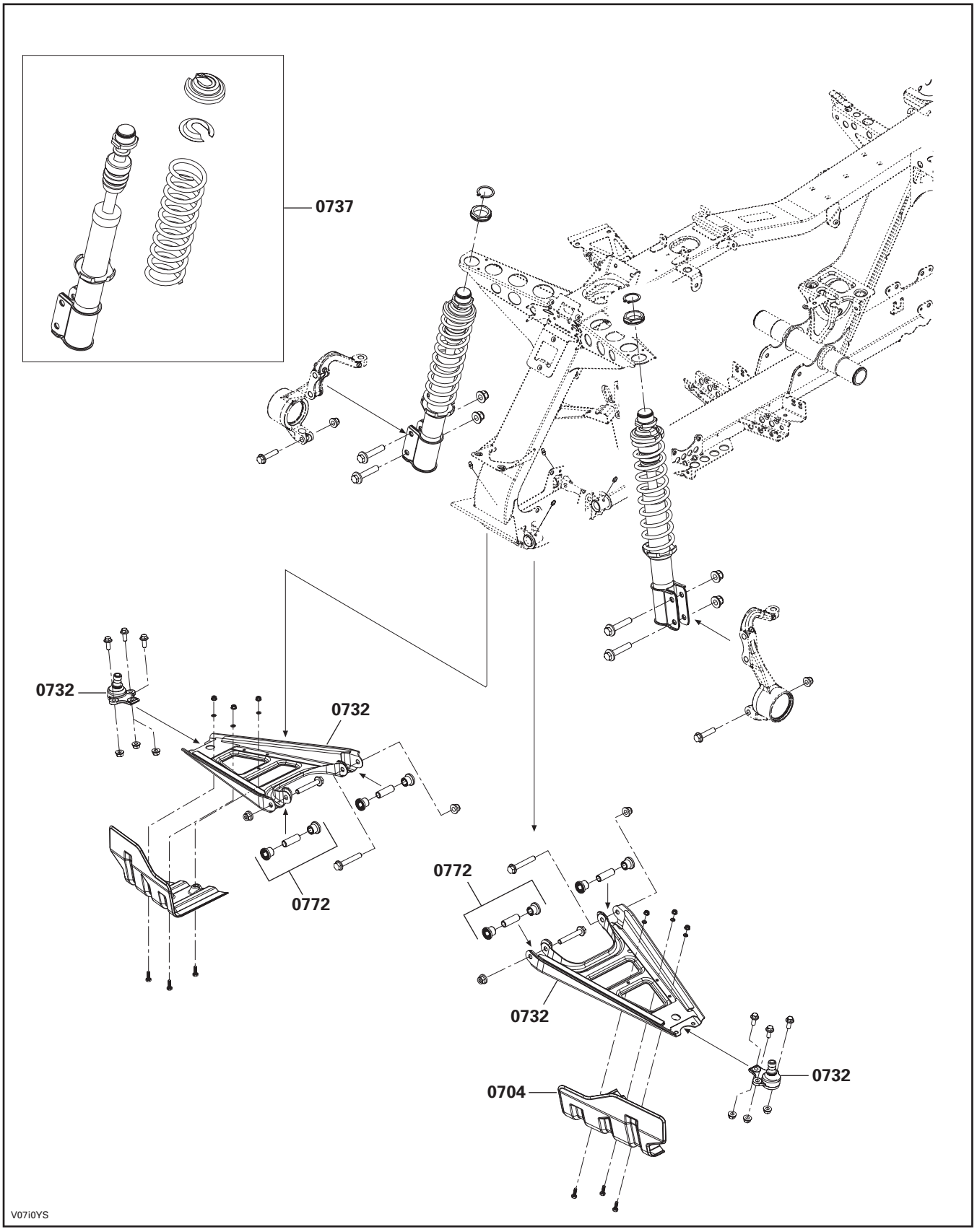
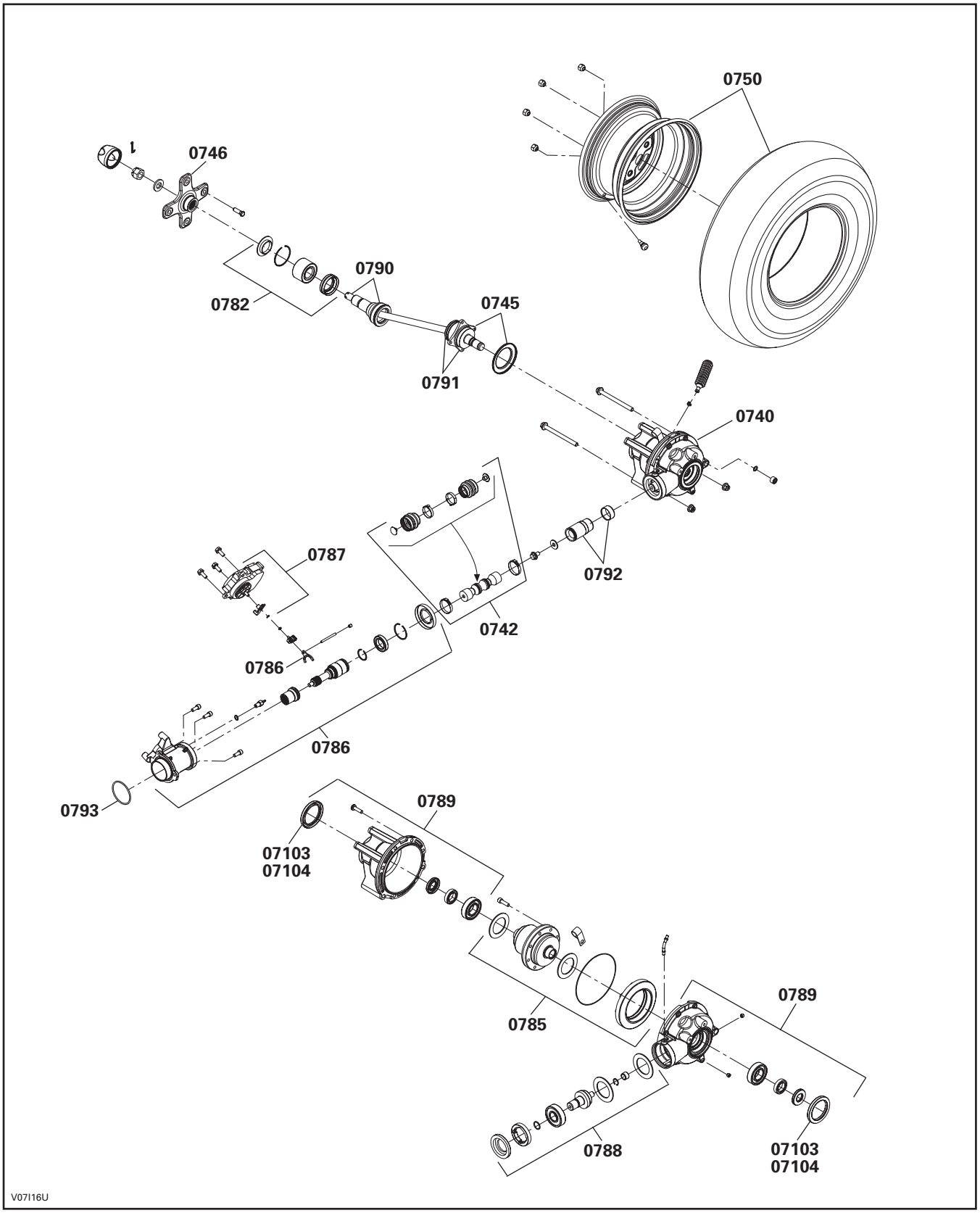
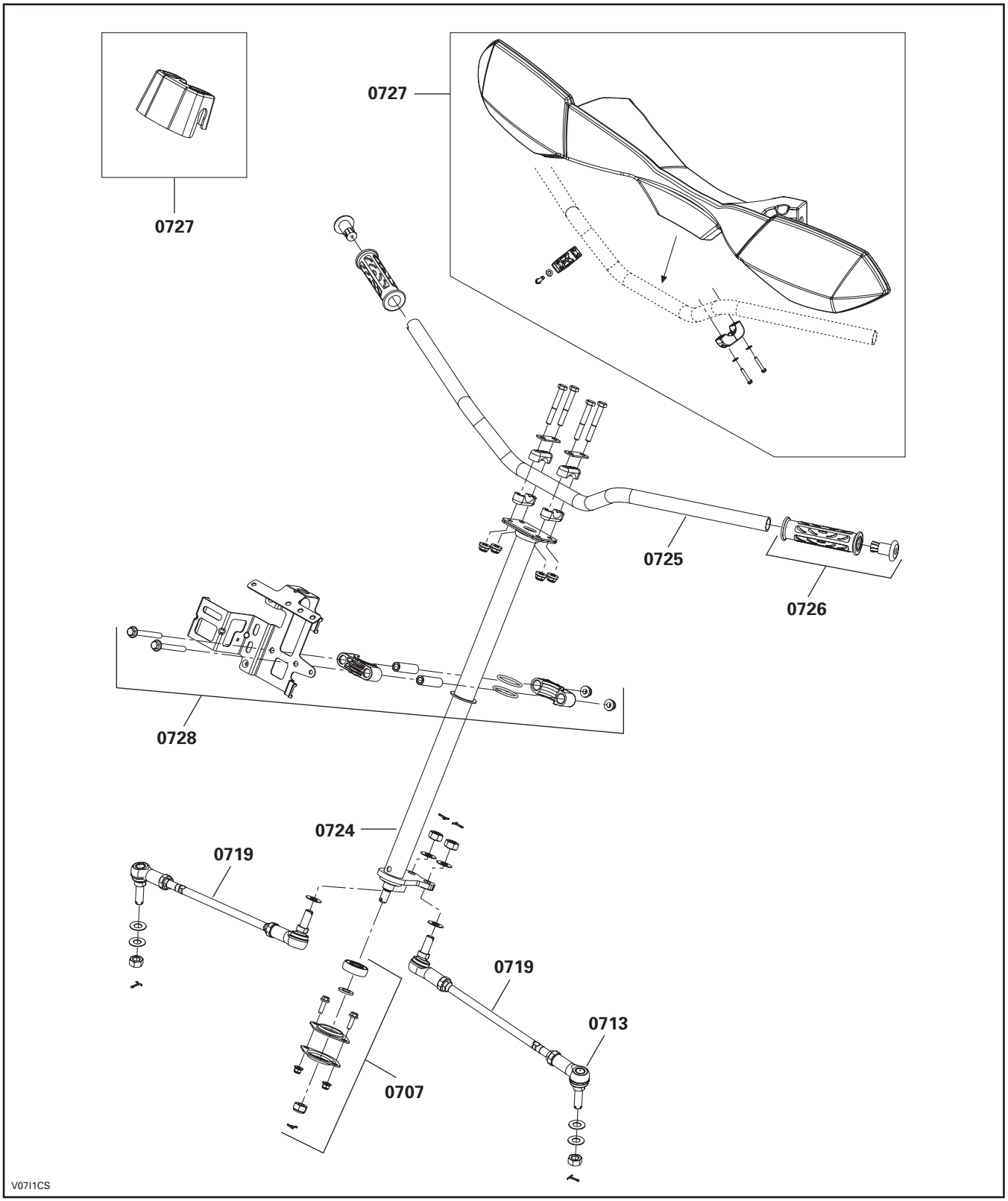


07 SYSTEM/SYSTÈME
STEERING/FRONT DRIVE SYSTEM AND SUSPENSION
DIRECTION/SYSTÈEME D'ENTRAÎNEMENT AVANT ET SUSPENSION

Outlander 400

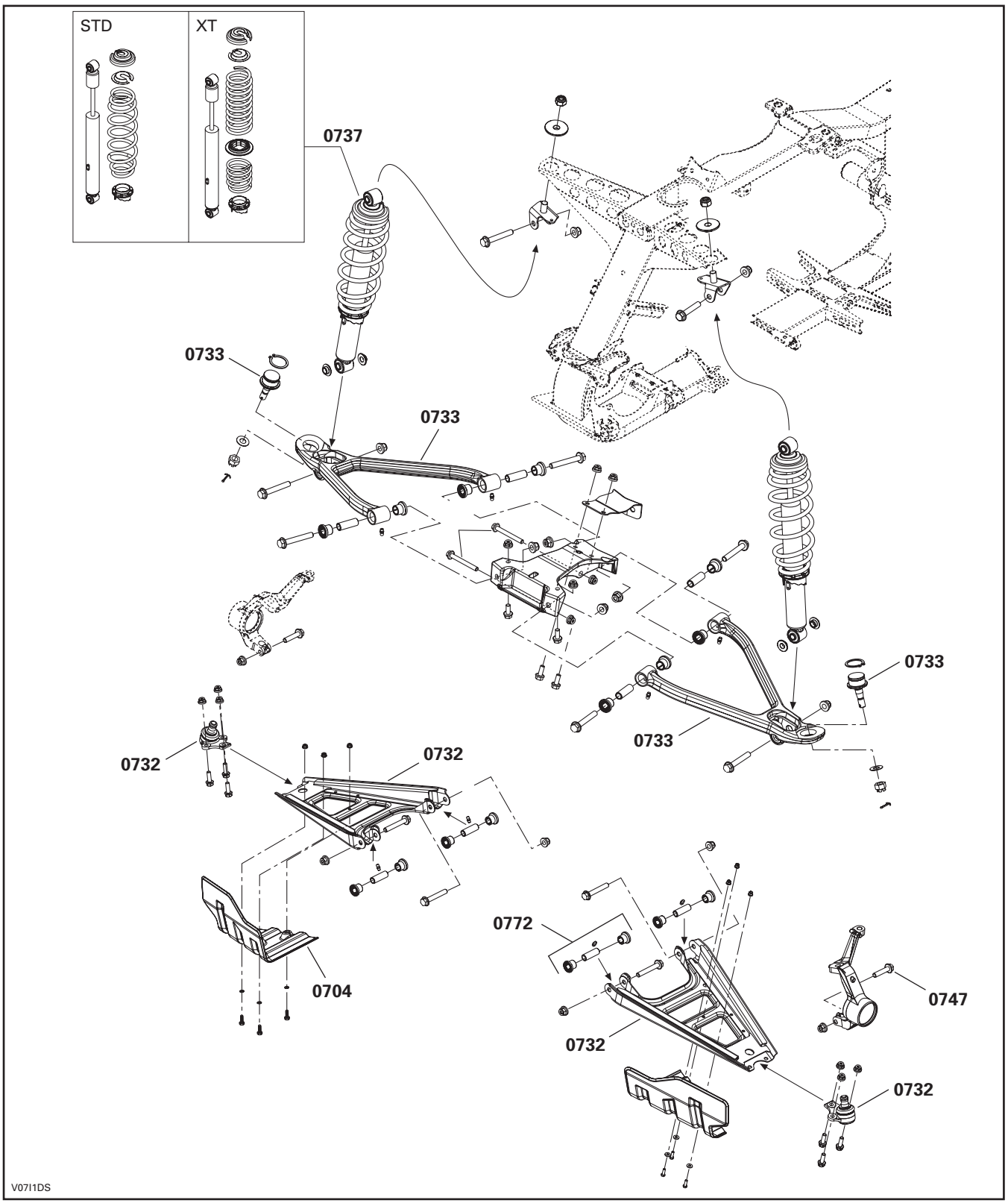


Outlander/Renegade

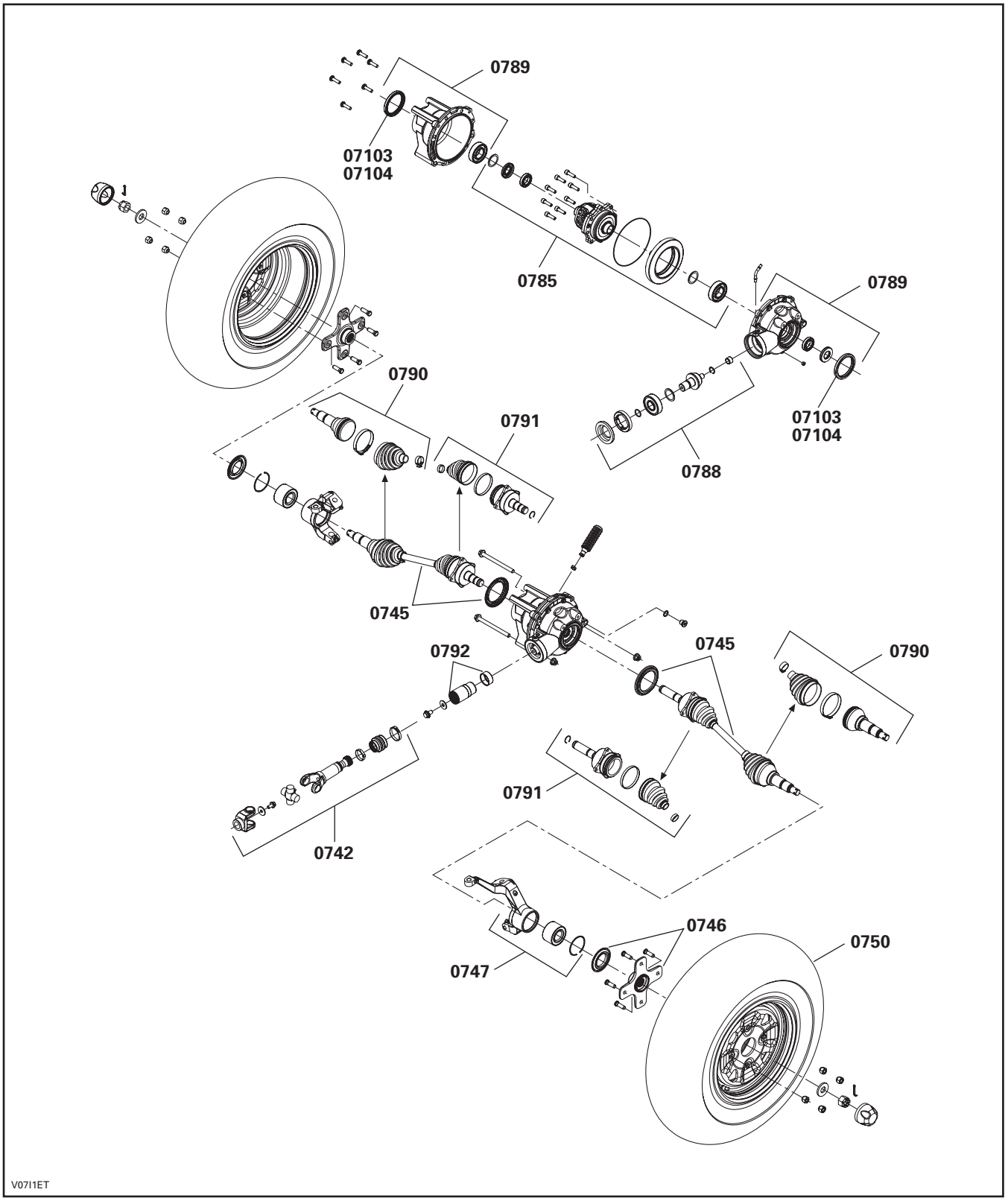


STEERING/FRONT DRIVE SYSTEM AND SUSPENSION
DIRECTION/SYSTÈEME D'ENTRAÎNEMENT AVANT ET SUSPENSION

Outlander/Renegade



Outlander/Renegade



08 SYSTEM/SYSTÈME REAR DRIVE SYSTEM AND SUSPENSION
SYSTÈME D'ENTRAINEMENT ARRIÈRE ET SUSPENSION

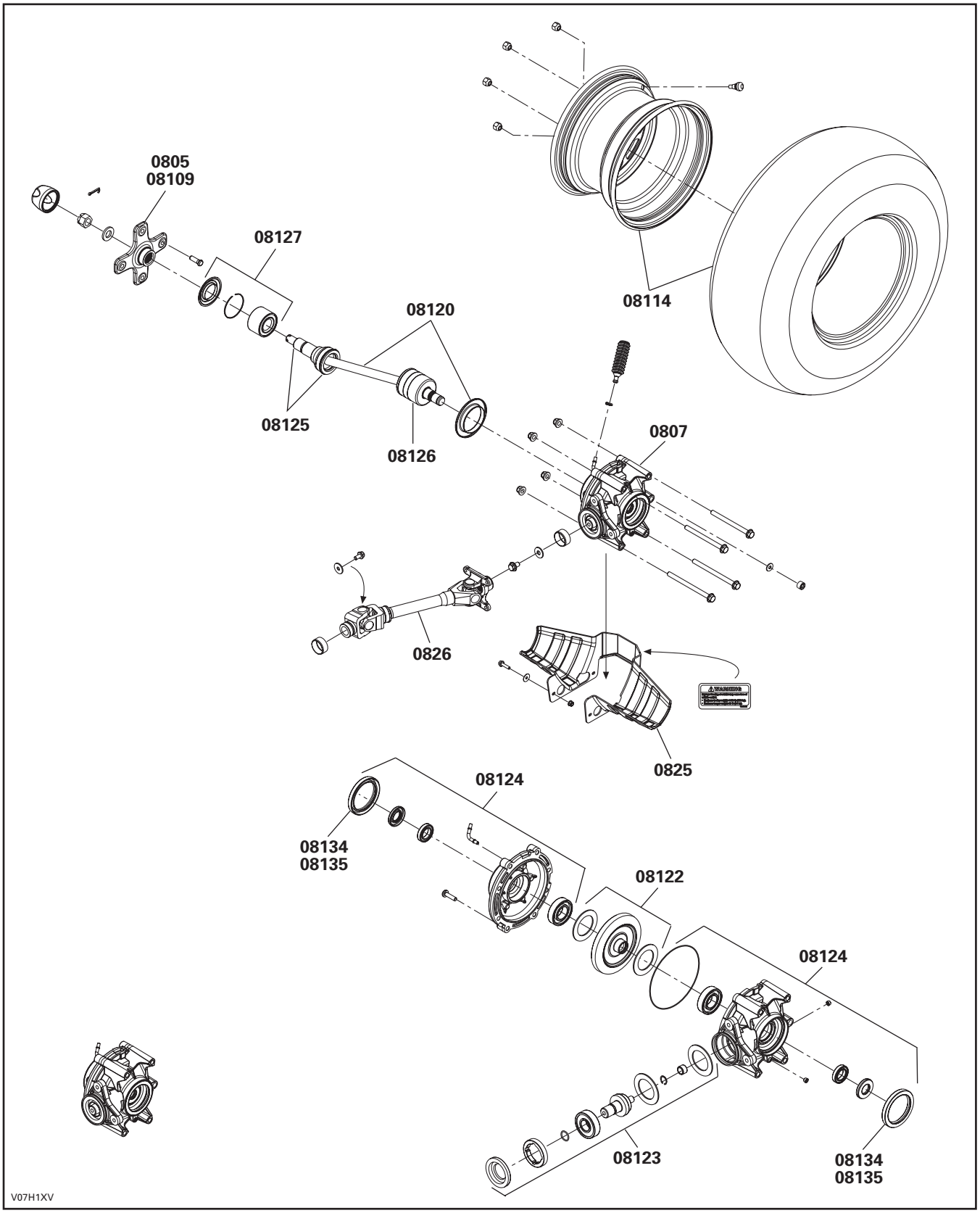
SYSTEM SYSTÈME	CODE	DESCRIPTION	OUTLANDER 400	OUTLANDER MAX 400	OUTLANDER 500	OUTLANDER MAX 500	OUTLANDER 650/800	OUTLANDER MAX 650/800	RENEGADE 500/800
			1	2	3	4	5	6	7
08	**00**	**NO LABOR INVOLVED AUCUNE MAIN D'OEUVRE**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
08	05	REAR WHEEL HUB (RH) MOYEU DE ROUE ARRIÈRE (DROIT)	0.3	0.3	0.3	0.3	0.3	0.3	0.3
08	07	REAR DIFFERENTIAL (ASS'Y) DIFFÉRENTIEL ARRIÈRE (COMPLET)	0.9	0.9	0.9	0.9	0.9	0.9	0.9
08	25	PROTECTOR REAR DIFFERENTIAL PROTECTEUR DE DIFFÉRENTIEL ARRIÈRE	0.3	0.3	0.3	0.3	0.3	0.3	0.3
08	26	REAR PROPELLER SHAFT (ASS'Y) ARBRE DE PROPULSION ARRIÈRE (COMPLET)	0.9	0.9	0.7	0.7	0.7	0.7	0.7
08	62	SWING ARM BRAS OSCILLANT	0.7	1.0	0.7	1.0	0.7	1.0	1.0
08	101	LH PROTECTOR PROTECTEUR GAUCHE	0.3	0.3	0.3	0.3	0.3	0.3	0.3
08	102	RH PROTECTOR PROTECTEUR DROIT	0.3	0.3	0.3	0.3	0.3	0.3	0.3
08	109	REAR WHEEL HUB (LH) MOYEU DE ROUE ARRIÈRE (GAUCHE)	0.3	0.3	0.3	0.3	0.3	0.3	0.3
08	111	REAR SHOCK (RH OR LH) AMORTISSEUR ARRIÈRE (DROIT OU GAUCHE)	0.3	0.3	0.3	0.3	0.3	0.3	0.3
08	114	REAR RIM AND/OR TIRE JANTE ARRIÈRE ET/OU PNEU	0.4	0.4	0.4	0.4	0.4	0.4	0.4
08	120	CV JOINT (RH OR LH) JOINT HOMOCINÉTIQUE (DROIT OU GAUCHE)	0.5	0.5	0.5	0.5	0.5	0.5	0.5
08	121	STABILIZER BAR BARRE STABILISATRICE	0.4	0.7	0.4	0.7	0.4	0.7	0.7
08	122	RING GEAR AND/OR SHIM COURONNE DE LANCEMENT ET/OU CALE	2.0	2.0	2.0	2.0	2.0	2.0	2.0
08	123	RING GEAR DRIVE GEAR AND/OR BEARING AND/OR SHIM PIGNON DE COMMANDE DE LA COURONNE ET/OU ROULEMENT À BILLE ET/OU CALE	2.0	2.0	2.0	2.0	2.0	2.0	2.0
08	124	COVER AND/OR PINION COVER AND/OR SEAL AND/OR BEARING COUVERCLE ET/OU COUVERCLE DE PIGNON ET/OU JOINT D'ÉTANCHÉITÉ ET/OU ROULEMENT À BILLE	2.2	2.2	2.2	2.2	2.2	2.2	2.2
08	125	BOOT WHEEL KIT AND/OR CV JOINT (RH OR LH) ENSEMBLE DE SOUFFLET DE ROUE ET/OU JOINT CV (DROIT OU GAUCHE)	0.6	0.6	0.6	0.6	0.6	0.6	0.6
08	126	BOOT DIFFERENTIAL KIT AND/OR PLUNGING JOINT (RH OR LH) ENSEMBLE DE SOUFFLET DE DIFFÉRENTIEL ET/OU JOINT PLONGENT (DROIT OU GAUCHE)	0.6	0.6	0.6	0.6	0.6	0.6	0.6
08	127	RADIAL BALL BEARINGS ROULEMENTS À BILLE RADIALES	0.7	0.7	0.7	0.7	0.7	0.7	0.7

SYSTEM SYSTÈME	CODE	DESCRIPTION	OUTLANDER 400	OUTLANDER MAX 400	OUTLANDER 500	OUTLANDER MAX 500	OUTLANDER 650/800	OUTLANDER MAX 650/800	RENEGADE 500/800
			1	2	3	4	5	6	7
08	128	UNIT PACK KIT ENSEMBLE DE JOINT CARDAN	1.2	1.2	1.2	1.2	1.2	1.2	1.2
08	129	UNIT PACK KIT (2) ENSEMBLE DE JOINT CARDAN (2)	1.5	1.5	1.5	1.5	1.5	1.5	1.5
08	134	DIFFERENTIAL SEAL (1) JOINT D'ÉTANCHÉITÉ DU DIFFÉRENTIEL (1)	0.5	0.5	0.5	0.5	0.5	0.5	0.5
08	135	DIFFERENTIAL SEALS (2) JOINTS D'ÉTANCHÉITÉ DU DIFFÉRENTIEL (2)	1.0	1.0	1.0	1.0	1.0	1.0	1.0

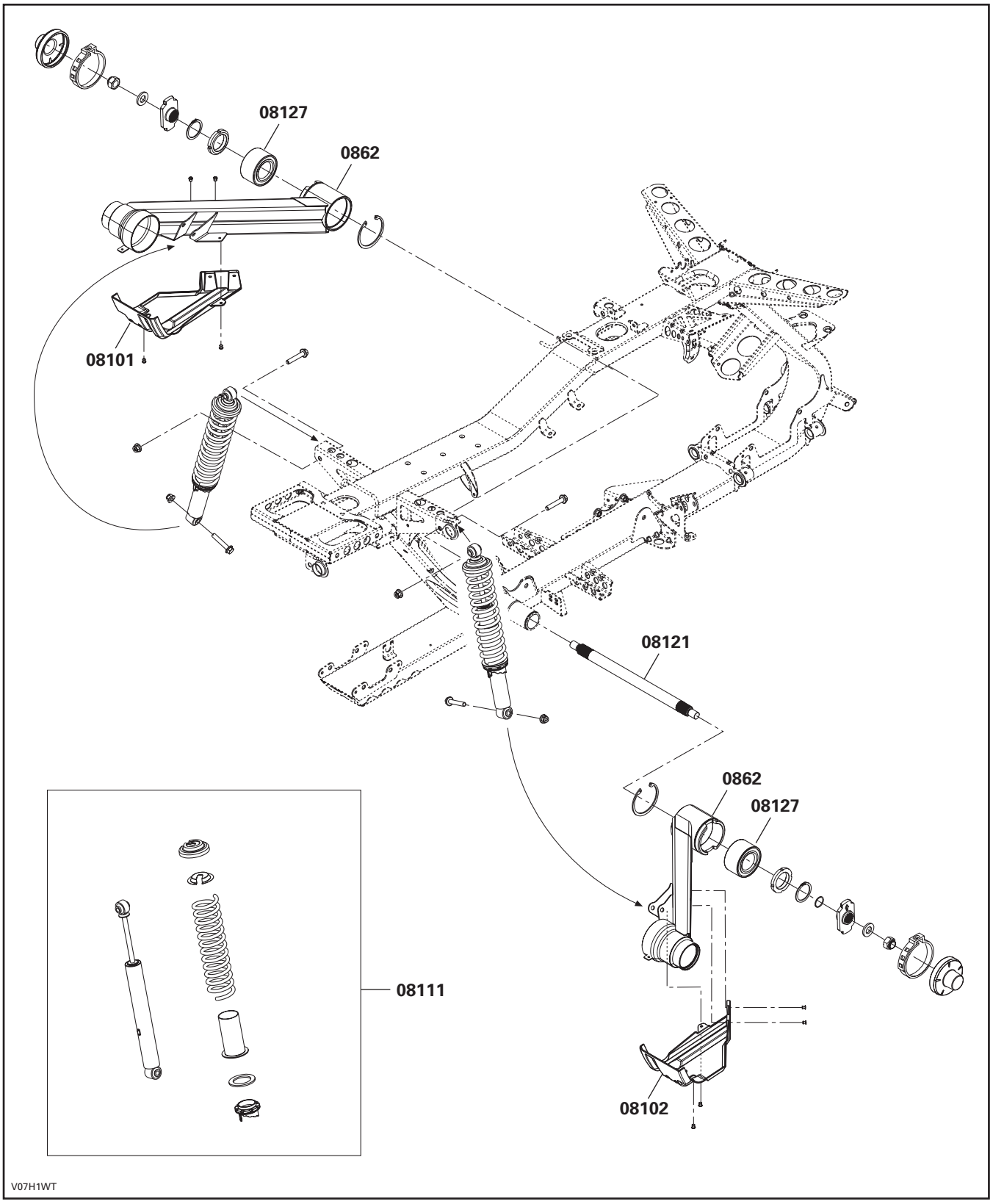
08 REAR DRIVE SYSTEM AND SUSPENSION
SYSTEM/SYSTÈME

SYSTÈME D'ENTRAINEMENT ARRIÈRE ET SUSPENSION

Outlander/Renegade



Outlander/Renegade



09 BODY AND ACCESSORIS
CARROSSERIE ET ACCESSOIRES

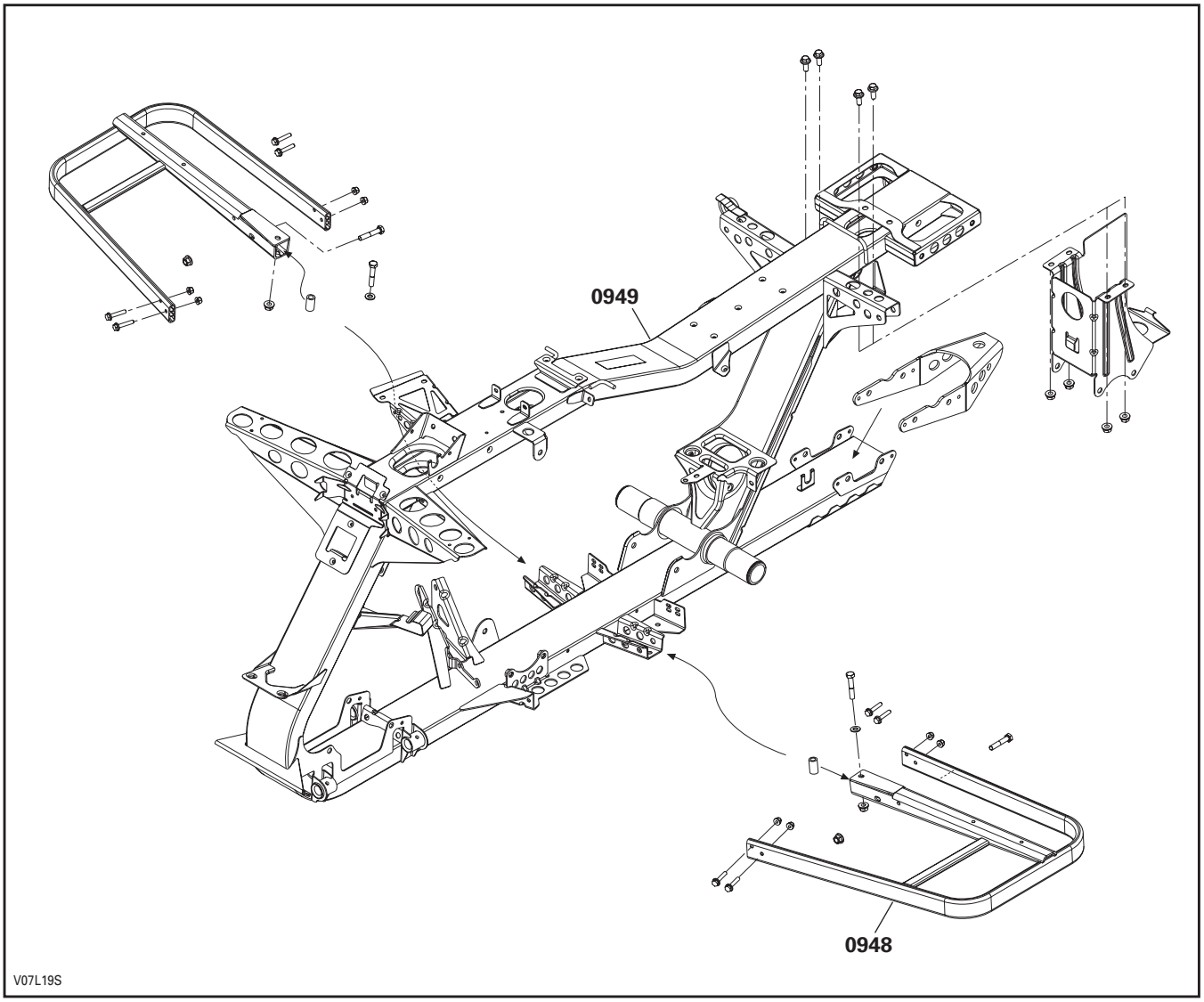
SYSTEM/SYSTÈME

SYSTEM SYSTÈME	CODE	DESCRIPTION	OUTLANDER 400	OUTLANDER MAX 400	OUTLANDER 500	OUTLANDER MAX 500	OUTLANDER 650/800	OUTLANDER MAX 650/800	RENEGADE 500/800
			1	2	3	4	5	6	7
09	**00**	**NO LABOR INVOLVED AUCUNE MAIN D'OEUVRE IMPLIQUÉE**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
09	13	LUGGAGE RACK KIT (FRONT OR REAR) ENSEMBLE DE PORTE-BAGAGES (AVANT OU ARRIÈRE)	0.3	0.3	0.3	0.3	0.3		0.3
09	17	CONSOLE CONSOLE	0.3	0.3	0.3	0.3	0.3	0.3	0.3
09	21	SEAT AND/OR SUPPORT SIÈGE ET/OU SUPPORT	0.3	0.3	0.3	0.3	0.3	0.3	0.3
09	22	SEAT COVER HOUSSE DE SIÈGE	1.5	1.5	1.5	1.5	1.5	1.5	1.5
09	26	FRONT BUMPER PARE-CHOCS AVANT	0.6	0.6	0.6	0.6	0.6	0.6	0.3
09	27	WINCH LATCH ATTACHE DE TREUIL	0.3	0.3	0.3	0.3	0.3	0.3	
09	28	FRONT FASCIA FASCIA AVANT	0.7	0.7	0.7	0.7	0.7	0.7	0.7
09	29	REAR FASCIA FASCIA ARRIÈRE	0.3	0.3	0.3	0.3	0.3	0.3	
09	34	REAR BUMPER PARE-CHOCS ARRIÈRE	0.8	0.8	0.8	0.8	0.8	0.8	0.8
09	39	FRONT OR REAR MUDGUARD KIT (RH OR LH) ENSEMBLE DE GARDE-BOUE AVANT OU ARRIÈRE (DROIT OU GAUCHE)	0.3	0.3	0.3	0.3	0.3	0.3	0.3
09	45	REAR HANDLE (RH OR LH) POIGNÉE ARRIÈRE (DROIT OU GAUCHE)		0.3		0.3		0.3	
09	48	FOOTREST (RH OR LH) MARCHEPIED (DROIT OU GAUCHE)	0.4	0.4	0.4	0.4	0.4	0.4	0.5
09 *	49	FRAME CHÂSSIS	12.3	12.9	12.8	13.5	12.8	13.5	13.5
09	56	REAR FENDER AILE ARRIÈRE	0.7	0.7	0.7	0.7	0.7	0.7	0.8
09	57	FRONT FENDER AND/OR SUPPORT (RH OR LH) AILE AVANT ET/OU SUPPORT (DROIT OU GAUCHE)	1.5	1.5	1.5	1.5	1.5	1.5	1.5
09	80	FRONT GRILLS GRILLES AVANT	0.3	0.3	0.3	0.3	0.3	0.3	0.3
09	91	FOOTWELL (RH OR LH) REPOSE-PIED (DROIT OU GAUCHE)	0.3	0.3	0.3	0.3	0.3	0.3	0.3
09	93	PROTECTION PLATE PLAQUE DE PROTECTION	0.3	0.3	0.3	0.3	0.3	0.3	0.3
09	95	EACH DECAL (1) CHAQUE AUTOCOLLANT (1)	0.3	0.3	0.3	0.3	0.3	0.3	0.3

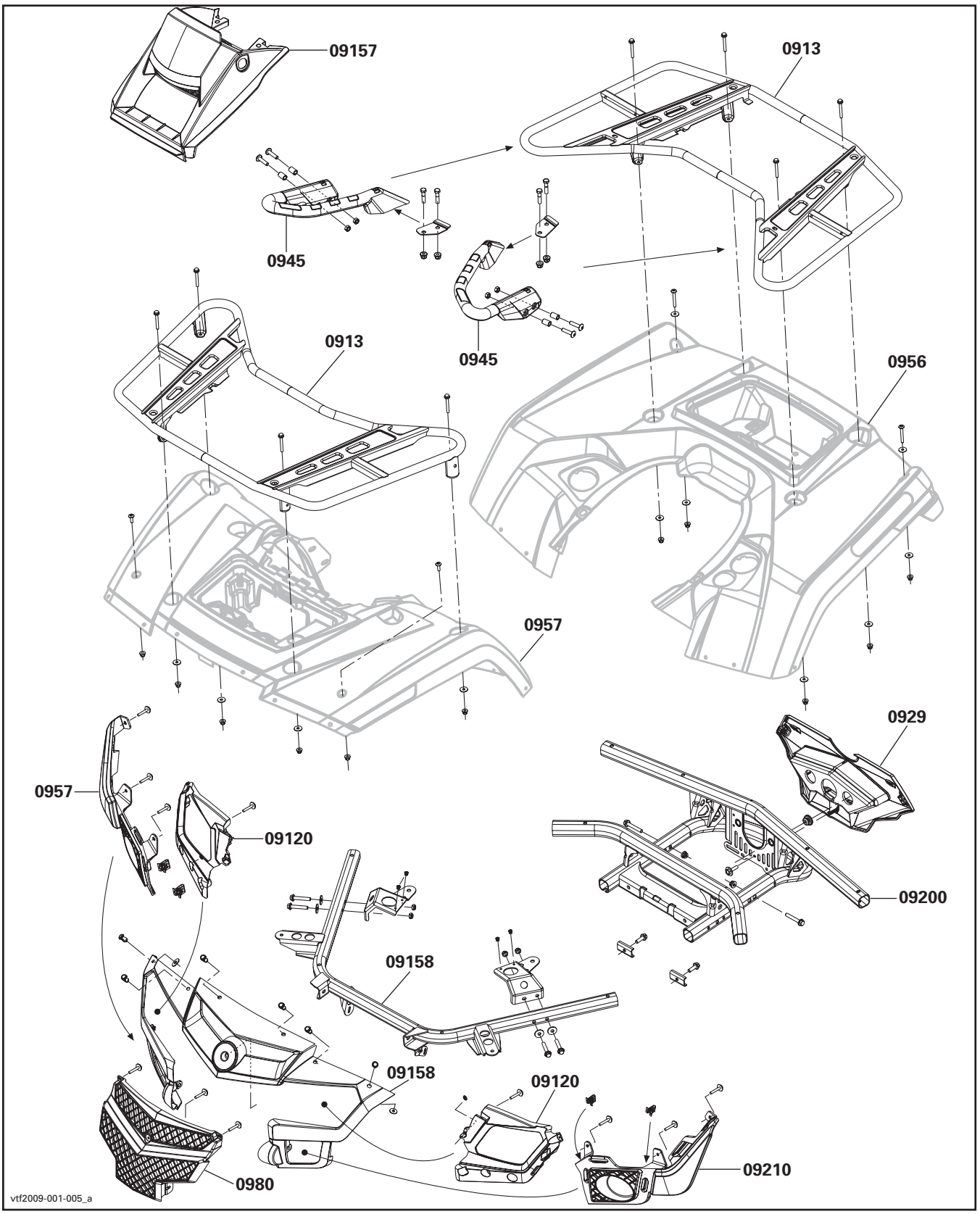
SYSTEM SYSTÈME	CODE	DESCRIPTION	OUTLANDER 400	OUTLANDER MAX 400	OUTLANDER 500	OUTLANDER MAX 500	OUTLANDER 650/800	OUTLANDER MAX 650/800	RENEGADE 500/800
			1	2	3	4	5	6	7
09	108	REAR SEAT SIÈGE ARRIÈRE		0.3		0.3		0.3	
09	120	FRONT LIGHT FASCIA FASCIA DE LUMIÈRE AVANT			0.4	0.4	0.4	0.4	
09	136	BACKREST (ASS'Y) DOSSIER (COMPLET)		0.3		0.3		0.3	
09	138	HAND PROTECTOR PROTÈGE MAIN			0.3	0.3	0.3	0.3	
09	149	ENGINE SIDE PANELS (2) PANNEAUX MOTEUR (2)	0.3	0.3	0.3	0.3	0.3	0.3	0.3
09	157	UPPER CONSOLE CONSOLE SUPÉRIEURE			0.4	0.4	0.4	0.4	0.6
09	158	FRONT FENDER SUPPORT SUPPORT D'AILE AVANT	1.6	1.6	1.6	1.6	1.6	1.6	1.6
09	161	REAR BUMPER (XT) PARE-CHOC ARRIÈRE (XT)	0.3	0.3	0.3	0.3	0.3	0.3	
09	162	FRONT BUMPER (XT) PARE-CHOC AVANT (XT)	0.3	0.3	0.3	0.3	0.3	0.3	
09	200	REAR FENDER SUPPORT SUPPORT D'AILE ARRIÈRE	0.9	0.9	0.9	0.9	0.9	0.9	
09	210	FRONT FASCIA (RH OR LH) FASCIA AVANT (DROIT OU GAUCHE)			0.3	0.3	0.3	0.3	0.4

09 SYSTEM/SYSTÈME BODY AND ACCESSORIS CARROSSERIE ET ACCESSOIRES

Outlander/Renegade



Outlander



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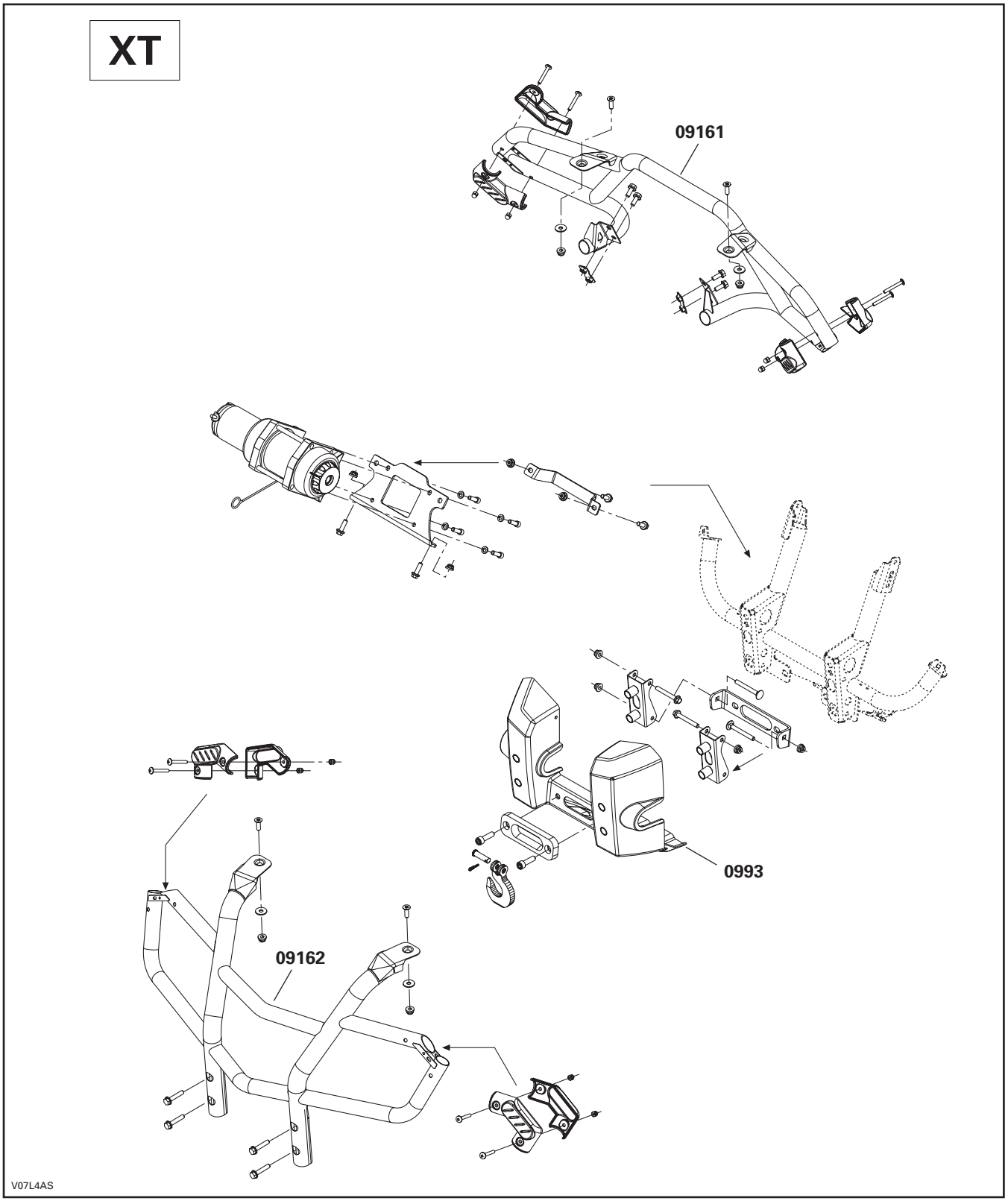
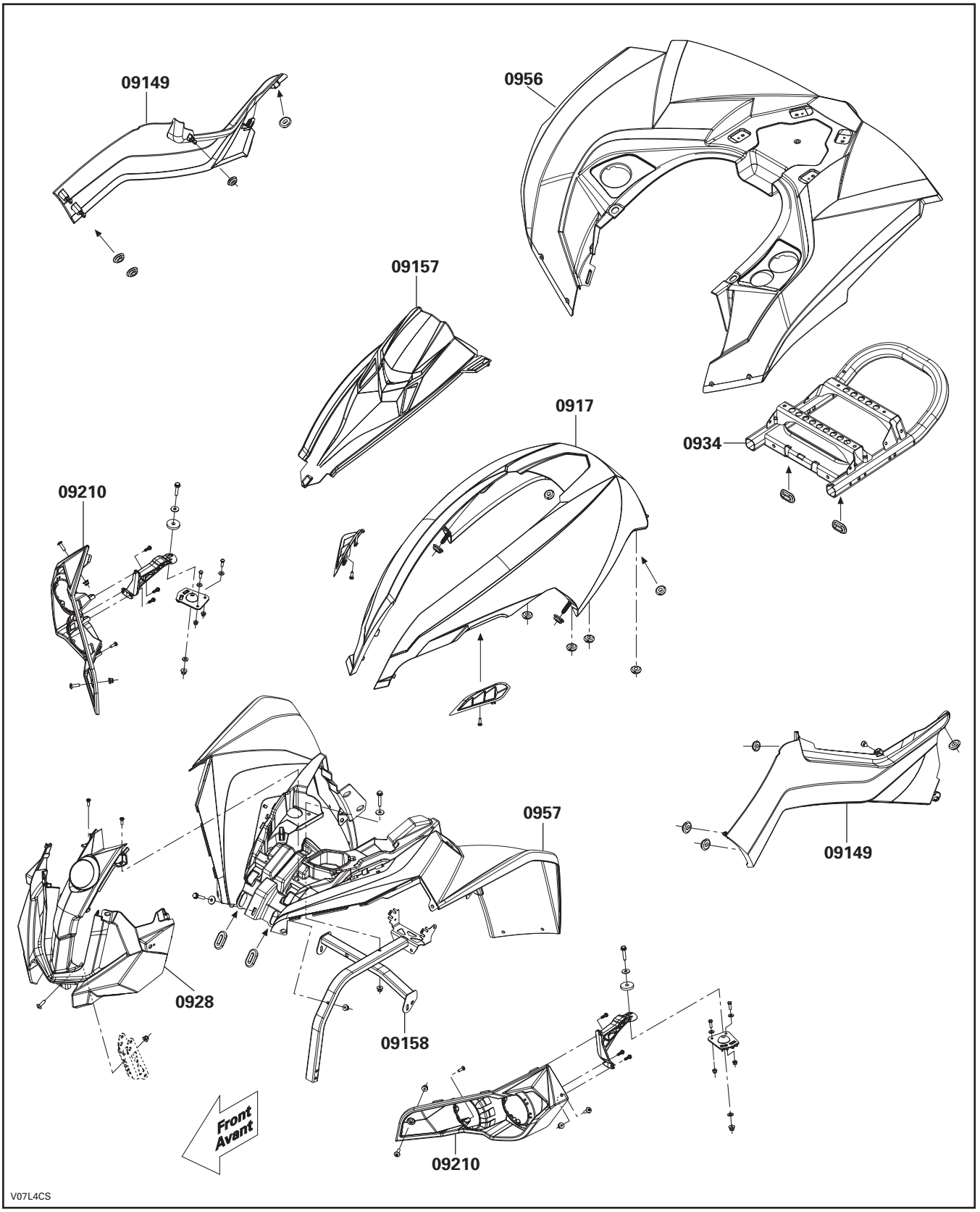


Renegade

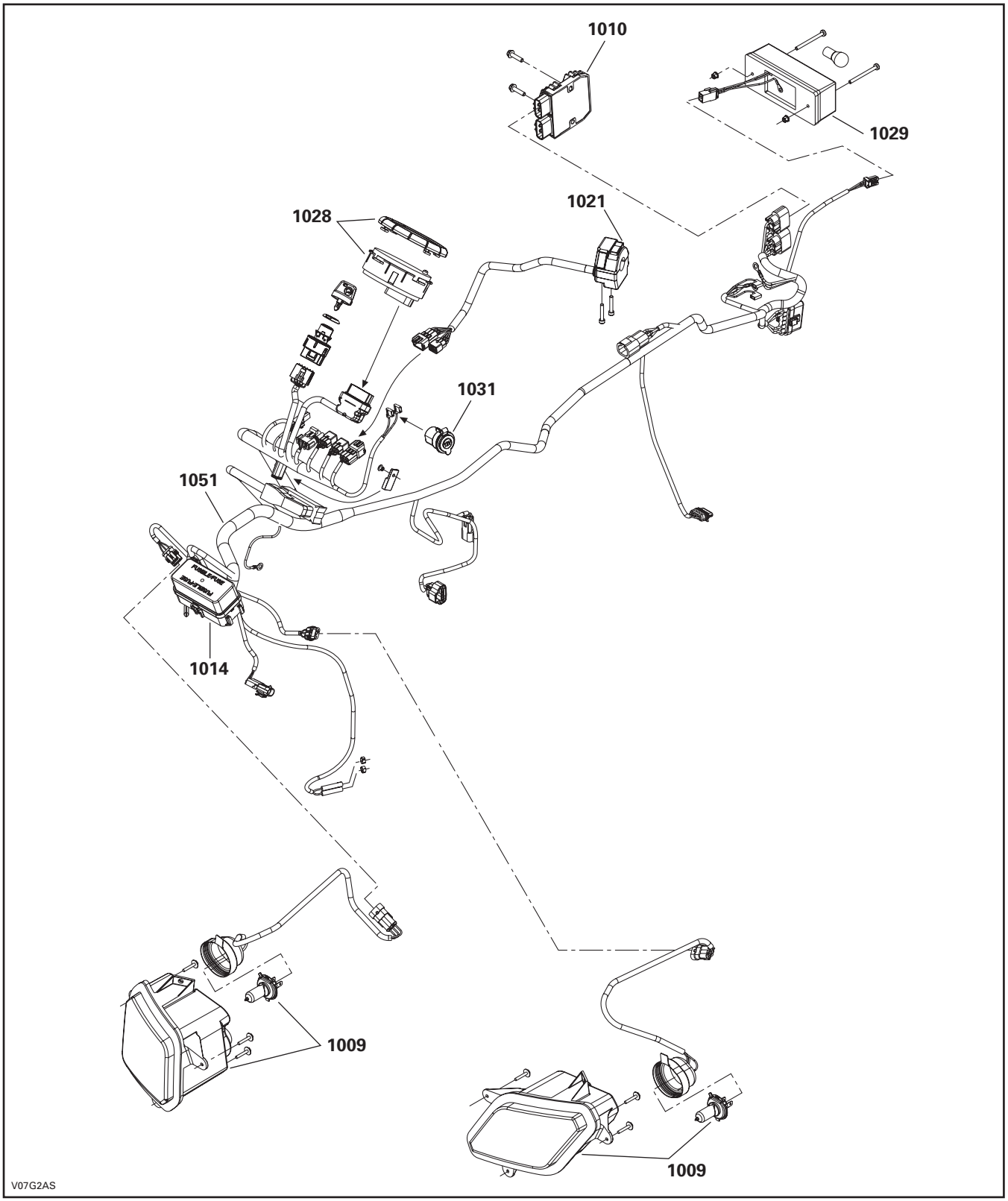


ELECTRICAL SYSTEM
SYSTÈME ÉLECTRIQUE

SYSTEM SYSTÈME	CODE	DESCRIPTION	OUTLANDER 400	OUTLANDER MAX 400	OUTLANDER 500	OUTLANDER MAX 500	OUTLANDER 650/800	OUTLANDER MAX 650/800	RENEGADE 500/800
			1	2	3	4	5	6	7
10	**00**	**NO LABOR INVOLVED AUCUNE MAIN-D'OEUVRE**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
10	01	IGNITION SWITCH INTERRUPTEUR D'ALLUMAGE	0.3	0.3	0.3	0.3	0.3	0.3	0.3
10	09	HEADLAMP AND/OR HEADLAMP SUPPORT (ASS'Y) (RH OR LH) PHARE AVANT ET/OU SUPPORT (COMPLET) (DROIT OU GAUCHE)	0.3	0.3	0.3	0.3	0.3	0.3	0.3
10	10	VOLTAGE REGULATOR RÉGULATEUR DE TENSION	0.3	0.3	0.3	0.3	0.3	0.3	0.3
10	13	BATTERY BATTERIE	0.3	0.3	0.3	0.3	0.3	0.3	0.3
10	14	FUSE BOX BOÎTE-FUSIBLE	0.3	0.3	0.4	0.4	0.4	0.4	0.4
10	21	MULTIFUNCTION SWITCH INTERRUPTEUR MULTIFONCTION	0.3	0.3	0.3	0.3	0.3	0.3	0.3
10	28	SPEEDOMETER/TACHOMETER INDICATEUR DE VITESSE/COMPTE-TOURS	0.3	0.3	0.3	0.3	0.3	0.3	0.3
10	29	TAIL LAMP HOUSING (ASS'Y) BOÎTIER DE FEU ARRIÈRE (COMPLET)	0.3	0.3	0.3	0.3	0.3	0.3	0.3
10	31	DC OUTLET PLUG PRISE D'ACCESSOIRE DC	0.3	0.3	0.3	0.3	0.3	0.3	0.3
10	34	ELECTRONIC MODULE MODULE ÉLECTRONIQUE	1.3	1.3	0.4	0.4	0.4	0.4	0.4
10	45	WINCH (ASS'Y) (XT) TREUIL (COMPLET) (XT)	0.4	0.4	0.4	0.4	0.4	0.4	
10	46	WINCH SOLENOID (XT) SOLÉNOÏDE DE TREUIL (XT)	0.4	0.4	0.4	0.4	0.4	0.4	
10	47	WINCH SWITCH (XT) INTERRUPTEUR DE TREUIL (XT)	0.5	0.5	0.5	0.5	0.5	0.5	
10	51	MAIN WIRE HARNESS CÂBLAGE PRINCIPAL	3.1	3.1	2.9	2.9	2.9	2.9	2.9
10	61	FRONT FLASHERS 1 OR 2 (**CE** ONLY) CLIGNOTANTS AVANT 1 OU 2 (**CE** SEULEMENT)	0.3	0.3	0.3	0.3	0.3	0.3	0.3
10	62	REAR FLASHERS 1 OR 2 (**CE** ONLY) CLIGNOTANTS ARRIÈRE 1 OU 2 (**CE** SEULEMENT)	0.3	0.3	0.3	0.3	0.3	0.3	0.3
10	63	HAZARD WARNING BUTTON (**CE** ONLY) COMMUTATEUR D'URGENCE (**CE** SEULEMENT)	0.3	0.3	0.3	0.3	0.3	0.3	0.3
10	64	DIRECTION INDICATOR SWITCH (**CE** ONLY) INTERRUPTEUR CLIGNOTANTS (**CE** SEULEMENT)	0.3	0.3	0.3	0.3	0.3	0.3	0.3
10	65	12 VOLT RELAY (CE ONLY) RELAIS 12 VOLT (CE SEULEMENT)	0.3	0.3	0.3	0.3	0.3	0.3	0.3
10	66	HORN AVERTISSEUR	0.3	0.3	0.3	0.3	0.3	0.3	0.3

SYSTEM SYSTEME	CODE	DESCRIPTION	OUTLANDER 400	OUTLANDER MAX 400	OUTLANDER 500	OUTLANDER MAX 500	OUTLANDER 650/800	OUTLANDER MAX 650/800	RENEGADE 500/800
			1	2	3	4	5	6	7
10	67	RELAY RELAIS			0.3	0.3	0.3	0.3	0.3
10	68	ANY BULBS TOUTES LES AMPOULES	0.4	0.4	0.4	0.4	0.4	0.4	0.4

Outlander



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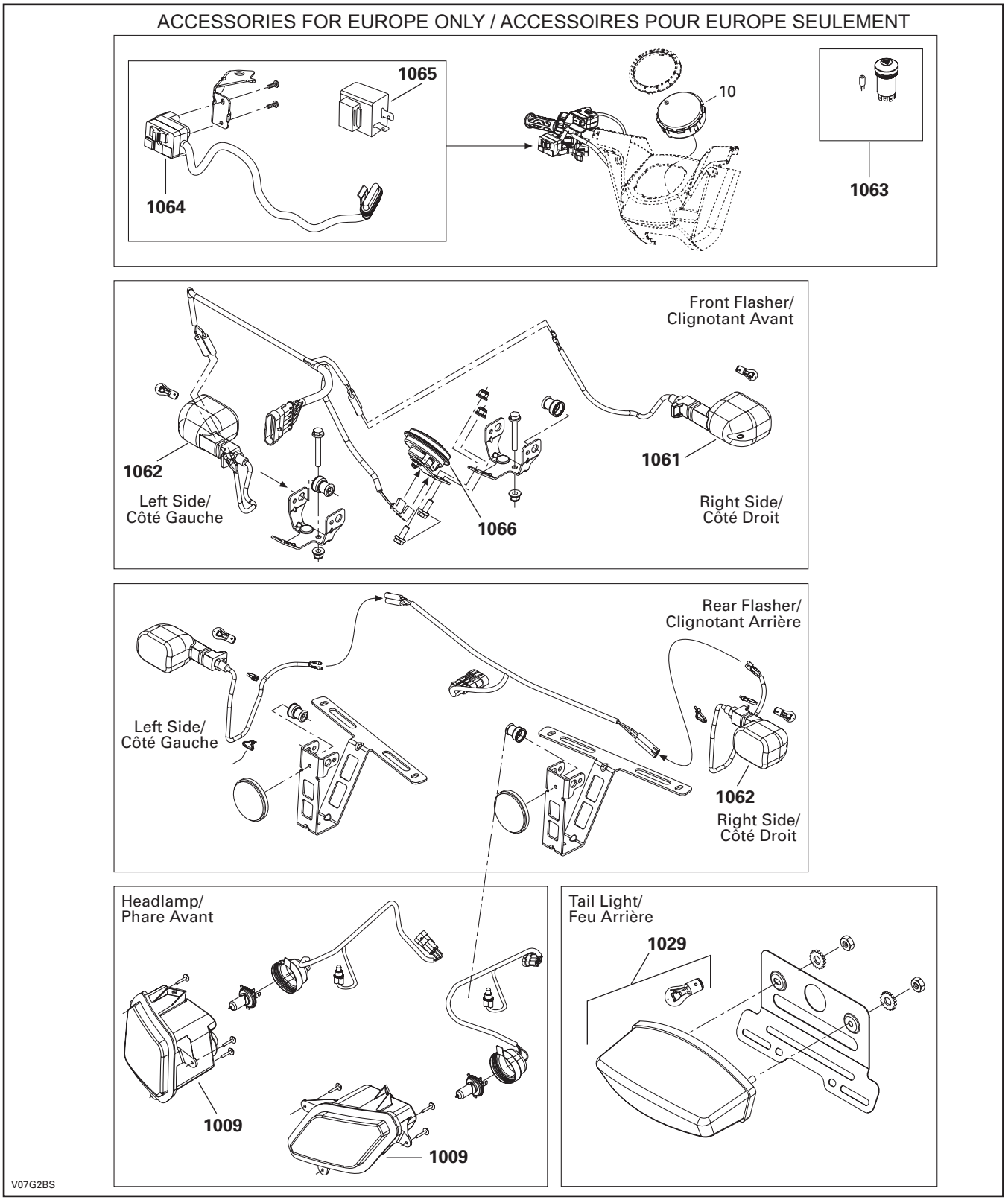

CLAIM TYPE 02
RÉCLAMATION DE TYPE 02

SYSTEM SYSTÈME	CODE	DESCRIPTION	OUTLANDER 400	OUTLANDER MAX 400	OUTLANDER 500	OUTLANDER MAX 500	OUTLANDER 650/800	OUTLANDER MAX 650/800	RENEGADE 500/800
			1	2	3	4	5	6	7
11	**00**	**NO LABOR INVOLVED AUCUNE MAIN-D'OEUVRE**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
11	MT1	SCHEDULED MAINTENANCE TRACKING SUIVI DES ENTRETIENS PLANIFIÉS	0	0	0	0	0	0	0

FLAT RATE TIME SUGGESTION

DEALER'S NO.: _____ DATE: _____

DEALER'S NAME: _____

FILE IDENTIFICATION NO.: _____

ADDRESS: _____

_____

_____

YEAR	MODEL DESCRIPTION	OPERATION	JOB CODE	PRESENT FLAT RATE	SUGGESTED FLAT RATE

Detailed procedure used:

_____

_____

_____

_____

_____

_____

_____

Signature: _____

BOMBARDIER RECREATIONAL PRODUCTS INC.

WARRANTY DEPARTMENT
75, J.A. BOMBARDIER ST.
SHERBROOKE (QUEBEC)
CANADA, J1L 1W3

FAX NUMBER: 819 566-3590

BARÈME DE TEMPS À TAUX FIXE
SUGGESTION

N° DU CONCESSIONNAIRE: _____ DATE: _____

NOM DU CONCESSIONNAIRE: _____

N° D'IDENTIFICATION DU DOSSIER: _____

ADRESSE: _____

_____

_____

ANNÉE	DESCRIPTION DU MODÈLE	OPÉRATION	CODE DE TRAVAUX	TTP ACTUEL	TTP SUGGÉRÉ

Détails de la marche à suivre:

_____

_____

_____

_____

_____

_____

_____

Signature: _____

BOMBARDIER PRODUITS RÉCRÉATIFS INC.

SERVICE DE GARANTIE
75, RUE J.-A. BOMBARDIER
SHERBROOKE (QUÉBEC)
CANADA, J1L 1W3

N° DU TÉLÉCOPIEUR: 819 566-3590