This service manual covers the 2011/2012 Can-Am Commander Series.

Can-Am's newer manuals use very thin paper you can see through, so the text is not as dark as most of my manuals to prevent text and picture bleed-through.

Some models may need supplemental manuals which have blue titles. Use the base manual for everything not contained in the supplement if your model or year requires a supplement.

This manual is fully searchable, just hold down the control key and the F key to search on any word.

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Please leave them negative feedback & email me at kj@green-manuals.com .

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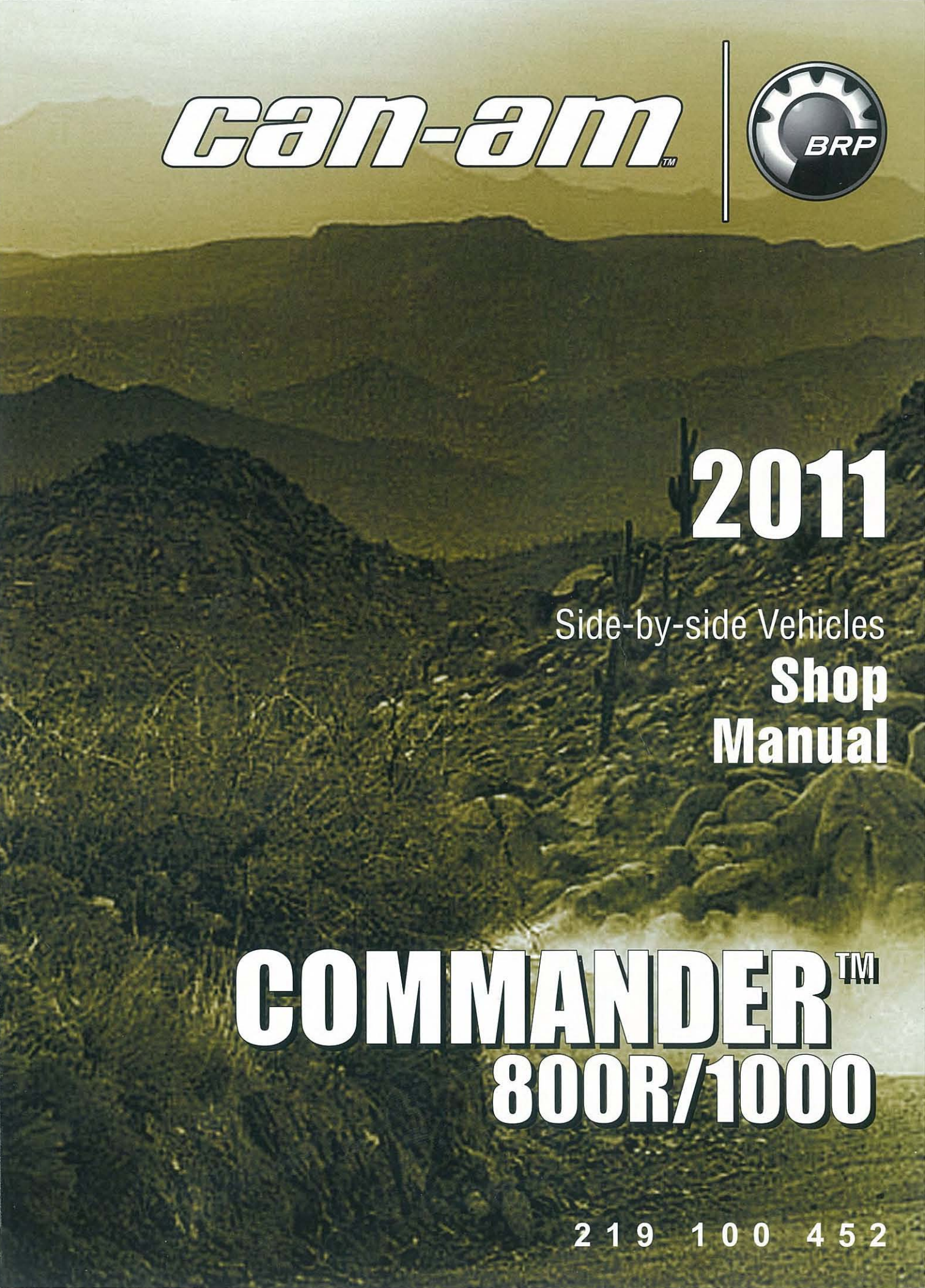
Thank you for choosing us.

This service manual covers the 2


can-am
BRP
2011
Side-by-side Vehicles
Shop
Manual
COMMANDER™
800R/1000
219 100 452

2011
Shop Manual

Commander™ 800R/1000
Series

can-am

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SAFETY NOTICE

This manual has been prepared as a guide to correctly service and repair the 2011 Can-Am™ Commander SSV as described 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 BRPTI.

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

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

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

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

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

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

⚠ WARNING

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

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

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

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

Although the mere reading of such information does not eliminate the hazard, your understanding of the information provided will promote its correct use. Always use common shop safety practices.

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

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

This shop manual covers the following BRP made 2011 Can-Am side by side vehicles.

MODEL	ENGINE TYPE	MODEL NUMBER
Commander 800R	810	6CBA, 6CBC, 6DBA, 6DBD
Commander 1000	1010	6ABA, 6ABC, 6BBA, 6BBB, 6BBC, 6BBD, 6BBE, 6BBF, 6EBA, 6EBC, 6CBA, 6CBC

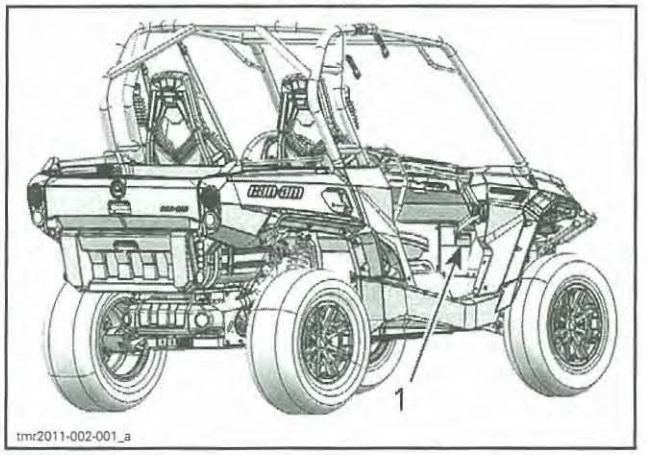
The information and component/system descriptions contained in this manual are correct at time of writing. BRP however, maintains a policy of continuous improvement of its products without imposing upon itself any obligation to install them on products previously manufactured.

Due to late changes, there may be some differences between the manufactured product and the description and/or specifications in this document.

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

VEHICLE INFORMATION

VEHICLE IDENTIFICATION NUMBER (VIN)



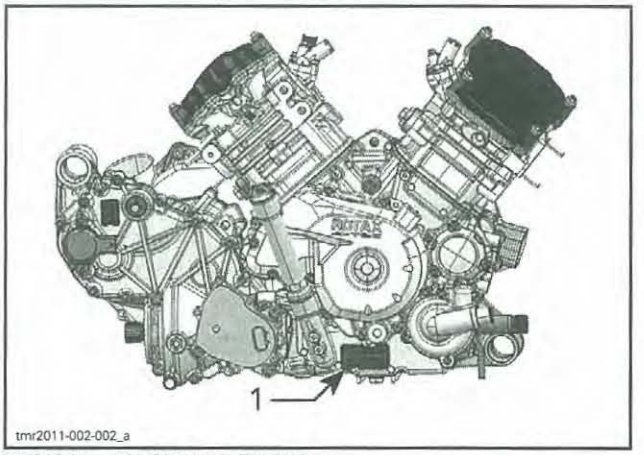
TYPICAL
1. VIN (Vehicle Identification Number) location

The VIN (Vehicle Identification Number) decal is located under the glove box on the passenger side.

VIN Decal Description

TYPICAL — VEHICLE IDENTIFICATION NUMBER LABEL
1. VIN (Vehicle Identification Number)
2. Model number
3. Manufacturing date

ENGINE IDENTIFICATION NUMBER (EIN)

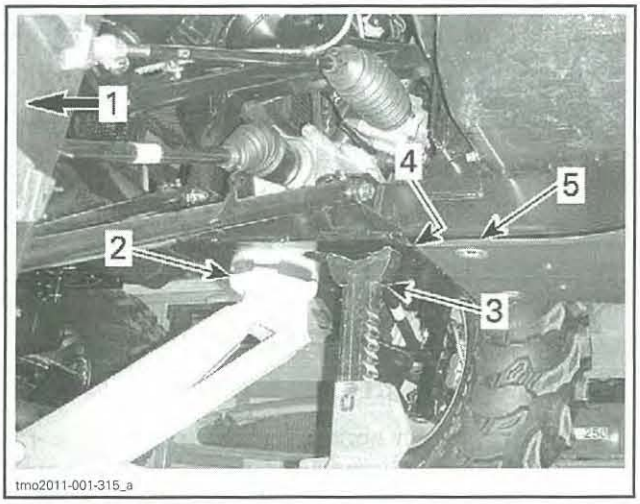


TYPICAL - RH SIDE OF ENGINE
1. Engine Identification Number (EIN)

LIFTING AND SUPPORTING THE VEHICLE

Front of Vehicle

1. Place vehicle on a flat non slippery ground.
2. Ensure vehicle shift lever is set to PARK.
3. Install an hydraulic jack under front skid plate.
4. Lift front of vehicle and install a jack stand on each side under frame section in front of the lip for center skid plate.

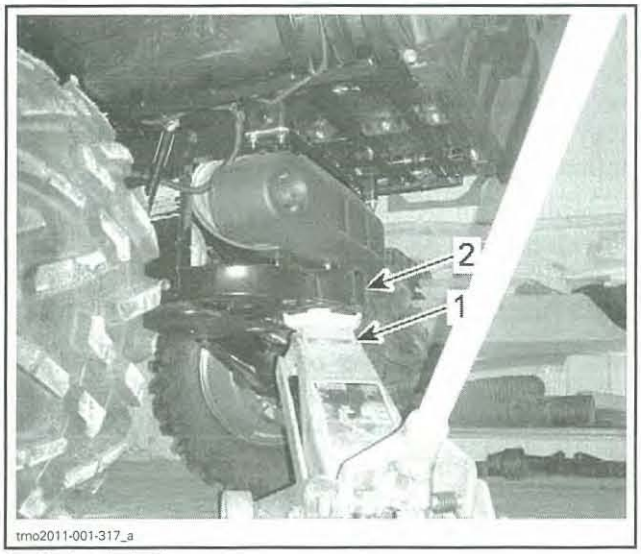


1. *Front of vehicle*
2. *Hydraulic jack*
3. *Jack stand*
4. *Lip for center skid plate*
5. *Center skid plate*

5. Lower hydraulic lift and ensure vehicle is supported safely onto both jack stands.

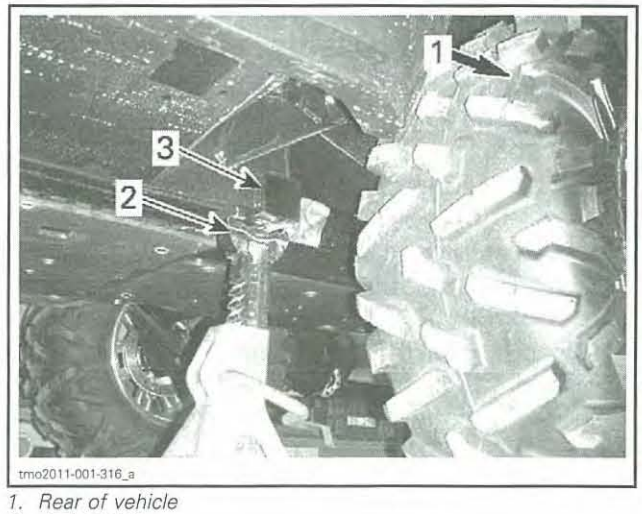
Rear of Vehicle

1. Place vehicle on a flat non slippery ground.
2. Activate 4WD mode.
3. Ensure vehicle shift lever is set to PARK.
4. Install a hydraulic jack under the trailer hitch.



1. *Hydraulic jack*
2. *Trailer hitch*

5. Lift rear of vehicle and install a jack stand on each side under frame section in front of rear wheel.



1. *Rear of vehicle*
2. *Jack stand*
3. *Frame section*

6. Lower hydraulic lift and ensure vehicle is supported safely onto both jack stands.

HOISTING THE VEHICLE

The vehicle may be lifted off the ground by the cage using a hoist and a lifting strap.

NOTICE **The lifting strap must be wrapped around the horizontal side tubes at the top of the cage, NOT fore and aft. Lifting vehicle by the fore and aft tubes of the cage can cause damage.**

1. *Lifting strap around horizontal side tubes (top)*
2. *Hoist hook*

⚠ WARNING

- Ensure hoist and lifting strap are rated for lifting the total vehicle weight. Refer to applicable manufactures instructions.
- Ensure lifting strap is in good condition before lifting vehicle.
- Do not allow anyone in the vehicle or under any portion of the vehicle while it is suspended by a hoist.
- Do not perform any work on the vehicle while it is suspended by a hoist.

TRANSPORTING THE VEHICLE

If the vehicle needs to be transported, it should be carried inside a full size pick-up box or on a flatbed trailer of the appropriate size and capacity.

NOTICE **Do not tow this vehicle - towing can seriously damage the vehicle's drive system.**

When contacting a towing or transporting service, be sure to ask for tie-down straps, a flatbed trailer, loading ramp or power ramp to safely lift and secure the vehicle. Ensure the vehicle is properly transported as specified in this section.

NOTICE **Avoid using chains to tie down the vehicle - they may damage the surface finish or plastic components.**

To load the vehicle for transport, proceed as follows:

1. Set gear shift lever to NEUTRAL (N).
2. Remove the key from the ignition switch.
3. If the vehicle is equipped with a winch, use the winch to roll the vehicle onto the transport vehicle.
4. If the vehicle is not equipped with a winch, proceed as follows:
   - 4.1 Put a strap around the lower arm of each front suspension.
   - 4.2 Attach the straps to the winch cable of the towing vehicle.
   - 4.3 Pull the vehicle on the flatbed trailer with the winch.

NOTE: Be sure to leave the gear shift lever in NEUTRAL (N).

5. Tie down the front wheels to the front of the trailer using tire towing straps.
6. Pass a tie-down strap inside each rear wheel.
7. Firmly attach the rear wheels tie-down straps to both sides of the rear of the trailer with ratchets.
8. Ensure that both the front and rear wheels are firmly secured to the trailer.

ENGINE EMISSIONS INFORMATION

MANUFACTURER'S RESPONSIBILITY

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

DEALER RESPONSIBILITY

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

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

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

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

OWNER RESPONSIBILITY

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

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

EPA EMISSION REGULATIONS

Vehicles manufactured by BRP are certified to the EPA standards as conforming to the requirements of the regulations for the control of air pollution emitted from new vehicle engines. This certifica-

tion 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 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

MANUAL INFORMATION

MANUAL PROCEDURES

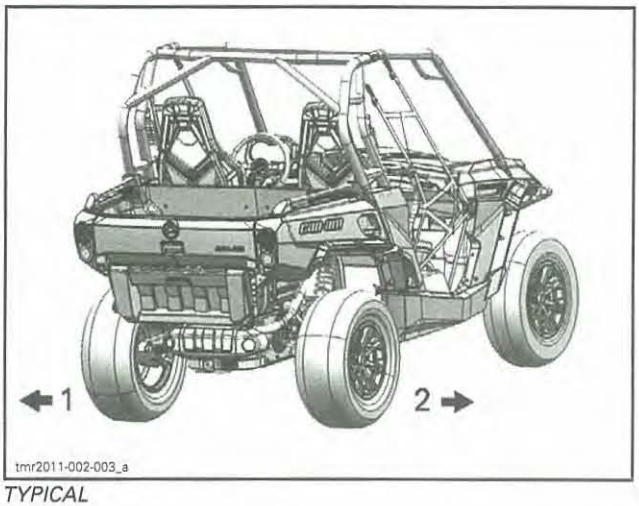
Many of the procedures in this manual are interrelated. Before undertaking any task, you should read and thoroughly understand the entire section or subsection in which the procedure is contained.

⚠ WARNING

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

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

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



TYPICAL
1. Left
2. Right

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

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

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

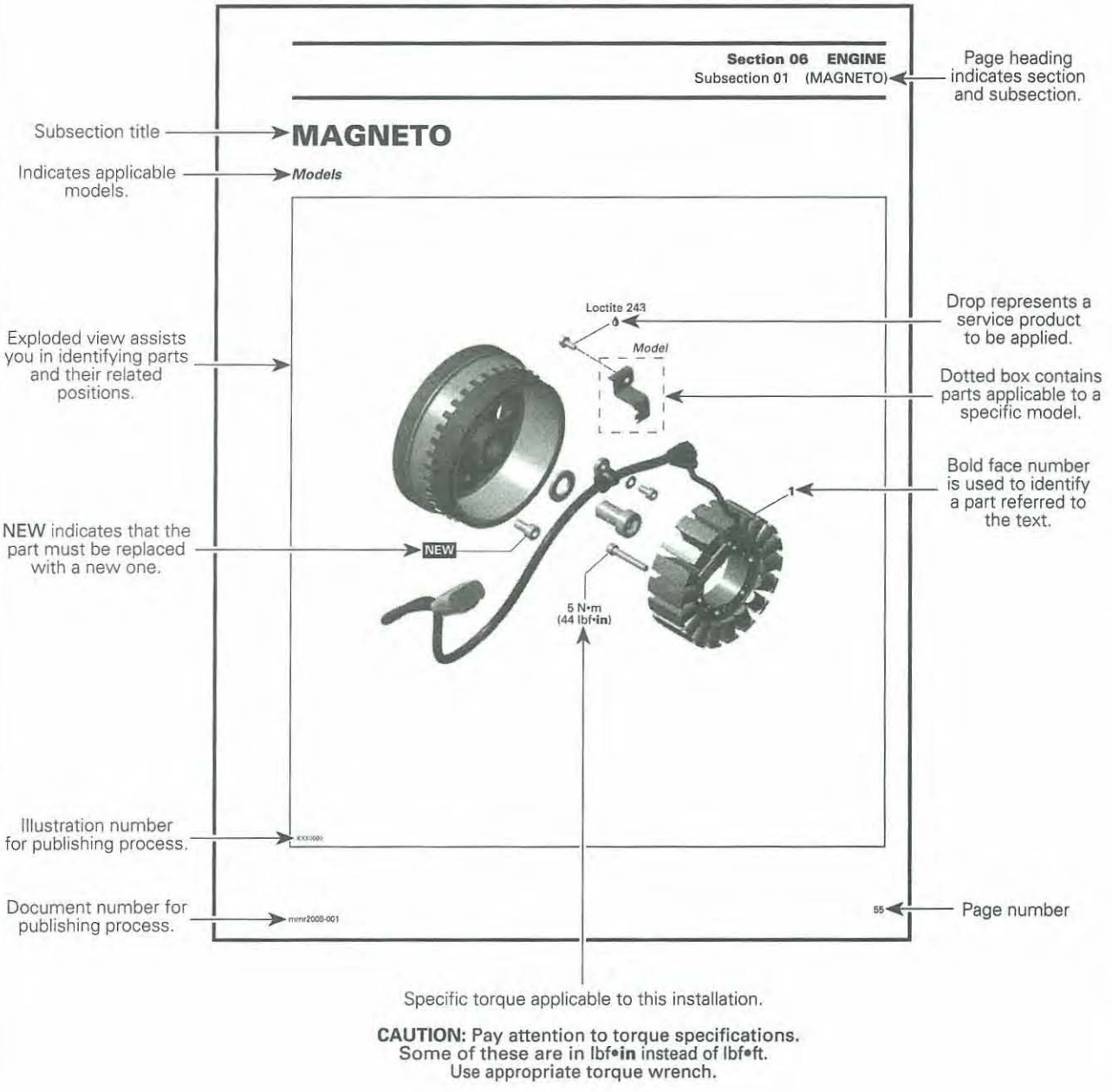
MANUAL LAYOUT

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

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

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

TYPICAL PAGE



TYPICAL PAGE

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

GENERAL

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

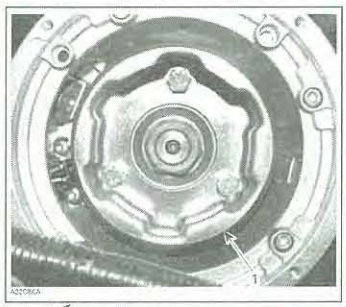
During assembly/installation, use the torque values and service products as in the exploded views.

Reference to a specific section or subsection.

Clean threads before applying a threadlocker. Refer to *SELF-LOCKING FASTENERS* and *LOCTITE 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

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

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.

TYPICAL

Illustration always follows text to which it applies.

Models

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

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

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

typical_txt_2008_en

TIGHTENING TORQUE

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

⚠ WARNING

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

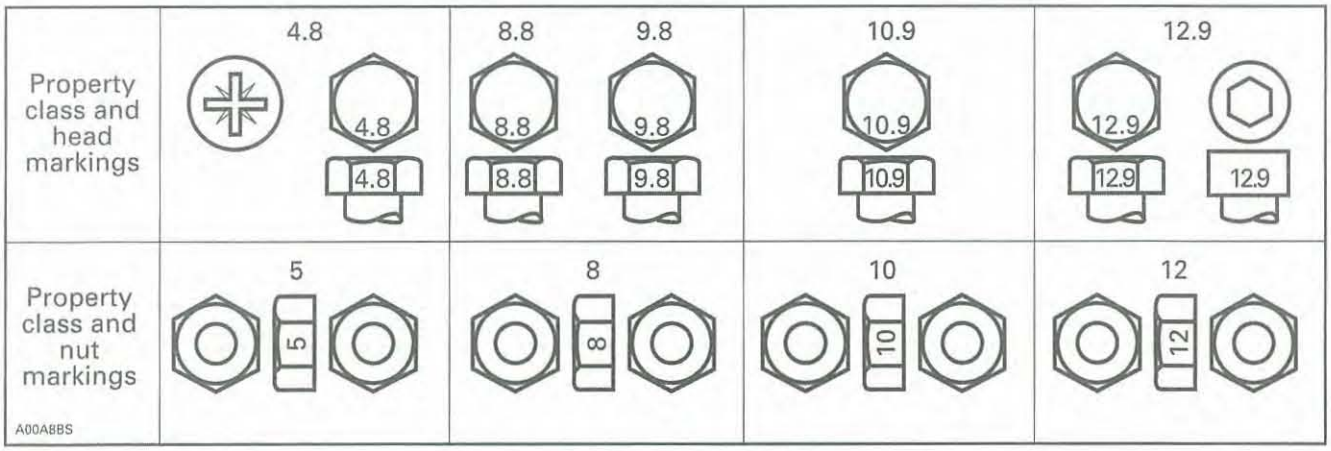
In order to avoid a poor assembly, tighten screws, bolts, or nuts in accordance with the following procedure:

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

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

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

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

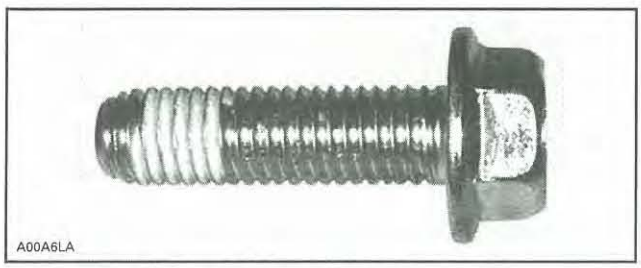


FASTENER SIZE	FASTENER GRADE/TORQUE			
	5.8 Grade	**8.8 Grade**	**10.9 Grade**	**12.9 Grade**
M4	1.5 – 2 N•m (13 – 18 lbf•**in**)	2.5 – 3 N•m (22 – 27 lbf•**in**)	3.5 – 4 N•m (31 – 35 lbf•ft)	4 – 5 N•m (35 – 44 lbf•ft)
M5	3 – 3.5 N•m (27 – 31 lbf•ft)	4.5 – 5.5 N•m (40 – 47 lbf•ft)	7 – 8.5 N•m (62 – 75 lbf•ft)	8 – 10 N•m (71 – 89 lbf•ft)
M6	6.5 – 8.5 N•m (58 – 75 lbf•ft)	8 – 12 N•m (71 – 106 lbf•ft)	10.5 – 15 N•m (93 – 133 lbf•**in**)	16 N•m (142 lbf•**in**)
M8	15 N•m (133 lbf•**in**)	25 N•m (18 lbf•ft)	32 N•m (24 lbf•ft)	40 N•m (30 lbf•ft)
M10	29 N•m (21 lbf•ft)	48 N•m (35 lbf•ft)	61 N•m (45 lbf•ft)	73 N•m (54 lbf•ft)
M12	52 N•m (38 lbf•ft)	85 N•m (63 lbf•ft)	105 N•m (77 lbf•ft)	128 N•m (94 lbf•ft)
M14	85 N•m (63 lbf•ft)	135 N•m (100 lbf•ft)	170 N•m (125 lbf•ft)	200 N•m (148 lbf•ft)

FASTENER INFORMATION

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

SELF-LOCKING FASTENERS PROCEDURE



TYPICAL — SELF-LOCKING FASTENER

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

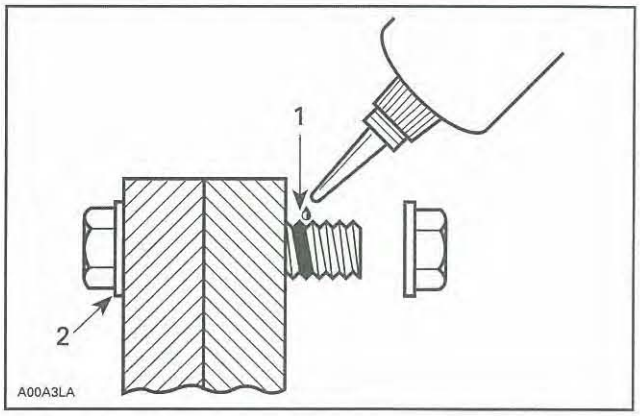
Use a metal brush or a tap to properly clean a threaded hole, then use a solvent. Allow the solvent time to act, approximately 30 minutes, then wipe off. Solvent utilization is to ensure proper adhesion of the product used for locking the fastener.

LOCTITE® APPLICATION PROCEDURE

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

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

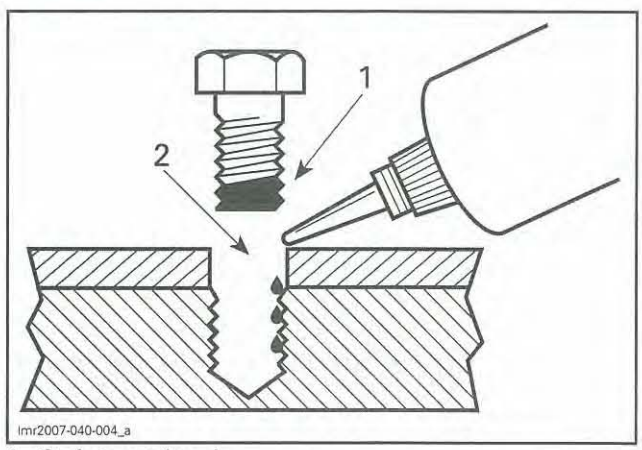
Threadlocker Application for Uncovered Holes (Bolts and Nuts)



1. Apply here
2. Do not apply

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

Threadlocker Application for Blind Holes

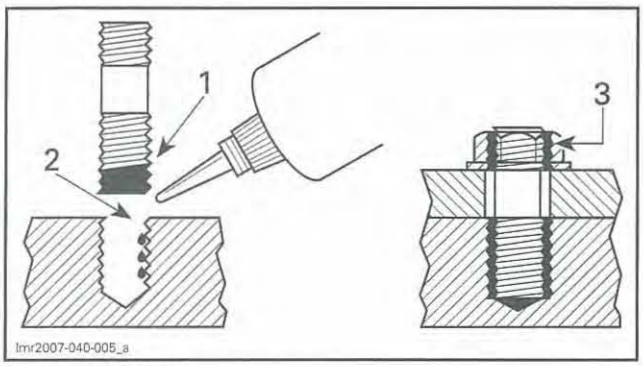


1. On fastener threads
2. On threads and at the bottom of hole

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

4. Apply several drops along the threaded hole and at the bottom of the hole.
5. Apply several drops on bolt threads.
6. Tighten as required.

Threadlocker Application for Stud Installation in Blind Holes



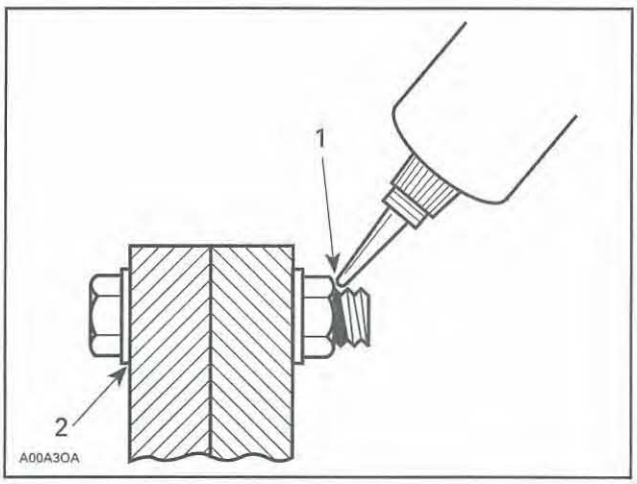
1. On stud threads
2. On threads and in the hole
3. On retaining nut threads

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

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

4. Apply several drops of proper strength Loctite on stud threads.
5. Install stud.
6. Install cover, part, etc.
7. Apply a few drops of proper strength Loctite on uncovered stud threads.
8. Install and tighten retaining nut(s) as required.

Threadlocker Application for Pre-Assembled Parts

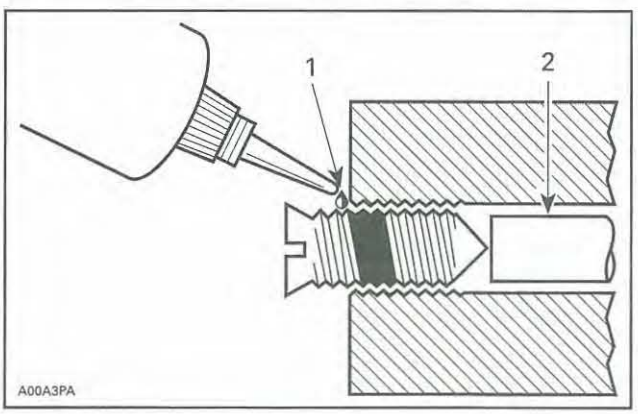


1. Apply here
2. Do not apply

1. Clean bolts and nuts with solvent.
2. Assemble components.
3. Tighten nuts.
4. Apply a few drops of proper strength Loctite on bolt/nut contact surfaces.
5. Avoid touching metal with tip of flask.

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

Threadlocker Application for an Adjustment Screw

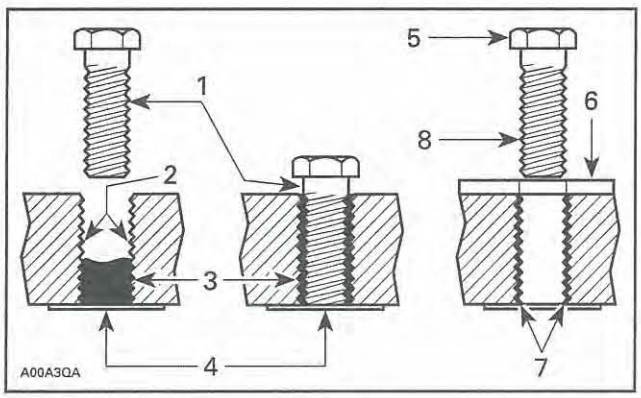


1. Apply here
2. Plunger

1. Adjust screw to proper setting.
2. Apply a few drops of proper strength Loctite threadlocker on screw/body contact surfaces.
3. Avoid touching metal with tip of flask.

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

Application for Stripped Thread Repair



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

Standard Thread Repair

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

If a plate is used to align bolt:

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

NOTE: NOT intended for engine stud repairs.

Repair of Small Holes/Fine Threads

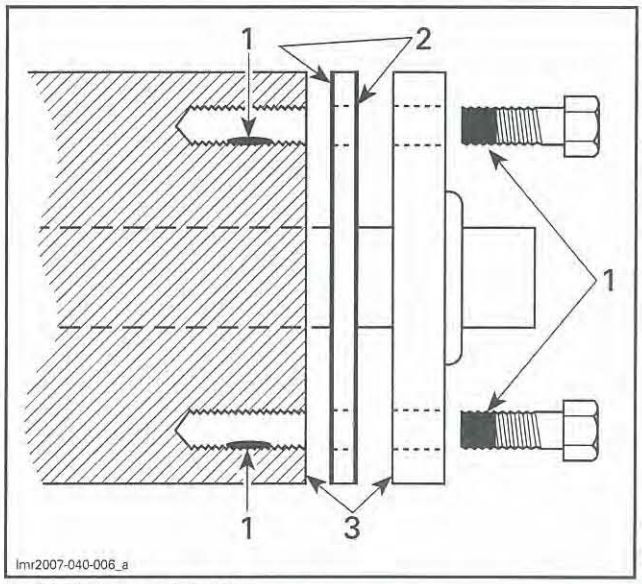
Option 1: Enlarge damaged hole, then follow *STANDARD THREAD REPAIR* procedure.

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

Permanent Stud Installation (Light Duty)

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

Gasket Compound Application



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

1. Remove old gasket and other contaminants using LOCTITE CHISEL (GASKET REMOVER) (P/N 413 708 500). Use a mechanical means only if necessary.

NOTE: Avoid grinding.

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

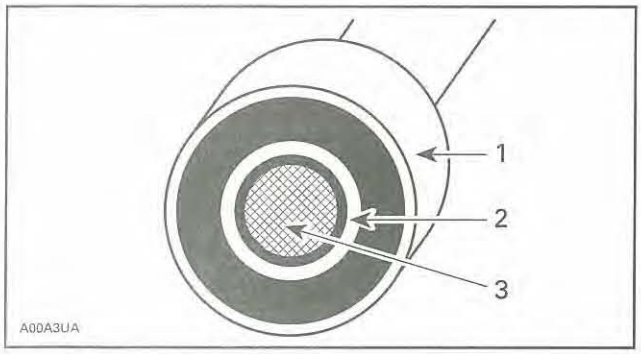
NOTE: If the cover is bolted to blind holes, apply proper strength Loctite in the hole and on threads. Tighten fastener.

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

6. Tighten as usual.

Threadlocker Application for Mounting on a Shaft

Mounting with a Press



1. Bearing
2. Proper strength Loctite
3. Shaft

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

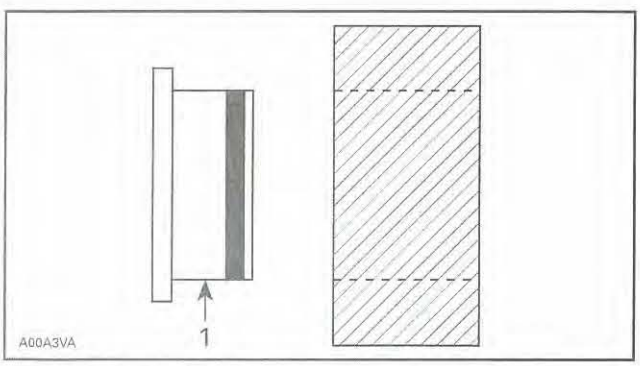
NOTE: Retaining compound is always forced out when applied on shaft.

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

Mounting in Tandem

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

Threadlocker Application for Case-In Components (Metallic Gaskets)



1. Proper strength Loctite

1. Clean inner housing diameter and outer gasket diameter.
2. Spray housing and gasket with LOCTITE PRIMER N (P/N 293 800 041).
3. Apply a strip of proper strength Loctite on leading edge of outer metallic gasket diameter.

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

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

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

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

SERVICE TOOLS INDEX

ADAPTER HOSE
(P/N 529 035 652)

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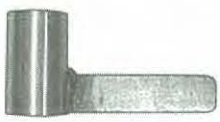
BACKLASH MEASUREMENT TOOL
(P/N 529 035 665)



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BLIND HOLE BEARING PULLER SET
(P/N 529 036 117)

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BLIND HOLE PULLER KIT
(P/N 529 036 056)

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CAMSHAFT TIMING TOOL
(P/N 529 036 201)

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CLUTCH PULLER
(P/N 529 035 746)

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CRANKCASE SUPPORT MAG/PTO
(P/N 529 036 031)

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CRANKSHAFT LOCKING BOLT
(P/N 529 035 617)

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CRANKSHAFT PROTECTOR
(P/N 529 036 034)

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CRANKSHAFT TDC POSITION TOOL
(P/N 529 036 200)

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CRIMPING TOOL (HEAVY GAUGE WIRE)
(P/N 529 035 730)

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CV JOINT EXTRACTOR
(P/N 529 036 005)

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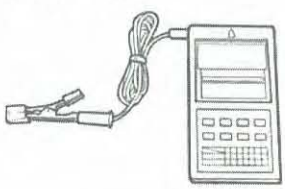
DIGITAL INDUCTION TACHOMETER
(P/N 529 014 500)



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DISCONNECT TOOL
(P/N 529 035 714)

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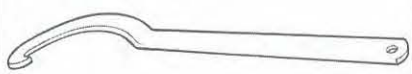
DRIVE PULLEY HOLDER (CVT)
(P/N 529 006 400)



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DRIVE SHAFT OIL SEAL INSTALLER
(P/N 529 036 028)

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DRIVE SHAFT OIL SEAL PROTECTOR
(P/N 529 036 029)

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DRIVEN CLUTCH HOLDER
(P/N 529 035 771)

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ECM ADAPTER TOOL
(P/N 529 036 166)

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ECM TERMINAL REMOVER 2.25
(P/N 529 036 175)

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ECM TERMINAL REMOVER 3.36
(P/N 529 036 174)

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ENGINE LIFTING TOOL
(P/N 529 036 022)

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FLUKE 115 MULTIMETER
(P/N 529 035 868)

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FUEL HOSE ADAPTER
(P/N 529 036 023)

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GEAR LOCK PIN
(P/N 529 035 747)

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HANDLE
(P/N 420 877 650)

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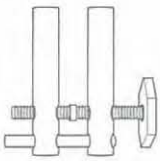
LARGE HOSE PINCHER
(P/N 529 032 500)



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MAGNETO DIAGNOSTIC HARNESS
(P/N 529 036 199)

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MAGNETO PULLER
(P/N 529 035 748)

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MPI-2 DIAGNOSTIC CABLE
(P/N 710 000 851)

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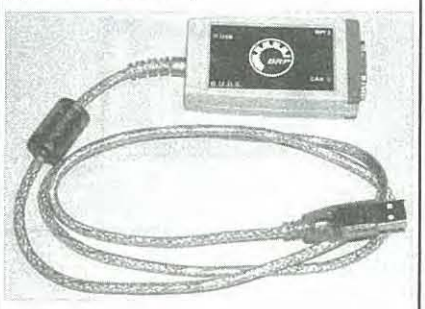
MPI-2 INTERFACE CARD
(P/N 529 036 018)



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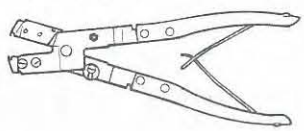
OETIKER PLIERS
(P/N 295 000 069)



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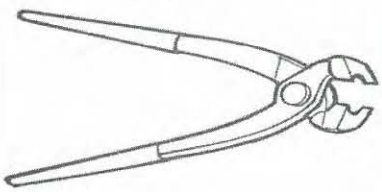
OETIKER PLIERS
(P/N 295 000 070)



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OIL SEAL INSTALLER (GEARBOX)
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OIL SEAL INSTALLER
(P/N 529 036 204)

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OIL SEAL PUSHER
(P/N 529 035 757)

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PISTON CIRCLIP INSTALLER
(P/N 529 035 921)

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PISTON CIRCLIP INSTALLER
(P/N 529 036 153)

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PISTON RING COMPRESSOR
(P/N 529 035 919)

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PLAIN BEARING
REMOVER/INSTALLER
(P/N 529 036 032)

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PLAIN BEARING
REMOVER/INSTALLER
(P/N 529 035 917)

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PRESSURE GAUGE
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PTO COVER OIL SEAL INSTALLER
(P/N 529 036 033)

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

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SEAL PUSHER
(P/N 529 035 766)

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SPANNER SOCKET
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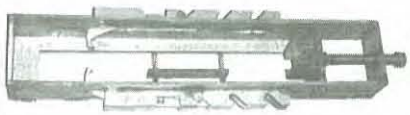
SPRING COMPRESSOR
(P/N 529 036 184)



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STEERING ALIGNMENT TOOL
(P/N 529 036 059)

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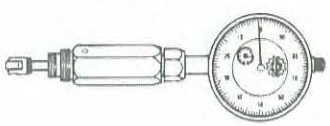
TDC DIAL INDICATOR
(P/N 414 104 700)



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TEST CAP
(P/N 529 035 991)

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VACUUM/PRESSURE PUMP
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VALVE GUIDE INSTALLER
(P/N 529 036 140)

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VALVE GUIDE REMOVER 5 MM
(P/N 529 035 924)

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VALVE SPRING COMPRESSOR CUP
(P/N 529 035 764)

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VALVE SPRING COMPRESSOR
(P/N 529 035 724)

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BREAK-IN INSPECTION

This vehicle should be serviced after the first 10 hours or 300 km (200 mi) of operation, whichever comes first, by an authorized Can-Am dealer. The break-in inspection is very important and must not be neglected.

The following message will appear in the cluster as a reminder of when the break-in inspection is due: MAINTENANCE SOON. The message can be cancelled by alternately pressing the override button and the brake pedal 3 times, or by using B.U.D.S. software.

BREAK-IN INSPECTION CHART	Inspect	Clean	Lubricate	Tighten	Adjust	Replace
ENGINE						
Engine oil and filter						X
Valve clearance	X				X	
Cylinder head screws				X		
Air filter	X					
Engine seals	X					
Engine mounting fasteners	X					
Exhaust system	X					
COOLING SYSTEM						
Radiator/cooling system leak (leak test)	X					
FUEL SYSTEM						
Throttle body	X					
Fuel lines, fuel rails, connections, check valves and fuel tank leak test	X					
ELECTRICAL SYSTEM						
Spark plugs	X					
Battery connections	X					
CVT TRANSMISSION						
CVT air inlet/outlet	X					
CVT air filter	X					
GEARBOX						
Gearbox oil						X
Vehicle speed sensor		X				
DRIVE SYSTEM						
Front differential/rear final drive oil						X
Front differential/rear final drive (seals and vents)	X					
Front and rear propeller shaft joints	X		X			
WHEEL						
Wheel nuts/studs	X			X		
Wheel beadlock (X model)				X		

BREAK-IN INSPECTION CHART	Inspect	Clean	Lubricate	Tighten	Adjust	Replace
STEERING SYSTEM						
Steering system (column, bearing, etc.)	X					
Front wheel alignment	X					
BRAKES						
Brake fluid	X					
OCCUPANT RESTRAINT SYSTEM						
Seat belts	X					
Side nets	X					
BODY/CHASSIS						
Cage fasteners	X					
Upper and lower tailgates latches	X					
Seats latch	X					

PERIODIC MAINTENANCE SCHEDULE

Maintenance is very important for keeping the vehicle in a safe operating condition. Proper maintenance is the owner's responsibility. The vehicle should be serviced as per the maintenance schedule.

The following message will appear in the cluster after the first 10 hours of operation and then at every 50 hours that follow as a reminder of when an inspection is due: **MAINTENANCE SOON**. The message can be cancelled by alternately pressing the override button and the brake pedal 3 times, or by using B.U.D.S. software.

⚠ WARNING

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

EVERY 750 KM (500 MI) OR 25 HOURS OF OPERATION (whichever comes first)
Clean the CVT air inlet/outlet
Inspect and clean the CVT air filter
Inspect the brake pads
Tighten the wheel lug nuts
Inspect the drive shaft boots and protectors
Inspect passenger grab handles condition
Inspect hitch condition
Inspect driver and passenger seat latch operation
Inspect tailgates latch operation

EVERY 1 500 KM (1,000 MI) OR 50 HOURS OF OPERATION (whichever comes first)
Replace the air filter
Verify battery condition
Inspect the front differential/rear final drive oil level
Inspect the drive shaft joints condition
Inspect the front/rear propeller shaft joint condition
Grease the front/rear propeller shaft joints
Inspect the tie rod ends
Inspect shock absorbers for any leaks
Lubricate shock absorber spherical bearings (X model)
Inspect and lubricate front suspension arms

EVERY 3 000 KM (2,000 MI) OR 100 HOURS OF OPERATION OR 1 YEAR (whichever comes first)
Inspect seat belts (check for any damages and proper operation)
Inspect side nets (check for any damages and ensure they buckle properly)
Replace the engine oil and filter
Inspect and adjust the valve clearance
Inspect and clean the muffler spark arrester
Check engine coolant strength
Inspect throttle body
Clean the fuel pump pre-filter
Inspect the fuel pump pressure
Replace fuel vent breather filter
Inspect the drive belt
Inspect, clean and lubricate the drive and driven pulleys (including the one-way bearing)
Inspect the gearbox oil level and condition
Inspect wheel bearings
Inspect the steering system (column, bearing, etc.)
Inspect and clean the brake system
Inspect frame for any damage
Replace rear final drive oil

EVERY 6 000 KM (4,000 MI) OR 200 HOURS OF OPERATION OR 2 YEARS (whichever comes first)
Replace the engine coolant
Verify the cooling system and perform a pressure test on pressure cap and cooling system
Verify the fuel system and perform a fuel system leak test
Replace spark plugs
Replace the front differential oil
Replace gearbox oil
Clean the vehicle speed sensor
Replace the brake fluid

PERIODIC MAINTENANCE PROCEDURES

SERVICE TOOLS

Description	Part Number	Page
TEST CAP	529 035 991	18
VACUUM/PRESSURE PUMP	529 021 800	18, 28

SERVICE PRODUCTS

Description	Part Number	Page
BRAKE FLUID	293 600 131	28
BRP PREMIXED COOLANT	219 700 362	13
COSMO RUBBER GREASE	293 550 055	27
SUSPENSION GREASE	293 550 033	26
XPS PARTS AND BRAKES CLEANER	219 701 705	22, 27
XPS SYNTHETIC BLEND OIL (SUMMER GRADE)	293 600 121	12
XPS SYNTHETIC GEAR OIL (75W 140)	293 600 140	21, 24
XPS SYNTHETIC GEAR OIL (75W 90)	293 600 043	24
XPS SYNTHETIC GREASE	293 550 010	27
XPS SYNTHETIC OIL (WINTER GRADE)	293 600 112	12

GENERAL

This subsection provides:
- Fluid level vérifications
- Maintenance procedures.

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

PROCEDURES

AIR FILTER REPLACEMENT

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

Air Filter Replacement Guideline

Air filter replacement should be adjusted according to riding conditions as it is critical to ensure proper engine performance and life span.

Air filter replacement frequency must be increased for the following dusty conditions:
- Riding on dry sand
- Riding on dry dirt covered surfaces
- Riding on dry gravel roads or similar conditions.

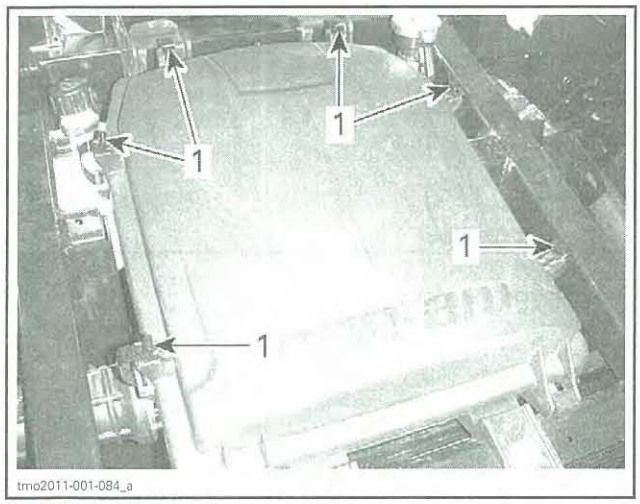
NOTE: Riding in a group in these conditions would increase even more the air filter replacement requirement.

Air Filter Removal

Remove service cover.

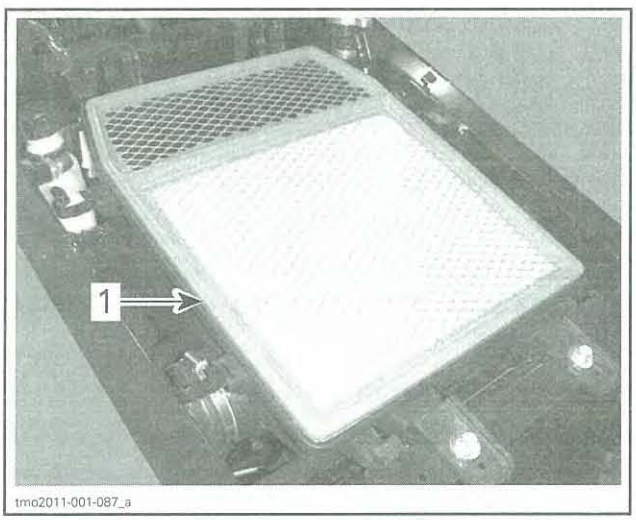
1. Service cover

Release clamps and remove air filter housing cover.



1. Release clamps

Remove air filter.



1. Air filter

Replace air filter if clogged. Always use the recommended air filter or an equivalent.

Air Filter Installation

Inspect air filter housing for cleanliness.

NOTICE **If any sands or other particles are found in air filter housing, clean it using a vacuum cleaner.**

Install air filter.

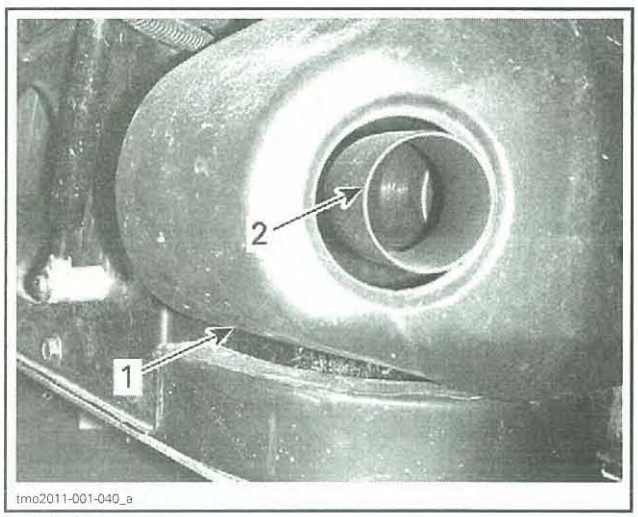
Install air filter housing cover and latch all clamps.

Install service cover.

MUFFLER SPARK ARRESTER CLEANING AND INSPECTION

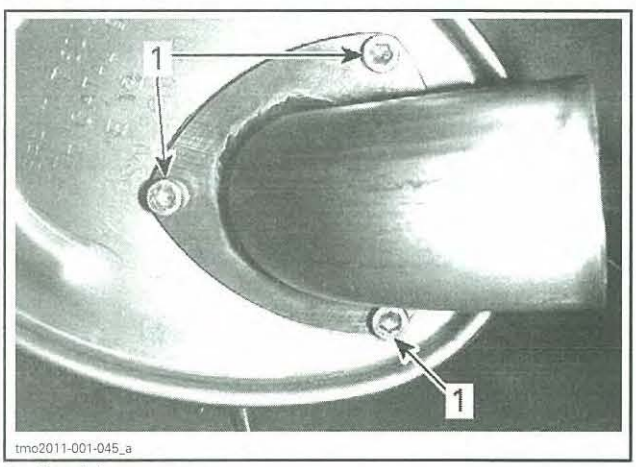
⚠ CAUTION **Never perform this operation immediately after the engine has been running as exhaust system is very hot.**

Remove the muffler cover.



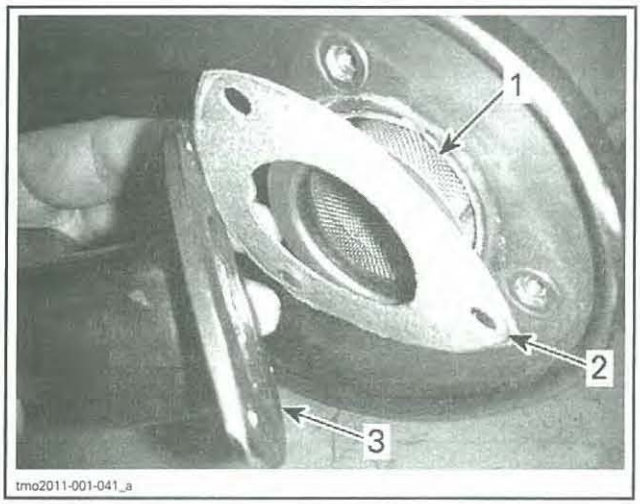
1. Muffler cover
2. Exhaust tail pipe

Remove and discard the tail pipe retaining screws.



1. Retaining screws

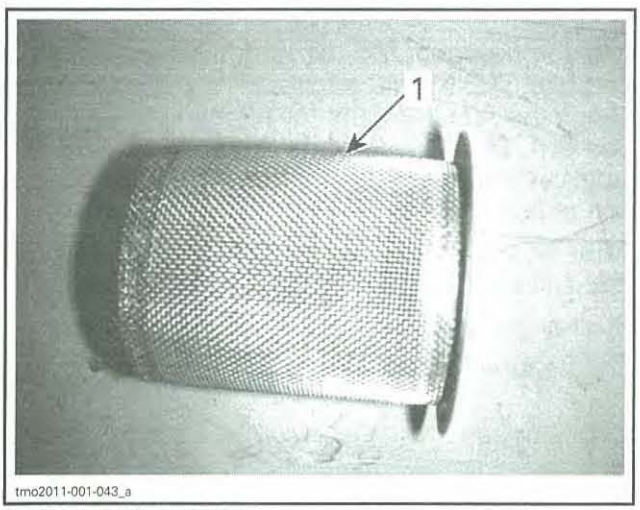
Remove exhaust tail pipe, gasket (discard) and spark arrester.



1. Spark arrester
2. Gasket
3. Exhaust tail pipe

Remove carbon deposits from the spark arrester using a brush.

NOTICE Use a soft brush and be careful to avoid damaging spark arrester mesh.



1. Clean spark arrester

Inspect mesh of spark arrester for any damage. Replace as required.

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

Install new gasket and retaining screws.

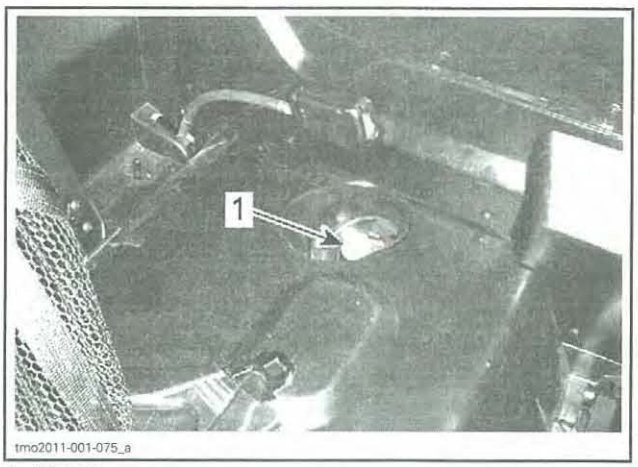
PART	TORQUE
Tail pipe retaining screws	11 N•m ± 1 N•m (97 lbf•**in** ± 9 lbf•**in**)

ENGINE OIL LEVEL VERIFICATION

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

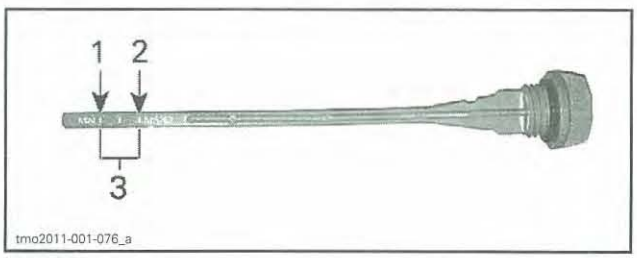
With vehicle on a level surface and engine cold, check the oil level as follows:

1. Remove passenger seat.
2. Unscrew dipstick then remove it and wipe clean.



1. Dipstick

3. Reinstall dipstick, screw in it completely.
4. Remove dipstick and check oil level. It should be near or equal to the upper mark.



TYPICAL
1. MIN.
2. MAX.
3. Operating range

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

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

Repeat the above procedures until oil level reaches the dipstick's upper mark.

NOTE: Do not overfill. Wipe off any spillage.

Properly tighten dipstick.

Install passenger seat.

ENGINE OIL CHANGE

Place vehicle on a level surface.

Oil change and oil filter replacement should be done with a warm engine.

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

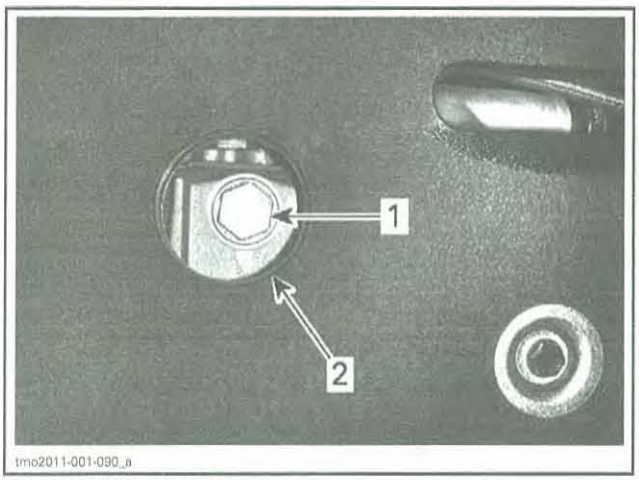
Ensure vehicle is on a level surface.

Remove dipstick.

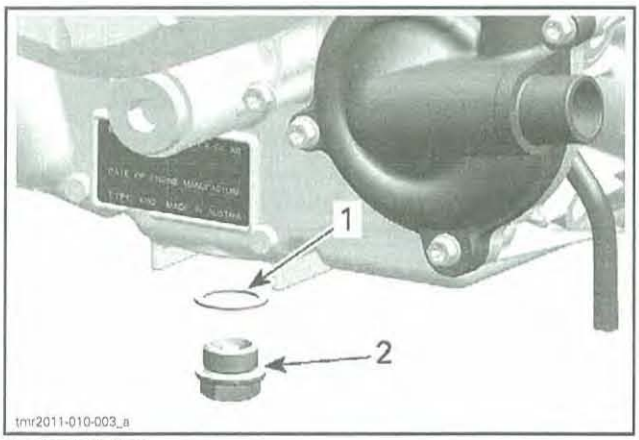
Place a drain pan under the engine drain plug area.

Clean the drain plug area.

Unscrew drain plug and discard the gasket ring.



DRAIN PLUG ACCESS
1. *Oil drain plug*
2. *Skid plate*



1. *Gasket ring*
2. *Drain plug*

Allow oil to drain completely from the crankcase.

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

Install a NEW gasket ring on the drain plug.

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

Install and tighten drain plug to the recommended torque.

DRAIN PLUG TIGHTENING TORQUE
30 N•m ± 2 N•m (22 lbf•ft ± 1 lbf•ft)

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

Refill engine with recommended engine oil.

ENGINE OIL CAPACITY
2.2 L (23.25 qt (U.S. liq.))

RECOMMENDED ENGINE OIL	
SEASON	TYPE
Summer	XPS SYNTHETIC BLEND OIL (SUMMER GRADE) (P/N 293 600 121)
Winter	XPS SYNTHETIC OIL (WINTER GRADE) (P/N 293 600 112)

If recommended XPS oil is not available, use a 4-stroke SAE 5W 40 engine oil that meets or exceeds the requirements for API service classification 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.

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

Start engine and let it idle for a few minutes.

Ensure oil filter and drain plug areas are not leaking.

Stop engine.

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

Dispose oil and filter as per your local environmental regulations.

ENGINE OIL FILTER REPLACEMENT

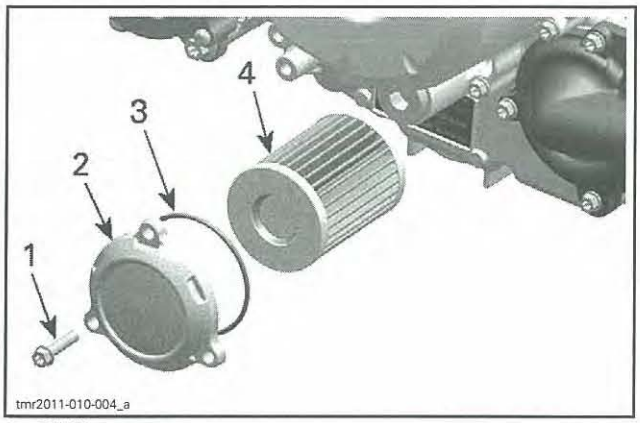
Oil Filter Removal

Clean oil filter area.

Remove oil filter cover screws.

Remove oil filter cover.

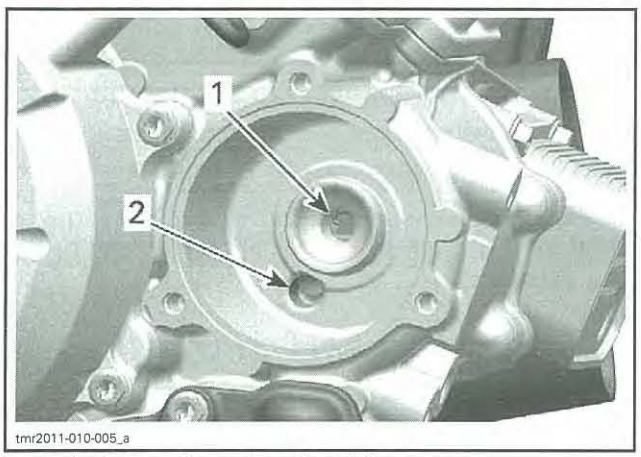
Remove oil filter.



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

Oil Filter Installation

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

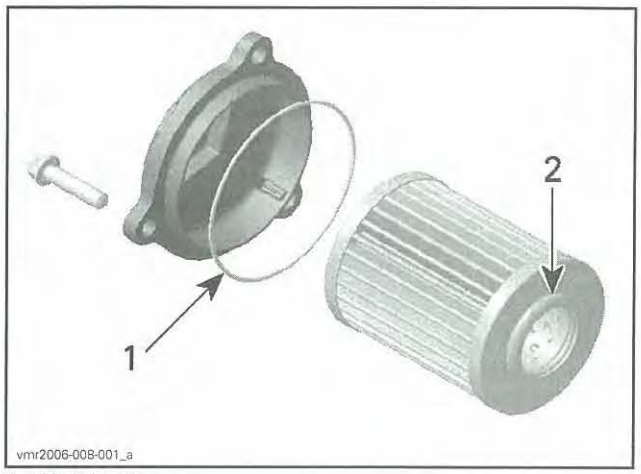


1. *Outlet bore to the engine oil providing system*
2. *Inlet bore from the oil pump to the oil filter*

Install a NEW O-ring on oil filter cover.

Install the filter into the cover.

Apply engine oil on O-ring and grease on the end of filter.



1. *Slightly oil*
2. *Slightly oil*

Install the cover on the engine.

Tighten oil filter cover screws to recommended torque.

OIL FILTER COVER SCREWS TIGHTENING TORQUE
10 N•m ± 1 N•m (89 lbf•**in** ± 9 lbf•**in**)

RECOMMENDED ENGINE COOLANT

COOLANT	
BRP RECOMMENDED PRODUCT	BRP PREMIXED COOLANT (P/N 219 700 362)
ALTERNATIVE, OR IF NOT AVAILABLE	Distilled water and antifreeze solution (50% demineralized water, 50% antifreeze)

NOTICE **Always use ethylene-glycol antifreeze containing corrosion inhibitors specifically formulated for internal combustion aluminum engines.**

ENGINE COOLANT LEVEL VERIFICATION

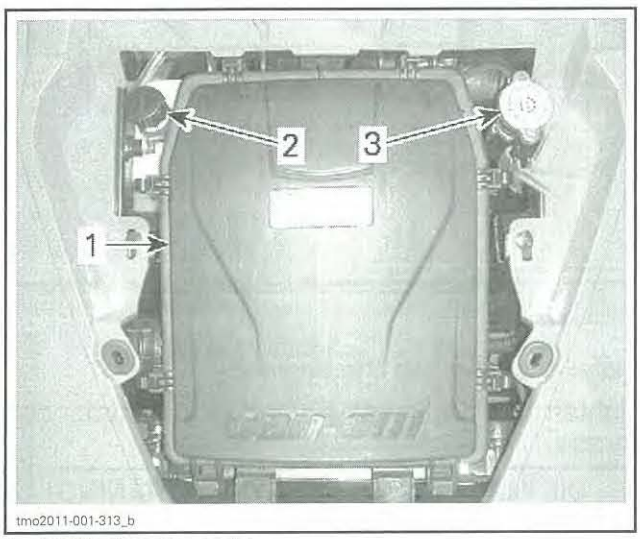
⚠ WARNING

Check coolant level with engine cold.

1. Place vehicle on a level surface.
2. Open service cover.
3. Remove the pressure cap.

⚠ WARNING

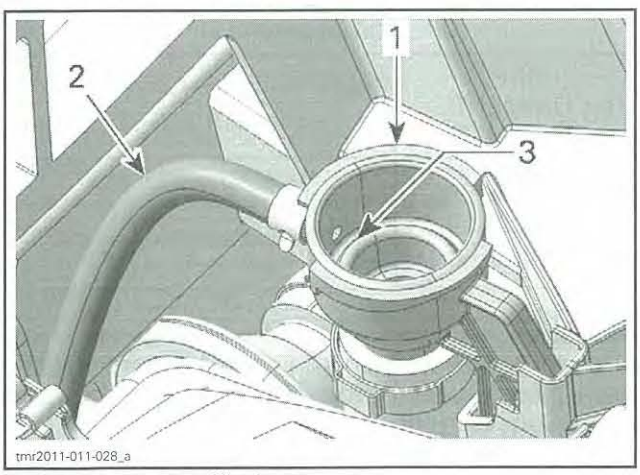
In order to avoid potential burns, do not remove the pressure cap if the engine is hot.



tmo2011-001-313_b

1. Air filter housing cover
2. Coolant expansion tank cap
3. Pressure cap

4. Ensure cooling system is full up to the pressure cap seat.

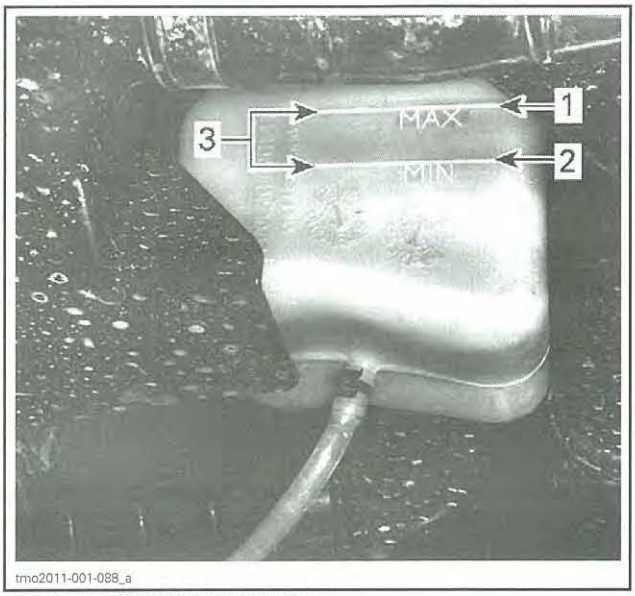


tmr2011-011-028_a

1. Cooling system refill adapter
2. Expansion tank hose
3. Coolant system full level (pressure cap seat)

5. Add coolant in system as necessary.
6. Properly reinstall pressure cap on refill adapter.
7. Check coolant level in expansion tank.

NOTE: Coolant level can be checked by looking at the side of the coolant expansion tank under the RH front fender.



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COOLANT EXPANSION TANK
1. MAX. level
2. MIN. level
3. Operating range

8. Add coolant if level is below MIN. mark. Use a funnel to avoid spillage. **Do not overfill.**
9. Properly reinstall coolant expansion tank cap.
10. Reinstall service cover.

NOTE: A cooling system that frequently requires addition of coolant is an indication of leaks or engine problems.

ENGINE COOLANT SPECIFIC GRAVITY CHECK

Remove pressure cap.

Use an antifreeze tester to test coolant strength.

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

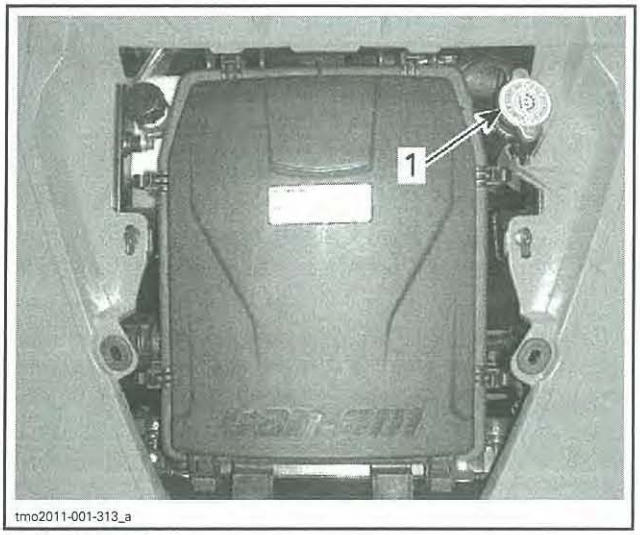
ENGINE COOLANT REPLACEMENT

Cooling System Draining

⚠ WARNING

In order to avoid potential burns, do not remove the pressure cap or loosen the coolant drain plug if the engine is hot.

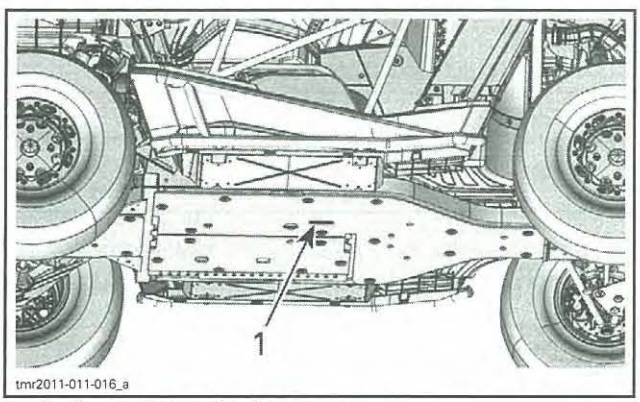
1. Remove service cover.
2. Remove the cooling system pressure cap.



1. Pressure cap

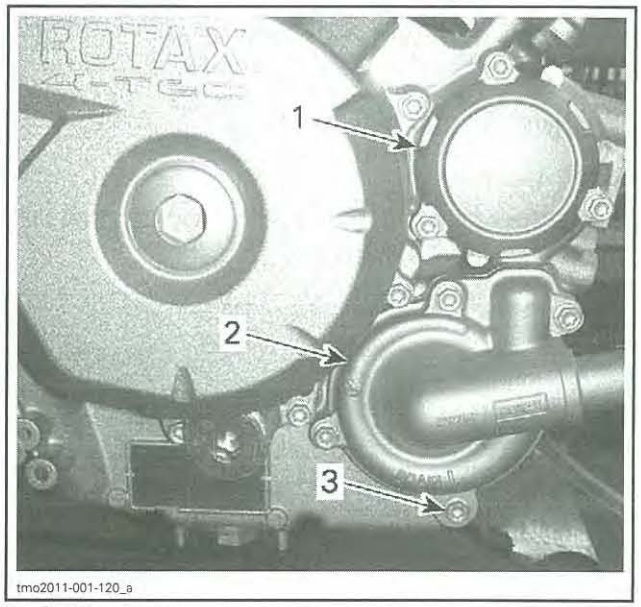
3. Unscrew coolant drain plug and drain the coolant into a suitable container.

NOTE: The drain plug is accessible from underneath the vehicle.



1. Cooling system drain plug access

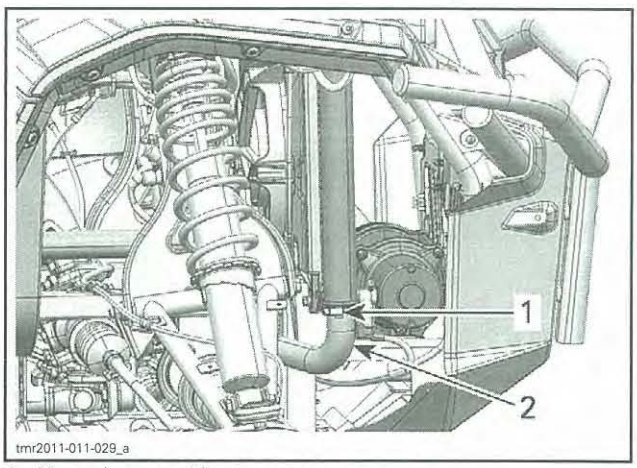
NOTE: Do not unscrew the coolant drain plug completely.



1. Oil filter cover
2. Water pump cover
3. Coolant drain plug

4. Disconnect the lower radiator hose and drain the remaining coolant into a suitable container.

NOTE: Take note of the position of the hose clamp on the lower radiator hose at the radiator.



1. Hose clamp position to note
2. Lower radiator hose to remove

5. Drain cooling system completely.
6. Reinstall cooling system drain plug.

COOLING SYSTEM DRAIN PLUG TORQUE
9 N•m to 11 N•m (80 lbf•**in** to 97 lbf•**in**)

7. Reinstall radiator hose as noted prior to removal.

RADIATOR HOSE CLAMP
2.5 N•m to 3.5 N•m (22 lbf•**in** to 31 lbf•**in**)

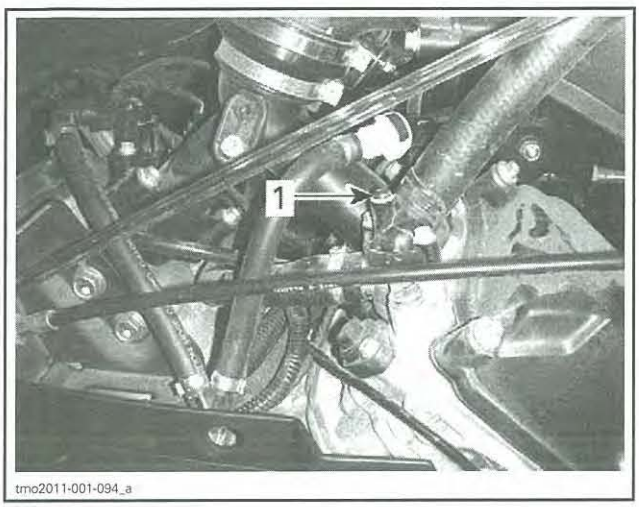
8. Siphon the cooling system expansion tank.

9. Fill cooling system with coolant, refer to *COOLING SYSTEM BLEEDING* procedure.

Cooling System Bleeding

800R Models

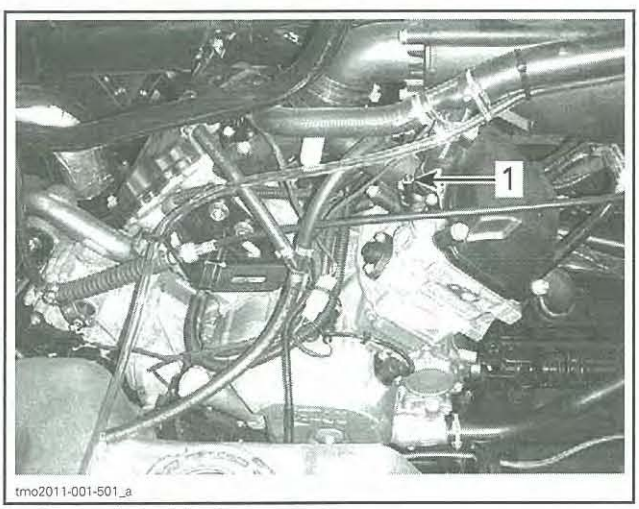
1. Unscrew bleed screw on thermostat housing cover of front cylinder.



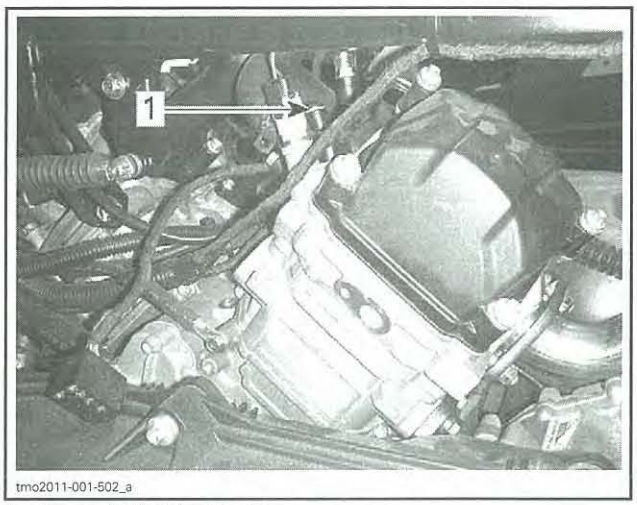
TYPICAL
1. Bleed screw

1000 Models

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



1. Front cylinder bleed screw



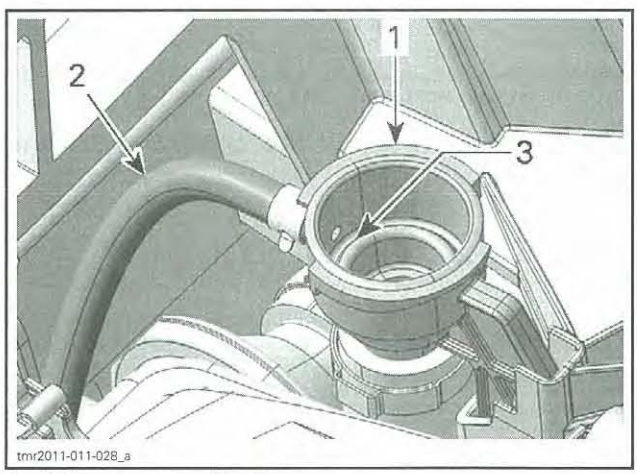
1. Rear cylinder bleed screw

All Models

3. Remove the pressure cap.
4. Fill the cooling system until coolant comes out of the bleed screw(s).
5. Install the bleed screw(s) using NEW gasket ring(s) and torque as per following chart.

BLEED SCREW INSTALLATION	
GASKET RING	TORQUE
New	4.4 N•m to 5.6 N•m (39 lbf•**in** to 50 lbf•**in**)

6. Continue adding coolant until system is full up to the pressure cap seat in the refill adapter.

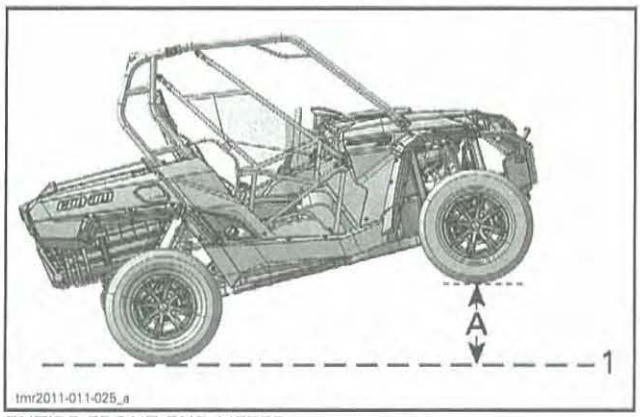


1. Cooling system refill adapter
2. Expansion tank hose
3. Coolant system full level (pressure cap seat)

7. Install pressure cap.

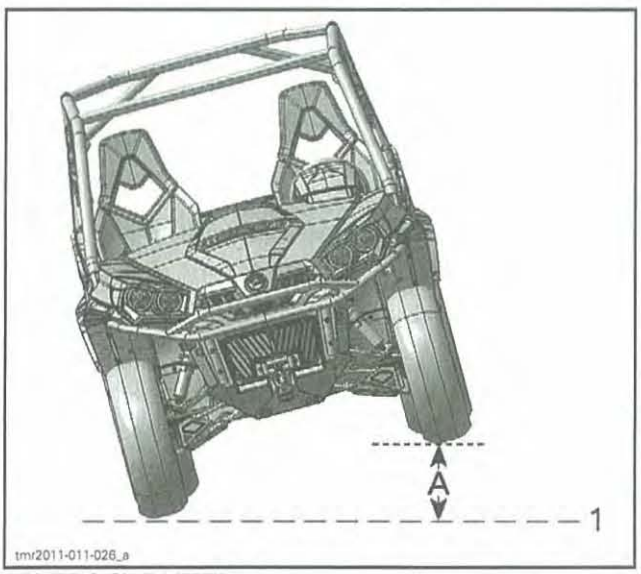
NOTICE The following steps must be carried out as specified to ensure proper cooling system bleeding in addition to the previous steps.

8. Lift the entire front end of the vehicle so the front tires are 60 cm (2 ft) above the ground for at least 1 minute.



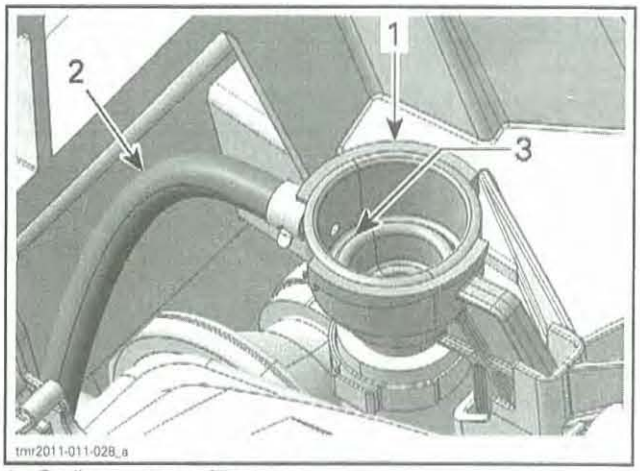
ENTIRE FRONT END LIFTED
1. Ground level
A. 60 cm (24 in)

9. Lower vehicle to the ground.
10. Remove pressure cap and add coolant as required.
11. Install pressure cap.
12. Lift driver's side of vehicle 60 cm (2 ft) above it's horizontal position for at least 1 minute.



DRIVER'S SIDE LIFTED
1. Ground level
A. 60 cm (24 in)

13. Lower vehicle to the ground.
14. Remove pressure cap and add coolant as required up to the pressure cap seat in the refill adapter.



1. Cooling system refill adapter
2. Expansion tank hose
3. Coolant system full level (pressure cap seat)

15. Install the pressure cap.
16. Check coolant level in the coolant expansion tank and fill to the MIN. level (as required).
17. Run engine at idle with the pressure cap ON until the cooling fan cycles on for a second time.
18. Stop the engine and let it cool down.

⚠ WARNING

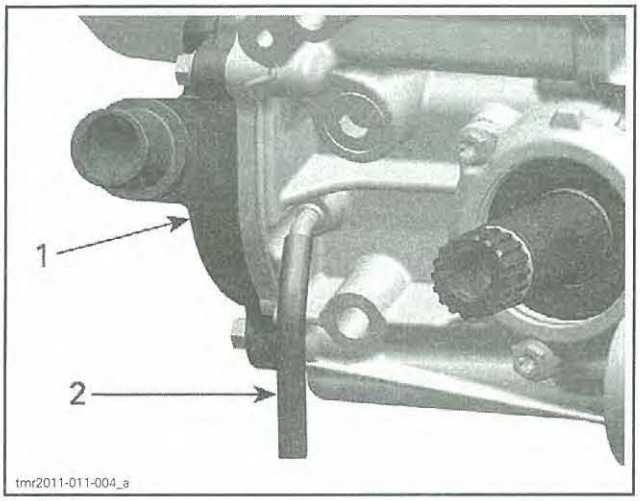
In order to avoid potential burns, do not remove the pressure cap if the engine is hot.

19. When the engine is cool, remove pressure cap and add coolant if required.
20. Install pressure cap.
21. Check coolant level in the expansion tank. Add coolant as required. Refer to *ENGINE COOLANT LEVEL VERIFICATION* in this subsection.

COOLING SYSTEM INSPECTION

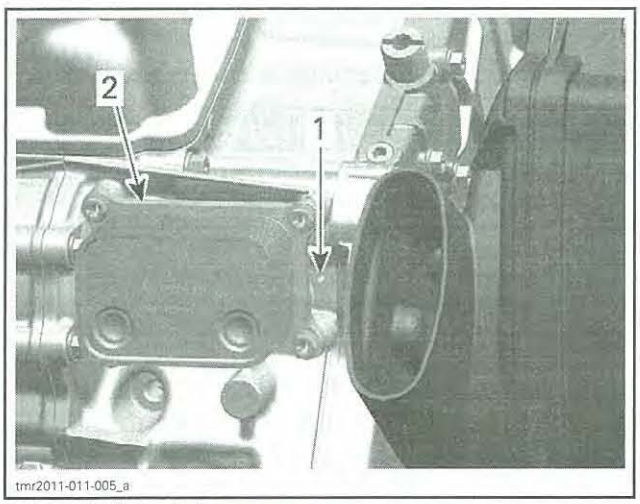
1. Check general condition of hoses and clamps for tightness.
2. Check the leak indicator hose for oil or coolant.

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



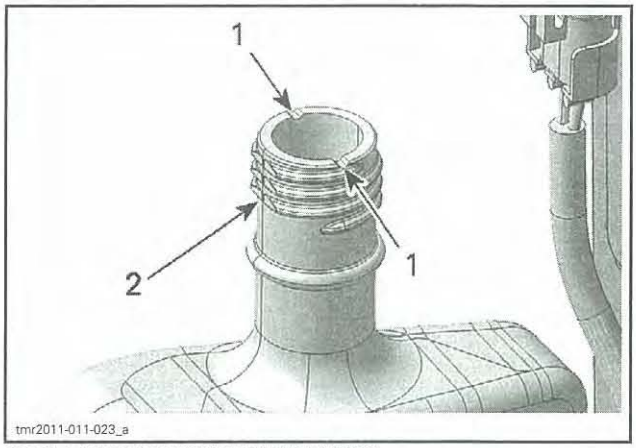
1. Water pump
2. Leak indicator hose

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



1. Leak indicator hole
2. Oil cooler

3. Ensure vents on coolant expansion tank neck are not obstructed (see following illustration).



COOLANT EXPANSION TANK VENTS
1. Slots atop neck
2. Flat threadless portion on tank neck

4. Carry out an *ENGINE COOLANT SPECIFIC GRAVITY CHECK* as detailed in this subsection.
5. Carry out a *PRESSURE CAP TEST* as detailed in this subsection.
6. Replace engine coolant if contaminated.

NOTE: Engine coolant should be replaced every 2 years or if contaminated.

COOLING SYSTEM LEAK TEST

⚠ WARNING

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

1. Open service cover.
2. Remove cooling system pressure cap.
3. Install TEST CAP (P/N 529 035 991) on filler neck.

4. Using the VACUUM/PRESSURE PUMP (P/N 529 021 800), pressurize cooling system.

COOLING SYSTEM LEAK TEST
103 kPa (15 PSI)

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

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

PRESSURE CAP TEST

Test the pressure cap using a cooling system tester.

Replace the cap if it does not hold the pressure, or if it opens at a relief pressure that is too low or too high.

PRESSURE CAP RELIEF PRESSURE
Approximately 110 kPa (16 PSI)

ENGINE VALVE CLEARANCE ADJUSTMENT

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

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

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

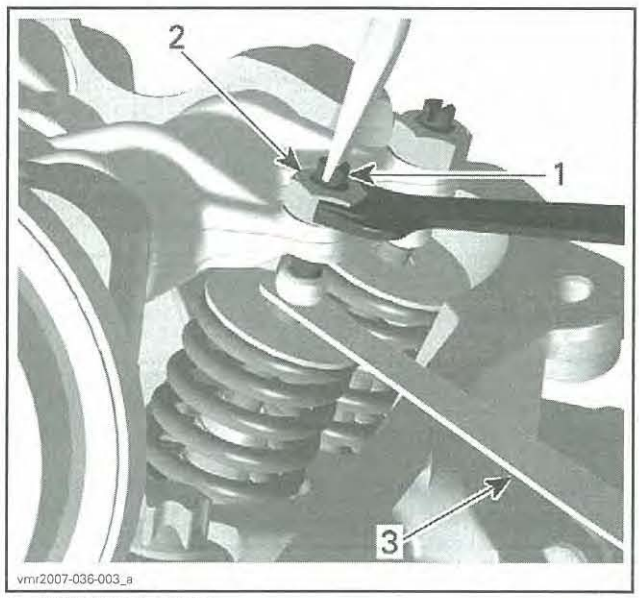
Using feeler gauge, check the valve clearance.

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

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

NOTE: Use mean value of exhaust/intake to ensure a proper valve adjustment.

Hold the adjustment 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.

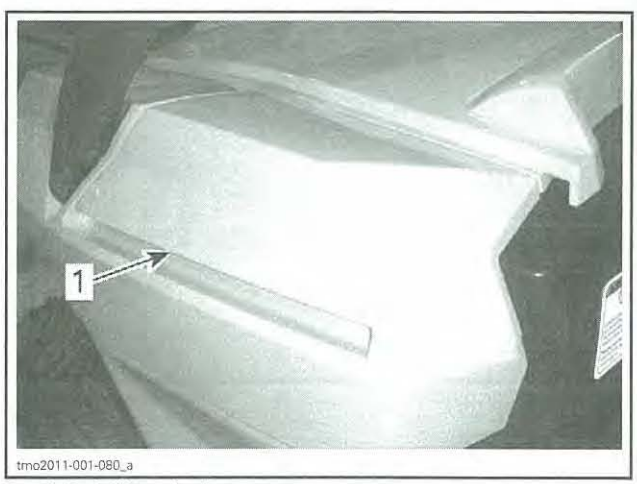
Before installing valve covers, recheck valve clearance.

CVT AIR FILTER CLEANING

CVT Air Filter

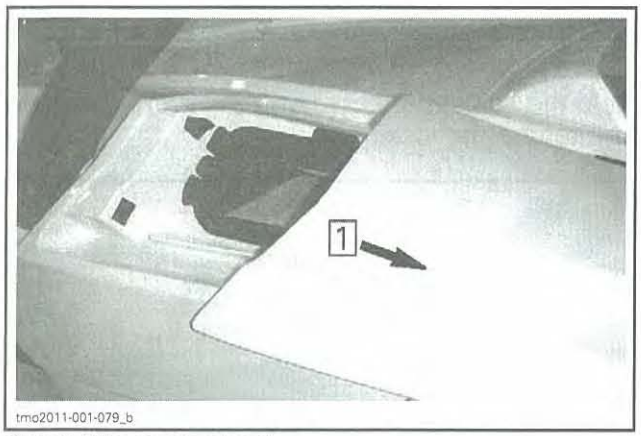
CVT Air Filter Removal

1. Remove the CVT air filter plastic cover located on LH side of hood near driver.



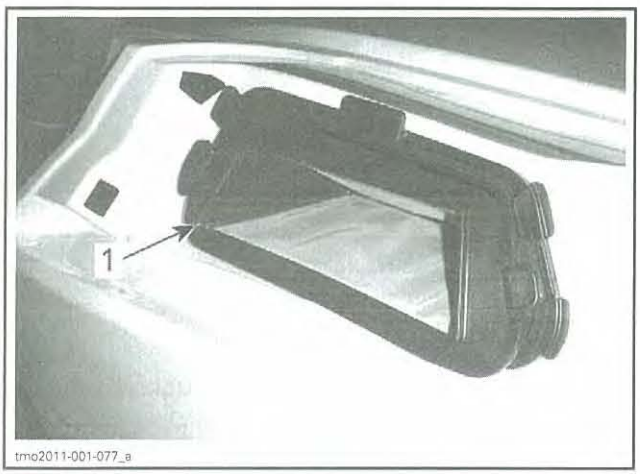
1. CVT air filter plastic cover

2. Slide the cover rearward.



Step 1: Slide cover rearward

3. Pull CVT air filter out.



1. CVT air filter

CVT Air Filter Cleaning

1. Remove CVT air filter.

1. CVT air filter

2. Inspect filter and replace if damaged.
3. Gently clean using a solution of soft soap and water, then rinse filter.
4. Dry filter completely.
5. Clean inside the CVT air inlet end.

CVT Air Filter Installation

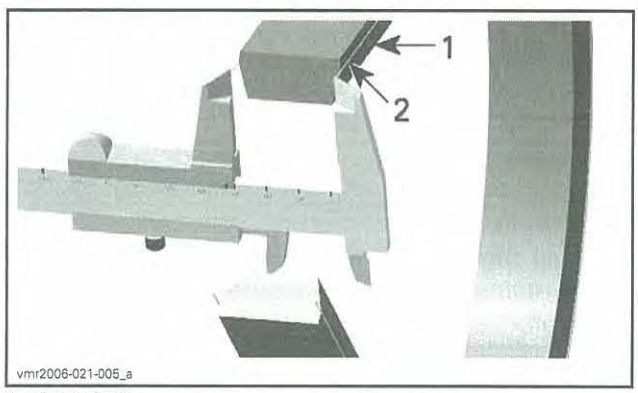
1. Install air filter on CVT inlet using retaining tabs.
2. Install CVT air filter cover by sliding in place toward front of vehicle.

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 (see table below).

DRIVE BELT WIDTH	
SERVICE LIMIT	30 mm (1.181 in)



1. Drive belt
2. Cord in drive belt

DRIVE PULLEY, DRIVEN PULLEY AND ONE-WAY BEARING MAINTENANCE

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

CVT AIR INLET/OUTLET CLEANING

1. Remove CVT cover, refer to *CONTINUOUSLY VARIABLE TRANSMISSION (CVT)* subsection.
2. Inspect and clean the air inlet and outlet openings from inside the inner CVT cover.
3. Inspect and clean the aft end of air outlet duct at rear of the vehicle.

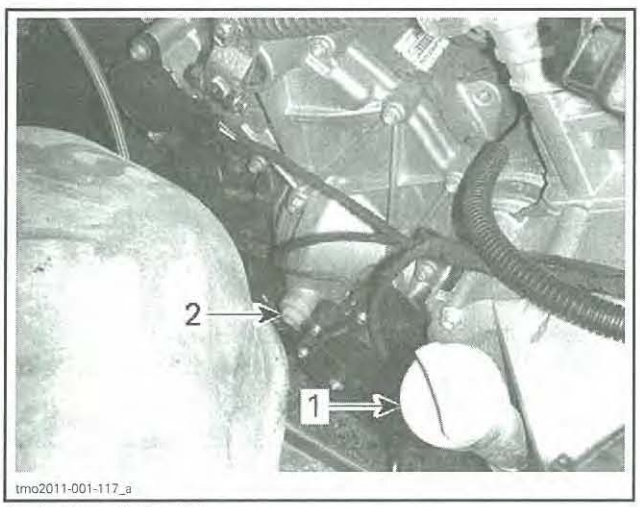
NOTE: If a lot of debris or grime are found in the CVT system, it may be necessary to remove the ducts and thoroughly clean them.

4. Reinstall CVT cover.

GEARBOX OIL LEVEL VERIFICATION

Remove the RH lateral console panel and the fuel tank cover.

Check the gearbox oil level by removing the gearbox oil level plug.



1. Engine oil dipstick
2. Gearbox oil level plug

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

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

GEARBOX OIL REPLACEMENT

Draining Procedure

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

Oil change should be done with a warm engine.

⚠ WARNING

The gearbox oil can be very hot.

Place a drain pan under the gearbox drain plug area.

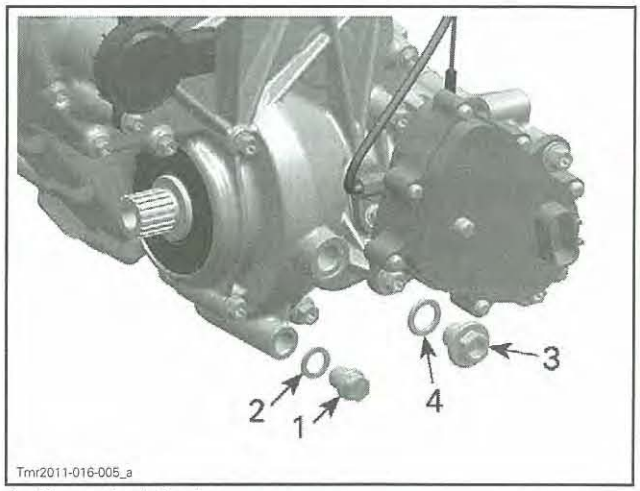
Clean drain plug area and remove magnetic drain plug with its sealing ring to drain gearbox oil.

Discard sealing ring. Always install a NEW one.

Remove oil filler screw including its O-ring.

NOTICE **Pay attention not to loose O-ring on oil filler screw.**

Wait a while to allow oil flow out of gearbox.



1. Magnetic drain plug
2. Sealing ring
3. Oil filler screw
4. O-ring

Dispose gearbox oil as per your local environmental regulations.

Inspection

Oil condition gives information about the teeth condition inside the gearbox. See *TROUBLESHOOTING* in this subsection.

Clean the magnetic drain plug from metal shavings and dirt. Presence of debris gives an indication of failure inside the gearbox. Check gearbox to correct the problem.

Replace O-ring of oil filler screw if brittle, hard or otherwise damaged.

Filling Procedure

Make sure that magnetic drain plug is reinstalled and tight.

Always install a NEW sealing ring.

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

With the vehicle on a level surface, fill the gearbox through the oil filler hole with XPS SYNTHETIC GEAR OIL (75W 140) (P/N 293 600 140) until the oil reaches the lower threads of the oil filler hole (around 450 ml (15.22 U.S. oz)).

However, if the XPS synthetic gear oil is not available use a gearbox oil that meets the requirements of 75W 140 API GL-5 synthetic gear oil.

Install the oil filler screw with its O-ring. Tighten oil filler screw to recommended torque.

PART	TORQUE
Oil filler screw	5 N•m ± 0.6 N•m (44 lbf•**in** ± 5 lbf•**in**)

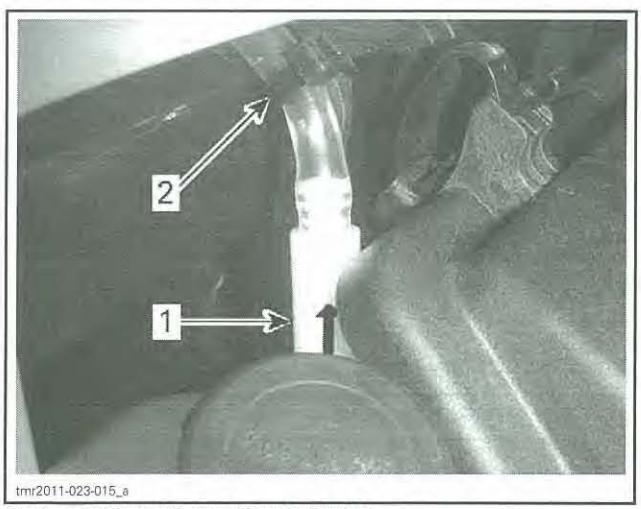
THROTTLE BODY INSPECTION

1. Refer to *AIR INTAKE SYSTEM* subsection and remove the following:
   - Air filter housing
   - Adapter hose between air filter housing and throttle body.
2. Visually inspect throttle plate and throttle body venturi for cleanliness.
3. Clean inside throttle body using a common throttle body cleaner if necessary.

FUEL TANK VENT BREATHER FILTER REPLACEMENT

Ensure breather filter is installed with the flow arrow pointing towards the vent hose.

Secure the vent hose using a locking tie as illustrated.



FUEL TANK VENT BREATHER FILTER
1. Direction arrow on breather filter pointing towards vent hose
2. Vent hose secured with a locking tie

FUEL SYSTEM INSPECTION

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

⚠ WARNING

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

FUEL PUMP PRESSURE TEST

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

FUEL PUMP PREFILTER CLEANING

1. Remove fuel pump from fuel tank, refer to *FUEL PUMP REMOVAL* in *FUEL TANK AND FUEL PUMP* subsection.
2. Clean the fuel pump prefilter (strainer) using XPS PARTS AND BRAKES CLEANER (P/N 219 701 705) and low pressure air.
3. If the fuel pump prefilter is heavily soiled, clogged or damaged:
   - Replace it with a new one. Refer to *FUEL PUMP STRAINER REPLACEMENT* in the *FUEL TANK AND FUEL PUMP* subsection.
   - Inspect inside of fuel tank for contaminants.
   - Clean fuel tank as required.
   - Inspect fuel tank vent breather filter. Replace as necessary. Refer to *FUEL TANK VENT BREATHER FILTER* in *FUEL TANK AND FUEL PUMP* subsection.

BATTERY INSPECTION

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

Inspect battery posts condition, battery rack mounting, straps and strap attachment points.

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

SPARK PLUG REPLACEMENT

Spark Plug Removal

Unplug the spark plug cable.

Clean the spark plug area with pressurized air.

Unscrew spark plug.

Spark Plug Installation

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

1. Using a wire feeler gauge, set electrode gap as specified in *TECHNICAL SPECIFICATIONS*.
2. Apply antiseize lubricant over the spark plug threads to prevent possible seizure.
3. Hand screw spark plug into cylinder head, then tighten with a torque wrench and an appropriate socket.

SPARK PLUG TORQUE
20 N•m ± 2 N•m (15 lbf•ft ± 1 lbf•ft)

VEHICLE SPEED SENSOR (VSS) CLEANING

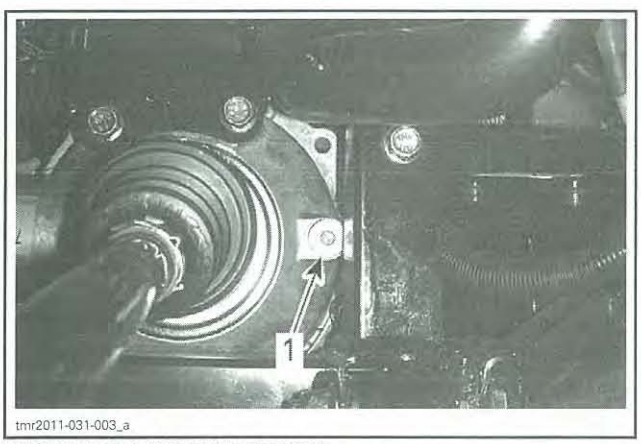
Remove the VSS. Refer to *VSS REMOVAL* in *GEARBOX AND 4X4 COUPLING UNIT* subsection.

Remove all metal particles and oil from the VSS magnet.

NOTE: A dirty VSS will cause erratic speedometer readings.

FRONT DIFFERENTIAL OIL LEVEL VERIFICATION

Clean filler plug prior to checking oil level.



FRONT RIGHT SIDE OF VEHICLE
1. Filler plug

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

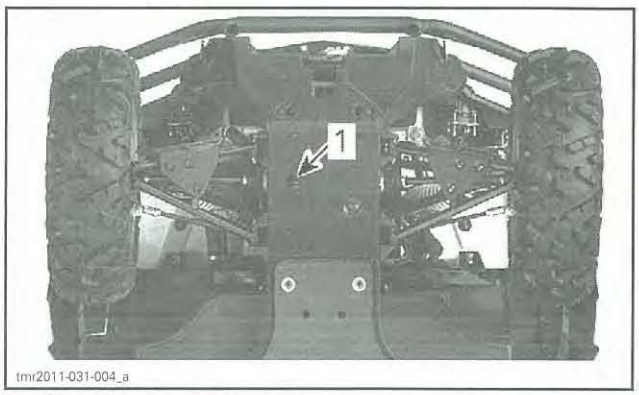
Reinstall filler plug with a NEW sealing ring.

TORQUE	
FILLER PLUG	22.5 N•m ± 2.5 N•m (17 lbf•ft ± 2 lbf•ft)

FRONT DIFFERENTIAL OIL REPLACEMENT

Place vehicle on a level surface. Set transmission in park position.

From underneath of vehicle, clean drain plug area.

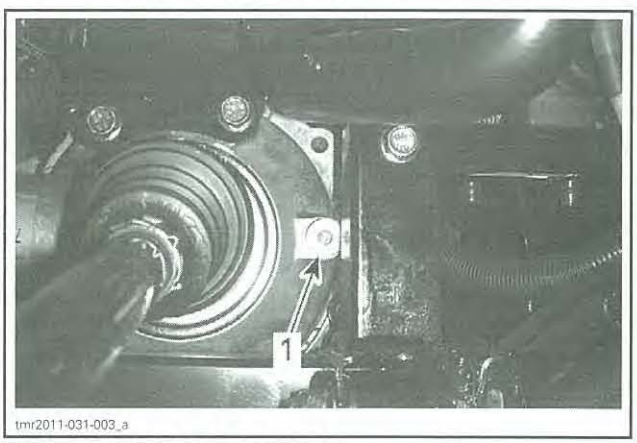


1. Drain plug access hole

Place a drain pan under the front differential.

Remove drain plug.

Unscrew filler plug.



FRONT RIGHT SIDE OF VEHICLE
1. Filler plug

Install drain plug.

TORQUE	
DRAIN PLUG	7.5 N•m ± 0.5 N•m (66 lbf•**in** ± 4 lbf•**in**)

Refill front differential with recommended oil.

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

Reinstall filler plug with a NEW sealing ring.

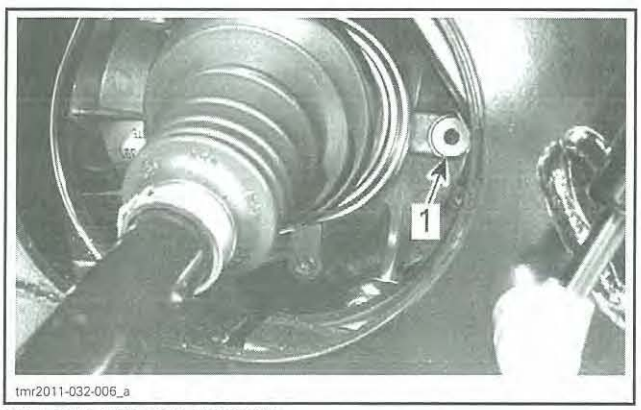
TORQUE	
FILLER PLUG	22.5 N•m ± 2.5 N•m (17 lbf•ft ± 2 lbf•ft)

REAR FINAL DRIVE OIL LEVEL VERIFICATION

Ensure vehicle is on a level surface.

Clean filler plug area.

Remove filler plug.



LH REAR SIDE OF VEHICLE
1. Filler plug

It is possible to verify the oil level by inserting a wire with a 90° bend through the oil filler hole.

Oil level is within the following distance from the bottom of oil filler plug threads when the vehicle is level on ground.

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

Reinstall filler plug with a NEW sealing ring.

TORQUE	
FILLER PLUG	22.5 N•m ± 2.5 N•m (17 lbf•ft ± 2 lbf•ft)

REAR FINAL DRIVE OIL REPLACEMENT

Ensure vehicle is on a level surface.

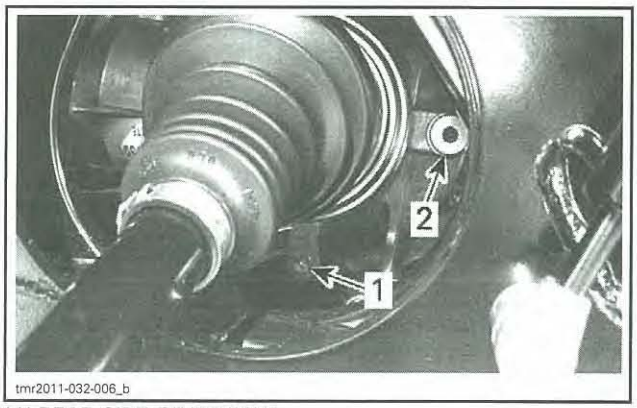
Remove the rear skid plate.

Clean filler and drain plug areas.

Place a drain pan under rear final drive.

Unscrew filler plug.

Remove drain plug.



LH REAR SIDE OF VEHICLE
1. Drain plug
2. Filler plug

Install drain plug.

TORQUE	
DRAIN PLUG	7.5 N•m ± 0.5 N•m (66 lbf•**in** ± 4 lbf•**in**)

Refill the rear final drive.

RECOMMENDED OIL	QUANTITY
XPS SYNTHETIC GEAR OIL (75W 140) (P/N 293 600 140) or a 75W 140 (API GL-5) gear oil	350 ml (12 U.S. oz)

Reinstall filler plug with a NEW sealing ring.

TORQUE	
FILLER PLUG	22.5 N•m ± 2.5 N•m (17 lbf•ft ± 2 lbf•ft)

DRIVE SHAFT BOOT AND PROTECTOR (VISUAL INSPECTION)

Visually inspect each drive shaft boot for grease leak, cracks or opening.

Check if the drive shaft boot protector are fixed firmly, not torn or otherwise damaged.

Replace if necessary.

DRIVE SHAFT JOINT INSPECTION

Turn and move drive shaft to detect excessive play.

PROPELLER SHAFT U-JOINT CONDITION

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

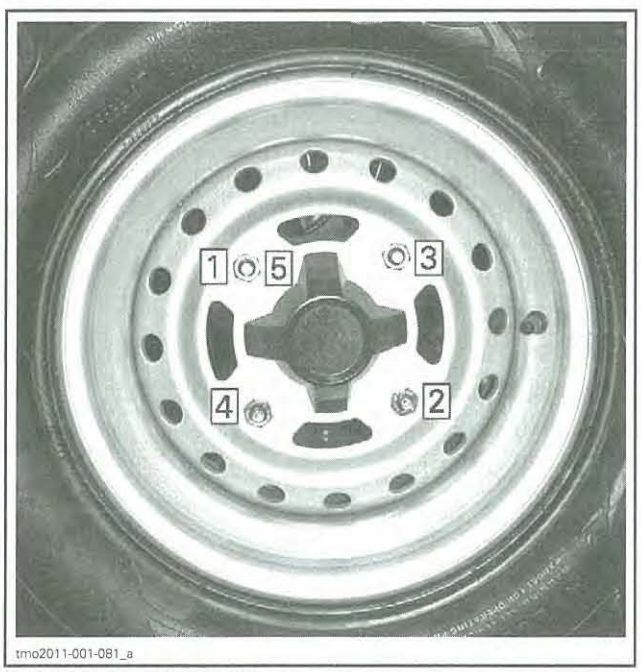
PROPELLER SHAFT U-JOINT LUBRICATION

PROPELLER SHAFT U-JOINT LUBRICATION
Use Hi-temp bearing grease NLGI-2 or an equivalent

WHEEL LUG NUT TORQUE CHECK

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

WHEEL LUG NUTS	
TORQUE	100 N•m ± 10 N•m (74 lbf•ft ± 7 lbf•ft)



TIGHTENING SEQUENCE

WHEEL BEARING INSPECTION

1. Safely lift and support the front of vehicle. Refer to *INTRODUCTION* subsection.
2. Hold wheel by the top and the bottom and move it. Check for any play.
3. If there is any loose, replace wheel bearing, refer to *STEERING SYSTEM* subsection.

NOTE: To properly locate play during this inspection, be sure to check other components for wear or loose (ball joints, suspension pivots, etc). If necessary repair or replace 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.

STEERING SYSTEM INSPECTION

Steering Column

Turn and move steering column to detect any play.

Rack and Pinion

Check rack and pinion boots for:
- Damage
- Cracks.

Replace if necessary.

Tie-Rod End

Check tie-rod end ball joint for:
- Damage
- Pitting
- Play.

Replace if necessary.

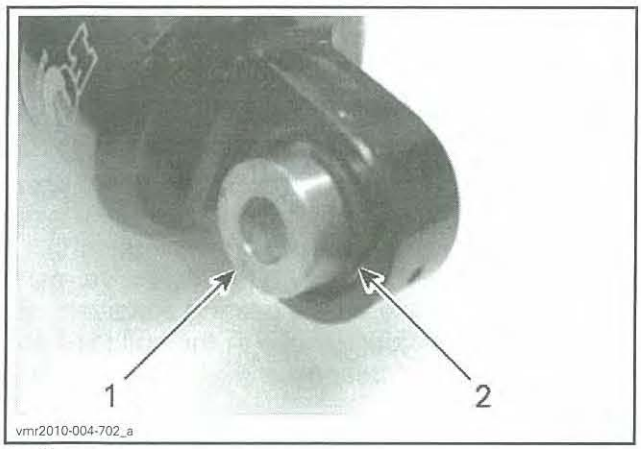
SHOCK ABSORBER INSPECTION

Check shock absorber for any leaks, replace if necessary.

SHOCK ABSORBER SPHERICAL BEARING LUBRICATION

HPG Shock Absorber with Remote Reservoir

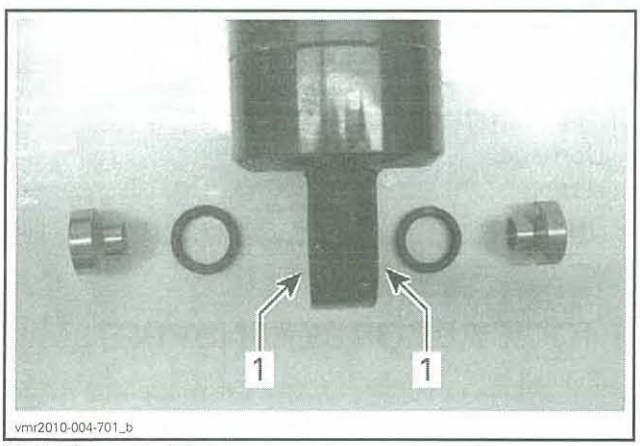
1. Remove shock absorber from vehicle.
2. Remove shock sleeves then O-rings from shock absorber.



1. Sleeve
2. O-ring

3. Clean spherical bearing using a shop rag to remove any dirt and debris.
4. Lubricate spherical bearing as illustrated.

SPHERICAL BEARING LUBRICATION
SUSPENSION GREASE (P/N 293 550 033)



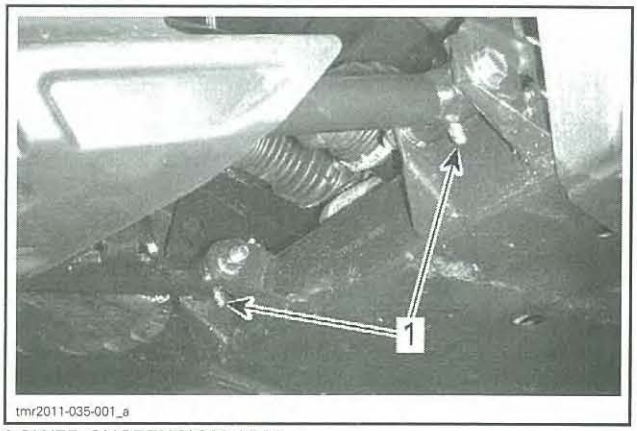
1. Apply grease here

5. Install O-rings then shock sleeves.
6. Install shock absorber.

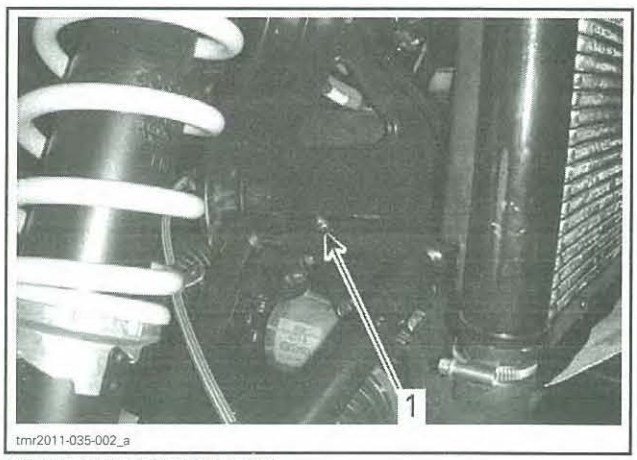
FRONT SUSPENSION ARM LUBRICATION

Lubricate suspension arm at grease fittings.

SUSPENSION ARM LUBRICATION
SUSPENSION GREASE (P/N 293 550 033)



LOWER SUSPENSION ARM
1. Grease fittings



UPPER SUSPENSION ARM
1. Grease fitting

FRONT SUSPENSION ARM INSPECTION

Check suspension arm for:
- Cracks
- Pitting
- Bending
- Distortion.

Check suspension arm for abnormal play:
- Side to side
- Up and down.

If any play is detected, inspect:
- Bushings
- Cushions
- Wear plates.

Check ball joint for:
- Damage
- Pitting
- Play.

Check ball joint bellows for:
- Damage
- Cracks.

BRAKE SYSTEM INSPECTION AND CLEANING

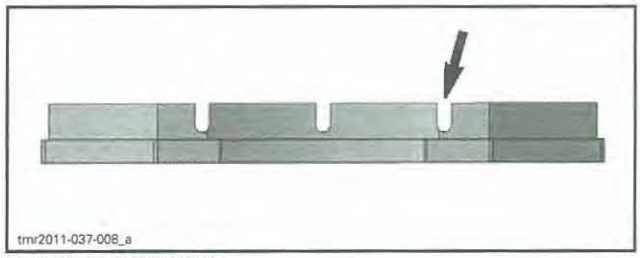
NOTICE Do not clean brake components in petroleum based solvent. Use brake system cleaner only. Soiled brake pads must be replaced with new ones.

Brake Pads

1. Measure brake pad lining thickness.

BRAKE PAD MINIMUM THICKNESS
1 mm (1/32 in)

NOTE: The brake pad grooves are wear indicators.



BRAKE PAD GROOVE

⚠ WARNING

Brake pads must always be replaced in pairs.

Brake Caliper

1. Remove calipers then check the following components:
   - Check brake pad pins
   - Check caliper boot for cracks
   - Check caliper movement on its support
   - Check pistons movement
   - Check pistons for scratches, rust or other damages.
2. Clean the following components using XPS PARTS AND BRAKES CLEANER (P/N 219 701 705):
   - Brake pads
   - Caliper support and slider
   - Caliper pistons, spring and pins.

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

3. Lubricate caliper sliders and pins using an appropriate *BRAKE CALIPER SYNTHETIC GREASE*.

Brake Disc

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

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

2. Clean brake disc using XPS PARTS AND BRAKES CLEANER (P/N 219 701 705).

Master Cylinder

1. Check master cylinder as follows:
   - Check cleanliness of master cylinder rod and boot.
   - Check master cylinder boot for cracks or damage.
2. If required, clean then lubricate master cylinder rod and boot using COSMO RUBBER GREASE (P/N 293 550 055).

Brake Pedal

1. Check brake pedal as follows:
   - Brake pedal pivot movement
   - Brake pedal pivot cleanliness.
2. If required, clean then lubricate brake pedal pivot using XPS SYNTHETIC GREASE (P/N 293 550 010).

Brake Hoses

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

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

BRAKE FLUID REPLACEMENT

Brake Fluid Draining

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

PRESEASON PREPARATION

Prior to using vehicle, proper vehicle preparation is required after a storage period.

If any worn, broken or damaged parts are found, replace them.

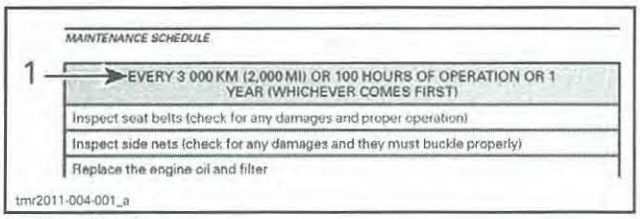
Remove rags that were installed for storage: CVT outlet hose and muffler.

Disconnect air inlet hose from the air filter housing and inspect for animal nests etc. Reinstall hose.

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

Reinstall battery. Refer to *CHARGING SYSTEM*.

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



1. Use this chart

NOTE: If the "every 6 000 km (4,000 mi) or 200 hours of operation or 2 years" maintenance service is due, also perform the related items as per the maintenance chart.

Test drive vehicle to confirm proper operation.

STORAGE PROCEDURE

SERVICE PRODUCTS

Description	Part Number	Page
BRP FUEL STABILIZER	413 408 600	33
BRP HEAVY DUTY CLEANER	293 110 001	34
XPS LUBE	293 600 016	34
XPS MULTI-PURPOSE CLEANER	219 701 709	34
XPS STORAGE OIL (EXCEPT U.S. COUNTRY)	413 711 600	33
XPS STORAGE OIL (U.S. COUNTRY ONLY)	413 711 900	33

GENERAL

If the SSV 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.

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

PROCEDURES

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

FUEL SYSTEM

Fuel System Protection

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.

NOTICE **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.

ENGINE

Engine Internal Lubrication

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

Proceed as follows:

1. Remove lateral console panels.
2. Remove spark plugs.
3. Spray storage oil into each cylinder.

NOTE: Use the storage oil as per country availability.

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

4. Press start button, 1 or 2 seconds maximum, to lubricate cylinders.
5. Reinstall the spark plugs.

NOTE: Do not run engine during storage period.

6. Block muffler outlet with a rag.

1. Muffler outlet

CVT Protection

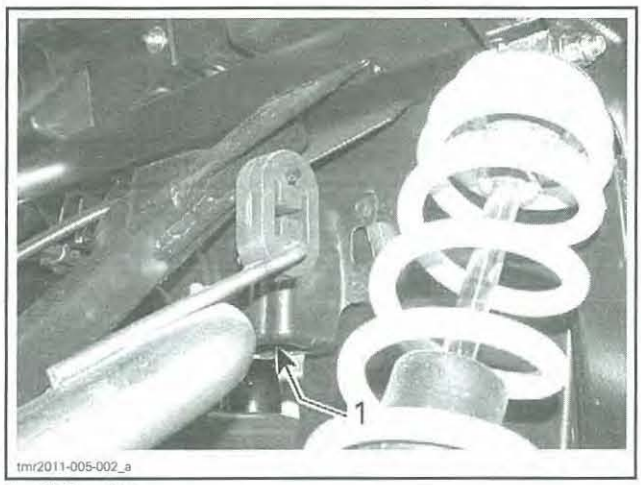
Remove drive belt. Refer to *ENGINE, CVT AND GEARBOX.*

Close CVT cover.

Block CVT outlet with a rag.

NOTE: To reach the CVT outlet, tilt the cargo box.

1. Tilted cargo box



1. CVT outlet

ELECTRICAL SYSTEM

Battery Removal

Remove the battery.

Charge and store battery.

DRIVE SYSTEM

Lubricate front and rear propeller joints.

Lubricate the engine output shaft with XPS LUBE (P/N 293 600 016).

CHASSIS

Lubrication

Lubricate front suspension (no lube on rear).

Tire Pressure

Inflate tires to the recommended pressure.

Vehicle Cleaning

Wash and dry the vehicle.

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.**

Remove any dirt or rust.

To clean the vinyl or plastic parts, use only flannel clothes with XPS MULTI-PURPOSE CLEANER (P/N 219 701 709).

NOTICE **It is necessary to use flannel cloths on plastic parts to avoid damaging surfaces. Never clean plastic parts with strong detergent, degreasing agent, paint thinner, acetone, products containing chlorine, etc.**

To 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 XPS LUBE (P/N 293 600 016).

Vehicle Protection

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

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

SPECIAL PROCEDURES

SERVICE PRODUCTS

Description	Part Number	Page
XPS LUBE	293 600 016	35

GENERAL

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

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

ROLLED OVER VEHICLE

In the event the vehicle was rolled over, check the following.

Inspect suspension components and steering system components.

Inspect body and chassis for damage (welded joints, bent or cracked parts).

Pay particular attention to the cage, shoulder protector, side nets, seat belts and their mechanisms.

⚠ WARNING

Do not use vehicle if any of the safety devices are damaged or inoperative.

Check all fluids level before restarting engine.

NOTICE **Check for oil accumulation in the air intake system. Check air filter.**

After restarting engine, check multifunction gauge if any malfunction is detected.

Troubleshoot and repair as required before using vehicle.

SUBMERGED VEHICLE

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

NOTICE **A submerged vehicle may cause several damages (short and long term) if not serviced adequately or soon enough. Do not crank or start engine.**

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

Replace the air filter.

Drain, inspect and clean the CVT.

Empty muffler (removal required).

Unplug ECM connectors and open fuse boxes. Check for presence of water. Dry as necessary.

Replace the engine oil (without starting the engine).

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

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

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

Install spark plugs (replace if required).

Replace gearbox oil.

Look for water in fuel tank, in doubt, flush fuel tank and refill with new gas.

Look for water in brake system. Replace brake fluid as required.

⚠ WARNING

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

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

Stop the engine.

Change engine oil and filter.

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

Check gearbox oil. Replace oil if contaminated with water.

Replace oil of front differential.

Replace oil of rear final drive.

Lubricate front and rear suspensions and propeller shaft joints. Refer to *FRONT AND REAR SUSPENSIONS*.

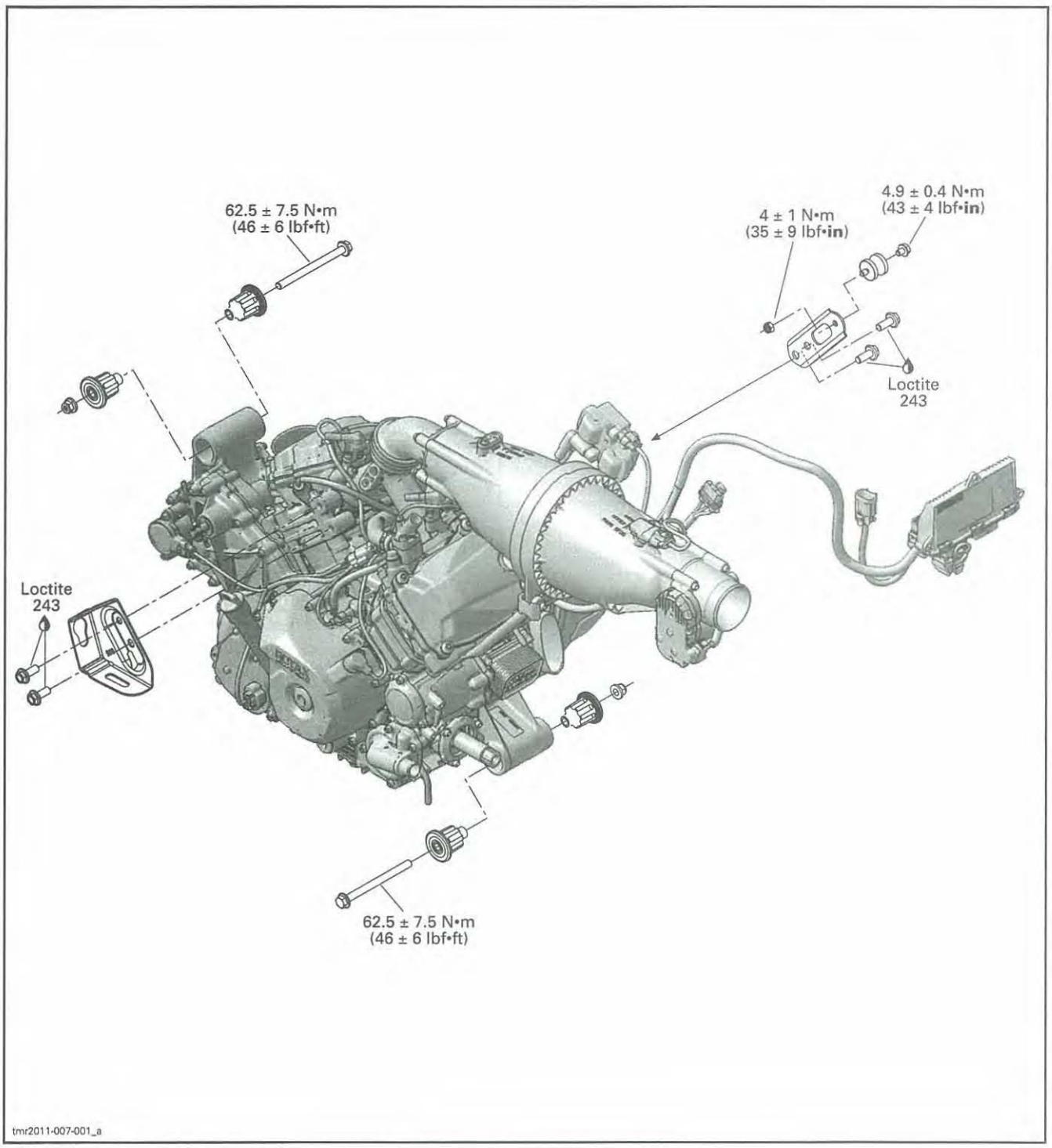
Spray all metal parts with XPS LUBE (P/N 293 600 016).

Test drive to confirm proper operation.

ENGINE REMOVAL AND INSTALLATION

SERVICE TOOLS

Description	Part Number	Page
ENGINE LIFTING TOOL	529 036 022	39



GENERAL

⚠ WARNING

To avoid potential burns, let engine and exhaust system cool down before 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 strictly be adhered to.
Locking devices when removed (e.g.: locking tabs, elastic stop nuts, self-locking fasteners, cotter pin, etc.) must be replaced.

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

PROCEDURES

ENGINE REMOVAL

Vehicle and Engine Preparation

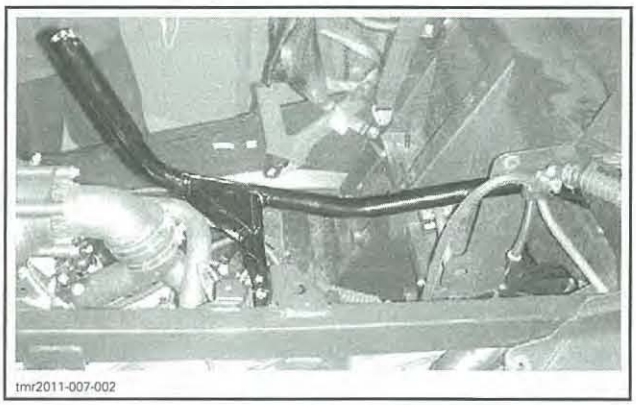
1. Place vehicle on a workstation that will have access to an engine-lifting hoist.
2. Safely lift and support the vehicle. Refer to *INTRODUCTION* subsection.
3. Unplug the BLACK (-) cable from battery, then the RED (+) cable.

NOTICE **Always unplug battery cables exactly in the specified order, the BLACK (-) cable first.**

4. Remove the front section of the cage.
5. Remove seats.
6. Refer to *BODY* subsection and remove the following plastic parts:
   - Upper and lower consoles
   - LH and RH lateral console panels
   - Under seat storage compartment
   - Fuel tank cowl
   - Glove box
   - RH inner panel.
7. Drain engine oil. Refer to *LUBRICATION SYSTEM* subsection.

NOTE: Drain engine oil only if engine overhaul is necessary.

8. Drain the engine coolant. Refer to *COOLING SYSTEM* subsection.
9. Remove fuel tank. Refer to *FUEL TANK AND FUEL PUMP* subsection.
10. Remove the LH passenger handhold bar.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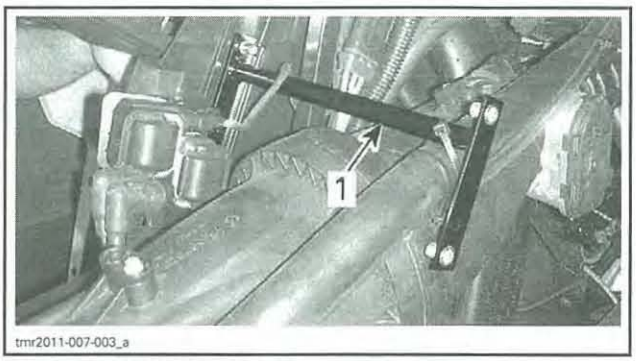
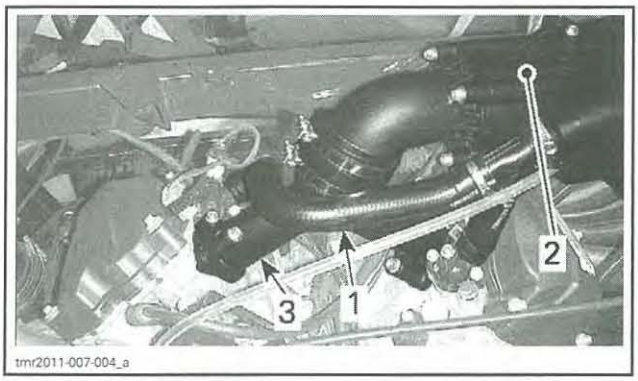
11. Remove the panel reinforcement support.



tmr2011-007-003_a

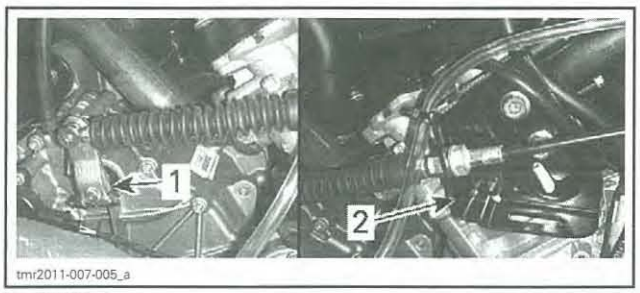
1. Panel reinforcement support

12. Disconnect both engine coolant hoses at cylinder heads.
13. Remove the plenumand the air intake manifold.
    13.1 Loosen clamp securing throttle body to plenum.
    13.2 Detach the plenum support from the front cylinder head.
    13.3 Unscrew air intake manifold from cylinder heads.
    13.4 Remove plenum and air intake manifold as an assembly.



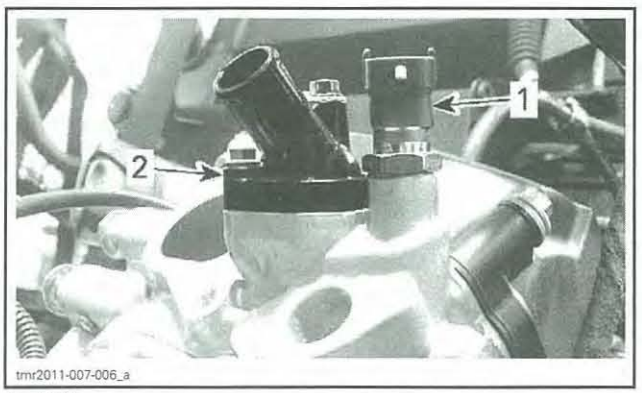
1. Engine coolant hoses
2. Plenum
3. Air intake manifold

14. Remove the shift plate.
15. Remove the shifter cable bracket.



1. Shift plate
2. Shifter cable bracket

16. Remove the front and rear head pipes. Refer to *EXHAUST SYSTEM* subsection.
17. Disconnect the coolant hose at water pump.
18. Disconnect the gearbox vent hose.
19. Remove the CVT outlet duct.
20. Unplug and remove the CTS (coolant temperature sensor).
21. Remove the coolant plastic housing from the rear cylinder head.



1. CTS
2. Coolant plastic housing

22. Detach the shifter cable from its bracket and remove it.

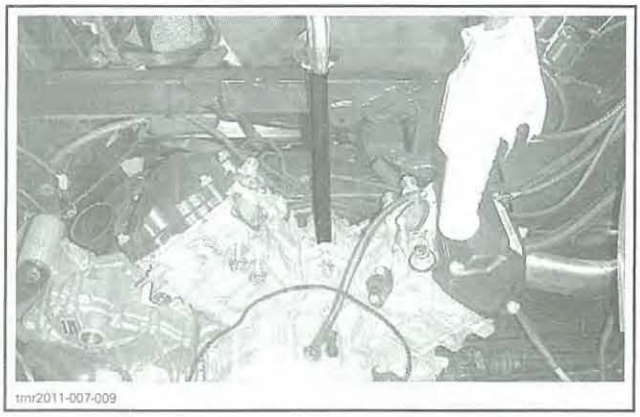
23. Remove the upper engine support with its rubber isolator.

1. Rubber isolator is located between frame and engine support

24. Disconnect the CVT inlet duct from the CVT cover.
25. Disconnect the crankcase vent hose.
26. Unplug all remaining connectors and remove required cables from engine. Cut all necessary locking ties.
    - Spark plug cables
    - Starter cable (retaining nut on starter body)
    - GBPS (Gear Box Position Sensor)
    - Vehicle speed sensor
    - Actuator connector
    - Neutral switch
    - OPS (Oil Pressure Sensor)
    - CPS (Crankshaft Position Sensor)
    - Engine ground cable (screwed on LH side of the engine)
    - Magneto.

Lifting Engine

1. Install the ENGINE LIFTING TOOL (P/N 529 036 022).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2. Remove retaining screws on front and rear propeller shafts.
3. Remove the front and rear engine support bolts.
4. Carefully lower the rear of the engine enough to reinstall temporally the engine support bolt.
5. Insert a spacer (± 9.5 mm (3/8 in) of thickness) between the engine support and the bolt.

NOTE: The spacer used in the following illustration is a monkey wrench of 25 cm (10 in).

tmr2011-007-010

6. Raise the front of engine to separate front propeller shaft from engine.

NOTE: If the propeller shaft cannot be removed easily, remove bolts retaining the front differential to create more space. Refer to *FRONT DRIVE* subsection.

7. Lower the front of engine to remove the rear engine support bolt and the spacer.
8. Remove engine from vehicle.

ENGINE INSTALLATION

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

Prior to install engine, inspect condition of engine mounts.

Install the rear propeller shaft onto engine output shaft.

Connect the front propeller shaft to engine output shaft while lowering engine.

Install rear and front engine mounting bolts then torque all mounting bolts.

NOTE: Do not install plastic parts, seats and cage front portion prior to *FINAL ASSEMBLY*.

Final Assembly Procedure

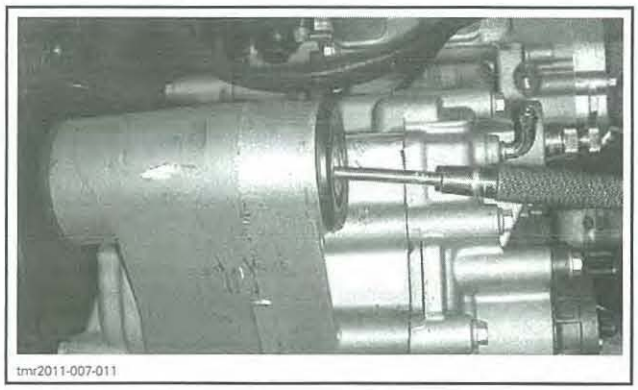
1. Fill engine with the recommended oil and quantity. Refer to *LUBRICATION SYSTEM* subsection.
2. Fill and bleed cooling system. Refer to *COOLING SYSTEM* subsection.
3. Check for any leaks.
4. Reinstall plastic parts, seats and the front portion of the cage.
5. Test drive vehicle to confirm proper operation.

ENGINE MOUNTS

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

Engine Mount Removal

Insert a punch into engine mount bushing and push the opposite engine mount out.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Engine Mount Installation

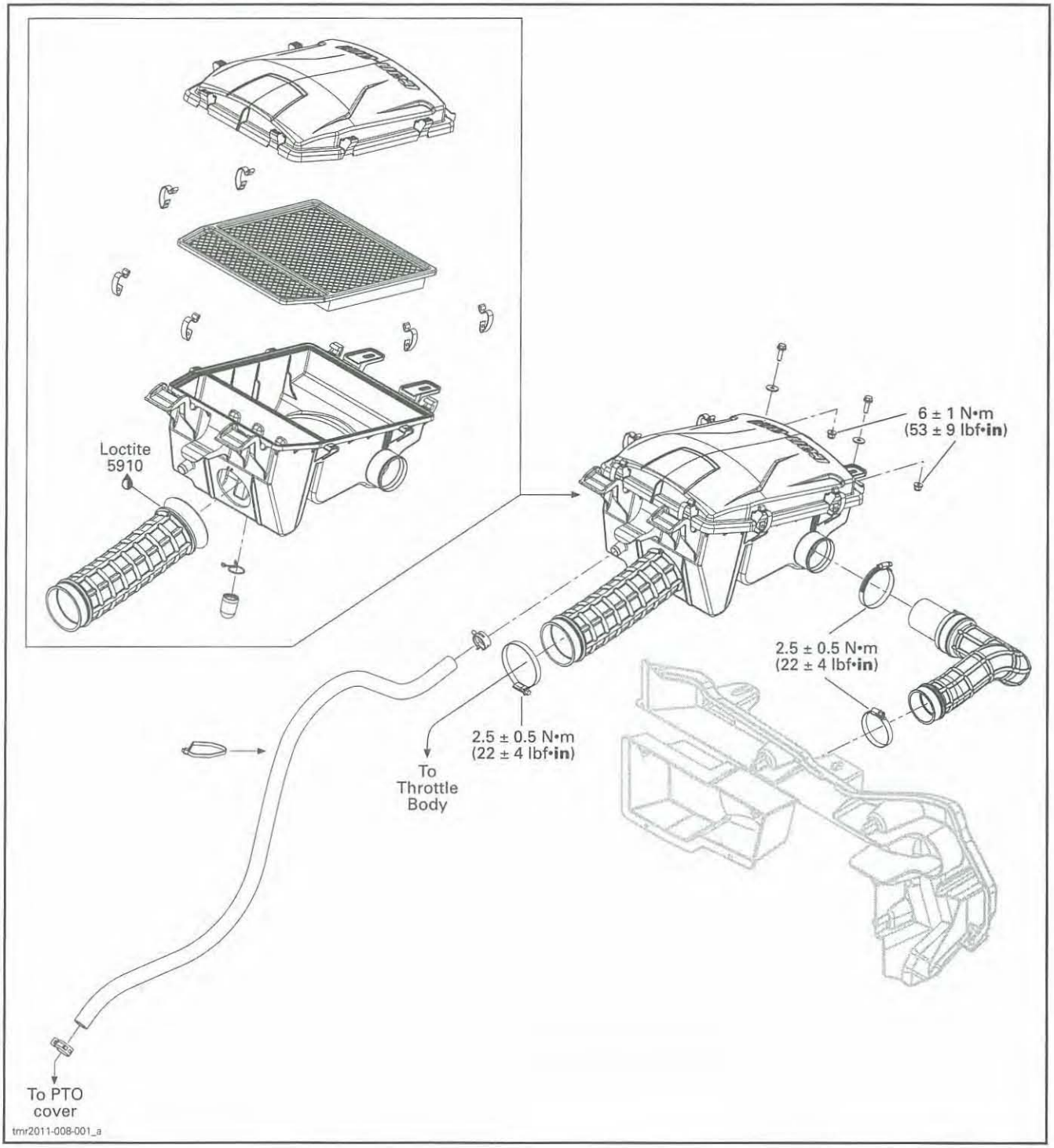
The installation is the reverse of the removal procedure.

AIR INTAKE SYSTEM

SERVICE PRODUCTS

Description	Part Number	Page
LOCTITE 5910	293 800 081	44

AIR FILTER HOUSING



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 when removed (e.g.: locking tabs, elastic stop nuts, cotter pin, etc.) must be replaced.

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

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

PROCEDURES

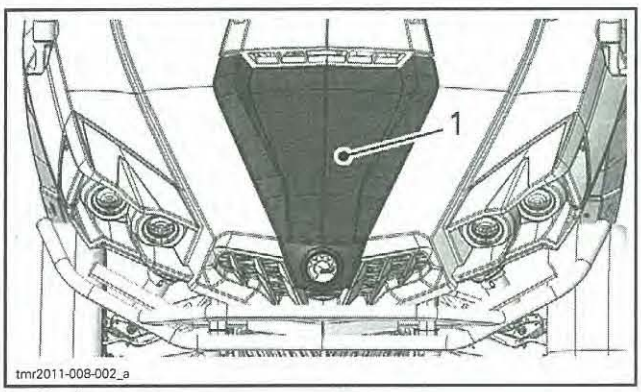
AIR FILTER

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

AIR FILTER HOUSING

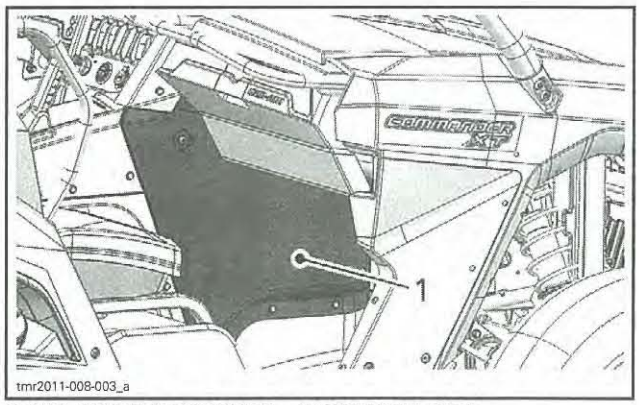
Air Filter Housing Removal

1. Remove the following parts:
   1.1 Service cover



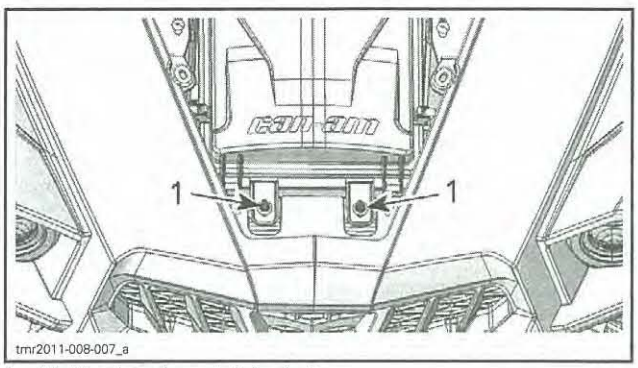
1. Service cover

   1.2 RH inner panel.



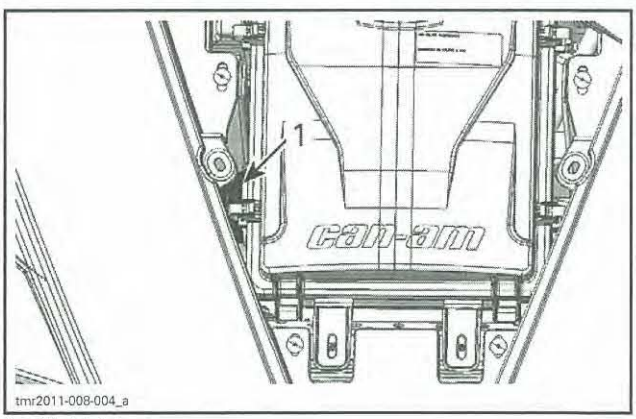
FROM INSIDE OF COCKPIT – PASSENGER SIDE
1. RH inner panel

2. Remove retaining bolts of air filter housing.



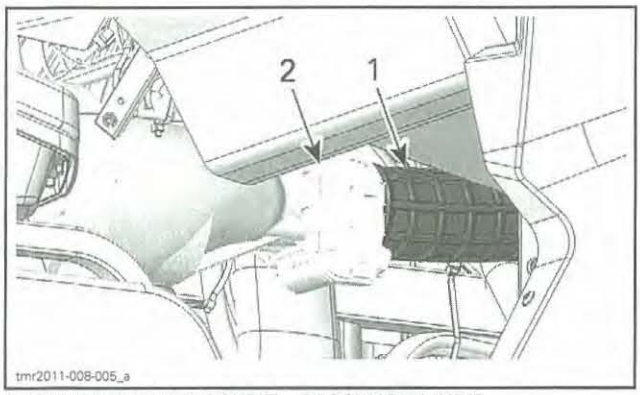
1. Air filter housing retaining bolts

3. Disconnect air inlet hose from the LH side of air filter housing.



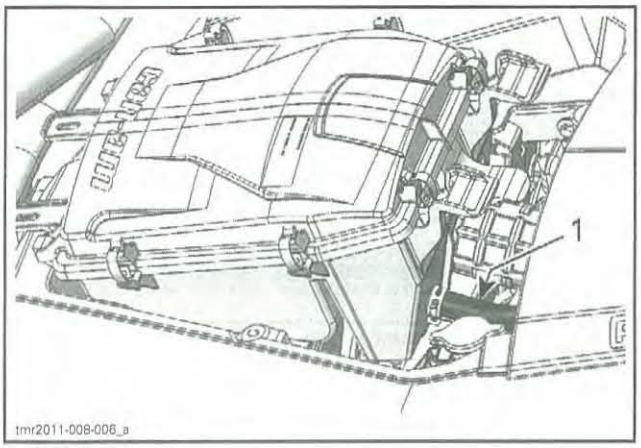
1. Air inlet hose

4. Disconnect intake adapter from throttle body.



FROM INSIDE OF COCKPIT – PASSENGER SIDE
1. *Intake adapter*
2. *Throttle body*

5. Disconnect vent hose from the rear of air filter housing.

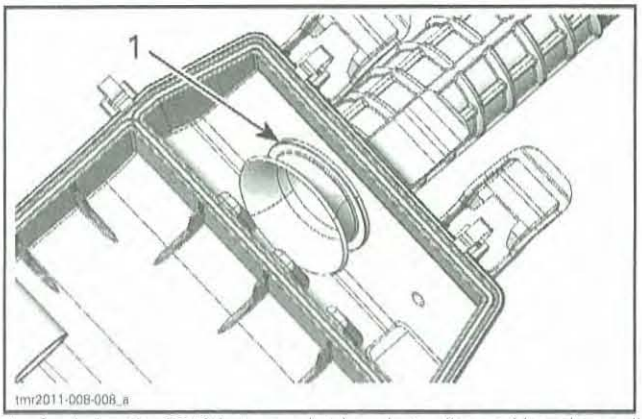


1. *Vent hose*

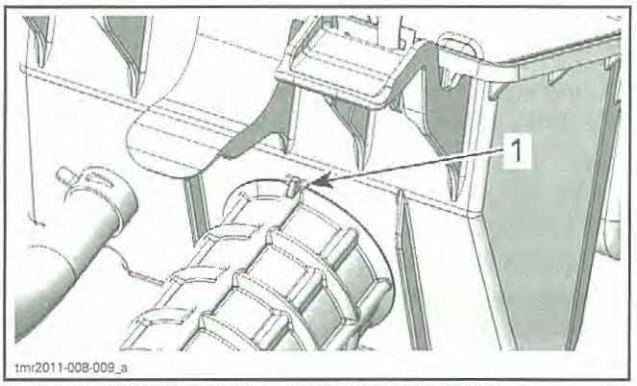
Air Filter Housing Installation

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

If the intake adapter is removed, reseal it with LOCTITE 5910 (P/N 293 800 081) and align its recess with the notch on air filter housing.



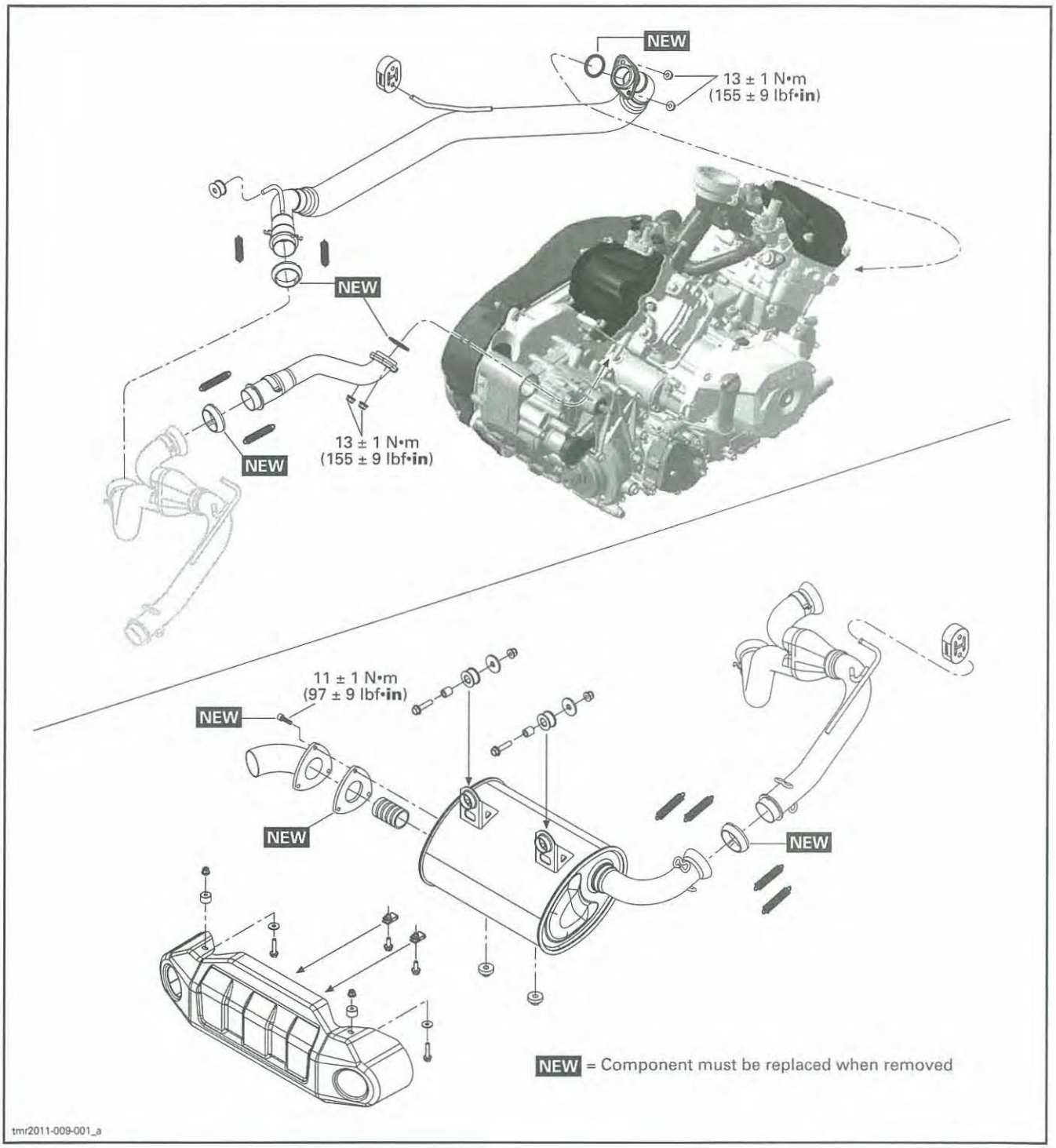
1. *Apply Loctite 5910 between intake adapter lips and housing wall*



1. *Intake adapter recess into air filter housing notch*

TORQUE	
Gear clamps	2.5 N•m ± 0.5 N•m (22 lbf•**in** ± 4 lbf•**in**)
Air filter housing nuts	6 N•m ± 1 N•m (53 lbf•**in** ± 9 lbf•**in**)

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

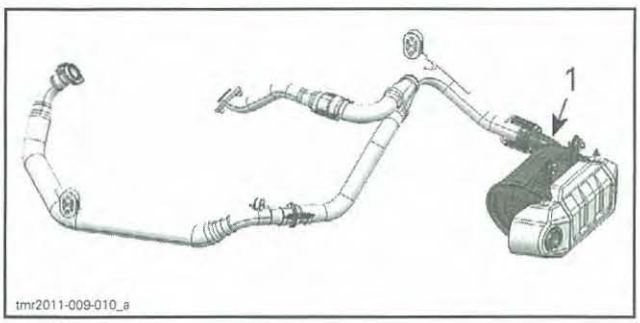
Hoses, cables or locking ties removed during a procedure must be reinstalled as per factory standards.

PROCEDURES

SPARK ARRESTER

For spark arrester servicing, refer to *PERIODIC MAINTENANCE PROCEDURES* subsection.

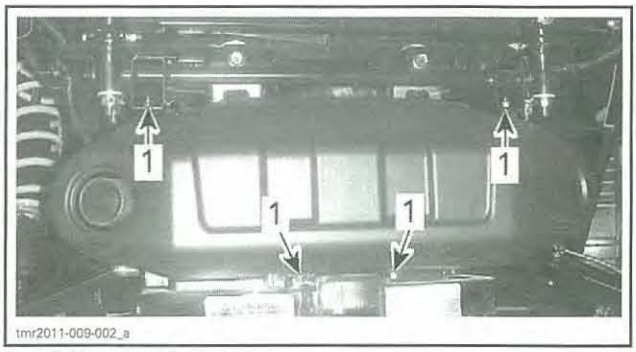
MUFFLER



1. Muffler

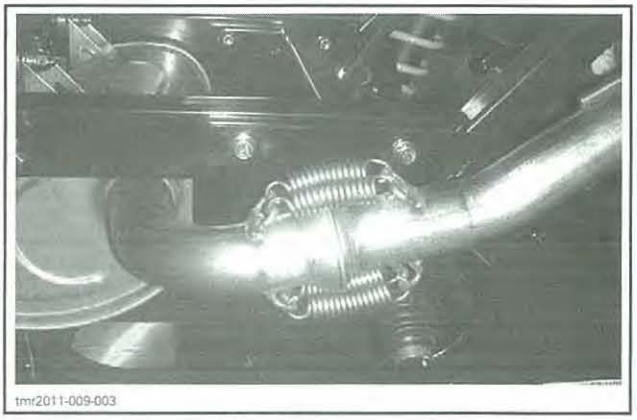
Muffler Removal

1. Remove the muffler cover.



1. Muffler cover bolts

2. Open cargo box and detach springs from the "Y" exhaust pipe.



3. Remove muffler retaining bolts.

4. Remove the muffler.
5. Discard the gasket at the end of "Y" exhaust pipe.

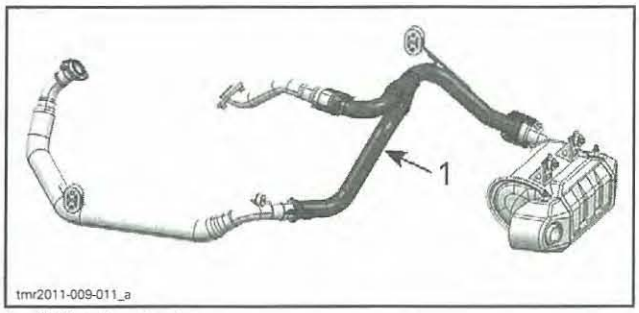
Muffler Inspection

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

Muffler Installation

For the installation, reverse the removal procedure.

"Y" EXHAUST PIPE



1. "Y" exhaust pipe

"Y" Exhaust Pipe Removal

1. Open the cargo box.
2. Remove the following parts:
   - Springs from head pipes
   - Muffler
   - "Y" exhaust pipe from vehicle.

"Y" Exhaust Pipe Inspection

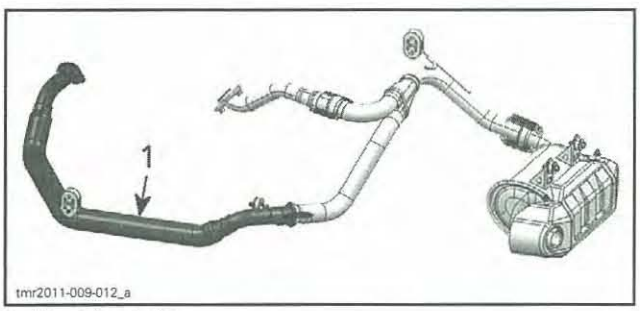
Check "Y" exhaust pipe for cracks, bending or other damages. Replace if need.

Check if the rubber support is brittle, hard or otherwise damage. Replace if need.

"Y" Exhaust Pipe Installation

The installation is the reverse of the removal procedure.

HEAD PIPE (FRONT CYLINDER)



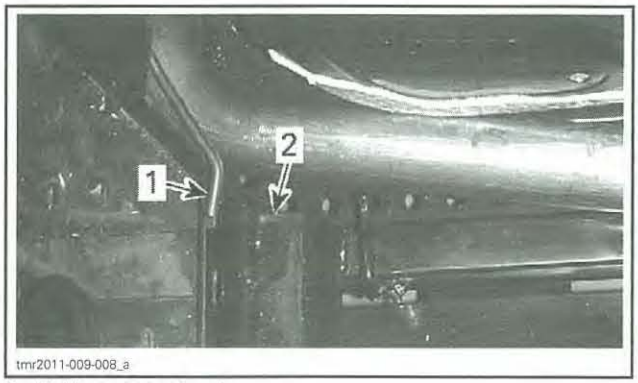
1. Front head pipe

Front Head Pipe Removal

1. Refer to *BODY* subsection and remove the following plastic parts:
   - LH lateral console panel
   - Under seat storage compartment.
2. Remove the following parts:
   - Springs from "Y" exhaust pipe
   - Rubber support
   - Head pipe nuts.
3. Remove front head pipe from vehicle according to following sub-steps:

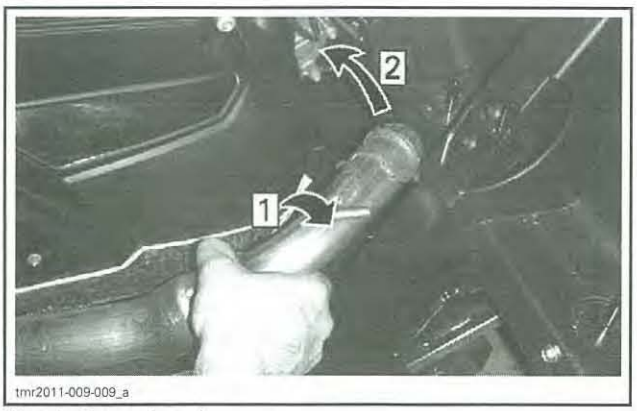
   NOTE: The space to remove the front head pipe is limited. When the head pipe is positioned correctly as shown, it can be removed easily without force.

   3.1 Position the rubber support rod near the front of the seat bracket.



1. Rubber support rod
2. Seat bracket

   3.2 Turn and lift the rear end of the head pipe.



Step 1: Turn outward
Step 2: Lift

   3.3 Remove head pipe from vehicle.

Front Head Pipe Inspection

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

Check if the rubber support is brittle, hard or otherwise damage. Replace if need.

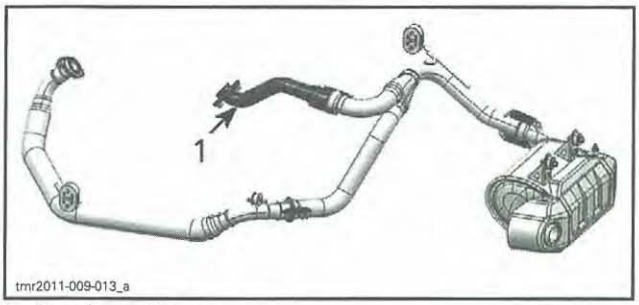
Front Head Pipe Installation

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

Install NEW exhaust gaskets.

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

HEAD PIPE (REAR CYLINDER)



1. Rear heap pipe

Rear Head Pipe Removal

1. Remove the following parts:
   - Springs from "Y" exhaust pipe
   - LH lateral console panel, refer to *BODY* subsection
   - Head pipe nuts.
2. Remove head pipe from the vehicle.
3. Remove and discard exhaust gaskets.

Rear Head Pipe Inspection

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

Check if the rubber support is brittle, hard or otherwise damage. Replace if need.

Rear Head Pipe Installation

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

Install NEW exhaust gaskets.

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

LUBRICATION SYSTEM

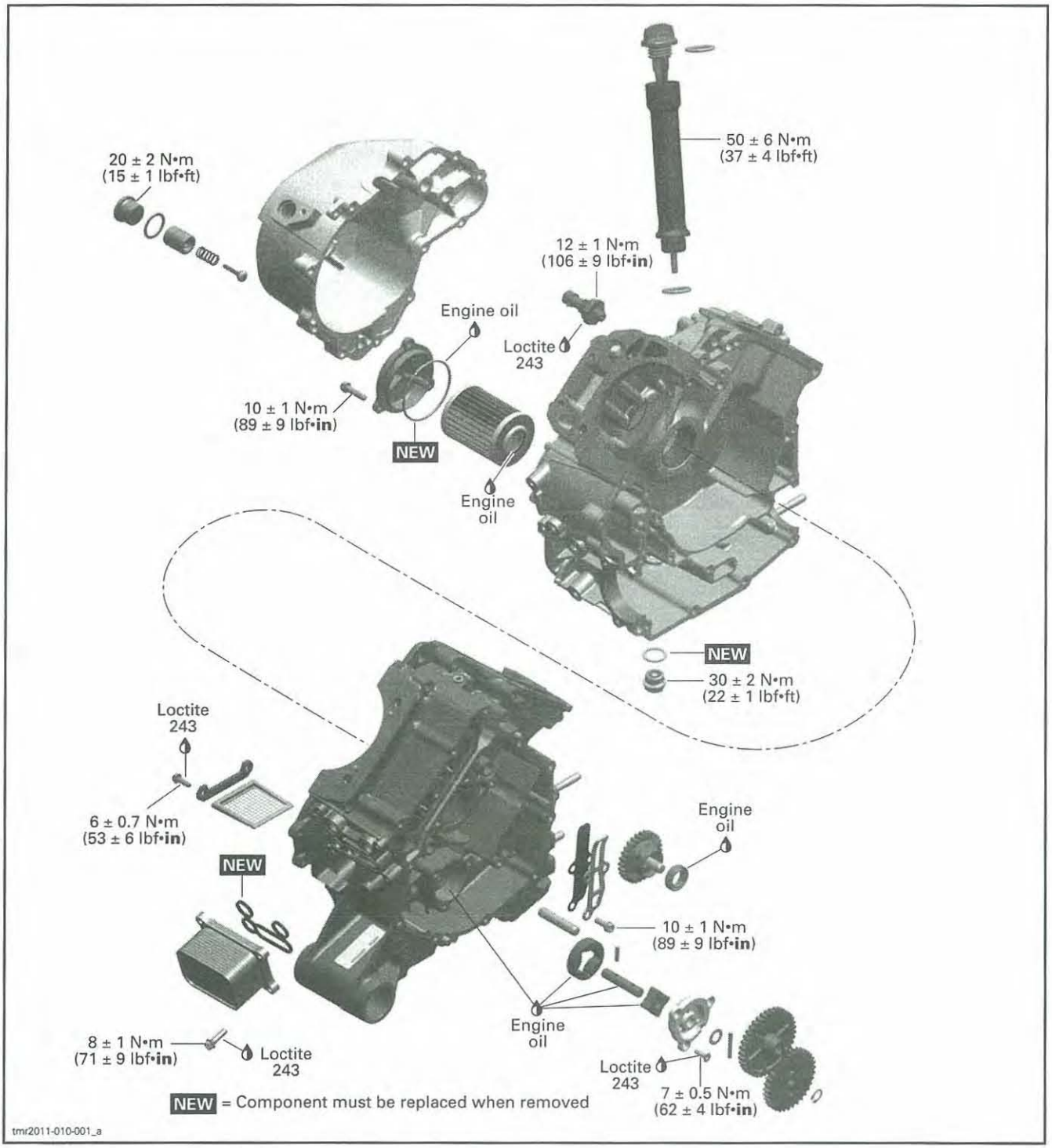
SERVICE TOOLS

Description	Part Number	Page
ADAPTER HOSE	529 035 652	52
DISCONNECT TOOL	529 035 714	52
PRESSURE GAUGE	529 035 709	52

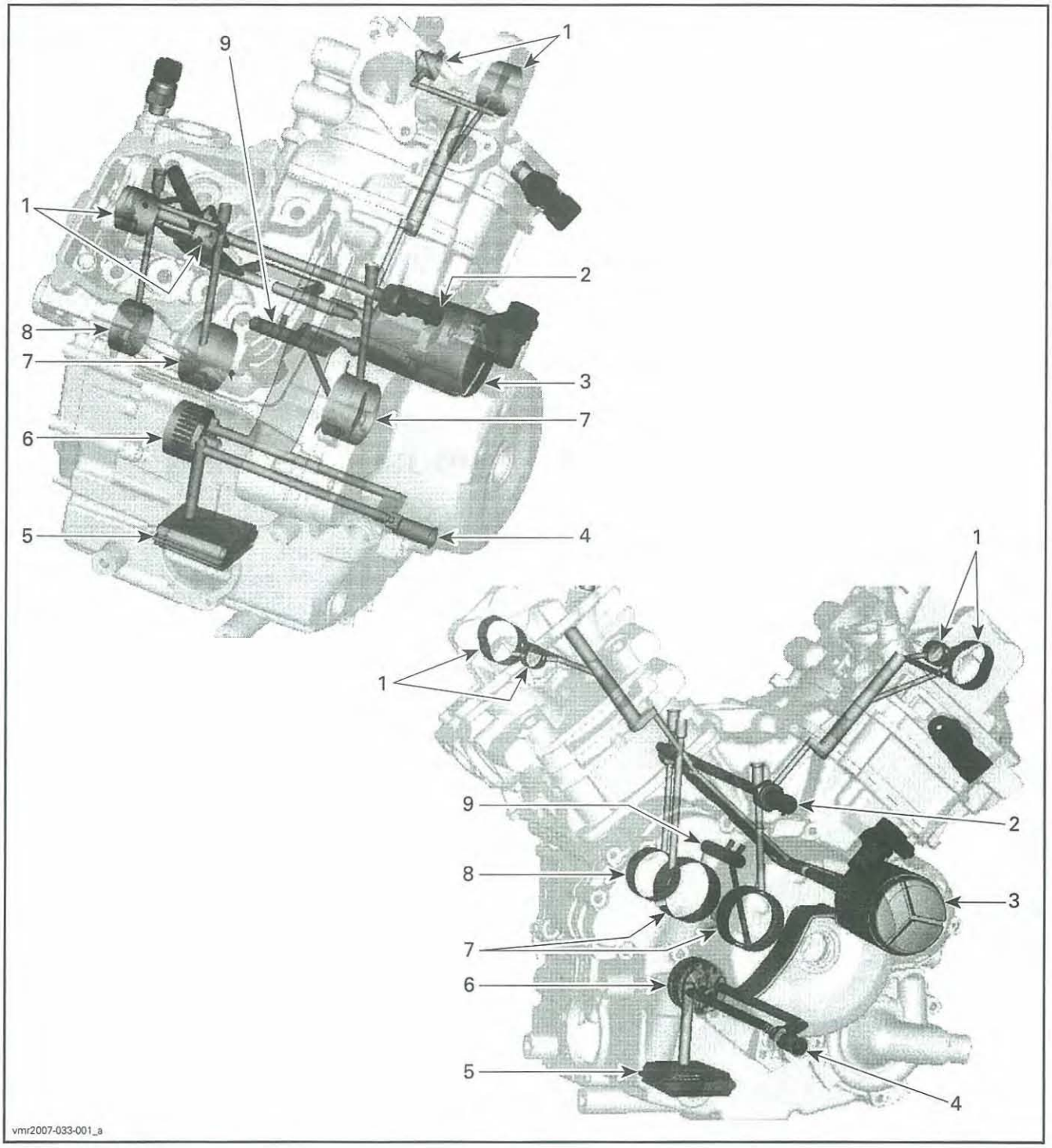
SERVICE PRODUCTS

Description	Part Number	Page
LOCTITE 243 (BLUE)	293 800 060	54

COMPONENTS


20 ± 2 N•m
(15 ± 1 lbf•ft)
50 ± 6 N•m
(37 ± 4 lbf•ft)
12 ± 1 N•m
(106 ± 9 lbf•in)
Engine oil
Loctite 243
10 ± 1 N•m
(89 ± 9 lbf•in)
NEW
Engine oil
NEW
30 ± 2 N•m
(22 ± 1 lbf•ft)
Loctite 243
6 ± 0.7 N•m
(53 ± 6 lbf•in)
NEW
Engine oil
10 ± 1 N•m
(89 ± 9 lbf•in)
Engine oil
8 ± 1 N•m
(71 ± 9 lbf•in)
Loctite 243
Loctite 243
7 ± 0.5 N•m
(62 ± 4 lbf•in)
NEW = Component must be replaced when removed
tmr2011-010-001_a

ENGINE LUBRICATION CIRCUIT



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

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

INSPECTION

ENGINE OIL PRESSURE

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

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

Install PRESSURE GAUGE (P/N 529 035 709) and ADAPTER HOSE (P/N 529 035 652).

The engine oil pressure should be within the following values.

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

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

Remove oil pressure gauge and adapter hose.

NOTE: To remove adapter hose from oil pressure gauge, use the DISCONNECT TOOL (P/N 529 035 714).

Reinstall the oil pressure switch.

TROUBLESHOOTING

LOW OR NO OIL PRESSURE

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

OIL CONTAMINATION

1. Defective water pump seal ring or rotary seal.
   - *Check for oil or coolant leak from indicator hole near water pump, refer to COOLING SYSTEM subsection. Replace seal if necessary.*
2. Cylinder head or cylinder base gasket leak.
   - *Retighten cylinder head to specified torque, refer to TOP END subsection. Replace gasket if tightening does not solve the problem.*
3. Engine internal damage.
   - *Repair engine.*
4. Oil cooler gasket leak.
   - *Replace oil cooler gasket and change engine oil.*

HIGH OIL CONSUMPTION

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

PROCEDURES

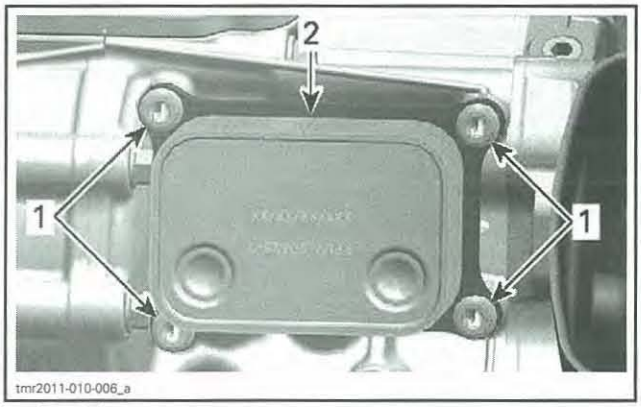
OIL COOLER

Oil Cooler Removal

Drain engine oil. Refer to *ENGINE OIL CHANGE* in the *PERIODIC MAINTENANCE PROCEDURES* subsection.

Drain coolant. Refer to *COOLING SYSTEM* subsection.

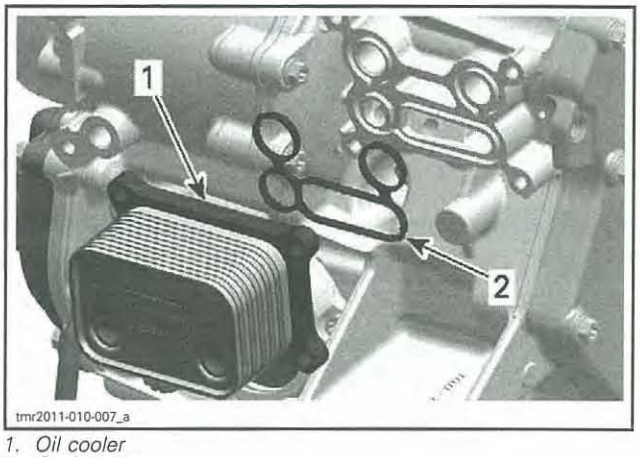
Remove oil cooler retaining screws.



1. Retaining screws
2. Oil cooler

Place rags or towels under oil cooler to catch remaining oil and coolant.

Remove oil cooler and discard gasket.



1. Oil cooler
2. Gasket

Oil Cooler Inspection

Check oil cooler for cracks or other damage.

Replace if necessary.

Oil Cooler Installation

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

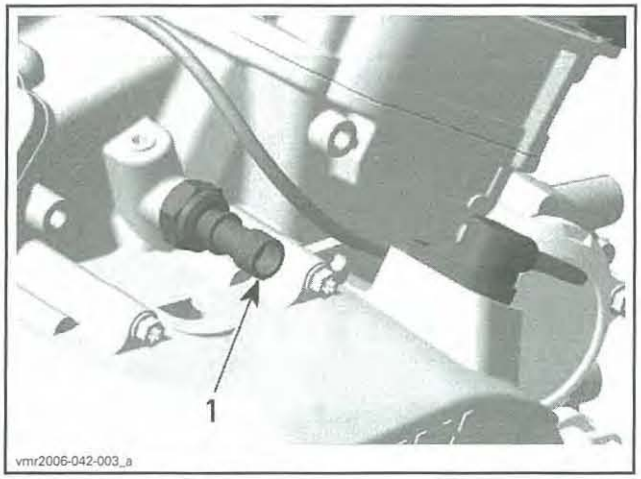
Wipe off any oil and coolant spillage.

Install a NEW gasket.

Refill engine oil with recommended oil and at the proper oil lever. Refer to *ENGINE OIL CHANGE* in the *PERIODIC MAINTENANCE PROCEDURES* subsection.

Refill and bleed cooling system. Refer to *COOLING SYSTEM* subsection.

OIL PRESSURE SWITCH (OPS)



1. Oil pressure switch

Oil Pressure Switch Activation

Oil pressure switch works when engine oil pressure is 20 kPa to 40 kPa (2.9 PSI to 5.8 PSI).

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

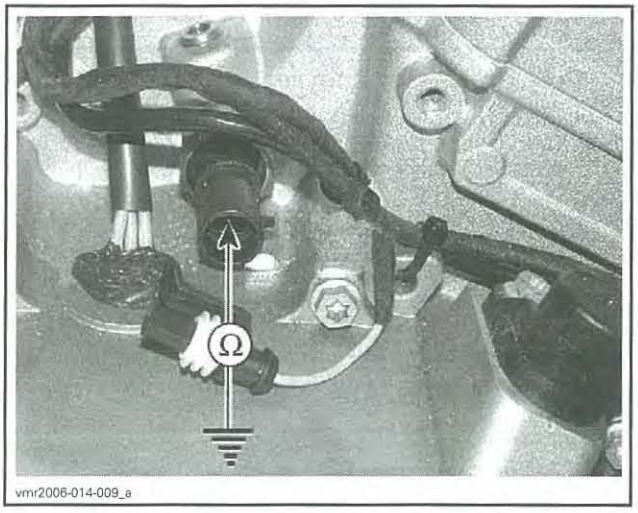
If the engine oil pressure is good, check the resistance of the oil pressure switch while engine is off and while engine is running.

Oil Pressure Switch Resistance Test

Disconnect the connector from the oil pressure switch.

Use a multimeter to check the resistance between as shown.

OPS CONNECTOR		ENGINE NOT RUNNING	ENGINE RUNNING
PIN		RESISTANCE (Ω)	
4	Engine ground	Close to 0 Ω (normally closed switch)	Infinite (open) when pressure reaches 20 kPa to 40 kPa (2.9 PSI to 5.8 PSI)



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

If the values are correct, check wiring.

Oil Pressure Switch Removal

Unplug the oil pressure switch connector.

Unscrew and remove oil pressure switch.

Oil Pressure Switch Installation

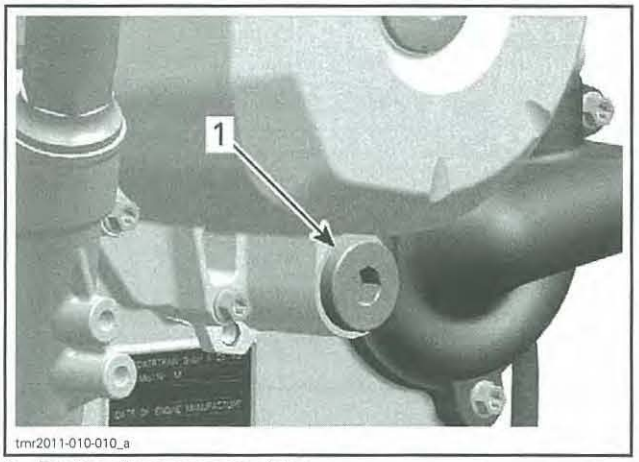
Apply LOCTITE 243 (BLUE) (P/N 293 800 060) on threads of oil pressure switch.

Tighten oil pressure switch to specified torque.

OIL PRESSURE SWITCH TIGHTENING TORQUE
12 N•m ± 1 N•m (106 lbf•**in** ± 9 lbf•**in**)

ENGINE OIL PRESSURE REGULATOR

The oil pressure regulator is located on the engine magneto side (inside magneto cover).

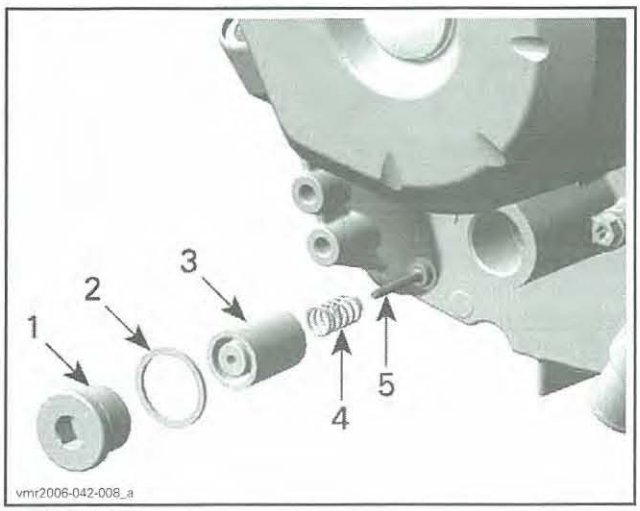


1. Engine oil pressure regulator

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

Oil Pressure Regulator Removal

Remove plug screw and pull oil pressure regulator out.



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

Oil Pressure Regulator Inspection

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

Check spring for free length.

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

NOTE: Replace worn or damaged components.

Clean bore and thread in the magneto housing from metal shavings and other contaminations.

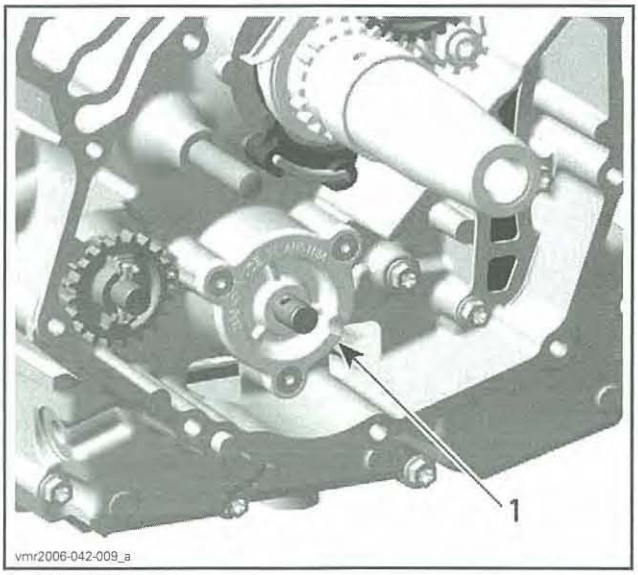
Oil Pressure Regulator Installation

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

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

OIL PUMP

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

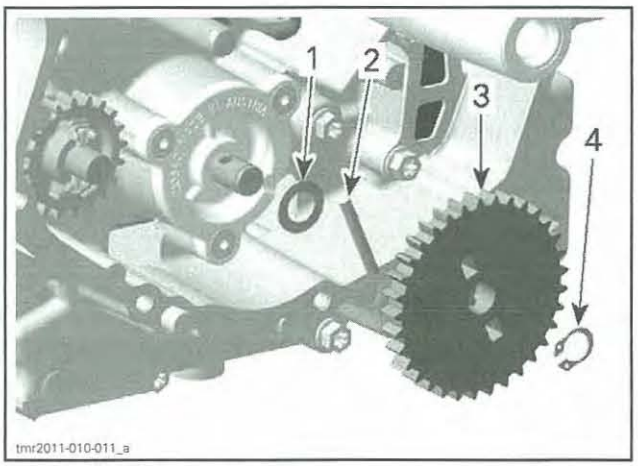


1. *Oil pump*

Oil Pump Removal

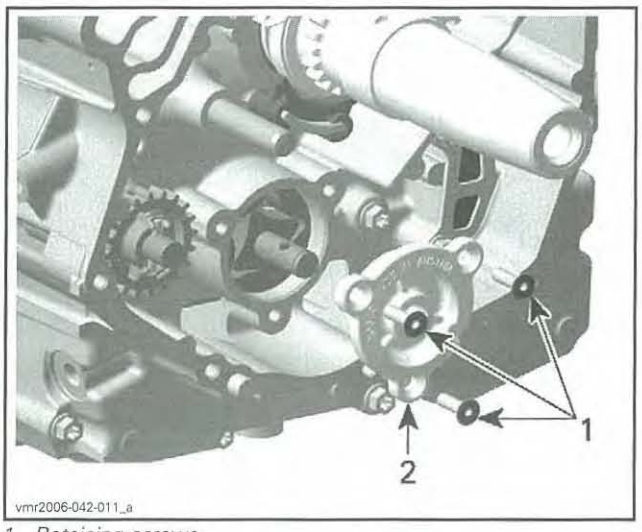
Remove the PTO cover. Refer to *PTO COVER* in the *BOTTOM END* subsection.

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



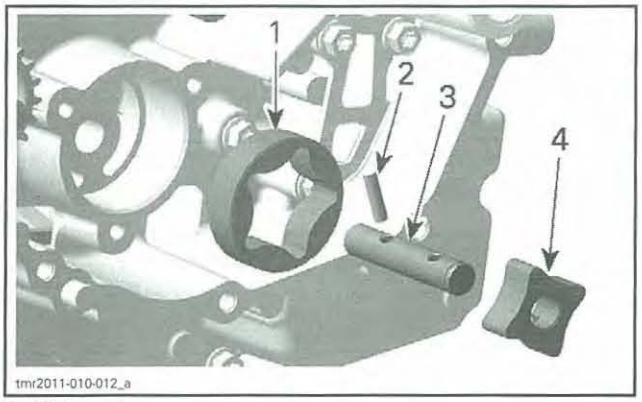
1. *Thrust washer*
2. *Needle pin*
3. *Oil pump gear*
4. *Retaining ring*

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



1. Retaining screws
2. Oil pump cover

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

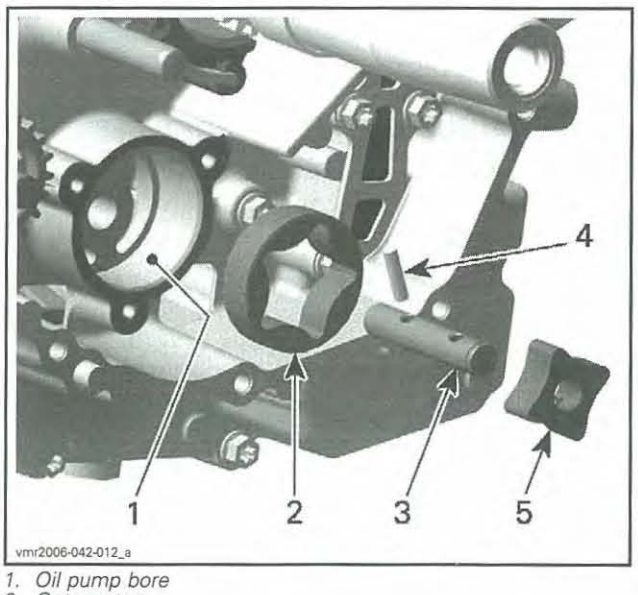


1. Outer rotor
2. Needle pin
3. Oil pump shaft
4. Inner rotor

Oil Pump Inspection

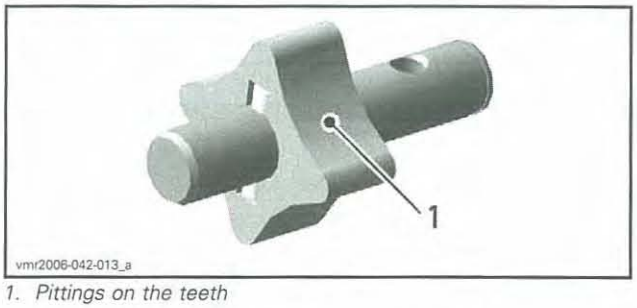
Inspect oil pump and oil pump cover bore for marks, scratches or other damages. Check for scratches in crankcase between outer rotor and oil pump bore. If so, replace damaged parts.

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



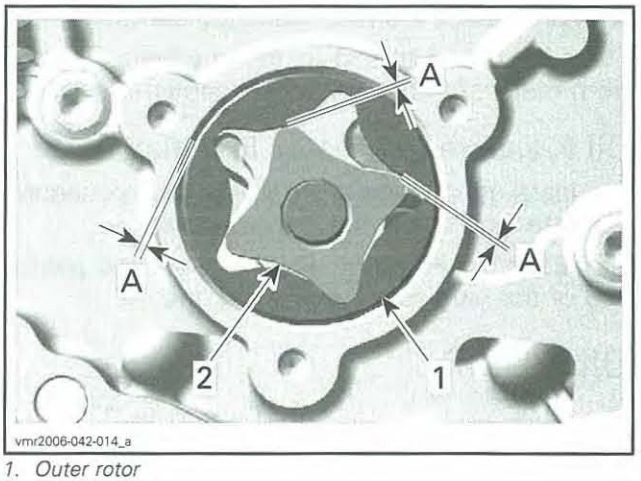
1. Oil pump bore
2. Outer rotor
3. Oil pump shaft
4. Needle pin
5. Inner rotor

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



1. Pittings on the teeth

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

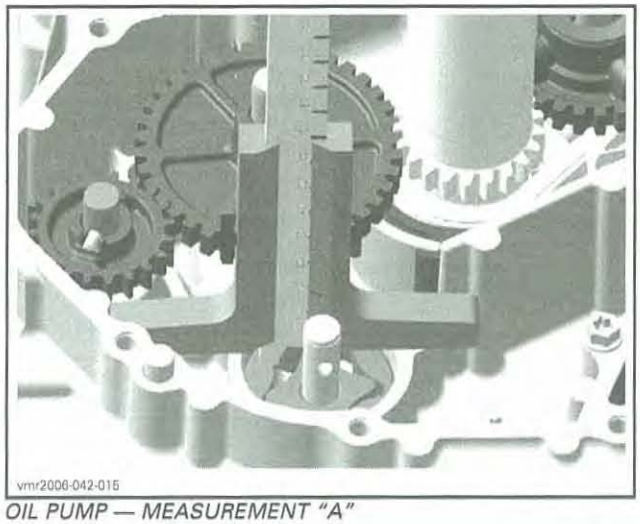


1. Outer rotor
2. Inner rotor
A. 0.25 mm (.0098 in)

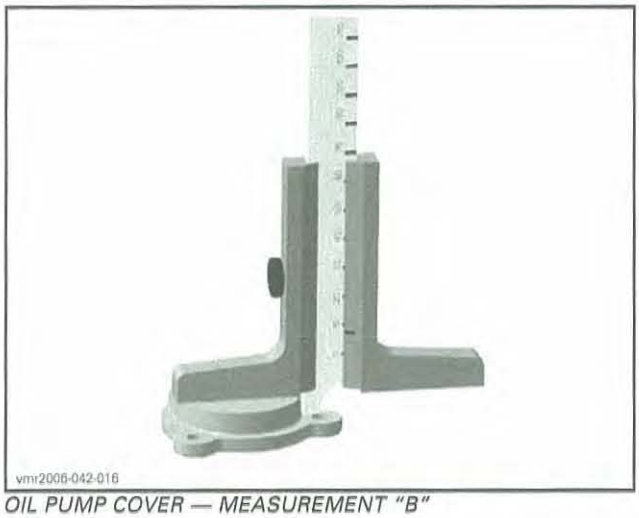
If clearance of inner and outer rotors exceeds the tolerance, replace oil pump shaft assembly. Ensure to also check oil pump cover. If damaged, replace the complete oil pump assembly.

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

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



OIL PUMP — MEASUREMENT "A"



OIL PUMP COVER — MEASUREMENT "B"

Difference between measurements A and B should not exceed specification. If so, replace the complete oil pump assembly.

OIL PUMP AXIAL CLEARANCE	
SERVICE LIMIT	0.2 mm (.008 in)

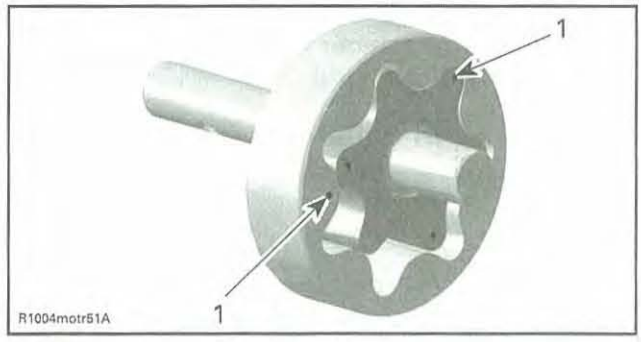
NOTE: When the axial clearance of the oil pump shaft assembly increases, the oil pressure decreases.

Oil Pump Installation

For installation, reverse the removal procedure.

Pay attention to the following details.

NOTE: The outer rotor and inner rotor are marked. When installing, make sure both markings are on the outer side.



TYPICAL
1. Markings

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

Oil Pump Final Test

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

ENGINE OIL STRAINER

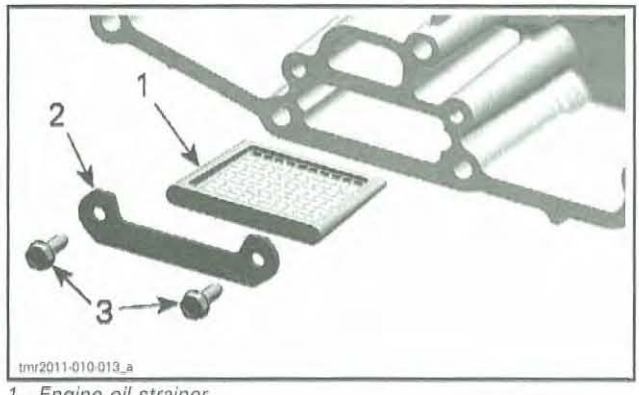
The engine oil strainer is located between both crankcase halves.

Oil Strainer Removal

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

Remove screws and retaining plate.

Pull out engine oil strainer.



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

Oil Strainer Cleaning and Inspection

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

⚠ WARNING

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

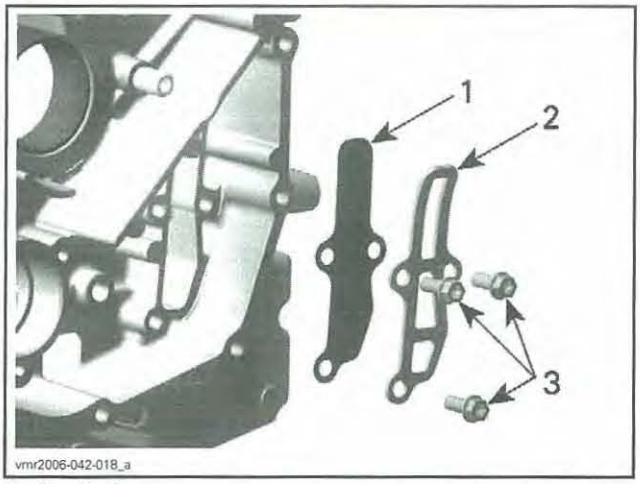
Check engine oil strainer for cracks or other damage. Replace if damaged.

Oil Strainer Installation

The installation is the reverse of the removal procedure.

REED VALVE

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



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

Reed Valve Removal

Remove:

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

Reed Valve Inspection

Check reed valve for cracks or other damage.

Replace reed valve if damaged.

Reed Valve Installation

The installation is the reverse of the removal procedure.

COOLING SYSTEM

SERVICE TOOLS

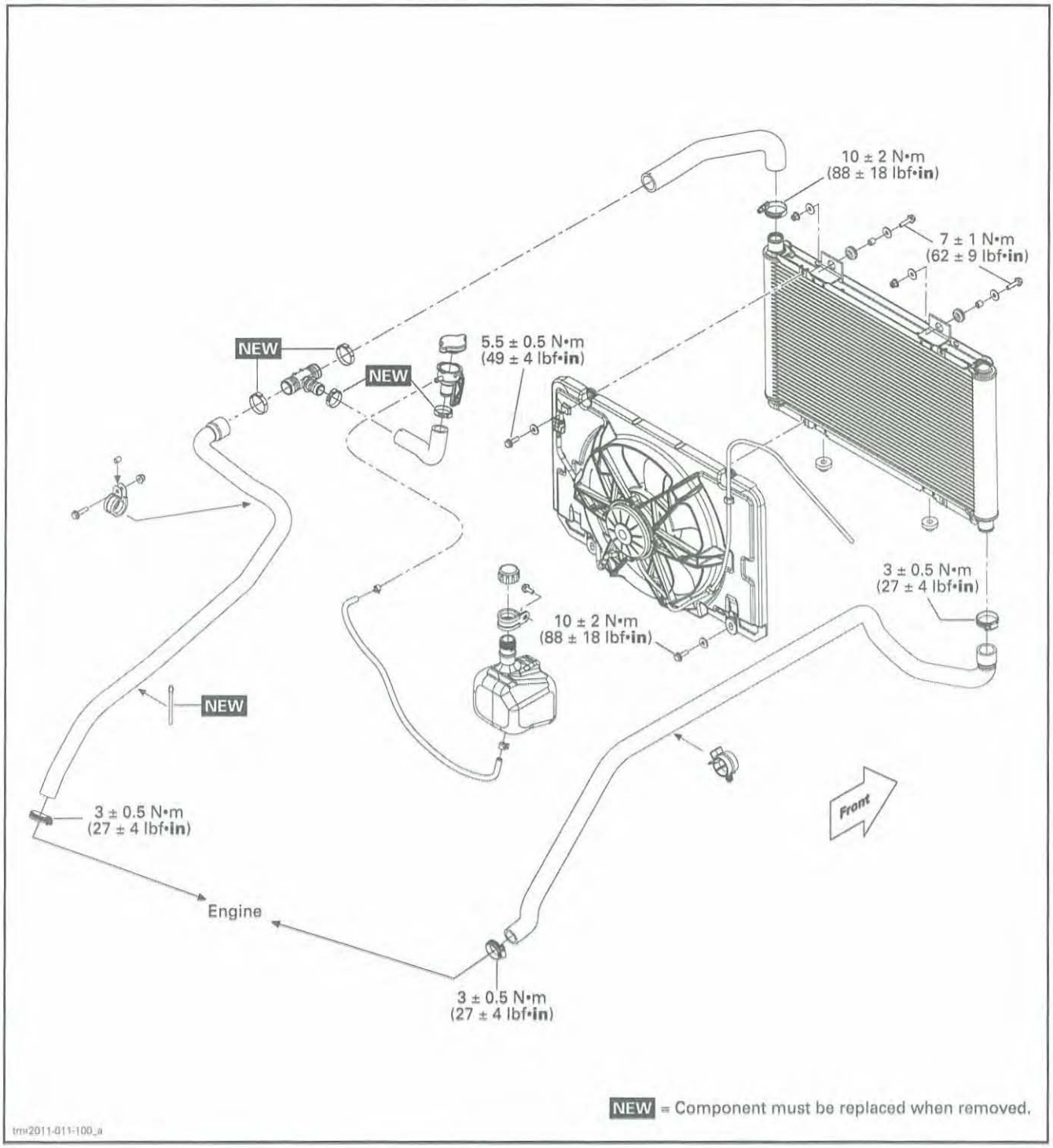
Description	Part Number	Page
BLIND HOLE PULLER KIT	529 036 056	76
FLUKE 115 MULTIMETER	529 035 868	68
HANDLE	420 877 650	78
LARGE HOSE PINCHER	529 032 500	64–66
OIL SEAL PUSHER	529 035 757	78
ROTARY SEAL PUSHER PLATE	529 036 130	74
SEAL PUSHER	529 035 766	74, 78

SERVICE PRODUCTS

Description	Part Number	Page
DOW CORNING 111	413 707 000	78
LOCTITE 243 (BLUE)	293 800 060	66

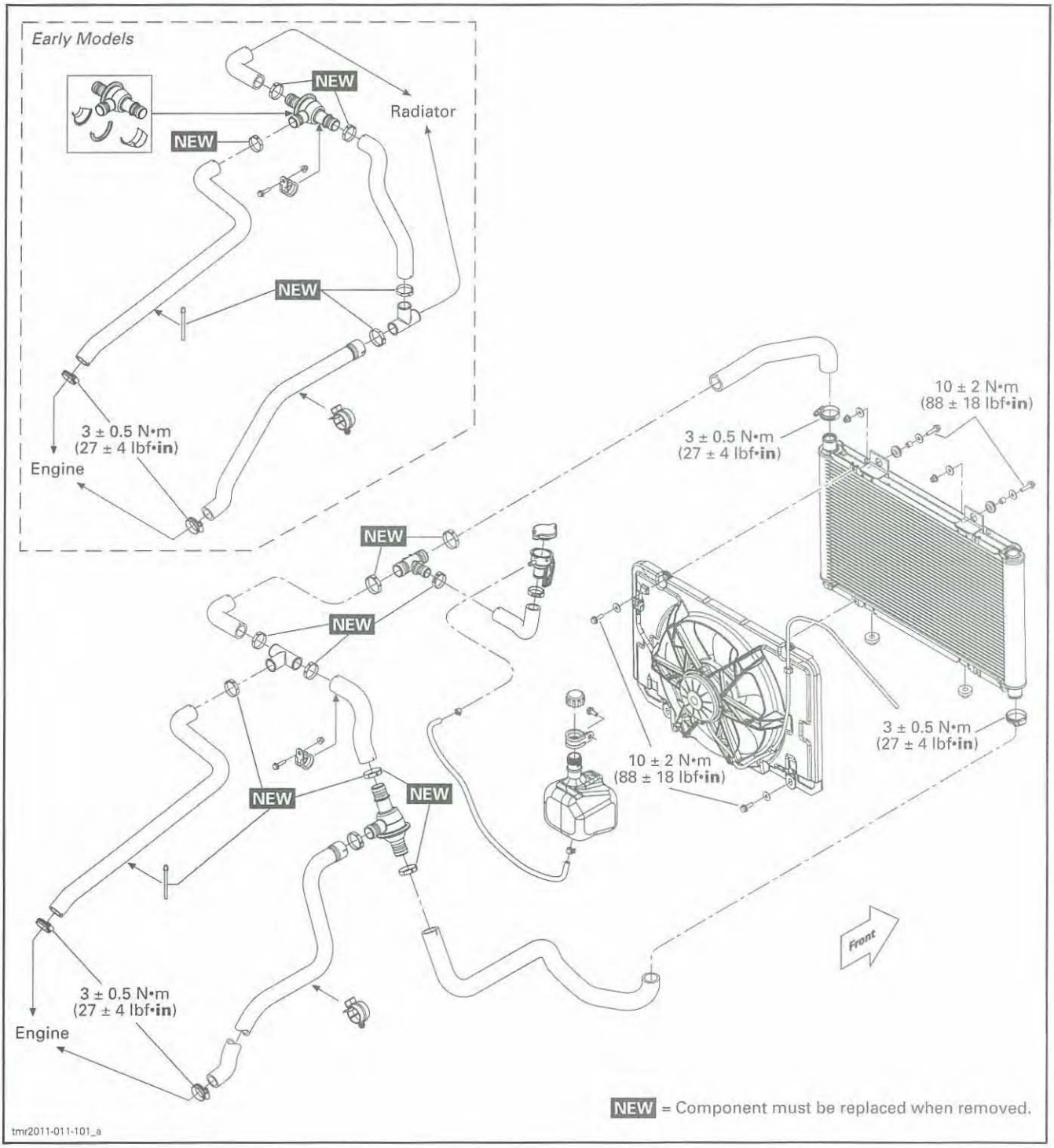
RADIATOR

800R Engine



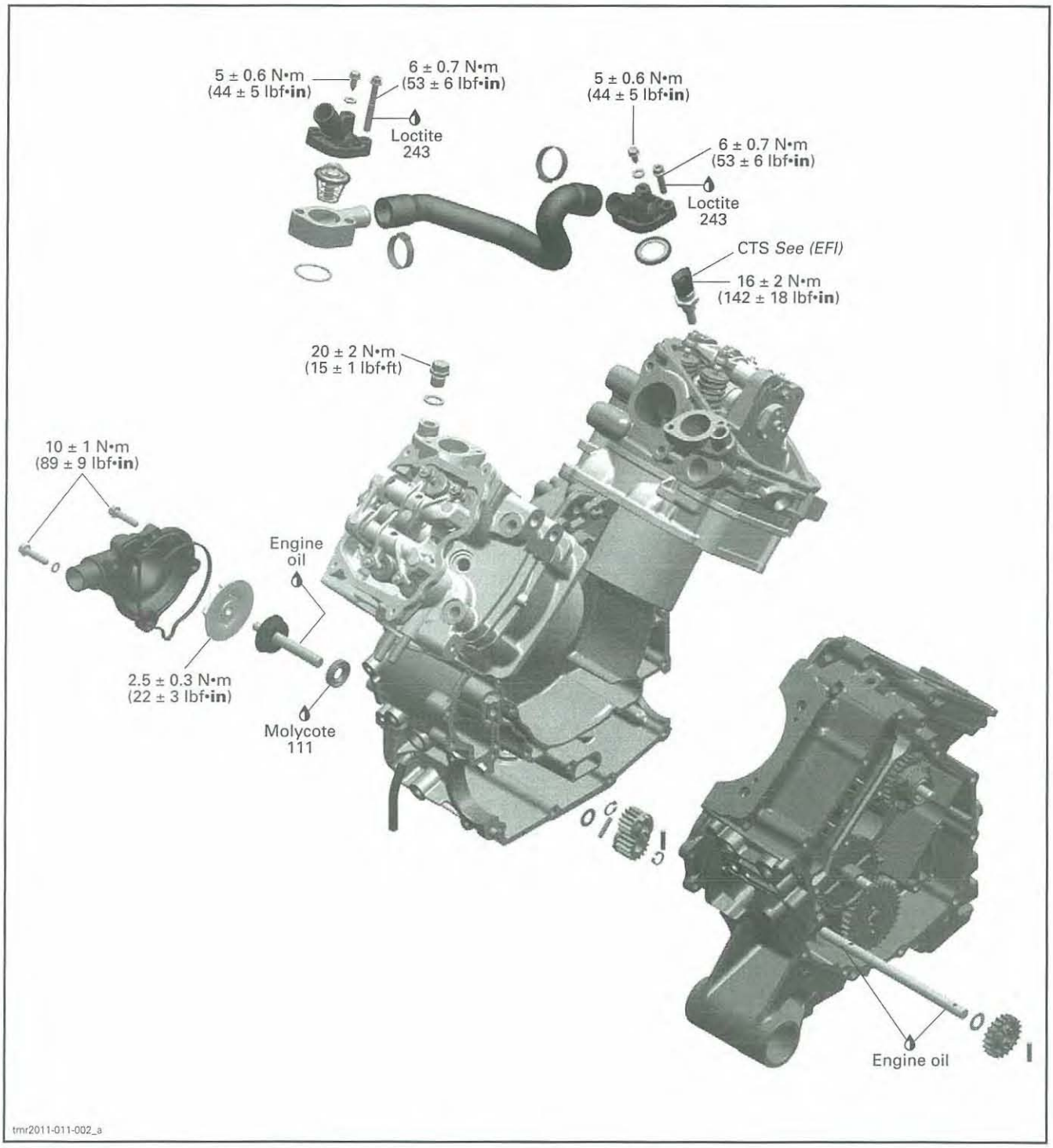
RADIATOR

1000 Engine



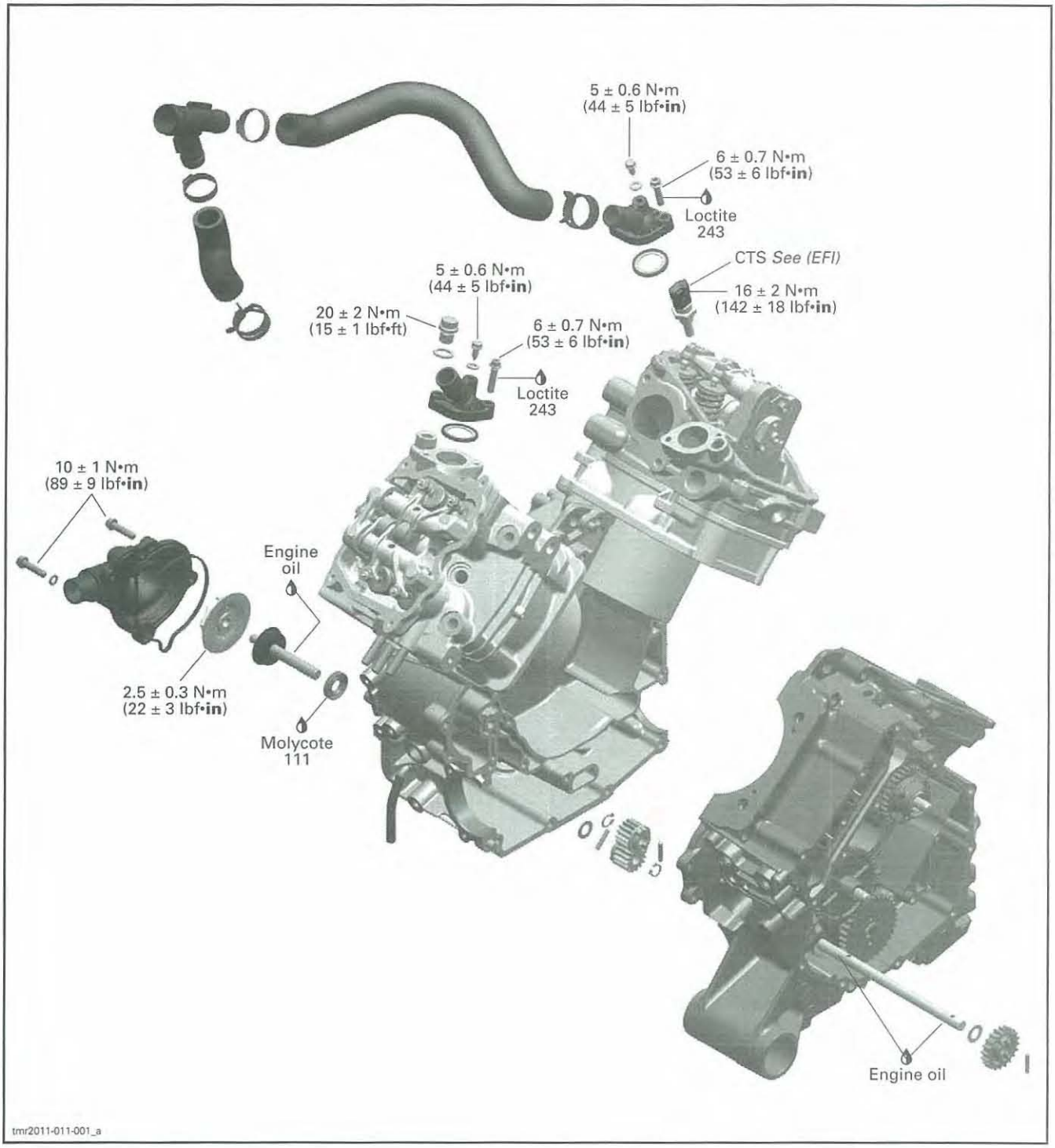
WATER PUMP

800R Engine



WATER PUMP

1000 Engine



GENERAL

⚠ WARNING

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

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

PROCEDURES

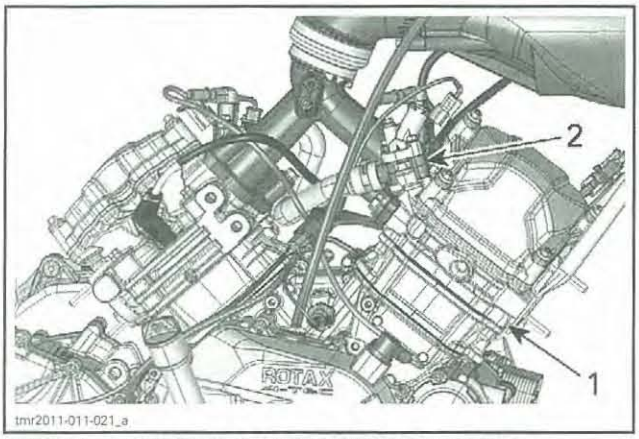
THERMOSTAT

The thermostat is a single action type.

Thermostat Location

800R Models

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

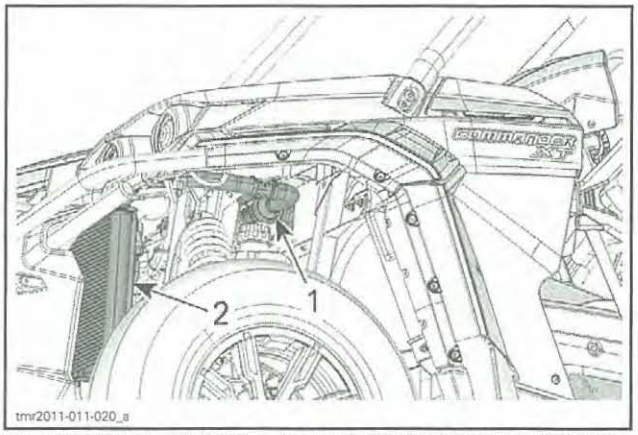


TYPICAL - THERMOSTAT LOCATION 800R MODELS
1. *Front cylinder*
2. *Thermostat housing*

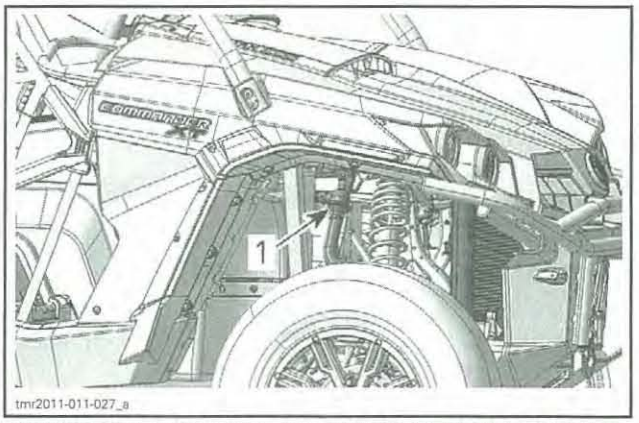
1000 Models

The thermostat is mounted in-line in the cooling system circuit.

There are two possible locations (see illustrations).



THERMOSTAT LOCATION - LH FRONT WHEEL WELL ACCESS
1. *In-line thermostat*
2. *Radiator*

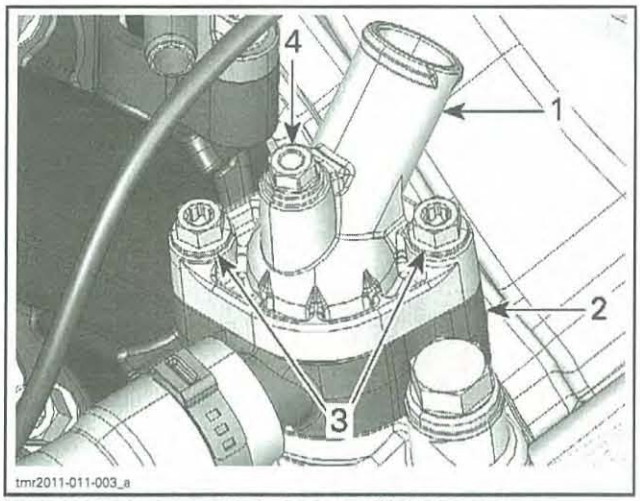


THERMOSTAT LOCATION - RH FRONT WHEEL WELL ACCESS
1. *In-line thermostat*

Thermostat Removal

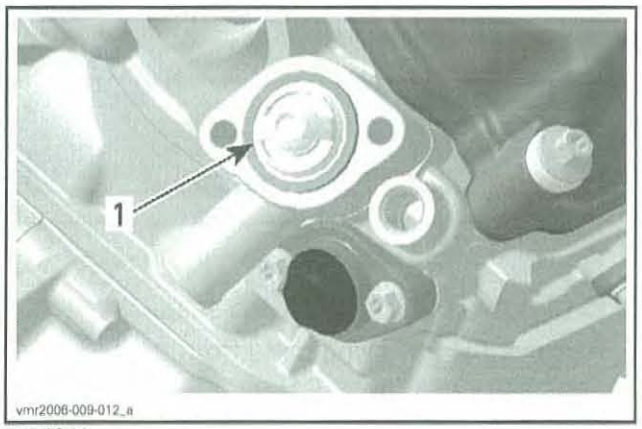
800R Models

1. Install a LARGE HOSE PINCHER (P/N 529 032 500) on both radiator hoses.
2. Drain remainder of cooling system, refer to *PERIODIC MAINTENANCE PROCEDURES* subsection.
3. Remove thermostat housing screws and remove thermostat cover.



THERMOSTAT LOCATION - FRONT CYLINDER HEAD
1. *Thermostat cover*
2. *Thermostat housing*
3. *Cover screws*
4. *Bleed screw*

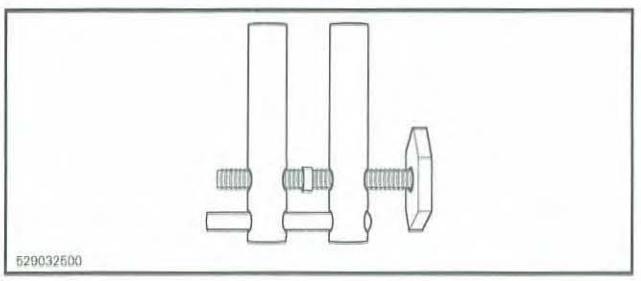
4. Pull thermostat and gasket from thermostat housing.

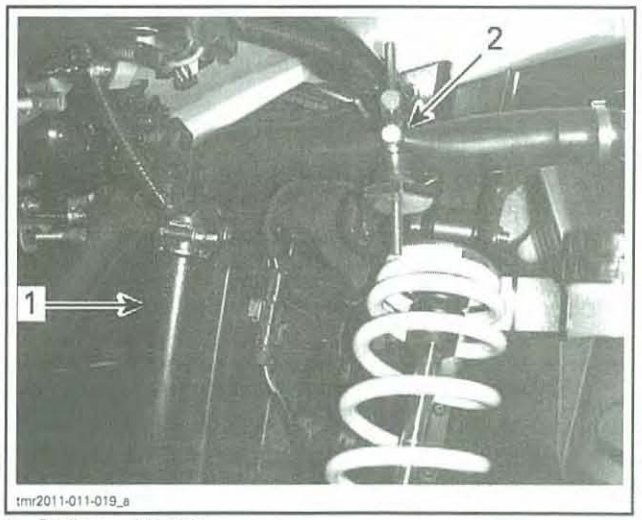


TYPICAL
1. *Thermostat with gasket*

1000 Models

1. Install a LARGE HOSE PINCHER (P/N 529 032 500) on both radiator hoses.



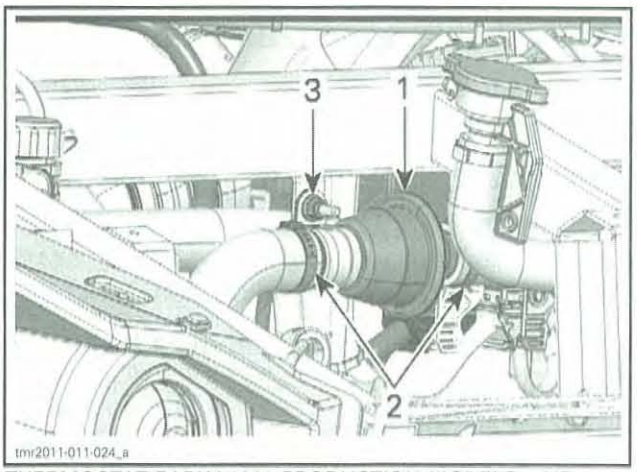


1. *Radiator - LH side*
2. *Large hose clamp on upper hose (lower hose RH side similar)*

2. Drain remainder of cooling system, refer to *PERIODIC MAINTENANCE PROCEDURES* subsection.

1000 Models with Thermostat Access thru LH Front Wheel Well

3. Remove service cover, refer to *BODY* subsection.
4. Remove air filter housing, refer to *AIR INTAKE SYSTEM* subsection.
5. Remove Oetiker clamps that secure hoses to thermostat.
6. Remove clamp that secures thermostat housing to frame.



THERMOSTAT EARLY 1000 PRODUCTION MODELS - AIR FILTER HOUSING REMOVED
1. *Thermostat*
2. *Oetiker clamps (3)*
3. *Support clamp*

7. Pull hoses from thermostat housing to remove thermostat.

1000 Models with Thermostat Access thru RH Front Wheel Well

8. Remove Oetiker clamps that secure hoses to thermostat.
9. Pull hoses from thermostat housing to remove thermostat.

Thermostat Test

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

THERMOSTAT OPENING TEMPERATURE		
MODELS	STARTS TO OPEN	FULLY OPEN
800R	65°C (149°F)	75°C (167°F)
1000	65°C (149°F)	88°C (190°F)

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

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

Thermostat Installation

800R Models

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

THERMOSTAT COVER INSTALLATION		
GASKET	PRODUCT	TORQUE
New	LOCTITE 243 (BLUE) (P/N 293 800 060) on screws	6 N•m ± 0.6 N•m (53 lbf•**in** ± 5 lbf•**in**)

1000 Models

Reverse removal procedures.

All Models

Refill cooling system.

Bleed cooling system, refer to *PERIODIC MAINTENANCE PROCEDURES* subsection.

NOTICE The cooling system must be bled as specified.

Check for coolant leaks.

RADIATOR

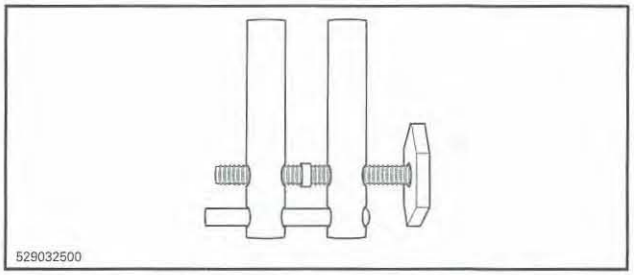
Radiator Inspection

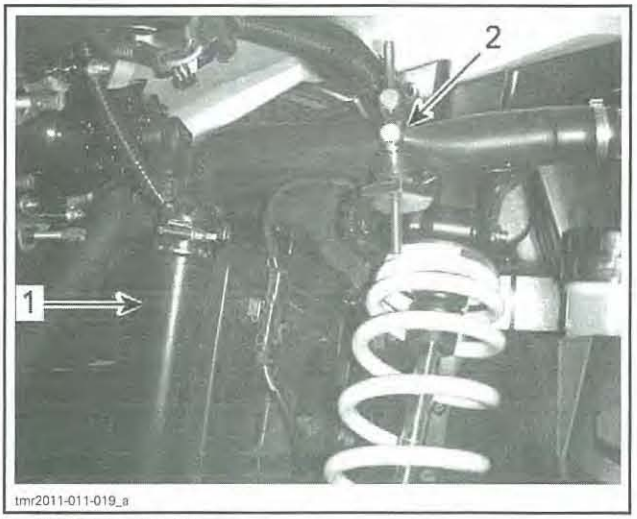
Check radiating fins for clogging or damage.

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

Radiator Removal

1. Install a LARGE HOSE PINCHER (P/N 529 032 500) on both radiator hoses.

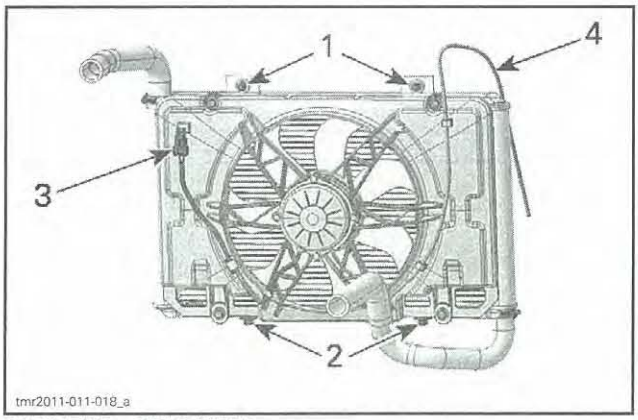




1. Radiator - LH side
2. Large hose clamp on upper hose (lower hose RH side similar)

2. Lift front of vehicle to extend suspension.
3. Remove the following parts from the radiator:
   - Radiator inlet hose (LH upper)
   - Radiator outlet hose (RH lower)
   - Radiator mounting screws (2 at top of radiator).
4. Disconnect cooling fan electrical connector.
5. Remove cooling fan vent hose from frame.

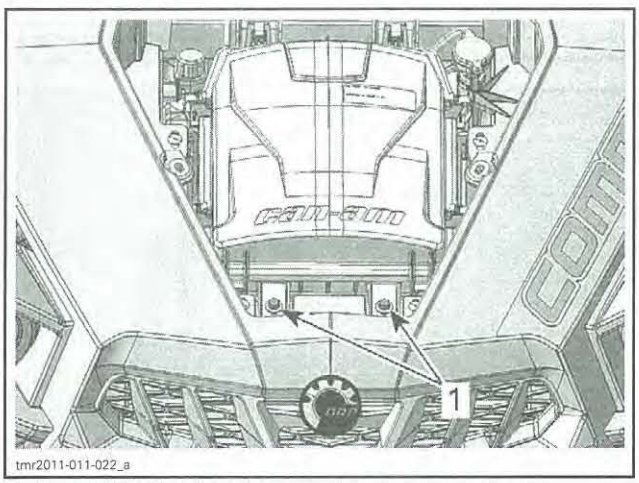
NOTE: Take note of the rooting of the vent hose on the cooling fan motor. See following illustration.



RADIATOR - REAR VIEW
1. *Radiator mounting screws*
2. *Lower mounting bushings*
3. *Radiator fan electrical connector*
4. *Fan motor vent hose*

6. Remove the 2 forward air filter housing mounting screws.

NOTE: This will make room for lifting the radiator off its lower mounting bushings.



1. *Forward air filter housing mounting screws to remove*

Models Equipped with a Winch

7. Remove the winch, refer to *LIGHTS, GAUGE AND ACCESSORIES* subsection.

All Models

8. Lift radiator t and tilt its lower end towards the front of the vehicle.

NOTE: Turning steering to LH stop or removing LH front wheel assembly provides greater access for radiator removal.

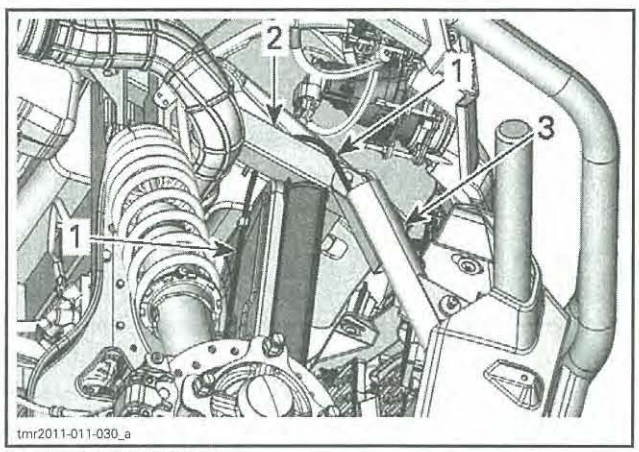
9. Carefully remove radiator through LH wheel well.

Radiator Installation

1. For installation, reverse the removal procedure however, pay attention to the following details.
2. Install the rubber bushings between bottom of radiator and radiator support.
3. Ensure the vent hose on the cooling fan motor is properly rooted as prior to removal.

NOTE: Cooling fan vent hose must pass over the top RH frame member, then be inserted down into the RH vertical bumper tube.

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



1. *Cooling fan vent hose*
2. *RH top frame member*
3. *RH vertical bumper tube*

4. Fill radiator with the recommended coolant. Refer to *PERIODIC MAINTENANCE PROCEDURES* subsection.
5. Bleed the cooling system, refer to *PERIODIC MAINTENANCE PROCEDURES* subsection.

NOTICE The cooling system must be bled as specified.

6. Check for coolant leaks from radiator and hoses.

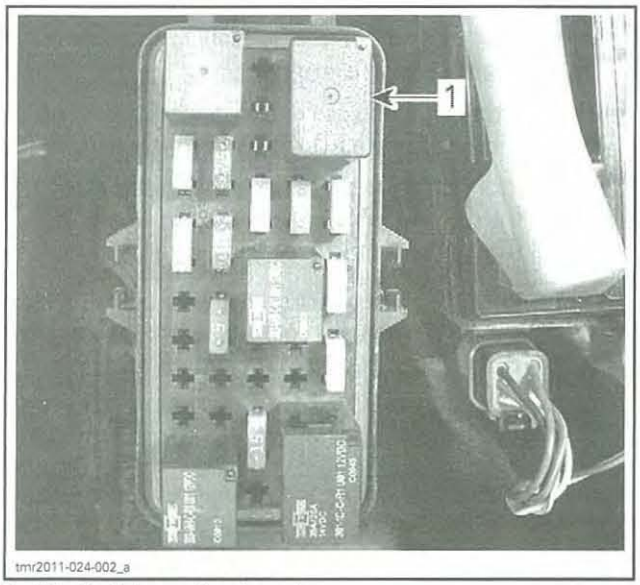
COOLANT TEMPERATURE SENSOR (CTS)

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

RADIATOR COOLING FAN RELAY (R1)

Relay Installation (Radiator Cooling Fan)

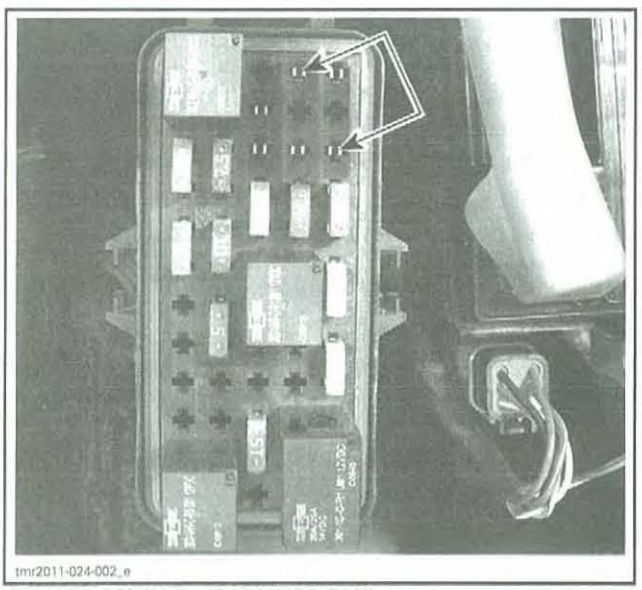
NOTE: Relay may be inverted by 180° at installation and it will work correctly. Ensure to align tabs of relay with terminals of fuse holder at installation.



1. R1: Radiator cooling fan relay

Relay Operation Test (Radiator Cooling Fan)

The easiest way to check the relay is to remove it and bypass it using a jumper. If the radiator cooling fan is activated, replace the relay. See illustration to find where to bypass the relay.

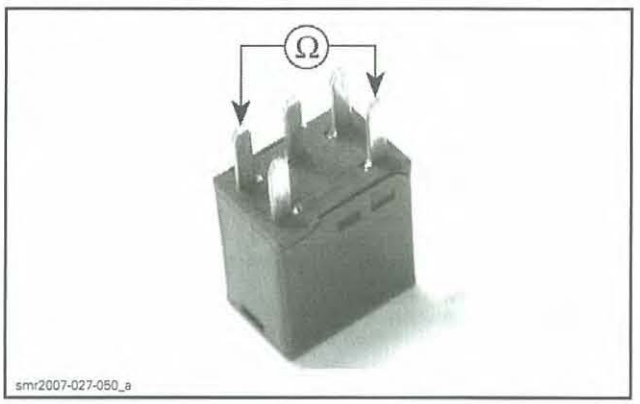


JUMPER RELAY R1 (RADIATOR FAN)

Relay Continuity Test (Radiator Cooling Fan)

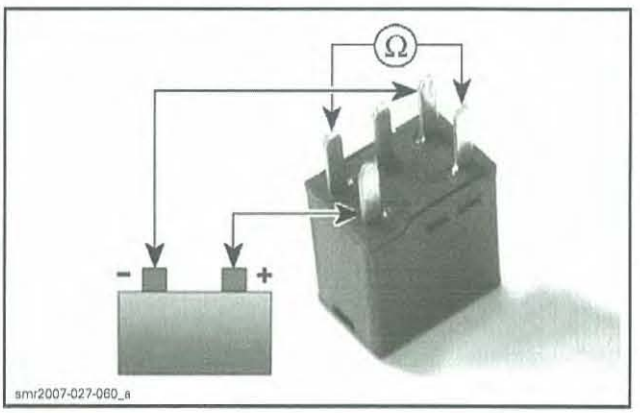
1. Remove relay.
2. Use the FLUKE 115 MULTIMETER (P/N 529 035 868), and select the Ω position.
3. Probe relay as follows.

TERMINAL		RESISTANCE
30	87	Open circuit (OL)



4. Connect battery as shown and probe relay again as follows.

TERMINAL		RESISTANCE
30	87	0.5 Ω max. (continuity)



If relay failed any test, replace it.

RADIATOR COOLING FAN

Radiator Cooling Fan Operation

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

ENGINE TEMPERATURE	INTAKE TEMPERATURE	COOLING FAN	CHECK ENGINE LIGHT	MESSAGE IN MULTIFUNCTION GAUGE	LIMP HOME MODE
—	88°C (190°F)	Turns ON	—	—	—
—	85°C (185°F)	Turns OFF	—	—	—
96°C (205°F)	—	Turns ON	—	—	—
92°C (198°F)	—	Turn OFF	—	—	—
115°C (239°F)	—	ON	Turns ON	- Check engine - Hi Temp	—
118°C (244°F)	—	ON	Flashes	Limp Home	Engine RPM limited to 4000

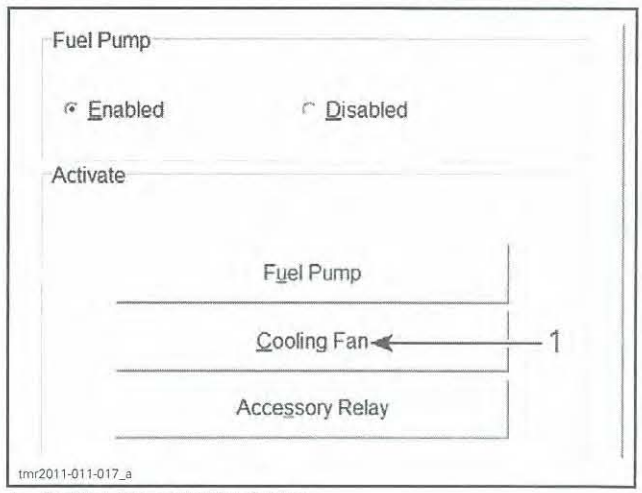
Radiator Cooling Fan Fuse Location

The fuse is located in the fuse box underneath the dashboard on the driver's side.

1. Cooling fan fuse

Radiator Cooling Fan Test

1. Connect the vehicle to B.U.D.S., refer to *COMMUNICATION TOOLS AND B.U.D.S.* for procedure and connector location.
2. In B.U.D.S. software, select the following:
   - **Read Data** button
   - **Activation** page tab
   - **ECM** page
   - **Cooling Fan** button.



1. Cooling Fan activation button

If fan turns on, check CTS, wiring harness and connectors. If all parts are good, replace the ECM.

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

COOLING FAN TROUBLESHOOTING CHART		
Is fan working?	YES →	Everything is OK
NO ↓		
Check "Relay driver" fuse (5A) and fan fuse (30A). Is fuse burnt?	YES →	Replace fuse Is fan working?
NO ↓		
Bypass fan relay R1		
↓		
Fan turns?	YES →	Replace relay Is fan working?
NO ↓		
Apply 12 Vdc to fan connector		
↓		
Fan turns?	NO →	Replace fan Is fan working?
YES ↓		
Check CTS		
↓		
CTS works?	NO →	Replace CTS Is fan working?
YES ↓		
Check wiring harness and connectors		
↓		
Harness and connectors good?	NO →	Repair or replace defective part(s)
YES ↓		
Try a new ECM	→	Is fan working?

Radiator Cooling Fan Removal

1. Disconnect fan motor electrical connector.
2. Remove fan motor vent tube from vehicle frame.
3. Remove 4 fan retaining screws.
4. Remove the radiator fan.

Radiator Cooling Fan Installation

For the installation, reverse the removal procedure.

WATER PUMP HOUSING

It is located on the engine MAG side.

Water Pump Housing Removal

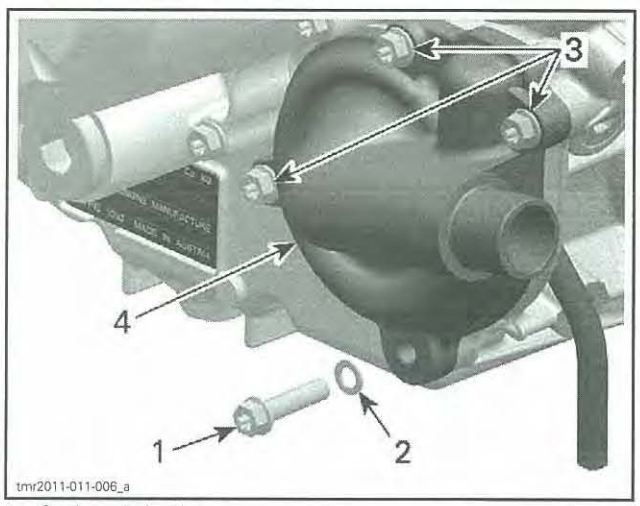
⚠ WARNING

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

Drain cooling system.

Remove radiator outlet hose from water pump housing.

Remove screws retaining water pump housing.

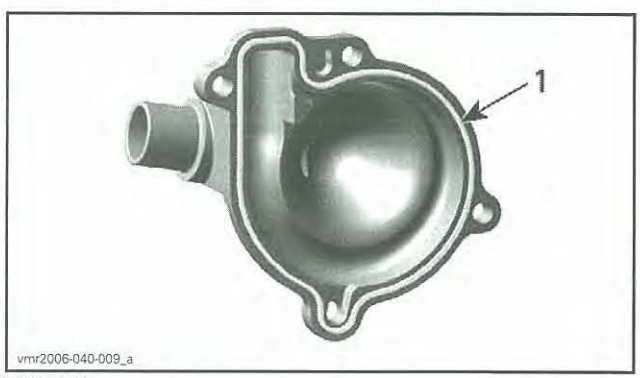


1. *Coolant drain plug*
2. *Sealing ring*
3. *Screws*
4. *Water pump housing*

Pull water pump housing to remove it.

Water Pump Housing Inspection

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



TYPICAL
1. *Gasket*

Water Pump Housing Installation

The installation is the opposite of the removal procedure.

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

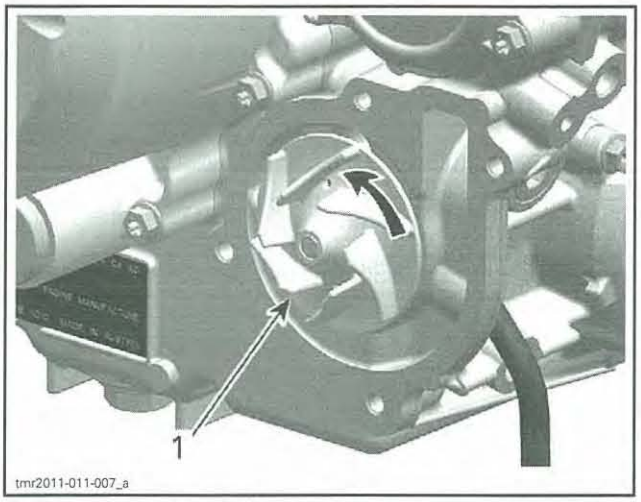
Tighten screws of water pump housing in a criss cross sequence.

WATER PUMP IMPELLER

Water Pump Impeller Removal

Remove water pump housing.

Unscrew impeller.



1. Turn counterclockwise to unscrew

NOTICE **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 damage. Replace impeller if damaged.

Water Pump Impeller Installation

The installation is the opposite of the removal procedure.

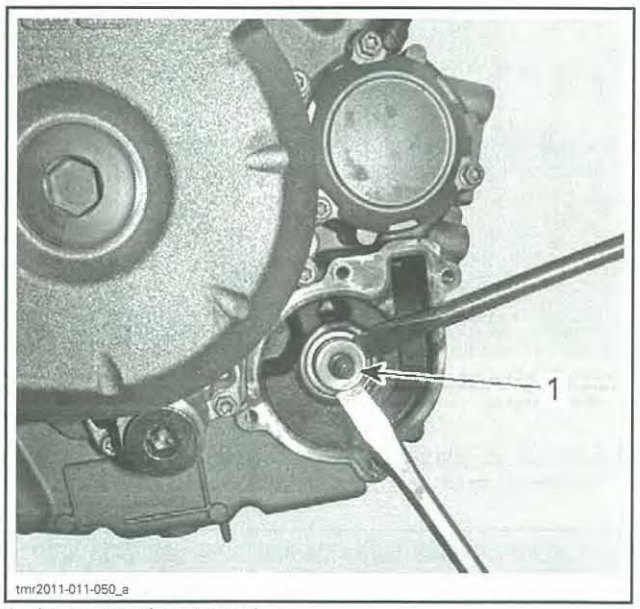
NOTICE **Be careful not to damage impeller fins during installation.**

WATER PUMP SHAFT AND SEALS

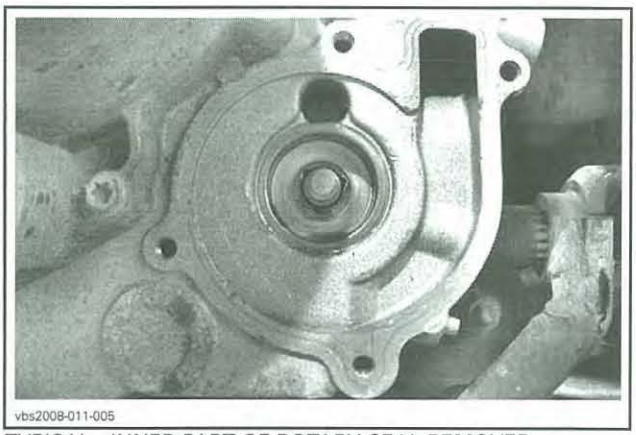
Rotary Seal and Oil Seal Removal (Assembled Engine)

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

1. Carefully pry out inner part of the rotary seal using 2 screwdrivers.

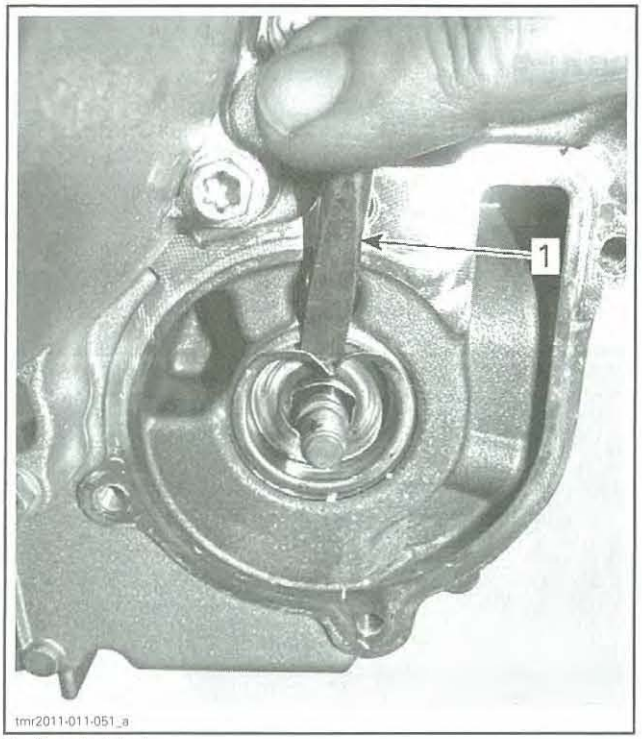


1. Inner part of rotary seal



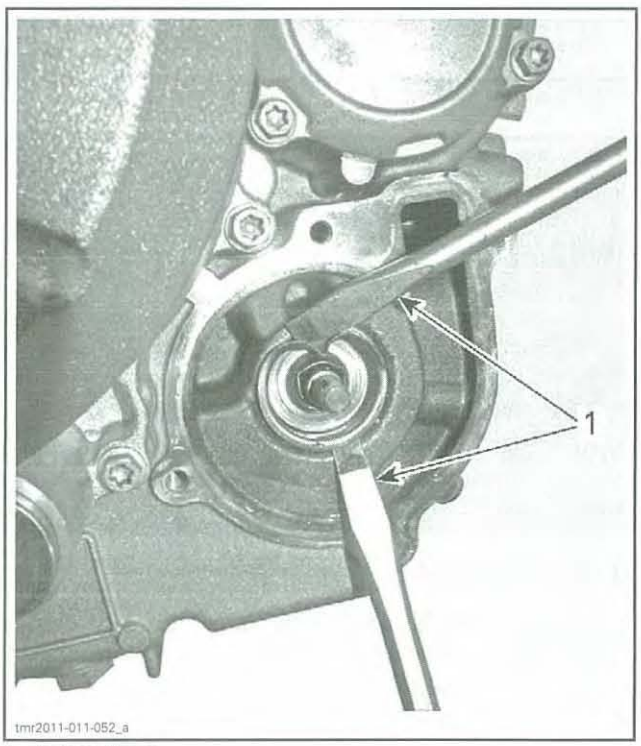
TYPICAL - INNER PART OF ROTARY SEAL REMOVED

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



1. Small chisel

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

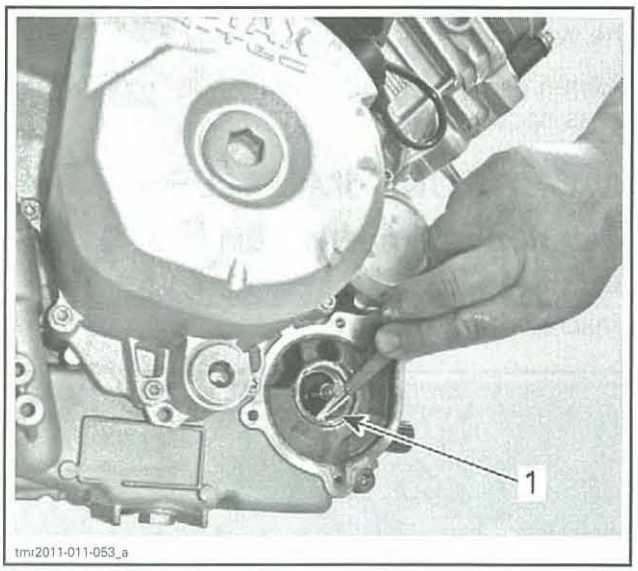


1. Screwdrivers

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

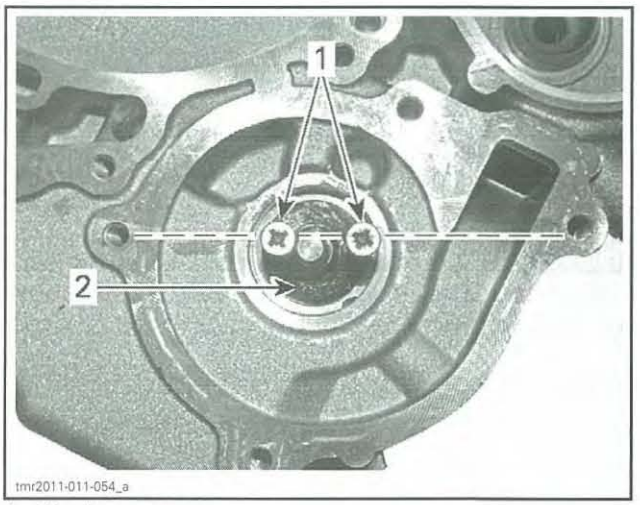
4. Thoroughly remove carefully sealing residue and burr of rotary seal using a scraper.

NOTICE Be careful not to damage water pump shaft.



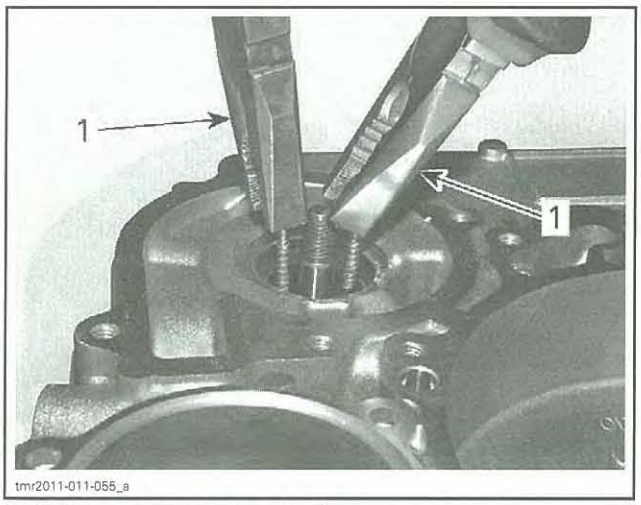
1. Scraper

5. Install 2 wooden screws in the seal.



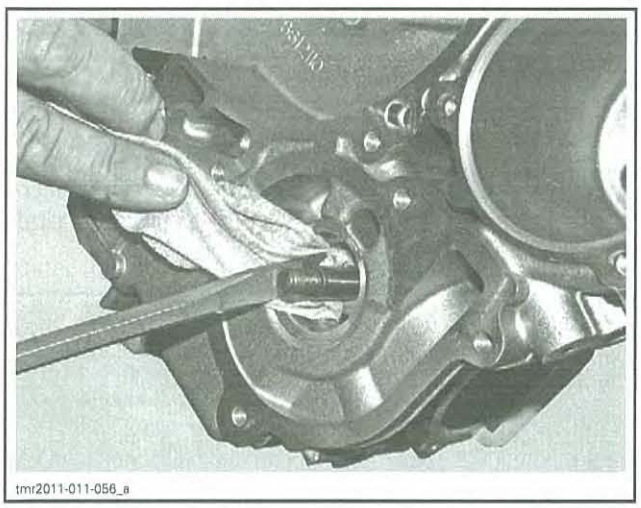
1. Wooden screws
2. Oil seal

6. Remove oil seal from crankcase by puling screws with pliers.



1. Pull on screws to remove seal

7. Check water pump shaft axial play. If not adequate, engine must be disassembled to replace the water pump shaft.
8. Clean oil seal seat.

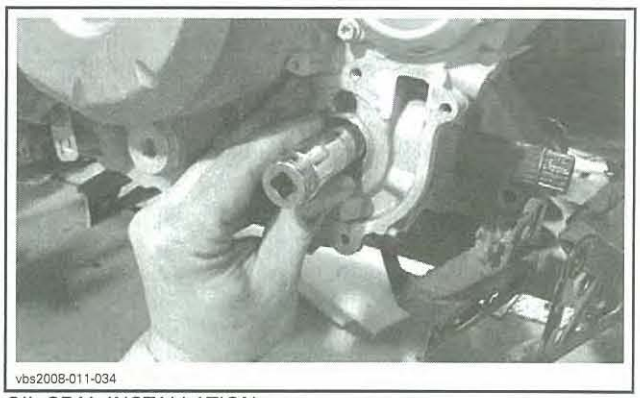


Rotary Seal and Oil Seal Installation (Engine Assembled)

Oil Seal

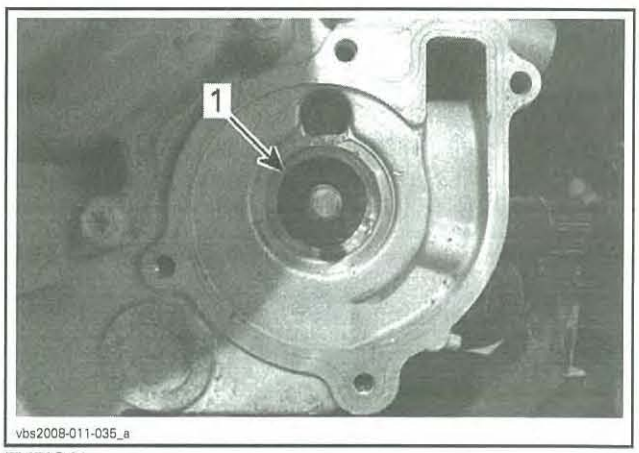
Apply engine oil on water pump shaft.

1. Apply grease to the lips of the oil seal.
2. Carefully install the oil seal over the water pump shaft.
3. Push the oil seal into the water pump cavity using a 17 mm (11/16 in) deep socket.



OIL SEAL INSTALLATION

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



TYPICAL
1. Oil seal properly seated

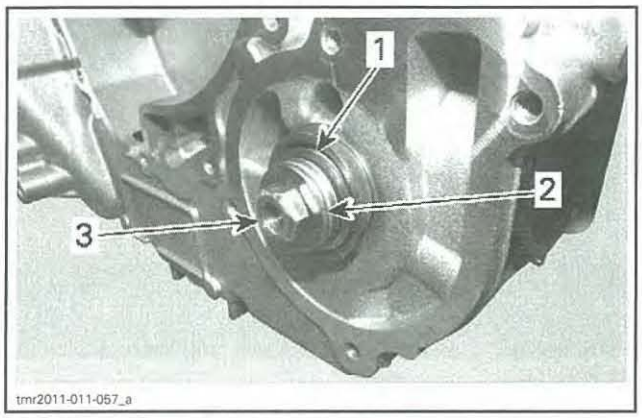
Rotary Seal

NOTICE **Read and thoroughly understand the entire procedure of installing the rotary seal before starting it.**

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

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

3. Place a robust M8 flat washer (P/N 420 227 935) onto water pump shaft.
4. Install a M8 x 1.25 nut onto water pump shaft by hand.
5. Then thread nut **1-1/2 turns** to pull the shaft into rotary seal.



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

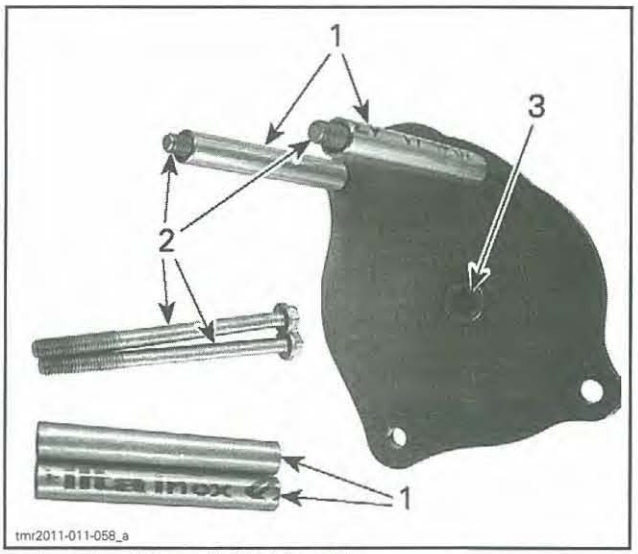
6. Remove M8 nut.

NOTE: The M8 flat washer remains on water pump shaft.

7. Use the ROTARY SEAL PUSHER PLATE (P/N 529 036 130) with M6 x 85 screws (P/N 420 440 347) and tubes (70 mm (2.75 in) length) to install rotary seal as follows.

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

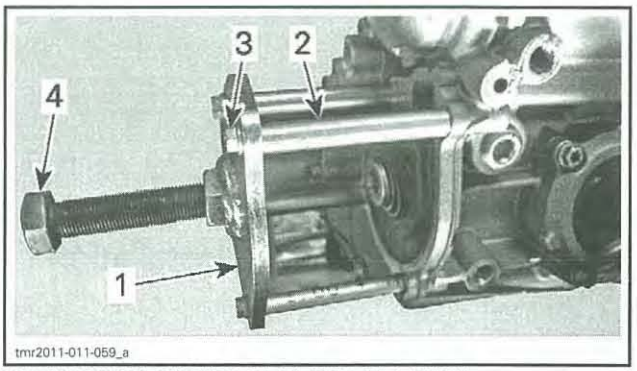
NOTE: Make sure the tool pusher bolt has a plane surface. If required, grind the pusher bolt.



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

8. Apply a little grease at the end of tool pusher bolt.
9. Ensure that the pusher bolt of rotary seal pusher plate is completely unscrewed.
10. Install rotary seal pusher plate on crankcase by torquing the M6 screws.

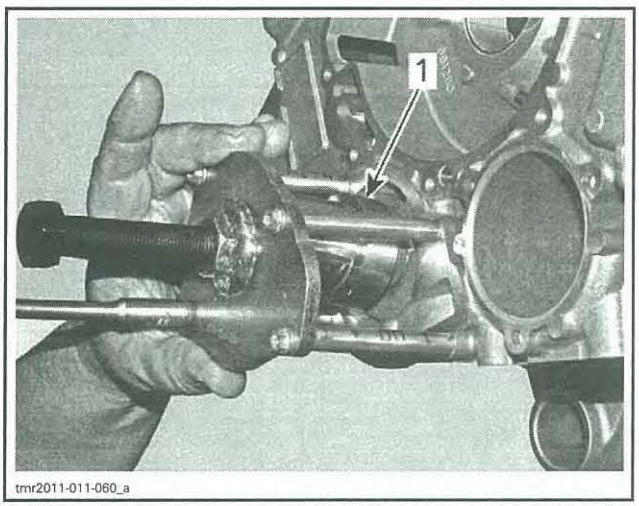
NOTICE Do not use pneumatic or electric tools for screwing the rotary seal pusher plate screws.



ROTARY SEAL PUSHER PLATE INSTALLATION
1. *Rotary seal pusher plate*
2. *Tube (70 mm (2.75 in) length)*
3. *M6 x 85 screw*
4. *Pusher bolt*

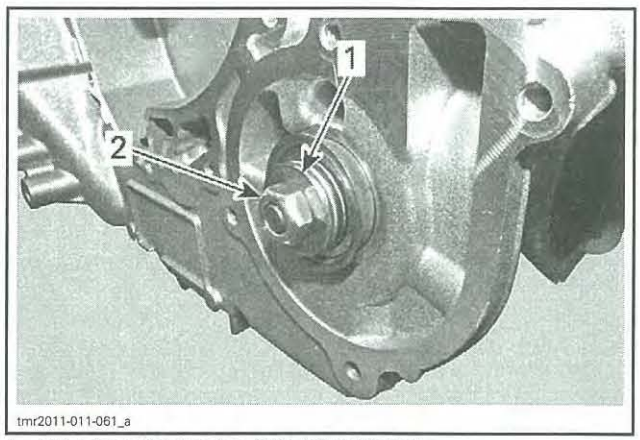
11. Install SEAL PUSHER (P/N 529 035 766) between rotary seal pusher plate and water pump shaft.

SEAL PUSHER (P/N 529 035 766)



SEAL PUSHER INSTALLATION WITH ROTARY SEAL PUSHER
1. Seal pusher aligned with pusher bolt

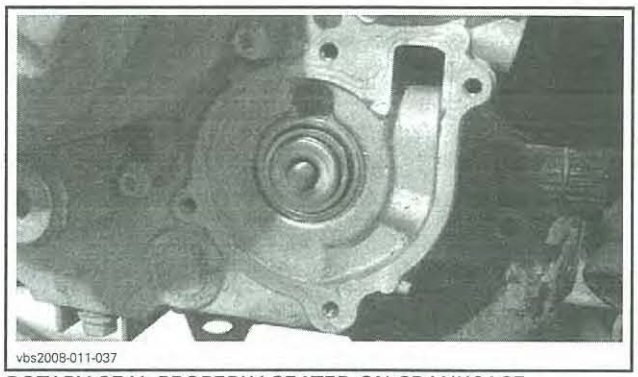
12. Tighten the pusher bolt by hand until it stops against the seal pusher.
13. Carefully thread the pusher bolt **1-1/2 turns**.
14. Ensure that the rotary seal is going straight into crankcase.
15. Remove tools from crankcase.
16. Place a robust M8 flat washer (P/N 420 227 935) onto water pump shaft.
17. Install M8 x 1.25 nut (P/N 233 281 414) onto water pump shaft.



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

Repeat the steps 5 to 15 another 2 times until rotary seal is completely seated in the crankcase.

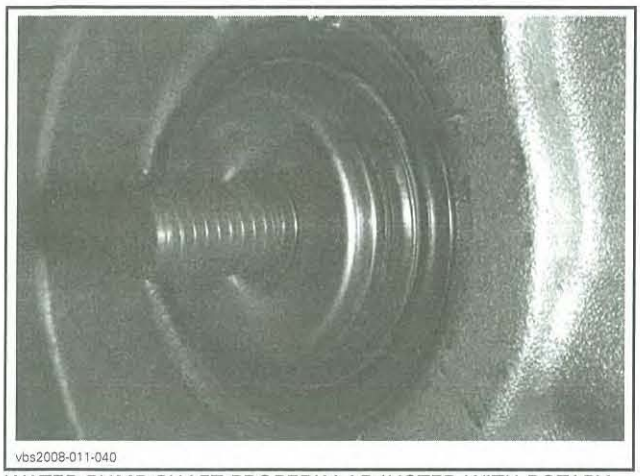
18. Remove tools from crankcase.



ROTARY SEAL PROPERLY SEATED ON CRANKCASE

19. Place a robust M8 flat washer onto water pump shaft.
20. Pull water pump shaft in proper position until the rotary seal is flush with the end of water pump shaft threads.

NOTICE **Ensure that the water pump shaft is properly adjusted with rotary seal.**

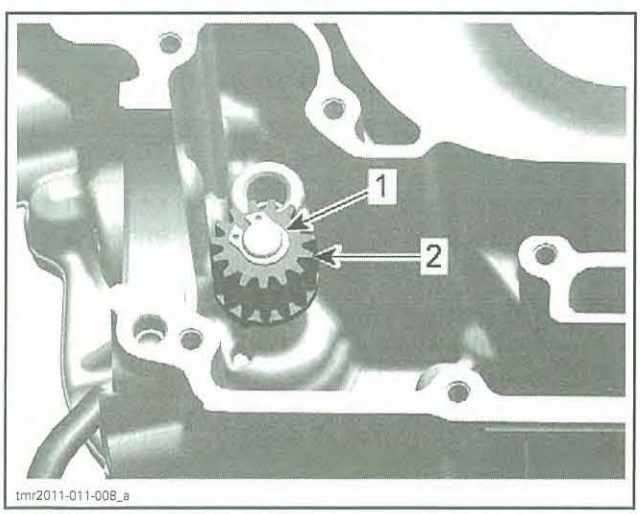


WATER PUMP SHAFT PROPERLY ADJUSTED WITH ROTARY SEAL

NOTICE Ensure that the water pump shaft moves freely while pushing it toward the crankcase.

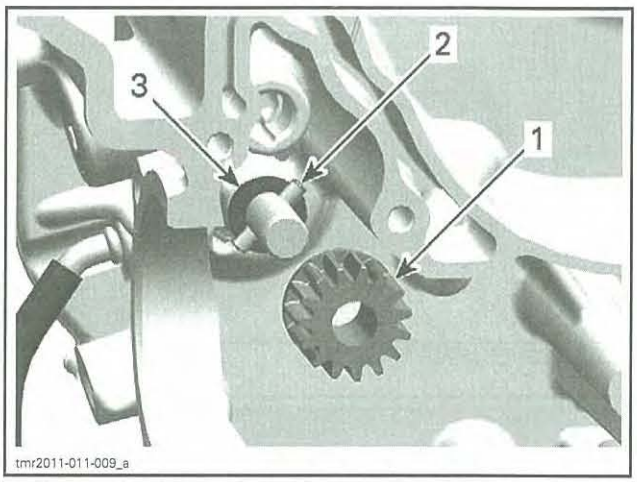
Water Pump Shaft/Seal Removal (Disassembled Engine)

1. Remove the following parts:
   - Water pump housing
   - Water pump impeller.
2. Remove the circlip retaining the intermediate driven gear on water pump shaft.



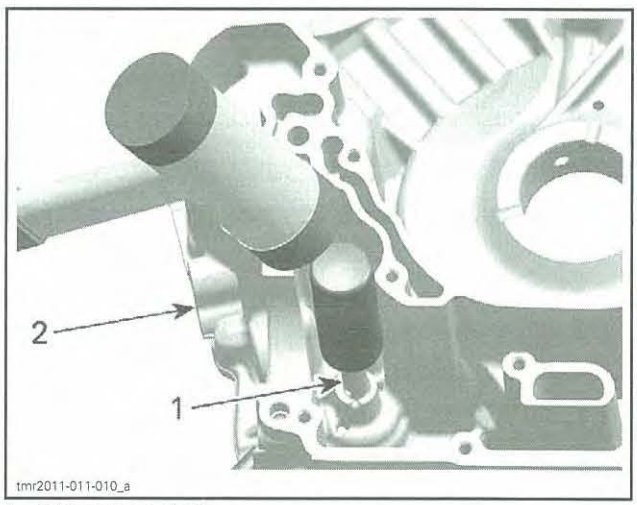
1. *Circlip*
2. *Water pump gear*

3. Remove the:
   - Water pump intermediate driven gear
   - Needle pin
   - Thrust washer.



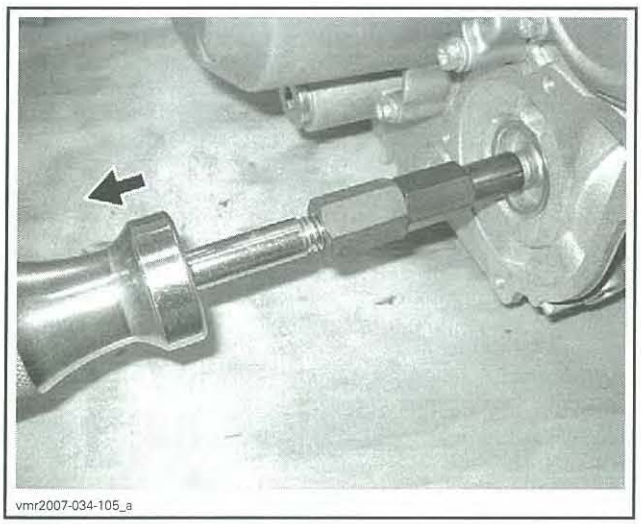
1. *Water pump intermediate driven gear (removed)*
2. *Needle pin*
3. *Thrust washer*

4. Using a soft hammer, push out water pump shaft with inner portion of rotary seal from inside of crankcase MAG side.



1. *Water pump shaft*
2. *Crankcase MAG side*

5. To remove outer part of rotary seal, use an expander from BLIND HOLE PULLER KIT (P/N 529 036 056).
6. Install expander snugly against outer part of rotary seal and pull seal out.

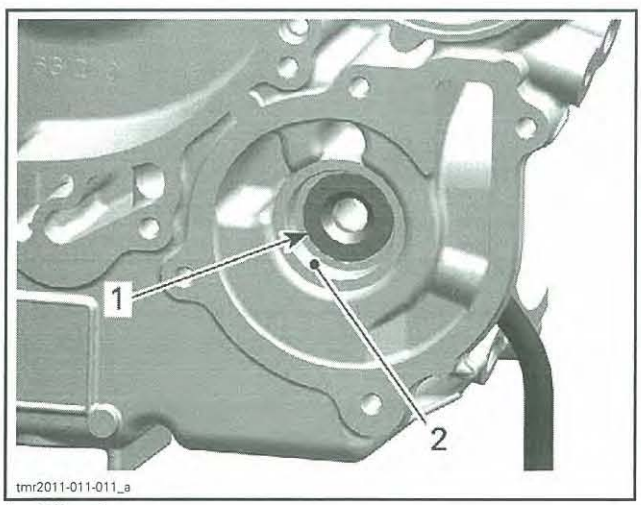

vmr2007-034-105_a

TYPICAL

NOTICE When removing water pump shaft, always replace rotary seal with water pump shaft. Also replace oil seal in crankcase (behind rotary seal).

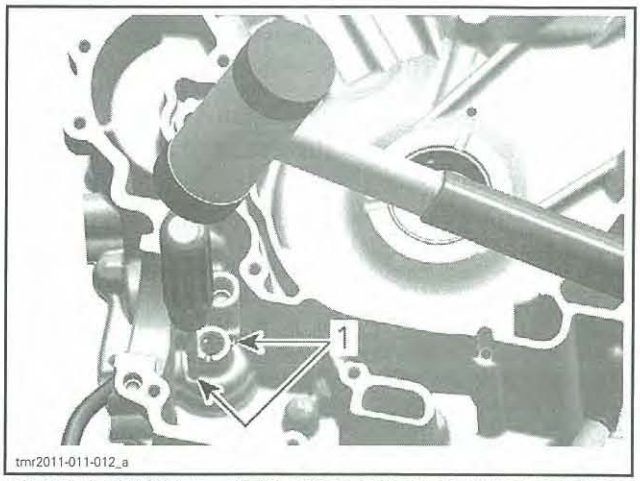
7. Remove oil seal from inside of crankcase MAG side using a pusher tool.

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



tmr2011-011-011_a

1. Oil seal
2. Machined surface for rotary seal



tmr2011-011-012_a

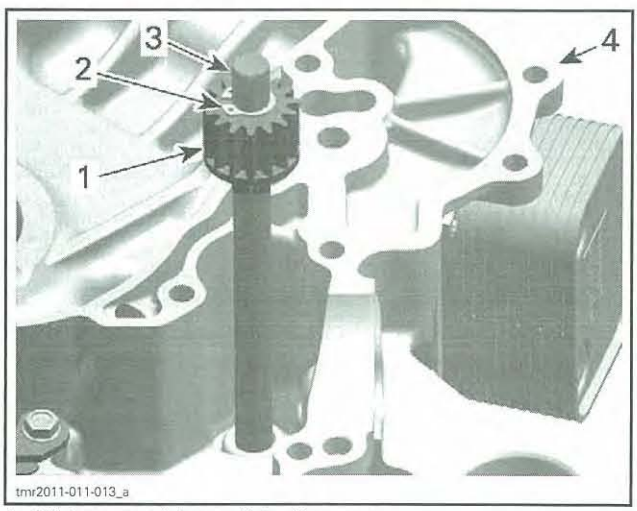
OIL SEAL REMOVAL - VIEW FROM INSIDE CRANKCASE MAG SIDE
1. Orifices for oil seal removal

Water Pump Shaft/Seal Inspection (Disassembled Engine)

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

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

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



tmr2011-011-013_a

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

Water Pump Shaft/Seal Installation (Disassembled Engine)

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

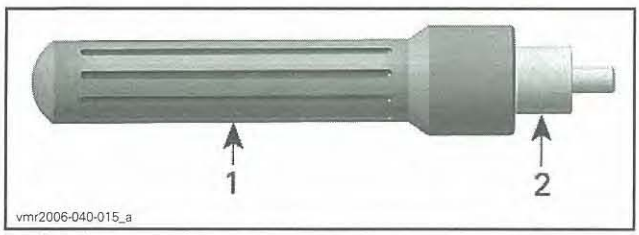
NOTE: For installation use the torque values specified in the exploded view.

NOTICE Always replace rotary seal and water pump shaft together. Also, install a NEW oil seal (behind rotary seal) at the same time.

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

Clean rotary seal surface of any old sealant.

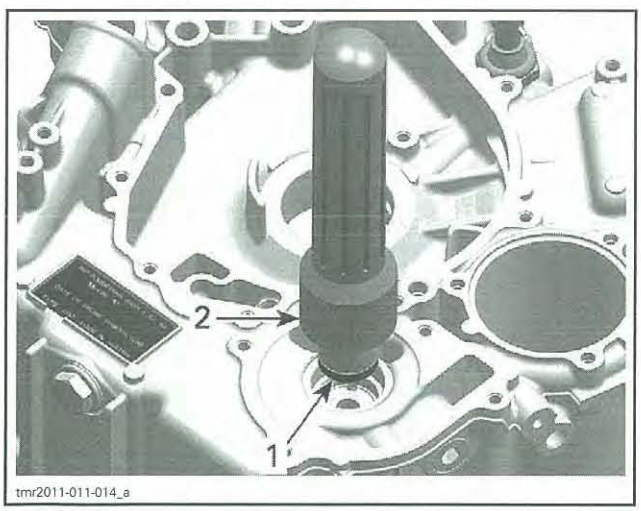
Use the OIL SEAL PUSHER (P/N 529 035 757) and the HANDLE (P/N 420 877 650) to install oil seal.



1. Handle
2. Pusher

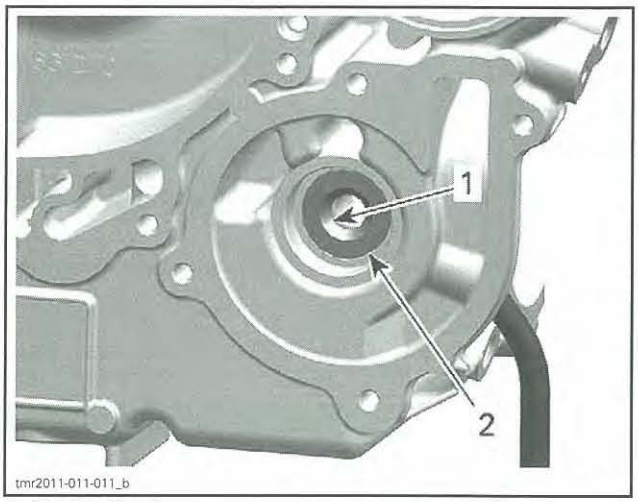
When installing the oil seal on the pusher, make sure the sealing lip points outwards.

Push NEW oil seal in place.



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

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



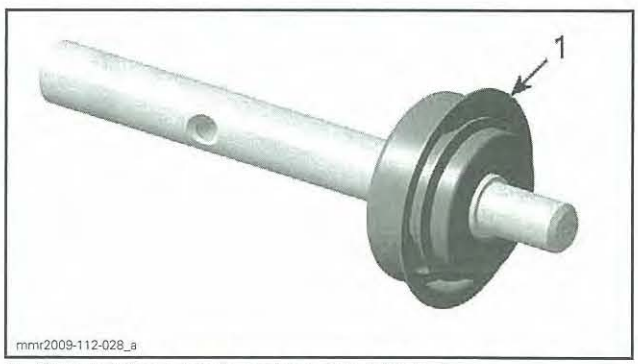
1. Sealing lip
2. Oil seal properly installed

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

Slide water pump shaft with the new rotary seal into crankcase.

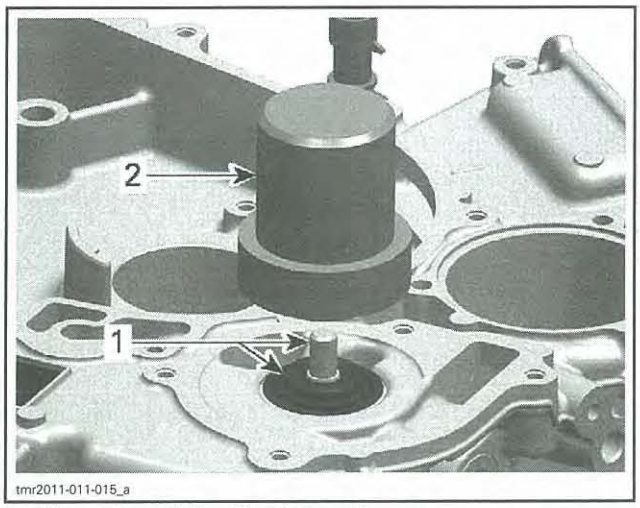
To properly install water pump shaft with rotary seal, use the SEAL PUSHER (P/N 529 035 766).

SEAL PUSHER (P/N 529 035 766)



1. Surface where rotary seal is pushed by tool

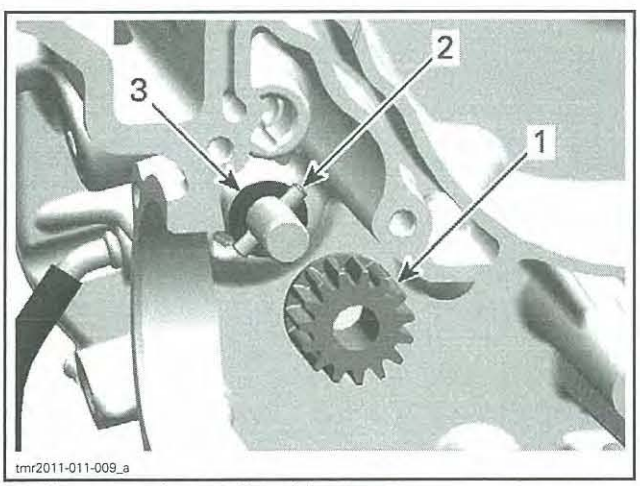
NOTICE Never use a hammer for rotary seal installation. Only use a press to avoid damaging the ceramic component.



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

Install thrust washer and needle pin on water pump shaft.

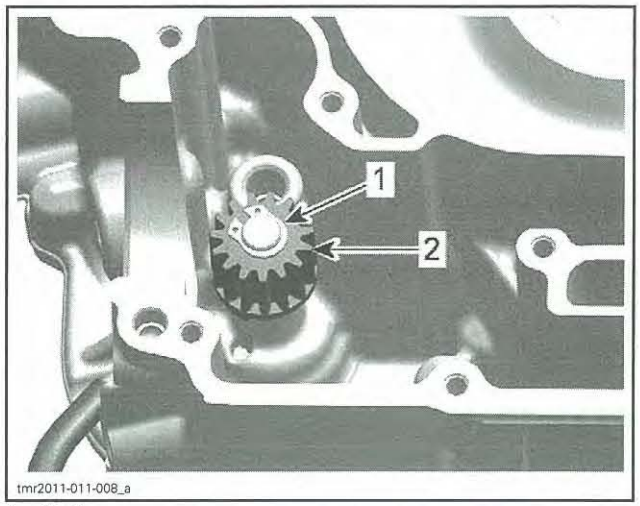
NOTICE **A missing thrust washer will cause a leaking rotary seal.**



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

Ensure water pump intermediate driven gear snaps properly onto needle pin, then install the circlip to retain the gear onto the shaft.

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



1. *Circlip*
2. *Water pump gear*

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

Tighten screws of the water pump housing crosswise.

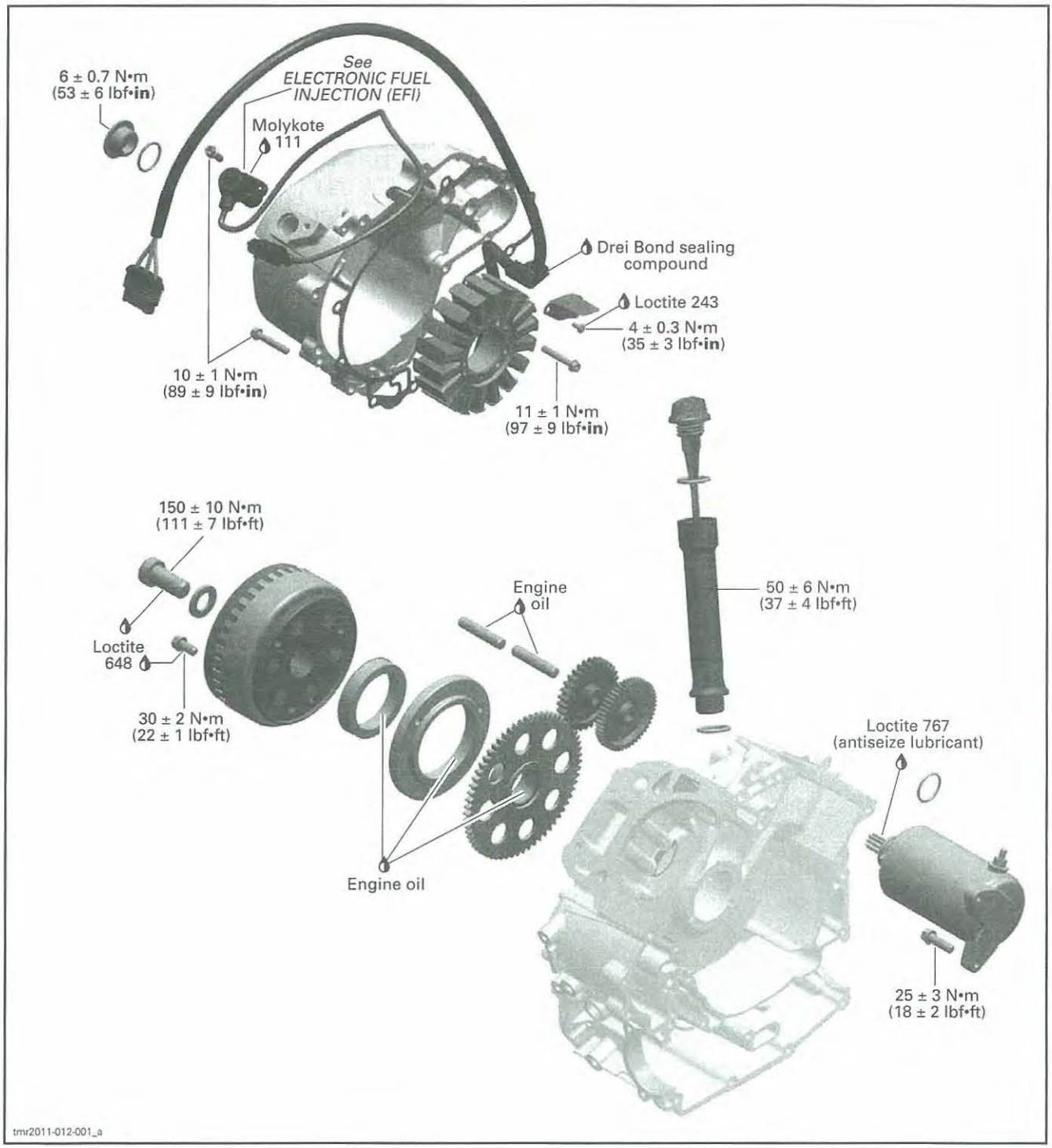
MAGNETO SYSTEM

SERVICE TOOLS

Description	Part Number	Page
CRANKSHAFT LOCKING BOLT	529 035 617	85
CRANKSHAFT PROTECTOR	529 036 034	86
MAGNETO DIAGNOSTIC HARNESS	529 036 199	84–85
MAGNETO PULLER	529 035 748	86

SERVICE PRODUCTS

Description	Part Number	Page
DREI BOND SEALING COMPOUND	420 297 906	83
LOCTITE 648 (GREEN)	413 711 400	88
LOCTITE 767 (ANTISEIZE LUBRICANT)	293 800 070	89
LOCTITE CHISEL (GASKET REMOVER)	413 708 500	83
PULLEY FLANGE CLEANER	413 711 809	87


6 ± 0.7 N•m
(53 ± 6 lbf•in)
See
ELECTRONIC FUEL
INJECTION (EFI)
Molykote
111
Drei Bond sealing
compound
Loctite 243
4 ± 0.3 N•m
(35 ± 3 lbf•in)
10 ± 1 N•m
(89 ± 9 lbf•in)
11 ± 1 N•m
(97 ± 9 lbf•in)
150 ± 10 N•m
(111 ± 7 lbf•ft)
Loctite
648
30 ± 2 N•m
(22 ± 1 lbf•ft)
Engine
oil
50 ± 6 N•m
(37 ± 4 lbf•ft)
Loctite 767
(antiseize lubricant)
Engine oil
25 ± 3 N•m
(18 ± 2 lbf•ft)
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GENERAL

During assembly/installation, use the 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 strictly be adhered to.
Locking devices when removed (e.g.: locking tabs, elastic stop nuts, self-locking fasteners, cotter pins, etc.) must be replaced.

PROCEDURES

MAGNETO COVER

Magneto Cover Access in Vehicle

Remove fuel tank, refer to *FUEL TANK AND FUEL PUMP*.

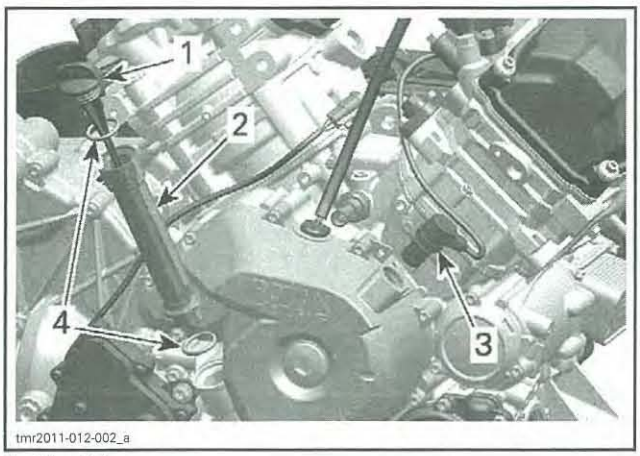
Magneto Cover Removal

Drain engine oil (refer to *LUBRICATION SYSTEM*).

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

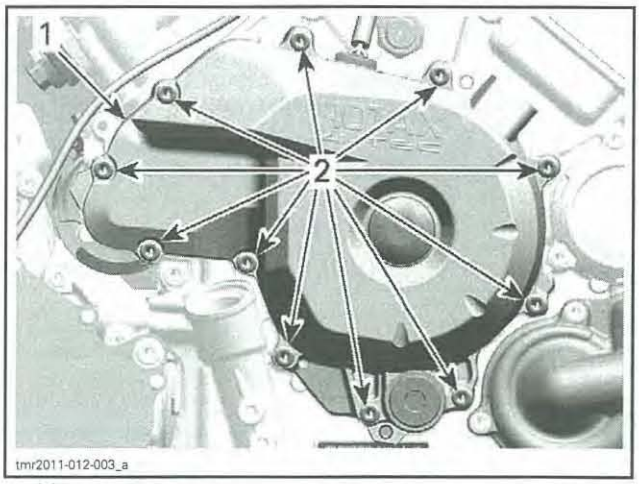
Disconnect magneto connector.

Remove dipstick and oil level tube with O-rings.



1. *Dipstick*
2. *Oil level tube*
3. *Crank position sensor (CPS)*
4. *O-rings*

Remove magneto cover retaining screws.



1. *Magneto cover*
2. *Retaining screws*

Pull out magneto cover.

Magneto Cover Inspection and Cleaning

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

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

⚠ WARNING

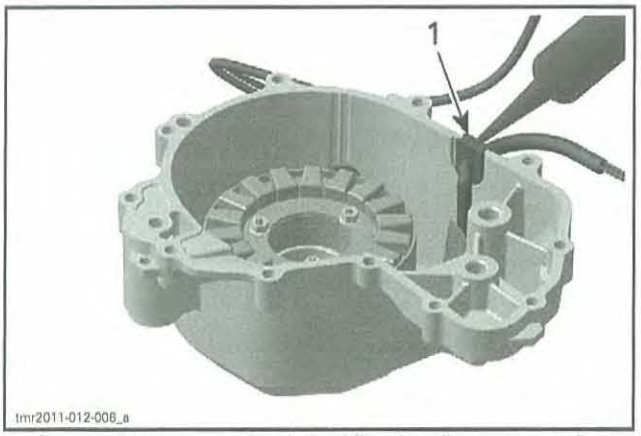
Wear safety glasses and work in a well ventilated area when working with strong chemical products. Also wear suitable non-absorbent gloves to protect your hands.

Magneto Cover Installation

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

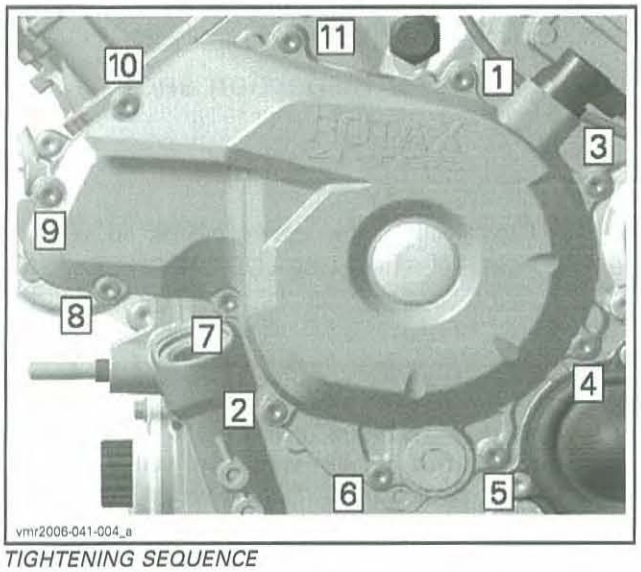
NOTE: At installation replace magneto cover gasket.

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



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

Tighten screws using the following sequence.



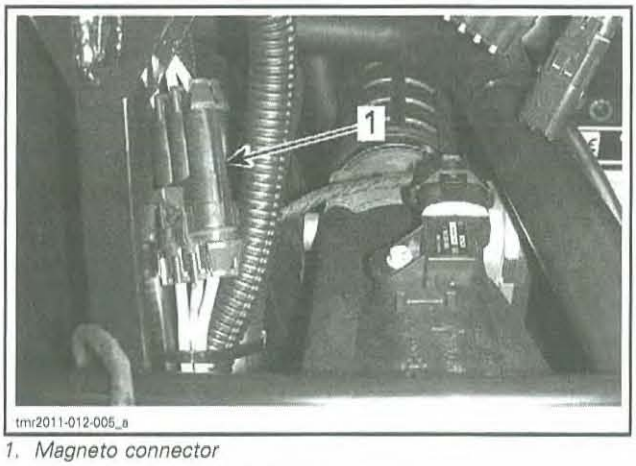
TIGHTENING SEQUENCE

Refill engine with recommended oil.

STATOR

Stator Connector Access

Refer to *BODY* and remove upper console.

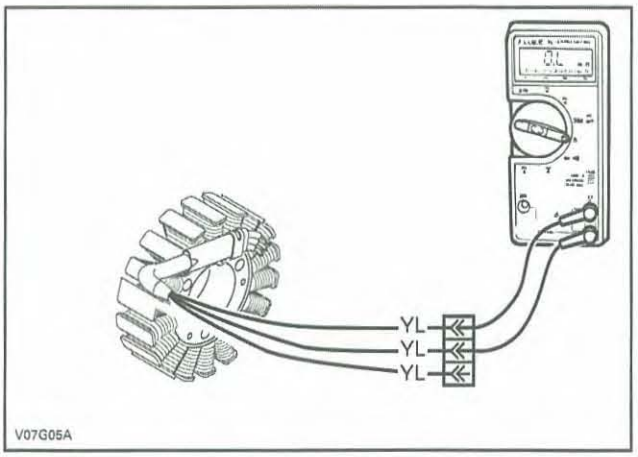


1. Magneto connector

Stator Static Test: Continuity

1. Disconnect the magneto connector.
2. Install the MAGNETO DIAGNOSTIC HARNESS (P/N 529 036 199) on magneto connector (magneto side).
3. Set multimeter to Ω.
4. Connect multimeter between YELLOW wires.
5. Read resistance.

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



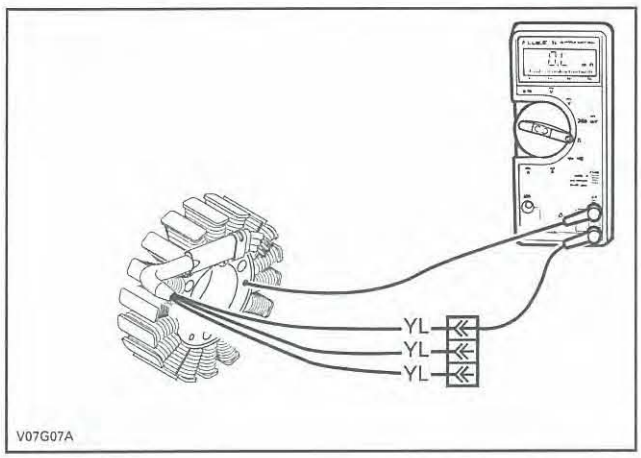
TYPICAL

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

Stator Static Test: Insulation

1. Install the MAGNETO DIAGNOSTIC HARNESS (P/N 529 036 199) on magneto connector (magneto side).
2. Set multimeter to Ω.
3. Connect multimeter between any YELLOW wire and engine ground.
4. Read resistance.

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



TYPICAL

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

Stator Dynamic Test: AC Voltage

1. Unplug magneto wiring harness connector.
2. Install theMAGNETO DIAGNOSTIC HARNESS (P/N 529 036 199) between unplugged connectors.

NOTE: Both connectors must be plugged.

3. Set multimeter to Vac.
4. Start engine.
5. Connect multimeter between YELLOW wires.
6. Read voltage as per following table.

TEST ENGINE SPEED	TERMINAL	VOLTAGE
4000 RPM	1 and 2	10 - 25 Vac
	1 and 3	
	2 and 3	

7. If voltage is lower than specification, replace stator.
8. Re-plug connectors properly.

Stator Removal

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

Remove screws securing the wire holding strip.

Remove stator retaining screws then the stator.

Stator Inspection

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

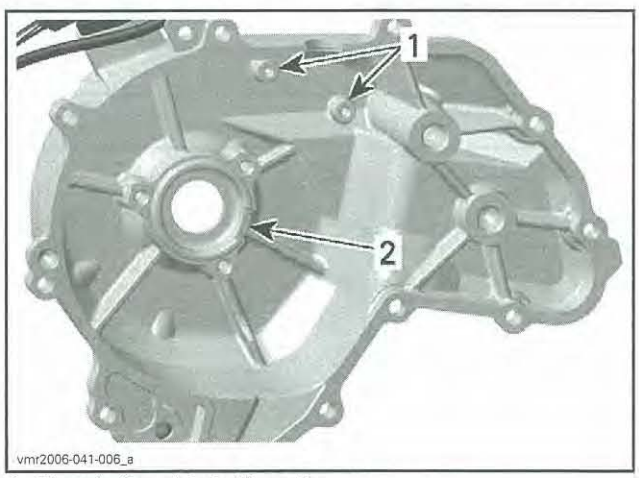
Check if stator wires are brittle, hard or otherwise damaged.

Stator Installation

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

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

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



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

ROTOR

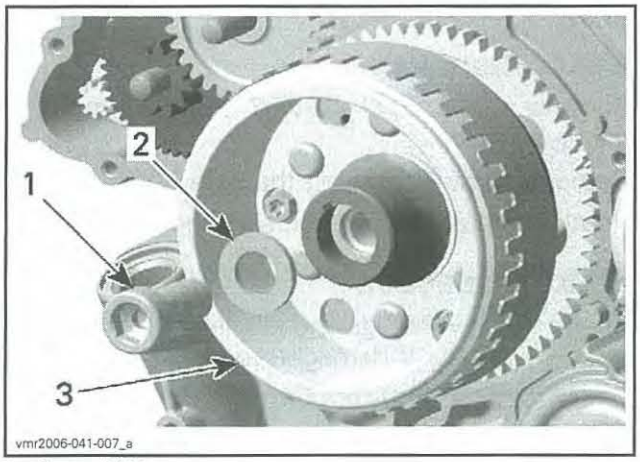
Rotor Removal

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

Lock crankshaft with CRANKSHAFT LOCKING BOLT (P/N 529 035 617) (refer to *BOTTOM END*).

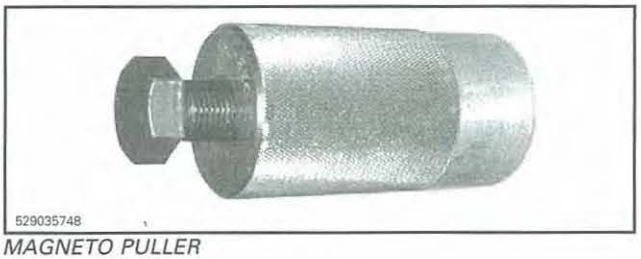
Heat screw in order to break the Loctite.

Remove screw and washer securing rotor to crankshaft.



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

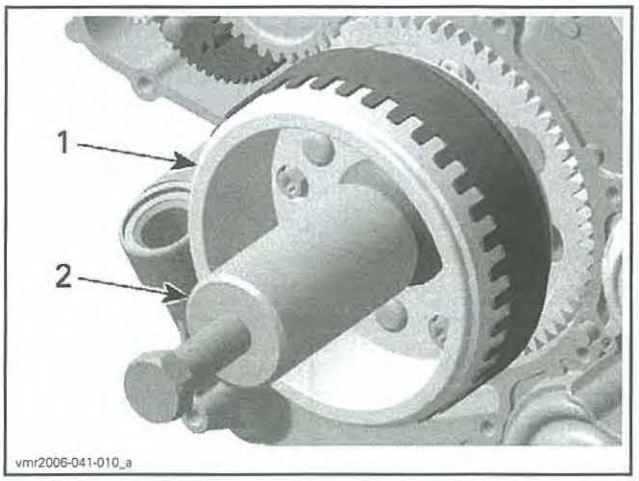
Install MAGNETO PULLER (P/N 529 035 748) and CRANKSHAFT PROTECTOR (P/N 529 036 034) then remove rotor.



MAGNETO PULLER

CRANKSHAFT PROTECTOR

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



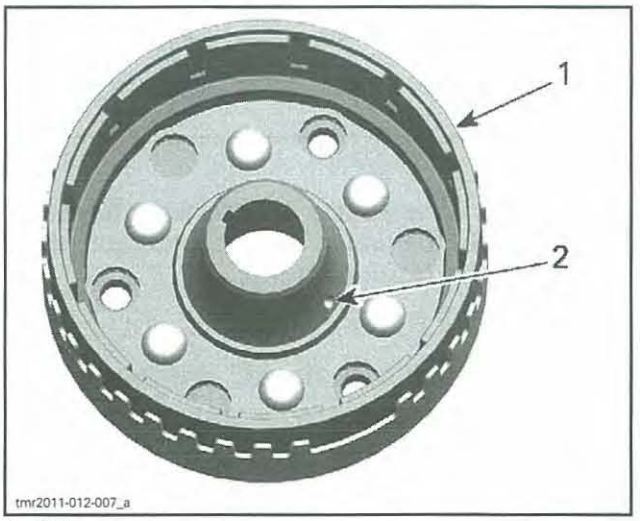
1. *Rotor*
2. *Magneto puller*

Screw magneto puller bolt to remove rotor.

Rotor Inspection

Check inner side of rotor for scratches or other damage.

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



1. *Rotor*
2. *Oil bore*

Check keyway of the rotor for wear or damages.

Check if trigger wheel teeth are bent or otherwise damaged.

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

Replace parts as necessary.

Rotor Installation

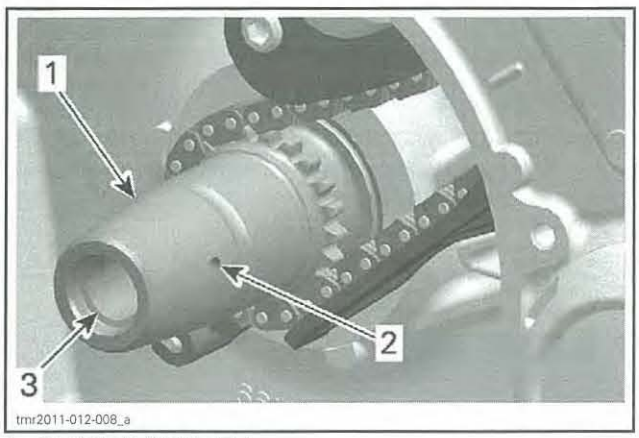
For installation, reverse the removal procedure. However, pay attention to the following.

Clean crankshaft taper and rotor with PULLEY FLANGE CLEANER (P/N 413 711 809).

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

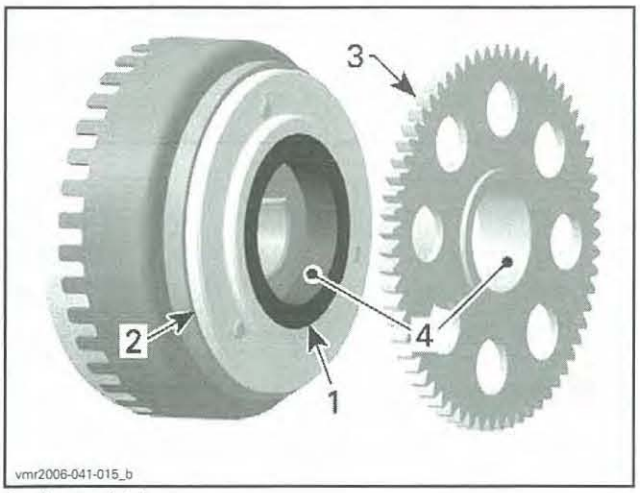
Blow pressurized air in the rotor oil bore.

Clean the crankshaft oil passage and threads using PULLEY FLANGE CLEANER (P/N 413 711 809).



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

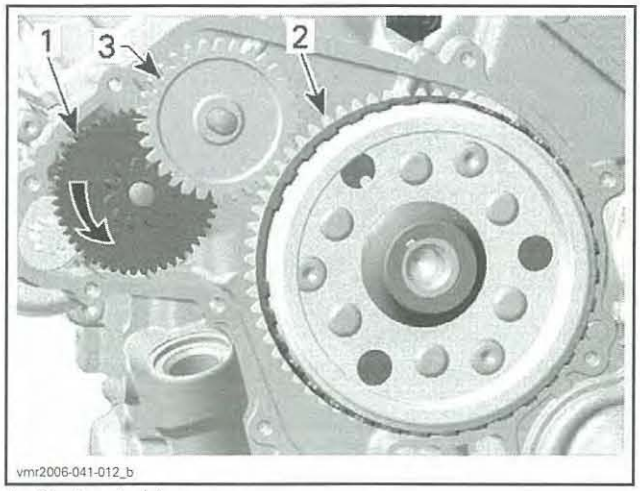
Oil sprag clutch and install sprag clutch gear.



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

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

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



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

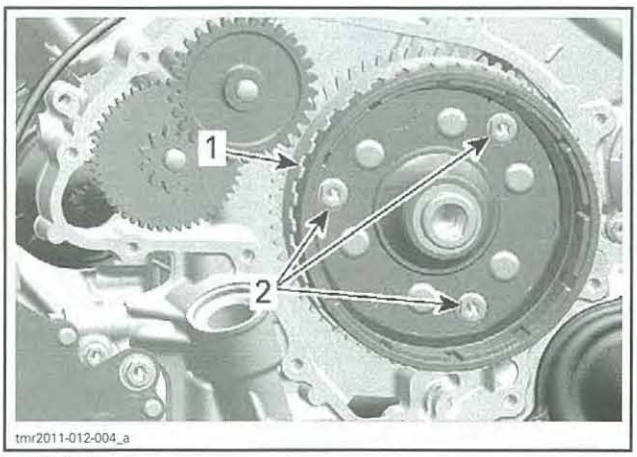
SPRAG CLUTCH

Sprag Clutch Removal

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

Heat screws in order to break the Loctite.

Loosen sprag clutch housing screws located inside rotor.

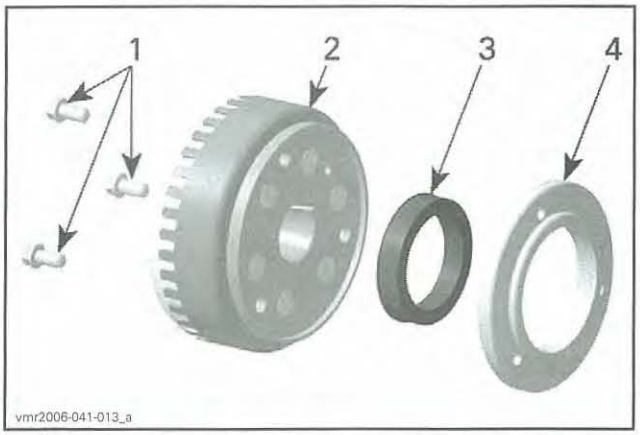


1. *Rotor*
2. *Sprag clutch housing screws*

Remove rotor (refer to *ROTOR* above).

Remove sprag clutch gear.

Remove sprag clutch housing screws and sprag clutch housing.



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

Sprag Clutch Inspection

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

Also check the collar of the sprag clutch gear.

Perform a functional test of the sprag clutch. To do so, rotate sprag clutch gear in sprag clutch.

NOTE: Sprag clutch must lock in counterclockwise direction.

SPRAG CLUTCH FUNCTIONAL TEST
1. Lock

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

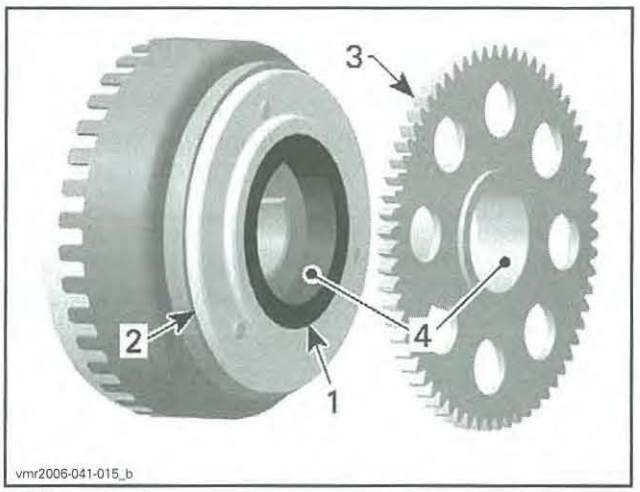
Sprag Clutch Installation

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

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

Install screws but do not torque yet.

Apply engine oil on sprag clutch and inside sprag clutch gear hole.



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

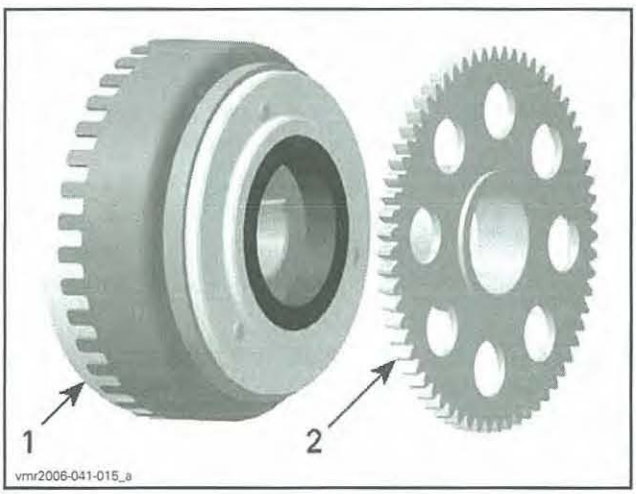
Install rotor then torque sprag clutch housing screws to 30 N•m (22 lbf•ft).

SPRAG CLUTCH GEAR

Sprag Clutch Gear Removal

Remove *ROTOR*. See procedure in this subsection.

Pull sprag clutch gear out of the rotor.

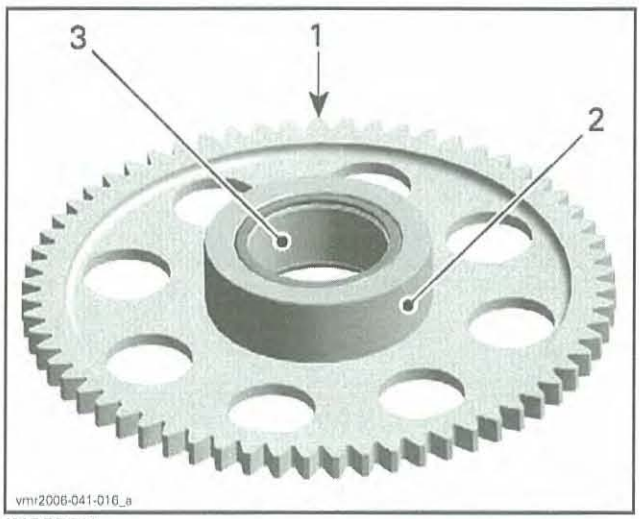


1. Rotor
2. Sprag clutch gear

Sprag Clutch Gear Inspection

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

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



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

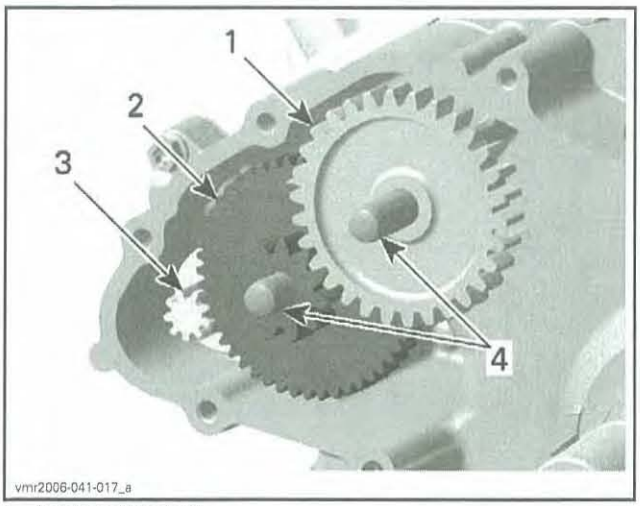
Sprag Clutch Gear Installation

The installation is the reverse of the removal procedure.

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

STARTER DRIVE GEARS

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



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

Starter Drive Gear Removal

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

Remove location pins, starter double gear and intermediate gear.

Starter Drive Gear Inspection

Inspect gears and location pins for wear and damage.

Replace parts as necessary.

Starter Drive Gear Installation

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

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

Apply engine oil on location pins.

TOP END

SERVICE TOOLS

Description	Part Number	Page
CRANKSHAFT LOCKING BOLT	529 035 617	112
PISTON CIRCLIP INSTALLER	529 035 921	115
PISTON CIRCLIP INSTALLER	529 036 153	115
PISTON RING COMPRESSOR	529 035 919	112
TDC DIAL INDICATOR	414 104 700	97
VALVE GUIDE INSTALLER	529 036 140	110
VALVE GUIDE REMOVER 5 MM	529 035 924	110
VALVE SPRING COMPRESSOR CUP	529 035 764	106
VALVE SPRING COMPRESSOR	529 035 724	106

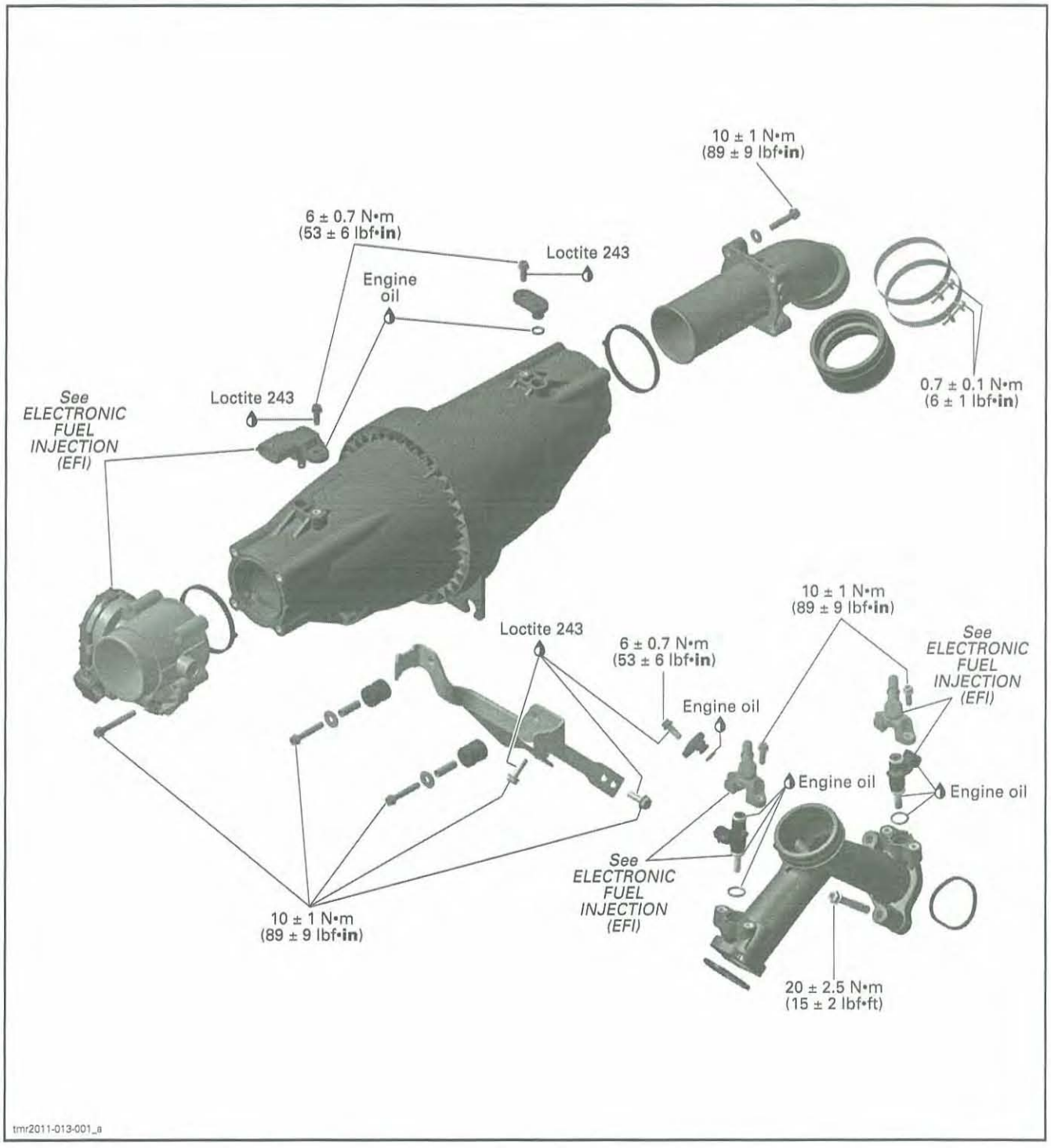
SERVICE TOOLS – OTHER SUPPLIER

Description	Part Number	Page
SNAP-ON PLIERS	YA 8230	108

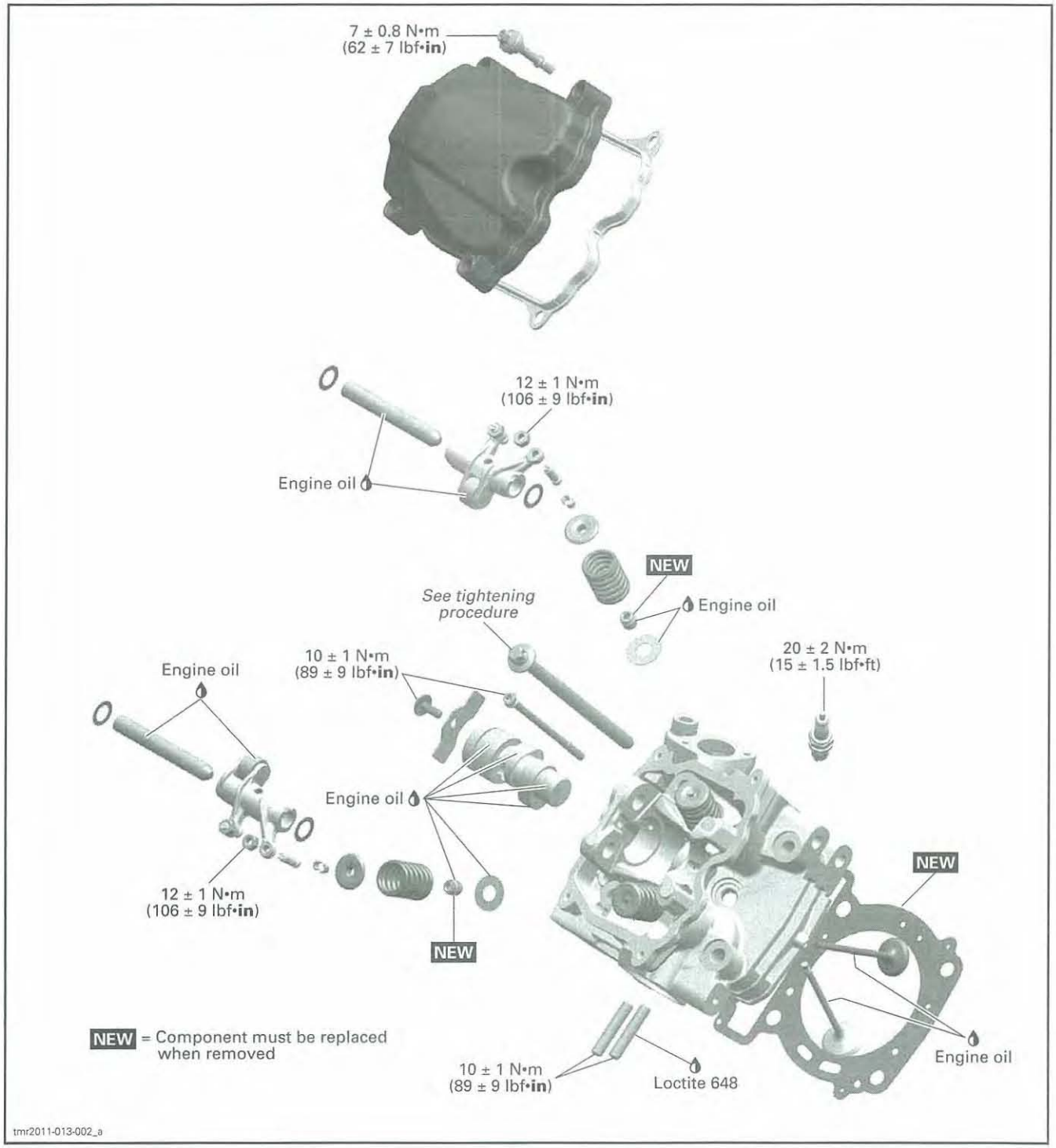
SERVICE PRODUCTS

Description	Part Number	Page
LOCTITE 767 (ANTISEIZE LUBRICANT)	293 800 070	111

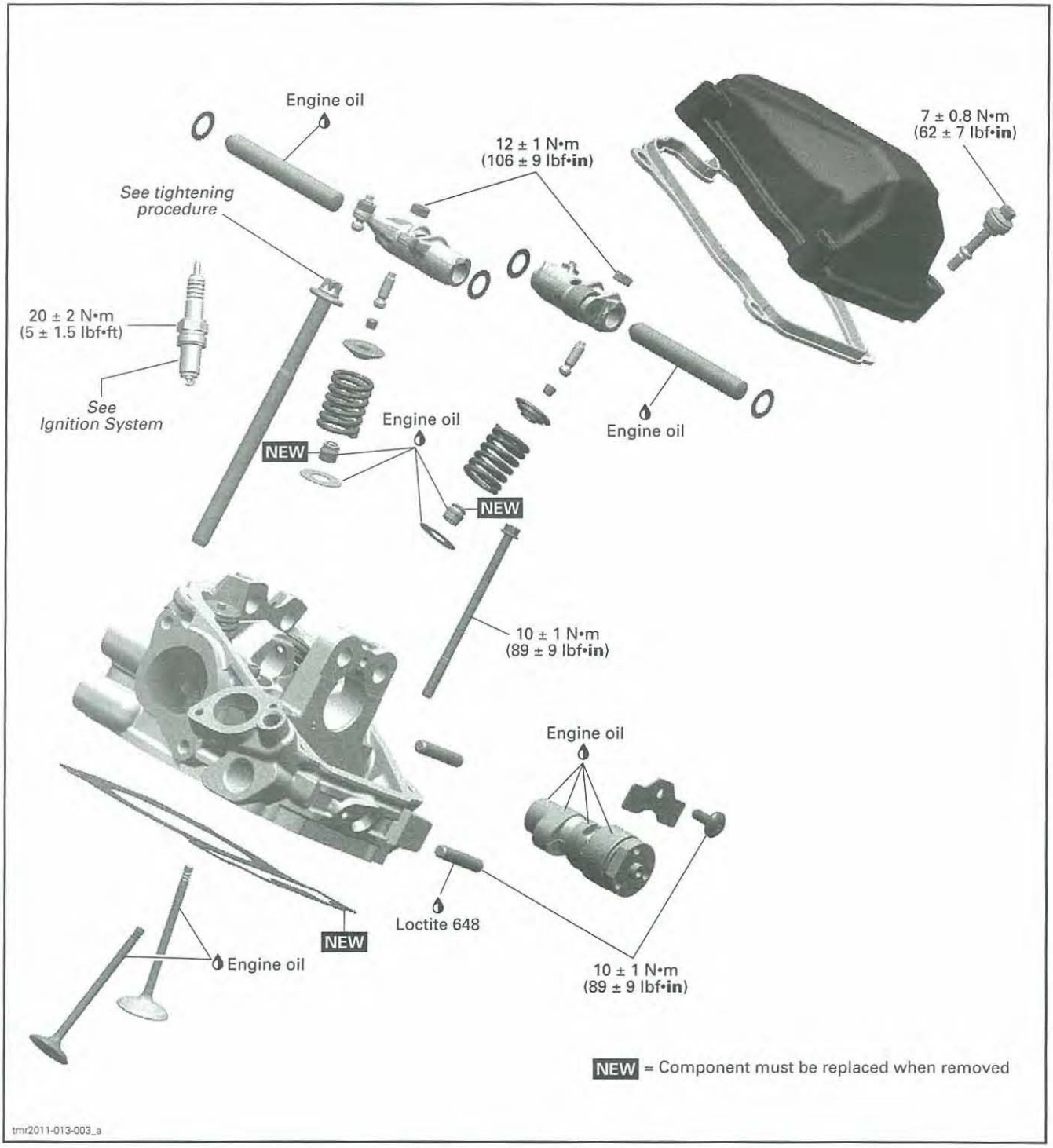
INTAKE MANIFOLD



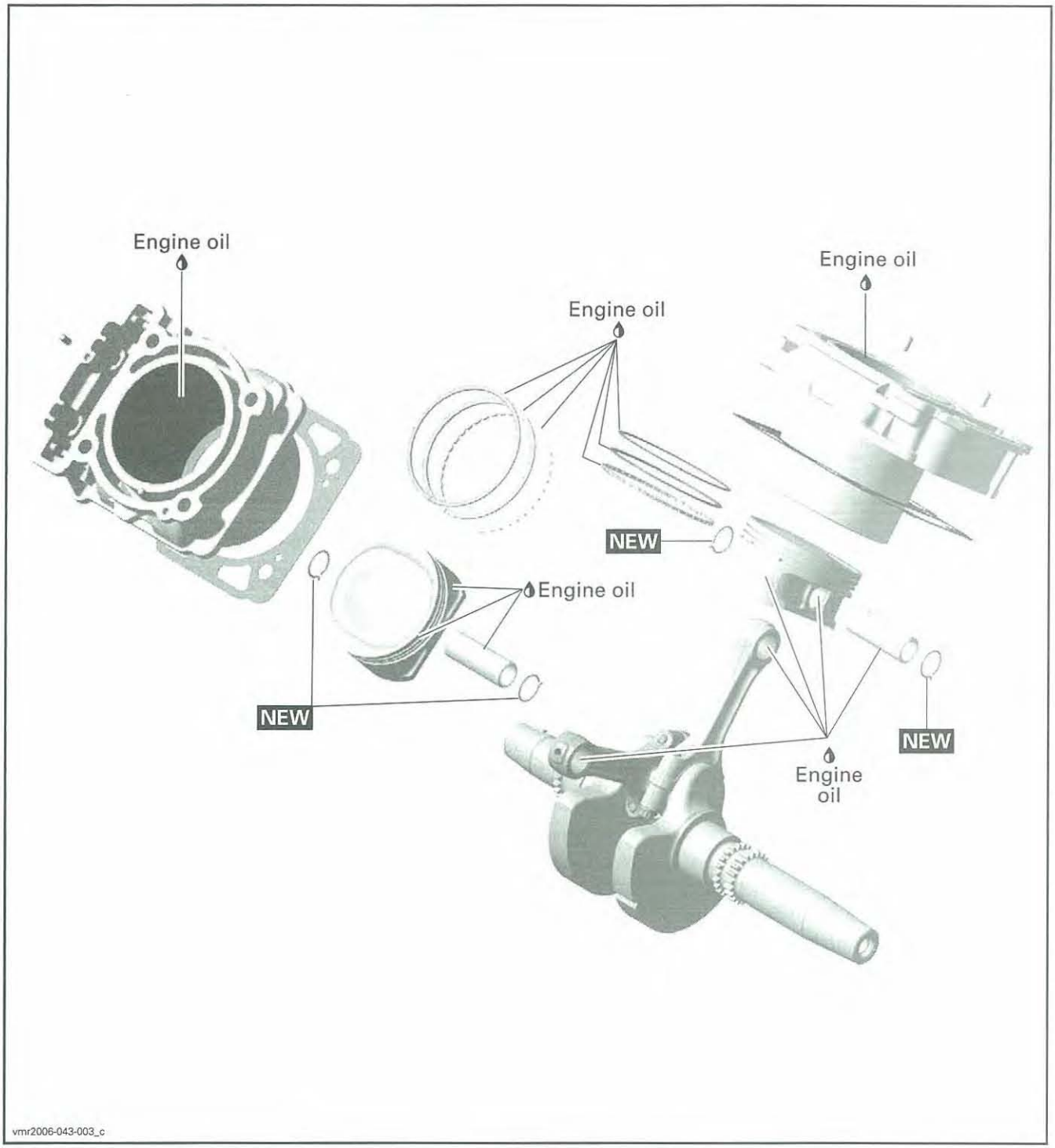
CYLINDER HEAD NO. 1



CYLINDER HEAD NO. 2

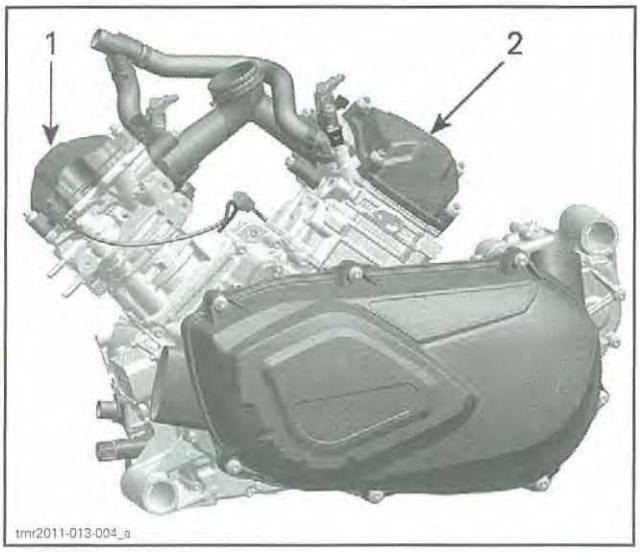


CYLINDERS AND PISTONS



GENERAL

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



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

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

Always place the vehicle on level surface.

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

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

Even if the removal of many parts is not necessary to reach another part, it is recommended to remove these parts in order to check them.

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 when removed (e.g.: locking tabs, elastic stop nuts, cotter pin, etc.) must be replaced.

When disassembling parts that are duplicated in the engine, (e.g.: valves), it is a strongly recommended to note their position (PTO/MAG side, front/rear cylinder) 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). Also, since used parts have matched together during the engine operation, they will keep their matched fit when you reassemble them together within their "group".

INSPECTION

LEAK TEST

Before performing the cylinder leak test, verify the following:

- Clamp(s) tightness
- Radiator and hoses.

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

⚠ WARNING

Prevent burning yourself on hot engine parts.

Preparation

Disconnect battery.

⚠ WARNING

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

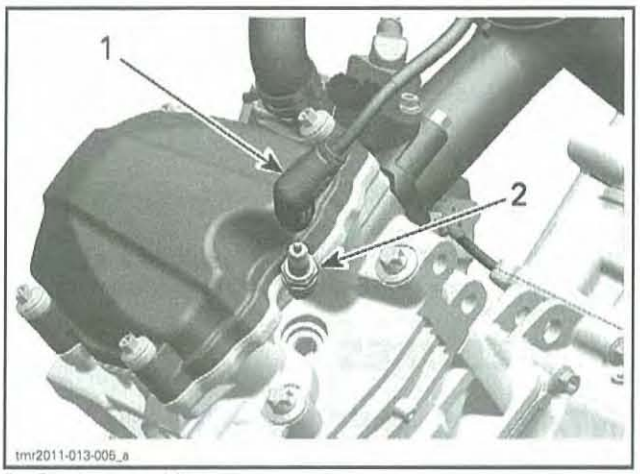
Remove radiator cap.

⚠ WARNING

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

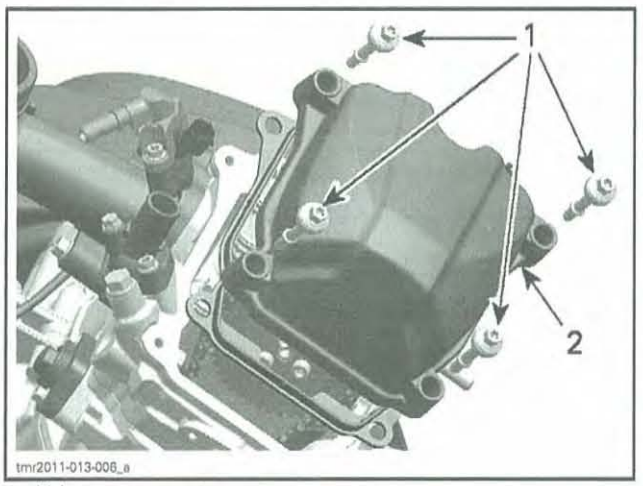
Unplug spark plug cable.

Clean spark plug area and remove spark plug from cylinder head.



1. *Spark plug cable*
2. *Spark plug*

Remove valve cover.



1. *Valve cover screws*
2. *Valve cover*

Rotate crankshaft until piston is at ignition TDC.

To turn crankshaft, there are two possible procedures.

First Procedure

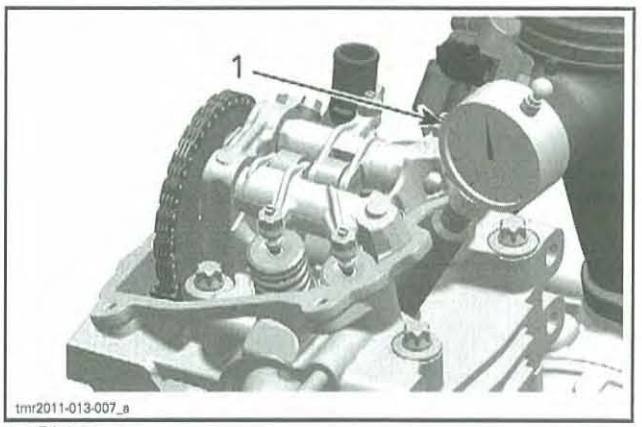
Turn the drive pulley.

Second Procedure

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

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

Using the TDC DIAL INDICATOR (P/N 414 104 700), turn the crankshaft and set the piston to precisely ignition TDC.

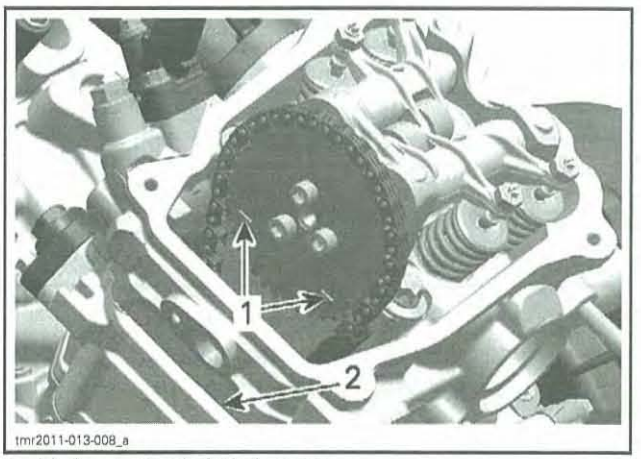


1. *Dial gauge*

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

NOTICE **Do not scratch or damage piston/cylinder surface.**

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



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

Leak Test

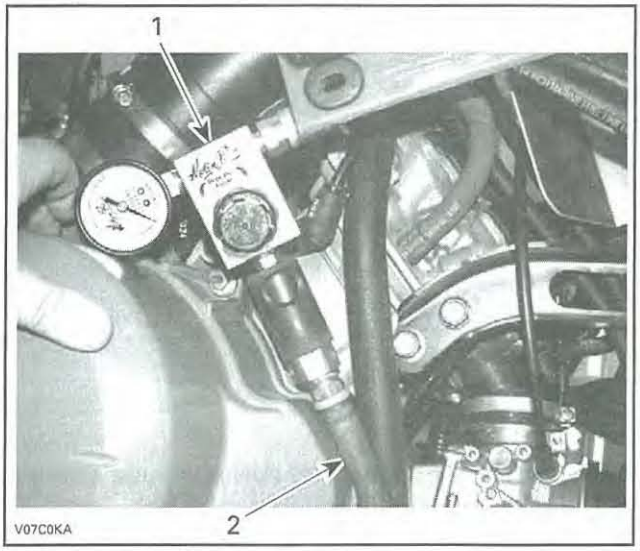
Connect to adequate air supply.

Set needle of measuring gauge to zero.

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

Install gauge adapter into previously cleaned spark plug hole.

Supply combustion chamber with air pressure.



TYPICAL
1. Leak tester
2. Air supply hose

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

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

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

Diagnosis

Listen for air leaks.

- Air escaping in intake port/throttle body means leaking intake valve(s)
- Air escaping in exhaust port means leaking exhaust valve(s)
- Air bubbles in the coolant (radiator) means leaking cylinder head gasket
- Air/coolant escaping from cylinder/head means damaged gasket(s) and/or loosened screws
- Air escaping into crankcase area means excessively worn cylinder and/or broken piston rings
- Air/oil escaping from crankcase means damaged gasket and/or loosened screws (refer to *BOTTOM END* subsection).

NOTE: For all 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 in other sections of this manual as required.

PROCEDURES

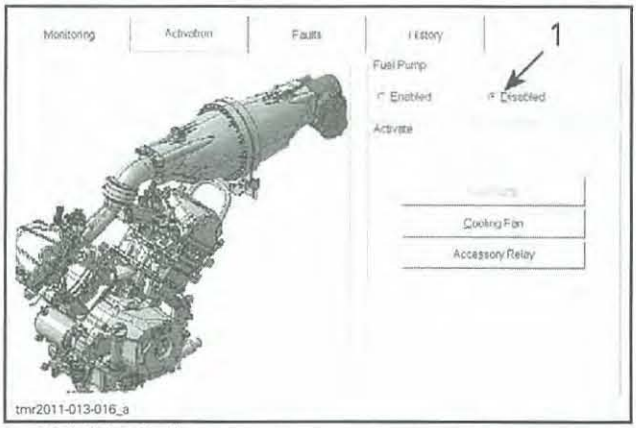
INTAKE MANIFOLD

Intake Manifold Access

Refer to *BODY* and remove the lower console.

Intake Manifold Removal

1. Disable fuel pump using B.U.D.S. Select the **ECM** and **Activation** tabs, then click on **Disabled** in the fuel pump area.

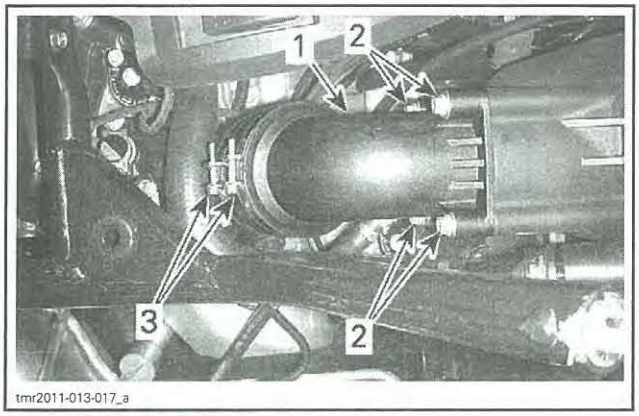


1. Click "Disabled"

2. Release fuel pressure by running engine until it runs out of gas.
3. Disconnect the fuel hoses at the fuel injectors, refer to *ELECTRONIC FUEL INJECTION (EFI)*.

⚠ CAUTION The fuel hose may still be under pressure.

4. Disconnect fuel injectors electrical connectors.
5. Remove intake plenum adapter.



1. *Plenum adapter elbow*
2. *Plenum elbow to plenum retaining screws*
3. *Plenum elbow to intake manifold clamps*

6. Remove intake manifold to cylinder head retaining screws, then remove intake manifold.

Intake Manifold Inspection

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

Intake Manifold Installation

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

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

INTAKE MANIFOLD RETAINING SCREWS TIGHTENING TORQUE
20 N•m ± 2.5 N•m (15 lbf•ft ± 2 lbf•ft)

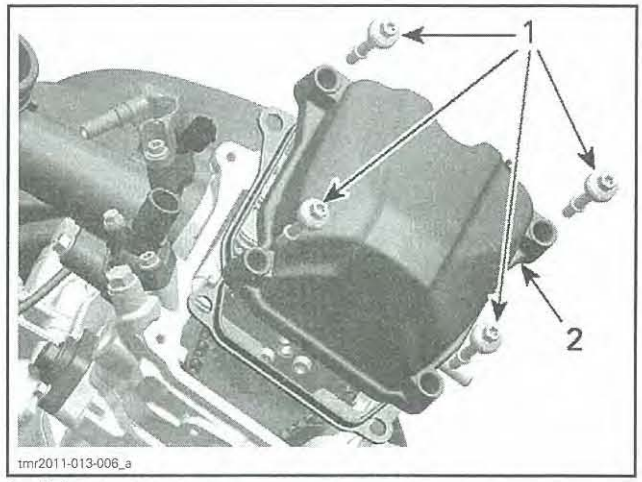
Enable fuel pump using B.U.D.S.

VALVE COVER

Valve Cover Removal

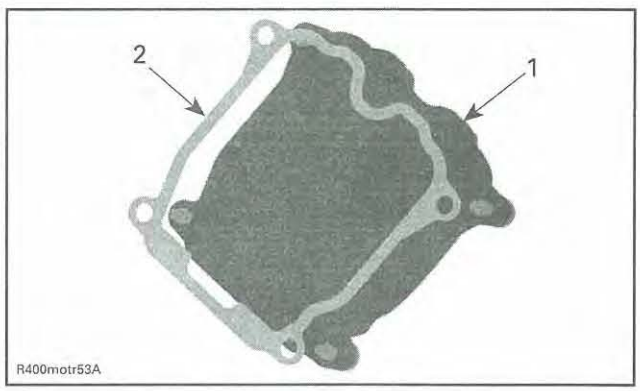
To remove cylinder 1 valve cover, remove plenum.

Remove valve cover screws of valve cover.



1. *Valve cover screws*
2. *Valve cover*

Remove valve cover and gasket.



1. *Valve cover*
2. *Gasket*

Repeat the procedure for the other valve cover if required.

Valve Cover Inspection

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

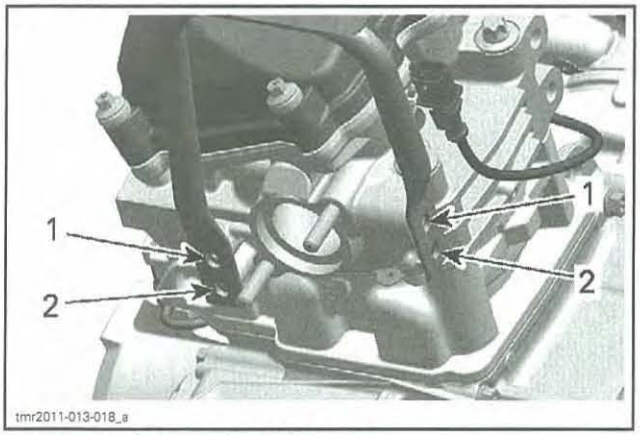
Valve Cover Installation

For installation, reverse the removal procedure.

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

VALVE COVER RETAINING SCREWS TIGHTENING TORQUE
7 N•m ± 0.8 N•m (62 lbf•**in** ± 7 lbf•**in**)

On cylinder 1, install the plenum bracket using the appropriate mounting holes.



1. Mounting holes for the 1000 engine
2. Mounting holes for the 800R engine

ROCKER ARM

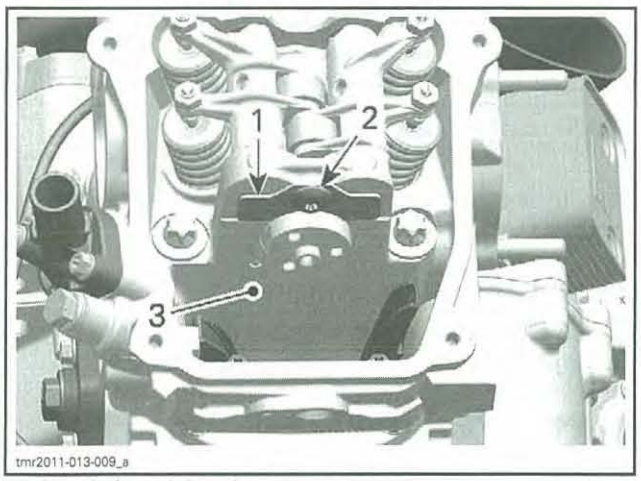
Rocker Arm Removal

Remove valve cover.

Place the cylinder at TDC ignition, refer to *TIMING CHAIN* subsection.

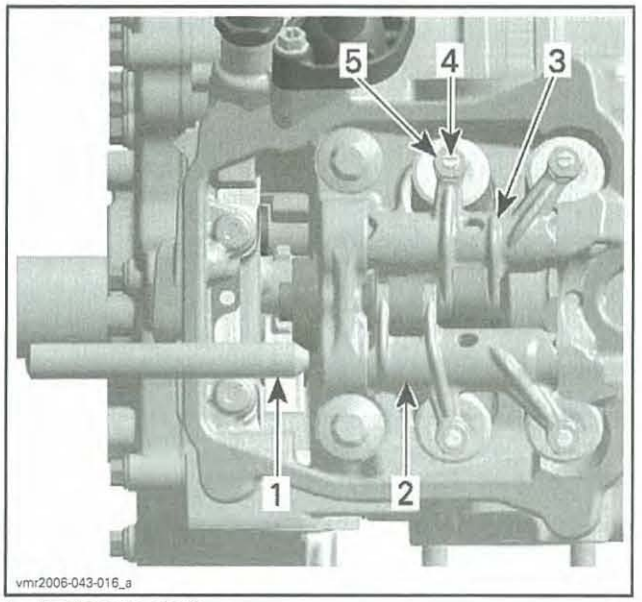
Remove timing chain tensioner and camshaft timing gear, refer to *TIMING CHAIN* subsection.

Remove pan head screw and camshaft retaining plate.



1. Camshaft retaining plate
2. Pan head screw
3. Cylinder head

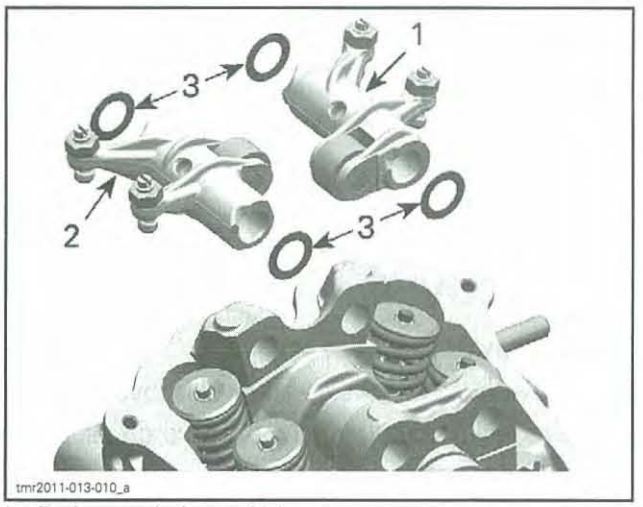
Remove rocker arm shafts.



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

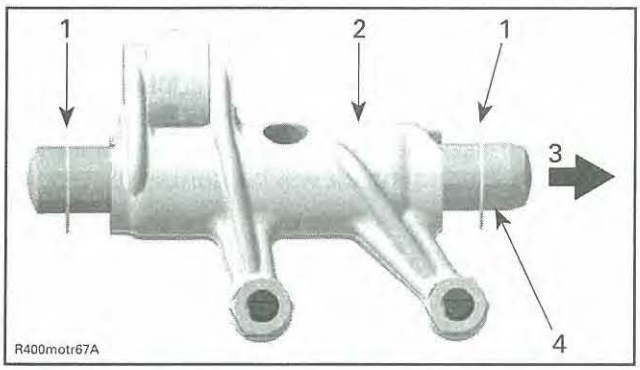
Remove rocker arm assembly (exhaust side and intake side) with adjustment screws and lock nuts.

Remove thrust washers.



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

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

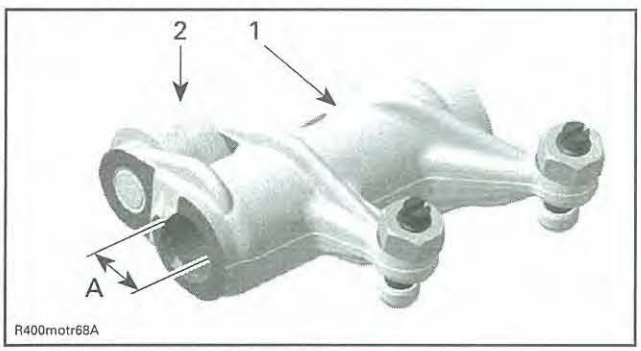


1. *2 thrust washers*
2. *Rocker arm (exhaust side)*
3. *Cylinder head (spark plug side)*
4. *Big taper to spark plug side*

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.



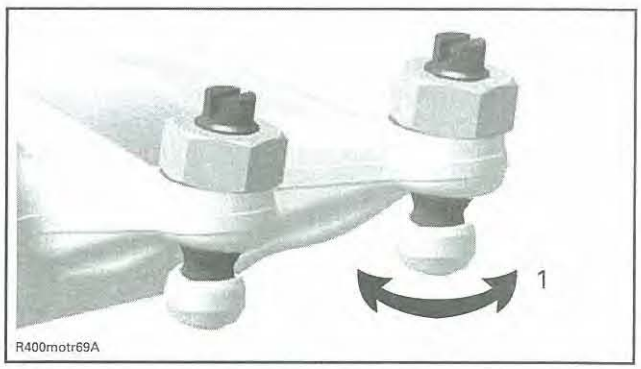
1. *Rocker arm (exhaust side)*
2. *Roller*

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 mm to 12.050 mm (.4739 in to .4744 in)
SERVICE LIMIT	12.060 mm (.4748 in)

Check adjustment screws for free movement, cracks and/or excessive play.

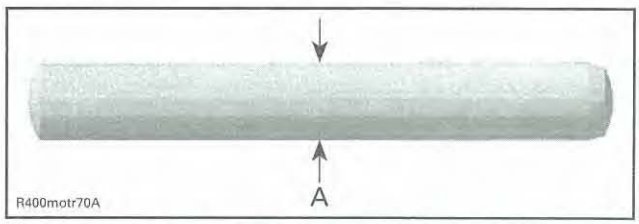


1. *Free movement of adjustment screw top*

Rocker Arm Shaft

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	12.00 mm to 12.018 mm (.4724 in to .4731 in)
SERVICE LIMIT	11.990 mm (.472 in)

Any area worn excessively will require parts replacement.

Rocker Arm Installation

NOTE: Use the same procedure for exhaust and intake rocker arm.

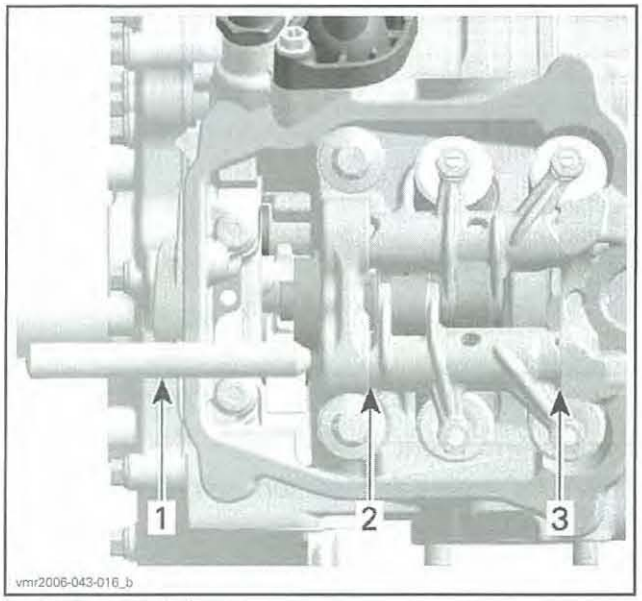
Apply engine oil on rocker arm shaft.

Install the rocker arm shafts with the chamfered edge first and use following procedure.

Insert a rocker arm pin through rocker arm pin bore.

Install a thrust washer at timing chain side, then the proper rocker arm (exhaust side or intake side).

Push in rocker arm shaft until its chamfer reaches the end of rocker arm bore.



1. *Rocker arm shaft*
2. *Thrust washer (timing chain side)*
3. *Thrust washer (spark plug side)*

Place the other thrust washer and push rocker arm shaft to end position.

Install the camshaft retaining plate.

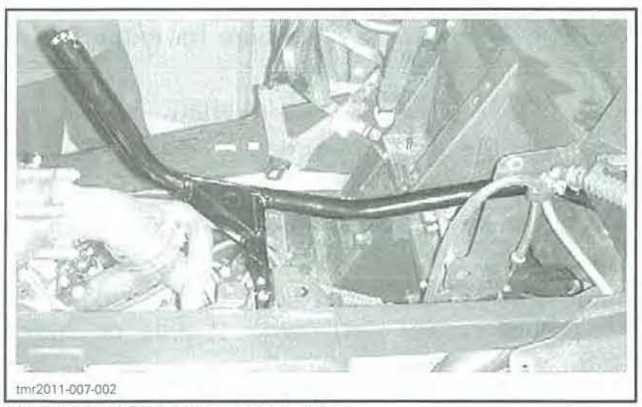
Adjust valve clearance, refer to *PERIODIC MAINTENANCE PROCEDURE*.

CYLINDER HEAD

Cylinder Head Access

Refer to *BODY* and remove:
- Lower console
- LH and RH lateral console panels.

Remove LH passenger handhold bar.



LH PASSENGER HANDHOLD BAR

Cylinder Head Removal

The removal procedure is the same for both cylinder heads.

Drain coolant (refer to *COOLING SYSTEM*).

NOTE: Before removing cylinder head, blow out remaining coolant by air pressure. During cylinder head removal, the remaining coolant in cylinder head could overflow into the engine and a little quantity of coolant could drop into the engine. In this case, the engine oil will be contaminated.

Disconnect spark plug wire.

Disconnect temperature sensor connector, located at rear cylinder head.

Remove the intake manifold (see *INTAKE MANIFOLD* in this subsection).

On cylinder 1, remove plenum.

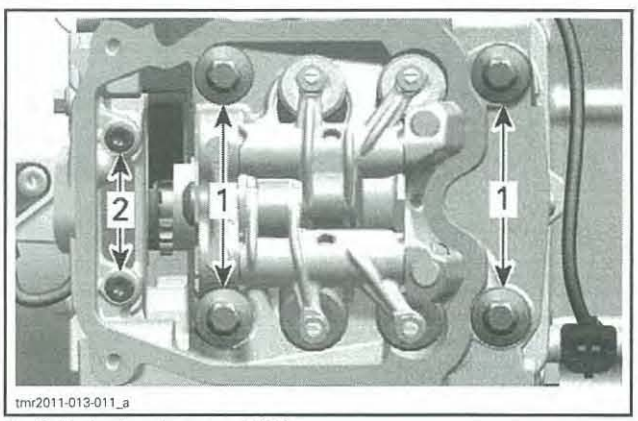
On cylinder 2, remove the shift cable bracket.

Remove the chain tensioner (see *CHAIN TENSIONER* in the *TIMING CHAIN* subsection).

Remove the valve cover and its gasket (see *VALVE COVER* above).

Remove the camshaft timing gear (see *TIMING CHAIN GEAR* in the *TIMING CHAIN* subsection).

Unscrew cylinder head M6 and M10 screws retaining cylinder head and cylinder to cylinder base.

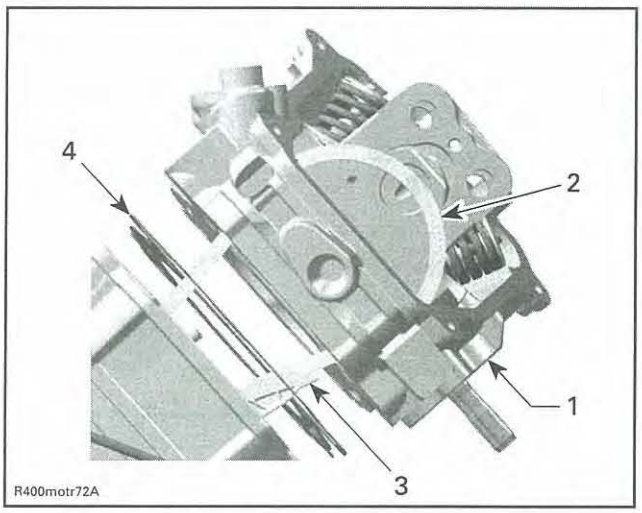


1. *Cylinder head screws M10*
2. *Cylinder head screws M6*

Pull up cylinder head.

Remove timing chain guide (fixed).

Remove and discard the cylinder head gasket.



1. Cylinder head
2. Timing chain
3. Chain guide (fixed)
4. Cylinder head gasket

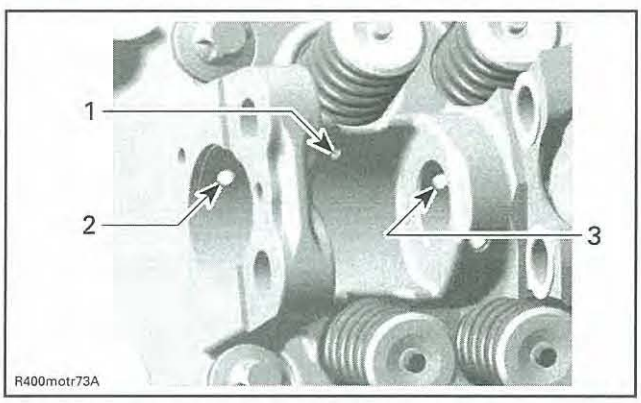
Cylinder Head Inspection

Inspect timing chain guide (fixed) for wear, cracks or other damages. Replace if necessary.

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

Check mating surface between cylinder and cylinder head for contamination. If so, clean both surfaces.

Clean oil support through the cylinder head from contamination.



1. Oil port to lubricate camshaft lobes intake/exhaust
2. Oil supply to camshaft bearing journal (timing chain side)
3. Oil supply to camshaft bearing journal (spark plug side)

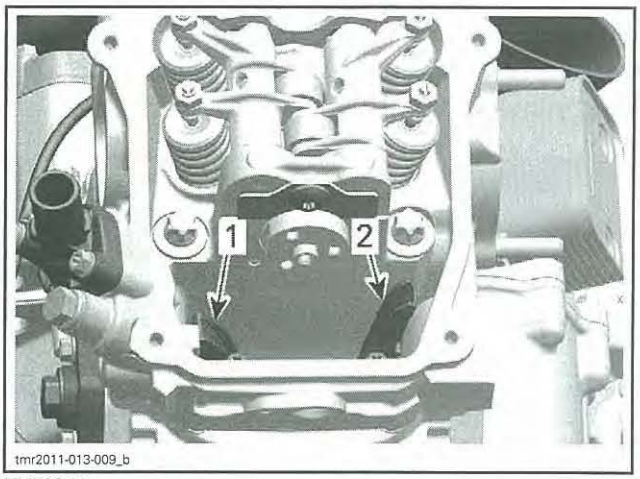
Cylinder Head Installation

NOTE: Never invert front and rear cylinder heads. On the 800R, cylinder heads are not identical.

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

Ensure dowel pins are in place.

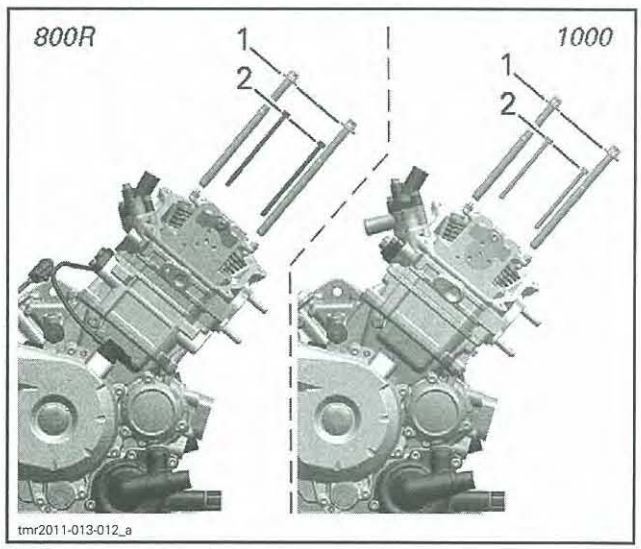
NOTICE Timing chain guide (fixed) has to be fixed between cylinder and cylinder head.



TYPICAL
1. Timing chain guide (tensioner side) mounted in crankcase
2. Timing chain guide (fixed) between cylinder and cylinder head

Install a NEW cylinder head gasket.

NOTICE Cylinder head screws of 800R engine and 1000 engine have different lengths.



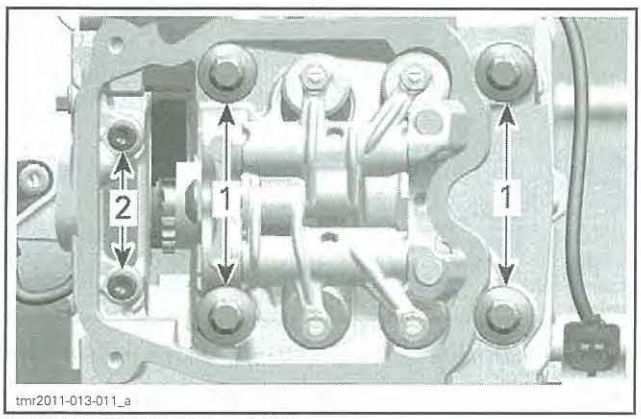
800R
1. M10 x 140
2. M6 x 85

1000
1. M10 x 159
2. M6 x 105

First, torque M10 cylinder head screws in criss-cross sequence to 20 N•m ± 1 N•m (15 lbf•ft ± 1 lbf•ft) then finish by tightening to 180° +/- 5°.

CYLINDER HEAD TIGHTENING TORQUE	
Preliminary torque	20 N•m ± 1 N•m (15 lbf•ft ± 1 lbf•ft)
Final torque	180° +/- 5°

Install cylinder head M6 screws.

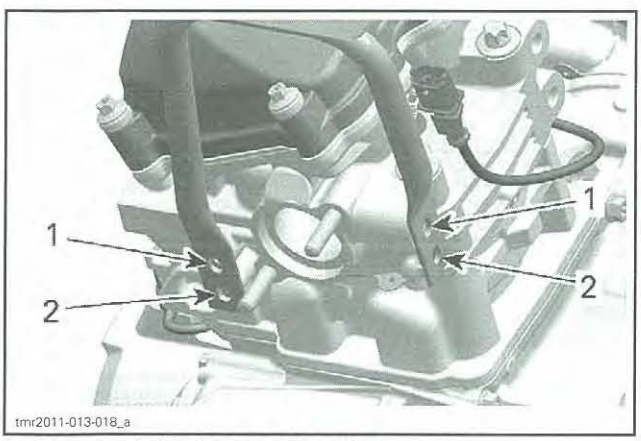


1. *Cylinder head screws M10*
2. *Cylinder head screws M6*

Check timing chain guide (tensioner side) for movement.

Remove crankshaft locking bolt and reinstall plug screw with sealing ring.

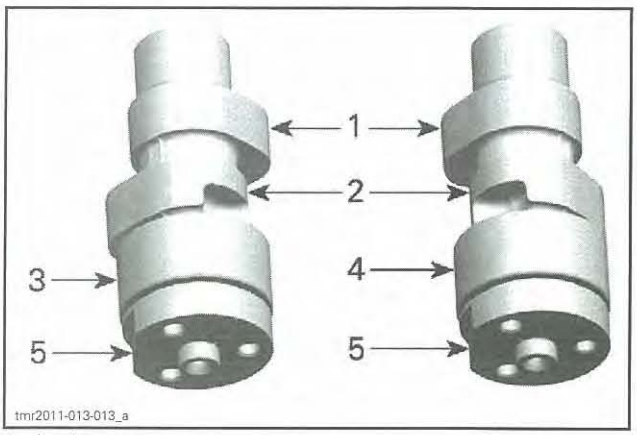
On cylinder 1, install the plenum bracket using the appropriate mounting holes.



1. *Mounting holes for the 1000 engine*
2. *Mounting holes for the 800R engine*

CAMSHAFT

NOTE: The engine is equipped with two different camshafts.



1. *Intake cam*
2. *Exhaust cam*
3. *Camshaft of cylinder 1*
4. *Camshaft of cylinder 2*
5. *Flat spot*

Camshaft Removal

The removal procedure is the same for both camshafts.

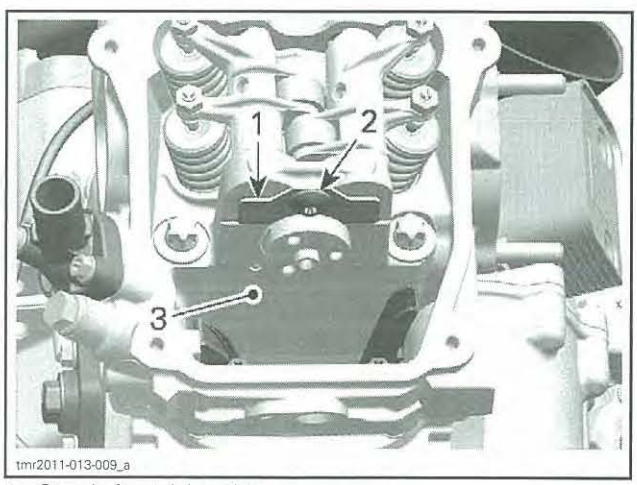
Each camshaft is different in design. Thus, it is important not to mix up any parts of the camshaft assembly with that of the other cylinder. Keep parts as a group.

Remove valve cover (see *VALVE COVER* in this subsection).

Remove the chain tensioner (see *CHAIN TENSIONER* in the *TIMING CHAIN* subsection).

Remove the camshaft timing gear (see *CAMSHAFT TIMING GEAR* in the *TIMING CHAIN* subsection).

Remove the camshaft retaining plate.

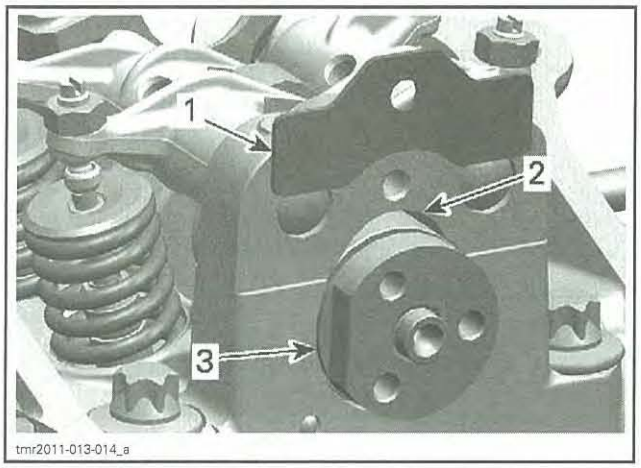


1. *Camshaft retaining plate*
2. *Pan head screw*
3. *Cylinder head*

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.

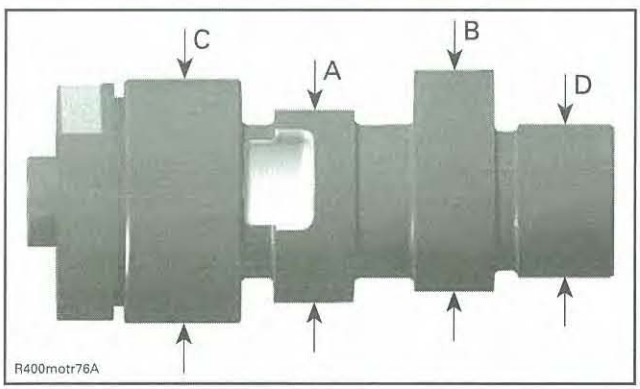


1. Camshaft retaining plate
2. Area for camshaft lobes
3. Camshaft

Camshaft Inspection

Check each lobe and bearing journal of camshaft for scoring, scuffing, cracks or other signs of wear.

Measure camshaft journal diameter and lobe height using a micrometer.



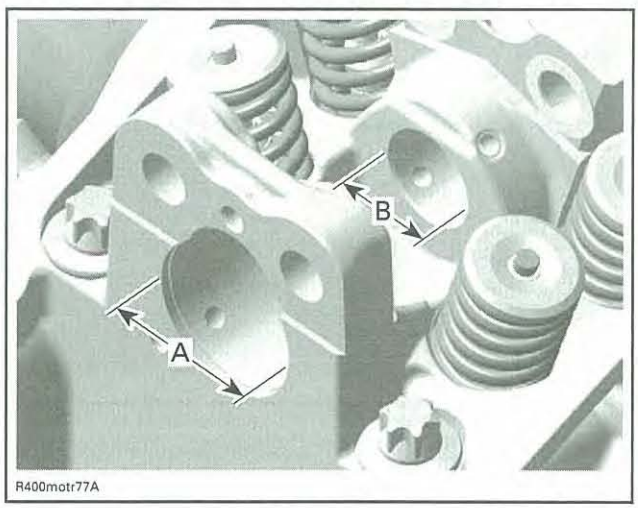
A. Camshaft lobe (exhaust valves)
B. Camshaft lobe (intake valves)
C. Camshaft journal (timing chain side)
D. Camshaft journal (spark plug side)

800R	
CAMSHAFT LOBE (EXHAUST)	
NEW	32.950 mm to 33.150 mm (1.2972 in to 1.3051 in)
SERVICE LIMIT	32.930 mm (1.2965 in)
CAMSHAFT LOBE (INTAKE)	
NEW	32.890 mm to 33.090 mm (1.2949 in to 1.3028 in)
SERVICE LIMIT	32.870 mm (1.2941 in)

1000	
CAMSHAFT LOBE (EXHAUST)	
NEW	32.860 mm to 33.060 mm (1.294 in to 1.302 in)
SERVICE LIMIT	32.840 mm (1.293 in)
CAMSHAFT LOBE (INTAKE)	
NEW	32.960 mm to 33.160 mm (1.298 in to 1.306 in)
SERVICE LIMIT	32.940 mm (1.297 in)

CAMSHAFT JOURNAL (TIMING CHAIN SIDE)	
NEW	34.959 mm to 34.975 mm (1.3763 in to 1.377 in)
SERVICE LIMIT	34.950 mm (1.376 in)
CAMSHAFT JOURNAL (SPARK PLUG SIDE)	
NEW	21.959 mm to 21.980 mm (.8645 in to .8654 in)
SERVICE LIMIT	21.950 mm (.8642 in)

Measure clearance between both ends of camshaft and cylinder head.



A. Camshaft bearing (timing chain side)
B. Camshaft bearing (spark plug side)

CAMSHAFT BEARING (TIMING CHAIN SIDE)	
NEW	35.000 mm to 35.025 mm (1.378 in to 1.3789 in)
SERVICE LIMIT	35.040 mm (1.3795 in)
CAMSHAFT BEARING (SPARK PLUG SIDE)	
NEW	22.000 mm to 22.021 mm (.8661 in to .867 in)
SERVICE LIMIT	22.040 mm (.8677 in)

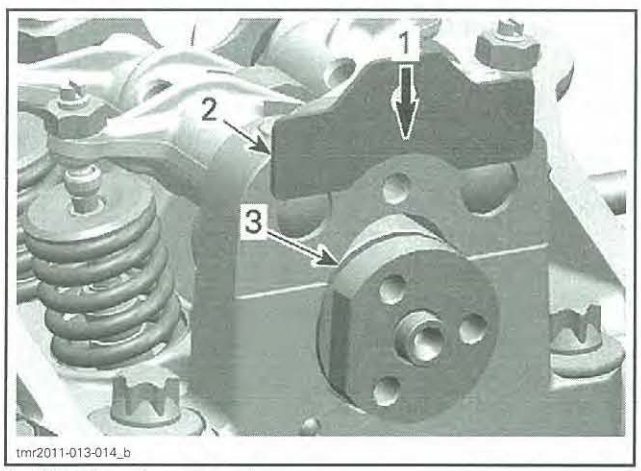
Replace parts that are not within specifications.

Camshaft Installation

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

NOTICE **The camshafts are not identical in design. Do not invert the camshafts during assembly. Any mix-up of the components will lead to engine damage.**

Place the camshaft retaining plate in the slot of the camshaft.



1. Direction of movement
2. Camshaft retaining plate
3. Slot retaining camshaft

For other parts, refer to proper installation procedure.

VALVE SPRINGS

Valve Spring Removal

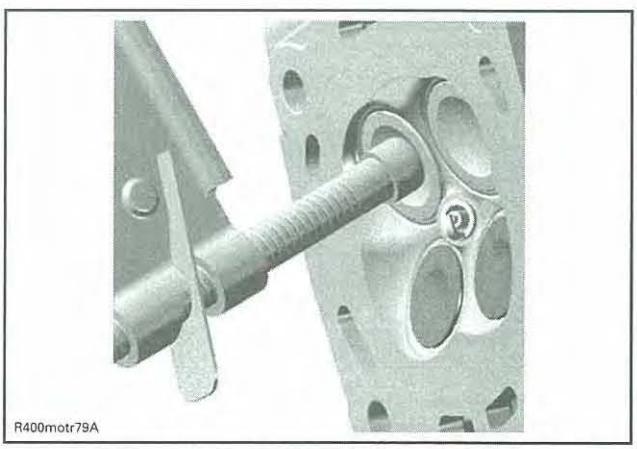
Remove rocker arms (see *ROCKER ARM* in this subsection).

Remove cylinder head (see *CYLINDER HEAD* in this subsection).

Compress valve spring using VALVE SPRING COMPRESSOR (P/N 529 035 724) and VALVE SPRING COMPRESSOR CUP (P/N 529 035 764).

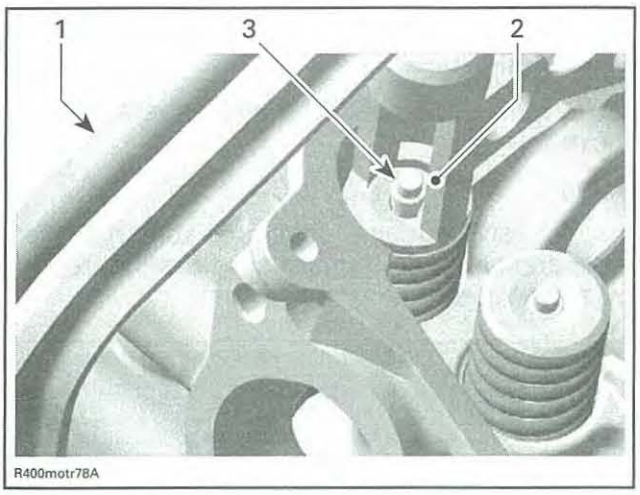
⚠ WARNING

Always wear safety glasses when disassembling valve springs. Be careful when unlocking valves. Components could fly away because of the strong spring preload.



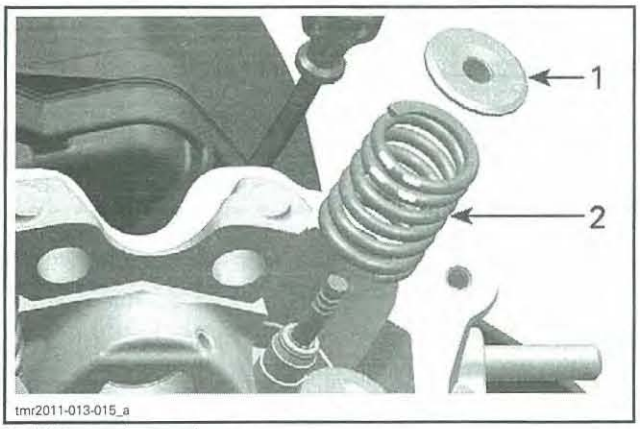
LOCATE VALVE SPRING COMPRESSOR CLAMP IN CENTER OF THE VALVE

Remove valve cotters.



1. *Valve spring compressor clamp*
2. *Valve spring compressor cup*
3. *Valve cotter*

Remove valve spring compressor and withdraw valve spring retainer and valve spring.

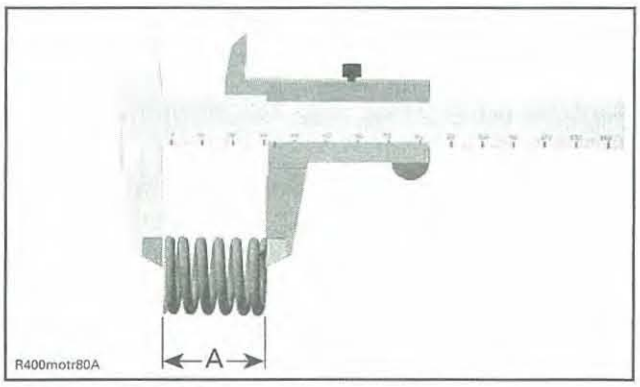


1. *Valve spring retainer*
2. *Valve spring*

Valve Spring Inspection

Check valve spring for visible damage. If so, replace valve spring.

Check valve spring for free length and straightness.



A. Valve spring length

VALVE SPRING FREE LENGTH	
NOMINAL NEW	40.81 mm (1.607 in)
SERVICE LIMIT	39.00 mm (1.535 in)

Replace valves springs if not within specifications.

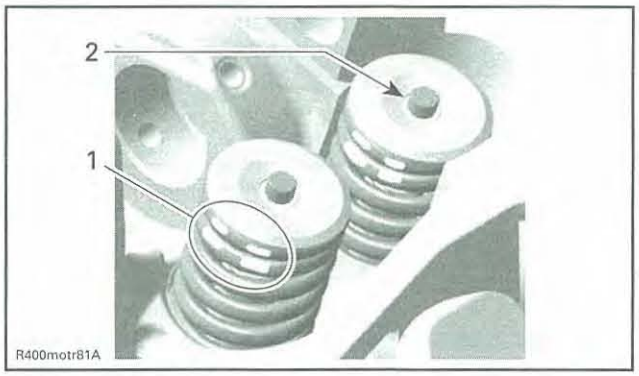
Valve Spring Installation

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

Colored area of the valve spring must be placed on top.

To ease installation of cotters, apply oil or grease on them so that they remain in place while releasing the spring.

NOTE: Valve cotter must be properly engaged in valve stem grooves.



1. *Position of the valve spring*
2. *Valve cotter*

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

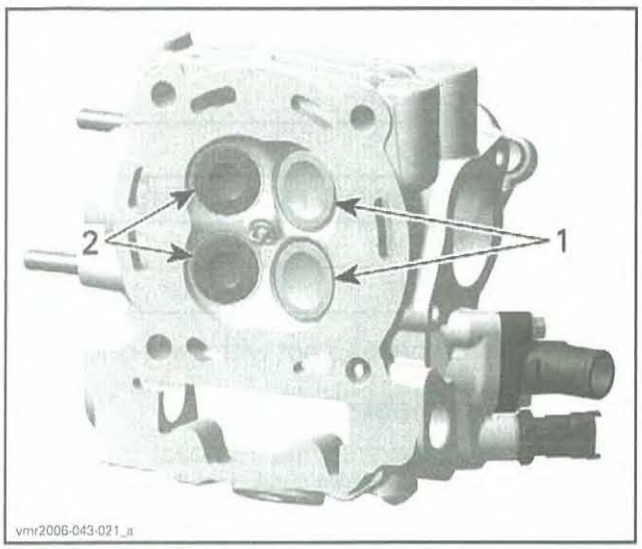
NOTICE **An improperly locked valve spring will cause engine damage.**

VALVES

Valve Removal

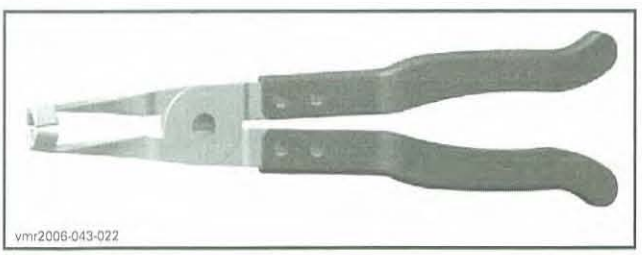
Remove valve spring, see *VALVE SPRING* in this subsection.

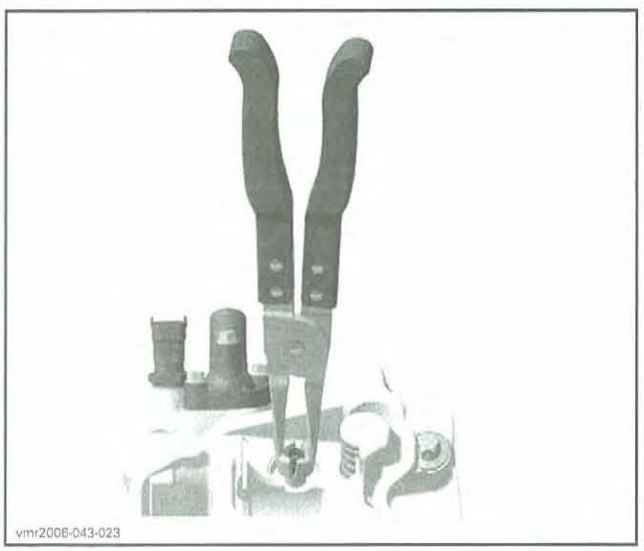
Push valve stem, then pull valves (intake and exhaust) out of valve guide.



1. *Intake valves 31 mm*
2. *Exhaust valves 27 mm*

Remove valve stem seal with SNAP-ON PLIERS (P/N YA 8230) and discard it.





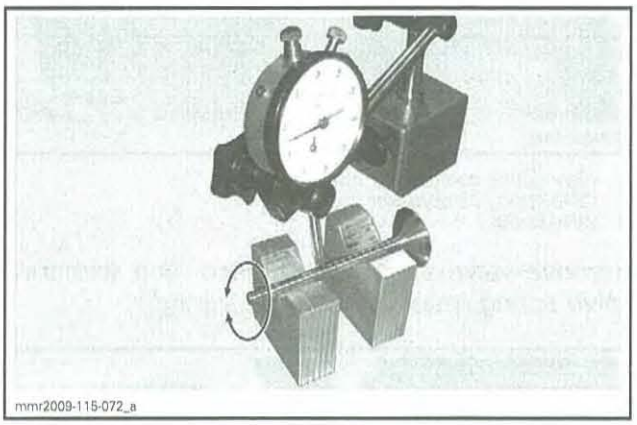
Valve Inspection

Valve Stem Seal

Always install new seals whenever valves are removed.

Valve

Inspect valve surface, check for abnormal stem wear and bending. If out of specification, replace by a new one.



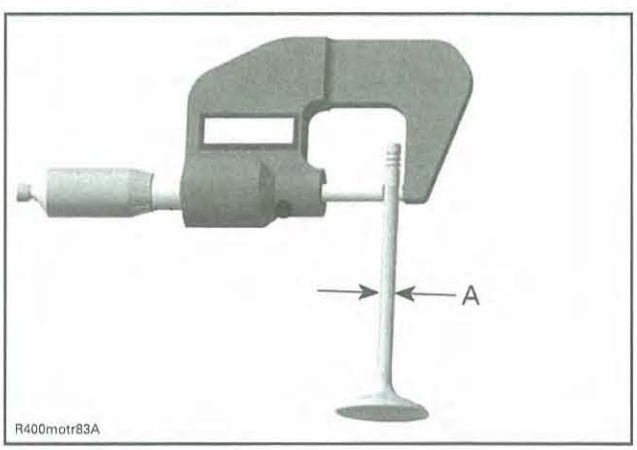
VALVE OUT OF ROUND (INTAKE AND EXHAUST VALVES)	
NEW	0.005 mm (.0002 in)
SERVICE LIMIT	0.06 mm (.0024 in)

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.



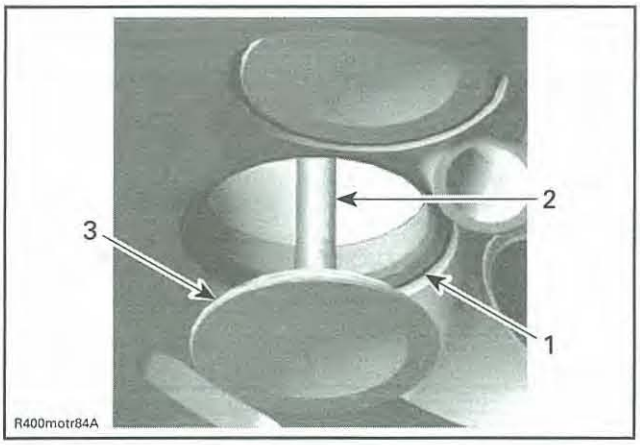
A. Valve stem diameter

VALVE STEM DIAMETER	
EXHAUST VALVE	
NEW	4.956 mm to 4.970 mm (.1951 in to .1957 in)
SERVICE LIMIT	4.930 mm (.1941 in)
INTAKE VALVE	
NEW	4.966 mm to 4.980 mm (.1955 in to .1961 in)
SERVICE LIMIT	4.930 mm (.1941 in)

Replace valve guide out of cylinder head if valve guide is out of specification or has other damages such as wear or friction surface (see *VALVE GUIDE PROCEDURE* in this subsection).

VALVE GUIDE DIAMETER (INTAKE AND EXHAUST VALVES)	
NEW	4.998 mm to 5.018 mm (.1968 in to .1976 in)
SERVICE LIMIT	5.050 mm (.1988 in)

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* in this subsection).

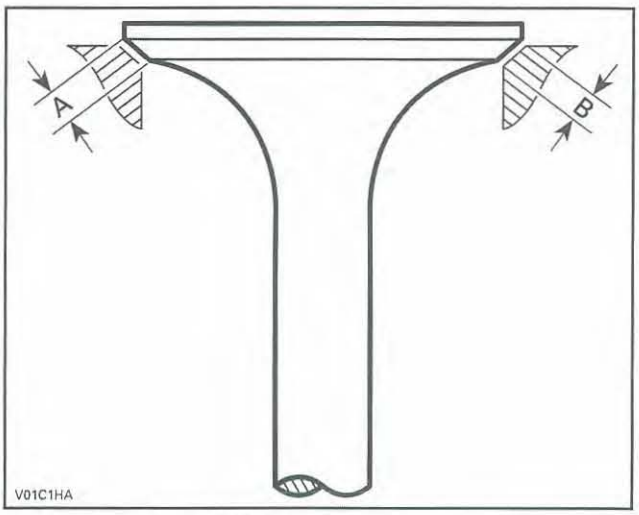
Measure valve face contact width.

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

Measure valve seat width using a caliper.

VALVE SEAT CONTACT WIDTH	
EXHAUST VALVE	
NEW	1.25 mm to 1.55 mm (.049 in to .061 in)
SERVICE LIMIT	2.00 mm (.079 in)
INTAKE VALVE	
NEW	1.05 mm to 1.35 mm (.041 in to .053 in)
SERVICE LIMIT	1.80 mm (.071 in)

If valve seat contact width is too wide or has dark spots, replace the cylinder head.



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

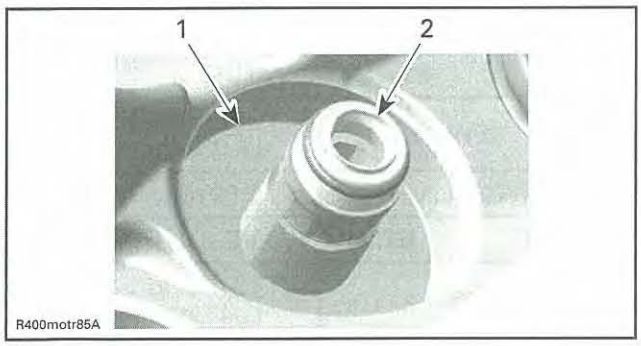
Valve Installation

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.

Apply engine oil on valve stem and install it.

NOTICE Be careful when valve stem is passed through sealing lips of valve stem seal.



1. Thrust washer
2. Sealing lips of valve stem seal

To ease installation of cotters, apply oil or grease on them so that they remain in place while releasing the spring.

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

NOTICE An improperly locked valve spring will cause engine damage.

VALVE GUIDES

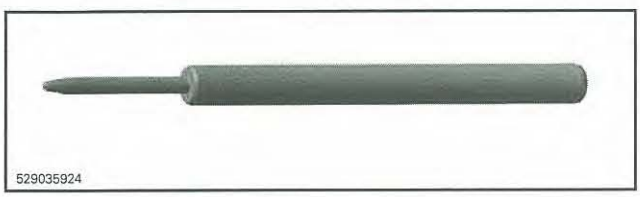
Valve Guide Removal

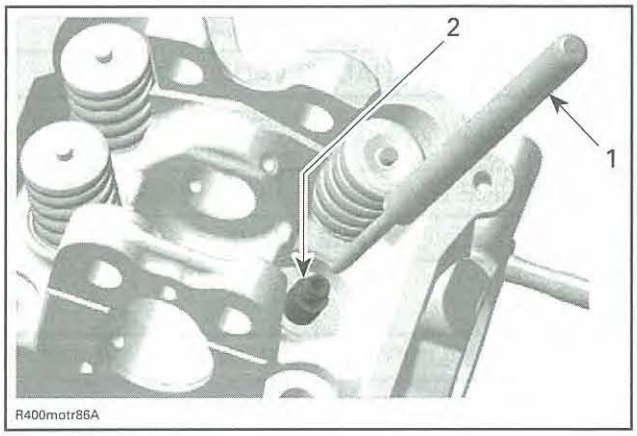
Remove cylinder head (see *CYLINDER HEAD* in this subsection).

Remove valves (see *VALVES* in this subsection).

NOTE: Clean valve guide area from contamination before removal.

Using the VALVE GUIDE REMOVER 5 MM (P/N 529 035 924) and a hammer, drive the valve guide out of cylinder head.





1. Valve guide remover
2. Valve guide

Valve Guide Inspection

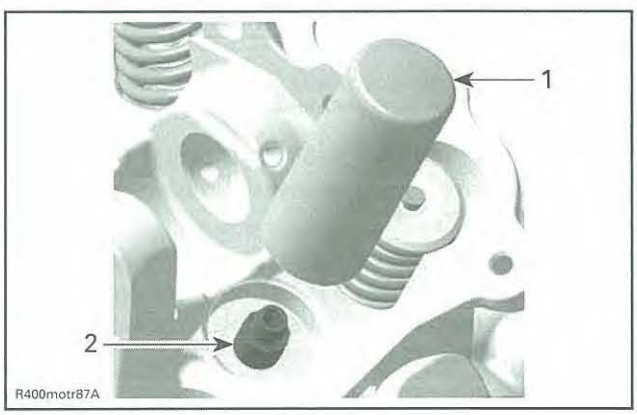
Always replace valve stem seals whenever valve guides are removed.

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.

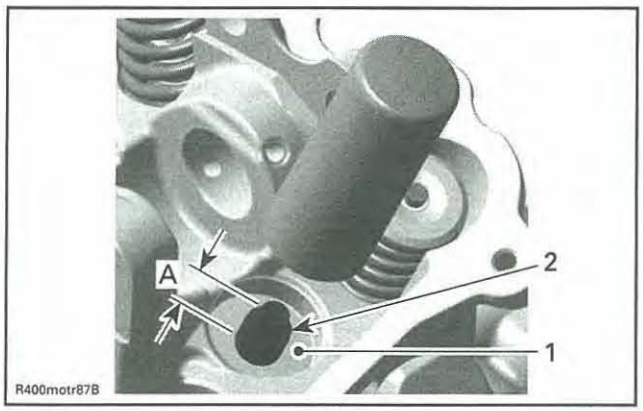
Use the VALVE GUIDE INSTALLER (P/N 529 036 140) to install valve guide.



1. Valve guide installer
2. Valve guide

NOTE: Apply LOCTITE 767 (ANTISEIZE LUBRICANT) (P/N 293 800 070) on valve guide prior to install it into the cylinder head.

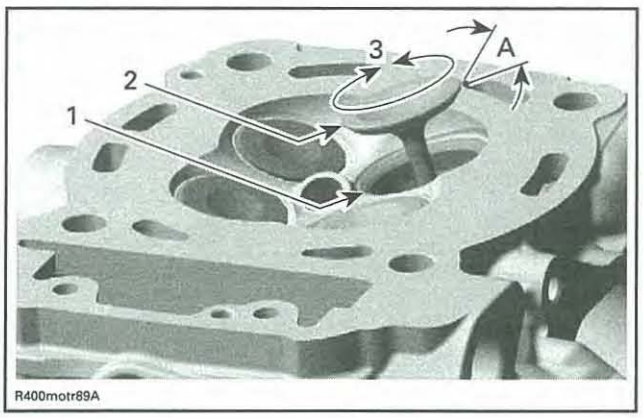
NOTICE Push valve guide in the cold cylinder head as per following illustration.



1. Thrust surface of cylinder head
2. Valve guide
A. Measurement from thrust surface to valve guide top

VALVE GUIDE (MEASUREMENT "A")	
NEW	14.00 mm to 14.40 mm (.5512 in to .5669 in)

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



1. Valve seat
2. Valve face (contact surface to valve seat)
3. Turn valve while pushing against cylinder head
A. Valve seat angle 45°

NOTE: Ensure to seat valves properly. Apply marking paste to ease checking contact pattern.

Repeat procedure until valve seat/valve face fits together.

CYLINDER

Cylinder Removal

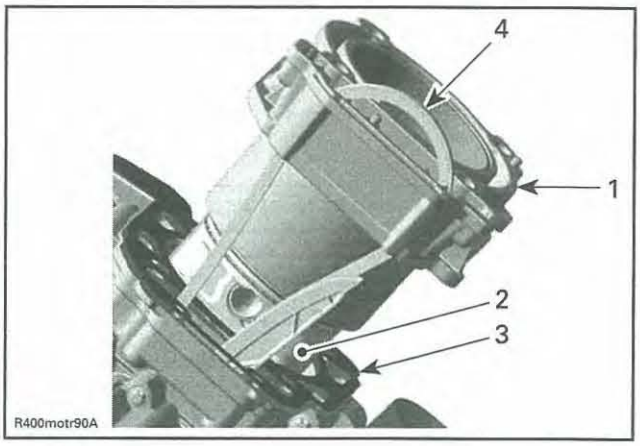
Remove chain tensioner (see *CHAIN TENSIONER* in the *TIMING CHAIN* subsection).

Remove the camshaft timing gear (see *CAMSHAFT TIMING GEAR* in the *TIMING CHAIN* subsection).

Remove the cylinder head (see *CYLINDER HEAD* in this subsection).

Pull cylinder.

Discard cylinder base gaskets.



1. Cylinder
2. Piston assembly
3. Cylinder base gasket
4. Camshaft timing chain

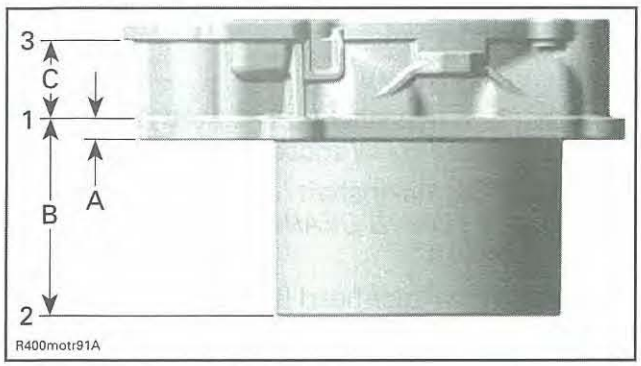
Cylinder Inspection

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 rings.

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

800R
A. 5 mm (.197 in) from cylinder bottom
B. 63 mm (2.48 in)
C. 32 mm (1.26 in)

1000
A. 5 mm (.197 in) from cylinder bottom
B. 58 mm (2.283 in)
C. 52 mm (2.047 in)

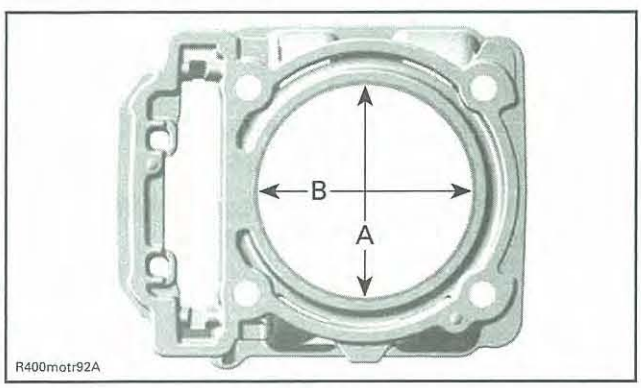
CYLINDER TAPER IN DIAMETER	
NEW (maximum)	0.038 mm (.0015 in)
SERVICE LIMIT	0.090 mm (.0035 in)

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 (maximum)	0.015 mm (.0006 in)
SERVICE LIMIT	0.020 mm (.0008 in)

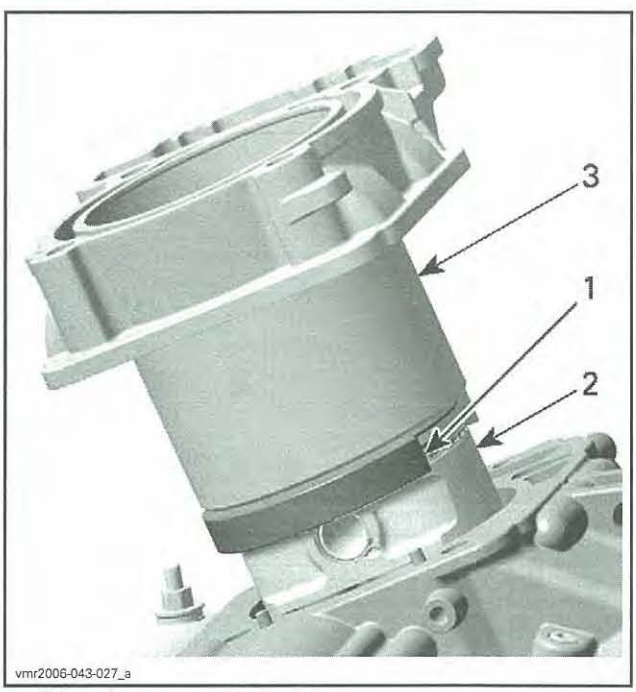
Cylinder Installation

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

NOTICE Always replace cylinder base gasket before installing the cylinder.

First mount cylinder 2. Then remove the CRANKSHAFT LOCKING BOLT (P/N 529 035 617). Crank the engine further and position piston 1 at TDC. Mount cylinder 1. The cylinder can not be pushed fully over the piston unless the piston is located at TDC.

Apply engine oil in the bottom area of the cylinder bore and also on the band of the PISTON RING COMPRESSOR (P/N 529 035 919).



1. Piston ring compressor tool
2. Piston
3. Cylinder

NOTE: Put timing chain through the chain pit then put the cylinder in place.

NOTICE Chain guide has to be fixed between cylinder and cylinder head.

NOTE: After both cylinders are installed, turn crankshaft until piston of cylinder 2 is at TDC and lock crankshaft. Refer to *CRANKSHAFT* in the *BOTTOM END* subsection.

Install cylinder head and the other parts in accordance with the proper installation procedures.

PISTON

Piston Removal

Remove cylinder head (see *CYLINDER HEAD* in this subsection).

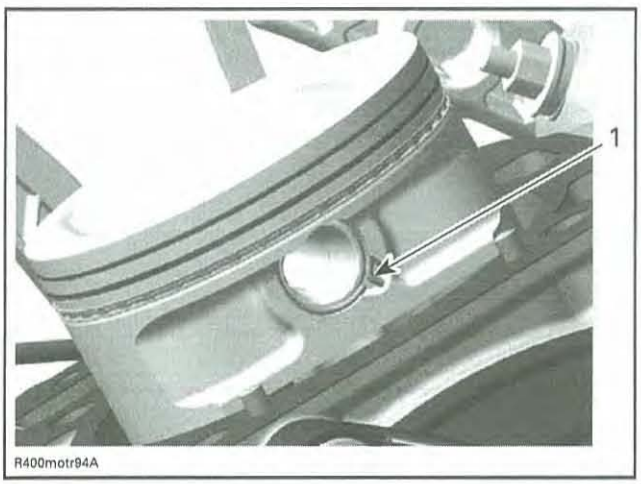
Remove the cylinder (see *CYLINDER* in this subsection).

Place a rag under piston and in the area of timing chain compartment.

⚠ WARNING

Piston circlips are spring loaded.

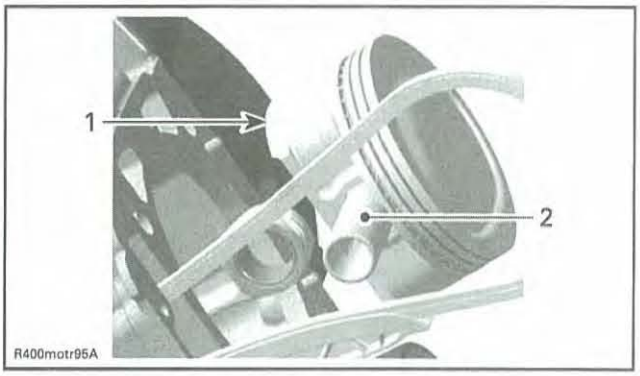
Remove one piston circlip and discard it.



1. Piston circlip

NOTE: The removal of both piston circlips is not necessary to remove piston pin.

Push piston pin out of piston.



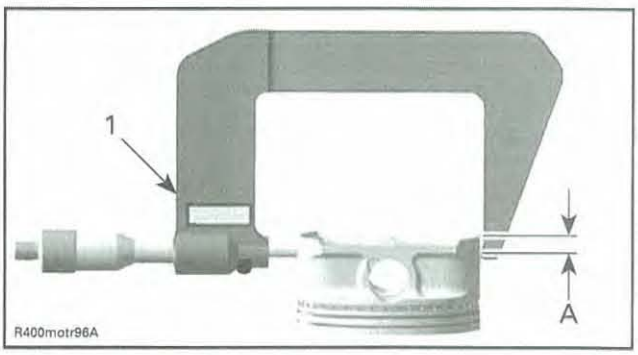
1. Piston
2. Piston pin

Detach piston from connecting rod.

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.



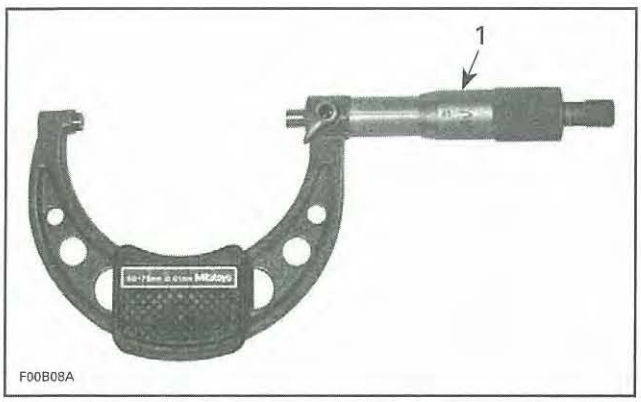
1. Measuring perpendicularly (90°) to piston pin
A. 8 mm (.315 in)

The measured dimension should be as described in the following tables. If not, replace piston.

PISTON MEASUREMENT	
NEW	90.950 mm to 90.966 mm (3.5807 in to 3.5813 in)
SERVICE LIMIT	90.850 mm (3.577 in)

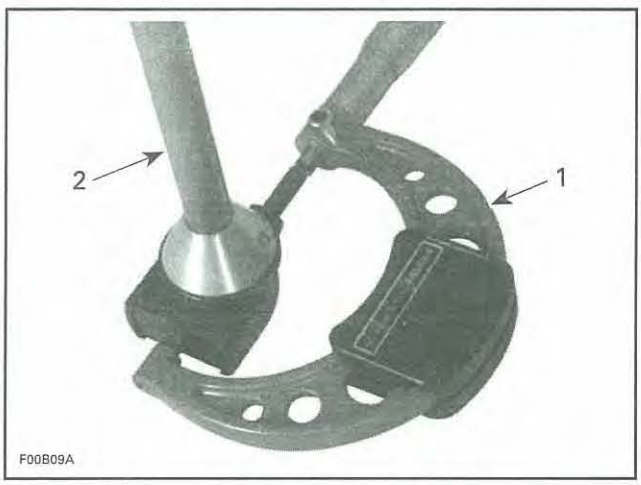
Piston/Cylinder Clearance

Adjust and lock a micrometer to the piston dimension.

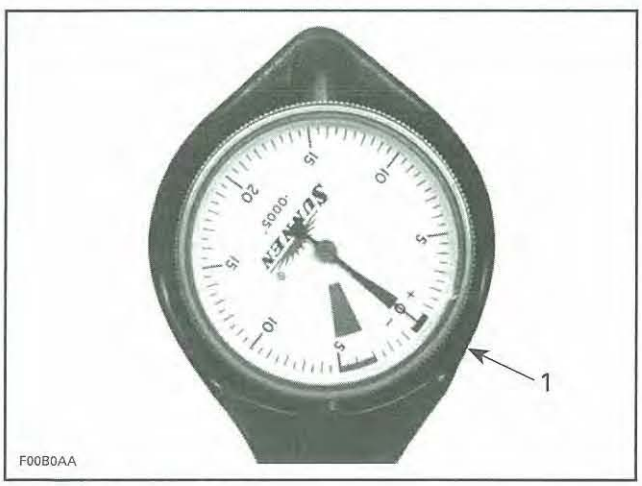


1. Micrometer set to the piston dimension

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 mm to 0.057 mm (.0011 in to .0022 in)
SERVICE LIMIT	0.100 mm (.0039 in)

NOTE: Make sure used piston is not worn.

If clearance exceeds specified tolerance, replace piston by a new one and measure piston/cylinder clearance again.

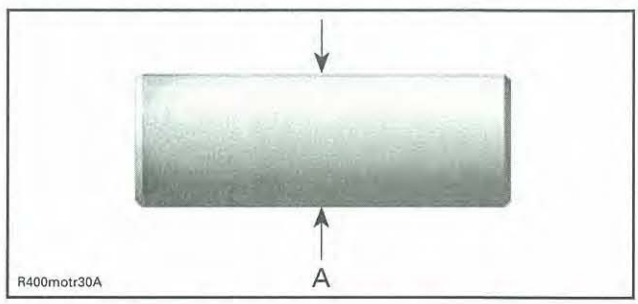
NOTE: Make sure the cylinder bore gauge indicator is set exactly at the same position as with the micrometer, otherwise the reading will be false.

Connecting Rod/Piston Pin Clearance

Using synthetic abrasive woven, clean piston pin from deposits.

Inspect piston pin for scoring, cracking or other damages.

Measure piston pin. See the following illustration for the proper measurement positions.

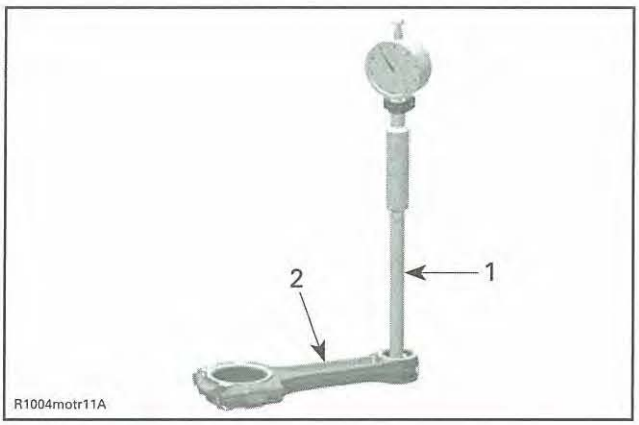


A. Piston pin diameter

PISTON PIN DIAMETER	
800R	
NEW	19.996 mm to 20.000 mm (.7872 in to .7874 in)
SERVICE LIMIT	19.980 mm (.7866 in)
1000	
NEW	21.996 mm to 22.000 mm (.866 in to .8661 in)
SERVICE LIMIT	21.980 mm (.8654 in)

Replace piston pin if diameter is out of specifications.

Measure inside diameter of connecting rod small end bushing.



1. *Bore gauge*
2. *Connecting rod*

CONNECTING ROD SMALL END DIAMETER	
800R	
NEW	20.010 mm to 20.020 mm (.7878 in to .7882 in)
SERVICE LIMIT	20.060 mm (.7898 in)
1000	
NEW	20.010 mm to 20.020 mm (.7878 in to .7882 in)
SERVICE LIMIT	20.050 mm (.7894 in)

Replace connecting rod if diameter of connecting rod small end is out of specifications. Refer to *BOTTOM END* subsection for removal procedure.

Compare measurements to obtain the connecting rod/piston pin clearance.

CONNECTING ROD/ PISTON PIN CLEARANCE	
SERVICE LIMIT	0.080 mm (.0031 in)

Piston Installation

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

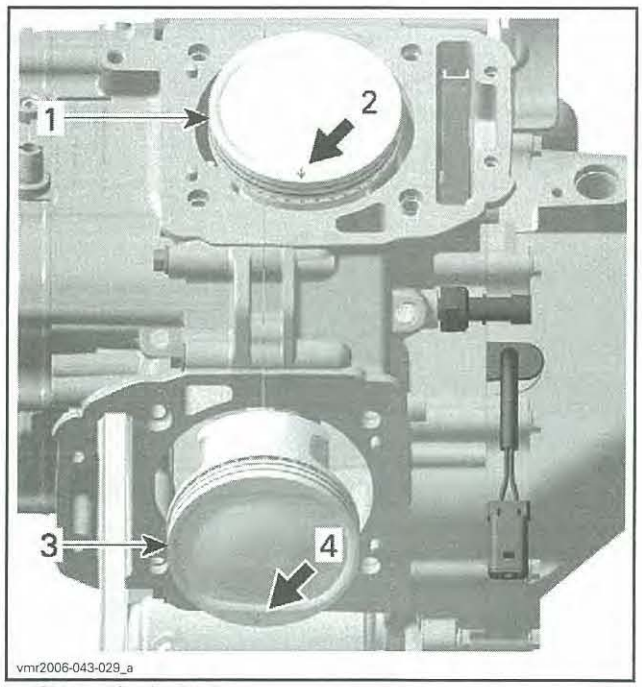
Apply engine oil on the piston pin.

Insert piston pin into piston and connecting rod.

For each cylinder, install piston with the punched arrow on piston dome is pointing toward the rear side of the engine.

Front cylinder: Mark on top of piston must show to intake side.

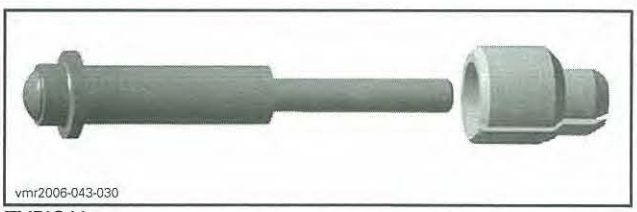
Rear cylinder: Mark on top of piston must show to exhaust side.



1. *Piston of cylinder 1*
2. *Mark on piston must show to intake side of cylinder 1*
3. *Piston of cylinder 2*
4. *Mark on piston must show to exhaust side of cylinder 2*

Use the piston appropriate circlip installer to assemble the NEW piston circlip as per following procedure:

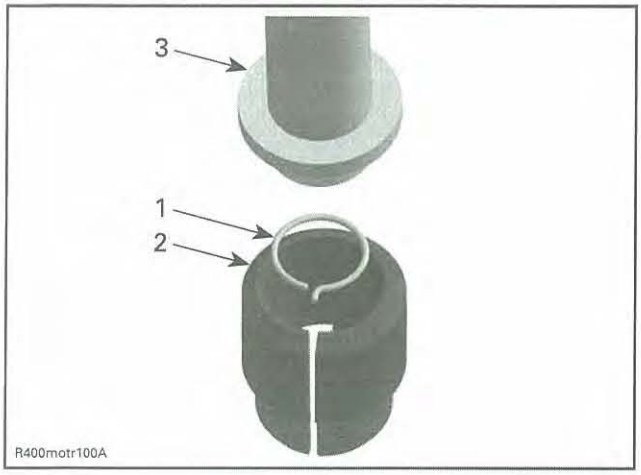
ENGINE TYPE	TOOL
800R	PISTON CIRCLIP INSTALLER (P/N 529 035 921)
1000	PISTON CIRCLIP INSTALLER (P/N 529 036 153)



TYPICAL

NOTICE **Always replace disassembled piston circlip(s) by new ones. Place a rag on cylinder base to avoid dropping the circlip inside the engine.**

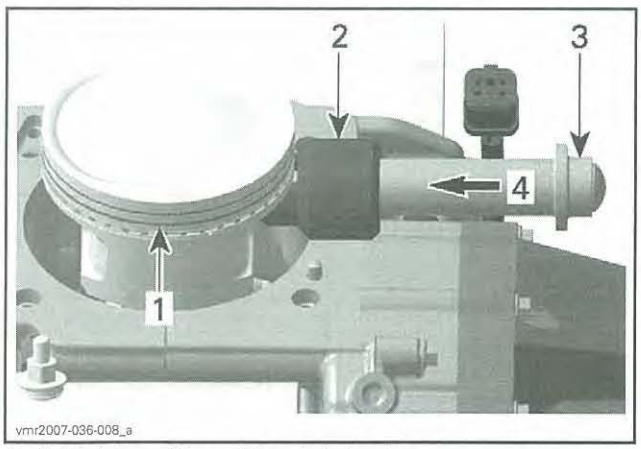
Place circlip in sleeve as per following illustration.



1. *Circlip*
2. *Sleeve*
3. *Assembly jig from piston clip installer*

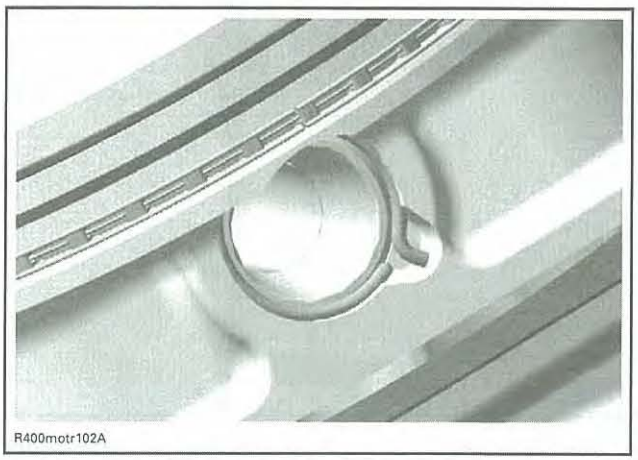
Push taper side of assembly jig until circlip reaches middle of sleeve.

Align sleeve with piston pin axis and push assembly jig until circlip engages in piston.



1. *Hold piston while pushing circlip in place*
2. *Sleeve*
3. *Assembly jig*
4. *Direction to push circlip*

NOTE: Take care that the hook of the piston circlip is positioned properly.



CORRECT POSITION OF THE PISTON CIRCLIP

PISTON RINGS

Ring Removal

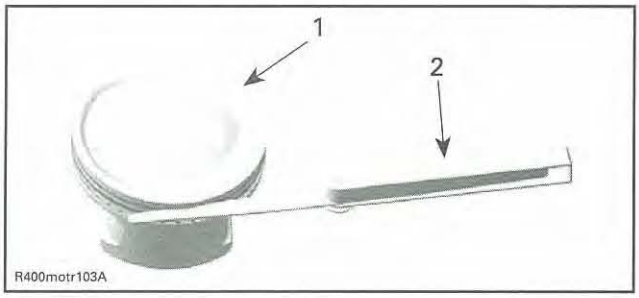
Remove the piston (see *PISTON* in this subsection).

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	0.03 mm to 0.07 mm (.0012 in to .0028 in)
SERVICE LIMIT	0.150 mm (.0059 in)
LOWER COMPRESSION RING	
NEW	0.02 mm to 0.06 mm (.0008 in to .0024 in)
SERVICE LIMIT	0.150 mm (.0059 in)
OIL SCRAPER RING	
NEW	0.01 mm to 0.18 mm (.0004 in to .0071 in)
SERVICE LIMIT	0.250 mm (.0098 in)



1. Piston
2. Feeler gauge

Ring End Gap

RING END GAP	
UPPER COMPRESSION RING	
NEW	0.20 mm to 0.40 mm (.008 in to .016 in)
SERVICE LIMIT	0.60 mm (.024 in)
LOWER COMPRESSION RING	
NEW	0.20 mm to 0.40 mm (.008 in to .016 in)
SERVICE LIMIT	0.70 mm (.028 in)
OIL SCRAPER RING	
NEW	0.20 mm to 0.70 mm (.008 in to .028 in)
SERVICE LIMIT	1.00 mm (.039 in)

To measure the ring end gap place the ring in the cylinder in the area of 8 mm to 16 mm (5/16 in to 5/8 in) from top of cylinder.

NOTE: In order to correctly position the ring in the cylinder, use piston as a pusher.

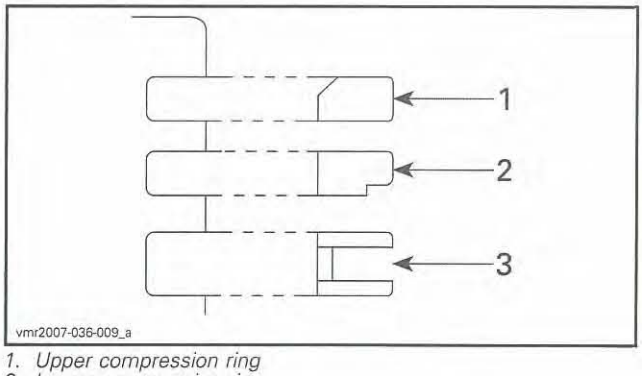
Using a feeler gauge, check ring end gap. Replace ring if gap exceeds above described specified tolerance.

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.



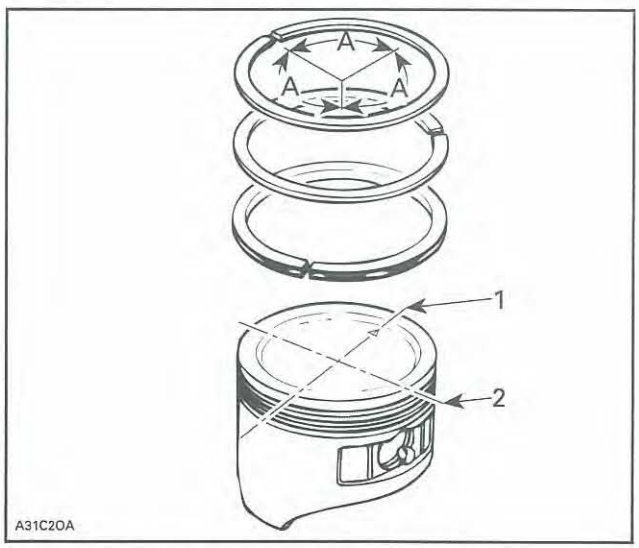
1. Upper compression ring
2. Lower compression ring
3. Oil scraper ring

NOTICE Ensure that top and second rings are not interchanged.

NOTE: Use a ring expander to prevent breakage during installation. The oil ring must be installed by hand.

Check that rings rotate smoothly after installation.

Space the piston ring end gaps 120° apart and do not align the gaps with the piston pin bore or the thrust side axis.



1. DO NOT align ring gap with piston thrust side axis
2. DO NOT align ring gap with piston pin bore axis
A. 120°

TIMING CHAIN

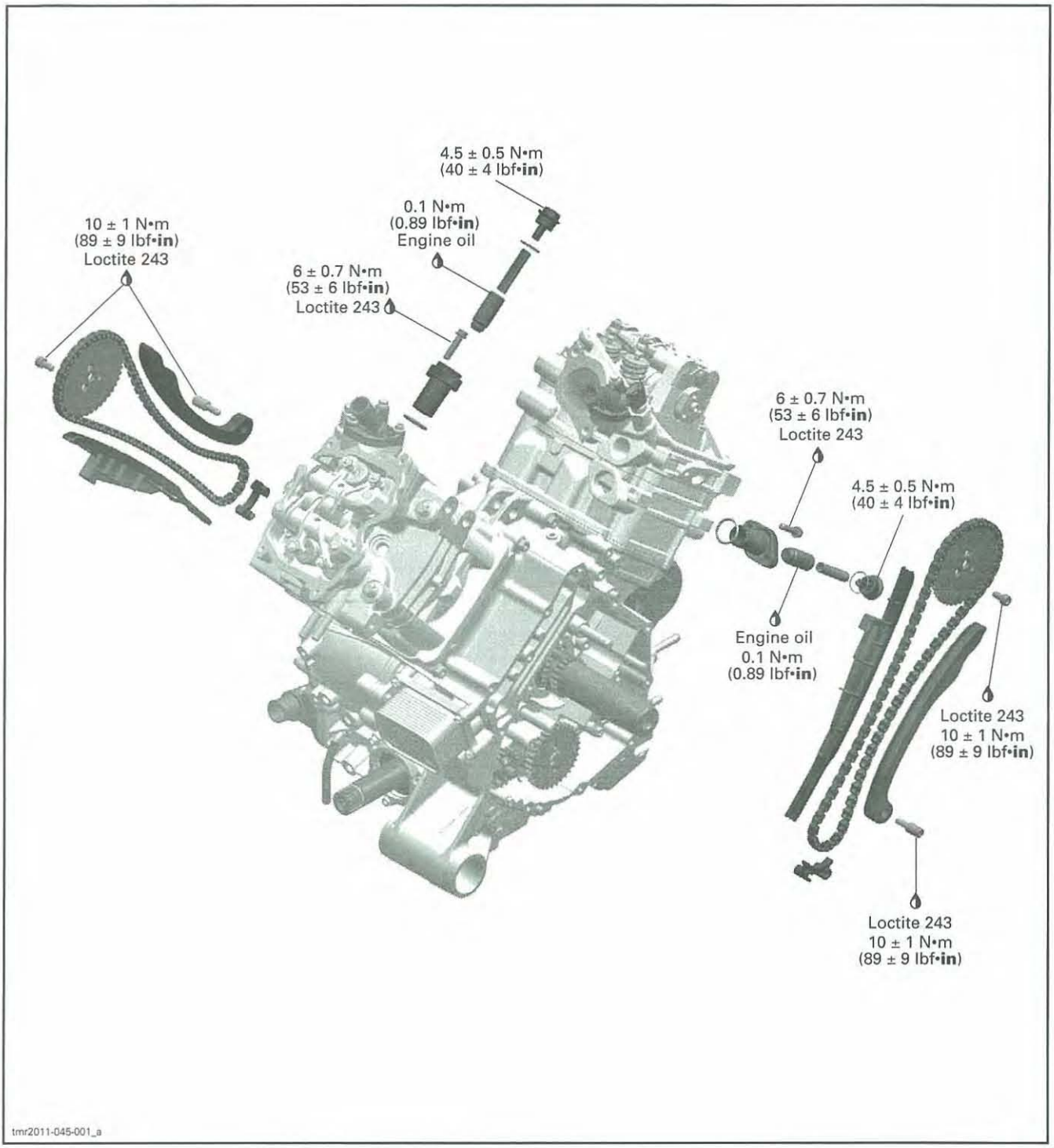
SERVICE TOOLS

Description	Part Number	Page
CAMSHAFT TIMING TOOL	529 036 201	123–124
CRANKSHAFT TDC POSITION TOOL	529 036 200	126–128

SERVICE PRODUCTS

Description	Part Number	Page
LOCTITE 243 (BLUE)	293 800 060	124

TIMING CHAIN



GENERAL

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

Clean threads before applying a threadlocker. Refer to *SELF-LOCKING FASTENERS* and *LOCTITE APPLICATION* in *INTRODUCTION* section.

⚠ WARNING

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

TROUBLESHOOTING

UNUSUAL ENGINE NOISE OR VIBRATION

1. IMPROPER VALVE CLEARANCE ADJUSTMENT AND/OR WORN OUT ROCKER ARM(S)
   - *Readjust valve clearance and/or replace defective part(s), refer to TOP END subsection.*
2. DEFECTIVE CHAIN TENSIONER
   - *Replace chain tensioner.*
3. WORN OUT TIMING CHAIN GUIDE(S)
   - *Replace timing chain guide(s).*
4. STRETCHED TIMING CHAIN OR WORN OUT TIMING GEARS
   - *Replace timing chain and timing gears.*
5. LOOSE TIMING GEAR RETAINING SCREWS
   - *Retighten screws to recommended torque.*
6. INCORRECT CAMSHAFT TIMING
   - *Replace damaged components and readjust camshaft timing.*

ENGINE LACKS ACCELERATION OR POWER

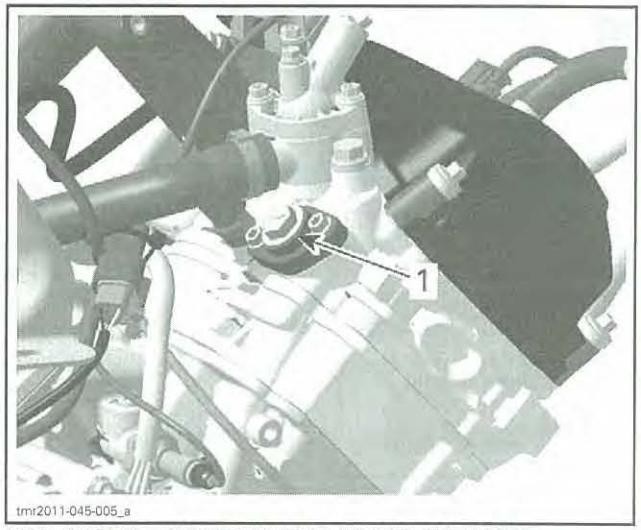
1. INCORRECT CAMSHAFT TIMING
   - *Replace damaged components and readjust camshaft timing.*

PROCEDURES

TIMING CHAIN TENSIONERS

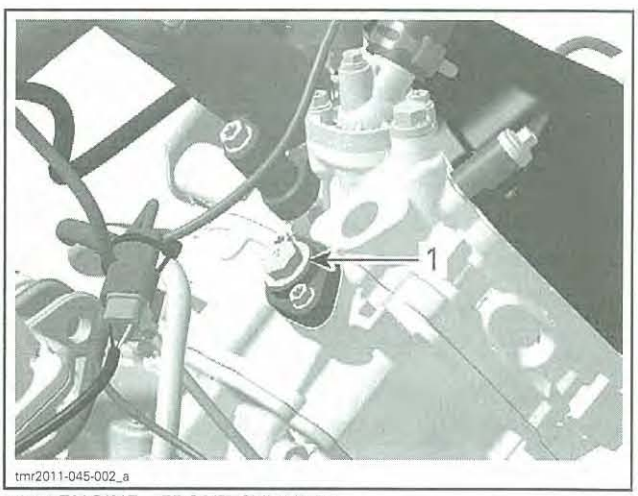
Timing Chain Tensioner Location

800R Engine



800R ENGINE - CYLINDER HEAD (FRONT CYLINDER)
1. Timing chain tensioner

1000 Engine



1000 ENGINE - FRONT CYLINDER
1. Timing chain tensioner

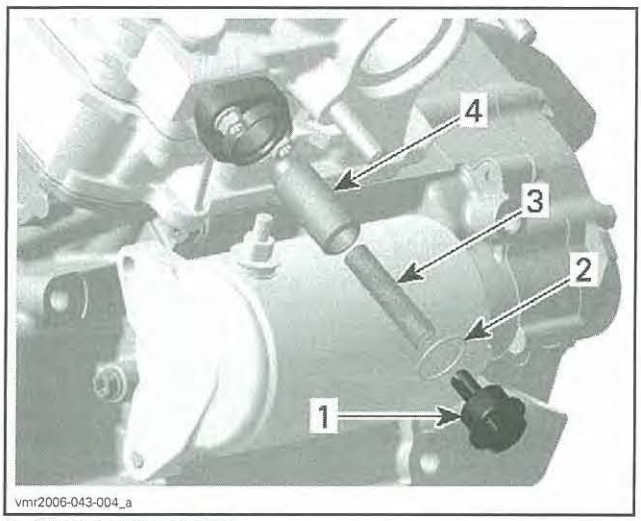
Timing Chain Tensioner Removal

Make sure the respective cylinder is set to TDC ignition. Refer to *CAMSHAFT TIMING GEARS* in this subsection.

Carefully unscrew chain tensioner plug and release spring tension.

⚠ CAUTION Tensioner is spring loaded.

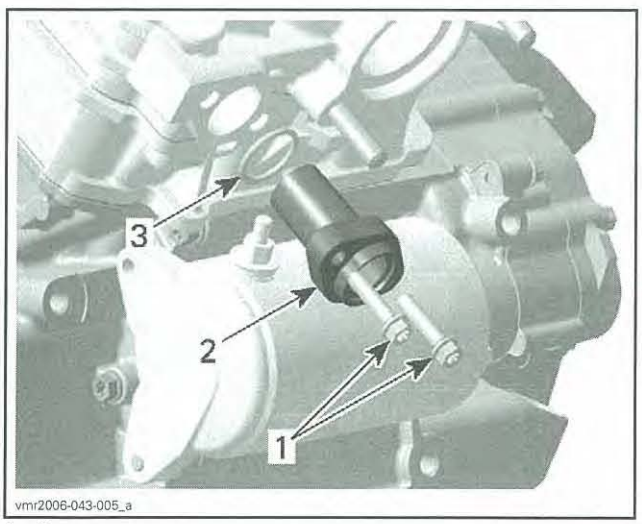
Remove O-ring, spring and chain tensioner plunger.



1. *Chain tensioner plug*
2. *O-ring*
3. *Spring*
4. *Chain tensioner plunger*

Remove chain tensioner housing retaining screws.

Remove chain tensioner housing and O-ring.



1. *Screws*
2. *Chain tensioner housing*
3. *O-ring*

Timing Chain Tensioner Inspection

Check the chain tensioner housing and plug for cracks or other damages. Replace if necessary.

Check chain tensioner plunger for free movement and/or scoring.

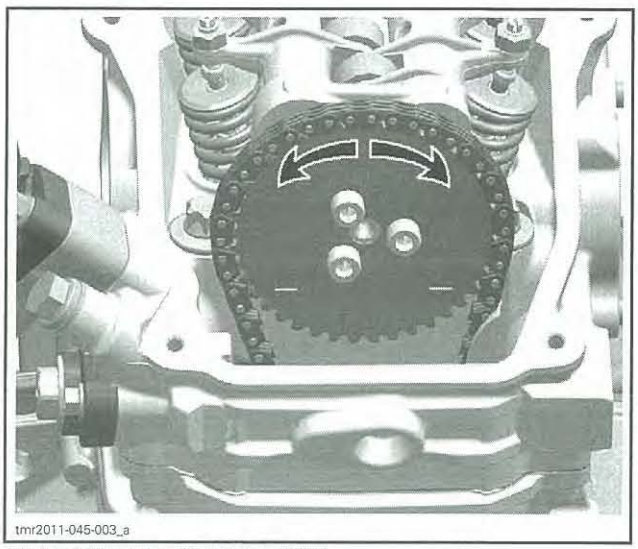
Check if O-rings are brittle, cracked or hard. Replace if necessary.

Check spring condition. Replace if broken or worn.

Timing Chain 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.



MOVE GEAR BACK AND FORTH

Apply engine oil on the plunger before installation.

Slightly turn the camshaft timing gear in order to get the timing chain play on the tensioner side.

Slightly screw the plunger in until the timing chain allows no more back and forth movement of the camshaft timing gear.

Screw the plunger in an additional 1/8 turn to reach the required specified torque.

TIMING CHAIN TENSIONER ADJUSTMENT (TORQUE)
0.1 N•m (.9 lbf•**in**)

NOTICE **Improper adjustment of the timing chain will lead to severe engine damage.**

Fit the spring on one side into the slot of the plug and on the other side into the plunger.

NOTE: Turn spring only clockwise in order to fit the spring end into the notch of the plunger and to avoid loosening the plunger during spring installation. Do not preload the spring.

NOTE: Do not forget to place the O-ring on chain tensioner plug.

Then compress the spring and screw the plug in.

NOTE: To avoid overstressed timing chain, the plug must engage into threads within the first full turn.

Remove locking tool and install all other removed parts.

Finally, tighten the plug.

CAMSHAFT TIMING GEARS

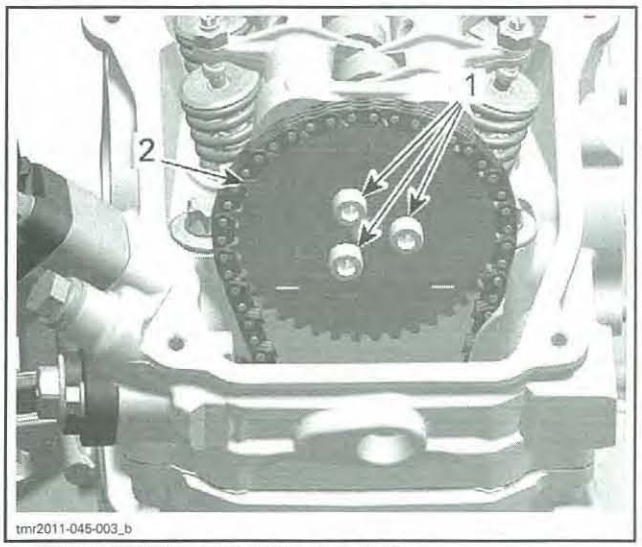
Camshaft Timing Gear Removal

Remove the valve cover, refer to *TOP END* subsection.

Turn crankshaft to TDC ignition of the respective cylinder and lock magneto flywheel, see *CAMSHAFT TIMING* in this subsection.

Unscrew timing chain tensioner. Refer to *TIMING CHAIN TENSIONERS* in this subsection.

Remove camshaft timing gear retaining screws.



1. Camshaft timing gear retaining screws
2. Camshaft timing gear

Remove the camshaft timing gear.

NOTE: Secure timing chain with a piece of wire.

Camshaft Timing Gear Inspection

Check camshaft timing gear for wear or deterioration.

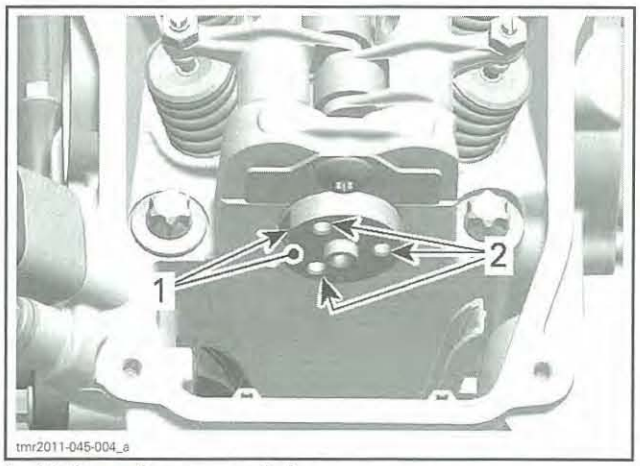
If gear is worn or damaged, replace it as a set (camshaft timing gear and timing chain).

For crankshaft gear, refer to *BOTTOM END* section, see *CRANKSHAFT*.

Camshaft Timing Gear Installation

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

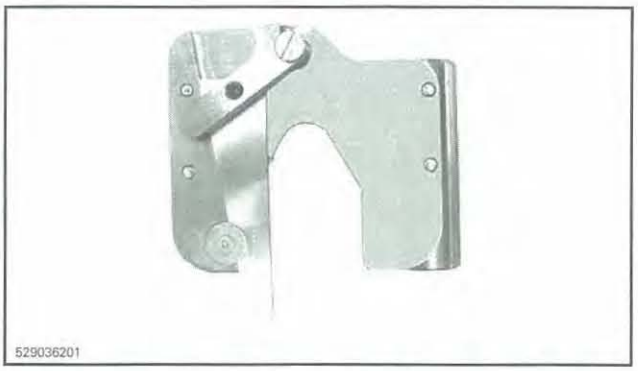
Clean mating surface and threads of camshaft prior installing camshaft timing gear.



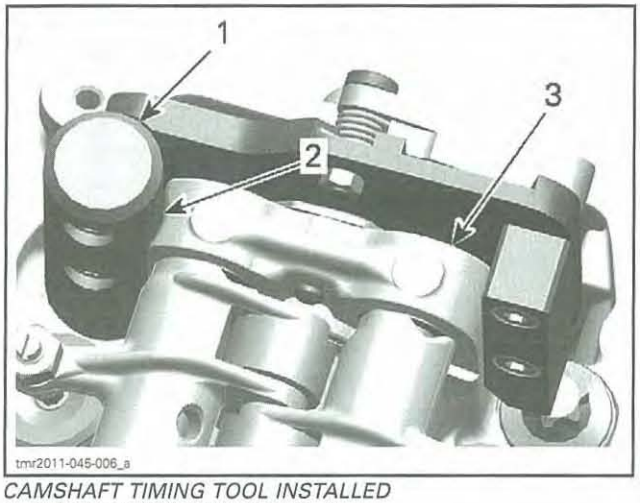
1. Mating surface on camshaft
2. Threads for camshaft screws

Crankshaft must be set to TDC ignition position before installing the timing chain, refer to *CAMSHAFT TIMING* in this subsection.

Install the CAMSHAFT TIMING TOOL (P/N 529 036 201).



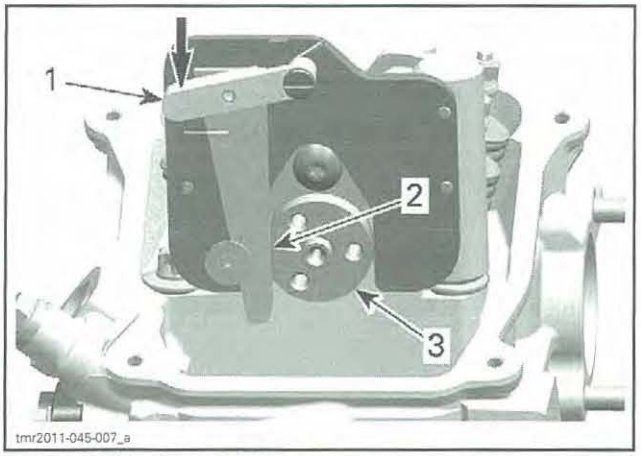
NOTE: Align tube of camshaft adjustment tool properly with machined radius on cylinder head.



CAMSHAFT TIMING TOOL INSTALLED
1. *Tube (camshaft adjustment tool)*
2. *Machined radius (camshaft adjustment tool)*
3. *Cylinder head*

Set camshaft to TDC ignition position by aligning the camshaft flange flat spot with the tool lever.

NOTE: In addition, to ensure proper camshaft timing, press camshaft adjustment tool lever downwards.

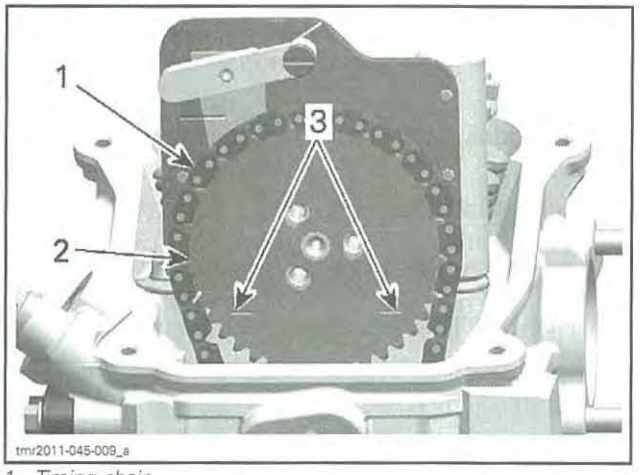


PRESS TOOL LEVER DOWN
1. *Lever*
2. *Flat spot*
3. *Camshaft*

NOTICE Crankshaft and camshaft must be locked at TDC ignition position to place camshaft timing gear and timing chain in the proper position.

Place camshaft timing gear along with the timing chain on the camshaft.

NOTE: The printed marks on the camshaft timing gear must be parallel to the cylinder head base.

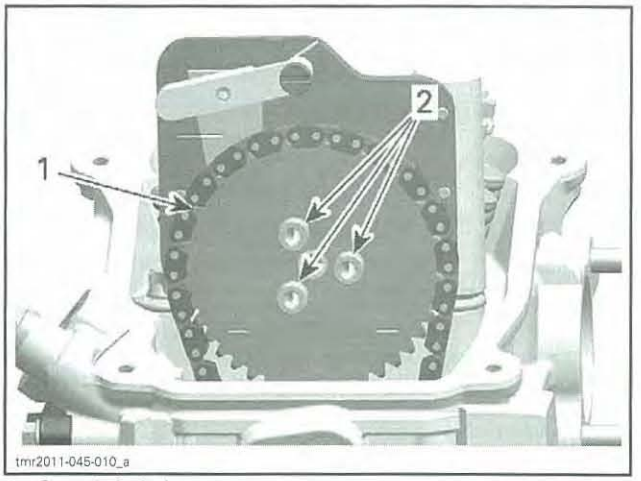


1. *Timing chain*
2. *Camshaft timing gear*
3. *Printed marks on camshaft timing gear*

Install and adjust timing chain tensioner, refer to *TIMING CHAIN TENSIONER* in this subsection.

Apply LOCTITE 243 (BLUE) (P/N 293 800 060) on the camshaft timing gear retaining screw threads.

Install and tighten camshaft timing gear retaining screws to specified torque.



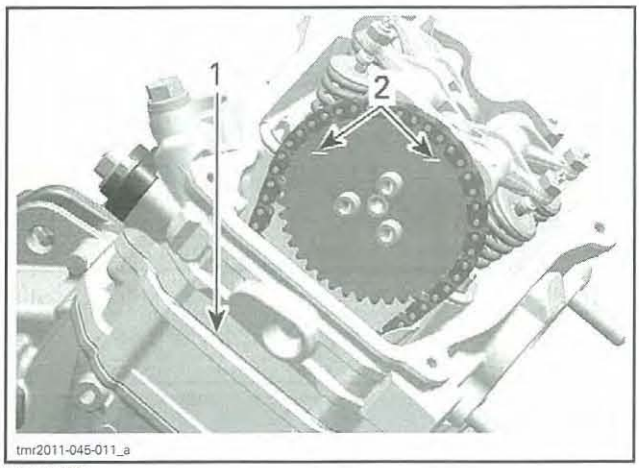
1. *Camshaft timing gear*
2. *Timing gear retaining screws*

CAMSHAFT TIMING GEAR RETAINING SCREWS TIGHTENING TORQUE
10 N•m ± 1 N•m (89 lbf•**in** ± 9 lbf•**in**)

Remove the CAMSHAFT TIMING TOOL (P/N 529 036 201).

Camshaft Timing

NOTE: If a piston (of cylinder 1 or 2) is set to TDC ignition, the camshaft timing gear of the opposite cylinder must be in the following position.



TYPICAL
1. *Cylinder head base*
2. *Marks on timing gear of the opposite cylinder*

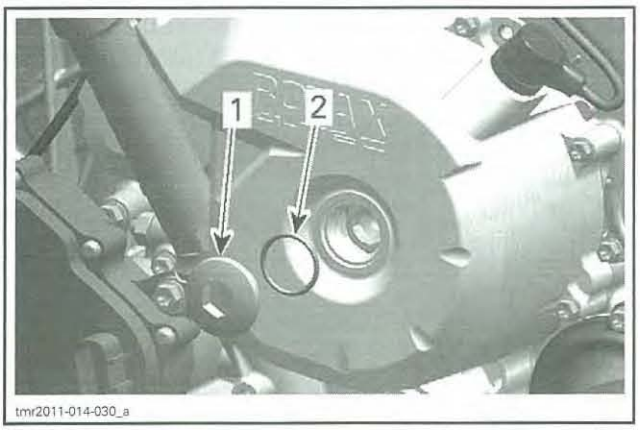
Camshaft Timing Cylinder 2 (rear)

Turn crankshaft until piston is at TDC ignition as follows.

Remove spark plug of both cylinders.

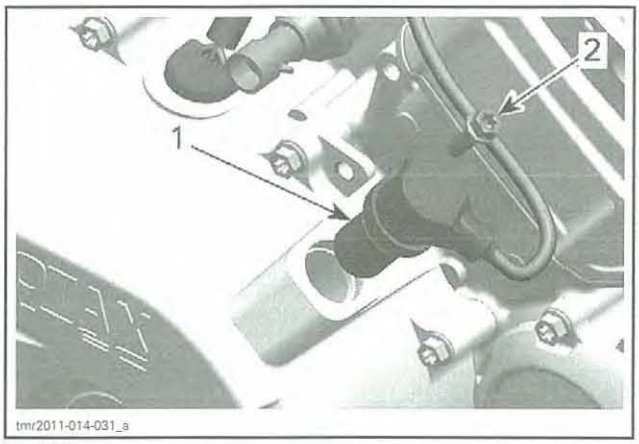
Remove valve covers of both cylinders.

Remove the plug and O-ring of magneto cover.



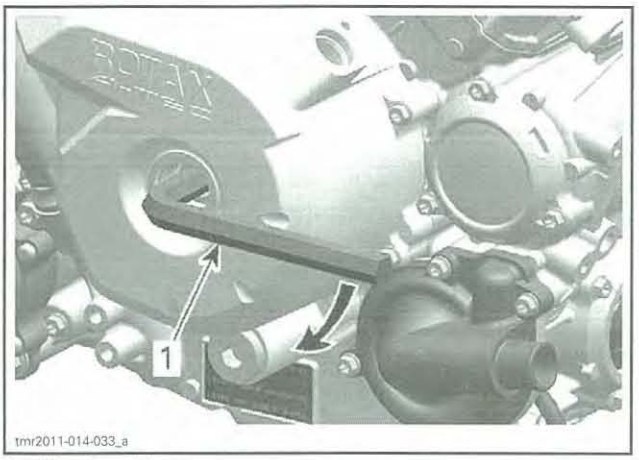
1. *Plug*
2. *O-ring*

Remove the crankshaft position sensor (CPS).



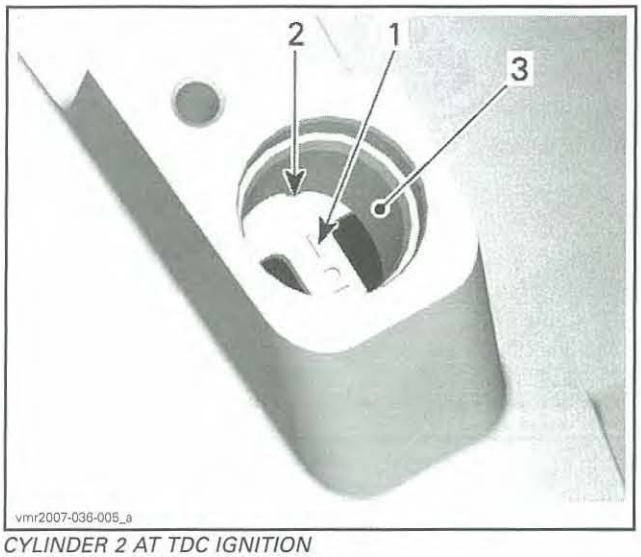
1. *CPS*
2. *Screw*

Use a 14 mm Allen key to turn crankshaft until piston 2, rear is at TDC ignition.



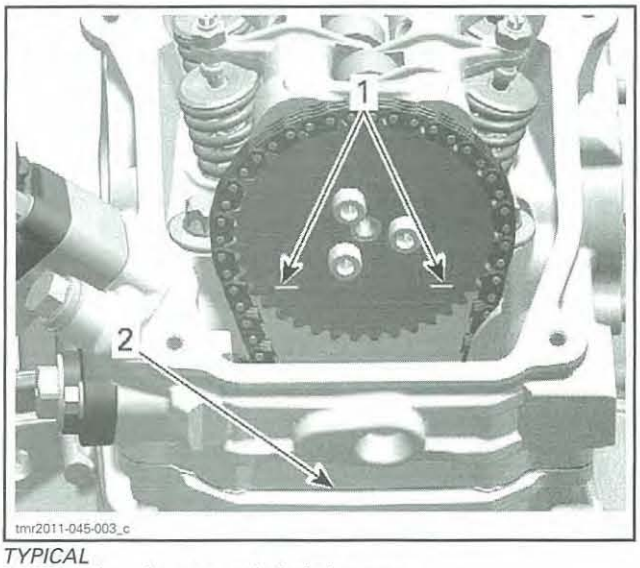
1. *Allen key 14 mm*

When rear piston is at TDC ignition, marks on magneto flywheel "2" and on the magneto cover are aligned.



CYLINDER 2 AT TDC IGNITION
1. *Mark "2" on magneto flywheel*
2. *Notch on magneto cover*
3. *Crankshaft position sensor location*

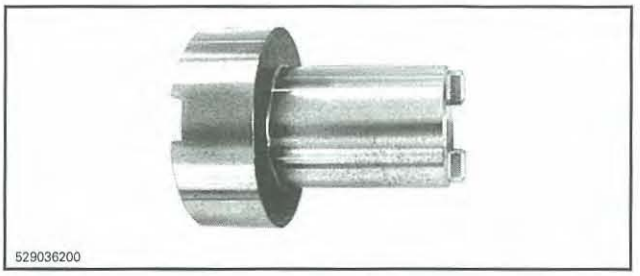
At TDC ignition, the printed marks on the camshaft timing gear have to be parallel to cylinder head base.



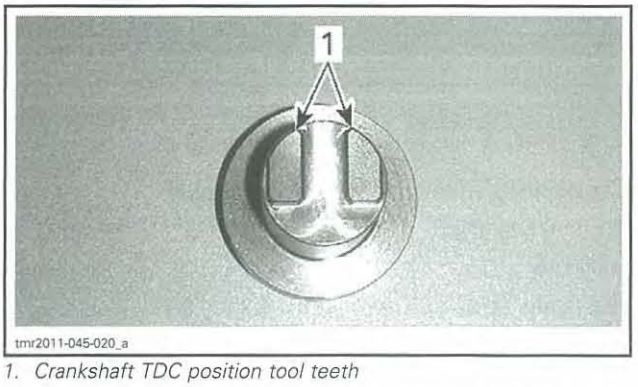
TYPICAL
1. *Printed marks on camshaft timing gear*
2. *Cylinder head base*

To lock crankshaft at TDC ignition, proceed as follows.

Insert CRANKSHAFT TDC POSITION TOOL (P/N 529 036 200) in CPS orifice to lock crankshaft in position.

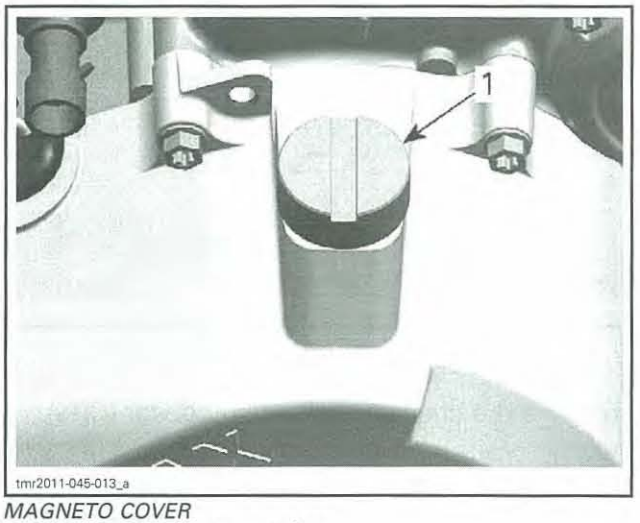


Make sure to match the crankshaft TDC position tool teeth with the magneto rotor shape.



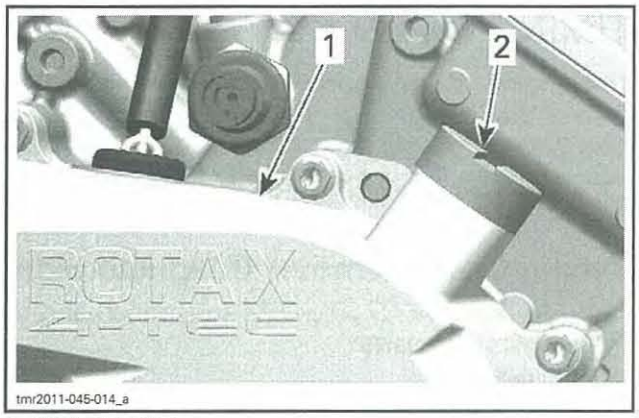
1. *Crankshaft TDC position tool teeth*

NOTICE Do not use the CRANKSHAFT TDC POSITION TOOL (P/N 529 036 200) to remove or install drive pulley or magneto retaining screws.



MAGNETO COVER
1. *Crankshaft position sensor bore*

NOTICE Tool must be inserted fully.



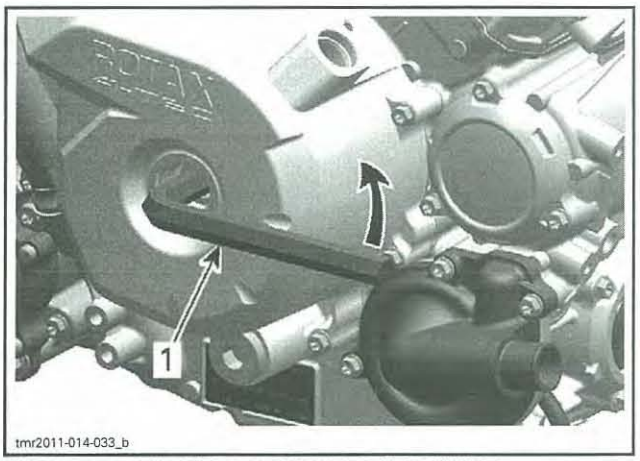
1. Magneto cover
2. Tool

Camshaft Timing Cylinder 1 (front)

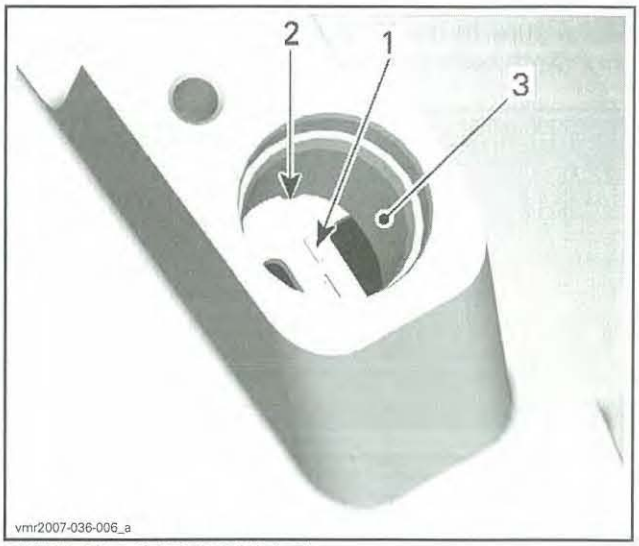
Turn cylinder 2 (rear) to TDC ignition, see *CAMSHAFT TIMING CYLINDER 2 (REAR)* in this subsection.

NOTE: Do not lock crankshaft yet.

Using a 14 mm Allen key, turn crankshaft 280° counterclockwise, until marks on magneto flywheel "1" and magneto cover are aligned.

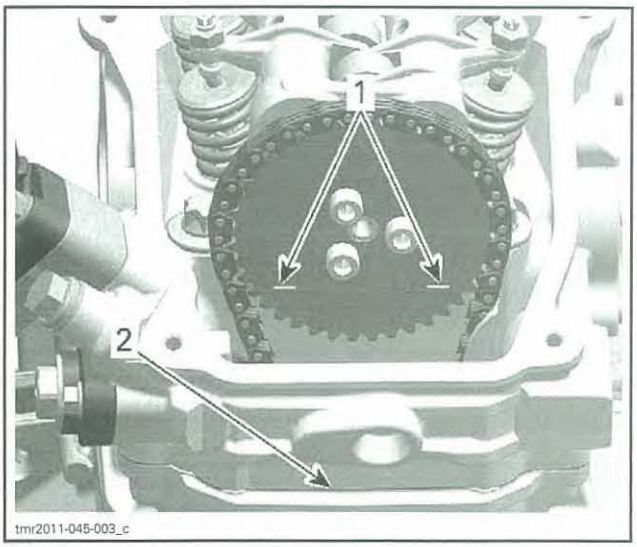


TURN CRANKSHAFT 280° COUNTERCLOCKWISE
1. Allen key 14 mm



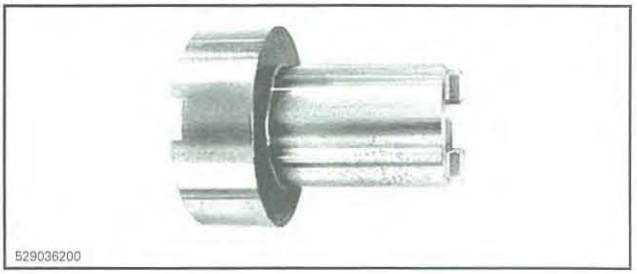
CYLINDER 1 AT TDC IGNITION
1. Mark "1" on magneto flywheel
2. Notch on magneto cover
3. Location of crankshaft position sensor

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

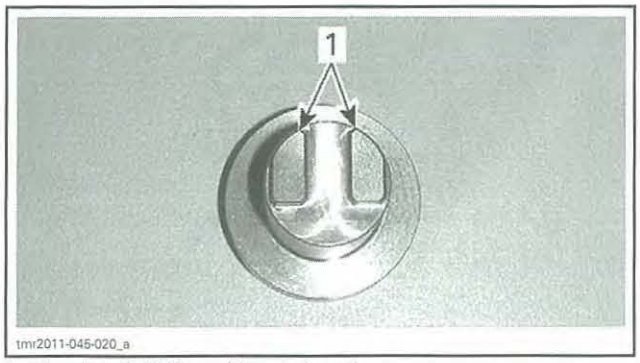


TYPICAL
1. Printed marks on camshaft timing gear
2. Cylinder head base

Insert the CRANKSHAFT TDC POSITION TOOL (P/N 529 036 200) in CPS orifice to lock crankshaft in position.

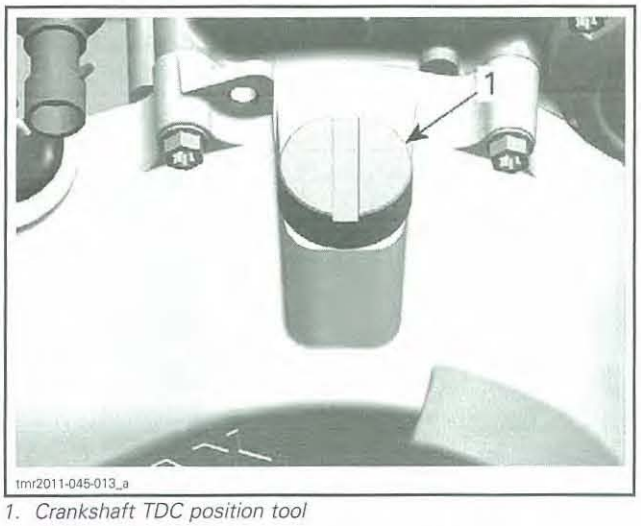


Make sure to match the crankshaft TDC position tool teeth with the magneto rotor shape.



1. Crankshaft TDC position tool teeth

NOTICE Do not use the CRANKSHAFT TDC POSITION TOOL (P/N 529 036 200)to remove or install drive pulley or magneto retaining screws.



1. Crankshaft TDC position tool

NOTICE Tool must be fully inserted.

1. Magneto cover
2. Tool

TIMING CHAIN

The engine is equipped with two timing chains. One of the timing chain is located on engine MAG side behind the magneto cover. The second timing chain is located on engine PTO side behind the PTO cover.

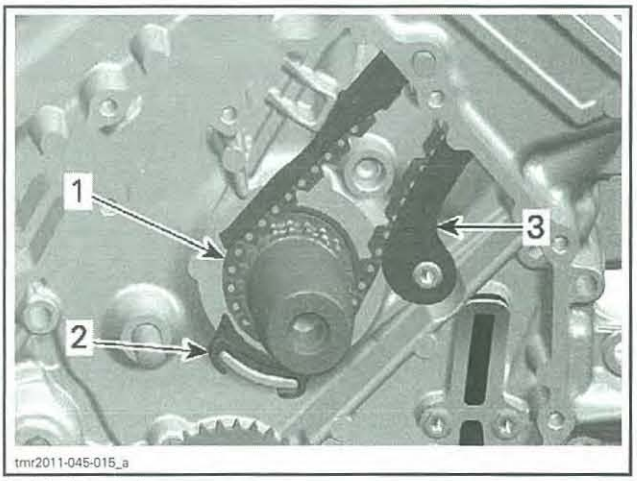
Timing Chain Removal (Magneto Side)

Refer to *MAGNETO SYSTEM* subsection and remove following parts:
- Magneto cover
- Rotor
- Sprag clutch gear.

Refer to *TOP END* subsection and remove following parts:
- Valve cover.

Refer to following procedures in this subsection and remove following parts:
- Chain tensioner
- Camshaft timing gear.

Remove timing chain guide (tensioner side) and lower timing chain guide.



1. Timing chain
2. Lower timing chain guide
3. Timing chain guide (tensioner side)

NOTE: Mark the operating direction of the timing chain before removal.

Carefully pull the timing chain downwards and sideways, then out of the crankcase.

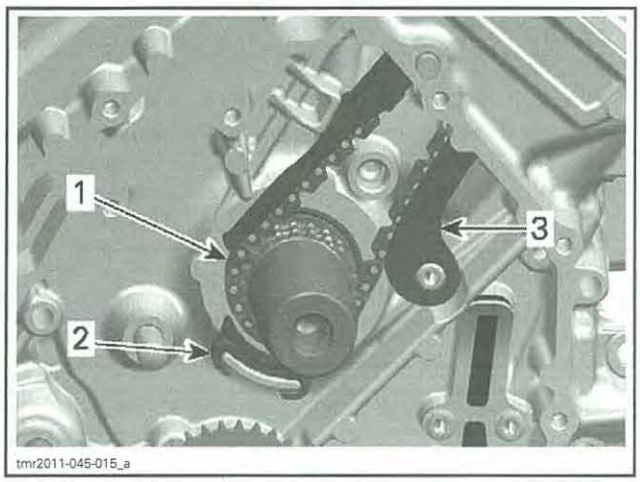
Timing Chain Removal (PTO Side)

Refer to *BOTTOM END* subsection and remove following parts:
- PTO cover
- Breather gear
- Intermediate gear.

Refer to *TOP END* subsection and remove following parts:
- Valve cover.

Refer to following procedures in this subsection and remove following parts:
- Chain tensioner
- Camshaft timing gear.

Remove timing chain guide (tensioner side) and lower timing chain guide.



1. *Timing chain*
2. *Lower timing chain guide*
3. *Timing chain guide (tensioner side)*

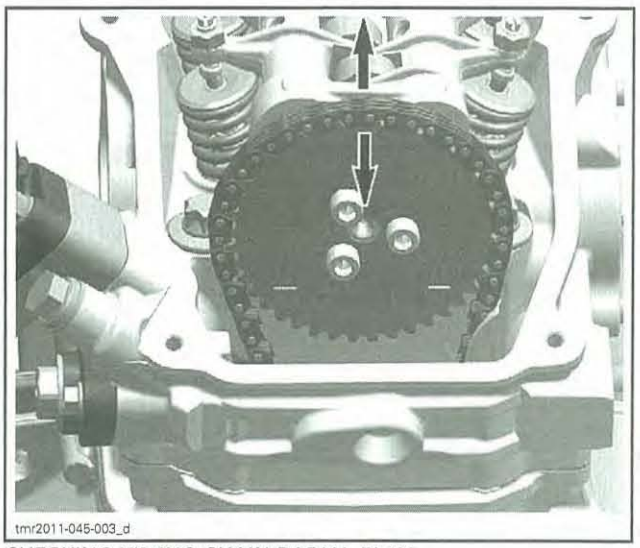
Carefully pull the timing chain sideward and down from the crankcase.

NOTE: Mark the operating direction of the timing chain before removal.

Timing Chain Inspection

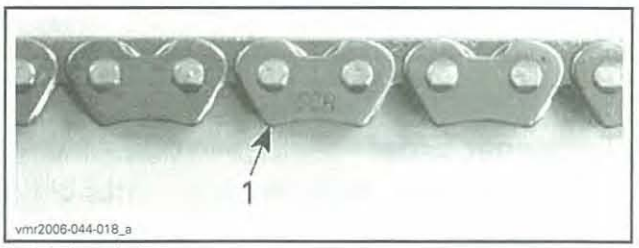
Inspection is the same for both timing chains.

Check timing chain on camshaft timing gear for excessive radial play.



CHECKING TIMING CHAIN RADIAL PLAY

Check chain condition for wear and teeth condition.



1. *Timing chain*

If chain is excessively worn or damaged, replace it as a set (camshaft timing gear and timing chain).

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

NOTE: Check also the timing chain guide (tensioner side).

Timing Chain Installation

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

NOTE: Installation is the same for both timing chains.

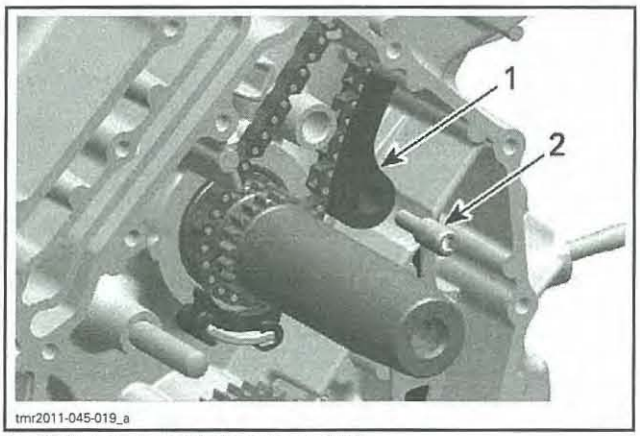
TIMING CHAIN GUIDE BEARING SCREW TIGHTENING TORQUE
10 N•m ± 1 N•m (89 lbf•**in** ± 9 lbf•**in**)

Install timing chain with camshaft timing gear.

NOTE: Ensure to carry out proper valve timing, refer to *CAMSHAFT TIMING GEARS* in this subsection.

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

TIMING CHAIN GUIDE (TENSIONER SIDE)



1. Timing chain guide (tensioner side)
2. Bearing screw

Timing Chain Guide Removal (Tensioner Side)

Refer to *TIMING CHAIN* in this subsection.

Timing Chain Guide Inspection (Tensioner Side)

Check timing chain guide for wear, cracks or deforming. Replace if necessary.

Timing Chain Guide Installation (Tensioner Side)

The installation is the reverse of the removal procedure.

TIMING CHAIN GUIDE BEARING SCREW TIGHTENING TORQUE
10 N•m ± 1 N•m (89 lbf•**in** ± 9 lbf•**in**)

BOTTOM END

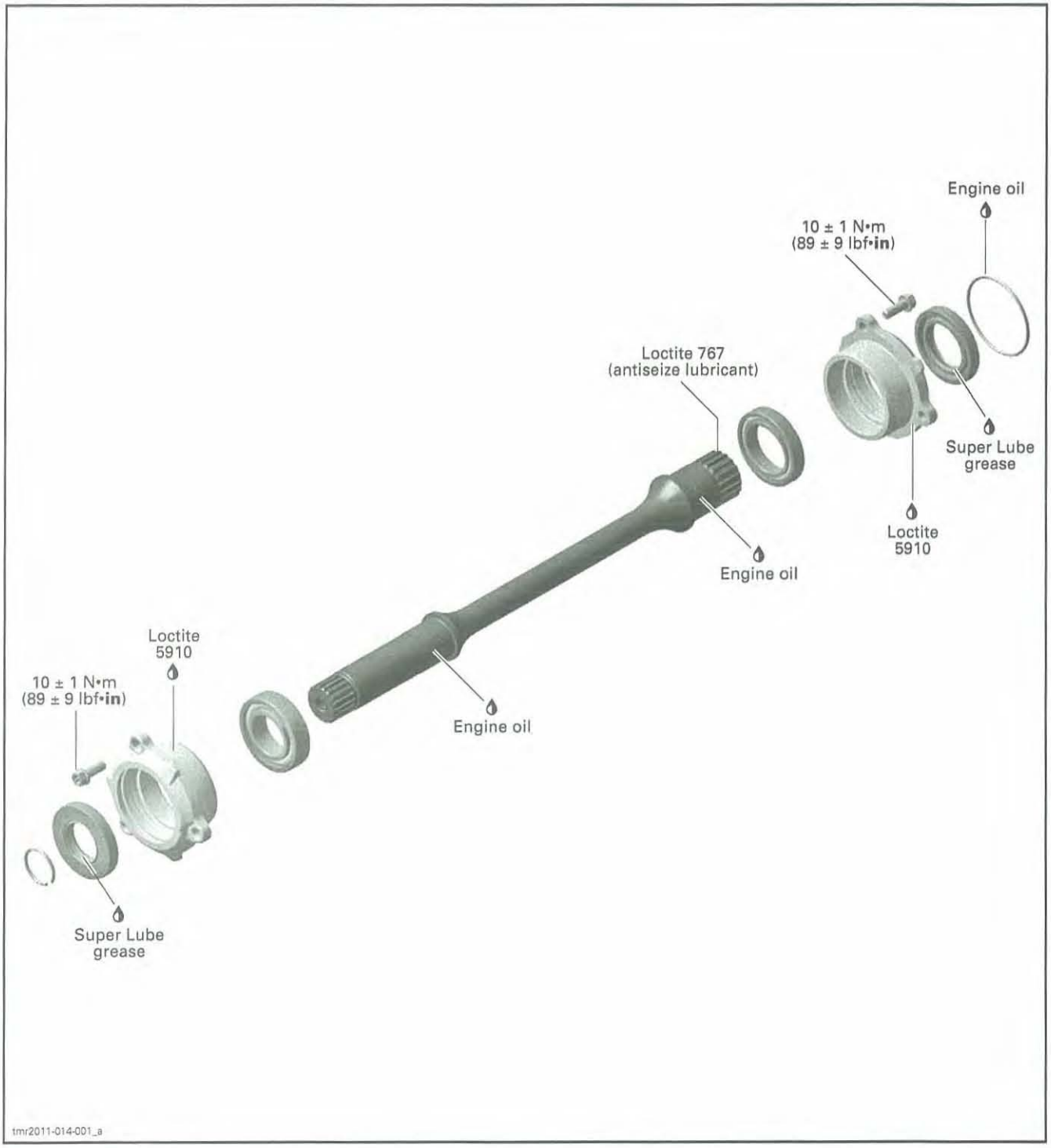
SERVICE TOOLS

Description	Part Number	Page
CRANKCASE SUPPORT MAG/PTO	529 036 031	144
CRANKSHAFT LOCKING BOLT	529 035 617	146
DRIVE SHAFT OIL SEAL INSTALLER	529 036 028	135
DRIVE SHAFT OIL SEAL PROTECTOR	529 036 029	137
PLAIN BEARING REMOVER/INSTALLER	529 036 032	139
PLAIN BEARING REMOVER/INSTALLER	529 035 917	143–144
PTO COVER OIL SEAL INSTALLER	529 036 033	137

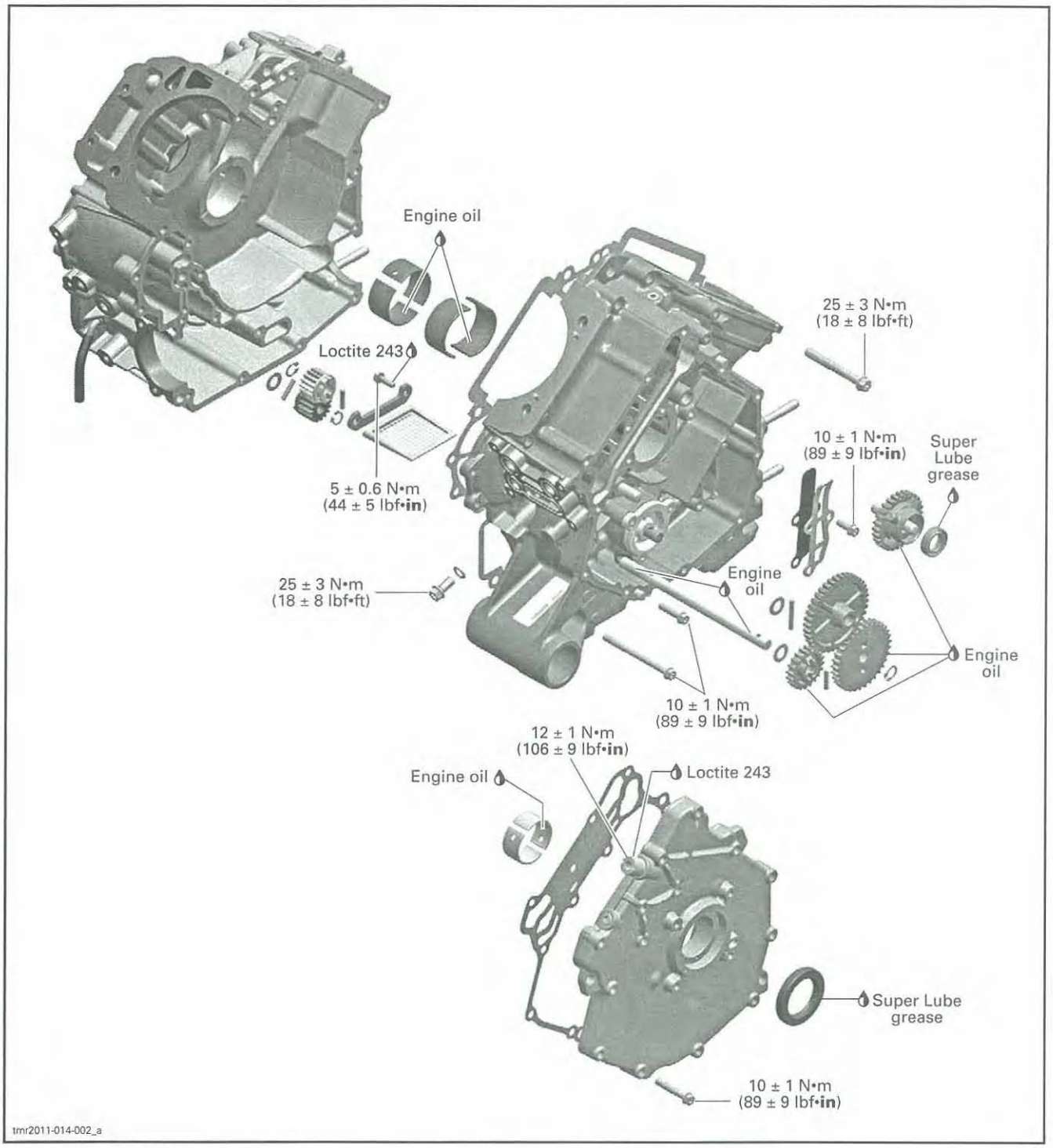
SERVICE PRODUCTS

Description	Part Number	Page
LOCTITE 5910	293 800 081	136
LOCTITE CHISEL (GASKET REMOVER)	413 708 500	136

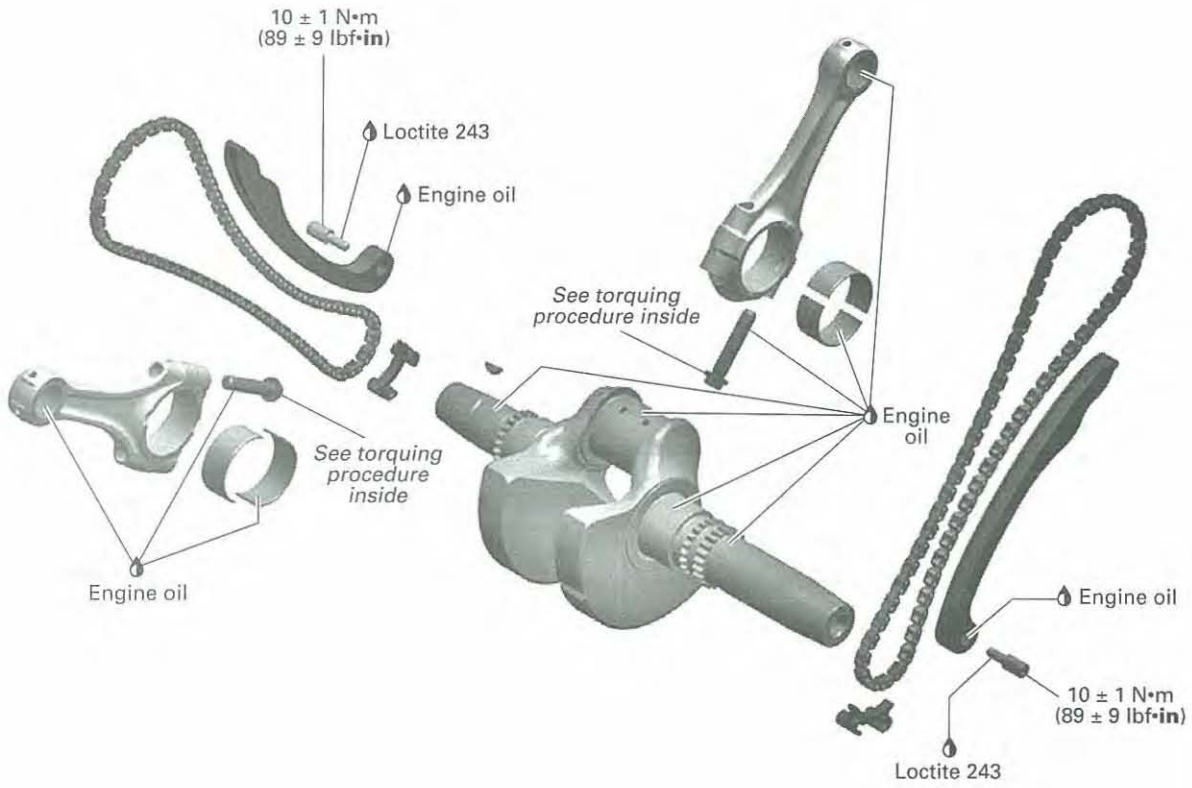
ENGINE DRIVE SHAFT



CRANKCASE AND PTO COVER



CRANKSHAFT



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GENERAL

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

Clean threads before applying a threadlocker. Refer to *SELF-LOCKING FASTENERS* and *LOCTITE APPLICATION* in *INTRODUCTION* section.

⚠ 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 where specified.

PROCEDURES

ENGINE DRIVE SHAFT

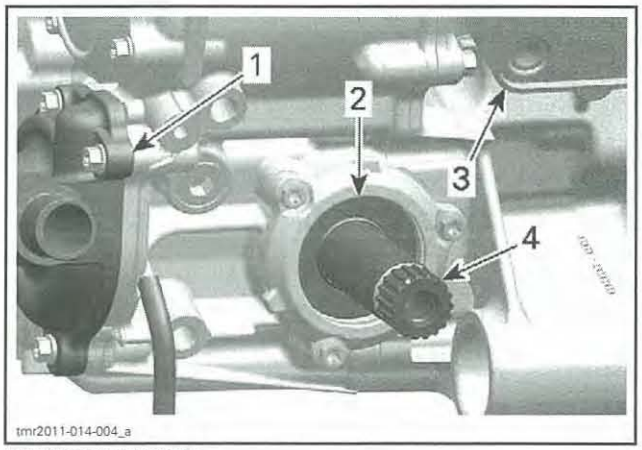
NOTE: The engine drive shaft transmits the power from the gearbox to the front differential and is located inside the crankcase.

Oil Seal Replacement (Engine Drive Shaft)

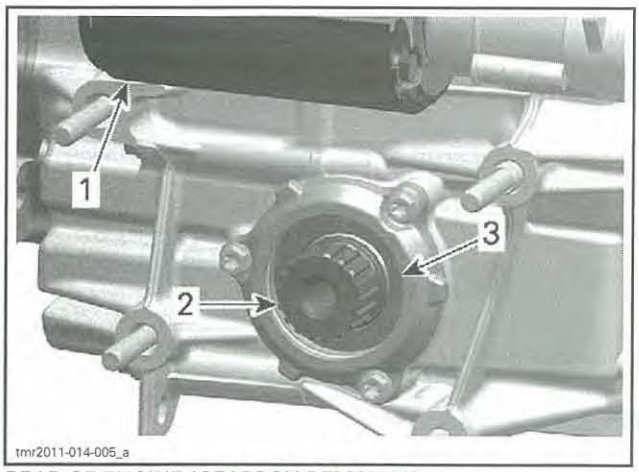
Remove the engine, Refer to *ENGINE REMOVAL AND INSTALLATION* subsection.

To remove the rear oil seal, the gearbox has to be removed from the engine, Refer to *GEARBOX AND 4X4 COUPLING UNIT* subsection.

To replace drive shaft oil seals, the bearing cover has to be removed. For bearing cover removal and installation refer to *ENGINE DRIVE SHAFT REMOVAL/INSTALLATION* in this subsection.



FRONT OF ENGINE
1. *Water pump cover*
2. *Oil seal front side*
3. *Oil cooler*
4. *Drive shaft*



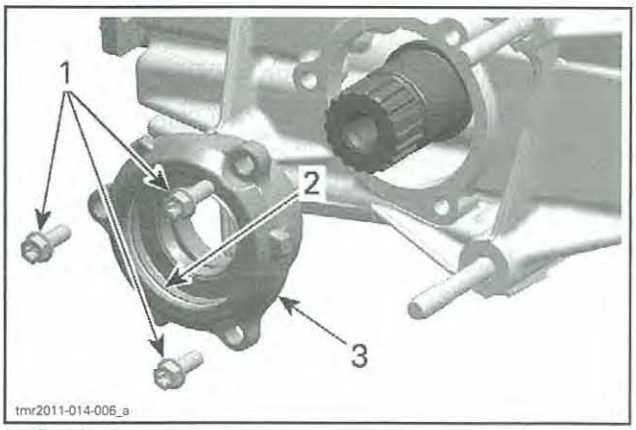
REAR OF ENGINE (GEARBOX REMOVED)
1. *Electric starter*
2. *Drive shaft*
3. *Oil seal gearbox side*

Use the DRIVE SHAFT OIL SEAL INSTALLER (P/N 529 036 028) to install drive shaft oil seals.

Engine Drive Shaft Removal

Remove the engine. Refer to *ENGINE REMOVAL AND INSTALLATION* subsection.

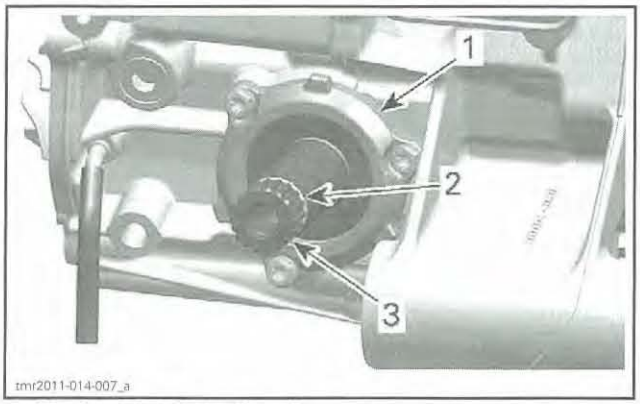
At rear of engine, remove the bearing cover and its O-ring.



1. *Bearing cover screws*
2. *O-ring*
3. *Bearing cover gearbox side*

Remove the bearing cover at the front of the engine.

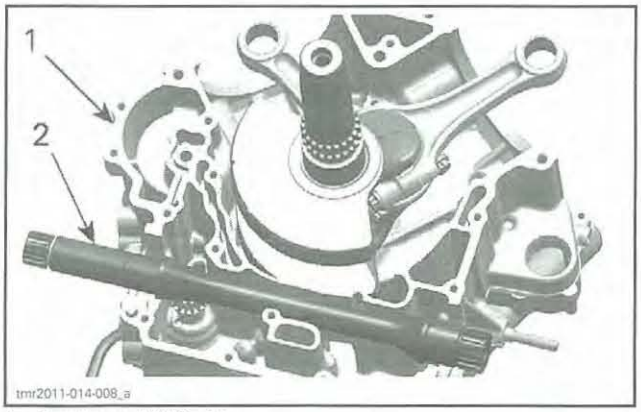
NOTICE Check ends of the circlip for sharp edges or burr before removing the drive shaft, to avoid damaging the oil seal.



1. *Bearing cover front drive side*
2. *Circlip*
3. *Drive shaft*

Split crankcase, refer to *CRANKCASE* in this subsection.

Remove engine drive shaft from the crankcase.

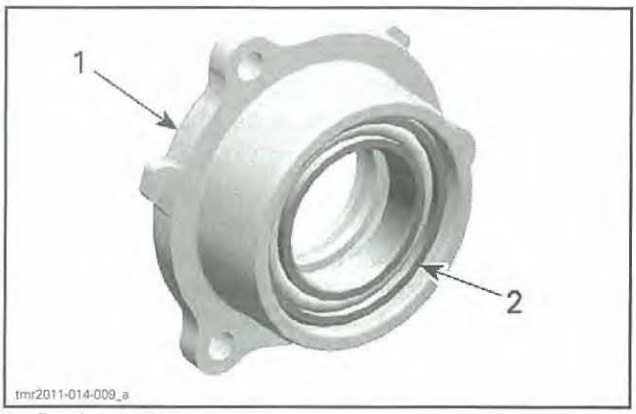


1. *Crankcase MAG side*
2. *Engine drive shaft*

Engine Drive Shaft Inspection

Replace oil seals and/or O-ring (bearing cover gearbox side) if they are brittle, hard or damaged.

Check drive shaft bearings for contamination and/or metal shavings. Check if bearings turn freely and smoothly. Replace if necessary.



1. *Bearing cover*
2. *Drive shaft bearing*

Check drive shaft for cracks, bend, pitting or other visible damages.

Check drive shaft splines for wear or damages.

Check oil seal running surface of the drive shaft for scratches. Replace if necessary.

Engine Drive Shaft Installation

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

Clean all metal components in solvent.

Crankcase surfaces and bearing covers are best cleaned using a combination of LOCTITE CHISEL (GASKET REMOVER) (P/N 413 708 500) and a brass brush. Brush a first pass in one direction then make the final brushing perpendicularly (90°) to the first pass.

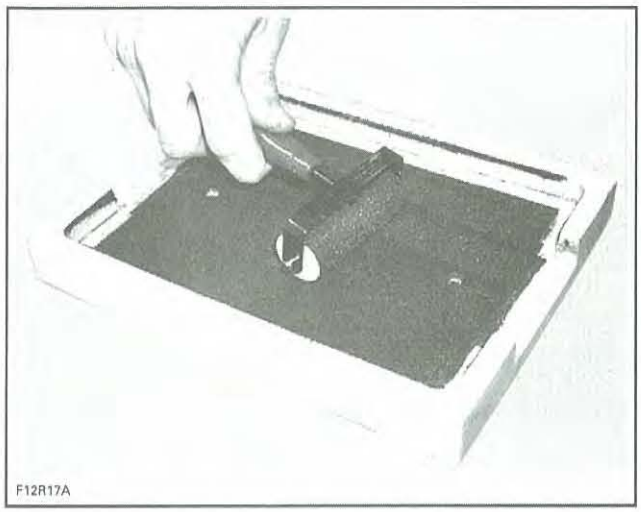
NOTICE **Do not wipe with rags. Use a new clean hand towel only.**

Use a suitable installer for installing bearings.

Use LOCTITE 5910 (P/N 293 800 081) on mating surfaces.

IMPORTANT: When beginning the application of the bearing cover sealant, the assembly and the first torquing should be done within 10 minutes. It is suggested to have all you need on hand to save time.

Use a plexiglass plate and apply some sealant on it. Use a soft rubber roller 50 mm - 75 mm (2 in - 3 in), available in arts products suppliers for printing, and roll the sealant to get a thin uniform coat on the plate (spread as necessary). When ready, apply the sealant on bearing cover surfaces.

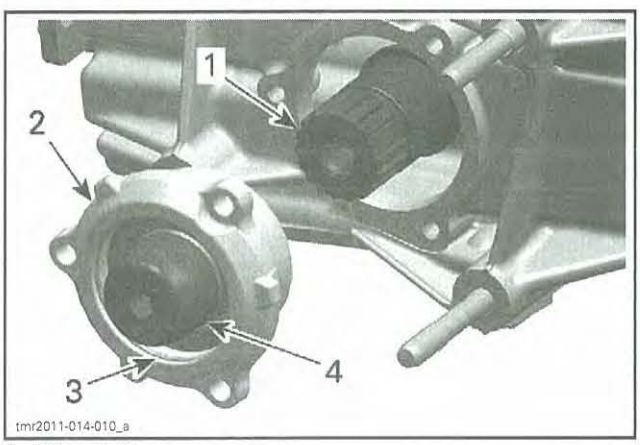

F12R17A

Do not apply in excess as it will spread out inside crankcase.

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

To install bearing cover at gearbox side, fit DRIVE SHAFT OIL SEAL PROTECTOR (P/N 529 036 029) into oil seal.

529036029



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1. *Drive shaft*
2. *Bearing cover gearbox side*
3. *O-ring*
4. *Protection sleeve*

Finally check for axial play of the drive shaft.

PTO COVER OIL SEAL

To replace oil seal it is not necessary to remove engine from vehicle.

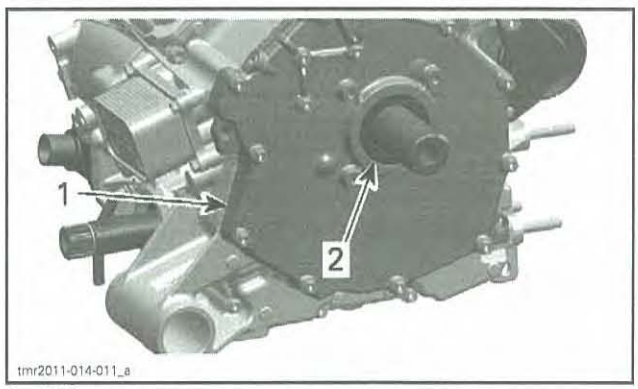
PTO Oil Seal Removal

Refer to *CONTINUOUSLY VARIABLE TRANSMISSION (CVT)* subsection to remove the following parts:

- CVT cover
- Drive pulley
- Driven pulley
- CVT air guide.

Remove oil seal with a small flat screwdriver.

NOTICE **Avoid scoring surfaces with tool.**



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1. *PTO cover*
2. *Oil seal*

PTO Oil Seal Inspection

Check oil seal running surface of crankshaft PTO side for grooves. Replace if necessary.

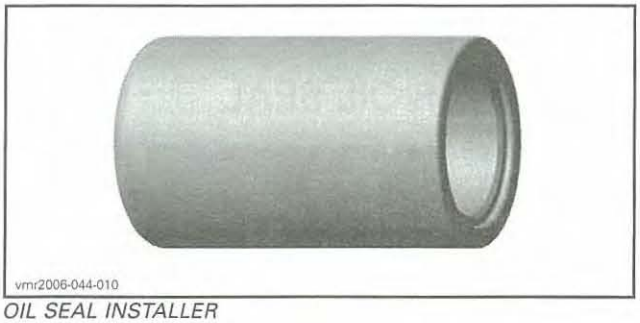
PTO Oil Seal Installation

The installation is the reverse of the removal procedure.

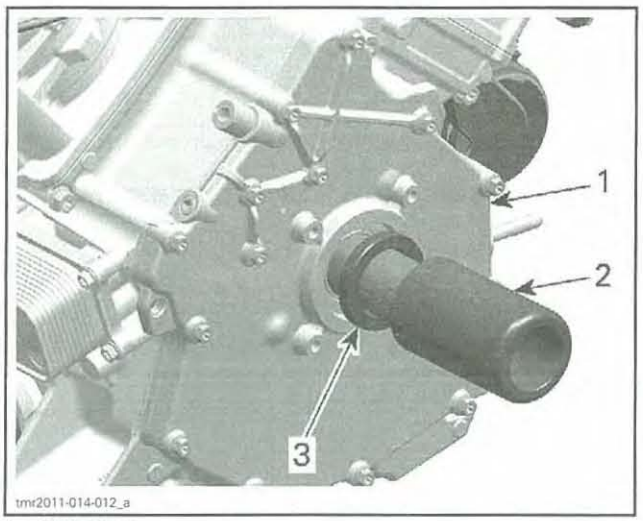
Pay attention to the following details.

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

Push oil seal in place by using the PTO COVER OIL SEAL INSTALLER (P/N 529 036 033).



OIL SEAL INSTALLER



1. *PTO cover*
2. *Oil seal installer*
3. *Oil seal*

PTO COVER

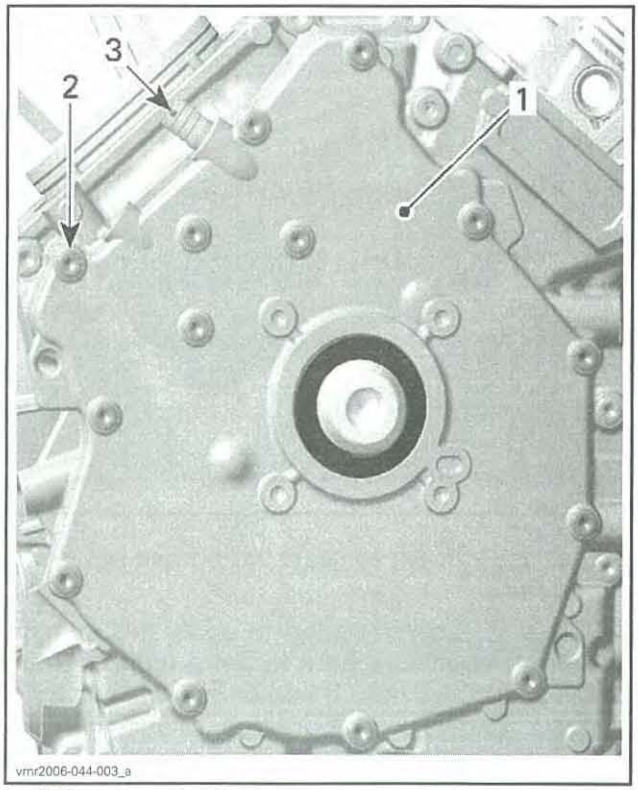
PTO Cover Removal

Refer to *CONTINUOUSLY VARIABLE TRANSMISSION (CVT)* subsection to remove the following parts:

- CVT cover
- Drive pulley
- Driven pulley
- CVT air guide.

Disconnect vent hose.

Remove PTO cover screws and pull PTO cover.



1. *PTO cover*
2. *PTO cover screws*
3. *Vent hose nipple*

PTO Cover Inspection

Check the PTO cover for cracks or other damage.

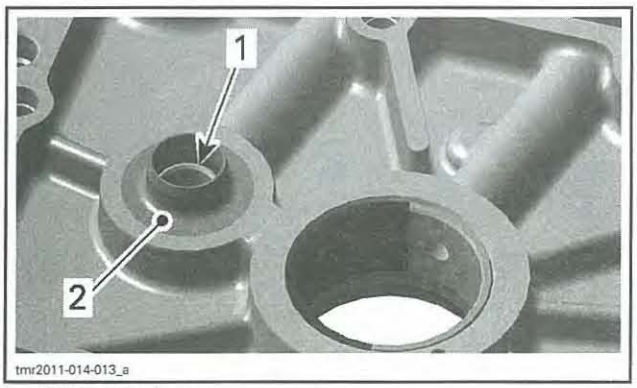
Replace PTO cover if damaged.

Clean oil breather bore in PTO cover from contaminations with part cleaner then use pressurized air to dry it.

⚠ WARNING

Always wear skin and eye protection. Chemicals can cause skin rash, skin burns and severe eye injury.

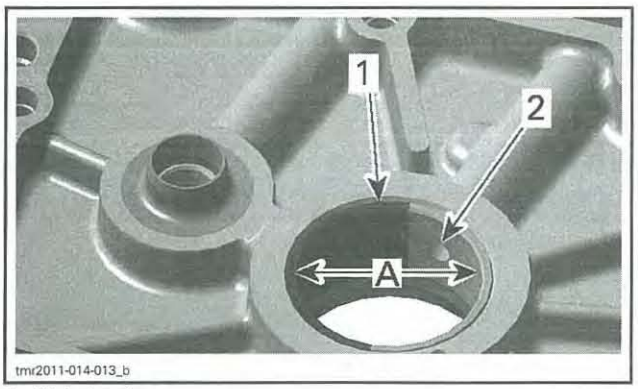
Check surface of sealing sleeve for wear or other damages. Replace PTO cover if damaged.



1. *Oil breather bore*
2. *Surface of sealing sleeve*

Check plain bearings for scorings or other damages.

NOTE: Measure plain bearing inside diameter (PTO cover) and compare to crankshaft journal diameter (PTO cover bearing). Refer to *CRANKSHAFT* in this section. Replace if the measurement is out of specification.



1. *Plain bearing*
2. *Oil bore*

A. Measure plain bearing inside diameter

PLAIN BEARING INSIDE DIAMETER (PTO COVER)	
SERVICE LIMIT	34.120 mm (1.3433 in)

Plain Bearing Replacement (PTO Cover)

Plain Bearing Removal

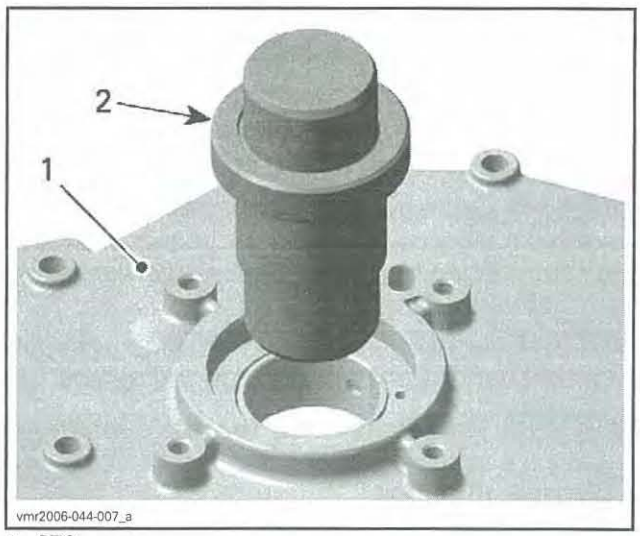
NOTICE Unless otherwise instructed, never use a hammer to install plain bearings. Use a press only.

Carefully remove the PTO oil seal with a screwdriver, without damaging the PTO cover.

Push-out the plain bearings from the outside towards the inside using the PLAIN BEARING REMOVER/INSTALLER (P/N 529 036 032).

PLAIN BEARING REMOVER/INSTALLER — PTO COVER

The PTO cover has to be supported from below with suitable support with straight surface, in order to prevent damage of the sealing surface.



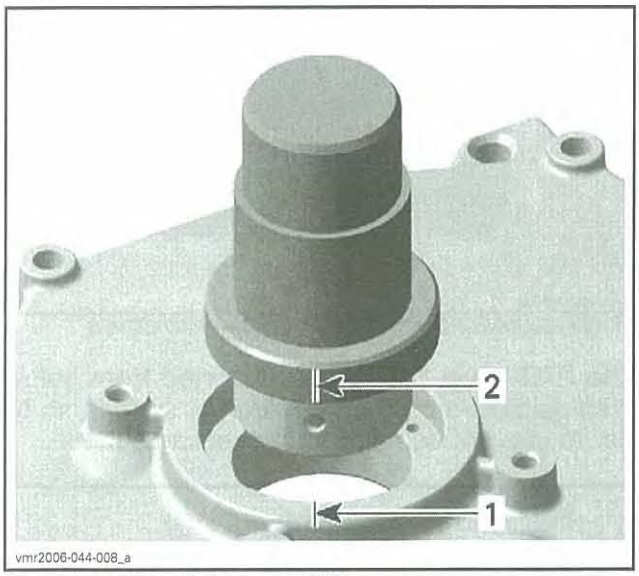
1. *PTO cover*
2. *Plain bearing remover/installer*

Plain Bearing Installation

NOTE: Do not lubricate plain bearings and/or PTO cover for installation.

Install plain bearings with the proper PLAIN BEARING REMOVER/INSTALLER (P/N 529 036 032) in a cool PTO cover.

NOTICE Mark position of oil bore on PTO cover and on plain bearing remover/installer. Align mark on plain bearing remover/installer with mark on PTO cover.

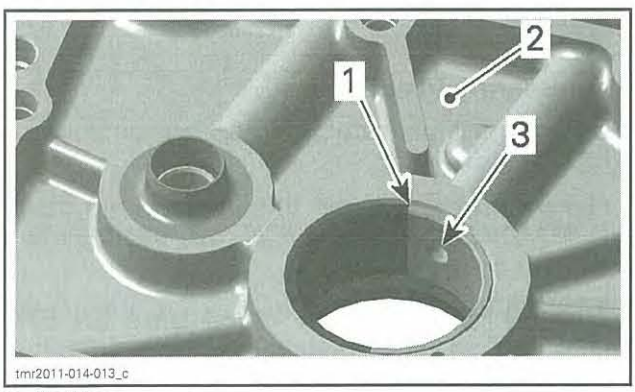


1. *Mark position of oil bore on PTO cover*
2. *Mark position of oil bore on plain bearing remover/installer*

Carefully press-in the plain bearings in the same direction as during disassembly, from the outside towards the inside. Support PTO cover with suitable support with straight surface, in order to prevent damage of the sealing surface.

NOTE: Wrong oil bore position will stop oil supply to plain bearings and will damage the engine.

NOTICE The partition of the plain bearings must be positioned near to oil bore in counterclockwise direction.



1. *Partition*
2. *PTO cover (inside)*
3. *Oil bore*

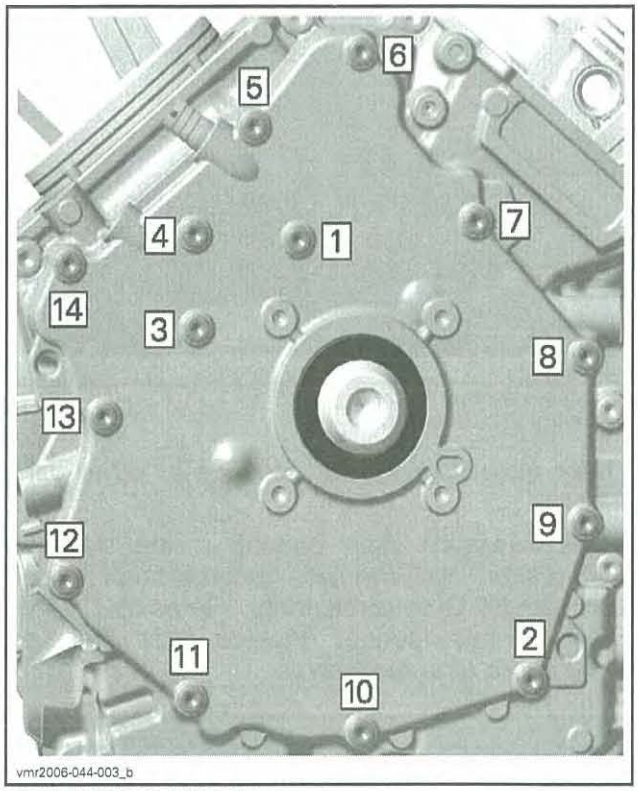
PTO Cover Installation

For installation, reverse the removal procedure.

Pay attention to the following details.

NOTE: At installation, replace PTO cover gasket and oil seal.

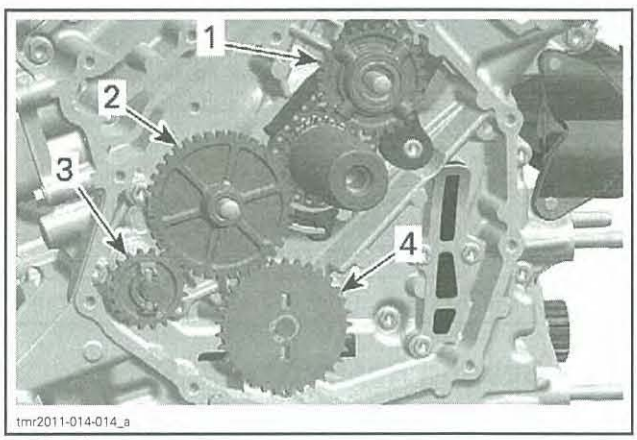
Tighten PTO cover screws following the illustrated sequence.



TIGHTENING SEQUENCE

DRIVE GEARS

The drive gears are located on the engine PTO side behind the PTO cover.



1. *Breather gear*
2. *Intermediate gear*
3. *Water pump drive gear*
4. *Oil pump drive gear*

Drive Gear Removal

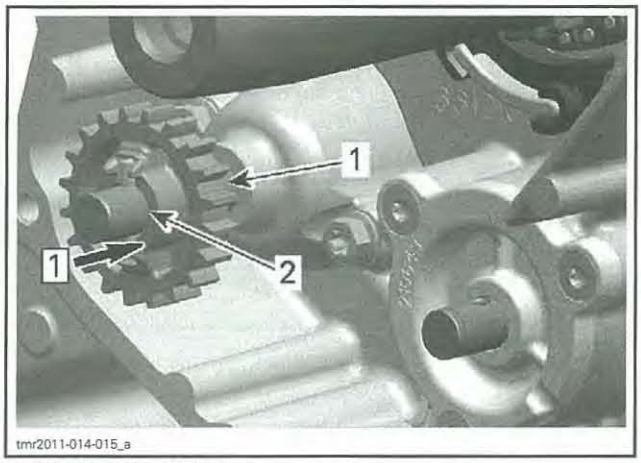
Remove PTO cover (refer to *PTO COVER*).

Withdraw intermediate gear and breather gear.

For oil pump drive gear removal, refer to *OIL PUMP* in *LUBRICATION SYSTEM*.

To remove water pump gear, pull the shaft assembly a bit out and turn it about one teeth until it stays out.

Then push water pump gear in.

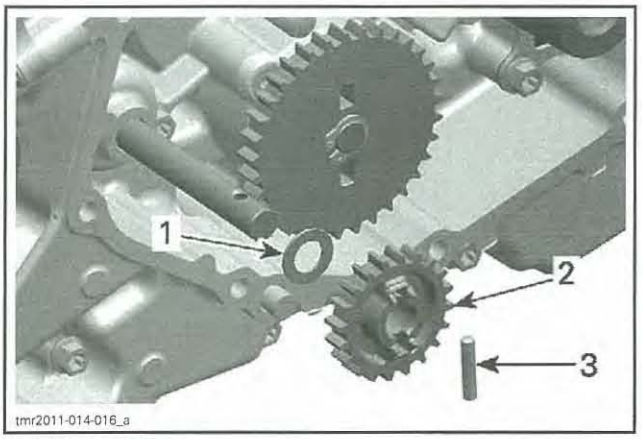


1. Water pump drive gear
2. Intermediate shaft

Step 1: Push gear in

Remove needle pin and pull water pump gear out.

Remove thrust washer from intermediate shaft.



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

Drive Gears Inspection

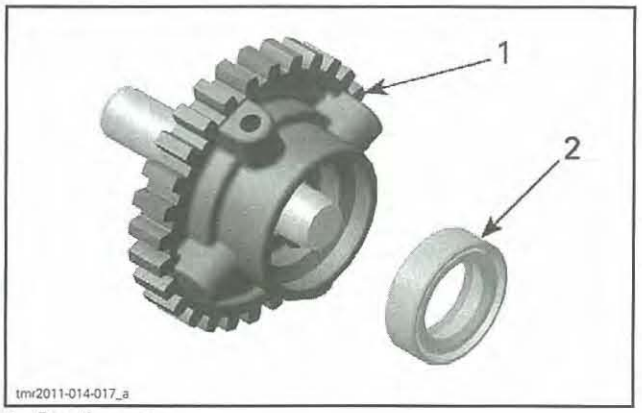
Intermediate Gear/Oil Pump Drive Gear/Water Pump Drive Gear

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

Breather Gear

The engine is equipped with a breather gear which prevents engine oil coming out through the breathing system into the air intake system.

Check if oil seal is brittle, hard or damaged. Replace if necessary.



1. Breather gear
2. Oil seal

Inspect gear for wear or other damage.

Check ball bearing for excessive play and smooth operation. Replace breather gear assembly if necessary.

Drive Gear Installation

The installation is essentially the reverse of the removal procedure.

Adequately oil the ball bearing of the breather gear.

CRANKCASE

Crankcase Disassembly

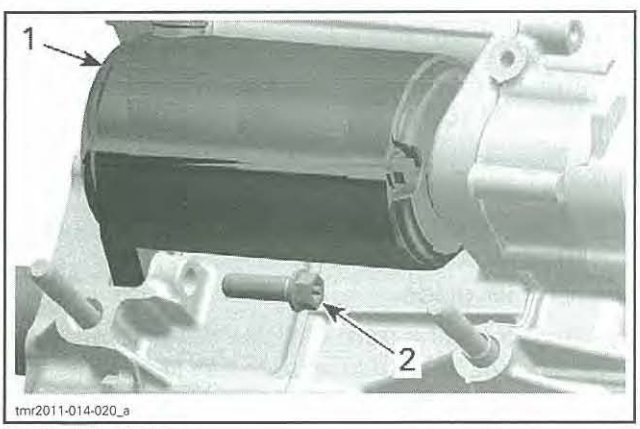
1. Refer to *PERIODIC MAINTENANCE PROCEDURES* subsection and:
   1.1 Drain cooling system.
   1.2 Drain engine oil.
   1.3 Drain gearbox oil.
2. Lock crankshaft. Refer to *CRANKSHAFT LOCKING PROCEDURE* in the this section.
3. Refer to *CONTINUOUSLY VARIABLE TRANSMISSION (CVT)* section to remove following parts:
   - CVT cover
   - Drive pulley
   - Driven pulley
   - CVT air guide.
4. Remove engine from vehicle. Refer to *ENGINE REMOVAL AND INSTALLATION* section.
5. Detach gearbox from engine. Refer to *GEARBOX AND 4X4 COUPLING UNIT.*
6. Refer to *MAGNETO SYSTEM* section to remove the following parts:
   - Magneto cover

- Rotor with sprag clutch gear
- Starter drive gears.

7. Refer to following procedures in this subsection to remove the following parts:
   - PTO cover
   - Drive gears
   - Bearing covers of engine drive shaft.
8. Refer to *TIMING CHAIN* section to remove following parts:
   - Chain tensioners
   - Camshaft timing gears
   - Timing chains
   - Timing chain guides.
9. Refer to *TOP END* section to remove following parts:
   - Front cylinder head
   - Rear cylinder head
   - Cylinders.
10. Refer to *COOLING SYSTEM* section to remove following parts:
    - Water pump housing.
11. Refer to *LUBRICATION SYSTEM* section to remove following parts:
    - Oil filter
    - Oil cooler
    - Oil pump drive gear.

NOTE: Oil pump removal from crankcase is not necessary, but recommended to see condition of oil pump (refer to *LUBRICATION SYSTEM* section).

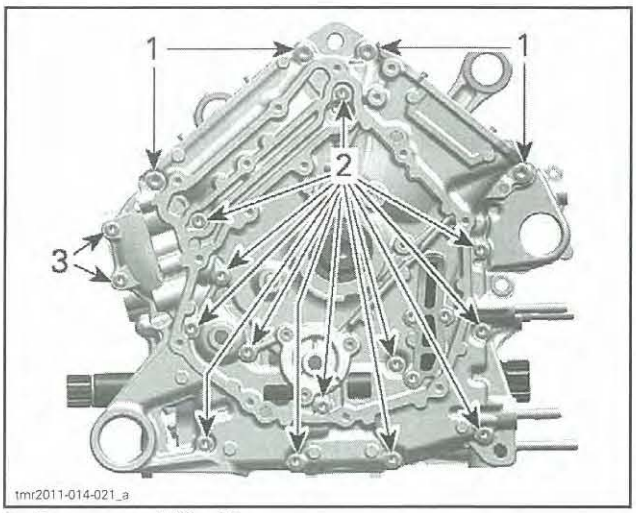
12. Remove electric starter.



1. Electric starter
2. Screw

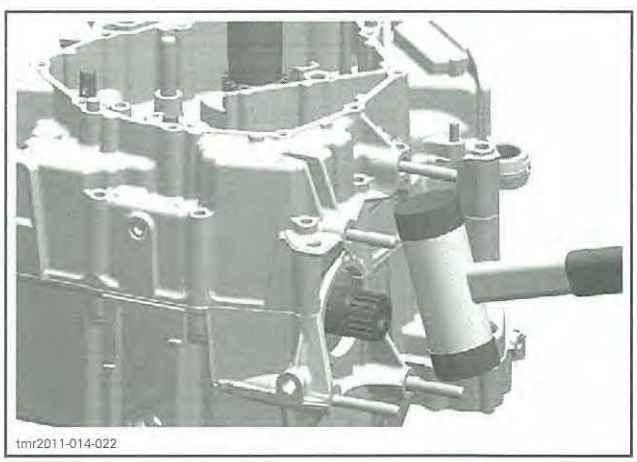
NOTE: Before splitting the crankcase, measure crankshaft axial play. Refer to *CRANKSHAFT*.

Remove retaining screws of crankcase.



1. Four screws M8 x 65
2. 13 screws M6 x 75
3. Two screws M6 x 25

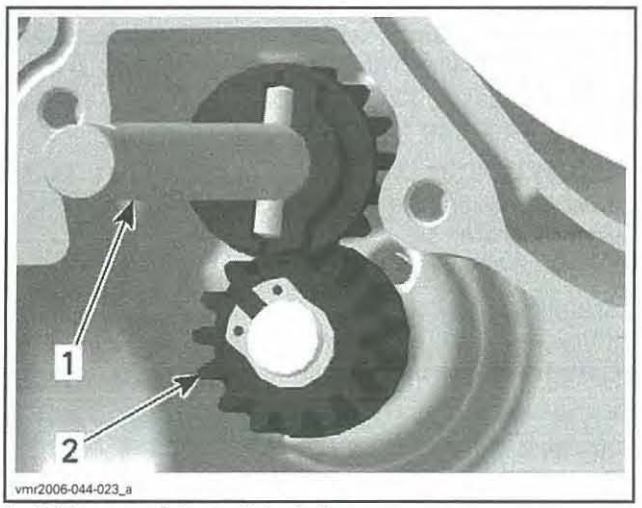
Carefully split crankcase halves by using a screwdriver and a soft hammer.



NOTE: During disassembly, do not damage the sealing surfaces of the crankcase halves.

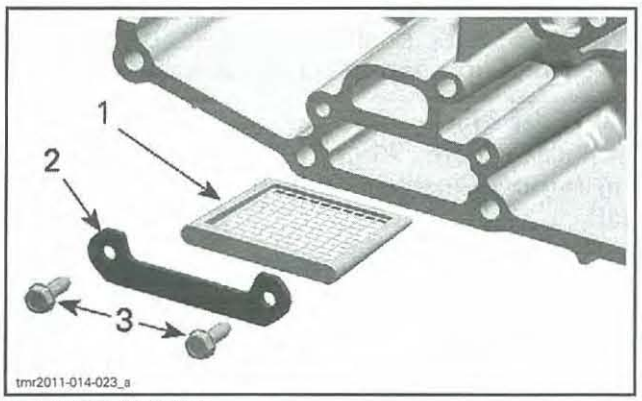
Pull crankshaft out of crankcase.

Remove the water pump intermediate shaft and the water pump gear.



1. *Water pump intermediate shaft*
2. *Water pump gear*

Remove engine oil strainer.



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

Crankcase Cleaning

⚠ WARNING

Use safety goggles to avoid eye injuries.

Clean crankcase using a part cleaner.

Dry crankcase using compressed air.

Blow the oil supply lines.

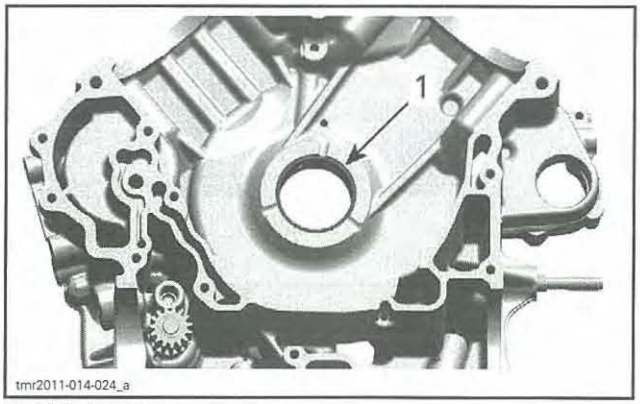
Oil Strainer

Clean the engine oil strainer (same procedure as for the crankcase).

Crankcase Inspection

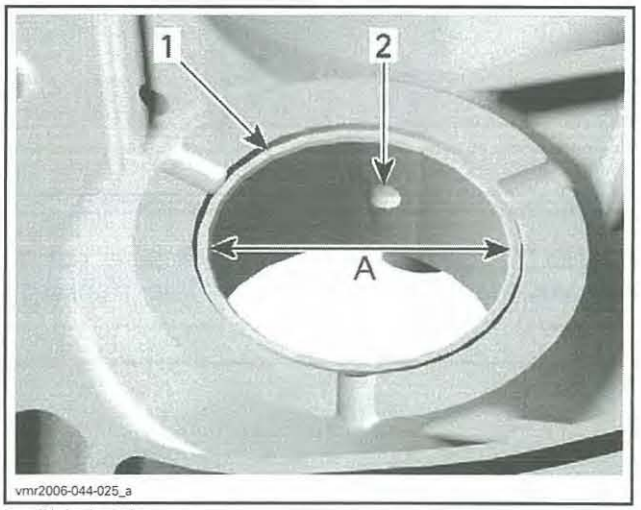
Check crankcase halves for cracks or other damage. Replace if damaged.

Check main bearings in MAG and PTO crankcase half for scorings or other damages.



1. *Plain bearing*

NOTE: Measure plain bearing inside diameter and compare to PTO/MAG main journal diameters of crankshaft (refer to *CRANKSHAFT*). Replace if the measurements are out of specification.



1. *Plain bearing*
2. *Oil bore*

A. Measure plain bearing inside diameter

MAIN BEARING INSIDE DIAMETER (PTO/MAG)	
SERVICE LIMIT	42.100 mm (1.6575 in)

Plain Bearing Replacement (Main)

Plain Bearing Removal

NOTICE **Always support crankcase halves properly when plain bearings are removed. Damages to crankcase halves may occur if this procedure is not performed correctly.**

NOTE: Always use a press for removal of plain bearings.

Remove plain bearings with the PLAIN BEARING REMOVER/INSTALLER (P/N 529 035 917).

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PLAIN BEARING REMOVER/INSTALLER (P/N 529 035 917)

Carefully push the plain bearings out, from the crankcase half inside towards the outside.

NOTE: Place the proper CRANKCASE SUPPORT MAG/PTO (P/N 529 036 031) under crankcase halves before removing plain bearings.

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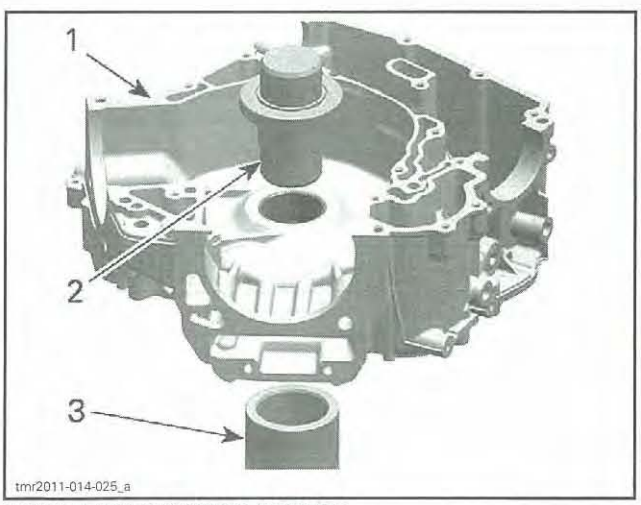
CRANKCASE SUPPORT SLEEVE (P/N 529 036 031)

NOTE: During disassembly, make sure not to damage the sealing surfaces of the crankcase halves.



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PUSH PLAIN BEARINGS OUTSIDE
1. *Crankcase half*
2. *Plain bearing remover/installer*
3. *Crankcase support sleeve (P/N 529 036 031)*

Plain Bearing Installation (Main)

NOTICE Unless otherwise instructed, never use hammer to install plain bearings. Use press only.

Install plain bearings with the proper PLAIN BEARING REMOVER/INSTALLER (P/N 529 035 917) in a cool crankcase. Do not lubricate plain bearings and/or crankcase for installation.

NOTE: Place the proper crankcase support sleeve under crankcase halves before installing the plain bearings (refer to *BEARING REMOVAL PROCEDURE*).

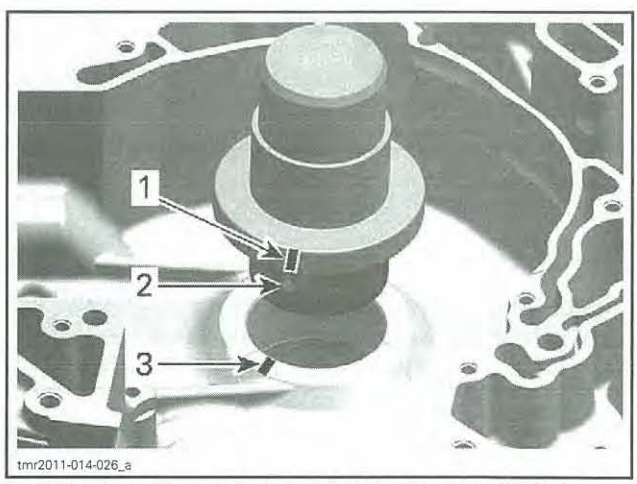
Carefully press in the plain bearings in the same direction as during disassembly, from the crankcase inside towards the outside.

During reassembly, make sure not to damage the sealing surfaces of the crankcase halves.

NOTE: Use an O-ring (Ø 42 x 1 mm to 1.5 mm (.04 in to .06 in) thickness) to hold plain bearings in place during installation. The O-ring will disappear in the groove of the plain bearing remover/installer.

NOTICE Mark position of plain bearing oil bore on plain bearing remover/installer.

NOTICE Mark position of oil bore on crankcase half. Align mark on plain bearing remover/installer with mark on crankcase half.



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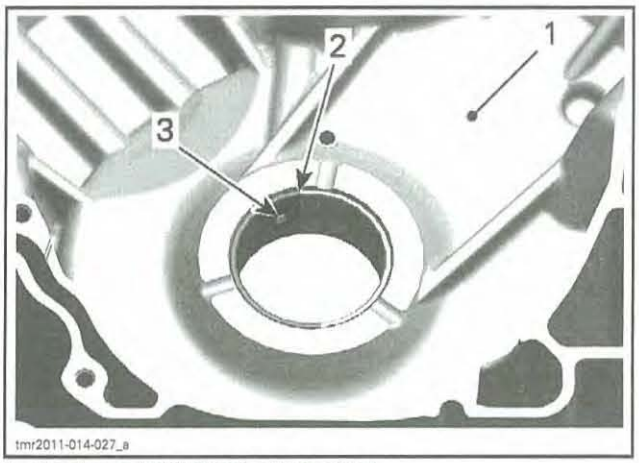
1. *Oil bore position marked on plain bearing remover/installer*
2. *Plain bearing oil bore*
3. *Oil bore position marked on crankcase*

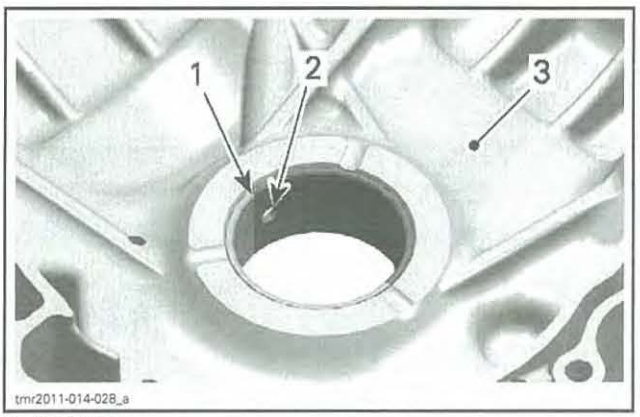
NOTE: Wrong oil bore position will stop oil supply to plain bearings and will cause engine damage.

NOTICE The partition of the plain bearings in crankcase half MAG side must be positioned near to oil bore in clockwise direction.



1. *Crankcase half MAG (inside surface)*
2. *Partition*
3. *Oil bore*

NOTICE The partition of the plain bearings in crankcase half PTO side must be positioned near to oil bore in counterclockwise direction.



1. *Partition*
2. *Oil bore*
3. *Crankcase half PTO (inside)*

Crankcase Assembly

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

Clean oil passages and make sure they are not clogged.

Clean all metal components in a solvent.

Install a new crankcase gasket.

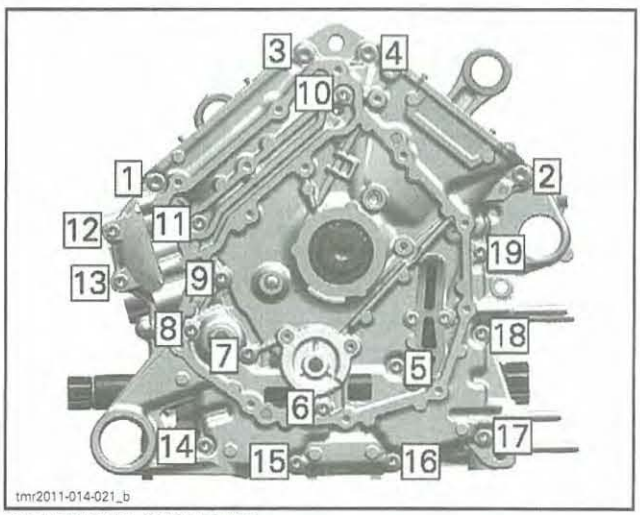
Oil the plain bearings before mounting the crankshaft.

NOTICE Correctly reinstall crankshaft (refer to *CRANKSHAFT*).

Properly reinstall engine oil strainer and screws.

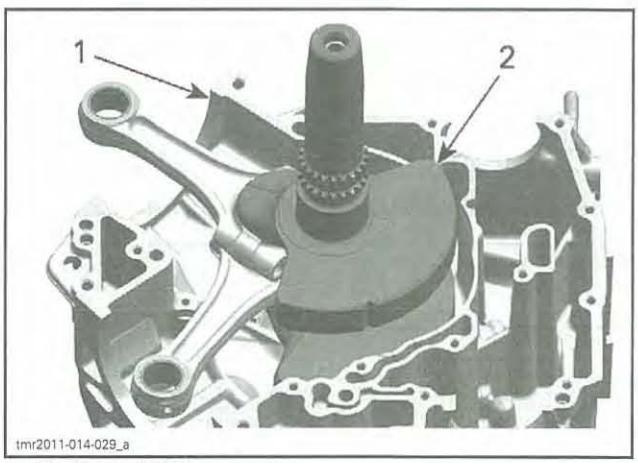
Reinstall water pump shaft shafts/gears (refer to *COOLING SYSTEM* section).

Tightening sequence for screws on crankcase is as per following illustration.



TIGHTENING SEQUENCE

CRANKSHAFT



1. *Crankcase MAG*
2. *Crankshaft*

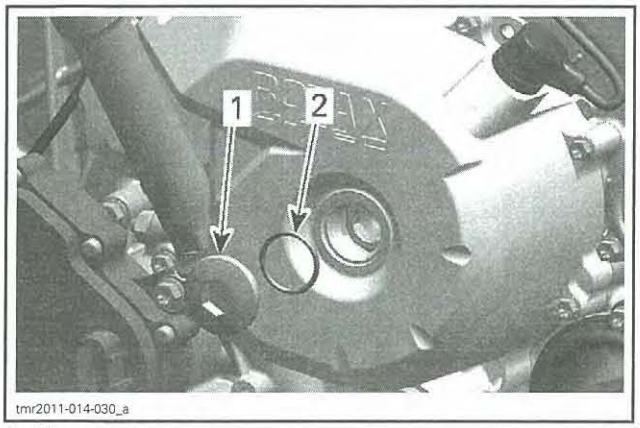
Crankshaft Locking Procedure

NOTE: When crankshaft is locked, the rear piston (cylinder 2, rear) is at TDC. Crankshaft can not be locked at cylinder 1 (front) TDC.

NOTICE To see if the rear piston (cylinder 2, rear) is at TDC ignition refer to *CAMSHAFT TIMING GEAR* in the *TIMING CHAIN* section.

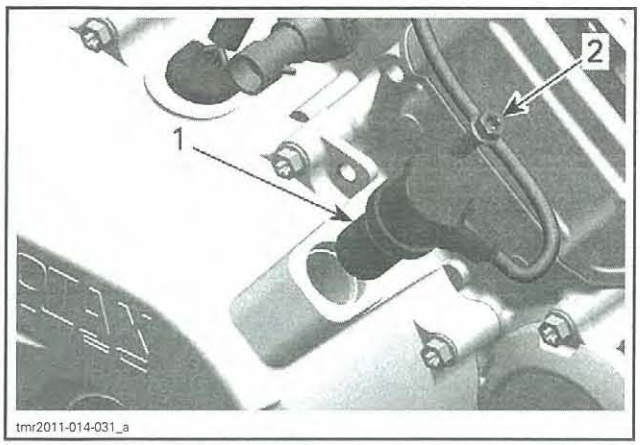
Remove:

1. spark plug cables and spark plugs of both cylinders
2. plug screw and O-ring of magneto cover



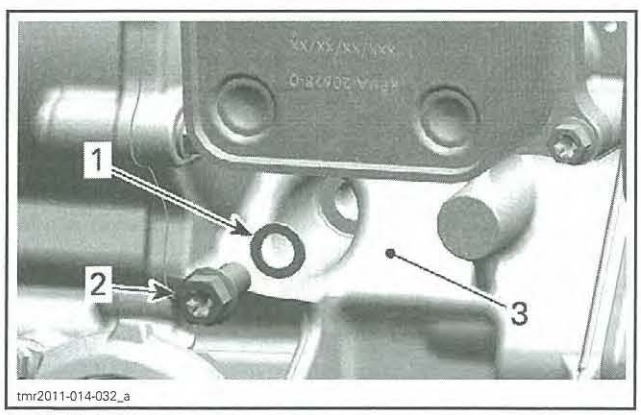
1. Plug screw
2. O-ring

3. crankshaft position sensor



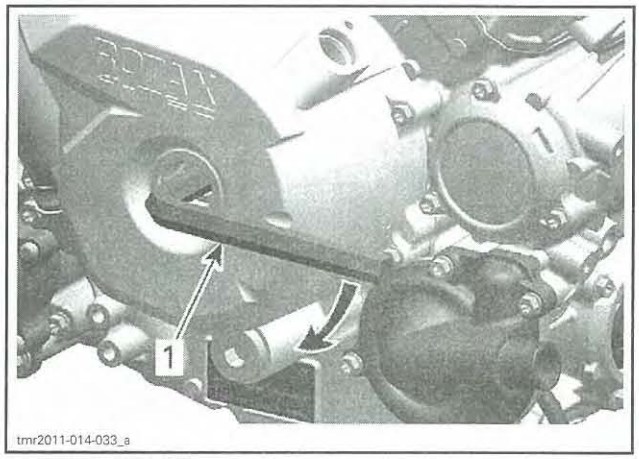
1. Crankshaft position sensor
2. Screw

4. plug screw with sealing ring.



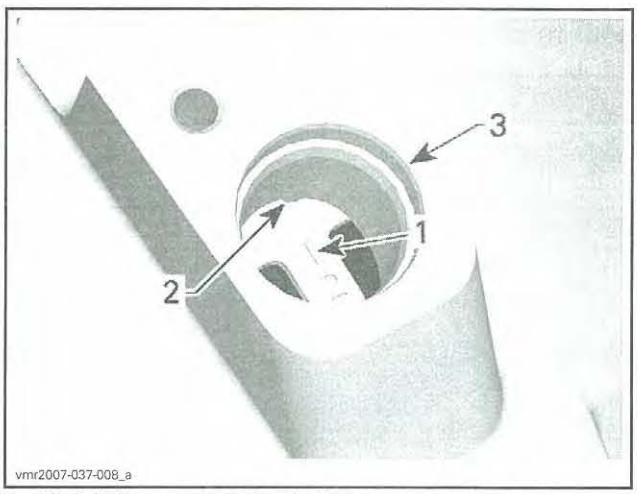
1. Sealing ring
2. Plug screw
3. Crankcase PTO side, front side

Use a 14 mm Allen key to turn crankshaft until piston 2, rear is at TDC.



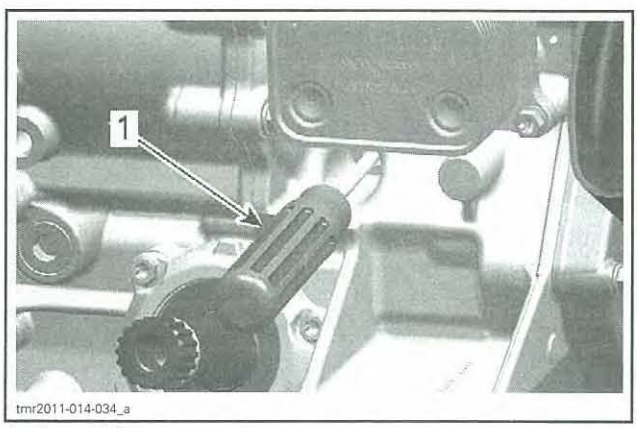
1. Allen key 14 mm

When rear piston is at TDC marks on magneto flywheel "2" and on the magneto cover are aligned.



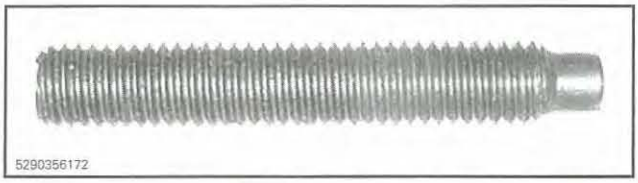
1. Mark "2" on magneto flywheel
2. Notch on magneto cover
3. Crankshaft position sensor location

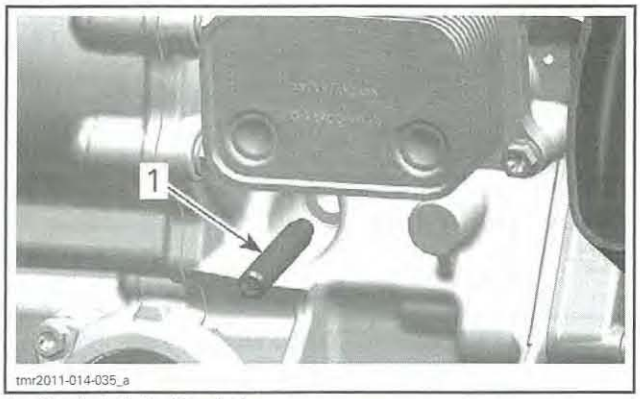
Use a screwdriver to check if the groove in the crankshaft is aligned with the hole.



1. Screwdriver

Lock crankshaft with CRANKSHAFT LOCKING BOLT (P/N 529 035 617).





1. Crankshaft locking bolt

Gradually insert the tool in the crankshaft groove. Make sure that the tool tip enters the groove and does not jam on the crankshaft balancer surface.

Crankshaft Removal

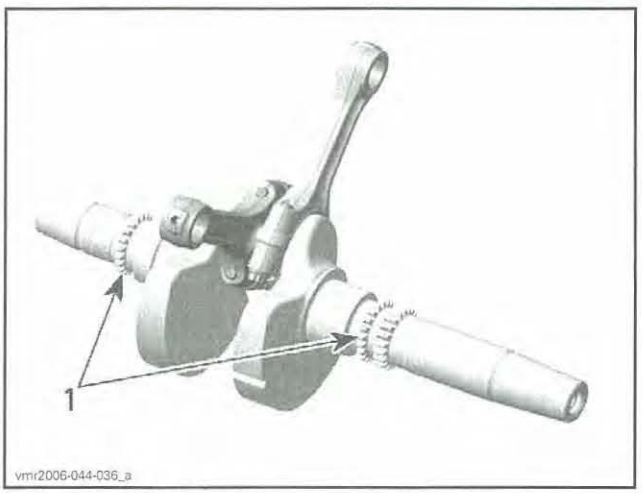
Refer to *CRANKCASE*.

Crankshaft Inspection

NOTE: Check each bearing journal of crankshaft for scoring, scuffing, cracks or other signs of wear.

NOTE: Replace crankshaft if the gears are worn or otherwise damaged.

NOTICE **Components out of specifications always have to be replaced. If this is not observed, severe damage may be caused to the engine.**



1. Crankshaft timing gears

Crankshaft Axial Play

NOTE: Axial play needs to be measured before splitting the crankcase.

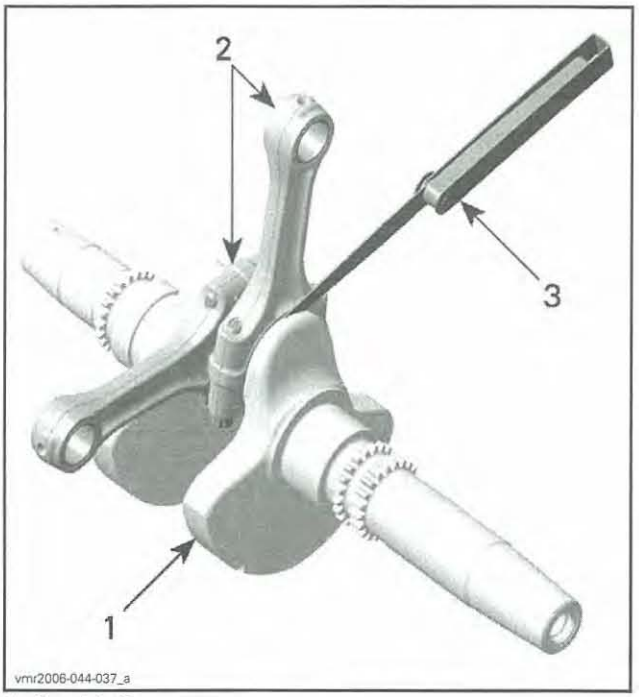
Measure play on PTO end, using a dial indicator.

CRANKSHAFT AXIAL PLAY	
NEW	0.200 mm to 0.500 mm (.008 in to .02 in)
SERVICE LIMIT	0.6 mm (.024 in)

If play is out of specification, replace crankcase and/or crankshaft.

Connecting Rod Big End Axial Play

Using a feeler gauge, measure distance between butting face of connecting rods and crankshaft counterweight. If the distance exceeds specified tolerance, replace the crankshaft.



1. Crankshaft
2. Connecting rods
3. Feeler gauge

CONNECTING ROD BIG END AXIAL PLAY	
800R Engine	
NEW	0.200 mm to 0.500 mm (.008 in to .02 in)
SERVICE LIMIT	0.6 mm (.024 in)
1000 Engine	
NEW	0.25 mm to 0.55 mm (.01 in to .022 in)
SERVICE LIMIT	0.6 mm (.024 in)

Connecting Rod/Piston Pin Clearance

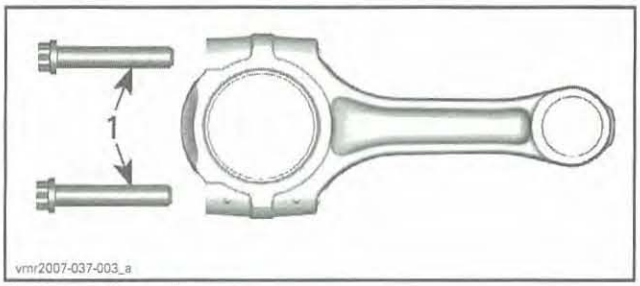
Refer to *TOP END* section.

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).

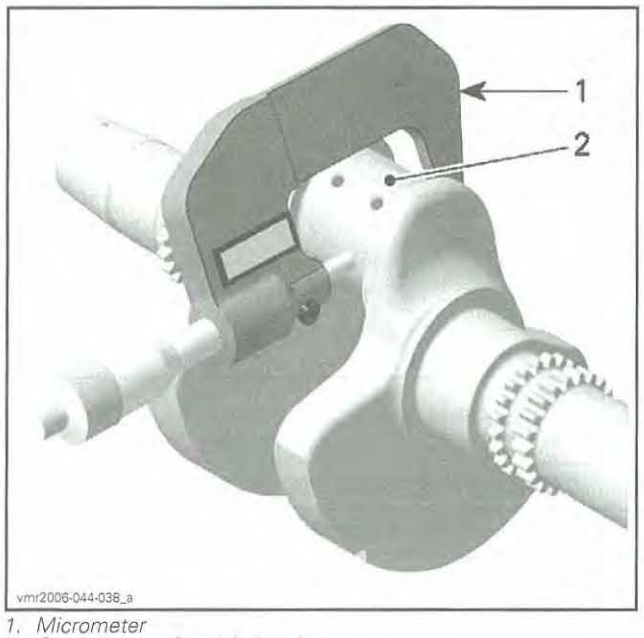
Remove connecting rods from crankshaft.

NOTICE Connecting rod screws are not reusable. Always discard screws and replace by new ones. It is recommended to install new plain bearings when reinstalling connecting rods.



1. Connecting rod screws

Measure crankpin. Compare to inside diameter of connecting rod big end.



1. Micrometer
2. Crankpin area for plain bearing

To measure the connecting rod big end diameter, use the OLD connecting rod screws.

Install the OLD plain bearings as they were mounted initially.

Carry out the tightening procedure described in *CRANKSHAFT ASSEMBLY* in this subsection.

A. Connecting rod big end plain bearing

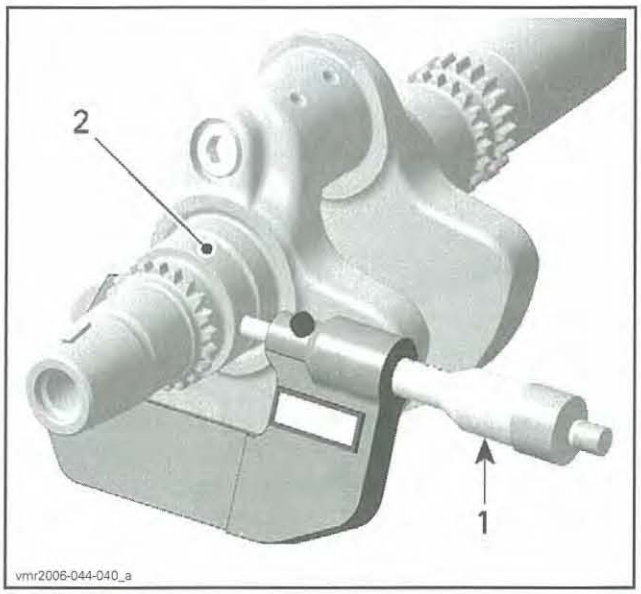
800R Engine	
CRANKSHAFT PIN DIAMETER	
NEW	40.009 mm to 40.025 mm (1.5752 in to 1.5758 in)
SERVICE LIMIT	39.990 mm (1.5744 in)
CONNECTING ROD BIG END DIAMETER	
SERVICE LIMIT	40.100 mm (1.5787 in)
CONNECTING ROD BIG END RADIAL CLEARANCE	
SERVICE LIMIT	0.09 mm (.0035 in)
1000 Engine	
CRANKSHAFT PIN DIAMETER	
NEW	41.986 mm to 42.010 mm (1.653 in to 1.6539 in)
SERVICE LIMIT	41.967 mm (1.6522 in)
CONNECTING ROD BIG END DIAMETER	
SERVICE LIMIT	42.100 mm (1.6575 in)
CONNECTING ROD BIG END RADIAL CLEARANCE	
SERVICE LIMIT	0.09 mm (.0035 in)

If crankshaft pin diameter is out of specification, replace crankshaft.

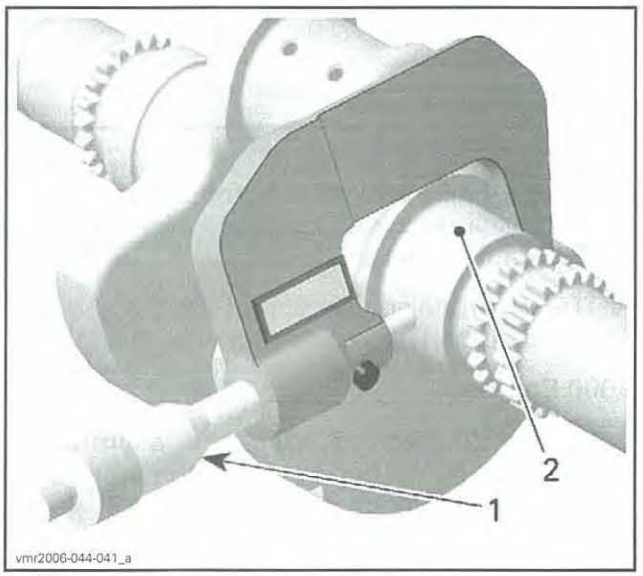
If connecting rod big end diameter or radial clearance is out of specification, replace plain bearings and recheck.

Crankshaft Radial Play MAG/PTO Side

Measure crankshaft on MAG/PTO side. Compare to inside diameter of MAG/PTO plain bearing (refer to *CRANKCASE*).



1. *Micrometer*
2. *Crankshaft area for MAG plain bearing*



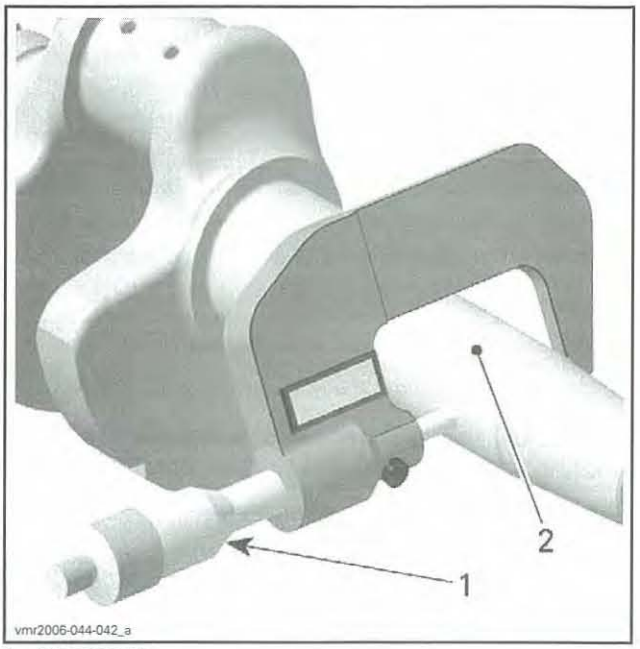
1. *Micrometer*
2. *Crankshaft area for PTO plain bearing*

CRANKSHAFT MAIN BEARING JOURNAL DIAMETER (MAG/PTO SIDE)	
NEW	42.016 mm to 42.040 mm (1.6542 in to 1.6551 in)
SERVICE LIMIT	42.000 mm (1.6535 in)

CRANKSHAFT RADIAL PLAY (MAG/PTO SIDE)	
SERVICE LIMIT	0.07 mm (.0028 in)

Crankshaft Radial Play (PTO Cover Bearing)

Measure crankshaft journal diameter (PTO cover bearing). Compare to plain bearing inside diameter (PTO cover). Refer to *PTO COVER* in this subsection.



1. *Micrometer*
2. *Crankshaft journal (PTO support bearing)*

CRANKSHAFT JOURNAL DIAMETER (PTO COVER BEARING)	
NEW	34.016 mm to 34.040 mm (1.339 in to 1.34 in)
SERVICE LIMIT	34.010 mm (1.339 in)

CRANKSHAFT RADIAL PLAY (PTO COVER BEARING)	
SERVICE LIMIT	0.10 mm (.0039 in)

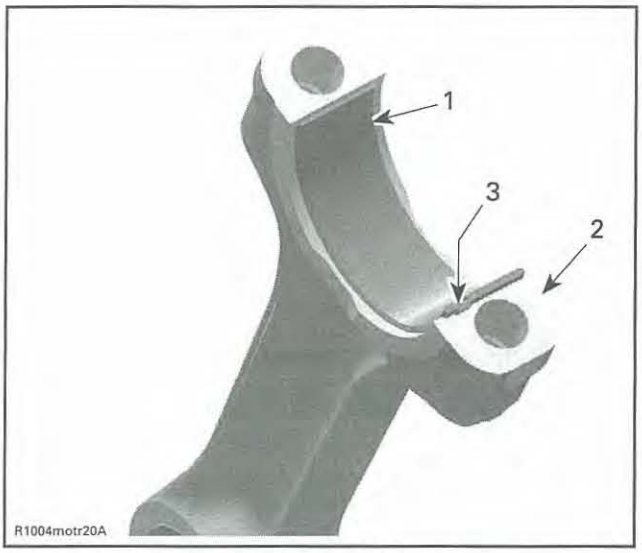
If crankshaft journal diameter is out of specification, replace crankshaft.

If crankshaft radial play (PTO cover bearing) out of specification, replace plain bearings and recheck.

Crankshaft Assembly

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

Put plain bearings correctly in place and clean the split surface on both sides (cracked area) carefully with compressed air.



1. Half plain bearing of connecting rod big end
2. Split surface of the connecting rod
3. Nose of plain bearing in line with connecting rod groove

NOTE: Oil the plain bearing surface of the connecting rod and crank pin before installation.

Oil NEW connecting rod screws.

Thread screws in the connecting rods, then tighten as per following procedure.

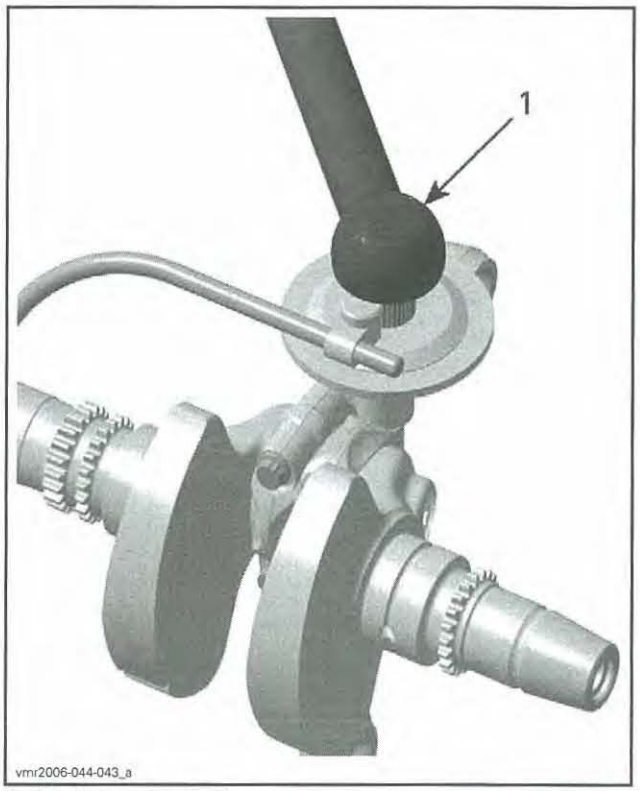
NOTICE Always use NEW connecting rod screws at final assembly. They are not reusable.

800R Engine:

Tighten screws in the following sequence:

CONNECTING RODS SCREWS TIGHTENING SEQUENCE	
1.	Tighten to 1/2 of specified torque
2.	Tighten to 20 N•m ± 2 N•m (15 lbf•ft ± 1 lbf•ft)
3.	Torque by an additional 60 ± 5° turn using an angle torque wrench

NOTE: Do not apply any thread locker.



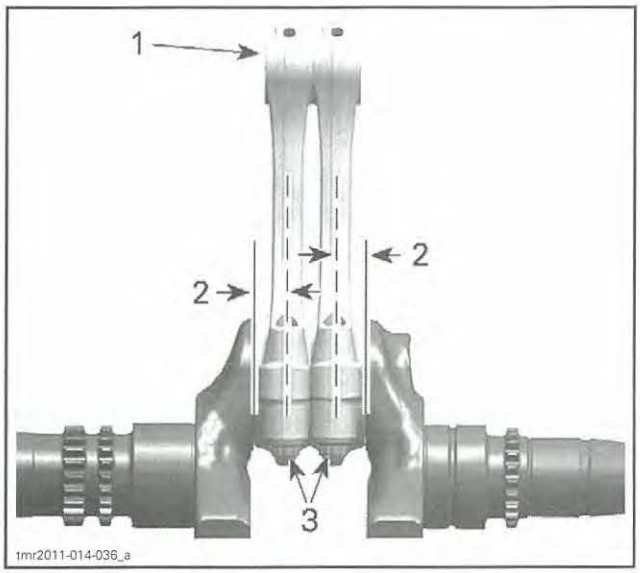
1. Angle torque wrench

NOTICE Failure to strictly follow this procedure may cause screw to loosen and lead to severe engine damage.

NOTE: The running direction of the big end bearings and of the piston pins must not change.

1000 Engine:

NOTICE Connecting rods are asymmetric. There must be no gap between the small ends when they face each other.

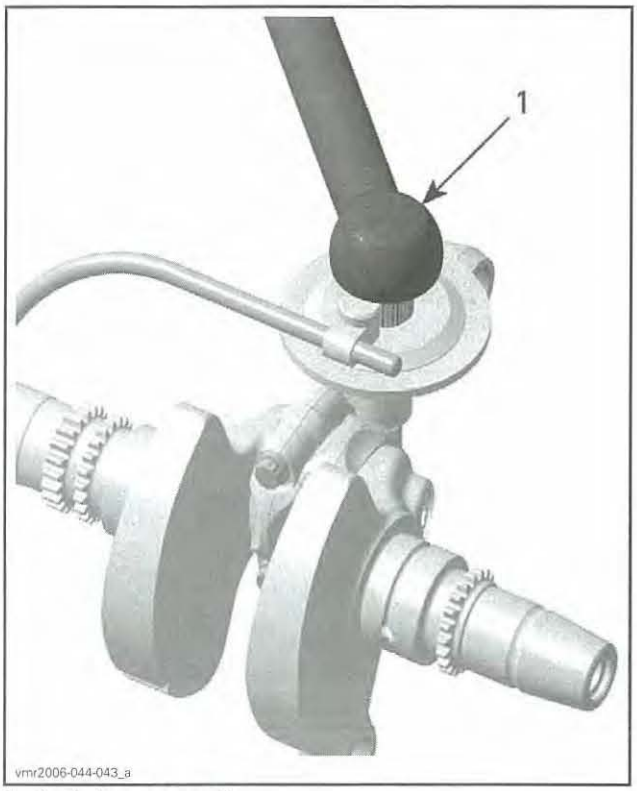


1. Connecting rod small ends
2. Connecting rod offset
3. Connecting rod screws

Tighten screws in the following sequence:

CONNECTING RODS SCREWS TIGHTENING SEQUENCE	
1.	Tighten to 1/2 of specified torque
2.	Tighten to 30 N•m ± 2 N•m (22 lbf•ft ± 1 lbf•ft)
3.	Torque by an additional 90 ± 5° turn using an angle torque wrench

NOTE: Do not apply any thread locker.



1. Angle torque wrench

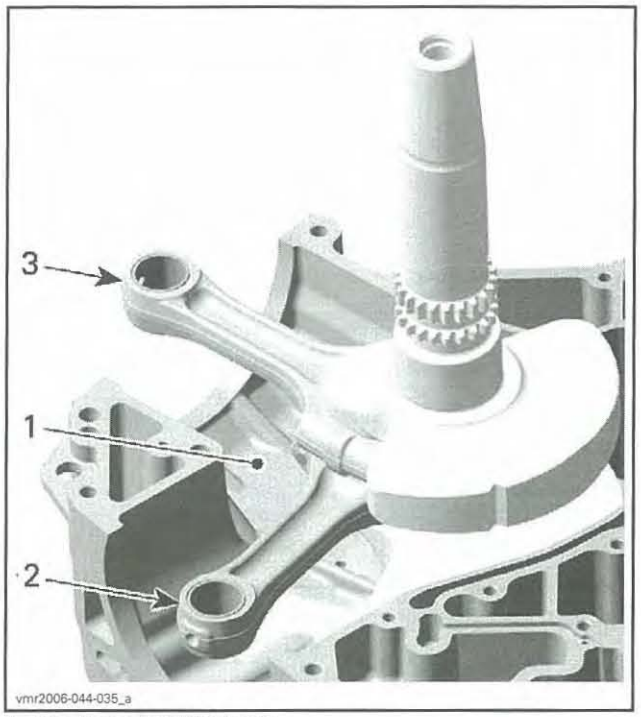
NOTICE Failure to strictly follow this procedure may cause screw to loosen and lead to severe engine damage.

Crankshaft Installation

For installation of crankshaft in crankcase reverse the removal procedure. Pay attention to the following details.

Do not mix up the connecting rods of cylinders 1 and 2 during installation.

NOTICE Observe the correct installation position when fitting the crankshaft with the connecting rods. The connecting rod MAG side has to face cylinder 1.



1. *Crankcase half MAG side*
2. *Connecting rod cylinder 1*
3. *Connecting rod cylinder 2*

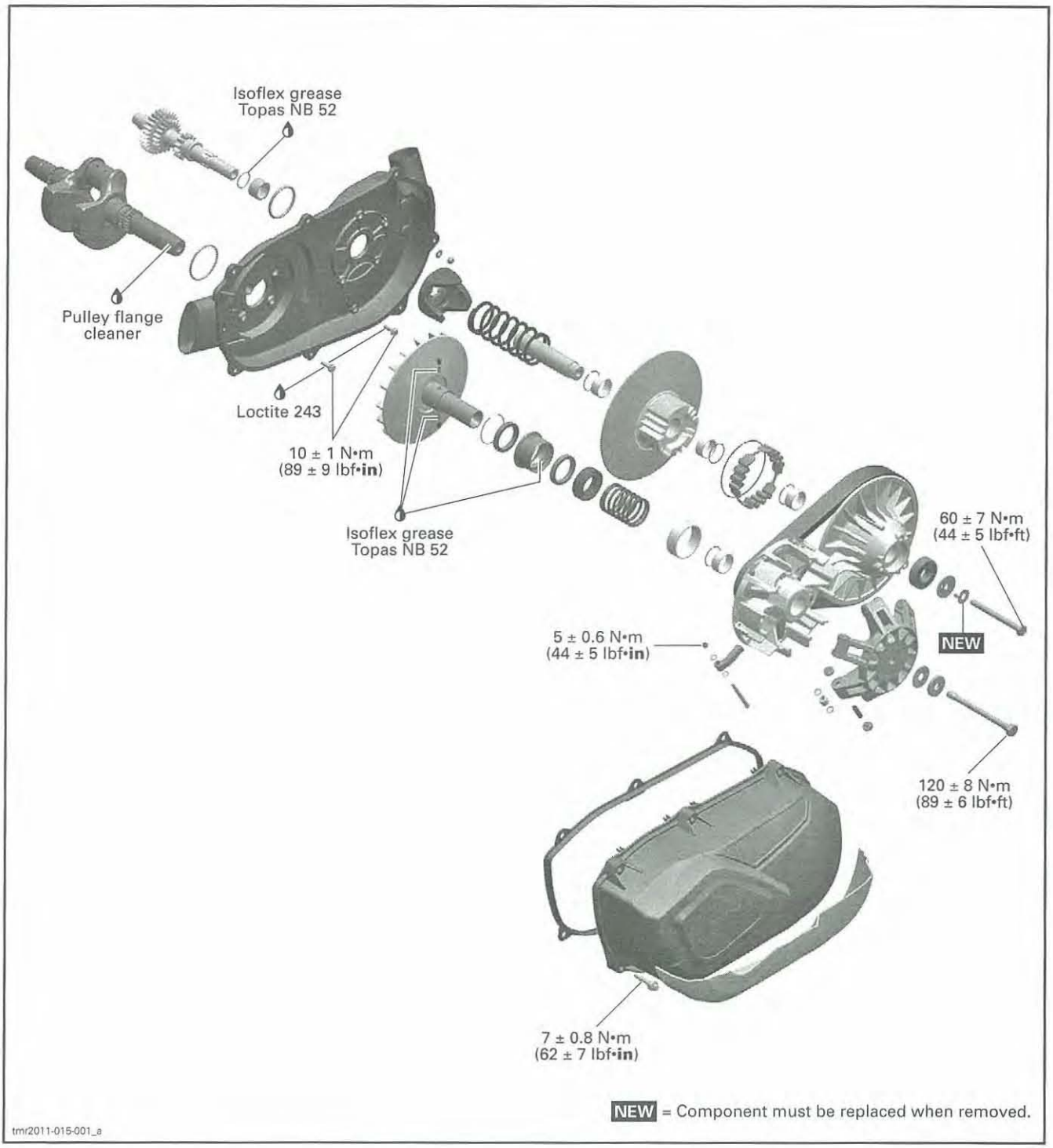
CONTINUOUSLY VARIABLE TRANSMISSION (CVT)

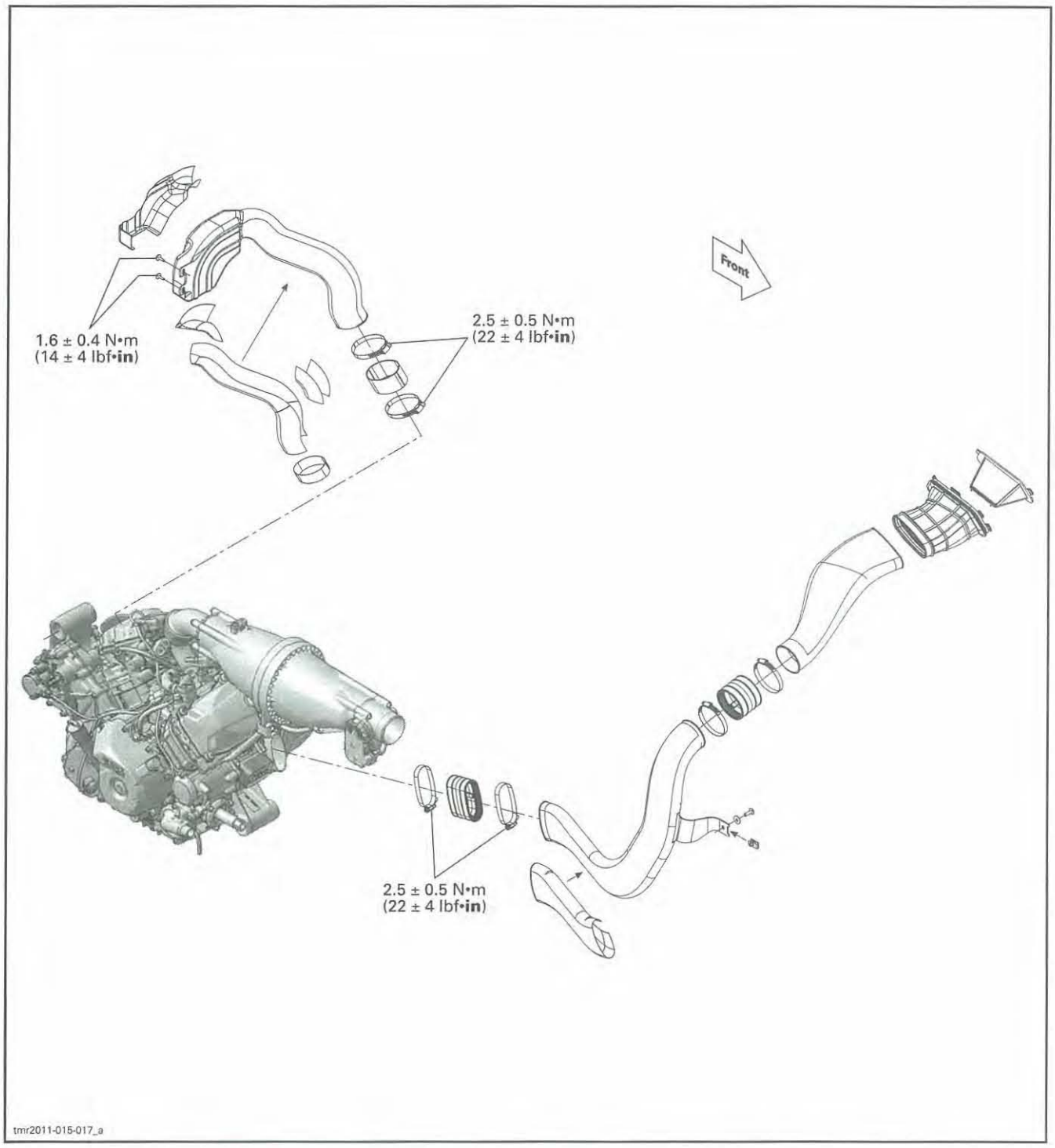
SERVICE TOOLS

Description	Part Number	Page
CLUTCH PULLER	529 035 746	159
DRIVE PULLEY HOLDER (CVT)	529 006 400	158
DRIVEN CLUTCH HOLDER	529 035 771	166
GEAR LOCK PIN	529 035 747	157

SERVICE PRODUCTS

Description	Part Number	Page
ISOFLEX GREASE TOPAS NB 52	293 550 021	164
PULLEY FLANGE CLEANER	413 711 809	161, 168


Isoflex grease
Topas NB 52
Pulley flange
cleaner
Loctite 243
10 ± 1 N•m
(89 ± 9 lbf•in)
Isoflex grease
Topas NB 52
60 ± 7 N•m
(44 ± 5 lbf•ft)
NEW
5 ± 0.6 N•m
(44 ± 5 lbf•in)
120 ± 8 N•m
(89 ± 6 lbf•ft)
7 ± 0.8 N•m
(62 ± 7 lbf•in)
NEW = Component must be replaced when removed.
tmr2011-015-001_a


1.6 ± 0.4 N•m
(14 ± 4 lbf•in)
2.5 ± 0.5 N•m
(22 ± 4 lbf•in)
Front
2.5 ± 0.5 N•m
(22 ± 4 lbf•in)
tmr2011-015-017_a

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.

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 must be replaced (e.g.: locking tabs, elastic stop nuts, cotter pin, etc.).

⚠ 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.

NOTICE 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.

NOTICE These pulleys have metric threads. Do not use SAE threads puller. Always tighten puller by hand to ensure that the drive pulley has the same type of threads (metric vs SAE) prior to fully tightening.

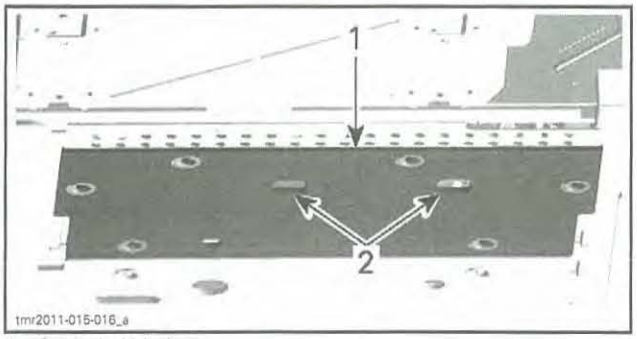
PROCEDURES

CVT COVER

CVT Cover Access

1. Refer to *BODY* and remove:
   - LH seat
   - LH lateral console panel.
2. Remove under seat storage compartment.

NOTE: The CVT cover lower screws are accessible through the square holes in the central skid plate.

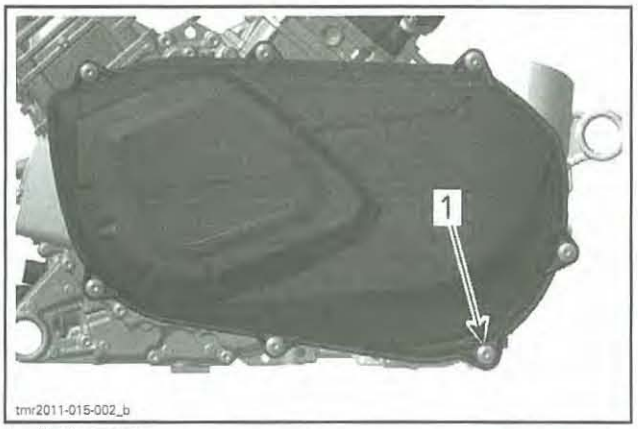


1. Central skid plate
2. Access holes

CVT Cover Draining

If water is present in CVT cover, it can be drained as follows:

1. Remove drain screw.



1. Drain screw

2. Let water drain from CVT cover.
3. Reinstall drain screw.

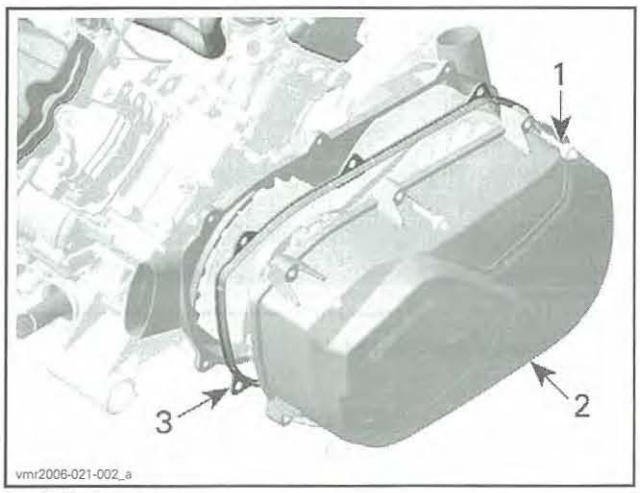
NOTICE If any debris entered the CVT cover, CVT must be cleaned and inspected.

CVT Cover Removal

Remove CVT cover screws.

NOTE: Remove the center top screw last. This screw allows to support the cover during removal.

Remove the CVT cover and its gasket.

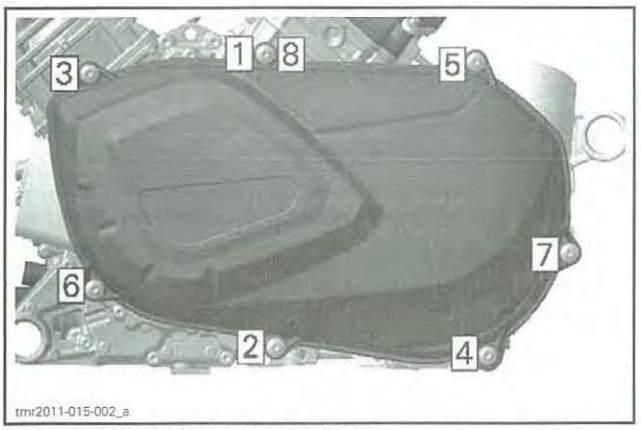


1. CVT cover screw
2. CVT cover
3. Gasket

CVT Cover Installation

Install the center top screw of first.

Tighten the CVT cover screws as per following sequence.



CVT COVER TIGHTENING SEQUENCE

CVT COVER SCREWS TIGHTENING TORQUE
7 N•m ± 0.8 N•m (62 lbf•**in** ± 7 lbf•**in**)

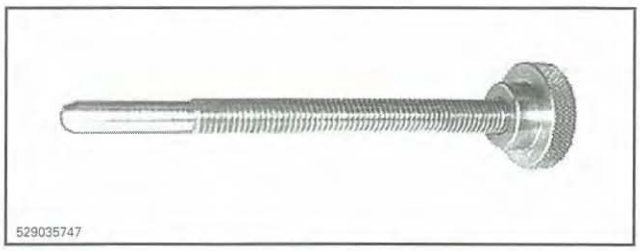
DRIVE BELT

Drive Belt Removal

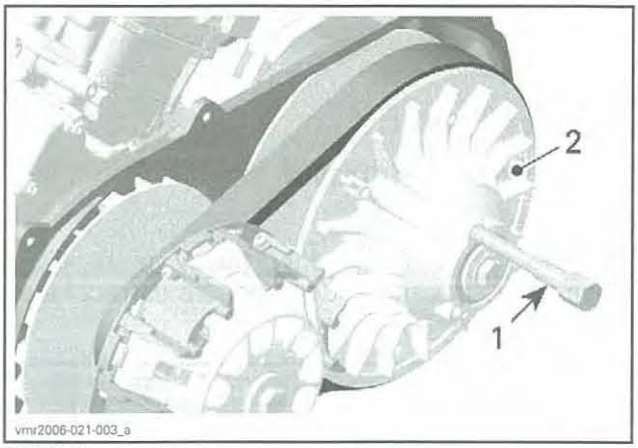
NOTICE In case of a drive belt failure, the CVT, cover and air outlet must be cleaned.

Remove *CVT COVER*.

Open driven pulley with the GEAR LOCK PIN (P/N 529 035 747).

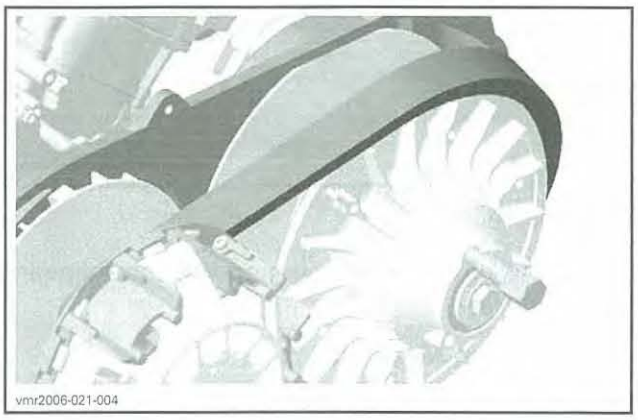


Screw tool in the threaded hole of driven pulley and tighten to open the pulley.



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

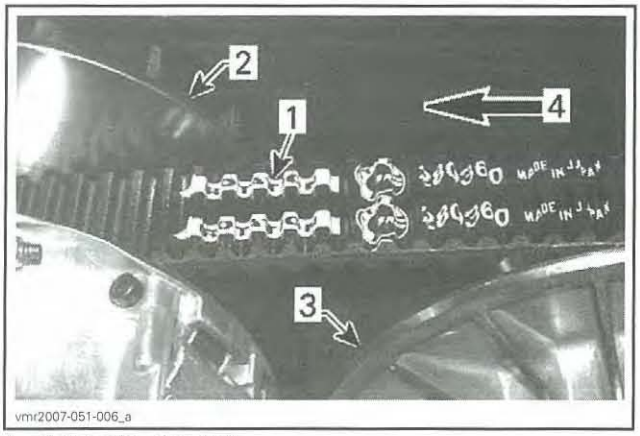
To remove belt, slip the belt over the top edge of fixed sheave, as shown.



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 front of the vehicle, viewed from top.



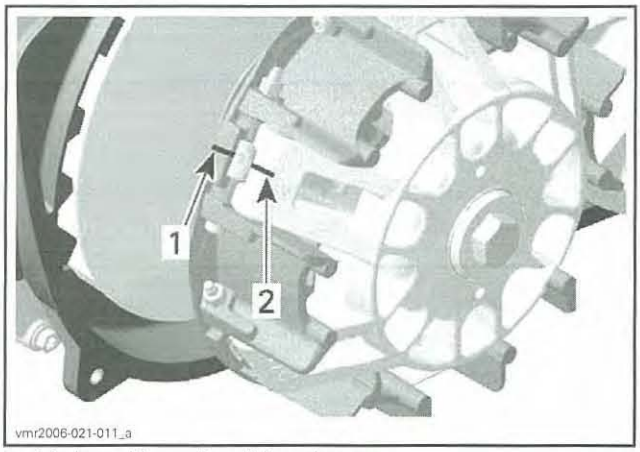
1. *Arrow printed on belt*
2. *Drive pulley (front)*
3. *Driven pulley (rear)*
4. *Rotation direction*

DRIVE PULLEY

Drive Pulley Removal

Remove *DRIVE BELT*.

Prior to removing the drive pulley, mark sliding sheave and governor cup to ensure correct indexation at reinstallation.



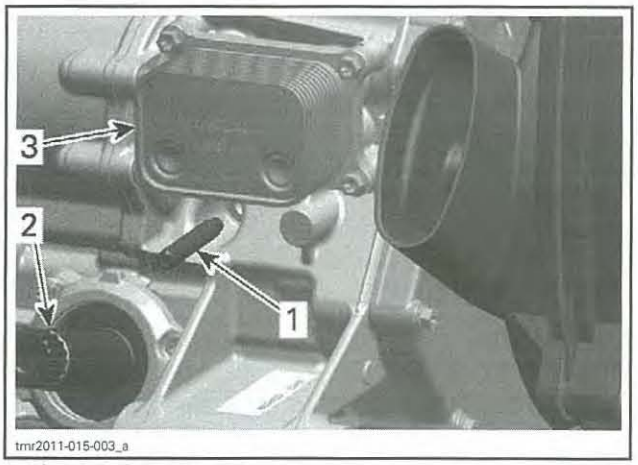
1. *Mark on drive pulley sliding sheave*
2. *Mark on governor cup*

Block the drive pulley using one of the following methods:

First Locking Method:

Remove spark plugs.

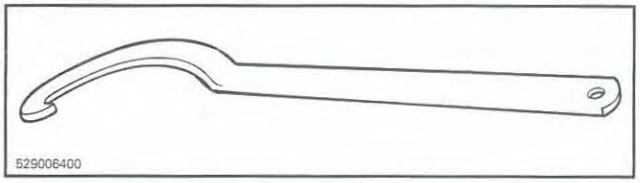
Lock crankshaft at TDC position. Refer to *BOTTOM END* section.

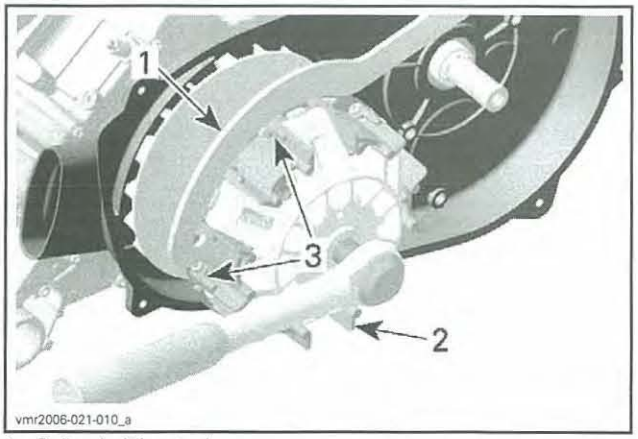


1. *Crankshaft locking bolt*
2. *Engine drive shaft (front side)*
3. *Oil cooler*

Second Locking Method:

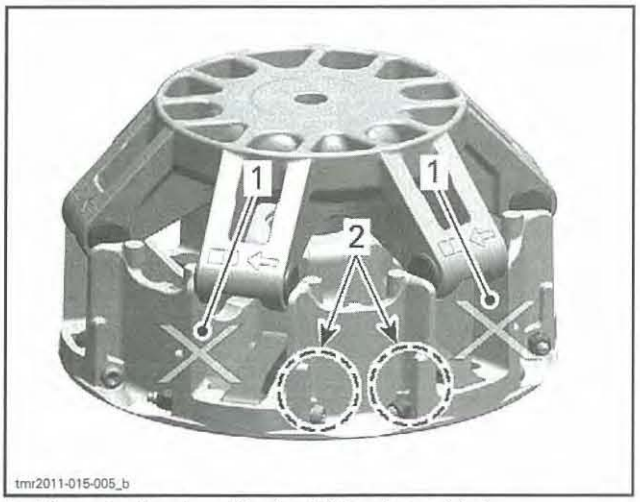
Block drive pulley with the DRIVE PULLEY HOLDER (CVT) (P/N 529 006 400).





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

NOTICE Do not lean the tool hook on the slider shoe guides.



1. Wrong tool hook positioning (slider shoe guides)
2. Correct tool hook positioning (outside slider shoe guides)

Drive Pulley Removal Continuation

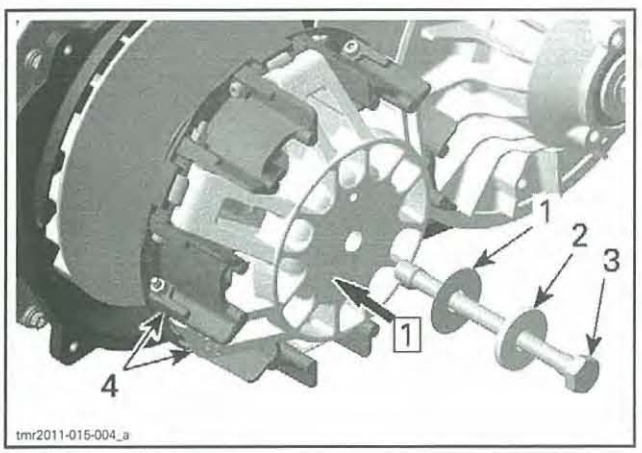
Loosen the drive pulley screw.

NOTE: Do not unscrew the drive pulley screw completely. If governor cup is stuck, hit it using a soft hammer.

Apply axial pressure with your hand on the sliding sheave and governor cup.

Remove drive pulley screw with its conical spring washer and thrust washer.

⚠ CAUTION Sliding sheave of drive pulley is spring loaded.

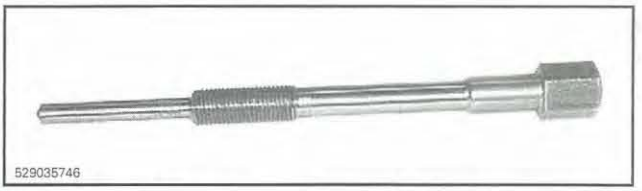


1. Thrust washer
2. Conical spring washer
3. Drive pulley screw
4. Sliding sheave with governor cup

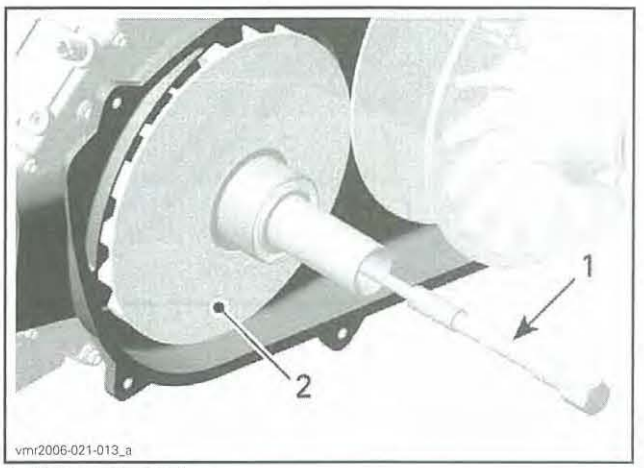
Step 1: Push

Slowly release and remove sliding sheave.

Screw CLUTCH PULLER (P/N 529 035 746) in fixed sheave to remove fixed pulley.



NOTICE Make sure to use the specified tool. Using another tool will damage the crankshaft threads.

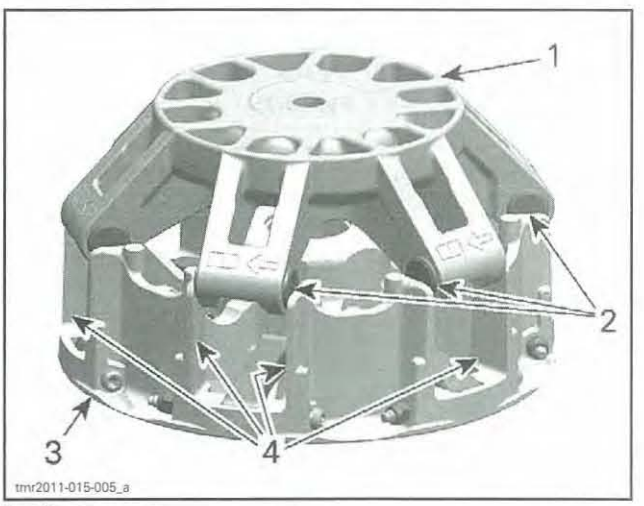


1. Drive pulley puller
2. Fixed sheave

Drive Pulley Disassembly

Governor Cup

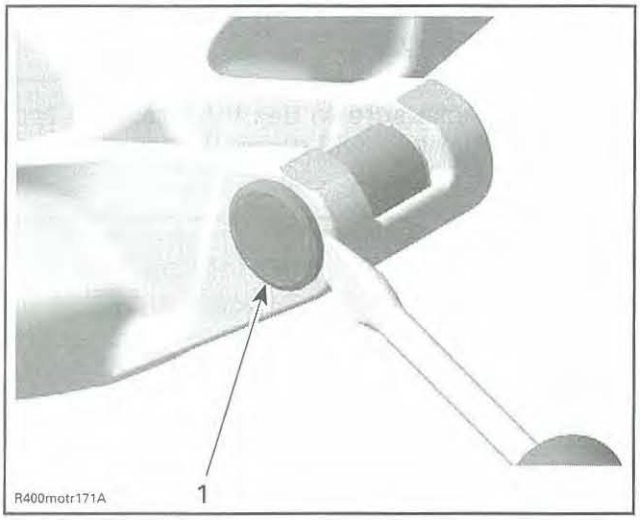
Carefully lift governor cup until slider shoes come at their highest position into guides.



1. Governor cup
2. Slider shoes
3. Sliding shave
4. Guides

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

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



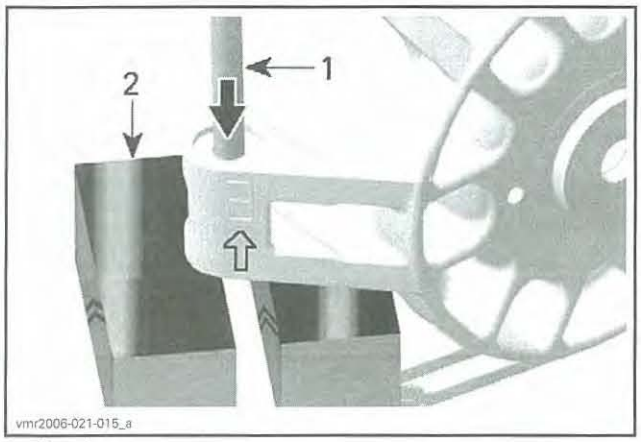
1. Slider shoe

Put governor cup on a vice to push out bearing sleeve of roller in the foreseen direction (against arrow). Use an appropriate punch (diameter of punch must be smaller than the bearing sleeve diameter).

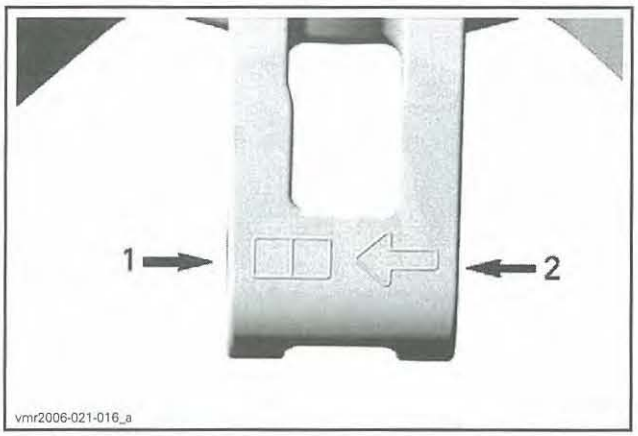
NOTICE Do not clamp the governor cup in the vice to push out bearing sleeve. Governor cup will be damaged.

NOTE: Use protection plates to avoid marks and/or damages to the governor cup.

NOTICE Always replace all rollers at the same time. Partly worn rollers may cause damage to the CVT system.

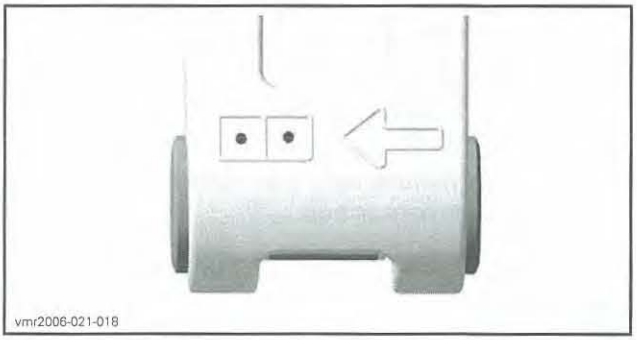


1. Punch
2. Vice



1. Removal direction
2. Assembly direction

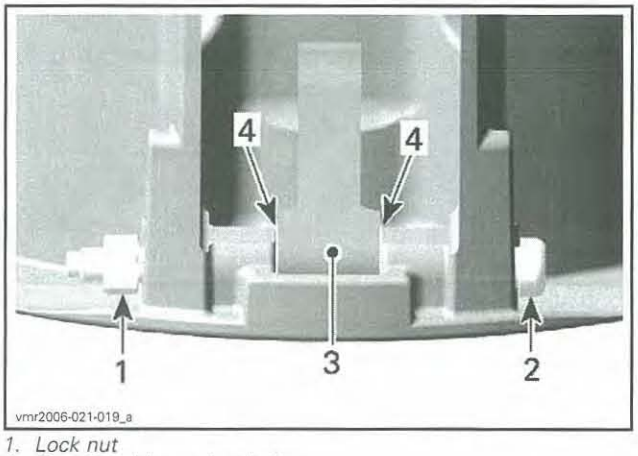
NOTE: Whenever removing a governor cup with already two marked boxes replace it by a new one.



Sliding Sheave

Unscrew lock nut and remove centrifugal lever pivot bolt. This drive pulley is equipped with 6 levers.

Remove centrifugal lever and both thrust washers.



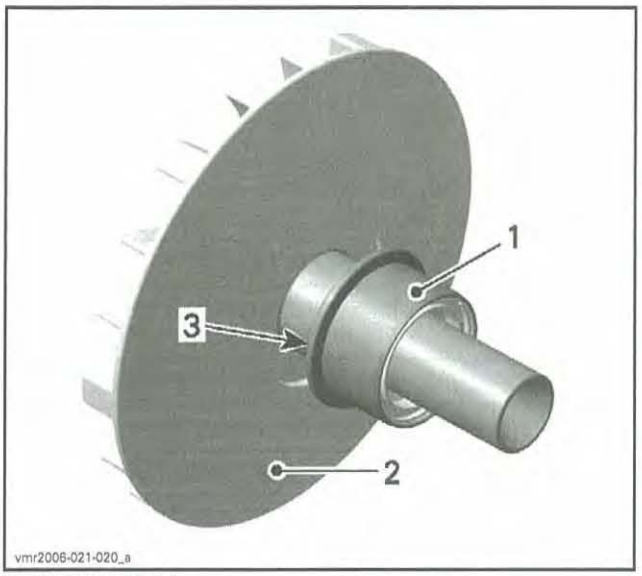
1. Lock nut
2. Centrifugal lever pivot bolt
3. Centrifugal lever
4. Thrust washers

Fixed Sheave

⚠ WARNING

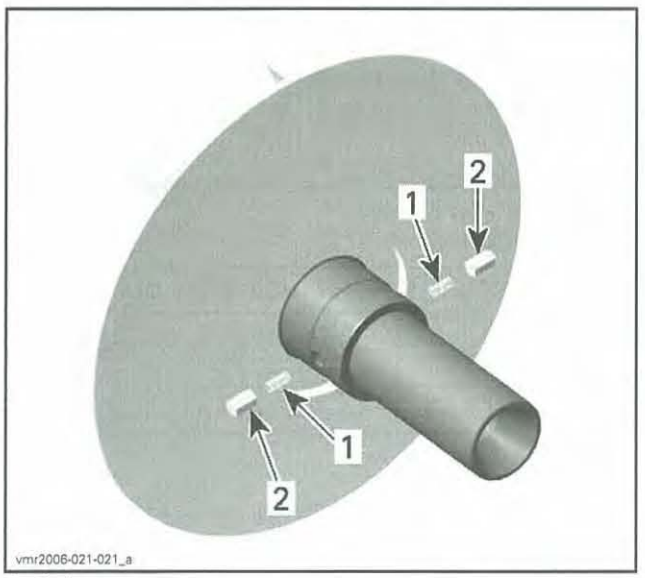
Always wear safety glasses to remove spring sleeves.

Pull and rotate one-way clutch slowly until the sheave of spring sleeves are visible.



1. *One-way clutch*
2. *Fixed sheave*
3. *Spring sleeve area*

Hold both spring sleeves with fingers and release when one-way clutch is disengaged.



1. *Springs*
2. *Spring sleeves*

Drive Pulley Cleaning

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

Using a paper towel with PULLEY FLANGE CLEANER (P/N 413 711 809) cleaning solvent, clean crankshaft tapered end and the taper inside the fixed sheave of the drive pulley, crankshaft threads and threads of drive pulley screw.

NOTICE **Avoid contact between cleaner and crankshaft seal because damage may occur.**

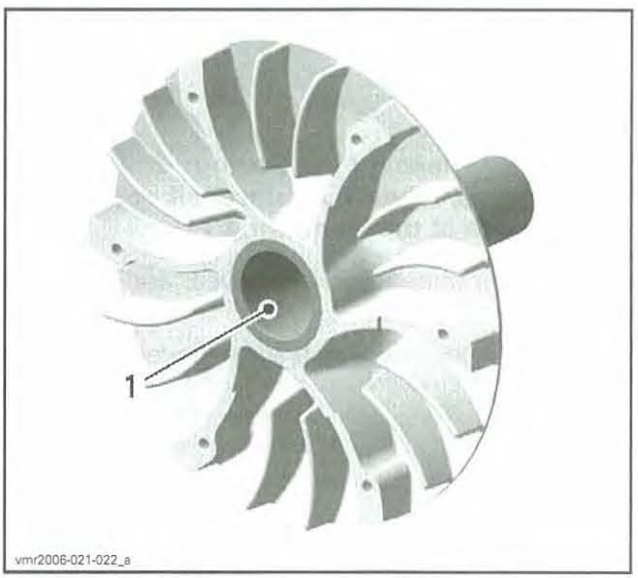
Remove all hardened oil deposits that have baked on crankshaft and pulley tapered surfaces with coarse or medium steel wool and/or sand paper no. 600.

NOTICE **Do not use any other type of abrasive.**

Reclean mounting surfaces with paper towel and PULLEY FLANGE CLEANER (P/N 413 711 809).

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

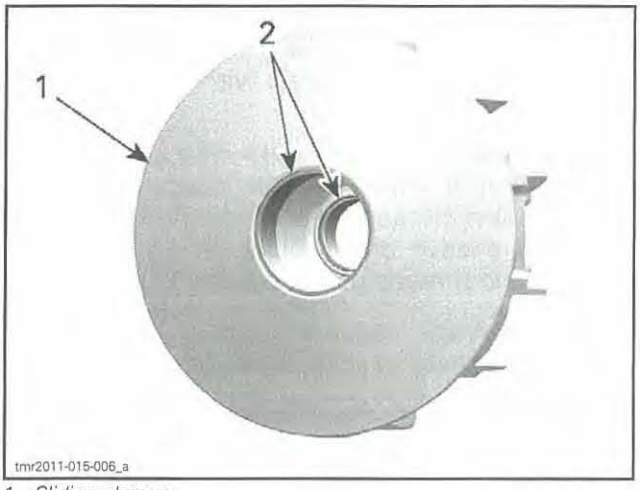
NOTICE **Mounting surfaces must be free of any oil, cleaner or towel residue.**



1. *Taper of fixed sheave*

Only use petrol base cleaner when cleaning bushings of sliding sheave.

NOTICE **Do not use acetone to clean bushing.**



1. Sliding sheave
2. Bushings

Drive Pulley Inspection

Bushings

For bushing inspection, refer to *SLIDING SHEAVE* in this subsection.

Governor Cup

Check governor cup for cracks or other visible damage. Replace if necessary.

Roller and Slider Shoe

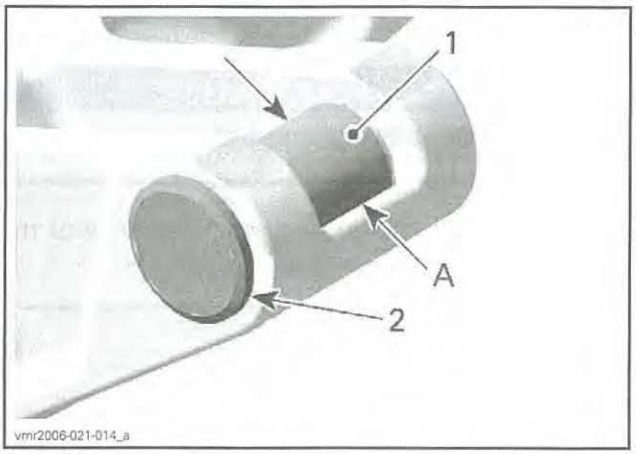
Check each roller for roundness of external diameter.

Check if rollers move freely.

NOTICE **Whenever replacing rollers and slider shoes, always replace all rollers and slider shoes at the same time.**

Check slider shoes for visible wear and replace if damaged.

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

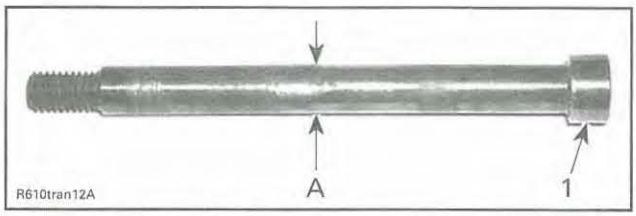


1. Roller
2. Slider shoe
A. Roller outer diameter

ROLLER OUTER DIAMETER	
NEW	13.70 mm to 13.80 mm (.539 in to .543 in)
SERVICE LIMIT	13.20 mm (.519 in)
ROLLER INNER DIAMETER	
NEW	8.05 to 8.15 mm (.317 to .321 in)
SERVICE LIMIT	9 mm (.354 in)

Centrifugal Lever Pivot Bolt

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

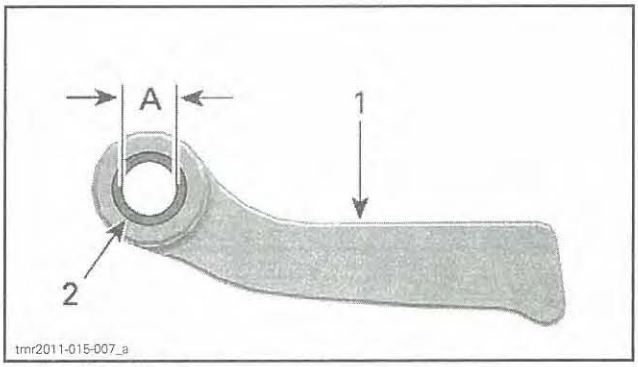


1. Centrifugal lever pivot bolt
A. Measure diameter here

CENTRIFUGAL LEVER PIVOT BOLT DIAMETER	
NOMINAL	6.078 mm to 6.100 mm (.239 in to .24 in)
SERVICE LIMIT	6.00 mm (.236 in)

Centrifugal Lever

Check bushing diameter in the centrifugal lever for wear. Replace centrifugal lever if necessary.

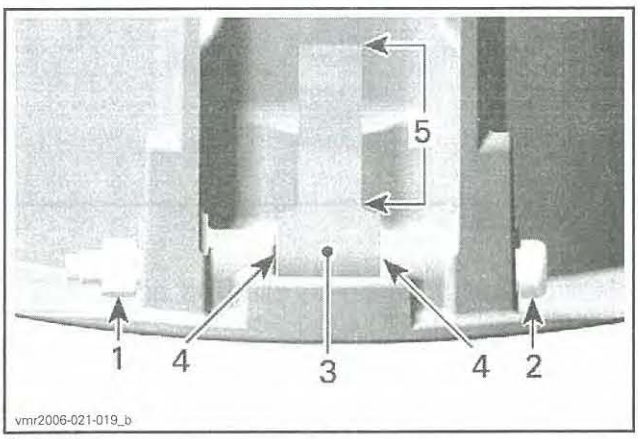


1. *Centrifugal lever*
2. *Bushing*

A. Bushing inner diameter

CENTRIFUGAL LEVER BORE DIAMETER	
NOMINAL	6.035 mm to 6.078 mm (.238 in 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*

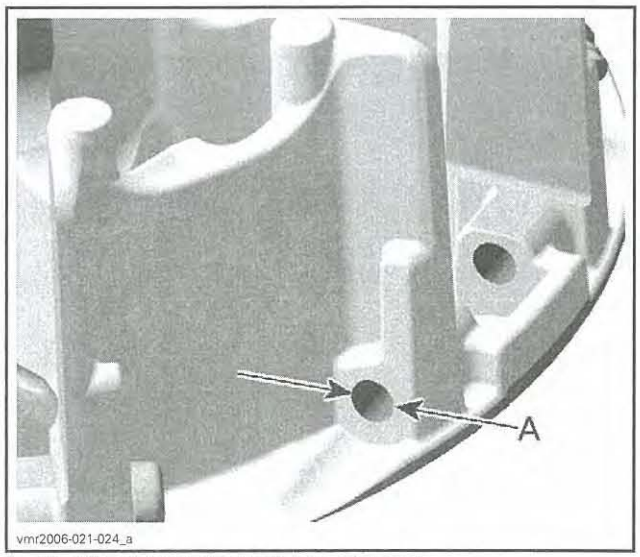
⚠ WARNING

Whenever replacing centrifugal levers, always replace all lever at the same time. Otherwise, unbalanced drive pulley will occur because of levers difference.

Sliding Sheave

Check sliding sheave for cracks and sliding contact surface for excessive wear. Replace sliding sheave if necessary.

Measure centrifugal lever pivot bolt bores. Replace sliding sheave if bores are out of specification or otherwise damaged.

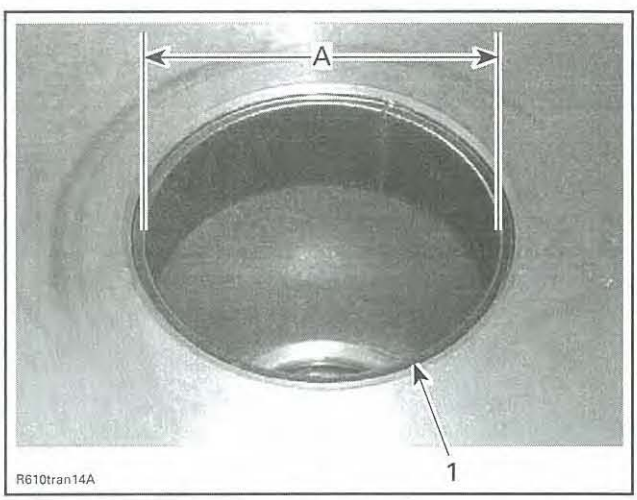


A. Centrifugal lever pivot bolt bore diameter

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

Measure bushing diameters of sliding sheave.

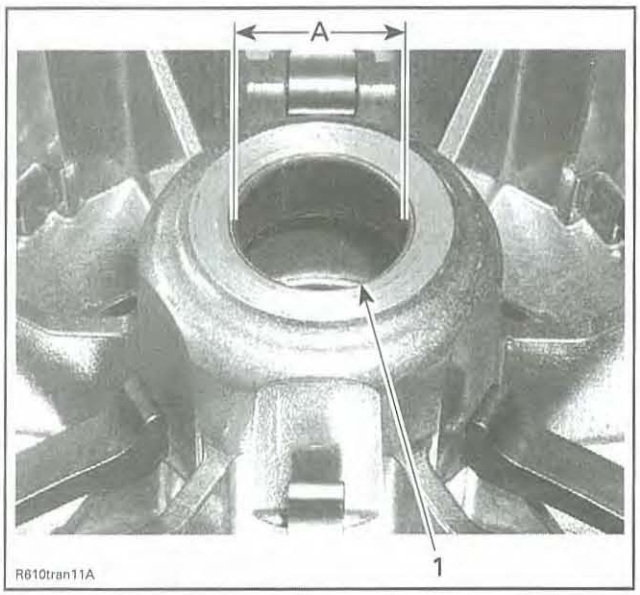
Use a dial bore gauge to measure bushing diameter. Measuring point must be at least 5 mm (1/4 in) from bushing edge.



1. *Bushing on fixed sheave side*

A. Bore diameter of bushing

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



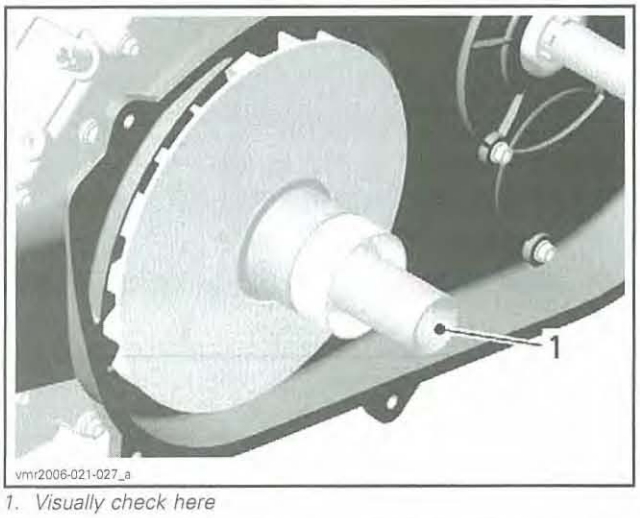
1. Bushing on governor cup side
A. Bore diameter of bushing

SLIDING SHEAVE SMALL BUSHING	
NOMINAL	32.000 mm to 32.040 mm (1.26 in to 1.261 in)
SERVICE LIMIT	32.200 mm (1.268 in)

Replace sliding sheave if one of the bushings is out of specification. Visually inspect coatings.

Fixed Sheave

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



1. Visually check here

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

Spring

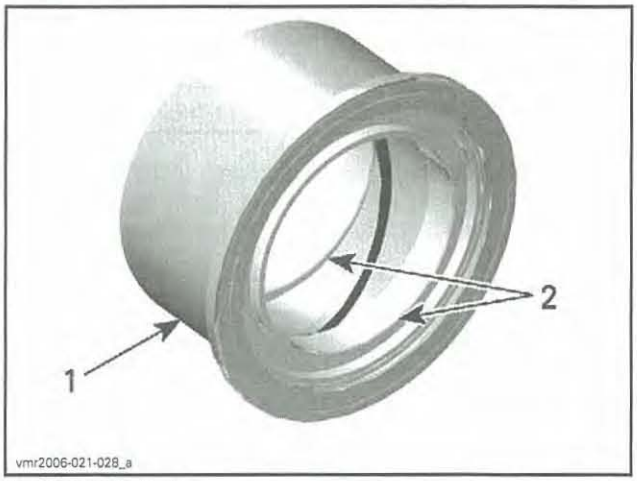
Measure spring free length and squareness. If spring is out of specification, replace by a new one.

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

One-Way Clutch

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

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



1. One-way clutch
2. Bearings

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

SPRING SLEEVE LENGTH	
NOMINAL	9.2 mm to 9.4 mm (.362 in to .37 in)
SERVICE LIMIT	9 mm (.354 in)

Drive Pulley Assembly

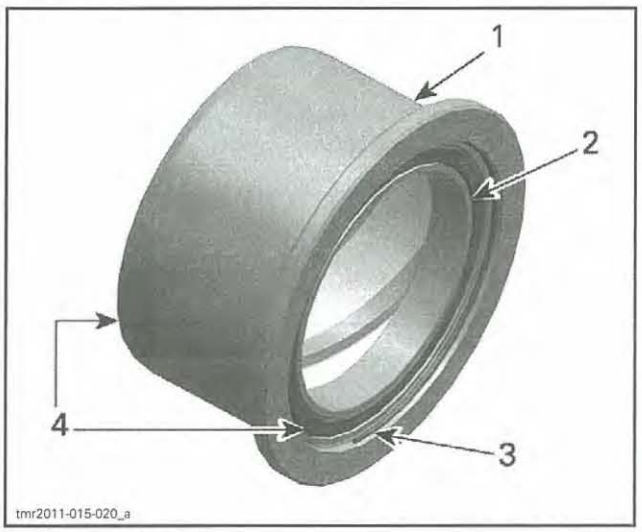
For assembly, reverse the disassembly procedure. Pay attention to following details.

One-Way Clutch

Clean parts.

Lubricate springs, spring sleeves and between one way clutch bearings using ISOFLEX GREASE TOPAS NB 52 (P/N 293 550 021). Push grease inside bearings to ensure adequate lubrication.

NOTE: Ball bearings have a seal on one side only. Install bearings with the seal towards the outside of the one-way clutch.



1. *One-way clutch*
2. *Bearing*
3. *Retaining ring*
4. *Seal*

Sliding Sheave

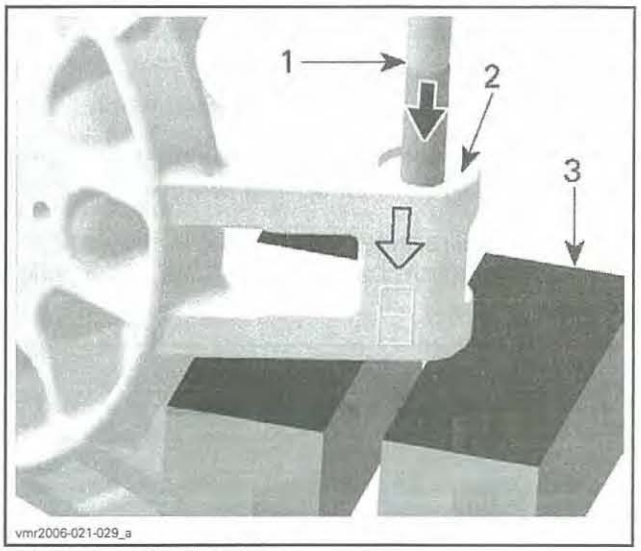
Install centrifugal levers with their thrust washers.

NOTICE **Centrifugal levers must move easily after installation.**

Governor Cup

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

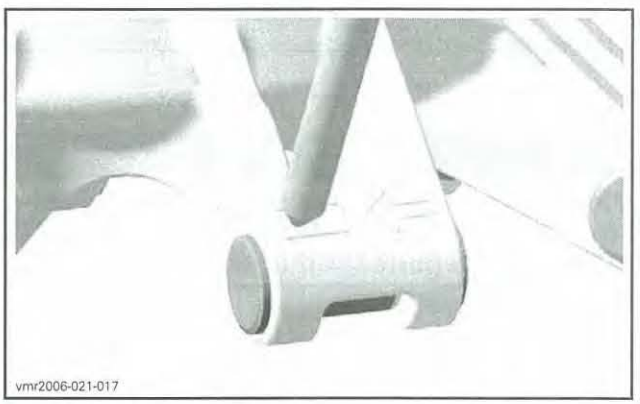
NOTICE **Final position has to be aligned with the contact surface of the slider shoes (no protrusion).**



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

Each time when replacing the bearing sleeves sign the foreseen box with a punch.

NOTICE **Do not tap too hard. Violent damage of the governor cup may appear.**



NOTICE **Rollers must move easily after installation.**

Insert slider shoes into governor cup to properly slide in guides.

Drive Pulley Installation

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

⚠ WARNING

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

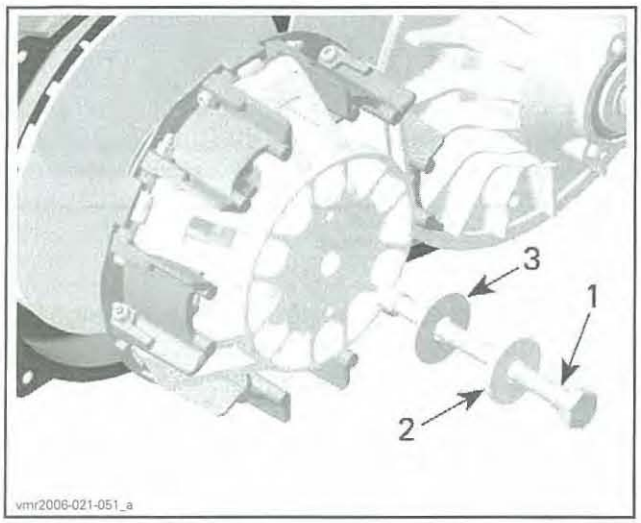
NOTICE **Never use any type of impact wrench at drive pulley removal and installation.**

Clean mounting surfaces as described in *CLEANING* above.

Install drive pulley on crankshaft extension.

NOTICE **Do not forget to place thrust washer prior to install conical spring washer.**

Install conical spring washer with its concave side towards drive pulley then install drive pulley screw.



1. *Drive pulley screw*
2. *Conical spring washer*
3. *Thrust washer*

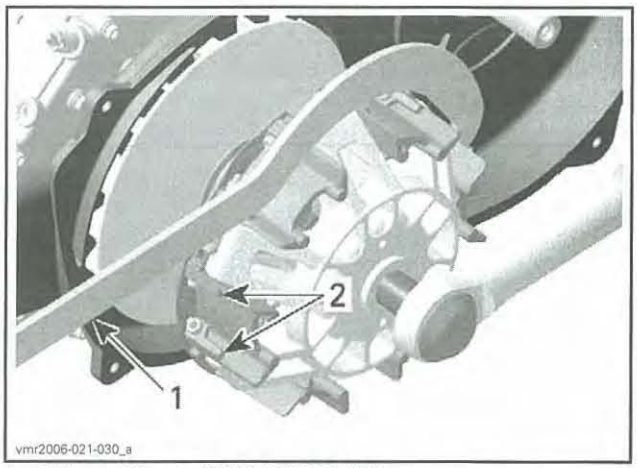
⚠ WARNING

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

To tighten the drive pulley screw, lock the drive pulley. Refer to the *DRIVE PULLEY REMOVAL* in this subsection for locking procedures.

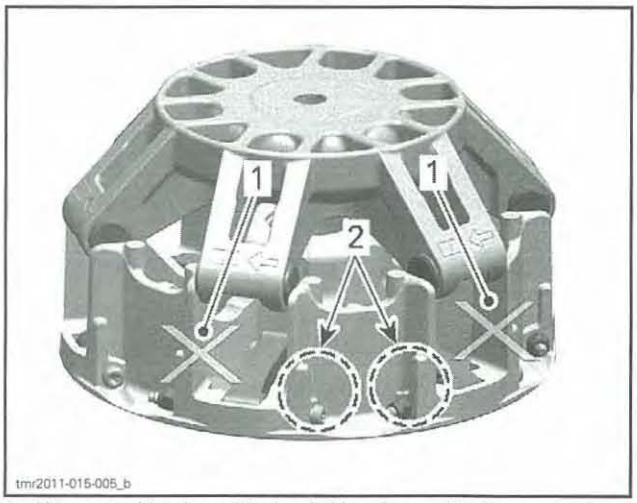
Tighten drive pulley screw to specified torque.

DRIVE PULLEY SCREW TIGHTENING TORQUE
120 N•m ± 8 N•m (89 lbf•ft ± 6 lbf•ft)



1. *Pulley holding tool (P/N 529 006 400)*
2. *Drive pulley removal/installation area*

NOTICE **Do not lean the tool hook on the slider shoe guides.**



1. *Wrong tool hook positioning (slider shoe guides)*
2. *Correct tool hook positioning (outside slider shoe guides)*

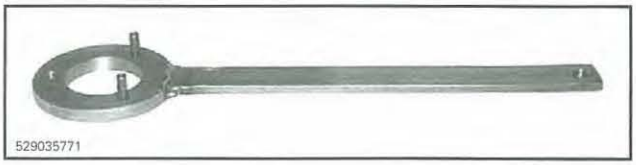
DRIVEN PULLEY

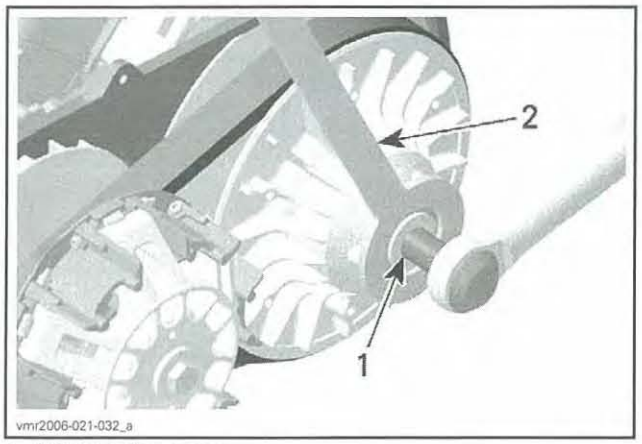
Driven Pulley Removal

Remove *DRIVE BELT*.

Using the DRIVEN CLUTCH HOLDER (P/N 529 035 771), hold the driven pulley and loosen the driven pulley screw.

NOTE: Do not unscrew the driven pulley screw completely.





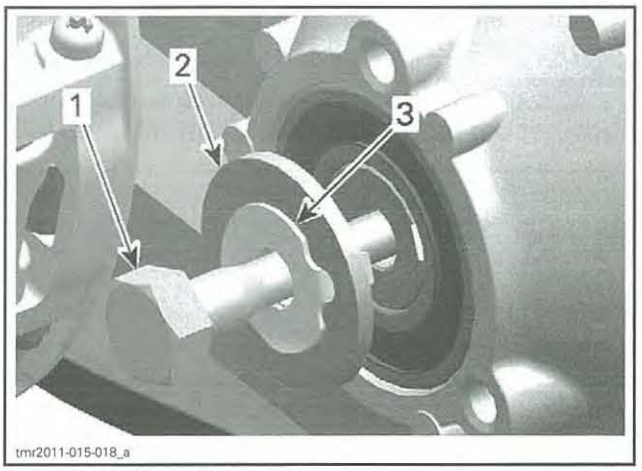
1. *Driven pulley screw*
2. *Pulley holding tool*

Apply axial pressure with your hand on driven pulley and maintain during screw removal.

Remove driven pulley screw, locking washer and washer.

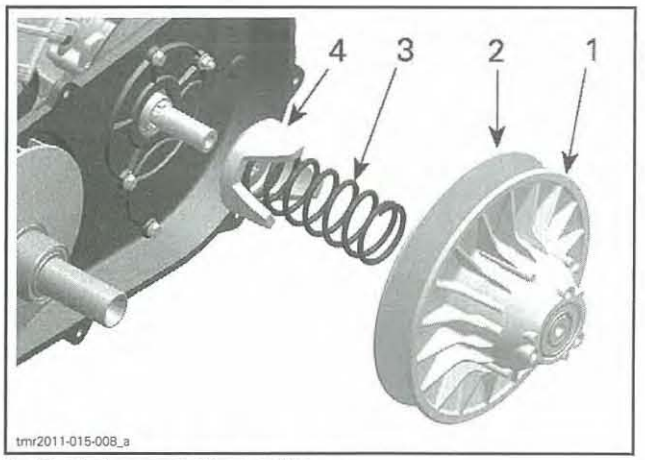
Discard locking washer.

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



1. *Driven pulley screw*
2. *Thrust washer*
3. *Locking washer*

Remove the driven pulley with the spring and the cam.

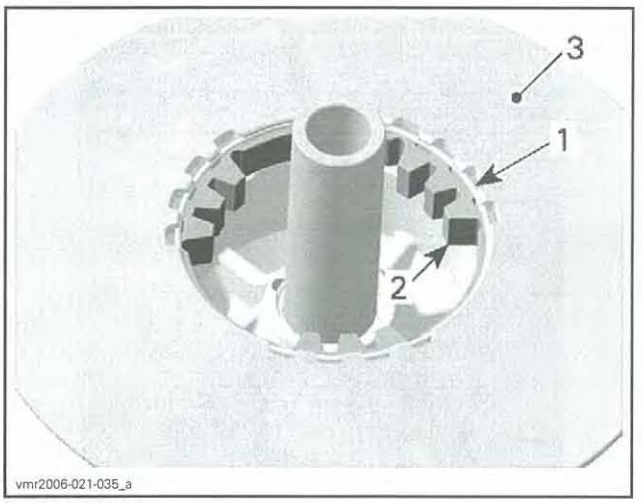


1. *Fixed sheave of driven pulley*
2. *Sliding sheave of driven pulley*
3. *Spring*
4. *Cam*

Driven Pulley Disassembly

Fixed Sheave

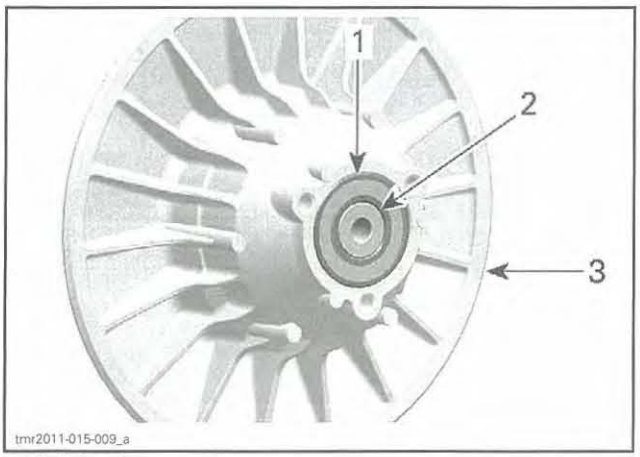
Remove retaining ring and lift torque gear.



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

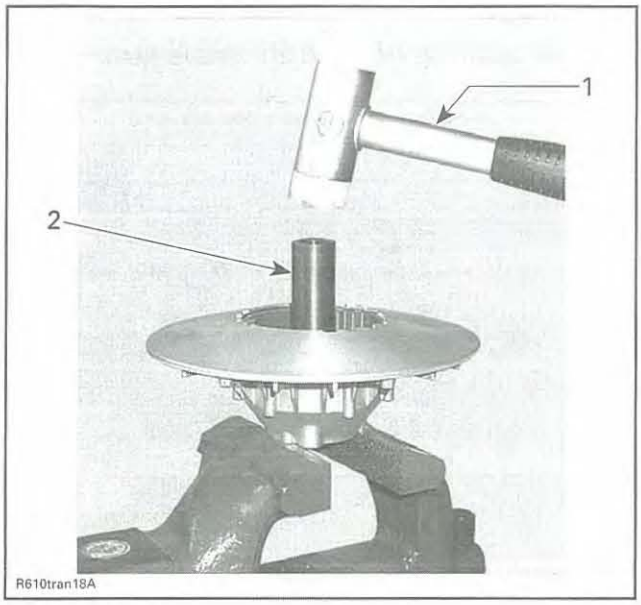
NOTE: The following procedure is not necessary except if ball bearing or shaft must be removed. Refer to *INSPECTION* before proceeding.

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



1. Ball bearing
2. Shaft
3. Fixed sheave of driven pulley

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

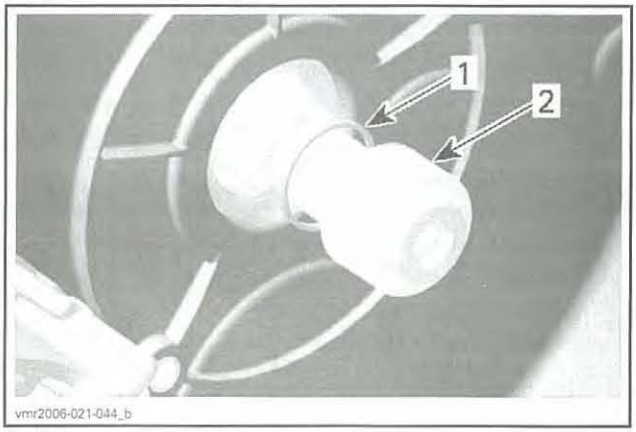


1. Soft hammer
2. Shaft

Remove shaft from ball bearing.

Remove distance sleeve and O-ring from countershaft.

Replace O-ring if brittle, hard or damaged.



1. O-ring
2. Distance sleeve

Driven Pulley Cleaning

When a dust deposit has to be removed from the cam or the shaft, use dry cloth.

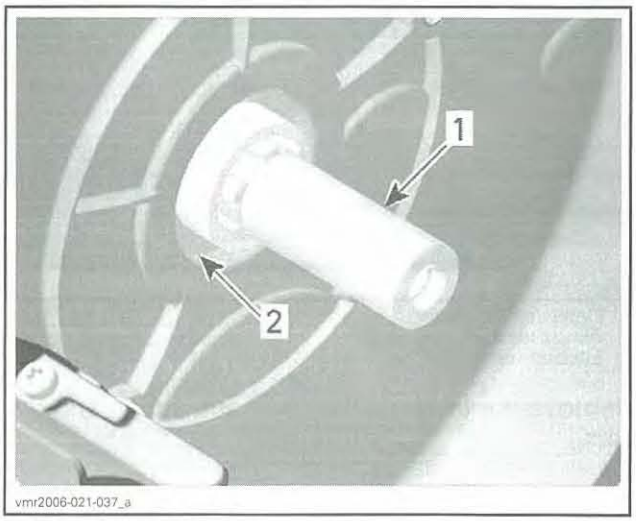
Clean pulley faces and shaft with fine steel wool and dry cloth.

Use PULLEY FLANGE CLEANER (P/N 413 711 809) to clean driven pulley.

Clean the CVT air guide area from contamination.

Using a paper towel with PULLEY FLANGE CLEANER (P/N 413 711 809) to clean countershaft end and the inside of the shaft.

NOTICE **To avoid damage, make sure cleaner does not contact the countershaft oil seal.**



1. Countershaft support
2. Countershaft oil seal

Driven Pulley Inspection

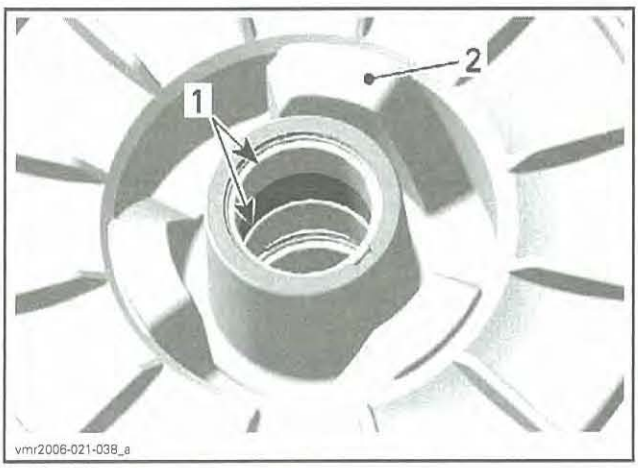
Sliding Sheave

Check sliding sheave for cracks and sliding contact surface for excessive wear. Replace sliding sheave if necessary.

Check bushings for cracks, scratch and for free movement when assembled to sliding sheave.

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

This bushing can not be replaced. Replace sliding sheave if bushings are out of specification. Visually inspect coatings.



1. Bushings
2. Backside of sliding sheave of driven pulley

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

Fixed Sheave

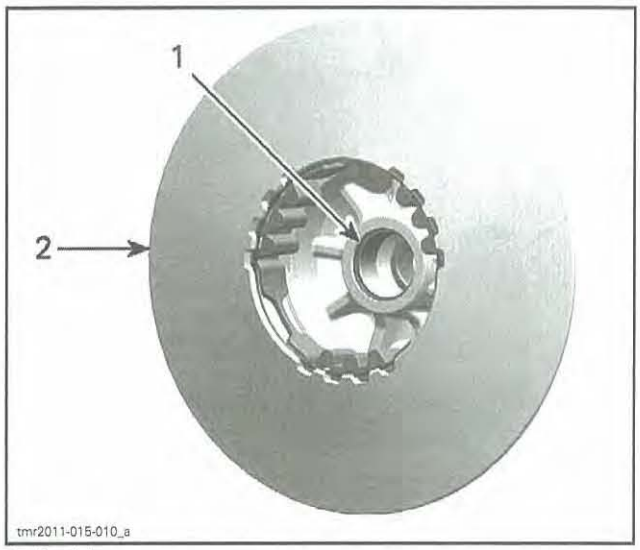
Check fixed sheave for cracks and excessive wear. Replace fixed sheave if necessary.

Check ball bearing for free play and smooth operation. Replace if necessary.

Check shaft for heavy wear or visible damage. Replace if necessary.

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

This bushing can not be replaced. Replace fixed sheave if bushing is out of specification. Visually inspect coatings.

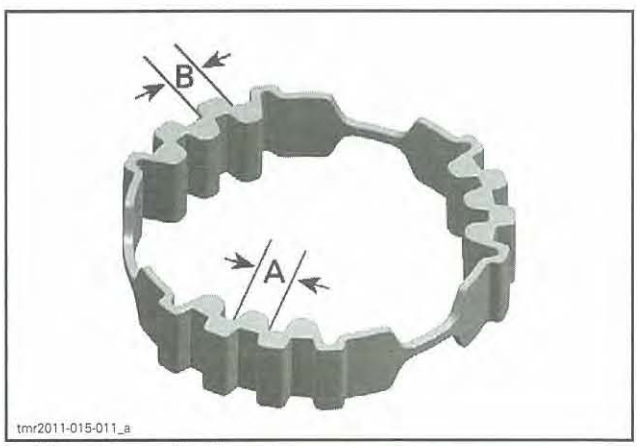


1. Bushing
2. Fixed sheave of driven pulley

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

Check torque gear for visible damage and cracks.

Measure wear limit with a caliper.

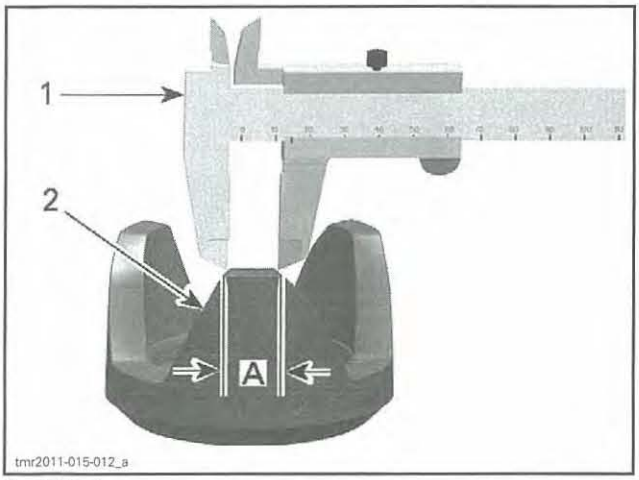


A. Measurement inside
B. Measurement outside

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

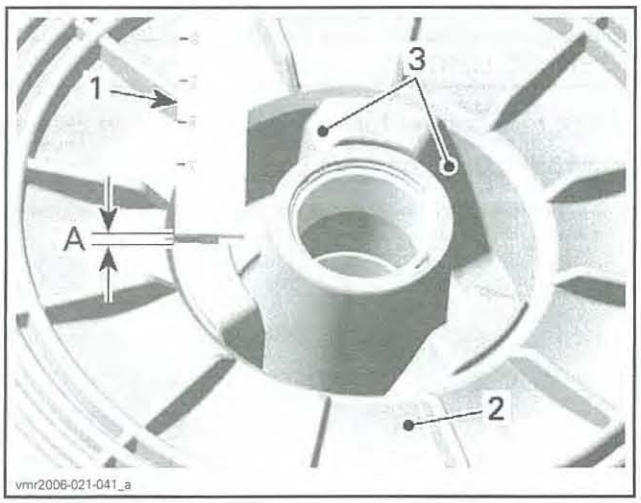
Cam

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



1. Caliper
2. Contact surface
A. Width to be measured due to wear on contact surface

WIDTH ON TOP SURFACE	
SERVICE LIMIT	9.00 mm (.354 in)



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

WEAR ON CONTACT SURFACE	
SERVICE LIMIT	1.00 mm (.039 in)

Spring

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

SPRING FREE LENGTH	
SERVICE LIMIT	125 mm (4.921 in)
CLUTCH SPRING SQUARENESS	
SERVICE LIMIT	3.8 mm (.15 in)

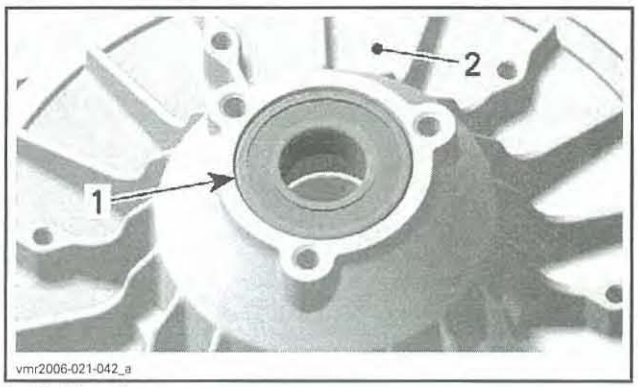
Driven Pulley Assembly

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.

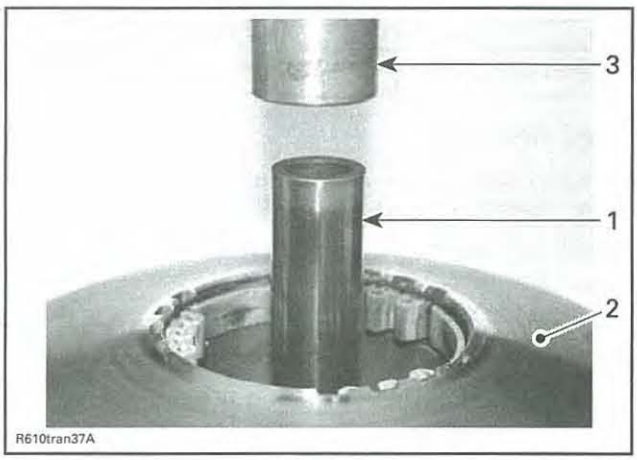
NOTE: Place new ball bearing in a freezer for 10 minutes before installation.

Install ball bearing with the writing on top and push only on the outer ring.



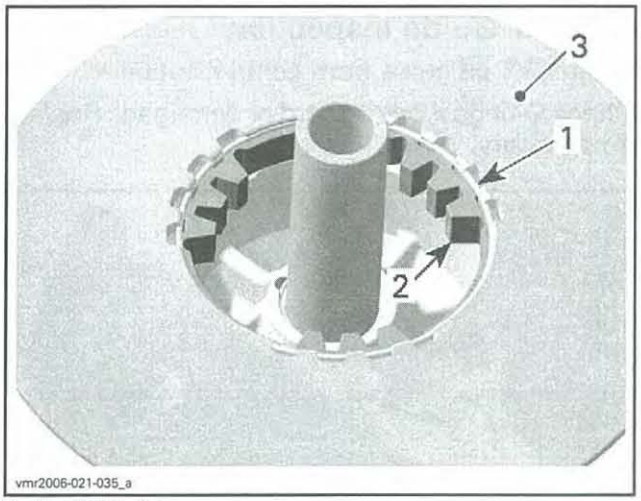
1. Ball bearing
2. Fixed sheave of driven pulley

NOTICE Do not use hammer, use press machine only.



1. Shaft
2. Fixed sheave
3. Press machine

Install torque gear then secure it with retaining ring.



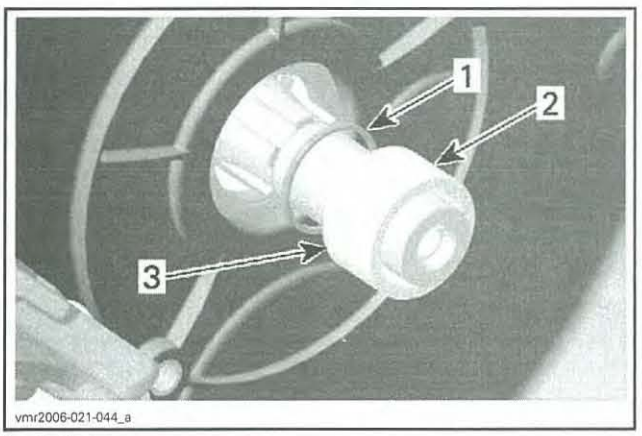
1. *Retaining ring*
2. *Torque gear*
3. *Fixed sheave of driven pulley*

Driven Pulley Installation

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

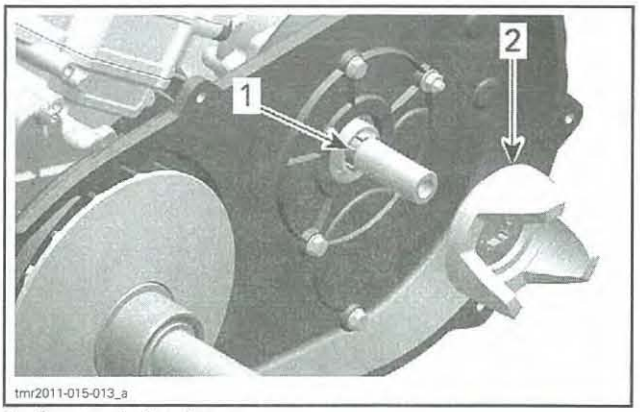
Place O-ring on countershaft splines and move it with distance sleeve in end position.

NOTICE **Chamfer on inside diameter of the distance sleeve must face gearbox side.**



1. *O-ring*
2. *Distance sleeve*
3. *Chamfered area of distance sleeve*

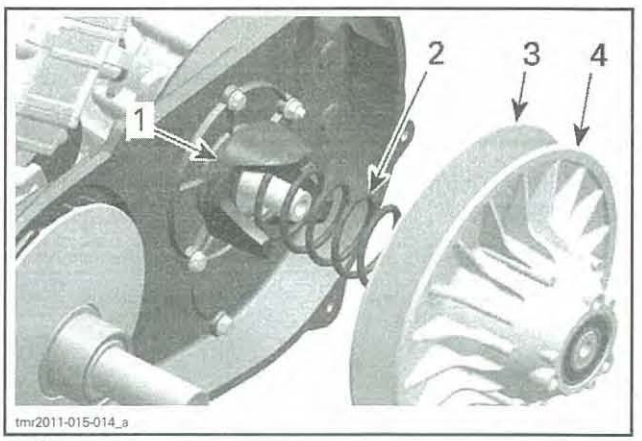
Install cam on countershaft end the right way on the countershaft splines.



1. *Countershaft splines*
2. *Cam*

Install sliding sheave into fixed sheave.

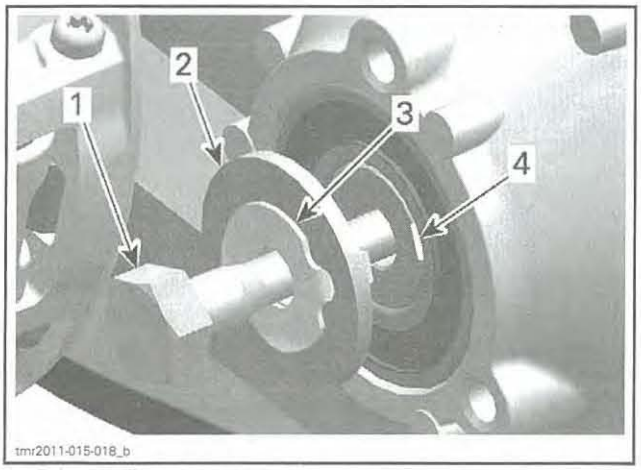
Place spring behind sliding sheave then align driven pulley with cam.



1. *Cam*
2. *Spring*
3. *Sliding sheave*
4. *Fixed sheave*

With your hand, push the driven pulley on the shaft to compress the spring. Install the driven pulley screw, locking washer and thrust washer.

NOTE: Insert locking washer tab through thrust washer hole, then in the shaft slot.



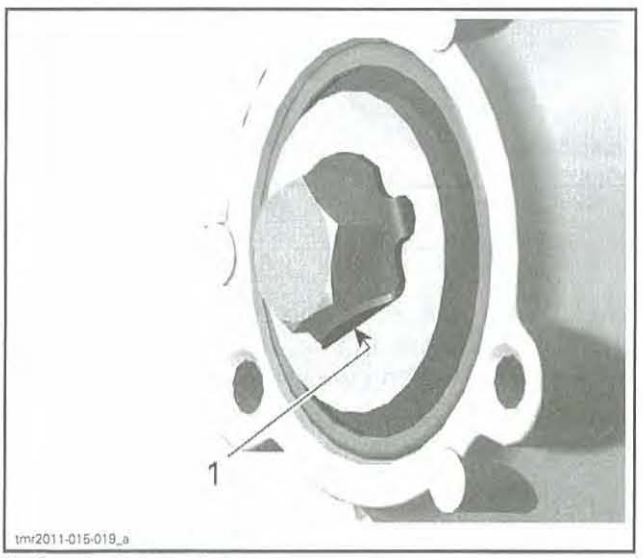
1. Driven pulley screw
2. Thrust washer
3. Locking washer
4. Shaft slot

NOTE: Driven pulley end-play is 0 (zero).

Tighten driven pulley screw.

DRIVEN PULLEY SCREW TIGHTENING TORQUE
60 N•m ± 7 N•m (44 lbf•ft ± 5 lbf•ft)

Bend the locking washer in order to lock the driven pulley screw.



1. Bent locking washer

CVT AIR GUIDE

CVT Air Guide Removal

Remove the *DRIVE PULLEY* and the *DRIVEN PULLEY*.

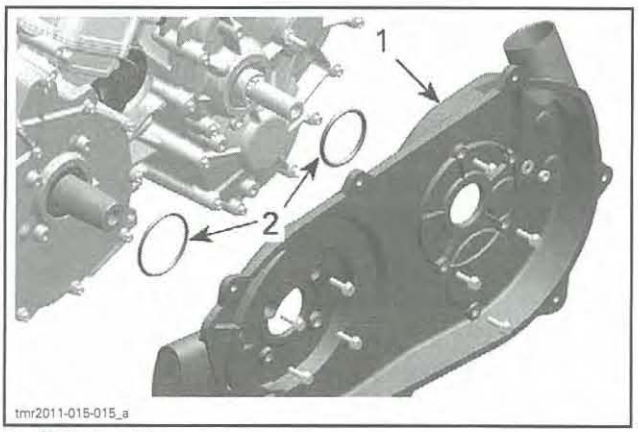
Unscrew the clamps retaining the CVT air hoses.

Remove CVT air guide.

CVT Air Guide Inspection

Clean CVT air guide from contamination

Check O-rings if brittle, hard or damaged. Replace if necessary.



1. CVT air guide
2. O-rings

CVT Air Guide Installation

For installation reverse the removal procedure.

GEARBOX AND 4X4 COUPLING UNIT

SERVICE TOOLS

Description	Part Number	Page
BLIND HOLE BEARING PULLER SET	529 036 117	189
DRIVE SHAFT OIL SEAL INSTALLER	529 036 028	182
ECM ADAPTER TOOL	529 036 166	178
FLUKE 115 MULTIMETER	529 035 868	176, 180
HANDLE	420 877 650	182
OIL SEAL INSTALLER (GEARBOX)	529 035 758	182
OIL SEAL INSTALLER	529 036 204	183

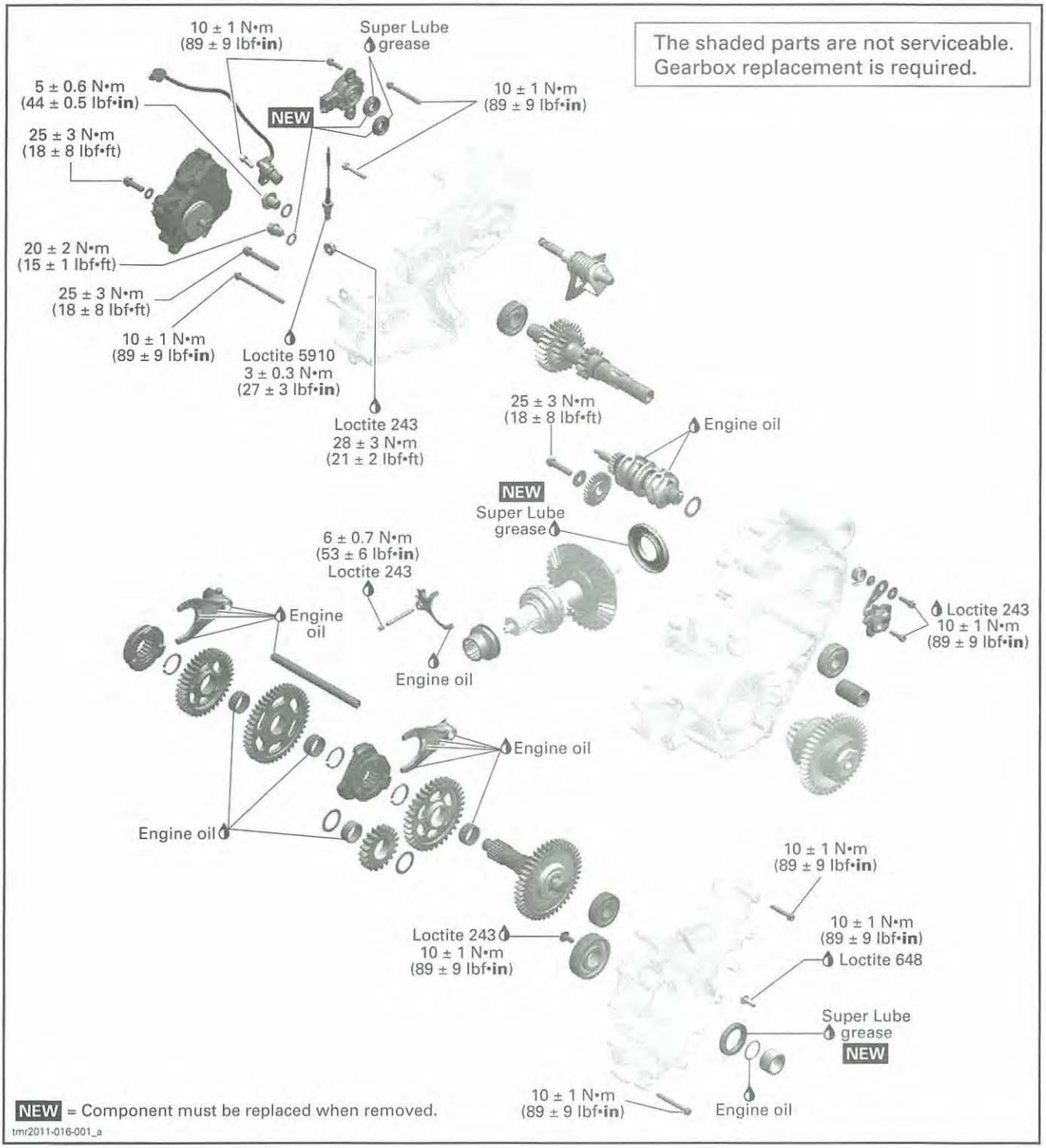
SERVICE TOOLS – OTHER SUPPLIER

Description	Part Number	Page
FLUKE RIGID BACK-PROBE	TP88	176

SERVICE PRODUCTS

Description	Part Number	Page
LOCTITE 5910	293 800 081	180, 195
LOCTITE CHISEL (GASKET REMOVER)	413 708 500	195
SUPER LUBE GREASE	293 550 030	177, 180, 183

GEARBOX COMPONENTS AND 4X4 COUPLING MECHANISM



GENERAL

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

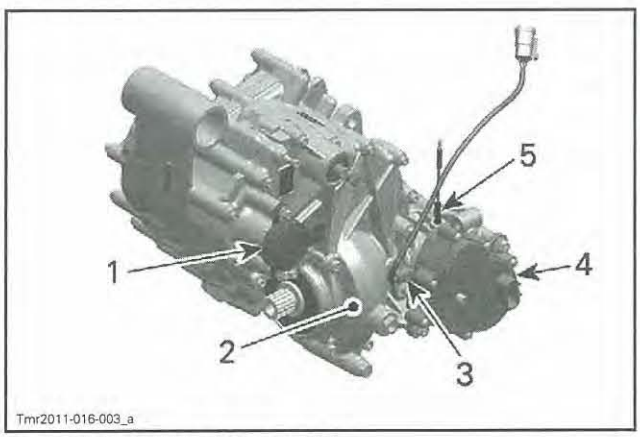
Clean threads before applying a threadlocker. Refer to *SELF-LOCKING FASTENERS* and *LOCTITE APPLICATION* at the beginning of this manual for complete procedure.

⚠ WARNING

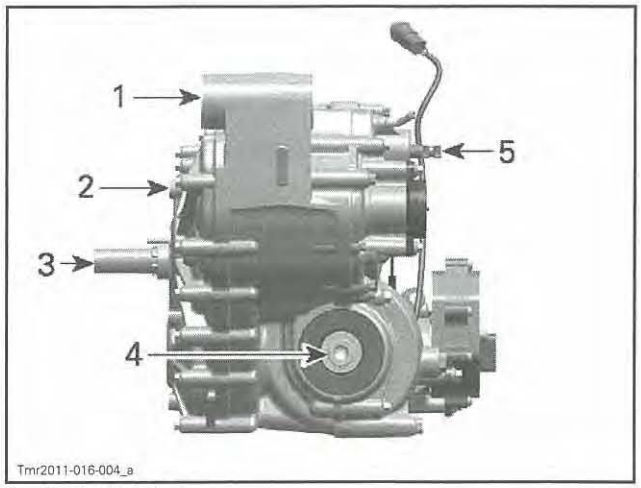
Torque wrench tightening specifications must strictly be adhered to.
Locking devices when removed (e.g.: locking tabs, elastic stop nuts, self-locking fasteners, etc.) must be replaced.

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

GEARBOX OVERVIEW



1. *Gearbox position sensor (GBPS)*
2. *Right cover*
3. *Vehicle speed sensor (VSS)*
4. *Actuator*
5. *4WD indicator switch*



1. *Center housing*
2. *Left cover*
3. *Countershaft*
4. *Output shaft*
5. *Shift shaft*

TROUBLESHOOTING

UNUSUAL GEARBOX NOISE AND/OR VIBRATIONS

1. Low oil level in gearbox.
   - *Oil leakage from gearbox. Replace damaged gasket(s) and/or oil seal(s).*
2. Defective bearings.
   - *Bearing(s) do(es) not turn smoothly. Replace bearing(s).*
3. Damaged or worn gears.
   - *Inspect gears for damages or missing teeth. Replace respective gears.*

GEAR INDICATION FAILS

1. Defective gearbox position sensor (GBPS).
   - *Perform a gearbox position sensor test.*
   - *Damaged wires. Repair as required.*

GEAR(S) IS (ARE) HARD TO SHIFT

1. Incorrect shifter cable adjustment.
   - *Adjust shifter cable (refer to SHIFTER CABLE in SHIFTER subsection.*

4 WHEEL DRIVE INDICATION FAILS

1. 4WD indicator switch failure.
   - *Test 4WD indicator switch. Replace as required.*
   - *Bad contact. Check for corrosion or loose connector.*
   - *Damaged wires. Repair as required.*

4 WHEEL DRIVE DOES NOT ENGAGE OR DISENGAGE

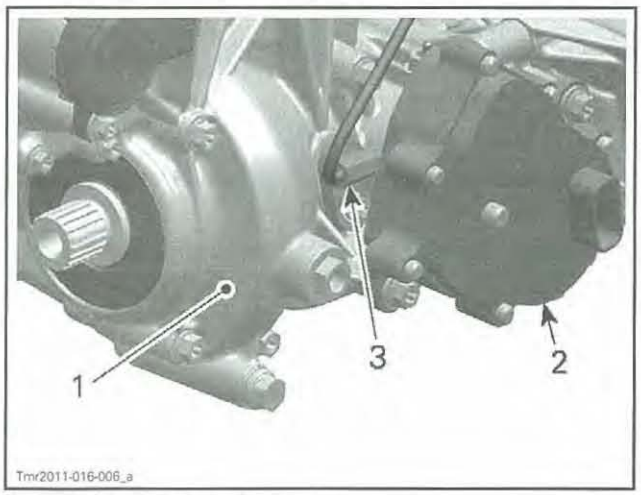
1. Defective 4WD switch.
   - *Check 4WD switch operation.*
2. Defective actuator.
   - *Test actuator.*
3. Damaged or worn shifting fork or sleeve.
   - *Remove actuator and inspect shifting fork and sleeve.*

PROCEDURES

VSS (VEHICLE SPEED SENSOR)

VSS Location

The vehicle speed sensor is located on the right housing of the gearbox behind the actuator.



1. Right housing of gearbox
2. Actuator
3. VSS (Vehicle Speed Sensor)

VSS Access

To reach the VSS, remove the following parts:
- Passenger seat
- RH lateral console panel
- Fuel tank cowl.

VSS Wire Identification

FUNCTION	PIN	COLOR
12-volt input from fuse F5	A	RED
Speed signal (to ECM-A E1)	B	WHITE
Ground (to ECM-A D4)	C	BLACK/GREEN

VSS Circuit Protection

CONDITION	CIRCUIT PROTECTION
Supplied with main relay activated	Fuse 5 of fuse block 1 (from main relay R2)

VSS Input Voltage Test

1. Use the FLUKE 115 MULTIMETER (P/N 529 035 868) and select Vdc.
2. Turn ignition switch ON.
3. Back-probe the VSS connector using FLUKE RIGID BACK-PROBE (P/N TP88) or equivalent.
4. Measure voltage as per following table.

VEHICLE SPEED SENSOR INPUT VOLTAGE TEST		
TEST PROBES		RESULT (KEY ON)
PIN A (RED wire)	PIN C (BLACK/GREEN wire)	Battery voltage

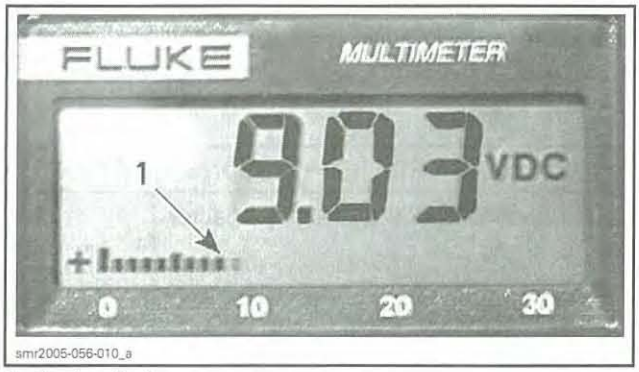
If voltage is not as specified, test positive and ground separately.

VSS Signal Test

1. Lift rear of vehicle so that rear wheels are off the ground.
2. Set transmission to 2WD and to Neutral.
3. Back-probe the VSS connector using FLUKE RIGID BACK-PROBE (P/N TP88) or equivalent.
4. Turn ignition switch ON.
5. Set multimeter to Vdc.
6. Measure voltage while slowly rotating rear wheels by hand.

VEHICLE SPEED SENSOR SIGNAL TEST		
TEST PROBES		RESULT (WHILE ROTATING WHEELS)
PIN B (WHITE wire)	PIN C (BLACK/GREEN wire)	Alternate reading between battery voltage and 0 Vdc

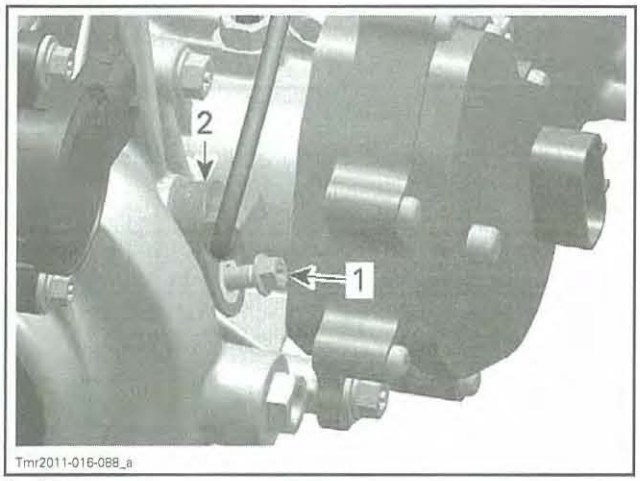
NOTE: Since we measure pulsating voltage, the numeric display will continuously change. The analog display may be easier to follow.



1. Analog display

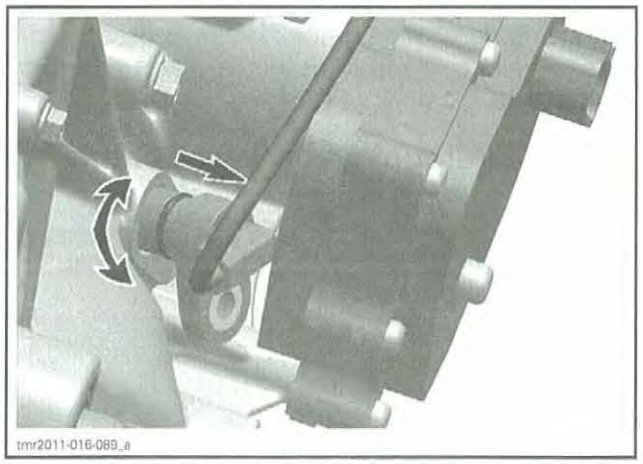
VSS Removal

Remove screw retaining the VSS.



1. Screw
2. VSS

Turn sensor and weave it out of the gearbox right cover.



VSS Installation

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

Apply SUPER LUBE GREASE (P/N 293 550 030) on VSS O-ring.

GBPS (GEARBOX POSITION SENSOR)

GBPS Reset

When replacing the gearbox position sensor (GBPS), it is required to reset (re-zero) its values for proper operation.

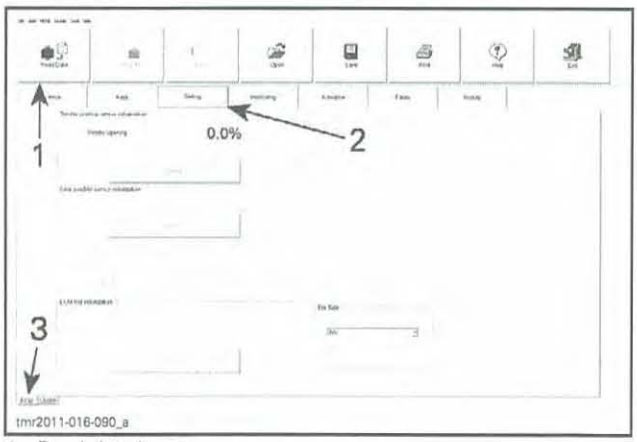
A reset must be carried out each time any of the following parts has been replaced:

- Gearbox assembly
- Shift drum
- GBPS
- ECM.

1. Connect vehicle to the latest applicable version of B.U.D.S. software, refer to *COMMUNICATION TOOLS AND B.U.D.S.* subsection.

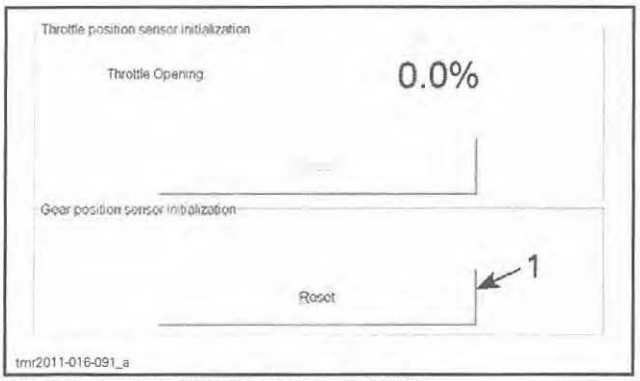
NOTE: Ignition key must stay ON during the reset procedure. If the key is turned off, the procedure must be carried out again.

2. In B.U.D.S., select the following:
   - **Read Data** button
   - **Setting** page tab
   - **ECM** tab.



1. Read data button
2. Setting page tab
3. ECM tab

3. Make sure that gearbox is set to NEUTRAL position.
4. In the **Gear Position Sensor Initialization** field, click on the **Reset** button.



GEAR POSITION SENSOR INITIALIZATION
1. Reset button

A message will be displayed if the operation is successful.

If an error occurred or the GBPS is not within the allowed range while resetting, the ECM will generate a fault code and will not accept the setting.

5. If a fault message is displayed, follow the instructions in the message(s).
6. Check for fault codes.

If a fault code is generated:
- Carry out the service action
- Reset the fault code
- Repeat the reset procedure.

7. Close and disconnect B.U.D.S.

NOTE: Do not turn ignition key OFF.

8. Verify gears engagement.
   - 8.1 With the vehicle on ground and in NEUTRAL position, start engine.
   - 8.2 During 4-5 seconds, rev engine to 2500 ± 200 RPM.
   - 8.3 Let engine returns to idle.
   - 8.4 Select an other position (P, R, H or L). Repeat substeps 8.2 and 8.3 until all position are verified.

   NOTE: The vehicle must be in movement to complete the procedure on R, H and L position.

GBPS Access

To reach the GBPS sensor, remove the following parts:
- Passenger seat
- RH lateral console panel
- Fuel tank cowl.

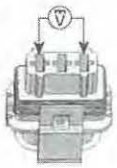
GBPS Input Voltage Test

NOTE: Prior to conduct testing, check fault codes in B.U.D.S.

Set shift lever in NEUTRAL position.

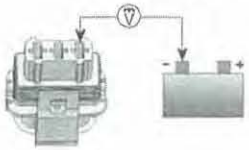
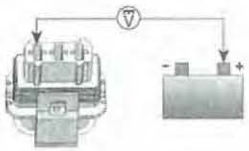
Unplug the GBPS connector.

Test as follow:

MULTIMETER PROBE POSITIONS	VOLTAGE
PIN 1 and PIN 3 of the GBPS connector 	5 volts

If voltage is adequate, check GBPS communication link (CAN).

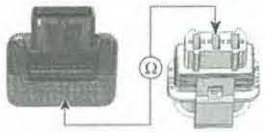
If there is no voltage, check each GBPS input as follows.

MULTIMETER PROBE POSITIONS	VOLTAGE
GBPS connector (pin 1) and battery ground 	5 volts
GBPS connector (pin 3) and battery + terminal 	Battery voltage

If there is no voltage, check wires and connector pins. Replace or repair defective parts and reset fault codes.

GBPS Communication Link Continuity Test

Unplug connector "A" from ECM and connect it to the ECM ADAPTER TOOL (P/N 529 036 166).

MULTIMETER PROBE POSITIONS	RESISTANCE @ 20°C (68°F)
GBPS connector (pin 2) and ECM adapter tool (pin F4) 	Below 1 Ω

If resistance is out of specification, check wires and connectors. Repair and reset fault codes.

If resistance is good and the other tests succeeded, replace the GBPS and reset fault codes.

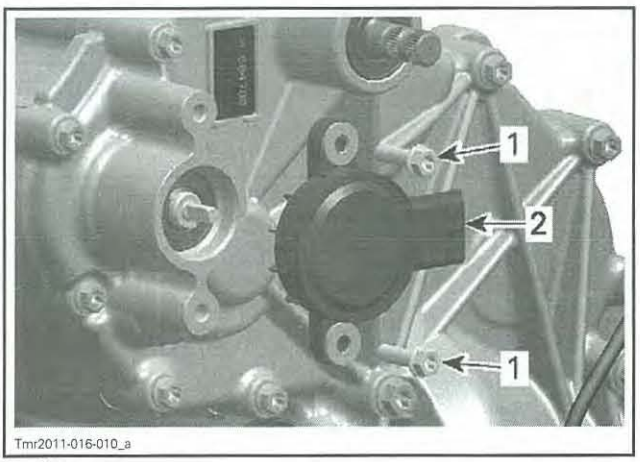
NOTE: The GBPS must be reset.

GBPS Removal

Set shift lever in NEUTRAL position.

Unplug GBPS connector.

Remove screws and withdraw GBPS.



Tmr2011-016-010_a

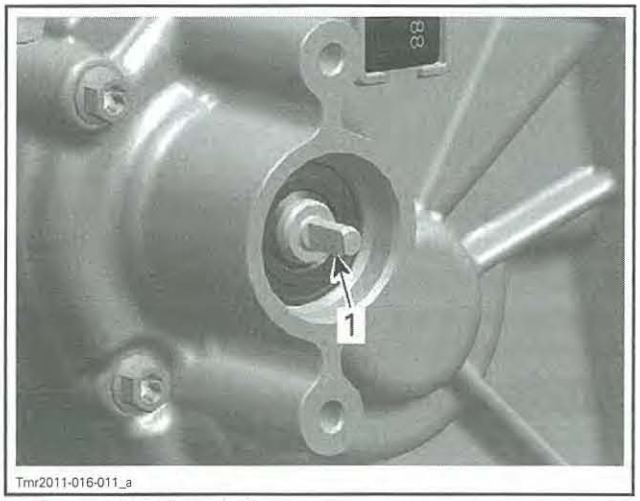
1. Screws
2. Gearbox Position Sensor (GBPS)

GBPS Installation

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

Shift lever must be in the NEUTRAL position.

Align GBPS with the flat on the shift drum shaft.



Tmr2011-016-011_a

1. Flat on shift drum shaft

Reset the GBPS. Refer to *GBPS RESET* in this subsection.

4WD INDICATOR SWITCH

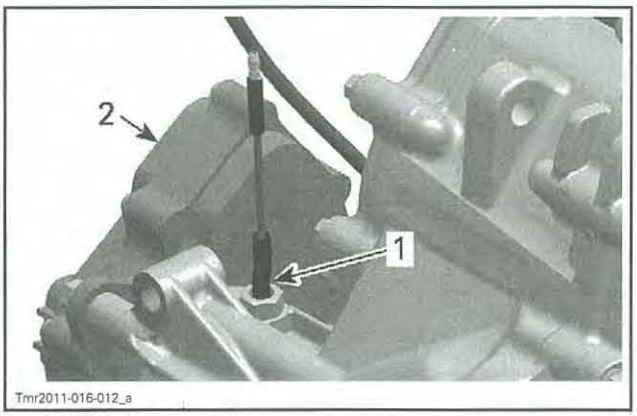
4WD Indicator Switch Access

To reach the 4WD indicator switch, remove the following parts:

- Passenger seat
- RH lateral console panel
- Fuel tank cowl.

4WD Indicator Switch Removal

Disconnect 4WD indicator switch connector.



Tmr2011-016-012_a

1. 4 WD indicator switch
2. Actuator

4WD Indicator Switch Test

Measure switch resistance as follows.

SWITCH POSITION	SWITCH WIRE		RESISTANCE
2WD	BLACK/ BEIGE	Engine ground	Infinite (OL)

If the resistance is out of specification, replace the 4WD indicator switch.

4WD Indicator Switch Installation

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

Take care do not damage indicator switch threads during installation.

Apply carefully some LOCTITE 5910 (P/N 293 800 081) on threads of indicator switch.

NOTICE Do not apply Loctite 5910 on switch plunger, as it will lead to switch malfunction.

ACTUATOR

Actuator Access

To access the actuator, remove the following parts:

- Passenger seat
- RH lateral console panel
- Fuel tank cowl.

Remove screws securing fuel tank and move tank on passenger's floor without disconnecting hoses and connector from fuel pump.

Actuator Test

Using the FLUKE 115 MULTIMETER (P/N 529 035 868), check if the 2WD/4WD selector works properly.

Unplug actuator connector.

Turn ignition key ON.

Measure voltage as follows.

SWITCH POSITION	SWITCH WIRE		VOLTAGE
2WD	WHITE/BLUE	WHITE	Battery voltage
4WD	WHITE/BLACK		

If the selector is out of specifications, check wires, connectors and replace the selector if necessary.

If the selector is good, check the vehicle harness.

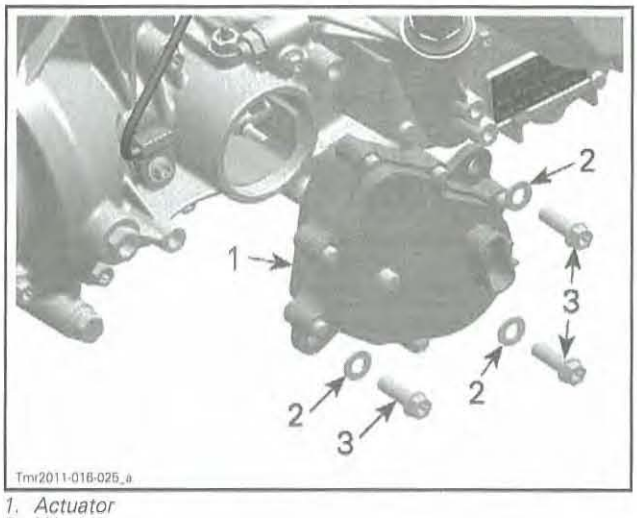
If the vehicle harness is good, replace the actuator.

Actuator Removal

NOTE: Before beginning any servicing on the actuator, make sure the vehicle is in 4WD position. No need to remove engine from vehicle.

Place a drain pan under actuator.

Remove actuator screws.



1. Actuator
2. Washer
3. Screw

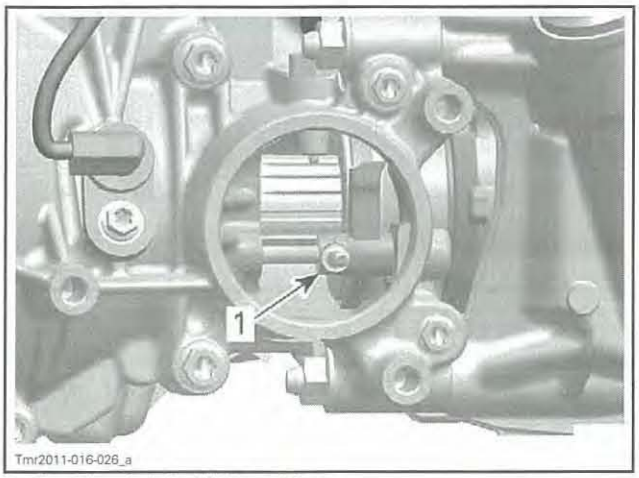
When all actuator bolts are removed, pull the actuator out of housing.

Actuator Installation

Apply a small amount of SUPER LUBE GREASE (P/N 293 550 030) on actuator O-ring.

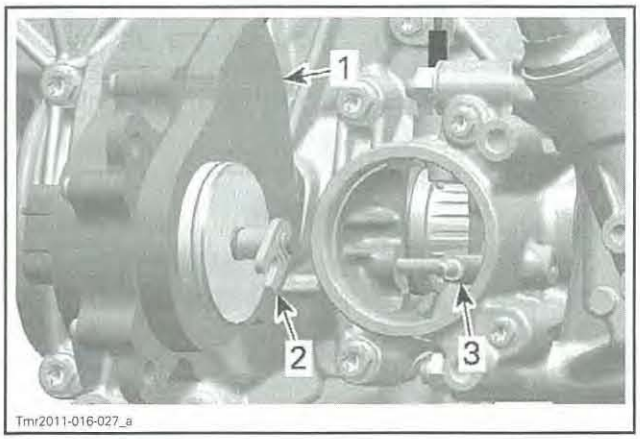
1. Actuator O-ring

Verify if coupling fork is in 4WD position. The coupling fork should be positioned toward the front of vehicle.



1. Coupling fork in 4WD position

Align the actuator fork with the pin on coupling fork then push the actuator in the housing. See the following illustration to position the actuator correctly.



1. Actuator
2. Actuator fork
3. Coupling fork

Rotate the actuator counterclockwise until it orients itself to mounting position.

NOTICE **Do not cut or break the actuator O-ring.**

Install all actuator screws and tighten them.

PART	TORQUE
Actuator screws	25 N•m ± 3 N•m (18 lbf•ft ± 2 lbf•ft)

Connect actuator.

Lift the front of vehicle.

Turn front wheels. The front propeller shaft should not turn (the PARK position must be selected).

If the front propeller shaft turns, the actuator is not installed correctly. Remove actuator and reinstall it.

Place ignition switch to ON position and select the 2WD position.

Turn front wheel again. The front propeller shaft should turn easily.

If the front propeller shaft does not turn, the actuator is not installed correctly. Remove actuator and reinstall it.

NOTICE **Refill missing gearbox oil, refer to *GEARBOX OIL REPLACEMENT* in *PERIODIC MAINTENANCE PROCEDURES* subsection.**

Install all other removed parts.

GEARBOX OIL SEALS

Gearbox Oil Seal Replacement

Replace oil seals if they are brittle, hard or damaged.

A small flat screwdriver can be used to remove most of these oil seals.

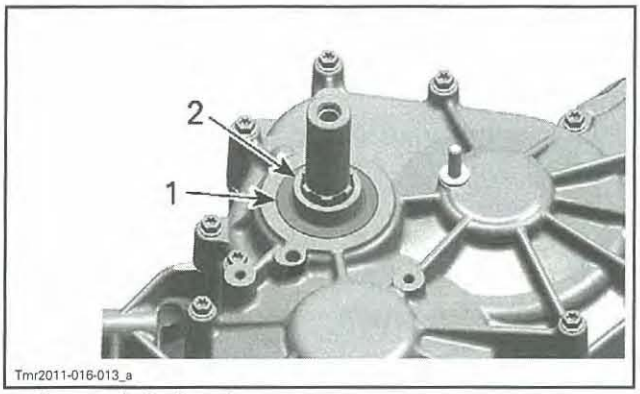
NOTICE **Avoid scoring parts during oil seal removal.**

When replacing an oil seal, take this opportunity to inspect the following:
- Check bearings behind each oil seal for contamination and/or metal shavings.
- Check oil seal running surfaces for scratches.

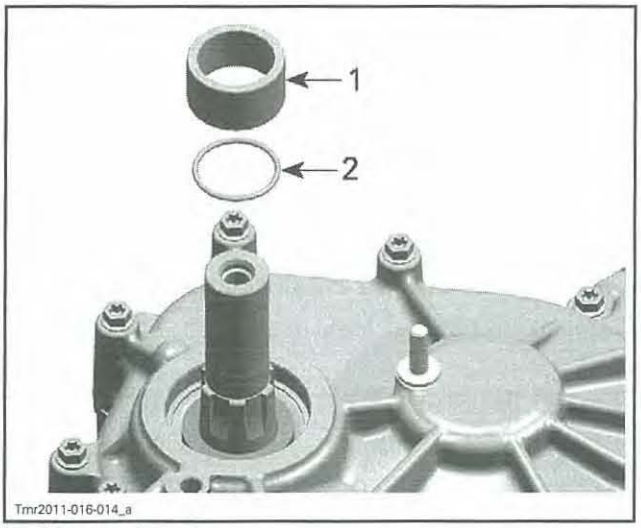
Countershaft Oil Seal

To replace the countershaft oil seal, remove:
- Drive and driven pulleys
- CVT air guide.

NOTE: When oil seal is removed also inspect O-ring behind distance sleeve.



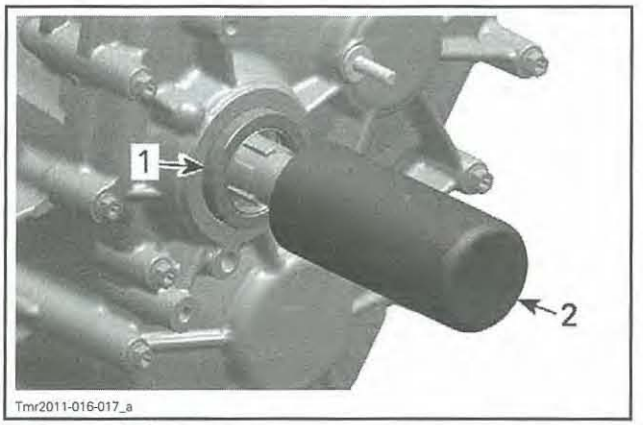
1. *Countershaft oil seal*
2. *Distance sleeve*



1. *Distance sleeve*
2. *O-ring*

Install countershaft oil seal with the DRIVE SHAFT OIL SEAL INSTALLER (P/N 529 036 028).

OIL SEAL INSTALLER



1. *Countershaft oil seal*
2. *Oil seal installer*

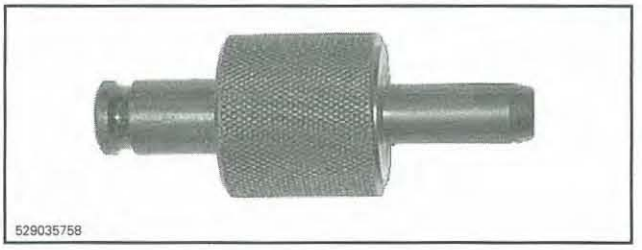
Shift Shaft Oil Seal

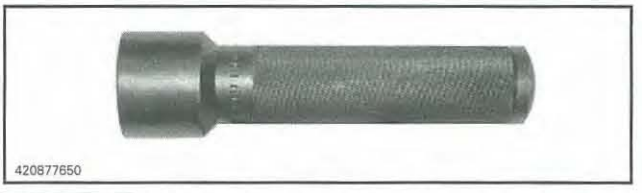
To replace the shift shaft oil seal, remove:
- RH lateral console panel and fuel tank cowl, refer to *BODY* subsection.
- Shift plate from shift shaft.

The shift shaft oil seal can be removed without removing the gearbox from the vehicle.

Use a suitable tube with the proper diameter to install the oil seal.

If gearbox housing is apart, use the OIL SEAL INSTALLER (GEARBOX) (P/N 529 035 758) and the HANDLE (P/N 420 877 650) for shift shaft oil seal installation.





NOTICE **Oil seal must be installed with sealing lip toward gearbox.**

Shift Drum Shaft Oil Seal

To replace the shift drum shaft oil seal, remove the *GBPS (GEARBOX POSITION SENSOR)*. See procedure in this subsection.

Use a suitable tube with the proper diameter to install the oil seal.

NOTICE Oil seal must be installed with sealing lip toward gearbox.

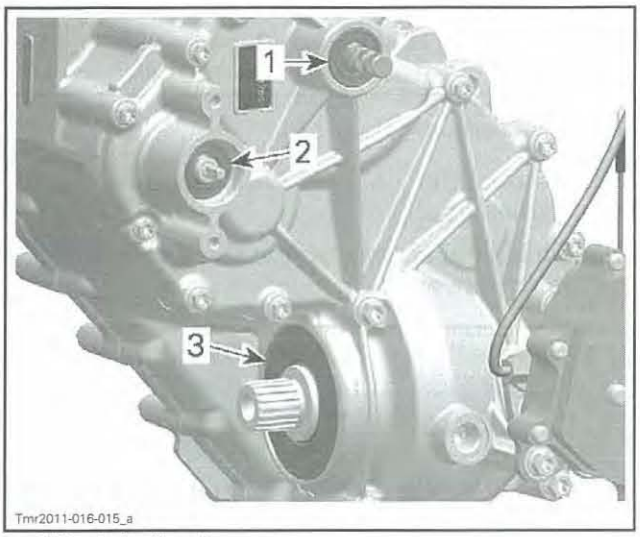
Output Shaft Oil Seal

To replace the output shaft oil seal, proceed as follows:

Remove propeller shaft screw from gearbox output shaft.

Remove rear final drive bolts.

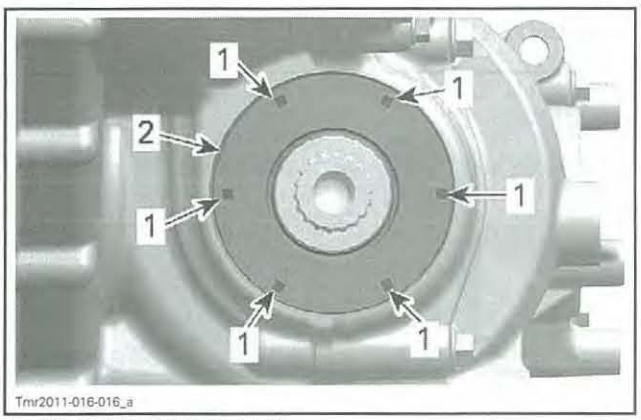
Move the rear final drive rearward to dislodge the propeller shaft from the gearbox output shaft.



1. *Shift shaft oil seal*
2. *Shift drum shaft oil seal*
3. *Output shaft oil seal*

Punch a sharp screwdriver through oil seal for removal.

NOTE: Position screwdriver only in marked areas to avoid damaging the ball bearing underneath oil seal during removal.



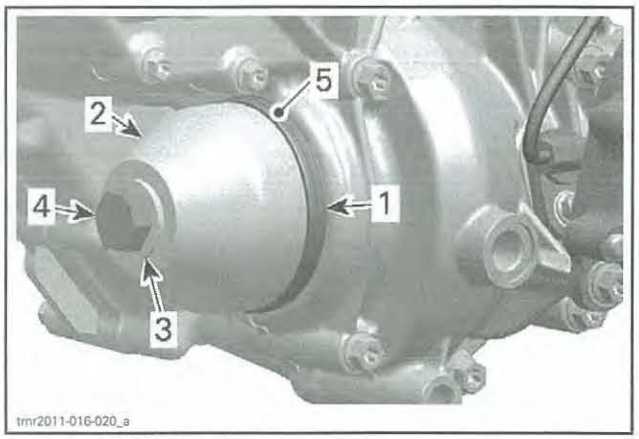
1. *Marked areas for removal*
2. *Output shaft oil seal*

Before beginning the installation ensure gearbox is set to PARK position.

Apply SUPER LUBE GREASE (P/N 293 550 030) on sealing lips.

Apply engine oil on outer diameter of oil seal to avoid damaging it during installation.

Place oil seal on output shaft using the OIL SEAL INSTALLER (P/N 529 036 204) with a flat washer (P/N 250 200 102) and a M12 x 1.25 x 35 hexagonal screw (P/N 207 683 544).



1. *Output shaft oil seal*
2. *Oil seal installer*
3. *Flat washer (P/N 250 200 102)*
4. *M12 x 1.25 x 35 hexagonal screw (P/N 207 683 544)*
5. *Apply engine oil on outer diameter of oil seal*

GEARBOX

Gearbox Removal

Remove engine from vehicle. Refer to *ENGINE REMOVAL AND INSTALLATION* for the procedure.

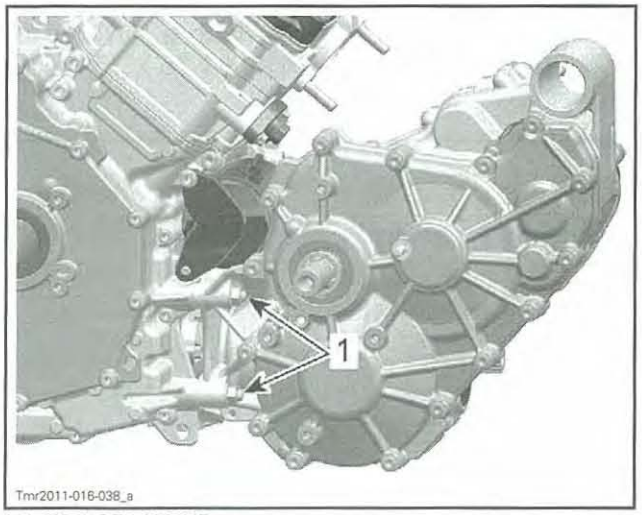
Refer to *CONTINUOUSLY VARIABLE TRANSMISSION (CVT)* subsection to remove following parts:

- CVT cover
- Drive and driven pulleys
- CVT air guide.

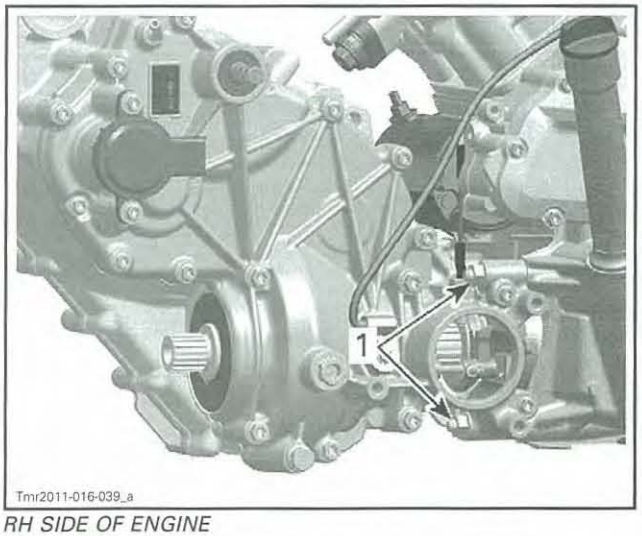
Drain gearbox. Refer to *GEARBOX OIL REPLACEMENT* in *PERIODIC MAINTENANCE PROCEDURES* subsection.

Remove *ACTUATOR*, see procedure in this subsection.

Unscrew the four (4) nuts that attach the gearbox to the engine.



LH SIDE OF ENGINE
1. Nut M8



RH SIDE OF ENGINE
1. Nut M8

Pull gearbox to separate it from engine.

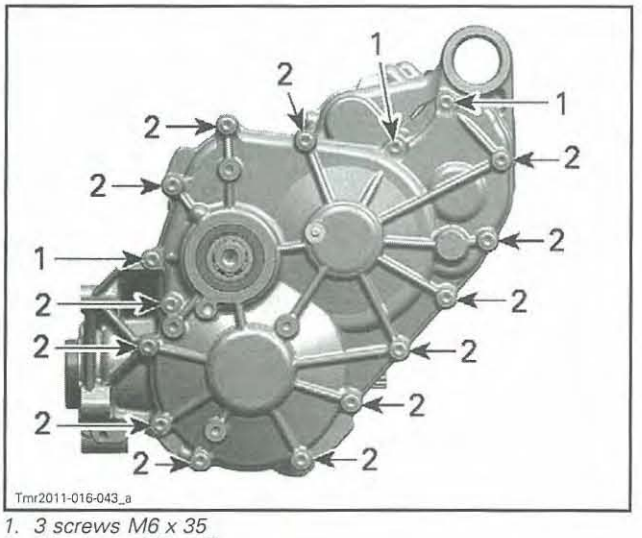
Gearbox Disassembly

NOTE: During gearbox disassembly, inspect the condition of each part closely.

Gearbox Left Cover

Set gearbox to NEUTRAL position.

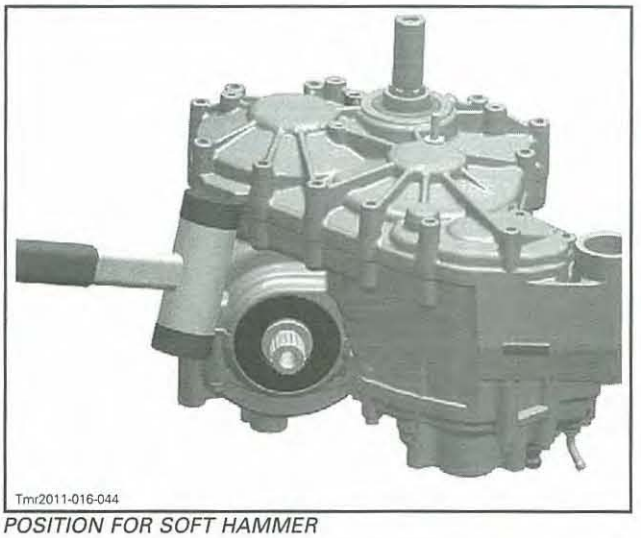
Unscrew all bolts retaining the gearbox left cover.



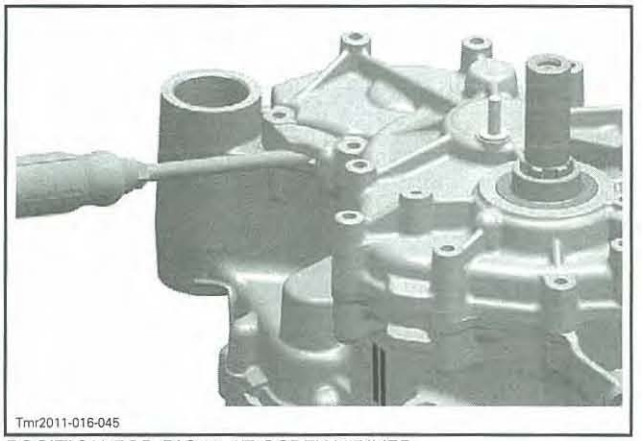
1. 3 screws M6 x 35
2. 13 screws M6 x 55

Place the center housing on a wood stand, left cover pointing upwards.

Using a big flat screwdriver and a soft hammer to lift the left cover.



POSITION FOR SOFT HAMMER

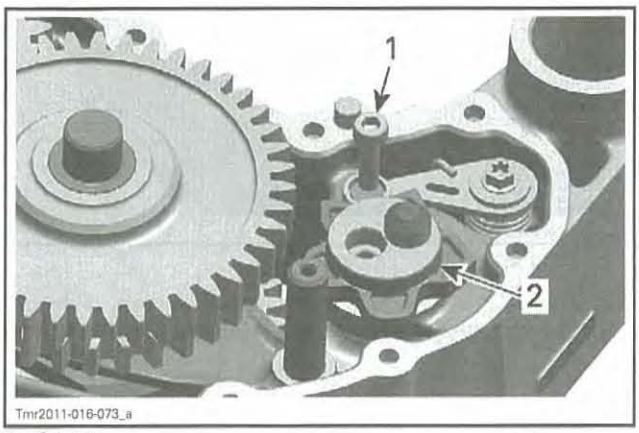


POSITION FOR BIG FLAT SCREWDRIVER

Index Lever and Index Washer

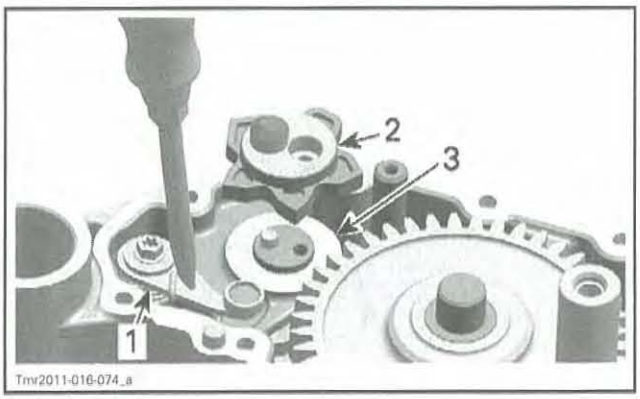
Set gearbox to NEUTRAL position.

Remove screw retaining the index washer to the shift drum.



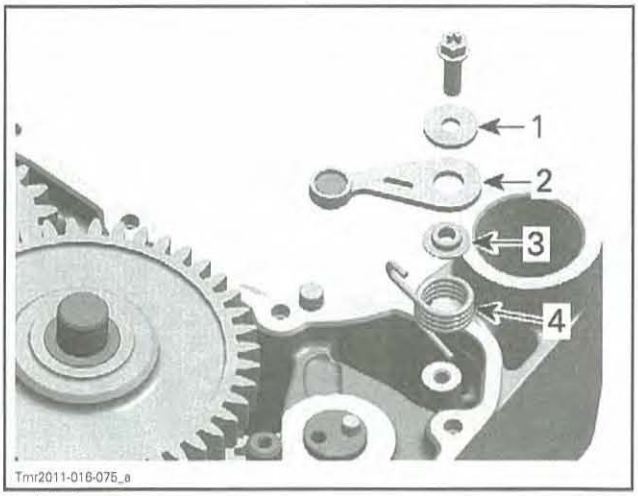
1. *Screw*
2. *Index washer*

Insert a flat screwdriver in the slot of index lever. Turn screwdriver clockwise and remove index washer.



1. *Index lever*
2. *Index washer*
3. *Shift drum*

Remove the index lever with washer, step ring and spring.

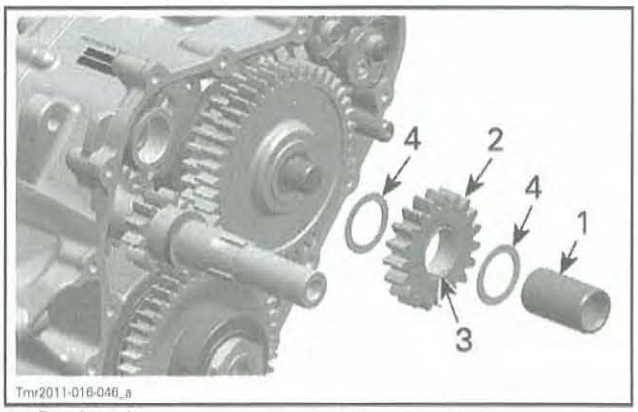


1. *Washer*
2. *Index lever*
3. *Step ring*
4. *Index spring*

Main Shaft and Shift Forks

Remove bearing pin, reverse intermediate gear and thrust washers.

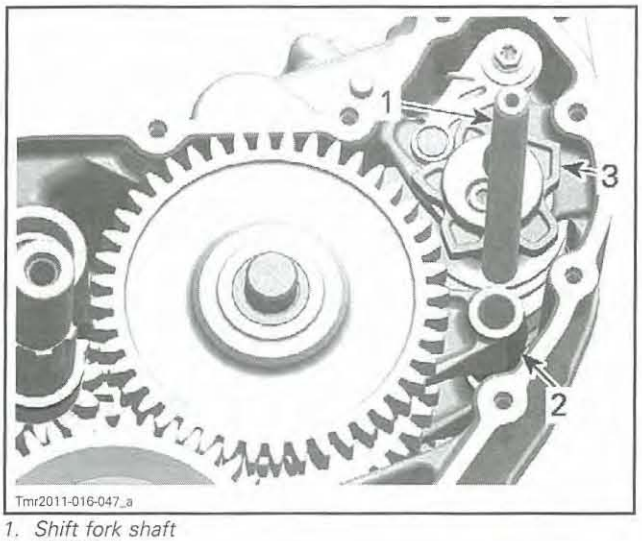
NOTE: Take care not to lose lower thrust washer during removal.



1. *Bearing pin*
2. *Reverse intermediate gear*
3. *Needle bearing*
4. *Thrust washers*

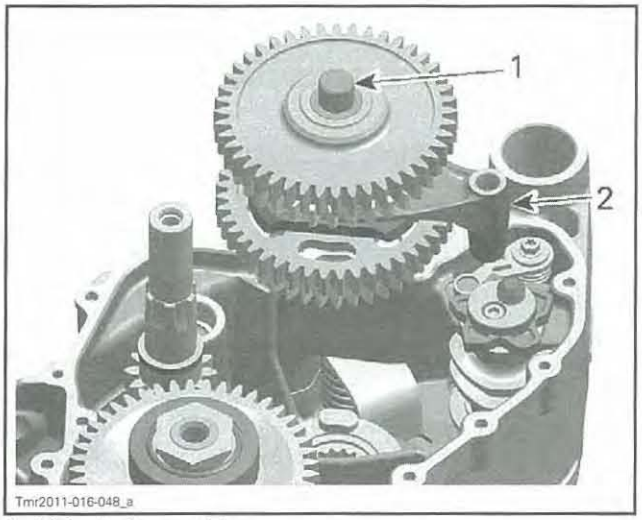
Remove shift fork shaft.

Disengage shift forks from shift drum.



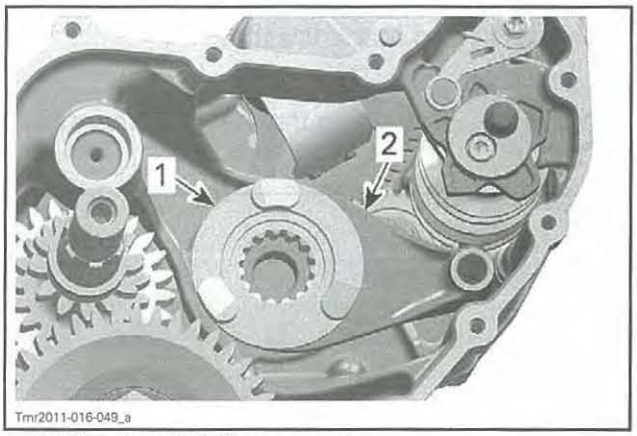
1. *Shift fork shaft*
2. *Shift fork*
3. *Shift drum*

Remove main shaft assembly with shift fork.



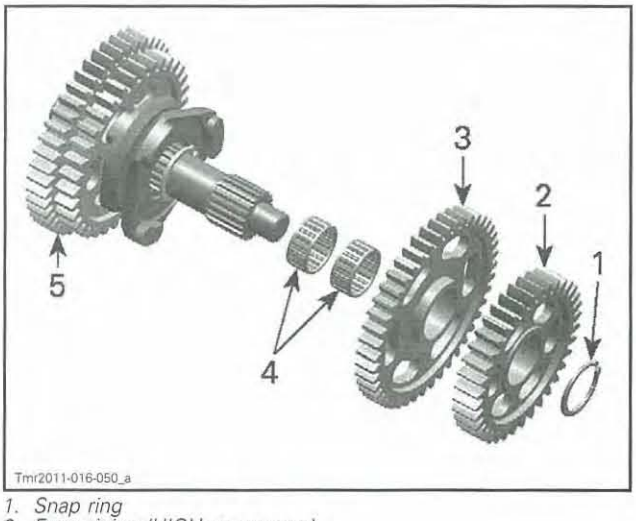
1. *Main shaft assembly*
2. *Shift fork*

Remove shifting sleeve (HIGH range gear) and shift fork.



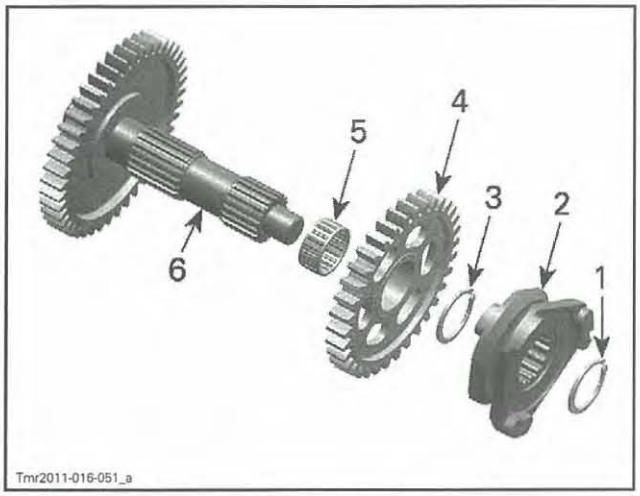
1. *Shifting sleeve (HIGH range gear)*
2. *Shift fork*

When required, remove from main shaft assembly:
- Snap ring (discard)
- HIGH range gear
- LOW range gear
- Needle bearings.



1. *Snap ring*
2. *Free pinion (HIGH range gear)*
3. *Free pinion (LOW range gear)*
4. *Needle bearing*
5. *Main shaft assembly*

Remove from main shaft assembly:
- Snap ring (discard)
- Shifting sleeve (LOW/REVERSE range gear)
- Snap ring (discard)
- REVERSE range gear
- Needle bearing.

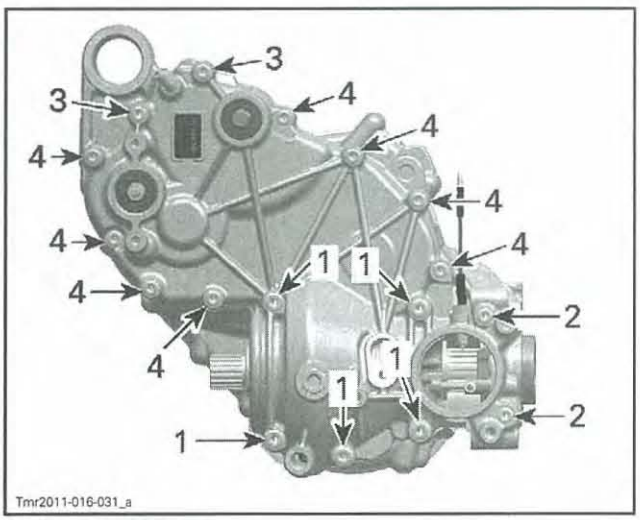


1. *Snap ring*
2. *Shifting sleeve (LOW/REVERSE range gear)*
3. *Snap ring*
4. *Free pinion (REVERSE range gear)*
5. *Needle bearing*
6. *Main shaft assembly*

Gearbox Right Cover

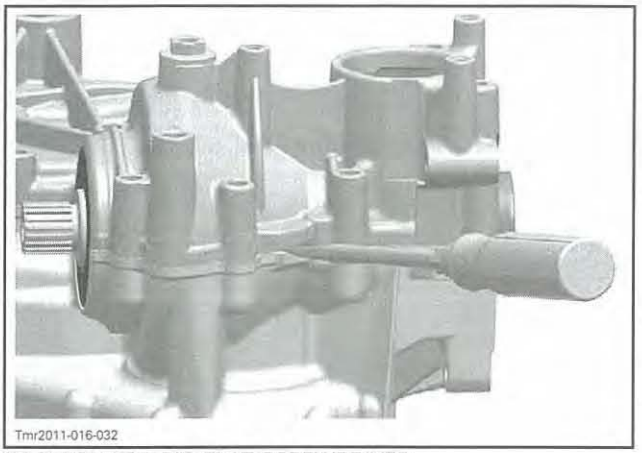
Remove *ACTUATOR* and *GBPS (GEARBOX POSITION SENSOR)*, see procedures in this subsection.

Unscrew all bolts retaining the gearbox right cover.



1. *5 screws M8 x 55*
2. *2 screws M6 x 85*
3. *2 screws M6 x 55*
4. *8 screws M6 x 35*

To remove cover, use 2 big screwdrivers.

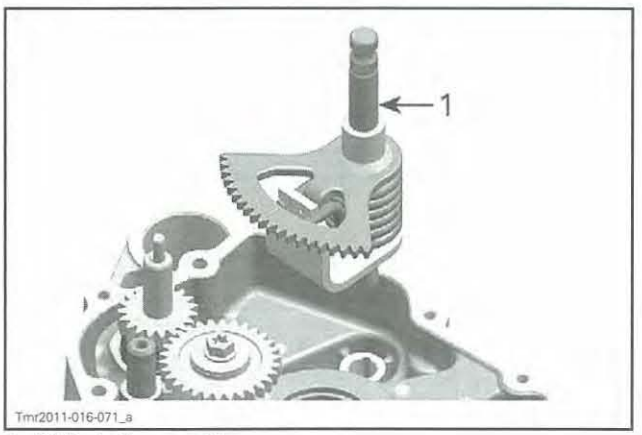


POSITION FOR BIG FLAT SCREWDRIVER

POSITION FOR BIG FLAT SCREWDRIVER

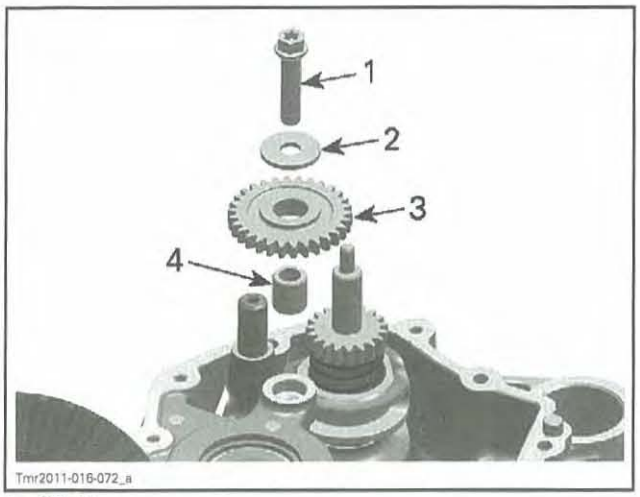
Shift Shaft and Shift Drum

Withdraw shift shaft assembly.



1. *Shift shaft assembly*

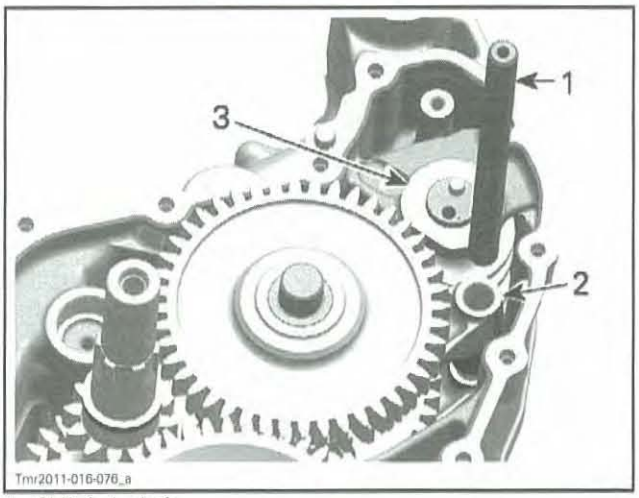
Remove screw retaining the shifting intermediate gear.



1. *Screw*
2. *Washer*
3. *Intermediate gear*
4. *Dowel pin*

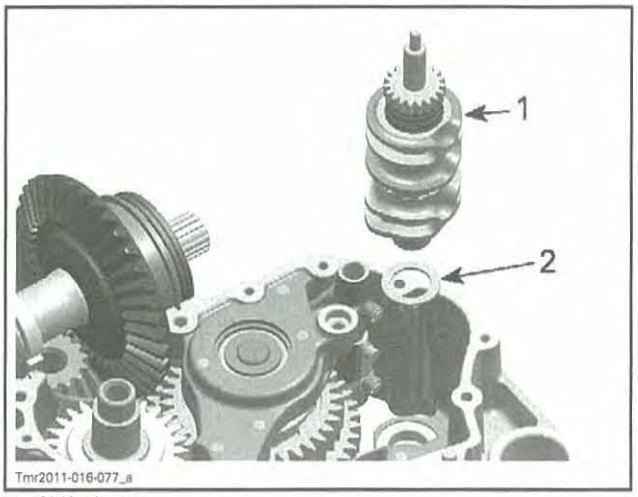
Remove shift fork shaft.

Disengage shift forks from shift drum.



1. *Shift fork shaft*
2. *Shift fork*
3. *Shift drum*

Remove shift drum and thrust washer.

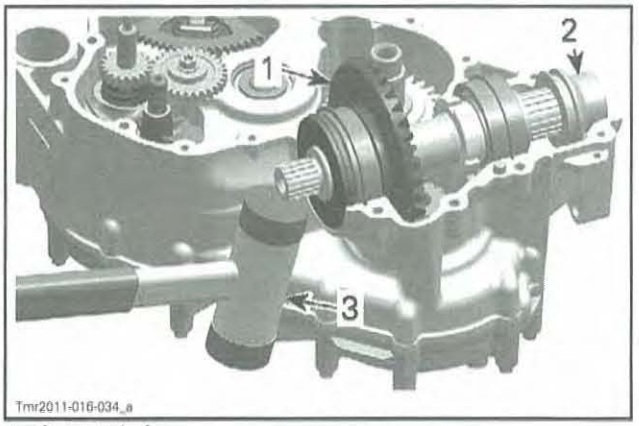


1. *Shift drum*
2. *Thrust washer*

Output Shaft and 4x4 Coupling Mechanism

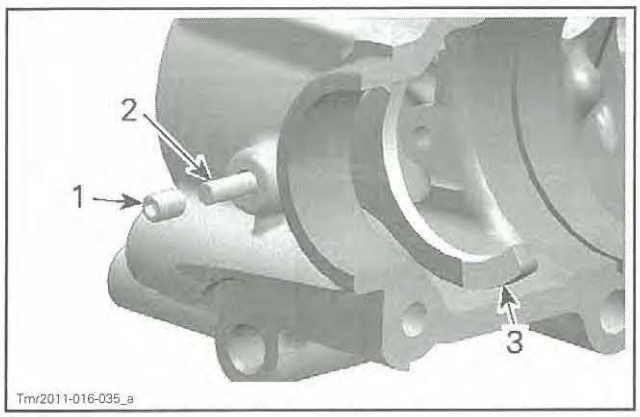
Remove output shaft from center housing and withdraw 4x4 coupling sleeve.

NOTICE **Use a soft hammer to remove output shaft.**



1. *Output shaft*
2. *4x4 coupling sleeve*
3. *Soft hammer*

Remove set screw, coupling fork shaft and coupling fork from right cover.

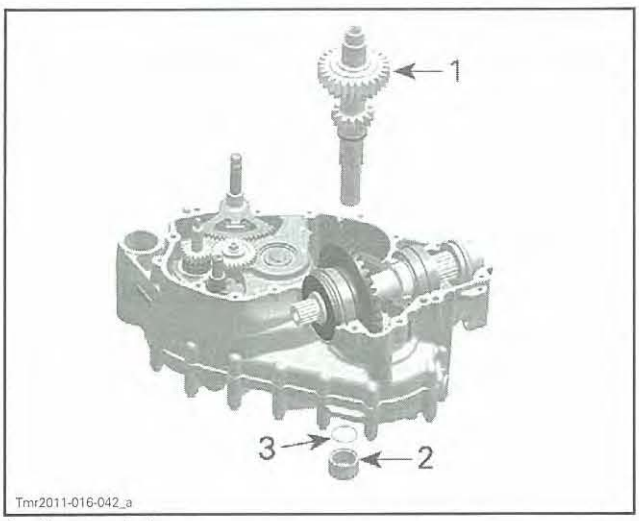


1. *Set screw*
2. *Coupling fork shaft*
3. *Coupling fork*

Countershaft

Use a soft hammer to push out countershaft from gearbox CVT side.

Remove distance sleeve and O-ring.



1. *Countershaft*
2. *Distance sleeve*
3. *O-ring*

Gearbox Bearings

If necessary heat housing up to 100°C (212°F) before removing ball bearings.

⚠ WARNING

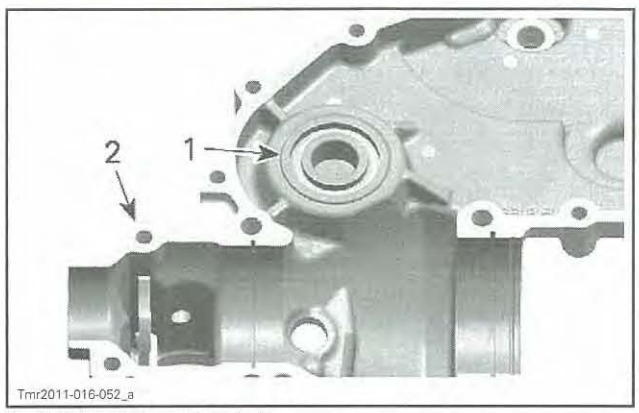
Clean oil, outside and inside, from housing before heating.

NOTICE Always support gearbox housings properly when ball bearings are removed. Housing damages may occur if this procedure is not performed correctly.

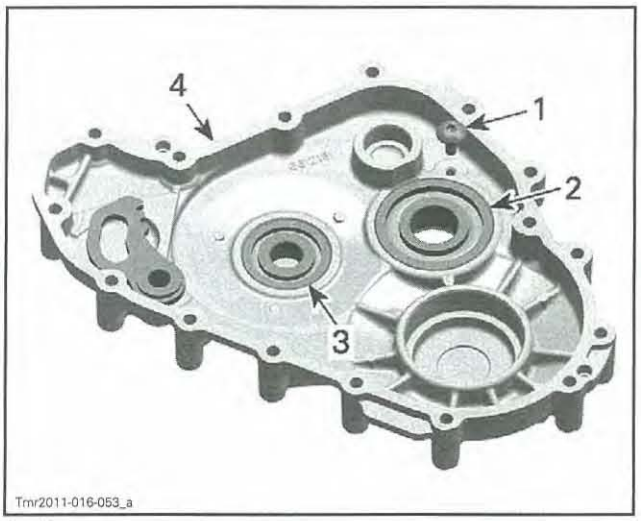
To remove ball bearings of countershaft (right cover) and main shaft (left cover) use the BLIND HOLE BEARING PULLER SET (P/N 529 036 117).

Remove screw securing the countershaft bearing in the left cover.

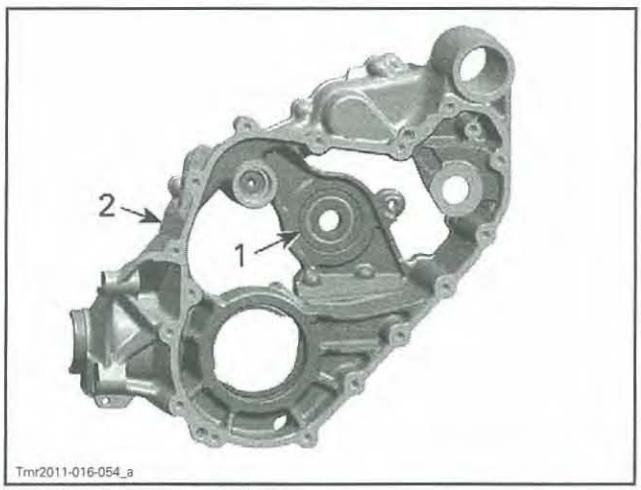
For ball bearings of countershaft (left cover) and main shaft (center housing) push with a suitable puller from outside in.



1. *Ball bearing countershaft*
2. *Right cover*



1. *Screw*
2. *Ball bearing countershaft*
3. *Ball bearing main shaft*
4. *Left cover*



1. *Ball bearing main shaft*
2. *Center housing*

Gearbox Inspection

Always verify for the following when inspecting gearbox components:

- Gear teeth damage
- Worn or scoured bearing surfaces
- Rounded engagement dogs and slots
- Worn shift fork engagement groove
- Worn splines on shafts and shifting sleeves.

Bearings

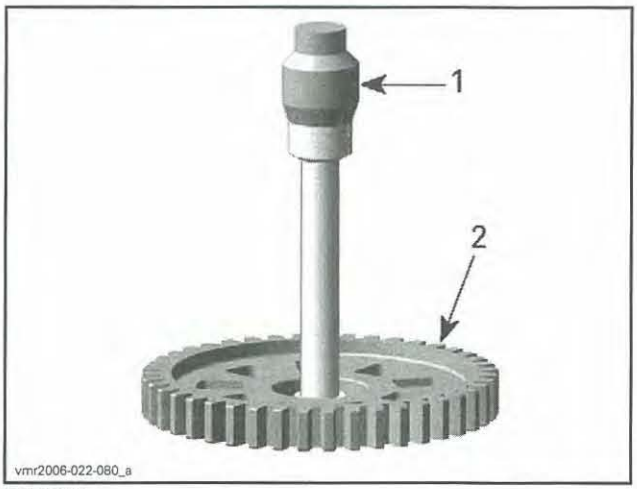
Check if ball bearings turn freely and smoothly.

Check all bearings, bearing points, tooth flanks and taper grooves.

Free Pinions

NOTE: Always replace snap rings and use special pliers to install them.

Check free pinions for wear.

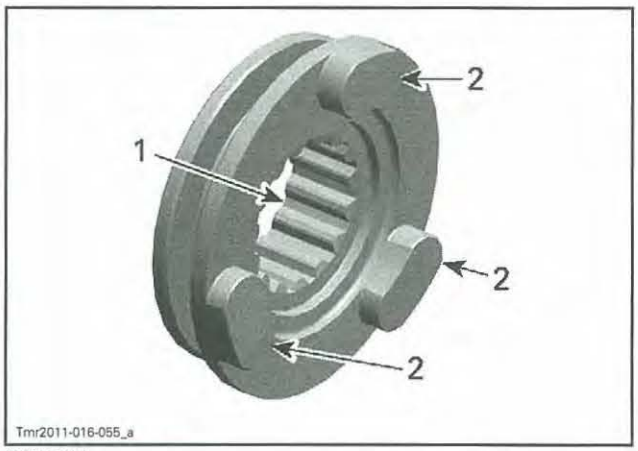


TYPICAL
1. *Micrometer*
2. *Free pinion*

DIAMETER FREE PINION	
NEW	29.000 mm to 29.013 mm (1.1417 in to 1.1422 in)
SERVICE LIMIT	29.015 mm (1.1423 in)

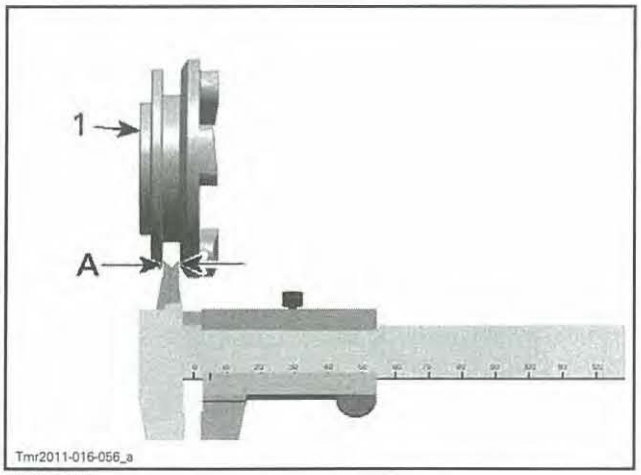
Shifting Sleeves

Check shifting sleeves for worn inner splines and rounded or damaged engagement dogs.



TYPICAL
1. *Inner splines*
2. *Engagement dogs*

Measure the width of shift fork engagement groove.

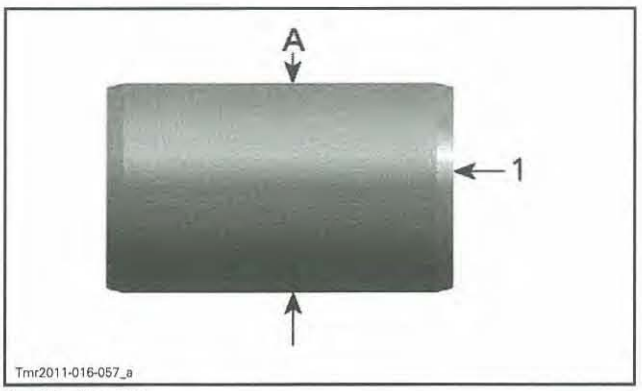


TYPICAL
1. Shifting sleeve
A. Width of shift fork engagement groove

WIDTH OF SHIFT FORK ENGAGEMENT GROOVE	
NEW	5.30 mm to 5.40 mm (.209 in to .213 in)
SERVICE LIMIT	5.50 mm (.217 in)

Shafts

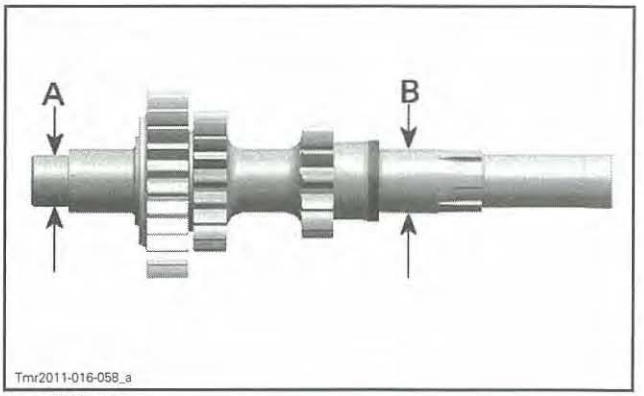
Check bearing pin of reverse intermediate gear for wear.



1. Bearing pin
A. Outer diameter

BEARING PIN OUTER DIAMETER	
NEW	24.987 mm to 25.000 mm (.984 in to .984 in)
SERVICE LIMIT	24.977 mm (.9833 in)

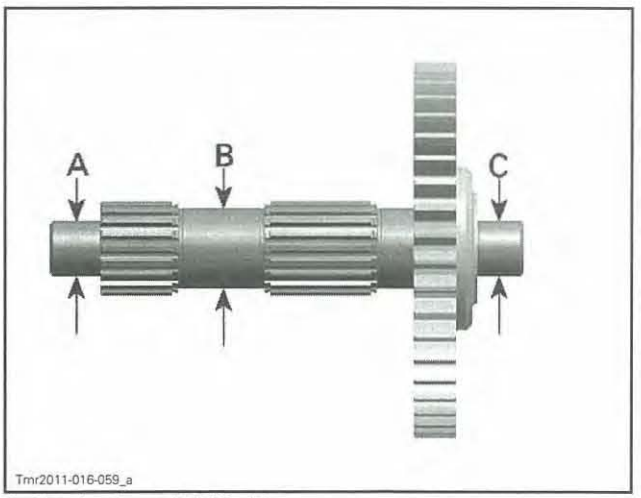
Check countershaft bearing journals for wear.



A. MAG side
B. Bearing journal CVT side

COUNTERSHAFT BEARING JOURNALS	
MAG SIDE	
NEW	19.977 mm to 19.990 mm (.786 in to .787 in)
SERVICE LIMIT	19.973 mm (.786 in)
CVT SIDE	
NEW	24.977 mm to 24.990 mm (.983 in to .984 in)
SERVICE LIMIT	24.970 mm (.983 in)

Check main shaft for wear.



A. Bearing journal MAG side
B. Free pinion bearing
C. Bearing journal CVT side

MAIN SHAFT	
FREE PINION BEARING	
NEW	24.987 mm to 25.000 mm (.984 in to .984 in)
SERVICE LIMIT	24.984 mm (.984 in)
BEARING JOURNAL CVT/MAG SIDE	
NEW	16.980 mm to 16.991 mm (.669 in to .669 in)
SERVICE LIMIT	16.976 mm (.668 in)

Shift Shaft

Check shift shaft for worn splines and gears.

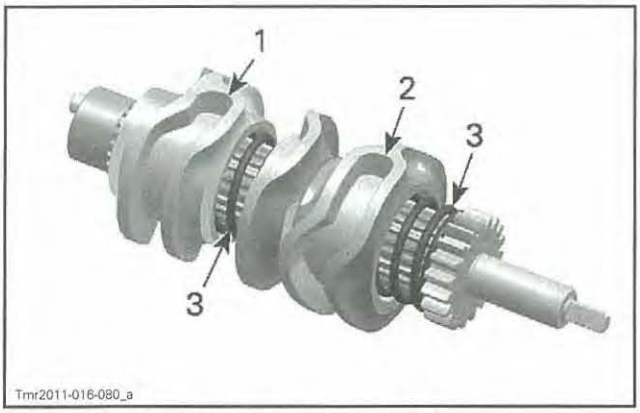
Check shift shaft spring for damages.

Shift Drum

NOTICE **Do not disassemble shift drum.**

Check if shifting gates move easily on shift drum splines and check condition of springs.

Check shift drum tracks for scouring or heavy wear, like rounded engagement slots.



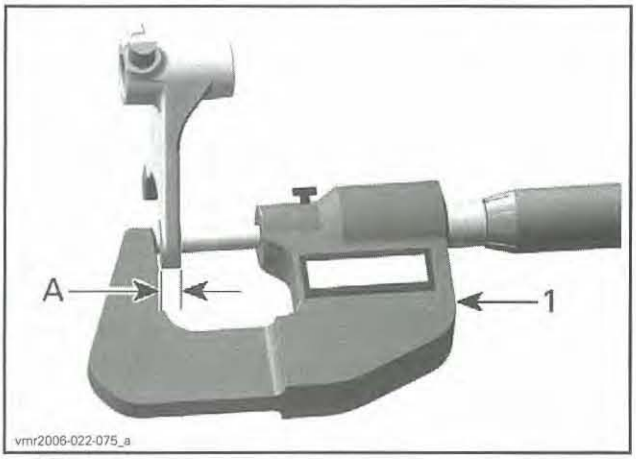
1. *Track for the low/reverse range gear shift fork*
2. *Track for the high range gear shift fork*
3. *Springs*

Shift Forks

Check both shift forks for visible damage, wear or bent shift fork claws.

Check engagement rollers for wear and smooth movement.

Measure the shift fork claw thickness.



1. *Micrometer*

A. Shift fork claw thickness

SHIFT FORK CLAW THICKNESS	
NEW	5.10 mm to 5.20 mm (.201 in to .205 in)
SERVICE LIMIT	5.00 mm (.197 in)

Shift Fork Shaft

Check shift fork shaft for visible damage or wear.

Check if shift fork shaft is straight.

Index Lever and Parking Lever

Index lever with roller must move freely.

Check parking lever for cracks or other damages.

Output Shaft

Check output shaft and its gear for cracks, bend, pitting or other visible damages.

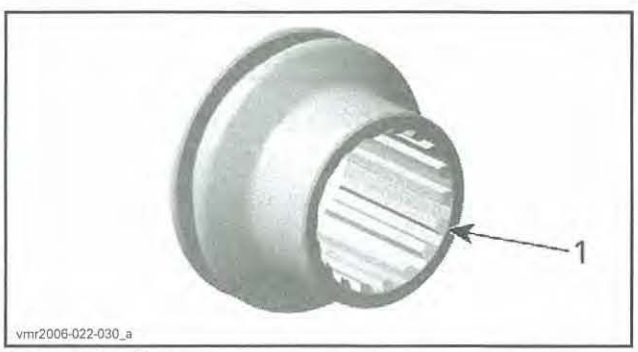
Check output shaft splines for wear or other damages.

Check if the output shaft bearings turn freely and smoothly.

Replace oil seal if brittle, hard or damaged.

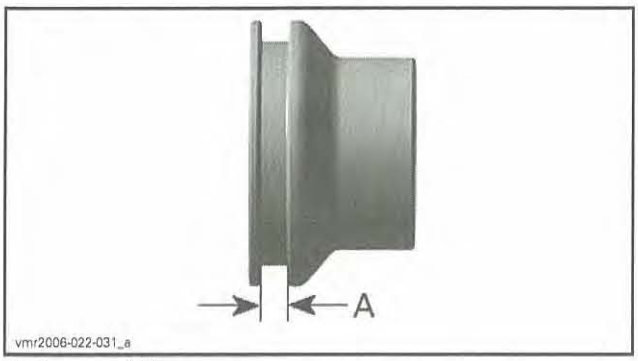
4x4 Coupling Sleeve

Check splines of coupling sleeve for wear or other damages.



1. *Inspect splines*

Measure the coupling sleeve groove width.



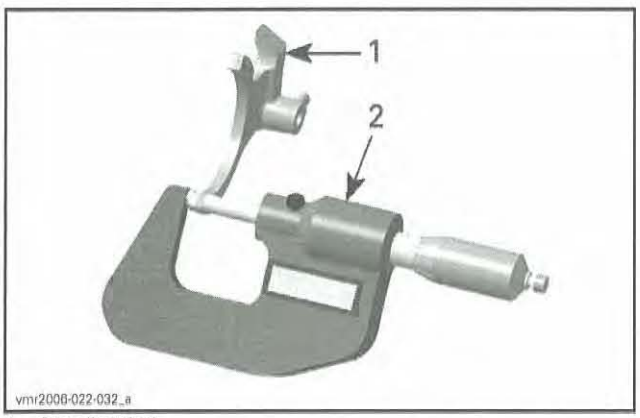
A. Groove width

COUPLING SLEEVE GROOVE WIDTH	
NEW	5.25 mm to 5.35 mm (.207 in to .211 in)
SERVICE LIMIT	5.50 mm (.217 in)

Coupling Fork

Check coupling fork for visible damage, wear or bent coupling fork claws.

Check coupling fork claw thickness.



1. Coupling fork
2. Micrometer

COUPLING FORK CLAW THICKNESS	
NEW	4.95 mm to 5.05 mm (.195 in to .199 in)
SERVICE LIMIT	4.80 mm (.189 in)

Gearbox Assembly

The assembly of gearbox is essentially the reverse of disassembly procedure. However, pay attention to the following details.

Gearbox Bearings

Unless otherwise instructed, never use hammer to install ball bearings. Use press machine only.

If necessary heat housings up to 100°C (212°F) before installing ball bearings.

⚠ WARNING

Clean oil, outside and inside, from housing before heating.

Place new bearing in freezer for 10 minutes before installation.

Use a suitable installer for installing ball bearings of countershaft and main shaft.

NOTE: Place gearbox housings on a wood stand before installing ball bearings.

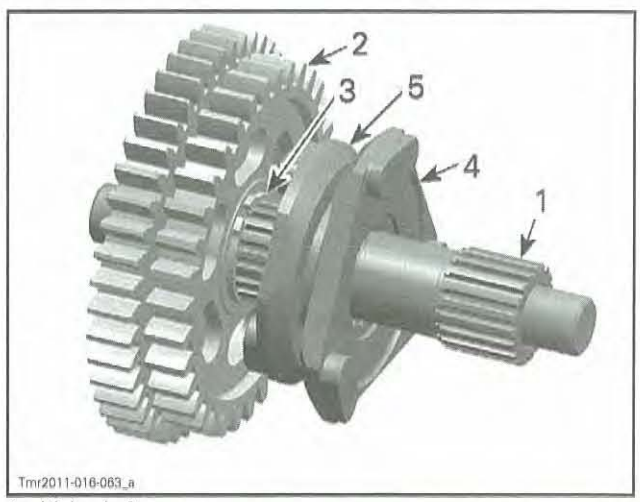
Install new oil seals with the proper installer (refer to *OIL SEALS* in this subsection).

Main Shaft and Shift Forks

Install NEW snap rings.

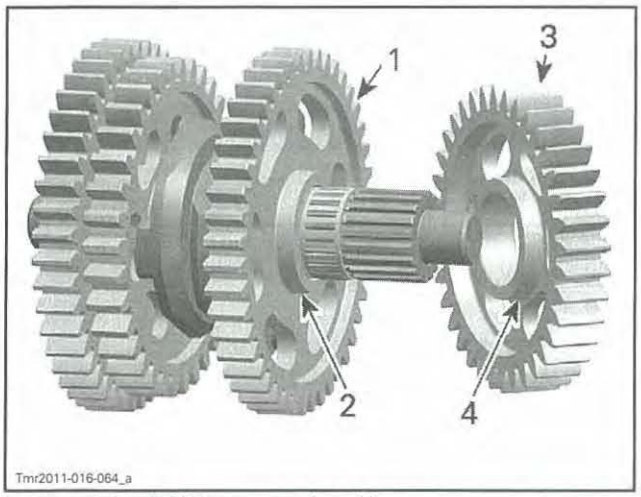
NOTE: Ensure snap rings are installed in the grooves properly.

Install free pinion (REVERSE range gear) and shifting sleeve (LOW/REVERSE range gear) properly.



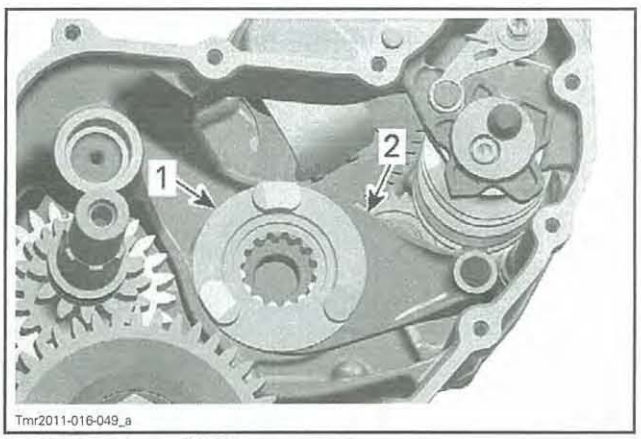
1. Main shaft
2. Free pinion (REVERSE range gear)
3. Snap ring
4. Shifting sleeve (LOW/REVERSE range gear)
5. Shifting dogs (REVERSE range gear)

Collars of free pinion (LOW range gear) and free pinion (HIGH range gear) must point together.



1. *Free pinion (LOW range gear), 44 T*
2. *Collar*
3. *Free pinion (HIGH range gear), 36 T*
4. *Collar*

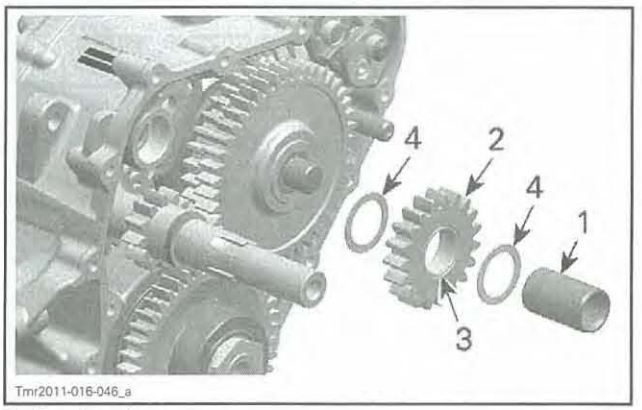
Place shifting sleeve (HIGH range gear) with shift fork in the center of on main shaft bearing in center housing.



1. *Shifting sleeve (HIGH range gear)*
2. *Shift fork*

Carefully fit main shaft assembly with shift fork (LOW/REVERSE range gear) into inner splines of shifting sleeve (HIGH range gear).

Install reverse intermediate gear.



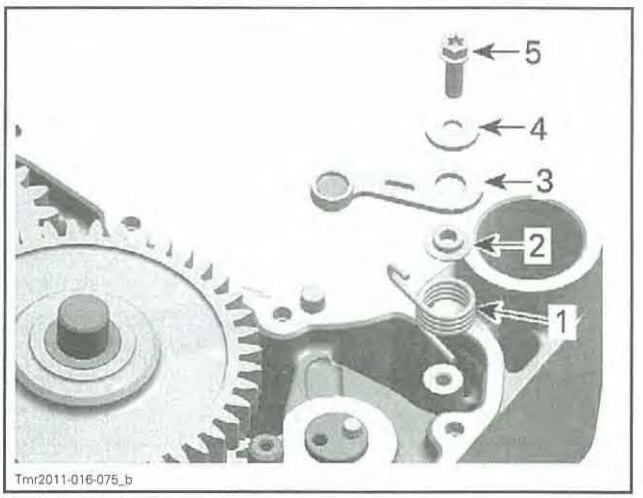
1. *Bearing pin*
2. *Reverse intermediate gear*
3. *Needle bearing*
4. *Thrust washers*

Finally engage shift forks in shift drum and install shift fork shaft.

NOTE: Run all gears as a final function check before installing left housing.

Index Lever and Index Washer

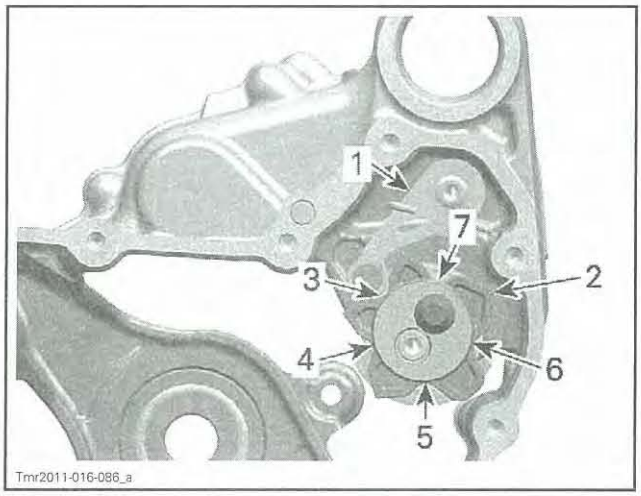
Fit step ring into index lever.



1. *Index spring*
2. *Step ring*
3. *Index lever*
4. *Washer*
5. *Screw*

Install index washer on shift drum.

Insert a flat screwdriver in the slot of the index lever, turn screwdriver clockwise and engage lever in index washer in neutral position as per following illustration.



1. *Index lever*
2. *Index washer*
3. *Neutral position*
4. *High range gear position*
5. *Low range gear position*
6. *Parking position*
7. *Reverse range gear position*

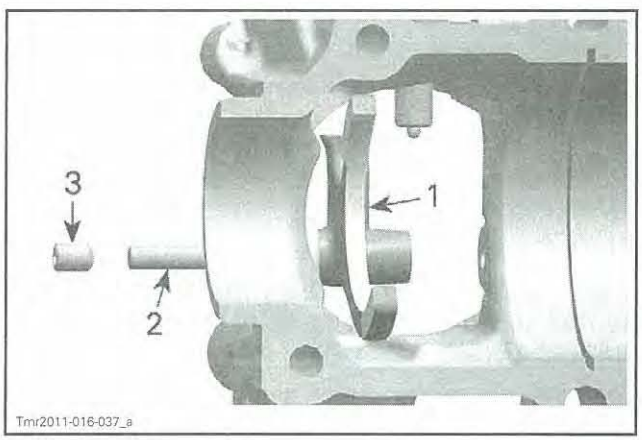
Output Shaft and 4x4 Coupling Mechanism

Install coupling sleeve onto the output shaft.

Place the output shaft with oil seal and coupling sleeve into the center housing.

NOTE: If same oil seal is installed, turn oil seal 90° offset to its original position to avoid leakage at housing mating surface.

Install coupling fork, coupling fork shaft and set screw in right cover before applying sealant to the mating surface.

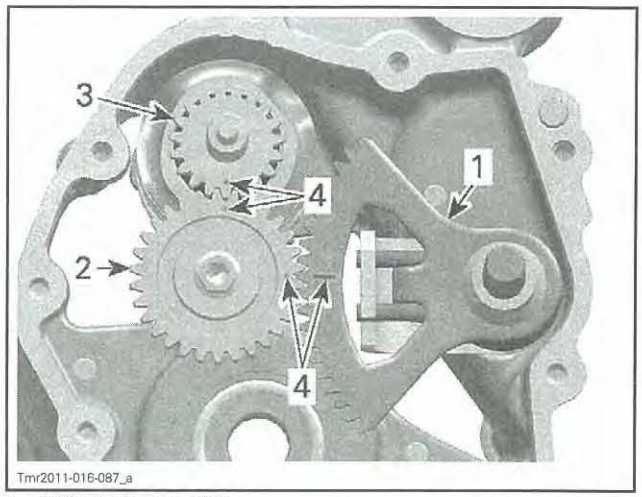


1. *Coupling fork*
2. *Coupling fork shaft*
3. *Set screw*

Shift Shaft and Shift Drum

Install shift drum and shift shaft.

Install shifting intermediate gear. Align its marks with the marks on shift drum gear and shift shaft.



1. *Shift shaft assembly*
2. *Shifting intermediate gear*
3. *Shift drum gear*
4. *Marks*

Engage both shift fork pins in their corresponding groove on the shift drum.

Install shift fork shaft.

NOTE: Turn gears to validate proper operation.

Sealing Compound Application

NOTE: Unless otherwise specify, the procedure to apply the sealant is the same for right or left cover.

Clean all metal components in a solvent.

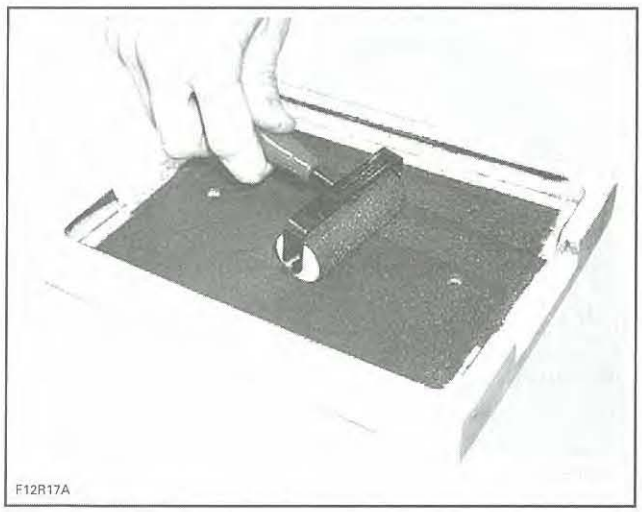
Gearbox housing mating surfaces are best cleaned using a combination of LOCTITE CHISEL (GASKET REMOVER) (P/N 413 708 500) and a brass brush. Brush a first pass in one direction then make the final brushing perpendicularly (90°) to the first pass cross (hatch).

NOTICE **Do not wipe with rags. Use a new clean hand towel only.**

IMPORTANT: When beginning the application of the gear housing sealant, the assembly and the first torquing should be done within 10 minutes. It is suggested to have all you need on hand to save time.

Use LOCTITE 5910 (P/N 293 800 081) on mating surfaces.

Use a plexiglass plate and apply some sealant on it. Use a soft rubber roller (50 mm - 75 mm (2 in - 3 in)), available in arts products suppliers for printing, and roll the sealant to get a thin uniform coat on the plate (spread as necessary). When ready, apply the sealant on gear housing mating surfaces.



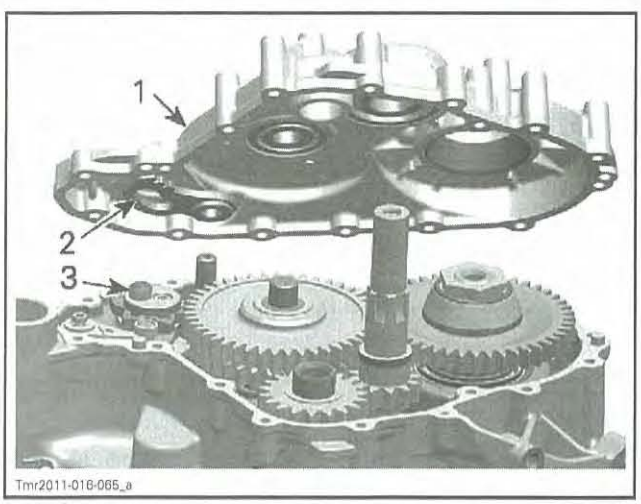
Do not apply in excess as it will spread out inside gear housing.

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

Left Cover

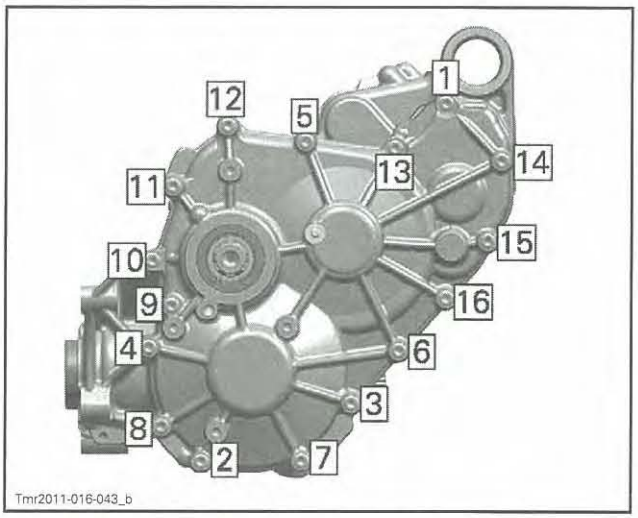
Apply sealing compound on mating surfaces of central housing. Refer to *SEALING COMPOUND APPLICATION*.

At installation of left cover, engage parking lock lever slot onto index washer pin.



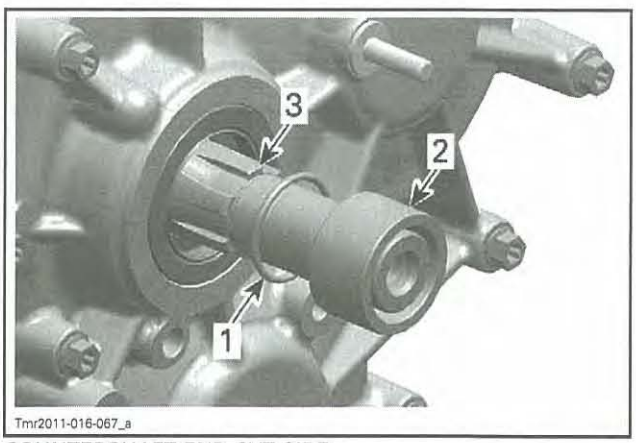
1. Left cover
2. Parking lock lever slot
3. Index washer pin

Install all screws on left cover and tighten them as per following sequence.



Install O-ring including distance sleeve on countershaft CVT side.

NOTICE Place O-ring including distance sleeve right away. Chamfered bore of distance sleeve has to face the gearbox.



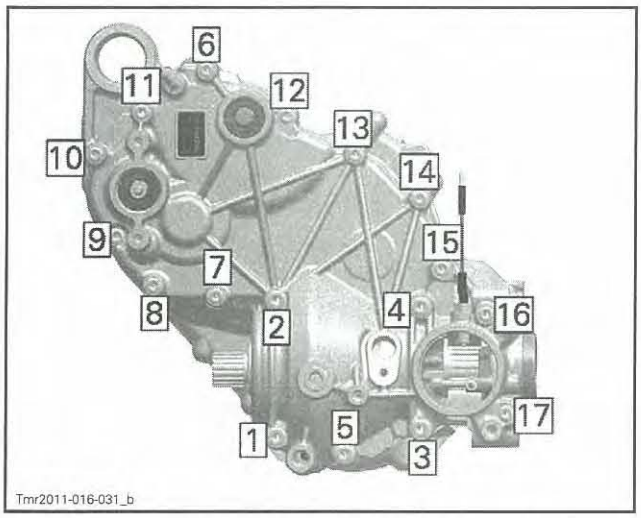
COUNTERSHAFT END CVT SIDE
1. O-ring
2. Distance sleeve
3. Countershaft end CVT side

Right Cover

Apply sealing compound on mating surfaces of central housing. Refer to *SEALING COMPOUND APPLICATION*.

To install the right cover align the coupling fork with the groove in the coupling sleeve.

Install all screws on right cover and tighten them as per following sequence.

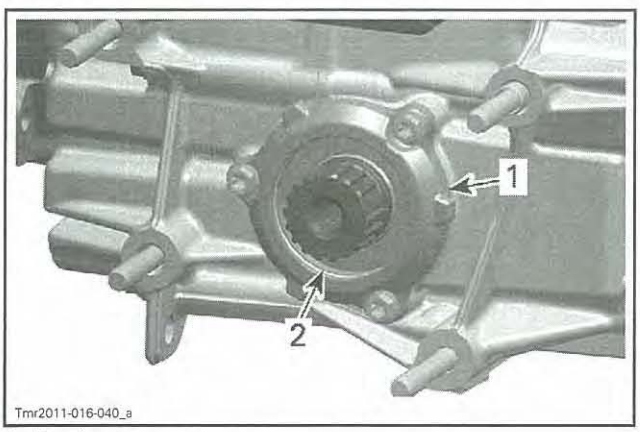


Install the actuator, refer to *ACTUATOR*.

Gearbox Installation

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

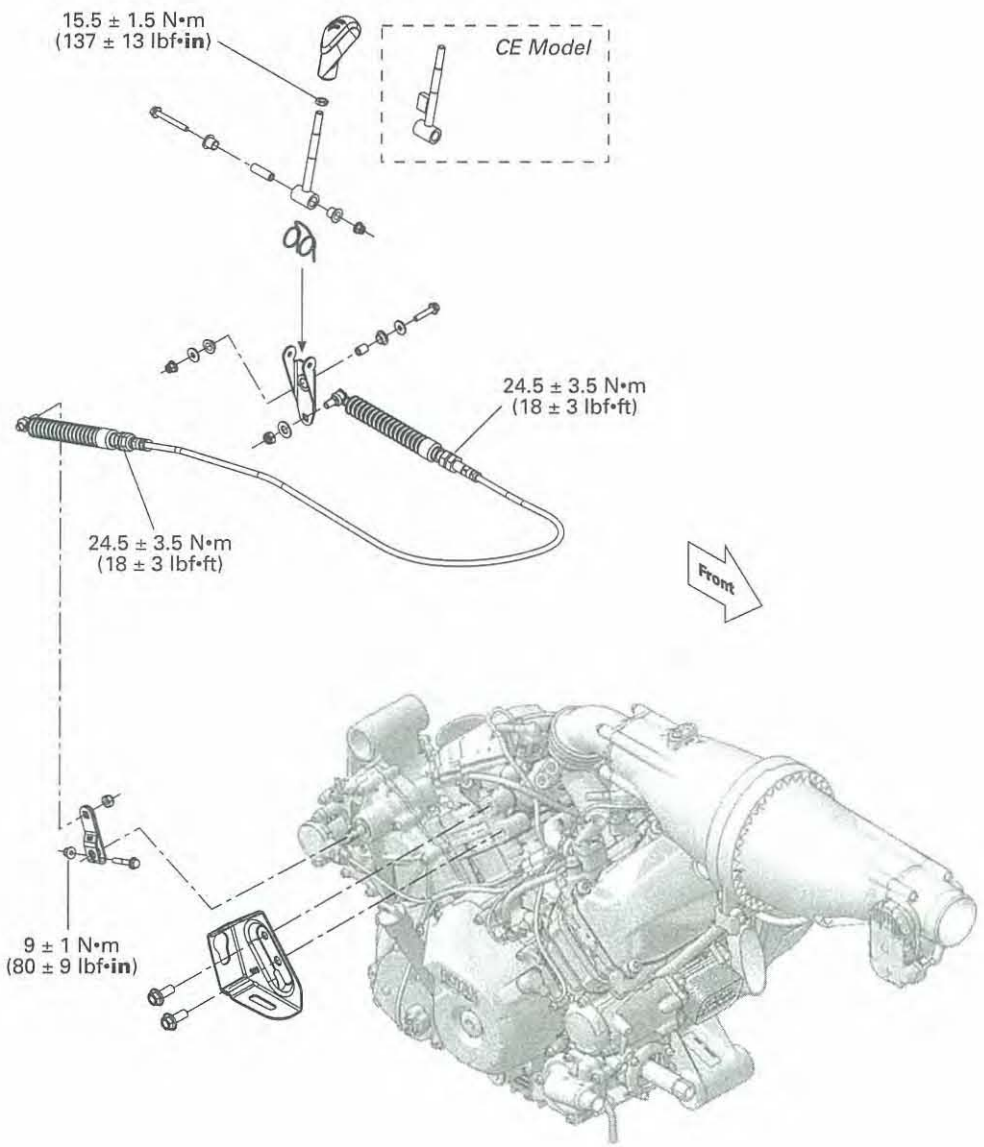
Before gearbox installation check O-ring in bearing cover if brittle, hard or damaged. Replace if necessary.



1. Bearing cover
2. O-ring

After installation refill gearbox oil, refer to *PERIODIC MAINTENANCE PROCEDURES*.

SHIFTER



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GENERAL

Before performing any servicing on shifter system, be sure the shift lever is on NEUTRAL position and the vehicle is secured using wheel blocks.

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 must be replaced when removed (e.g.: locking tabs, cotter pins, etc.).

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

PROCEDURES

SHIFT LEVER

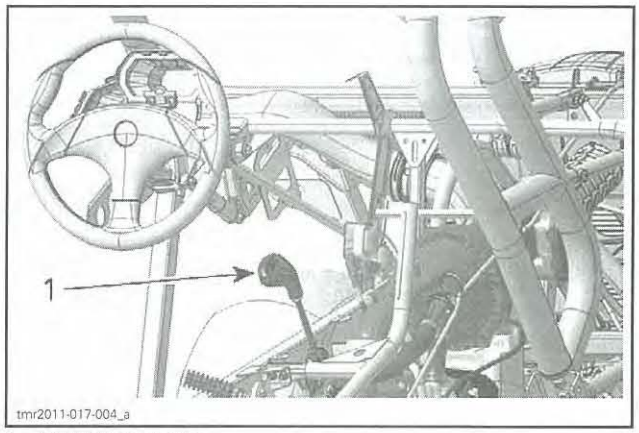
Shift Lever Access

1. Refer to *BODY* subsection and remove the following components:
   - Seats
   - Lower console
   - RH and LH lateral console panels.

NOTE: Move upper console upwards to access to lower console.

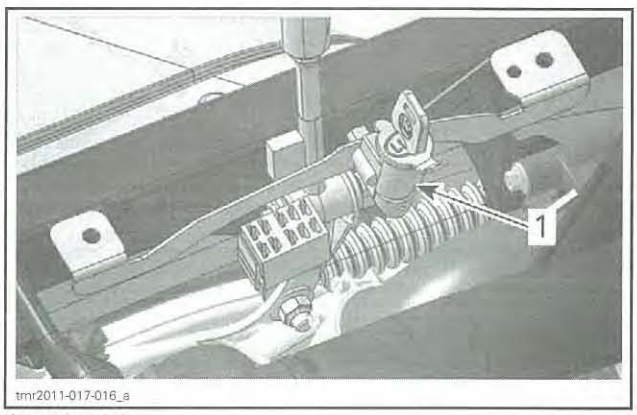
Shift Lever Removal

1. Remove body parts as required. Refer to *SHIFT LEVER ACCESS* in this subsection.
2. Place shift lever in NEUTRAL position.
3. Secure vehicle using wheel blocks.
4. Unscrew shift lever handle.



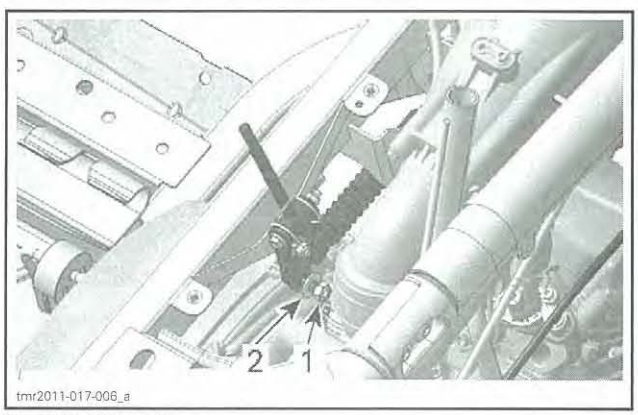
1. Shift lever handle

5. On CE models, remove locking device from vehicle.



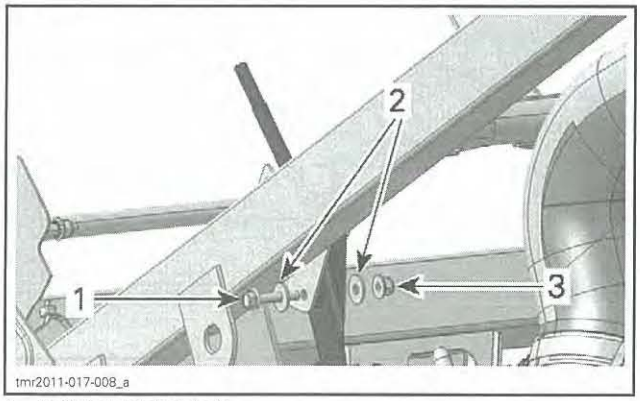
CE MODELS
1. Locking device

6. Detach shifter cable from shift lever by removing nut and washer.



1. Shift lever nut
2. Shift lever washer

7. Remove shift lever pivot bolt, washers and nut.



1. *Shift lever pivot bolt*
2. *Shift lever pivot washers*
3. *Shift lever pivot nut*

8. Remove shift lever.

Shift Lever Inspection

Check shift lever for bending or cracks.

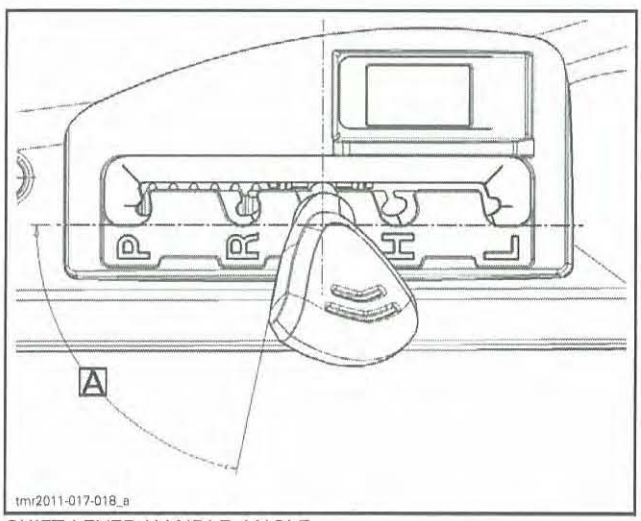
Check spring and bushing condition.

Replace all damaged parts.

Shift Lever Installation

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

Adjust shift lever handle as per the following illustration.



SHIFT LEVER HANDLE ANGLE
A. 78° ± 5°

Tighten shift lever handle nut to specification.

SHIFT LEVER HANDLE NUT TORQUE
15.5 N•m ± 1.5 N•m (137 lbf•**in** ± 13 lbf•**in**)

Adjust shifter cable, refer to *SHIFTER CABLE ADJUSTMENT* in this subsection.

Check if shift lever works properly in all positions.

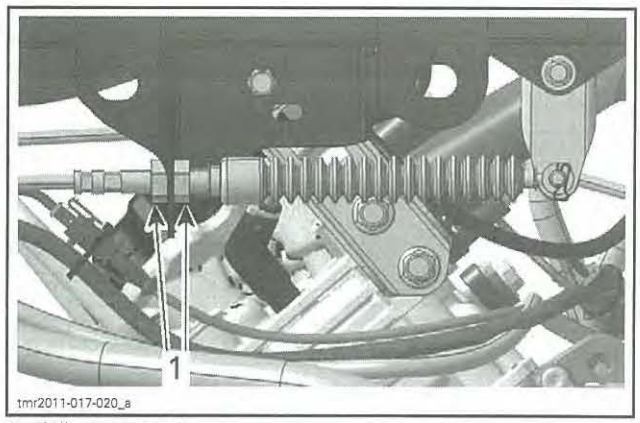
SHIFTER CABLE

Shifter Cable Adjustment

1. Place shift lever in NEUTRAL position.

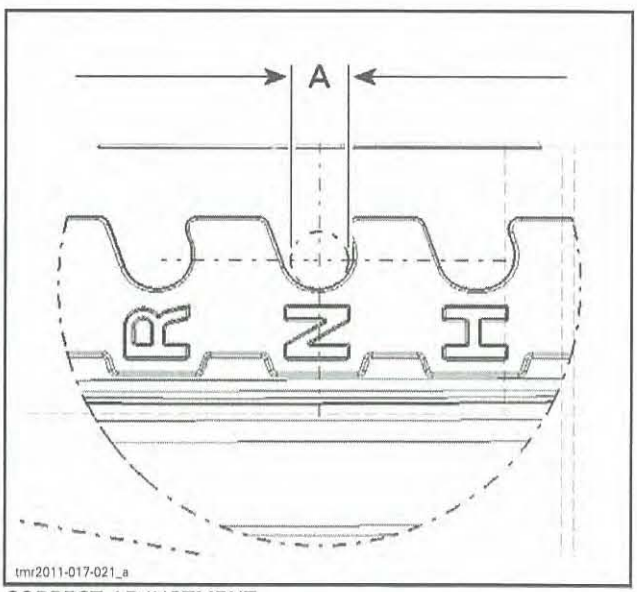
NOTICE **Move vehicle back and forth to ensure gearbox is set in neutral position.**

2. Secure vehicle using wheel blocks.
3. Remove body parts as required. Refer to *SHIFT LEVER ACCESS* in this subsection.
4. Loosen cable adjustment nuts.

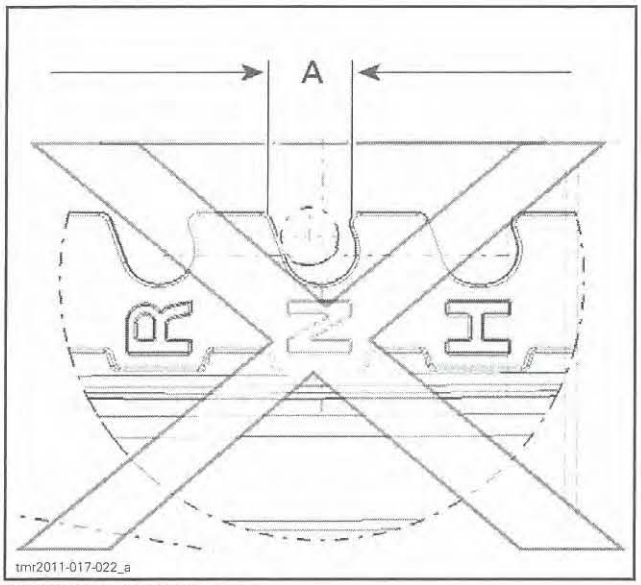


1. *Adjustment nuts*

5. Adjust cable nuts in order to center shift lever in neutral notch.



CORRECT ADJUSTMENT
A. Shift lever centered in neutral notch

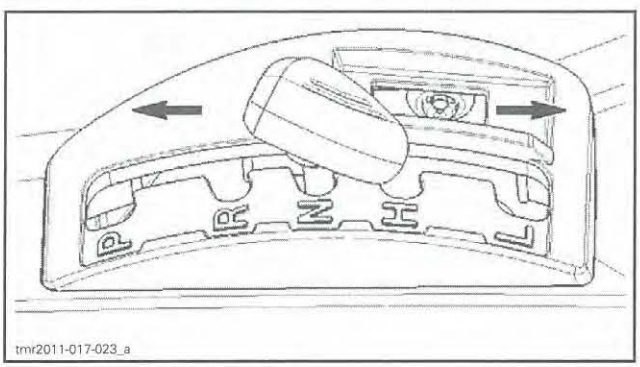


WRONG ADJUSTMENT
A. Shift lever centered in neutral opening

6. Tighten cable adjustment nuts to specification.

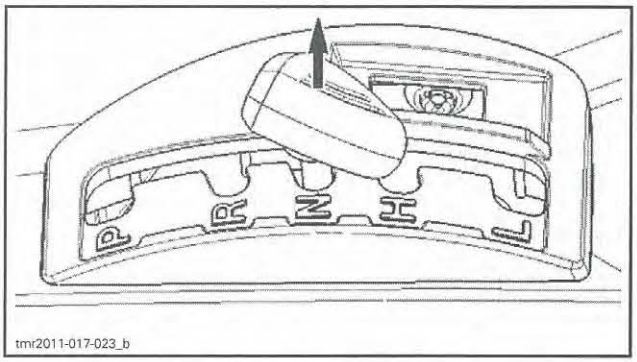
ADJUSTMENT NUTS TORQUE
24.5 N•m ± 3.5 N•m (18 lbf•ft ± 3 lbf•ft)

7. Move shift lever in R position then in H position.



8. Place shift lever in NEUTRAL position.
9. Check if shift lever is properly centered in neutral notch. Readjust as required.

NOTE: To properly check shift lever alignment into notch, move shift lever toward the RH side then let it return to position.



10. Test the shifter to confirm that the system works properly in all positions.

⚠ WARNING

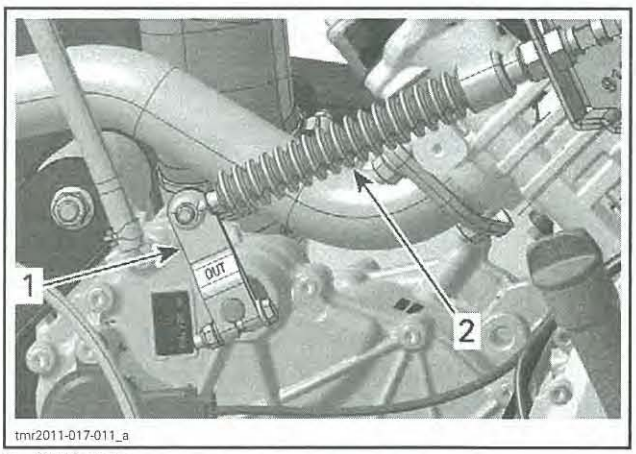
After adjustment, make sure that PARK position works properly.

SHIFT PLATE

Shift Plate Removal

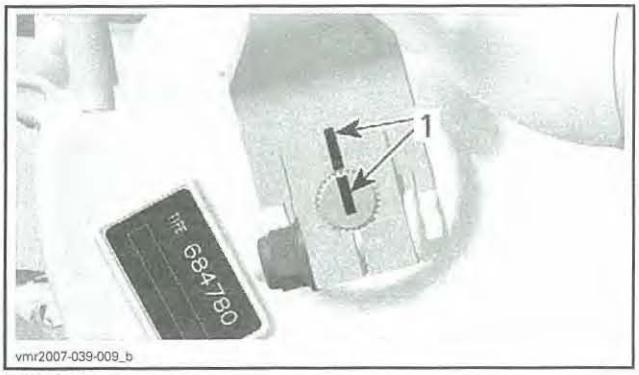
NOTE: Do not remove shift plate needlessly.

1. Remove shifter cable from shift plate.



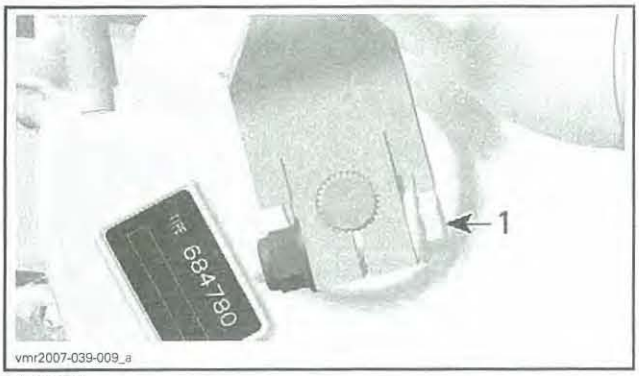
1. Shift plate
2. Shifter cable

2. Index shift plate and shift shaft.



TYPICAL
1. Trace a mark on both parts

3. Remove shift plate nut and bolt.



TYPICAL
1. Shift plate bolt

4. Remove shift plate.

Shift Plate Inspection

Check shift plate for:
- Cracks
- Bending
- Spline condition.

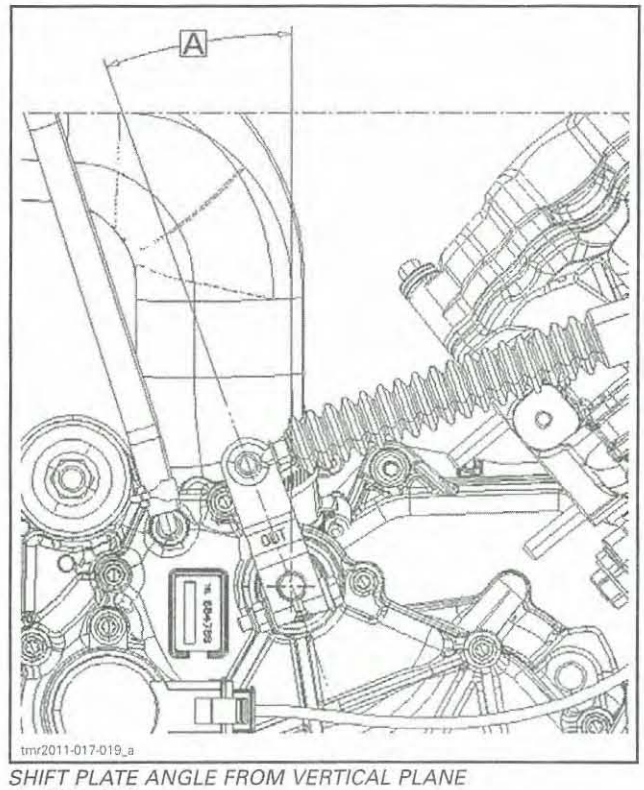
Shift Plate Installation

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

Place gearbox in NEUTRAL position before shift plate installation.

Install and align shift plate using marks previously traced.

If shift plate is installed on a new engine, adjust it as per the following illustration.



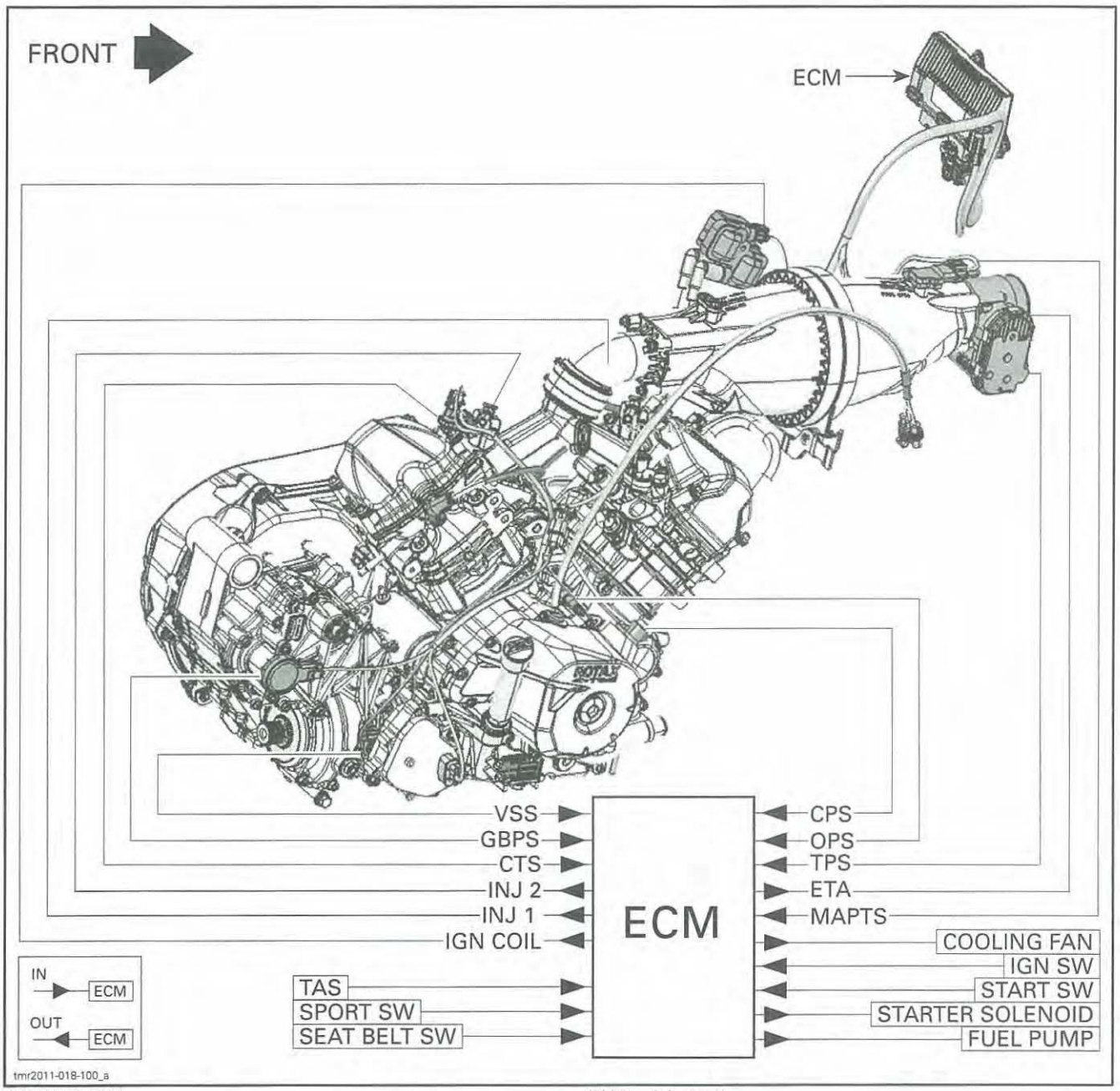
SHIFT PLATE ANGLE FROM VERTICAL PLANE
A. 20° ± 2.5°

Adjust shifter cable, refer to *SHIFTER CABLE ADJUSTMENT* in this subsection.

Tighten shift plate nut to specification.

SHIFT PLATE NUT TORQUE
9 N•m ± 1 N•m (80 lbf•**in** ± 9 lbf•**in**)

ENGINE MANAGEMENT SYSTEM (EMS)



COOLING FAN
CPS = Crankshaft Position Sensor
CTS = Cooling Temperature Sensor
ECM = Engine Control Module
ETA = Electric Throttle Actuator
FRONT
FUEL PUMP
GBPS = GearBox Position Sensor
IGN COIL = Ignition coil
IGN SW = Ignition switch
IN = Input
INJ 1= Injector 1
INJ 2 = Injector 2
MAPTS = Manifold Air Pressure/Temperature Tensor
OPS = Oil Pressure Switch
OUT = Output
SEAT BELT SWITCH
SPORT SWITCH
START SWITCH
STARTER SOLENOID
SW = Switch
TAS = Throttle Accelerator Sensor
TPS = Throttle Position Sensor
VSS = Vehicle Speed Sensor

GENERAL

SYSTEM DESCRIPTION

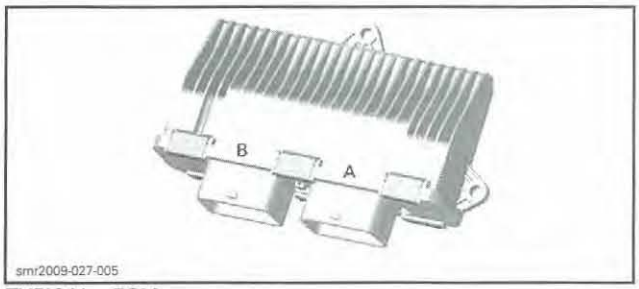
A highly advanced engine management system (EMS) is used to ensure a high power output with cleaner combustion.

There are 7 main systems that are controlled by the engine management system (EMS):

1. Electronic Fuel Injection (EFI)
2. Intelligent throttle control
3. Cooling system (cooling fan)
4. Ignition system
5. Starting system
6. Fuel pump system
7. D.E.S.S. system.

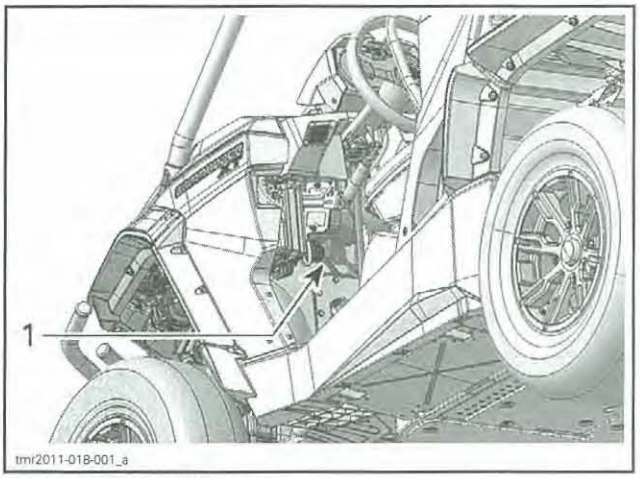
NOTE: For further information related to these systems, refer to the applicable subsection.

The ECM (Engine Control Module) is the central point of the engine management system.



TYPICAL - ECM

The ECM is located under the dashboard on the driver's side, above the control pedals.



TYPICAL - ECM LOCATION
1. ECM location

The ECM reads input signals from various switches, controls, and sensors, that it compares to pre-determined parameters, makes computations, and provides control signal outputs required for proper engine management.

The ECM also interacts through CAN bus with the gauge module for various functions, information exchange and display of messages. Refer to *CONTROLLER AREA NETWORK (CAN)* and *LIGHTS, GAUGE AND ACCESSORIES* subsections.

The ECM also features a permanent memory that will store the information on the various ignition keys programmed to the vehicle, fault codes, customer information, and other engine information, even when the battery is removed from the vehicle.

Diagnostic Mode

The ECM features a self-diagnostic mode that is activated on system power up (ignition key ON) for certain systems and components, and when the engine is running for others. Refer to *DIAGNOSTIC SYSTEM AND FAULT CODES* subsection for more information.

Monitoring System

The MONITORING SYSTEM monitors various electrical and electronic components of the engine control systems such as the:

- ETA (Electric Throttle Actuator)
- TPS (Throttle Position Sensor)
- TAS (Throttle Accelerator Sensor)
- ECM (Engine Control Module).

The engine management system provides for redundancies in these components should a failure or partial failure occur to which it will adjust system operation to protect the vehicle and most of importantly, the driver.

Should the engine management system not respond (or not respond correctly) to a failure, then the monitoring system will react to ensure vehicle and driver safety.

The monitoring system therefore ensures the engine management system is functioning correctly.

Limp Home Mode

The ECM may automatically put the engine in LIMP HOME MODE using default parameters when certain major faults are detected. LIMP HOME MODE may also be manually engaged

under certain fault conditions. For more information, refer to *DIAGNOSTIC SYSTEM AND FAULT CODES*.

COMMUNICATION TOOLS AND B.U.D.S.

SERVICE TOOLS

Description	Part Number	Page
MPI-2 DIAGNOSTIC CABLE	710 000 851	211
MPI-2 INTERFACE CARD	529 036 018	211–212

SERVICE TOOLS – OTHER SUPPLIER

Description	Part Number	Page
MALE-FEMALE EXTENSION SERIAL CABLE	DB9	211

GENERAL

Refer to *PROCEDURES* for instructions on the communication tools.

If communication problems occur, refer to *TROUBLESHOOTING* in this subsection.

TROUBLESHOOTING

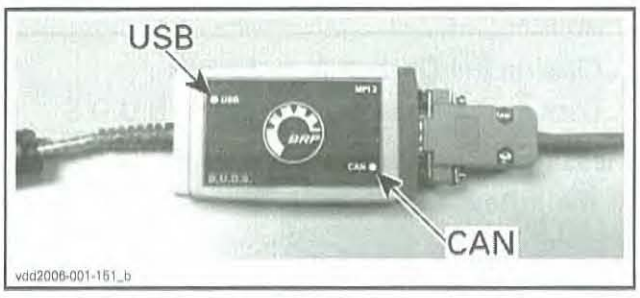
DIAGNOSTIC TIPS

IMPORTANT: Make sure all connections are made and vehicle is powered up **before starting B.U.D.S.** to allow proper communication between the vehicle and B.U.D.S. software.

MPI-2 Connection Troubleshooting

MPI-2 Status Lights

The MPI-2 includes 2 status lights that indicate the connection condition: USB and CAN. **Both lights must be GREEN** for the MPI-2 to function properly. Otherwise, refer to the following charts.



Prerequisite for USB Communication:
- PC Computer turned on.
- MPI-2 connected to PC computer.

USB LIGHT	
STATUS	WHAT TO DO
Light is OFF	– Check USB connection between MPI-2 and PC computer. – Check USB operation on PC computer (hardware or Windows drivers).
Light is GREEN	– Connections are GOOD. Communication can take place on USB side.

Prerequisite for CAN Communication:
- MPI-2 connected to diagnostic connector on vehicle.
- ECM turned on (electrical system powered up without engine started).
- Ignition key installed and turned to ON.
- B.U.D.S. started and logged on.

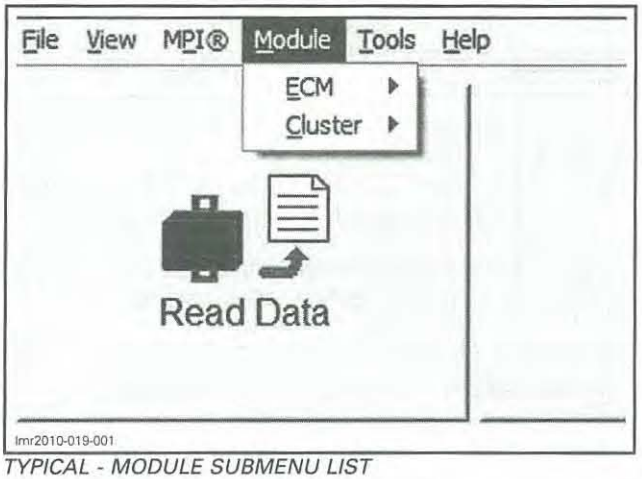
CAN LIGHT	
STATUS	WHAT TO DO
Light is OFF	Check connection between MPI-2 and diagnostic connector on vehicle.
Light is RED	Check CAN wires/connectors on vehicle.
Light is GREEN	Connections are GOOD. Communication can take place on CAN side.

Communication Problems when Using B.U.D.S.

Missing Module

If one or more "ECU" is (are) not communicating with the MPI, a module(s) may not be powered or may be defective.

1. To see which module is missing in B.U.D.S., first select the **Read Data** button at the top of the B.U.D.S. page.
2. Then click on **Module** in the menu bar to expand its submenu.
3. Look at the list of modules in the submenu. If a module is not visible in the submenu list, then it is not communicating with the MPI.



TYPICAL - MODULE SUBMENU LIST

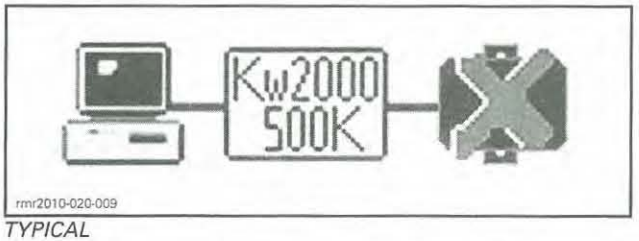
MODULE LIST	
MODULES	VEHICLE MODEL
ECM	Commander 800R and 1000 models
Cluster	

4. Ensure the missing module is properly connected.
5. If the module is connected, remove the connector from the module and test for the following:
   - Proper input voltage to the module
   - Ground circuit continuity
   - CAN bus continuity.

   Refer to the applicable *WIRING DIAGRAM* or appropriate subsection for details.

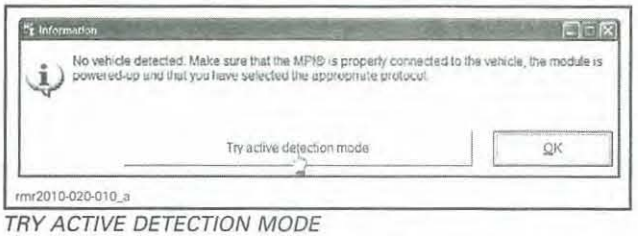
No Vehicle Detected

If an "X" is shown in the status bar and the protocol tool is blinking between Kw2000 500K and Kw2000, it means that no "ECU" is communicating with the MPI.



TYPICAL

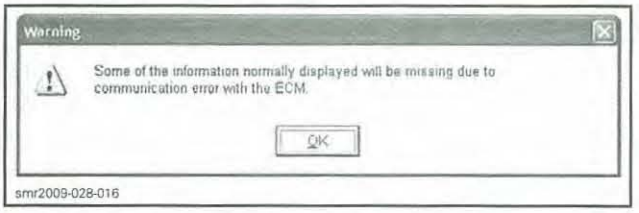
1. Check connections between the PC computer and the vehicle.
2. Activate the vehicle electrical system without starting the engine. Refer to *POWER DISTRIBUTION SYSTEM* subsection.
3. Ensure both USB and CAN lights on the MPI-2 are GREEN. Refer to *MPI-2 CONNECTION TROUBLESHOOTING* subsection.
4. If B.U.D.S. is trapped in a loop that continually displays the following message box, press on the **Try active detection mode** button in the message box. This will test if there is communication with the vehicle.



TRY ACTIVE DETECTION MODE

Message Box: "Some of the Information Normally Displayed..."

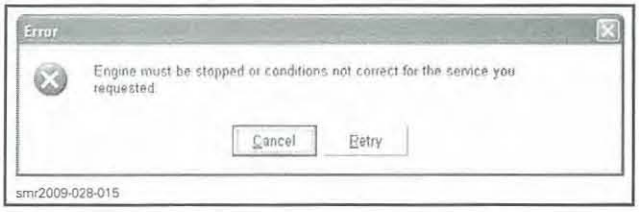
If the following message box is displayed in B.U.D.S.:



1. Click on the **OK** button in the box.
2. Click on the **Read Data** button in B.U.D.S.

Message Box: "Engine must be Stopped..."

If the following message box is displayed in B.U.D.S.:



1. Click on the **Cancel** button in B.U.D.S.
2. Continue with the procedure undertaken prior to the appearance of the message box.

PROCEDURES

MPI-2

The MPI-2 (Multi-Purpose Interface-2) in conjunction with the MPI-2 diagnostic cable is used with B.U.D.S. software to communicate with the ECM (engine control module) and other modules.

MPI-2 Power

The MPI-2 interface card uses the power from the PC computer's USB port.

Diagnostic Connector Location

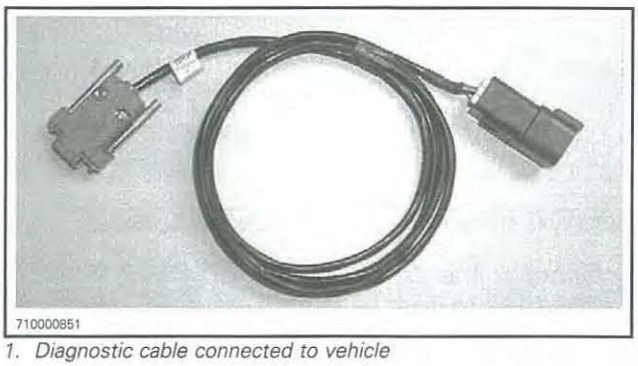
The 6-pin diagnostic connector is located under the dashboard on the driver's side. It is stored in it's protective cap on the lower RH side of the battery rack.

1. Diagnostic connector

NOTE: Do not mismatch the diagnostic connector with the one on the LH side of the battery rack. This connector has only 2 wires attached to it and is for manufacturer's use only.

Connecting the PC to the Vehicle

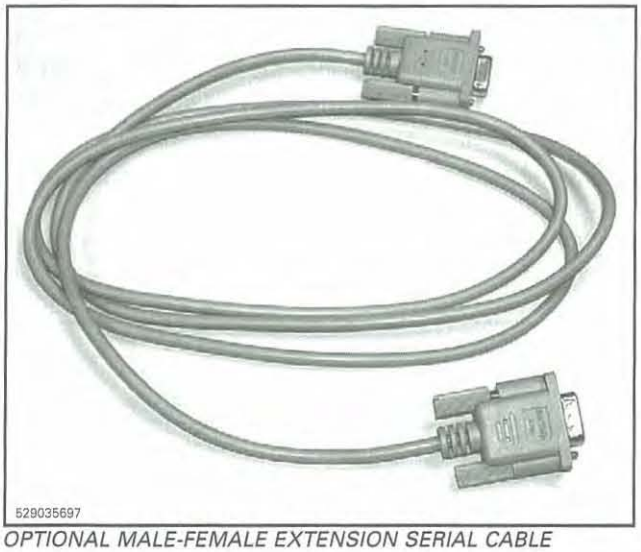
1. Locate the 6-pin diagnostic connector, refer to *DIAGNOSTIC CONNECTOR LOCATION* in this subsection.
2. Disconnect the 6-pin diagnostic connector from it's holder (protective cap).
3. Connect one end of the MPI-2 DIAGNOSTIC CABLE (P/N 710 000 851) to the vehicle connector.



1. Diagnostic cable connected to vehicle

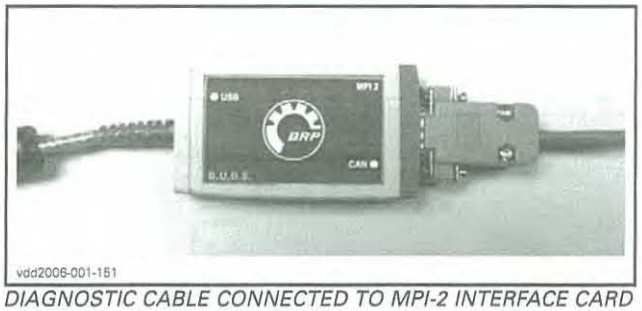
4. Connect the other end of diagnostic cable to the MPI-2 INTERFACE CARD (P/N 529 036 018).

NOTE: An optional MALE-FEMALE EXTENSION SERIAL CABLE (P/N DB9) available at electronic retail outlets can be used between diagnostic cable and MPI-2 interface. Do not exceed 7.6 m (25 ft).

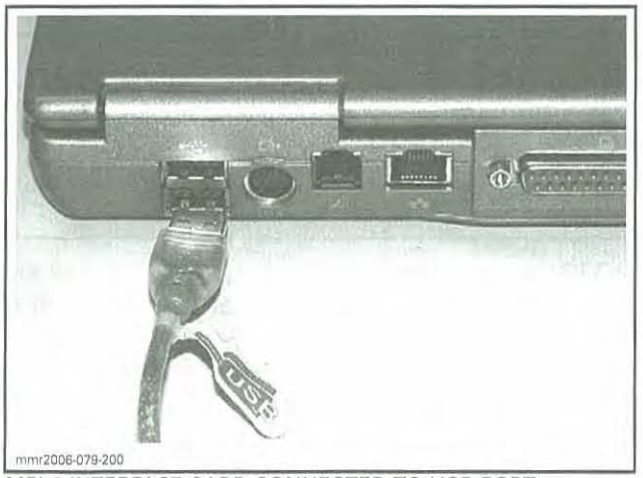


OPTIONAL MALE-FEMALE EXTENSION SERIAL CABLE

5. Connect the MPI-2 INTERFACE CARD (P/N 529 036 018) to the USB port of a PC (personal computer).



DIAGNOSTIC CABLE CONNECTED TO MPI-2 INTERFACE CARD



MPI-2 INTERFACE CARD CONNECTED TO USB PORT

6. Use B.U.D.S. 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 programming key(s) to the vehicle, allow electrical and electronic component monitoring, activation of certain components for diagnostic purposes, and to carry out setting changes.

For more information pertaining to the use of the B.U.D.S. software, use its **Help** menu which contains detailed information on its functions.

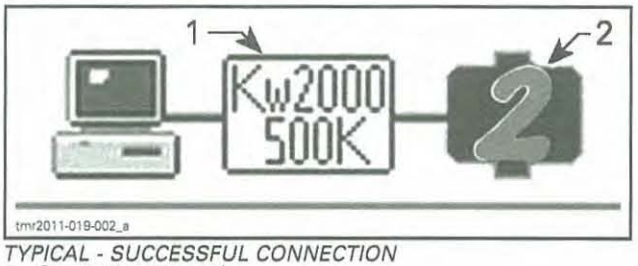
Always use the latest applicable B.U.D.S. version available on BOSSWeb.

How to Establish Communication Using B.U.D.S. Software

IMPORTANT: Ensure all connections have been made **before starting B.U.D.S.** to allow proper operation. Refer to *MPI-2* in this subsection.

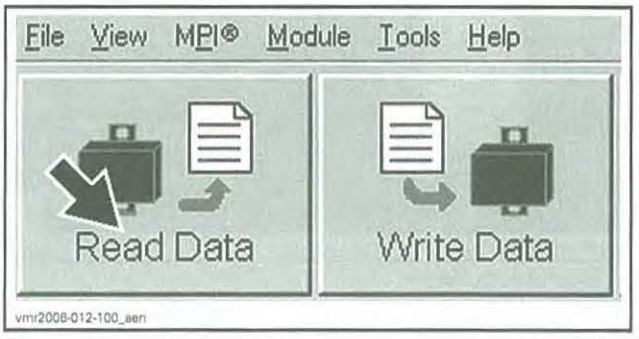
1. Turn ignition switch to ON using any of the keys provided with the vehicle. Do not start the engine.
2. Start B.U.D.S. and logon.
3. Ensure the status bar shows the Kw2000 (500K) protocol and the appropriate number of modules to its right according to the vehicle model.

VEHICLE MODEL	PROTOCOL	NUMBER OF MODULES
Commander 800R and 1000	Kw2000 (500K)	2



TYPICAL - SUCCESSFUL CONNECTION
1. *Connection protocol*
2. *Number of modules read*

4. Read ECUs by clicking the **Read Data** button.



B.U.D.S. is now ready to use.

When clicking on the **Read Data** button, B.U.D.S. will read the cluster and the ECM modules through CAN bus.

Electronic Modules ("ECU") Updates

NOTICE **Failure to strictly follow a procedure to update a module may permanently damage the module.**

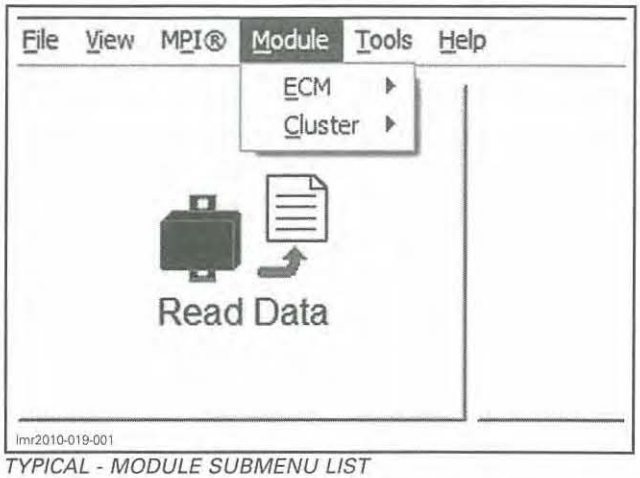
Whenever B.U.D.S. is started, check for an update icon in the B.U.D.S. status bar.

TYPICAL

If the icon is visible, it indicates that a file is available in B.U.D.S. to update at least one of the electronic modules:

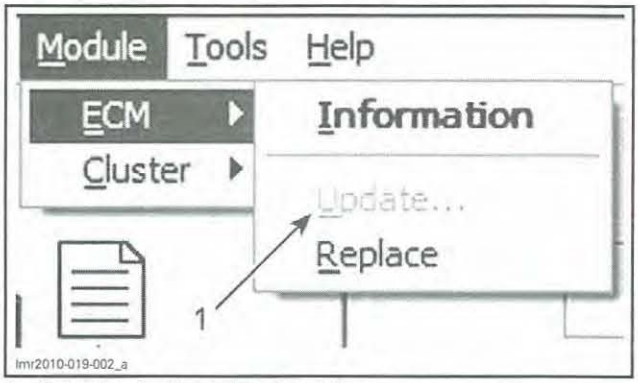
NOTE: If an update file is available on BOSSWeb but the B.U.D.S. software being used is not up to date, the update icon will not appear. Refer to the Service Bulletins to see if there is an update available.

Use the **Module** submenu and check all modules one at a time to see which module(s) can be updated.



TYPICAL - MODULE SUBMENU LIST

1. If the **Update** option is **greyed out**, no update file is available for this module.
2. If the **Update** option is **black**, an update file is available for this module.

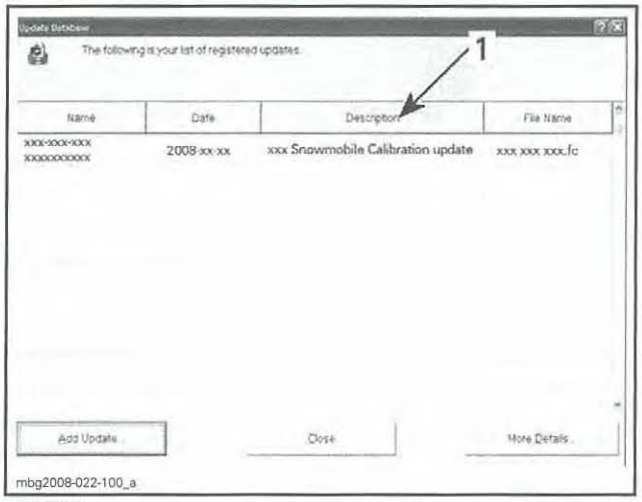


1. Greyed out: No update to perform
Black: Update file available

Before applying an update, log onto BOSSWeb and look in **Service** menu for the **Unit history** to find out if any information or publication related to the vehicle is available. If so, carefully follow the given instructions.

SERVICE, UNIT HISTORY

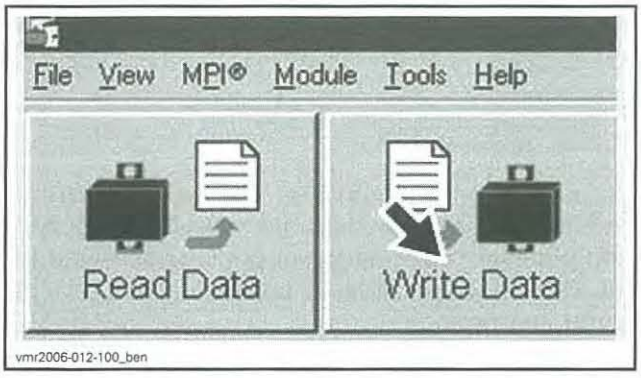
NOTE: When selecting the update menu in B.U.D.S., a dialog box will appear and the update file description may give some clue to finding the vehicle-related information in BOSSWeb.



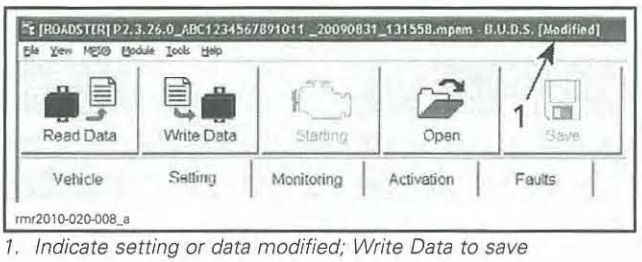
TYPICAL
1. File description

Writing Changes (Saving) to a Module

1. When making a data or setting change in a module using B.U.D.S., save the new data (or setting) in the module by clicking the **Write Data** button.



NOTE: If the word **Modified** appears in the vehicle file identification number at the top of the B.U.D.S. page, then a change has been made that requires selecting the **Write Data** for the change to be saved.



1. Indicate setting or data modified; Write Data to save

2. After the write data operation, turn the ignition key to the OFF position.

Disconnect MPI connections and store the vehicle diagnostic connector in its protective cap.

TYPICAL
1. Diagnostic connector in its storage cap

NOTICE **Failure to secure the diagnostic connector in its protective cap may result in corrosion or other damage to the terminals.**

NOTE: There is a 120 Ω resistor in the protective cap to minimize the possibility of communication error.

DIAGNOSTIC SYSTEM AND FAULT CODES

GENERAL

DIAGNOSTIC SYSTEM

The EMS features a diagnostic system that self-diagnoses various electrical and electronic components. This mode becomes active when the ignition key is turned ON.

NOTE: Some components require the engine to be running for them to be monitored for normal operation (fuel injectors for example).

The diagnostic system continuously validates that the components (control modules, sensors and actuators) are not faulty or defective. When a malfunction is detected, the related electronic module(s):

- Sets an active fault code.
- Adapts the proper protection strategy according to the failure.
- Sends out signals to the multifunction gauge to inform the rider of a particular condition.

If a minor fault occurs, the engine and vehicle will continue to operate without noticeable loss of performance.

If a more important fault occurs, engine RPM may be limited. The engine/vehicle will continue to operate with reduced performance.

If a major component of the EMS fails, engine RPM will be limited as well as vehicle speed.

These strategies are used to protect engine/electrical system from damage and to maintain safe operation of the vehicle. In extreme cases, the engine may also be completely shut down.

Pilot Lamps

When a problem is detected, a pilot lamp will turn on or blink in the multifunction gauge. If the fault that caused the pilot lamp to come on is momentary, the pilot lamp may turn off automatically, or may need to be reset by powering down the vehicle and then restarting it.

A message may also be displayed to provide additional information related to the fault that turned on the pilot lamp. Refer to the following chart.

PILOT LAMP		MULTIFUNCTION GAUGE MESSAGE	CAUSE	ADDITIONAL INFORMATION
	ON	HI TEMP	Engine is overheating.	Turns on when engine temperature reaches 114°C (237°F).
	ON	CHECK ENGINE	An engine management component is not functioning properly.	A fault code is active or has been activated that requires attention. No engine limitation.
	Blinks	LIMP HOME	An important engine management component is not working properly.	An active fault code pertaining to a critical engine function has been activated that requires attention as soon as possible. Engine behavior is modified or engine RPM is limited to protect engine.
	ON	PARK BRAKE (Early production models)	Brake pedal held pushed in or faulty brake light switch.	Turns ON when brake switch is activated continuously for 15 seconds. Brake pressure felt at switch or switch failed in closed position.
		BRAKE ACTIVATION (Later production models)	Brake pedal held pushed in or faulty brake light switch.	Turns ON when brake switch is activated continuously for 15 seconds above 5 km/h (3 MPH). Brake pressure felt at switch or switch failed in closed position.
"E" displayed instead of selected gear.			GBPS fault or related part.	GBPS signal fault or communication error.

Limp Home Mode

When a major component of the EMS is not operating properly, limp home mode will be set.

Engine RPM will be limited and/or engine behavior and control may be modified depending on the cause of the failure.

This mode allows the rider to return home, which would otherwise not be possible without this advanced system.

LIMP HOME will be displayed in the multifunction gauge and the CHECK ENGINE light symbol will be on in the gauge.

FAULT CODES

A fault code is an indication that a glitch or malfunction is detected by the monitoring system of the vehicle.

A fault code consists of 5 digits that starts by a letter followed by a 4 digit code that may be comprised of numbers and/or letters. The first letter defines the type of fault code while the remaining digits refer to a unique fault.

There are 2 types of fault codes used on the vehicle:
- "P" for power train and related system faults (Pxxxx)
- "U" for communication faults (Uxxxx)

There are 2 modules that generate and store the fault codes:
- ECM (Engine Control Module)
- Multifunction Gauge.

The ECM stores mainly "P" codes and some "U" codes.

The multifunction gauge stores a few "P" and "U" codes.

When many fault codes that may or may not be related to a specific system are set at the same time, it is likely to be the result of low battery voltage, a burnt fuse(s) or a faulty relay.

NOTE: The faults detected are saved in the ECM (Engine Control Module) or multifunction gauge even if the battery is disconnected.

Fault Code States

Fault codes have 3 possible states:
- Active state
- Occurred state
- Inactive state.

All types of fault codes may be viewed in the **Faults** page of B.U.D.S. **Only** fault codes in an **active state** may be viewed in the multifunction gauge.

Active Fault Codes

An active fault code is an indication of a fault that is presently active. The active fault may or may not compromise normal operation of the system(s) in question as indicated by the fault code(s). Service action should be taken to correct the problem that caused the fault code.

Once the cause of the active fault is corrected, the fault code must be cleared using B.U.D.S. to prevent it from being retained in memory.

Occurred Fault Codes

An occurred fault code indicates a fault that was active, but no longer is. The occurred fault does not presently affect system or component operation but is retained as a history of the faults that were detected.

The fault may have been generated due to a system or component that was momentarily operating outside normal parameters. Repeated occurred faults of this type should be considered when troubleshooting a problem, and may require that maintenance action be taken.

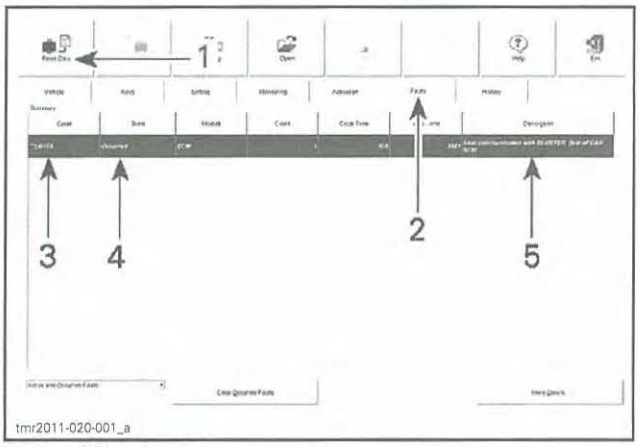
An occurred fault may also be generated when disconnecting and reconnecting a component, replacing a burnt fuse, when the software update of an electronic module has been carried out, or may be due to a momentary high or low voltage.

Inactive Fault Codes

An inactive fault code represents a fault code that is neither active, nor occurred. It is simply part of a list of all possible faults that can be monitored by the ECM and multifunction gauge, which may become active or occurred if the monitoring system detects an applicable fault. These codes can be viewed in B.U.D.S.

How to Read Fault Codes Using B.U.D.S. Software

1. Connect vehicle to the applicable version of B.U.D.S. software, refer to *COMMUNICATION TOOLS AND B.U.D.S. SOFTWARE* subsection.
2. Click on the **Read Data** button.
3. Select the **Faults** tab.



1. *Read Data button*
2. *Faults page tab*
3. *Recorded fault code*
4. *Fault code state*
5. *Fault code description*

For more information pertaining to the fault codes and report, refer to B.U.D.S. online help.

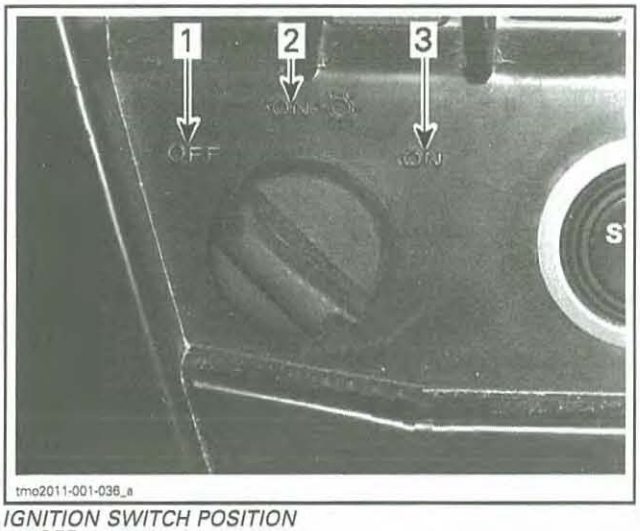
How to Read Fault Codes Using the Multifunction Gauge

A fault code must be active to be displayed in the multifunction gauge. If a fault code is occurred, it must be read using B.U.D.S.

Analog/Digital Gauge

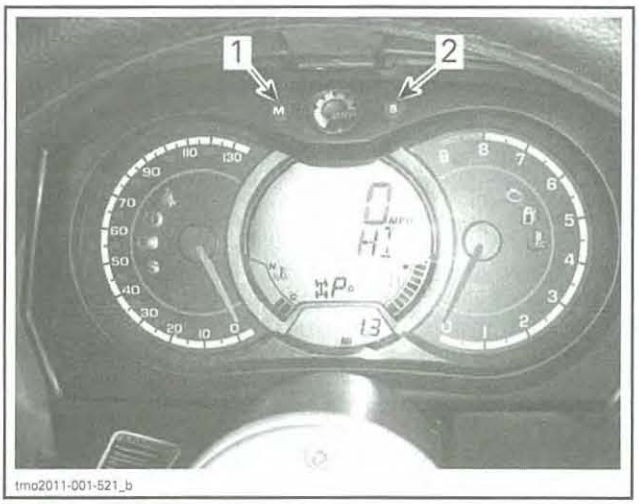
Proceed as follows to view the active fault codes:

1. Turn ignition key to ON **with lights** position.

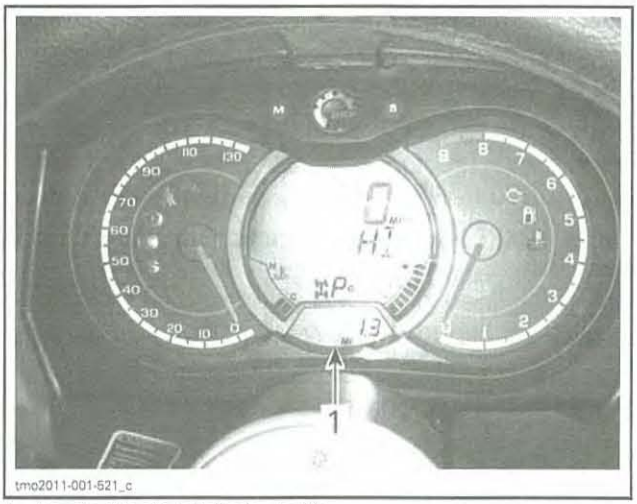


IGNITION SWITCH POSITION
1. *OFF*
2. *ON with lights (turn key to this selection)*
3. *ON*

2. Wait for the multifunction gauge to complete its self test function.
3. Press the S (set) button repeatedly until Hr (hour) is displayed in the secondary digital display.



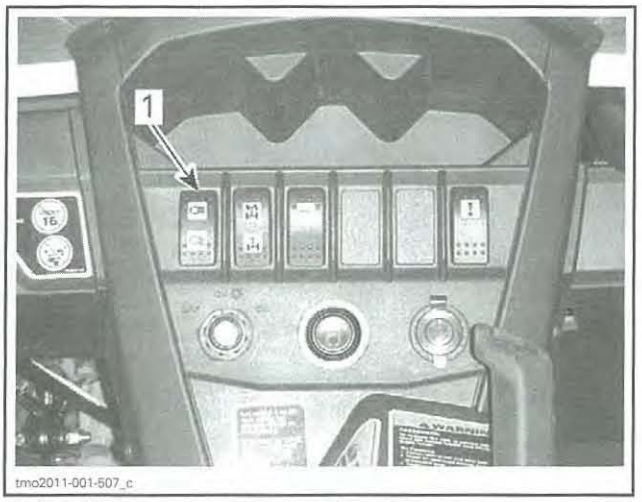
1. *M (mode) button*
2. *S (set) button (pressed repeatedly to toggle secondary display)*



1. *Toggle this digital display to Hr*

4. Press and hold the M (mode) button while quickly toggling the HI - LO beam switch to enter the fault code display function.

NOTE: A minimum of 3 HI - LO toggles must be completed within 2 seconds.



1. Low/High beam headlight switch

If a fault code is active, it will be displayed in the main digital display.

If no fault code is active, a scrolling NO ACTIVE FAULT CODE message will be displayed.

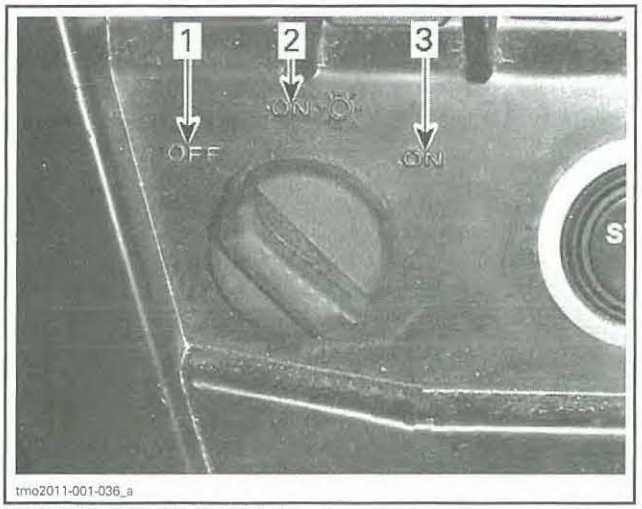
If there are multiple fault codes, the display will cycle through each fault code repeatedly. A maximum of 10 fault codes may be displayed.

If the fault code display function has been interrupted by another message, a fault code(s) may not have been displayed. Repeat the fault code display procedure to view all active fault codes.

To exit the fault code display function, press both the M and S buttons simultaneously.

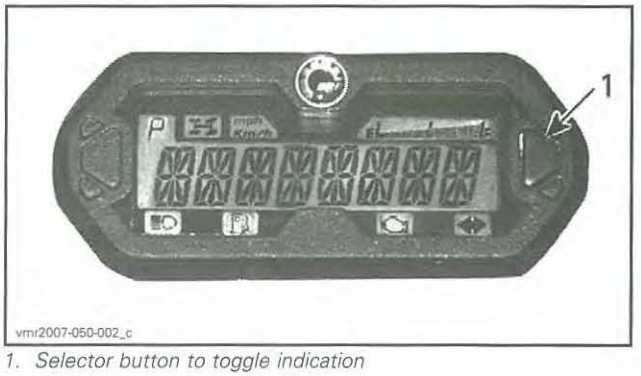
LCD Gauge

1. Turn ignition key to ON **with lights** position.

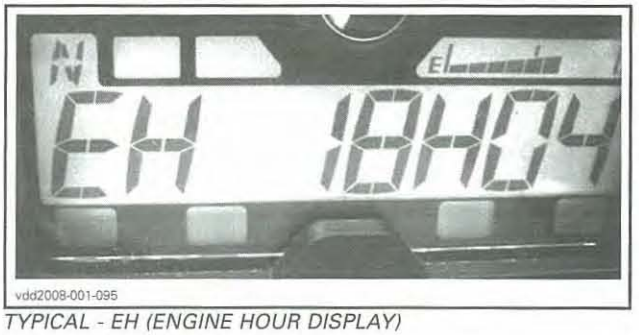


IGNITION SWITCH POSITION
1. OFF
2. ON (with lights)
3. ON

2. Press the selector button on the gauge repeatedly until Engine Hour (EH) is displayed on the gauge.



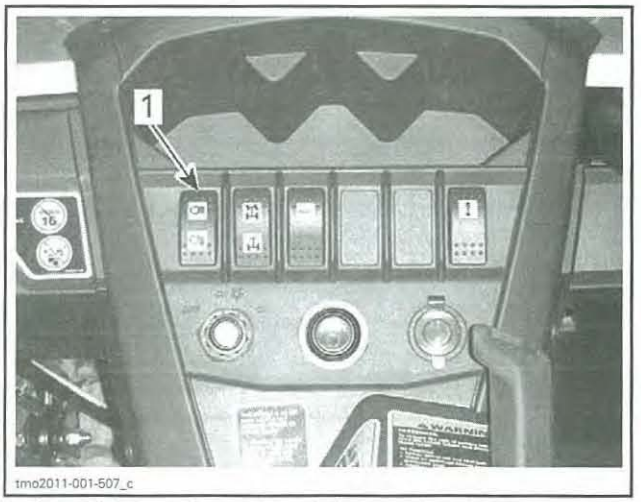
1. Selector button to toggle indication



TYPICAL - EH (ENGINE HOUR DISPLAY)

3. Press and HOLD the M button while QUICKLY toggling HI - LO beam switch to enter the fault code display function.

NOTE: A minimum of 3 HI - LO toggles must be completed within 2 seconds.



1. Low/High beam headlight switch to toggle quickly

If no P-Code is active, a "No Active P Codes" scrolling message will be displayed.

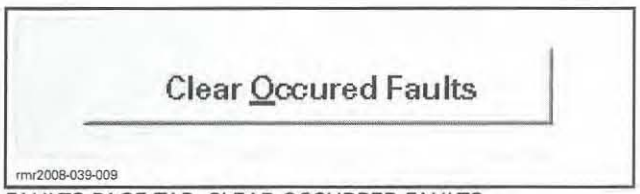
If there is an active P-Code, it will be displayed.

If there are multiple fault codes, the display will cycle through each fault code.

Once the last fault code is displayed, the gauge displays END then defaults back to normal operation.

How to Clear Fault Codes Using B.U.D.S. Software

The fault(s) (occurred state only) can be cleared by pressing the **Clear Occurred Faults** button in B.U.D.S.



FAULTS PAGE TAB, CLEAR OCCURRED FAULTS

This will reset the appropriate counter(s) and will also record that the problem has been fixed in the related ECU memory.

NOTE: An active fault code cannot be cleared. In other words, the problem relevant to the fault code must be repaired before the fault can be cleared.

SPECIFIC FAULTS

TPS Fault

A TPS fault may be considered to be a major fault as the TPS provides the most important feedback (2 signals) to the ECM on throttle position.

A TPS fault affects engine control as the throttle plate is moved by the ETA (electric throttle actuator) which, is controlled by the ECM (see *INTELLIGENT THROTTLE CONTROL (ITC)* subsection).

A TPS fault is generally followed by LIMP HOME mode and the engine is brought back to idle, or may be completely shutdown.

Low Battery Voltage Fault

If the battery voltage is low when the engine is running at idle RPM, the ECM will command an increase in RPM to a set value, thereby increasing the charging system output in order to prevent the battery from being discharged, and to allow normal system operation.

TAS Fault

If one TAS (throttle accelerator sensor) signal is missing, LIMP HOME MODE will be activated and the check engine light will come ON. Pressing and holding the OVERRIDE button will allow normal control of the accelerator pedal.

If both sensors in the TAS are at fault, a TAS FAULT message will appear in the gauge, the check engine light will come ON and the engine will run at idle. The accelerator pedal will not have any affect on engine RPM. However, the vehicle may be driven in LIMP HOME MODE by pressing the OVERRIDE button.

When limp home mode is engaged using the override button, a MANUAL LIMP HOME message will appear in the gauge. The OVERRIDE button can then be used as the accelerator, vehicle speed is controlled by pressing and/or releasing the button.

PARK BRAKE Fault Message in Gauge

Early Production Models (Only)

Although this vehicle is not equipped with a park brake, a PARK BRAKE message will be displayed in the gauge if a brake signal is received continuously for 15 seconds.

BRAKE ACTIVATION Fault Message in Gauge

Late Production Models

If a brake signal is received continuously for 15 seconds above 5 km/h (3 MPH), a BRAKE ACTIVATION message will be displayed in the gauge.

INTELLIGENT THROTTLE CONTROL (iTC)

GENERAL

SYSTEM DESCRIPTION

The iTC is an electronic throttle control system that includes:
- Throttle accelerator sensor (TAS)
- Electric throttle actuator (ETA)
- Throttle position sensor (TPS).

The TAS is part of the accelerator pedal module. The ETA and TPS are comprised in the throttle body.

The iTC is often referred to as a "throttle by wire" system (no throttle cable is used).

According to the accelerator pedal position and other EMS inputs, the ECM powers the ETA motor using pulse width modulation (PWM), to control the throttle plate. When the ECM detects through the TPS that the throttle plate has reached the targeted position, the ECM stops the throttle actuator.

Depending on various conditions and the type of key used, the iTC can modify the ETA response, limit the engine torque or vehicle speed.

For torque limitation, the ECM processes the TAS input differently depending on the specific mode. In other words, the driver's demand may not necessarily result in the corresponding throttle opening.

For vehicle speed limitation, the iTC controls the throttle opening to maintain a maximum set speed even if the accelerator is pedal fully depressed.

SYSTEM MAIN FEATURES

The use of the iTC allows the following features:
- Key modes
- Normal/Sport modes
- Override functions.

Key Modes

Normal Key

When a normal key is used, engine delivers approximately 70% of the accelerator pedal demand (less if normal mode is selected). Vehicle speed is limited to 70 km/h (43 MPH).

Performance Key

When a performance key is used, engine delivers 100% of the accelerator pedal demand (less if normal mode is selected). The vehicle speed is limited to 120 km/h (75 MPH).

Work Key (Option)

When a work key is used, engine delivers approximately 50% of the accelerator pedal demand (less if normal mode is selected). Vehicle speed is limited to 40 km/h (25 MPH).

Normal/Sport Modes

When sport mode is selected, the full potential of the specific ignition key is deployed except when gearbox is in reverse or low gear.

When normal mode selected, the full potential of the specific ignition key is not reached and the accelerator pedal response is smoother than in sport mode.

Reverse Override Function

In reverse gear, engine delivers less than the accelerator pedal demand and vehicle speed is limited to 20 km/h (12 MPH). Also, the accelerator pedal response is smoother than in high gear.

If the override button is depressed, vehicle speed and engine acceleration are increased. Even with the override is activated, the ECM will not allow the engine to deliver 100% of the accelerator pedal demand.

SYSTEM OTHER FEATURES

Driver's Seat Belt Monitoring

If driver's seat belt not fastened, speed is limited to approximately 15 km/h (9 MPH).

Brake Monitoring

If the ECM receives a brake switch signal while gearbox is in gear and the vehicle moving, the ETA will decrease throttle plate opening and engine speed will drop to idle.

NOTE: A defective brake light switch that would stay in a closed position would force the engine to run at idle.

Low Range Operation

When gearbox is in low range, engine delivers less than the accelerator pedal demand and the accelerator pedal response is smoother than in high gear.

Half Shaft Saver

In a case where the drive wheels would momentarily leave the ground while the driver holds the throttle, this mode protects the drive system.

The system will enter the half shaft saver mode if the ECM detects an excessive wheel acceleration rate. In such a case, the iTC will reduce the engine torque. When the wheels slow down, the system returns to normal mode.

Engine Temperature Monitoring

If coolant gets too hot, engine will deliver less than the accelerator pedal demand. The limitation is proportional to the overheat degree.

Battery Voltage Monitoring

If the battery voltage gets low, the engine idle RPM will be increased at approximately 1500 RPM.

Drowned Mode

In case of a fuel flood, the engine can be cranked without fuel injection.

To enter the drowned mode, depress and hold accelerator pedal (at least 20% of the travel) while cranking engine.

Limp Home Mode

When certain faults are occurring, the ECM will enter the limp home mode. In this mode, the engine will deliver less than the accelerator pedal demand.

PROCEDURES

SPORT/NORMAL SWITCH

Sport/Normal Switch Wire Information

FUNCTION	PIN	COLOR
Signal (to ECM B pin D4)	1	BROWN/GREEN
Ground through ECM (to ECM B pin A1)	2	ORANGE/VIOLET

SEAT BELT SWITCH

Seat Belt Switch Wire Information

FUNCTION	PIN	COLOR
Signal (to ECM B pin E3)	1	YELLOW/GREY
Ground through ECM (to ECM B pin A1)	2	ORANGE/VIOLET

OVERRIDE SWITCH

Override Switch Wire Information

FUNCTION	PIN	COLOR
Normal position signal (to ECM B pin D3)	1	VIOLET/YELLOW
Ground through ECM (to ECM B pin B1)	2	VIOLET/GREY
Override position signal (to ECM B pin F3)	3	VIOLET/ORANGE

THROTTLE ACCELERATOR SENSOR (TAS)

TAS Description

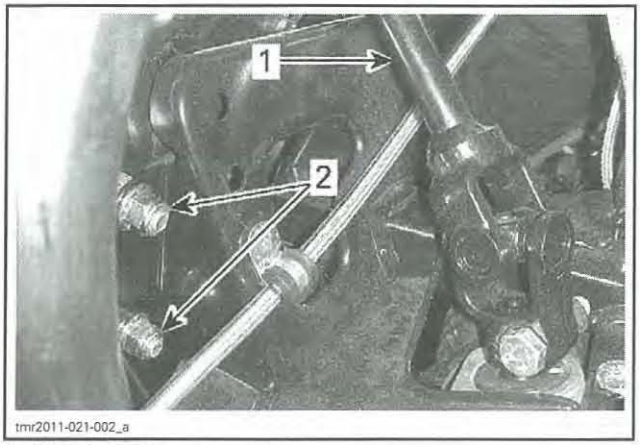
The throttle accelerator sensor (TAS) is a double hall effect sensor that sends a signal to the ECM which is proportional to the accelerator pedal. The redundancy is used for security purposes.

The voltage output of the hall effect sensors are different.

TAS Removal and Installation

The TAS is part of the accelerator pedal.

1. Note the wire routing and tie-wrap position.
2. Disconnect electrical connector.
3. Remove both accelerator pedal retaining nuts by outside the passenger compartment. Reach nuts by the RH side of the vehicle.



1. Steering column
2. Accelerator pedal retaining nuts

To install, reverse the removal procedure, however pay attention to the following:

Route and attach wires correctly.

Tighten nuts to the specified torque.

ACCELERATOR PEDAL RETAINING NUTS TIGHTENING TORQUE
13 N•m ± 1 N•m (115 lbf•**in** ± 9 lbf•**in**)

Carry out the *ECM FIRST INITIALIZATION*, refer to *ELECTRONIC FUEL INJECTION (EFI)* subsection.

TAS Wire Information

FUNCTION	PIN	COLOR
Signal	A	BLUE/GREEN
Ground through ECM	B	BLUE/RED
Voltage input (5 volt)	C	BLUE/ORANGE
Voltage input (5 volt)	D	BLUE/BLACK
Signal	E	BLUE/PINK
Ground through ECM	F	BLUE/VIOLET

TAS Failure

If one TAS signal fails, the vehicle will enter the limp home mode. In this case, depressing the override button will temporarily restore accelerator pedal operation (while button is depressed).

If both TAS signals fail, the engine speed will drop to idle. Depressing the override button will force the ECM to open the ETA to an angle that allows the vehicle to move.

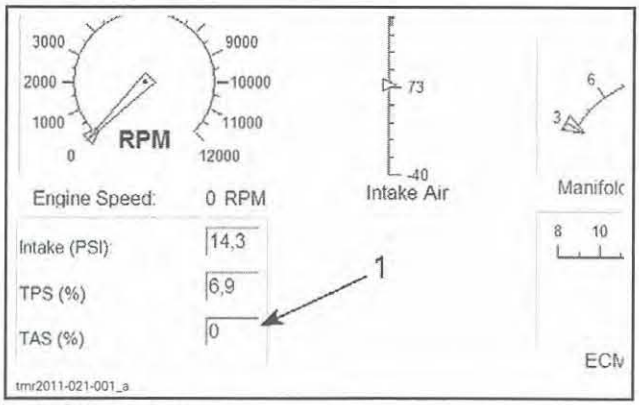
TAS Test with B.U.D.S.

The TAS signal can be monitored in B.U.D.S.

Connect to the latest applicable B.U.D.S. software. Refer to *COMMUNICATION TOOLS AND B.U.D.S.* section.

Select the **Monitoring** and **ECM** tabs.

Look at the **TAS (%)** window as you depress the accelerator pedal.



1. TAS % window

The TAS signal should vary from near 0% to near 100% depending on the pedal position, which confirms the TAS signal reaches the ECM.

ELECTRONIC FUEL INJECTION (EFI)

SERVICE TOOLS

Description	Part Number	Page
DIGITAL INDUCTION TACHOMETER	529 014 500	226
ECM ADAPTER TOOL	529 036 166	229, 241, 243–246
FLUKE 115 MULTIMETER	529 035 868	229, 235, 241, 244–245
OETIKER PLIERS	295 000 070	238

SERVICE PRODUCTS

Description	Part Number	Page
LOCTITE 243 (BLUE)	293 800 060	246
XPS SYNTHETIC GREASE	293 550 010	243

GENERAL

⚠ WARNING

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

⚠ WARNING

Fuel lines remain under pressure at all times. Always proceed with care and use appropriate safety equipment when working on pressurized fuel system. Wear safety glasses. Wipe off any fuel spillage. Do not allow fuel to spill on hot engine parts and/or on electrical connectors.

⚠ WARNING

Replace any damaged, leaking or deteriorated fuel lines or connections. Always, pressurize the fuel system if any fuel related component was disconnected or removed. Proceed with care when removing/installing high pressure test equipment.

SYSTEM DESCRIPTION

The electronic fuel injection system (EFI) is comprised of various sensors used for detecting ongoing operating conditions of the engine and vehicle, and includes all the components that perform the required adjustments to the engine.

Electrical System

ECM (Electronic Control Module)

From input signals, the ECM acknowledges driver demands and converts them to an engine torque requirement through calculation of several variables. Then, the ECM controls the iTC, the injection system and the ignition system to meet the torque requirement.

The ECM manages the engine torque requirements and controls engine operation to ensure it is delivering optimum performance and fuel economy. The ECM also controls idle RPM and limits maximum engine speed through the iTC system.

EFI Sensors

The ECM reads the inputs from the sensors which it compares to predetermined parameters stored in the ECM, makes computations, and activates the outputs accordingly (injectors, ignition coils etc.).

Signals from sensors are used by the ECM to determine the injection and ignition parameters (referenced to fuel maps) as required to maintain the optimum air-fuel ratio.

Air Intake System

Air Filter

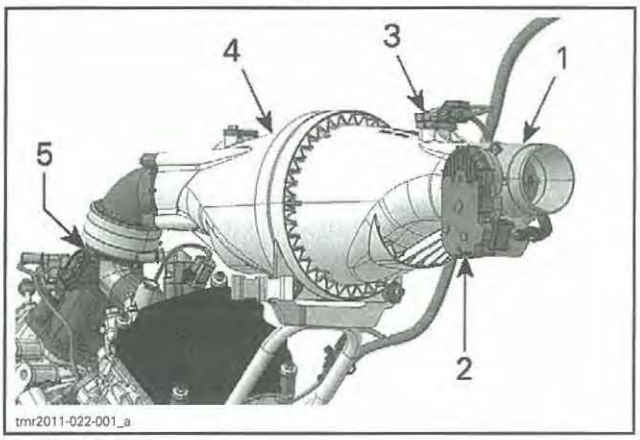
Air, drawn into the air filter housing, first passes through an inlet duct.

After it passes through the air filter, an air duct (intake adapter) is used to channel the air to the throttle body.

Throttle Body

The throttle body is mounted on the front end of the plenum, aft of the air filter housing.

Air for combustion, drawn in by the engine, flows through the air intake system, then through the throttle body where it is regulated by a throttle plate.



1. *Throttle body*
2. *ETA and TPS*
3. *MAPTS (Manifold Air Pressure Temperature Sensor)*
4. *Plenum*
5. *Air intake manifold*

Fitted on the throttle body, an electric throttle actuator (ETA) allows the ECM to electronically control the throttle plate opening which regulates the amount of air that enters the engine, and therefore engine torque.

There is no idle air control valve (IACV).

The TPS is also incorporated in the throttle body. It provides a signal to the ECM of the actual throttle plate position.

Plenum

After the air flows through the throttle body, it enters the plenum. The plenum provides a resonance effect which leads to an improved cylinder charge.

Fuel System

Fuel Rail

Two fuel rails, one for each injector, are mounted on the intake manifold. The fuel rails, which are used to secure the injectors to the manifold, also provide to the injectors the fuel pressure that they receive from the fuel pump.

The fuel pressure applied to the fuel rails is regulated by the fuel pressure regulator located in the fuel pump module.

Fuel Injectors

The fuel injectors are used to inject fuel into the intake ports of the cylinder head. One injector is used per cylinder.

Fuel Pump

An electric fuel pump with an integrated pressure regulator and fuel system filters is used. For more details on the fuel pump unit, refer to *FUEL TANK AND FUEL PUMP* subsection.

ADJUSTMENT

IDLE SPEED

Idle speed is not adjustable. The ECM controls the idle speed of the engine primarily through control of the throttle plate position.

The vehicle multifunction gauge can provide an accurate digital readout of the engine's idle speed.

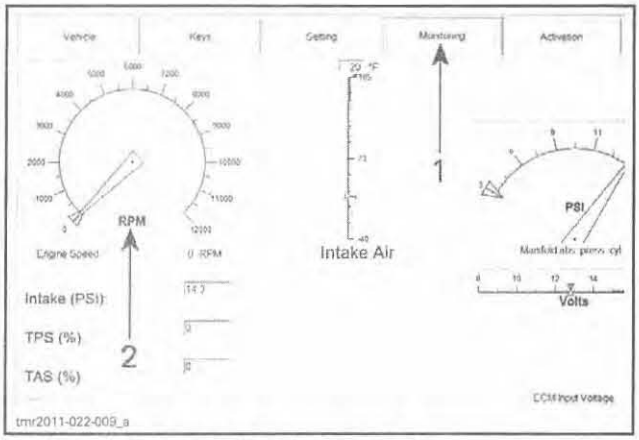
If desired, the engine RPM can be verified using a DIGITAL INDUCTION TACHOMETER (P/N 529 014 500).

Install the tachometer wire on a spark plug cable.

VERIFYING ENGINE RPM USING A DIGITAL INDUCTION TACHOMETER

The engine RPM may also be verified using the applicable B.U.D.S. software version, refer to *COMMUNICATION TOOLS AND B.U.D.S.* subsection.

In B.U.D.S., select the following:
- **Read Data** button
- **Monitoring** page tab
- **ECM** tab.



VERIFYING ENGINE RPM USING B.U.D.S.
1. **Monitoring** *page tab*
2. *Engine RPM indication*

NOTE: The multifunction gauge and B.U.D.S. use the same signal to provide the engine RPM indication.

TROUBLESHOOTING

DIAGNOSTIC TIPS

Engine problems are not necessarily related to the fuel injection system.

It is important to ensure that the engine and propulsion system, fuel delivery and electrical systems are functioning normally.

For diagnostics purposes, use B.U.D.S. software. See *COMMUNICATION TOOLS AND B.U.D.S.* subsection.

After a problem has been solved, be sure to clear the fault(s) in the ECM using the B.U.D.S. software.

⚠ WARNING

Electrical actuators and electronic modules may be powered up as soon as the ignition switch is set to ON. Always disconnect the battery prior to disconnecting any electrical or electronic parts.

Never use a battery charger to temporarily substitute the battery as it may cause the ECM to function erratically, or not at all.

Check related-circuit fuse solidity and condition with an ohmmeter. A visual inspection could lead to a false diagnosis.

Electrical Related Problems

It is important to check the following in the electrical system:
- Battery voltage
- Fuses
- Ground connections
- Wiring and connectors.

Ensure that all electronic components are genuine OEM. Any modification to the wiring harness may lead to poor system operation or generate fault codes.

Electrical Connections

Pay particular attention to ensure that terminals and pins are not out of their connectors, corroded, or out of shape.

When probing terminals, pay attention not to deform the terminals as this could cause a loose or intermittent connection that would be difficult to troubleshoot.

PROCEDURES

ENGINE CONTROL MODULE (ECM)

NOTE: As a first troubleshooting step, always check for applicable fault codes using B.U.D.S. software.

Quick Test to Validate ECM Operation

Turn ignition key to ON.

NOTE: Setting the ignition switch to ON wakes up the ECM, which then turns on the following.

QUICK INDICATION THAT ECM IS FUNCTIONING (assuming the observed component is in good working order)
Multifunction gauge turns ON.
Fuel pump turns on for approx. 5 seconds.
Rear lights turn on.
Headlamps turn on (ignition key on with lights position).

ECM First Initialization

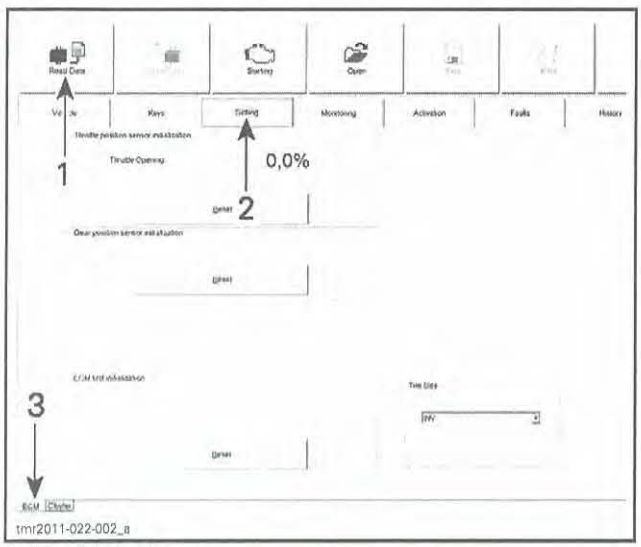
This procedure performs a reset of the following values in the ECM:
- TAS (Throttle Accelerator Sensor)
- TPS (Throttle Position sensor)
- GBPS (Gearbox Position Sensor).

This reset **must** be carried out whenever the ECM has been replaced.

This reset **may** be carried out whenever any of the following components have been replaced instead of their respective reset procedures:

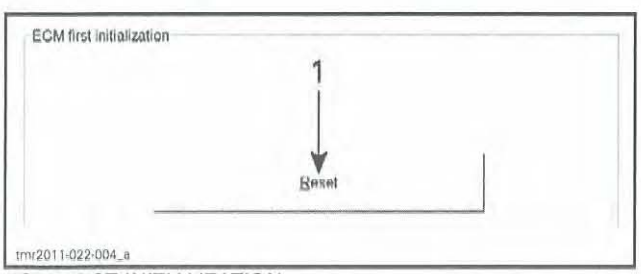
- Throttle body (for TPS)
- GBPS (Gearbox Position Sensor).

1. Connect vehicle to the applicable B.U.D.S. version, refer to *COMMUNICATION TOOLS AND B.U.D.S.* subsection.
2. In B.U.D.S., select the following:
   - **Read Data** button
   - **Setting** page tab
   - **ECM** page tab



*1. **Read Data** button*
*2. **Setting** page tab*
*3. **ECM** page tab*

3. In the **ECM first initialization** field, click on the **Reset** button.



ECM FIRST INITIALIZATION
*1. **Reset** button*

4. Follow the instructions in the message boxes that appear in B.U.D.S.

If the operation is successful, a message will be displayed stating that the reset was successful.

If an error occurred or a component is out of range, a message may be displayed. Follow the instructions in the message and repeat the procedure.

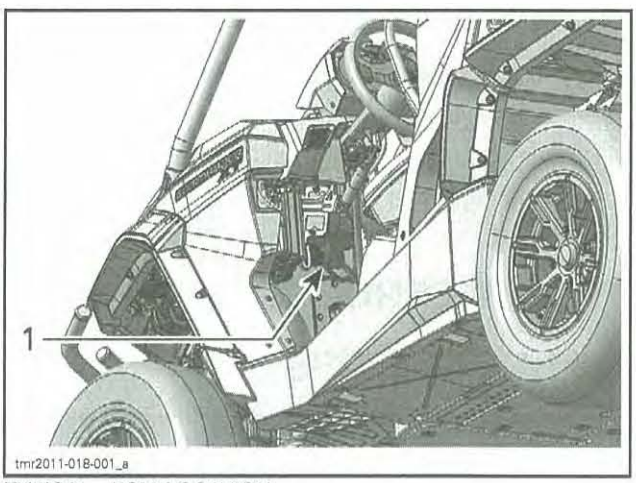
5. Check for fault codes.

If a fault code is generated, carry out the service actions, reset the fault and repeat the reset procedure.

6. Start engine and make sure it operates normally throughout its full engine RPM range.

ECM Access

The ECM is located under the dashboard, driver's side, above the control pedals.

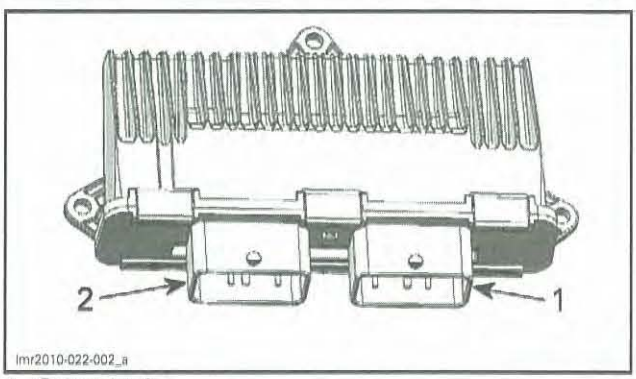


TYPICAL - ECM LOCATION
1. ECM location

ECM Connector Identification

There are 2 connectors connected to the ECM:

- Engine harness connected to ECM-A
- Vehicle system control harness connected to ECM-B.



1. Connector A
2. Connector B

The ECM connectors have 48 pins.

NOTE: For connector information, cleaning and probing, refer to *CONNECTOR INFORMATION* subsection.

ECM Adapter Tool

To probe ECM connector terminals, use the ECM ADAPTER TOOL (P/N 529 036 166).

NOTE: This tool will prevent deforming or enlarging terminals which would lead to bad ECM terminal contact creating intermittent or permanent problems.

ECM Power Supply Test

1. Disconnect connector "B" from the ECM.
2. Install ECM connector "B" on the ECM ADAPTER TOOL (P/N 529 036 166).
3. Install a jumper wire between B-H2 and B-M2 on the ECM adapter tool.
4. Turn the ignition switch to ON.
5. Use the FLUKE 115 MULTIMETER (P/N 529 035 868) and select Vdc.
6. Check for voltage as follows.

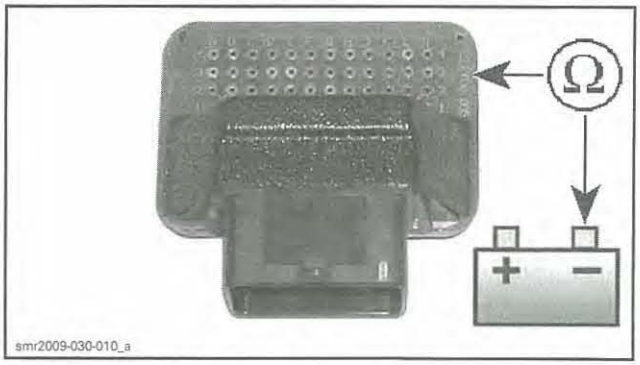
ECM ADAPTER	BATTERY	VOLTAGE
B-M4	Negative post	Battery voltage

If voltage is not measured, check the following:
- Main relay
- Wiring and connections, refer to the *WIRING DIAGRAM*.

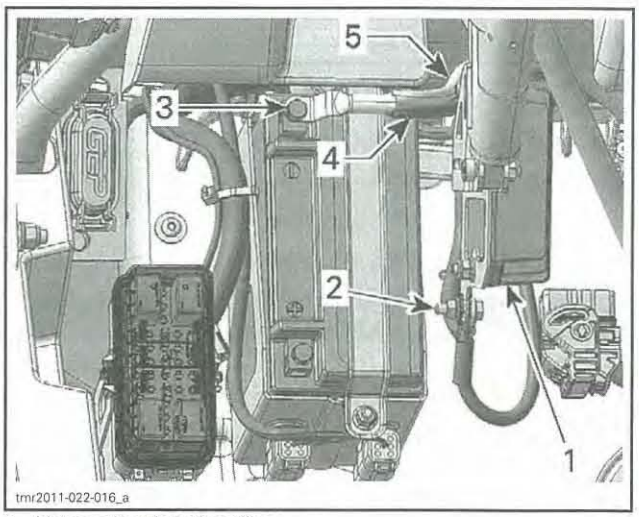
Continuity Test of ECM Ground Circuits

1. Disconnect connector "B" from ECM.
2. Install the ECM ADAPTER TOOL (P/N 529 036 166) on ECM-B connector.
3. Use the FLUKE 115 MULTIMETER (P/N 529 035 868) and select Ω.
4. Probe adapter terminals as per following table.

ECM ADAPTER	BATTERY POST	RESISTANCE
Pins B-L1, B-M2 and B-M3	Ground	Close to 0 Ω (continuity)



If any measurement is out of specification, check the following:
- Engine ground
- Battery ground
- Frame ground.



1. Voltage regulator/rectifier
2. Frame ground stud
3. Negative (-) battery post
4. Battery ground wire
5. Engine ground wire

ECM Removal

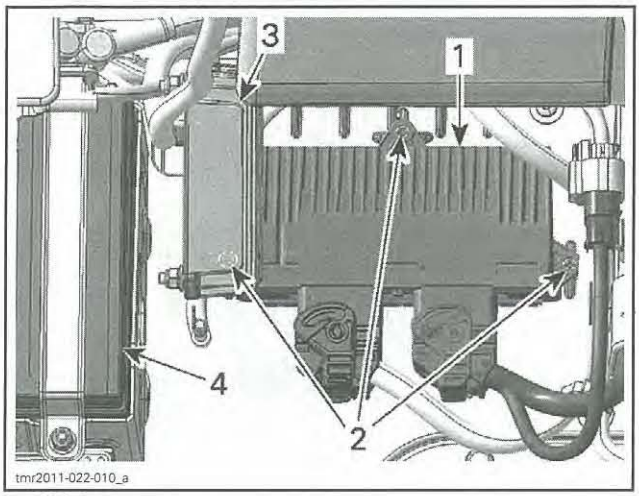
NOTE: If a new ECM is to be installed, first read the procedures in *ECM REPLACEMENT* in this subsection.

1. Disconnect battery cables.

NOTICE **Always disconnect the BLACK negative (–) battery cable first, then disconnect RED positive (+) cable.**

2. Disconnect both ECM connectors from ECM.

3. Unscrew all retaining screws and remove the ECM from its support.



1. *ECM*
2. *Retaining screws*
3. *Voltage regulator/rectifier*
4. *Battery*

ECM Installation

Reverse removal procedure however, pay attention to the following.

ECM INSTALLATION	
TORQUE	2 N•m ± 0.2 N•m (18 lbf•**in** ± 2 lbf•**in**)

1. Reconnect ECM connectors.
2. Reconnect battery cables.

⚠ WARNING

Always reconnect the RED positive (+) battery cable first, then reconnect BLACK negative (–) cable.

3. If a new ECM is installed, refer to *ECM REPLACEMENT* in this subsection.

ECM Replacement

Prior to replacing an ECM, ensure that all the recommendations in the general introduction of this section have been followed.

NOTE: Proceed with an *ECM FIRST INITIALIZATION* as it may resolve the problem.

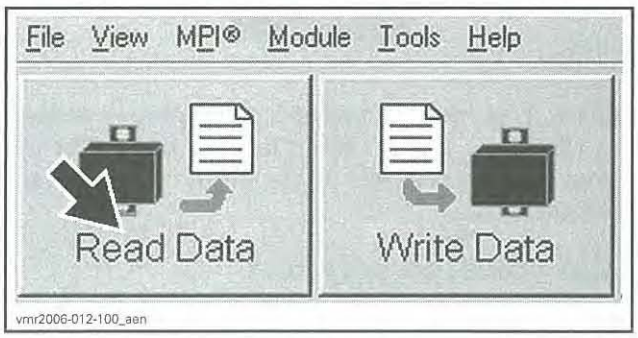
If the ECM is replaced, data must be transferred or entered into the new ECM using one of the following methods:

- 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.*

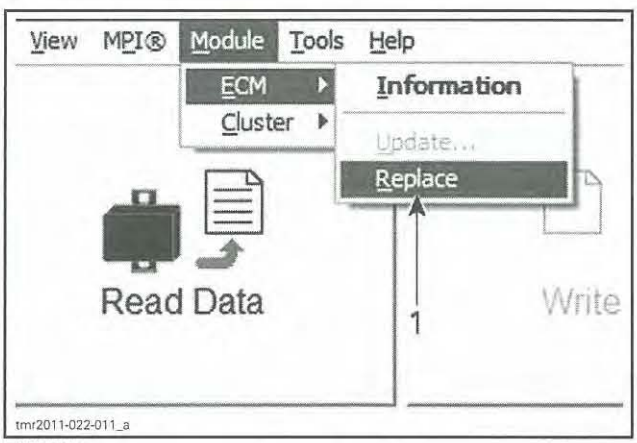
ECM Automated Data Transfer

To transfer the information recorded in the faulty ECM to the new ECM, carry out the following.

1. Connect vehicle to the applicable B.U.D.S. version. Refer to *COMMUNICATION TOOLS AND B.U.D.S.* subsection.
2. Turn **ignition switch to ON** to wake up the ECM.
3. In B.U.D.S., click the **Read Data button** to load the information from the faulty ECM into B.U.D.S.



4. 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.
5. Remove the old ECM. Refer to *ECM REMOVAL* in this subsection.
6. Install and connect the new ECM. Refer to *ECM INSTALLATION* in this subsection.
7. Turn ignition switch to ON to wake up the new ECM.
8. From the Module menu at the top of the B.U.D.S. page, choose:
   - ECM
   - Replace.



TYPICAL
1. *ECM* **Replace** *function in B.U.D.S.*

B.U.D.S. will automatically write the data from the PC computer into the new ECM.

9. Program the vehicle ignition keys into the new ECM, refer to *Digital Encoded Security System (D.E.S.S.)* subsection.
10. Perform the *ECM FIRST INITIALIZATION* procedure, refer to *ENGINE CONTROL MODULE* in this subsection.
11. Reinstall any remaining removed parts.

ECM Manual Data Entry

There are 2 possible methods to collect the required information. The 1st being the easiest:

1. Use B.U.D.S. to obtain the data from a saved .mpem file on your PC computer.
2. Collect the information from the vehicle and BOSSWeb.

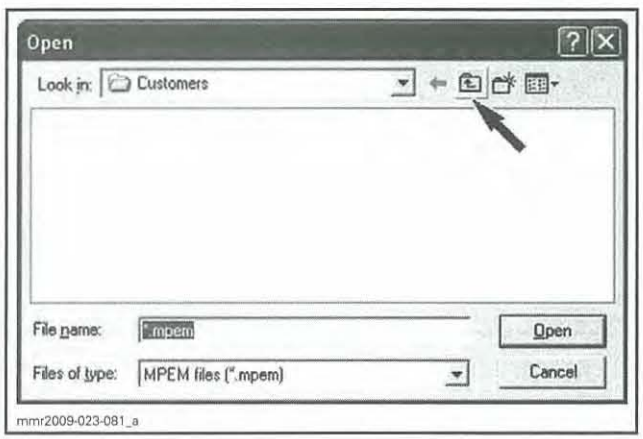
1st Collecting Method: Obtaining the Data from a Saved .mpem File

1. Use the B.U.D.S.

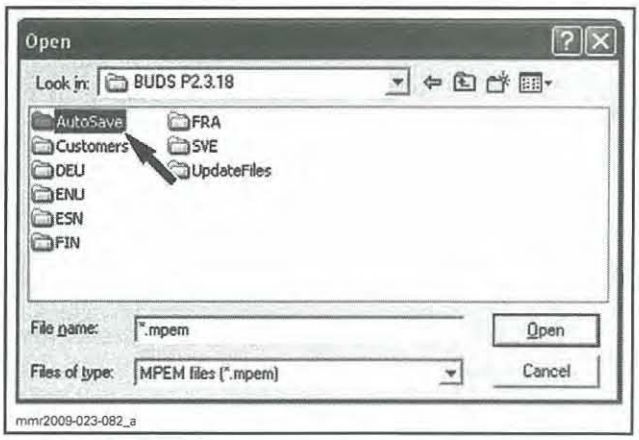
NOTE: It is not necessary to perform any connection. The PC computer can be used alone.

2. In B.U.D.S., click on the **Open** button.

3. Click once on the **Folder Up** button in the Open box.

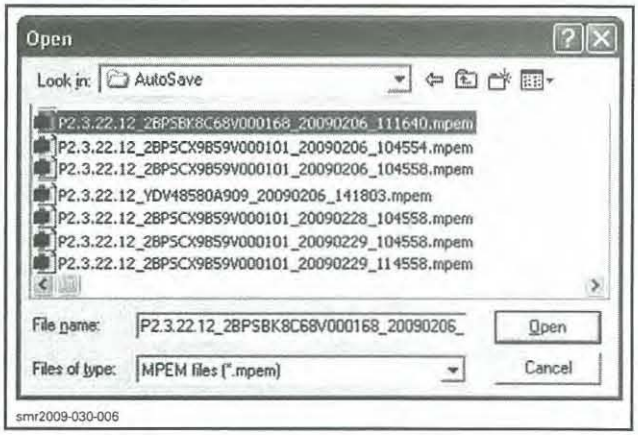


Double click on the **AutoSave** folder.



NOTE: You may have to go to another AutoSave folder from a previous version of B.U.D.S.

4. Choose the latest file saved for this specific vehicle.

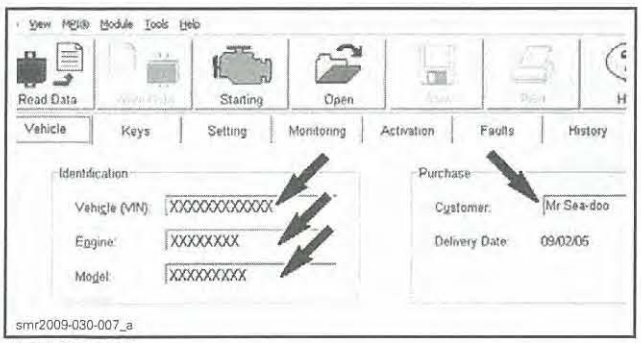


IMPORTANT: Be sure to use the file that specifically matches the vehicle you are servicing.

NOTE: The file name structure is as follows:
B.U.D.S. version_VIN_date read (yyyymmdd)_hour read (hhmmss).mpem
Example: P2.3.22.12_2BPSBK8C68V000168_20090206_111640.mpem Therefore: B.U.D.S. version: P2.3.22.12 VIN: 2BPSBK8C68V000168 Date: 2009 02 06 Hour: 11h 16m 40s

5. Select the **Vehicle** page tab and record (write down) the following information.
   1. Vehicle serial number
   2. Engine serial number (without the leading "M")

3. Vehicle model number
4. Customer name.

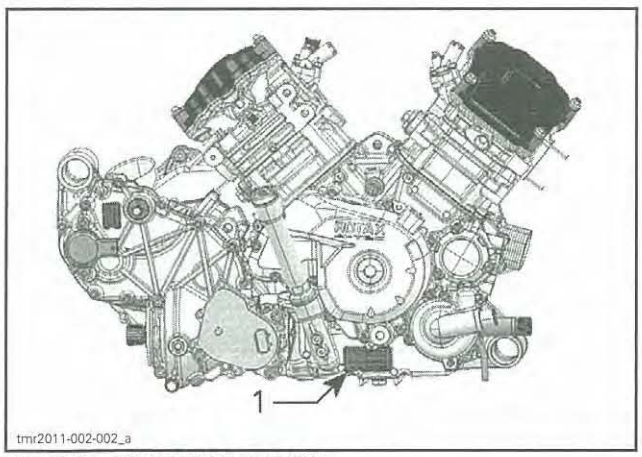


VEHICLE TAB

6. Enter recorded data in ECM as detailed in *ENTERING THE COLLECTED INFORMATION INTO THE ECM.*

2nd Collecting Method: Collect the Information from the Vehicle and BOSSWeb

1. Record engine serial number.



TYPICAL - RH SIDE OF ENGINE
1. Engine serial number

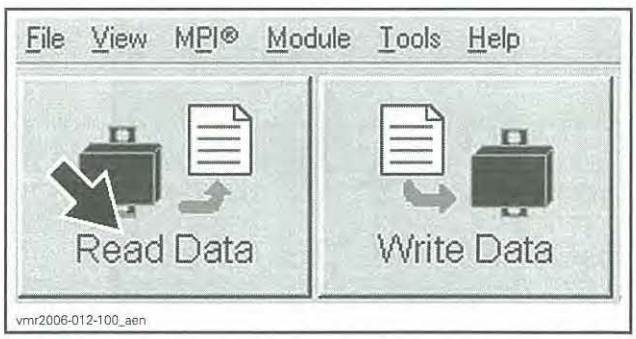
2. Record the following numbers using BOSSWeb. Look in **Service** menu and choose Unit history.
   1. Vehicle serial number
   2. Vehicle model number
   3. Customer name.

SERVICE, UNIT HISTORY

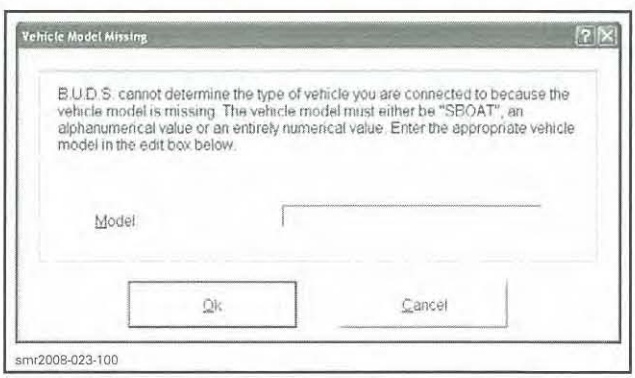
3. Enter the recorded data in the new ECM as detailed in *ENTERING THE COLLECTED INFORMATION INTO THE ECM.*

Entering the Collected Information Into the ECM

1. Use the applicable B.U.D.S. version. Refer to *COMMUNICATION TOOLS AND B.U.D.S.* subsection.
2. Turn ignition key to ON position.
3. In B.U.D.S., click the **Read Data** button to read the new ECM.

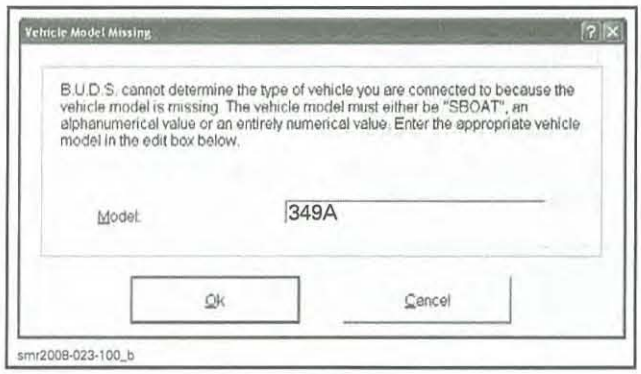


The following screen window will pop up.

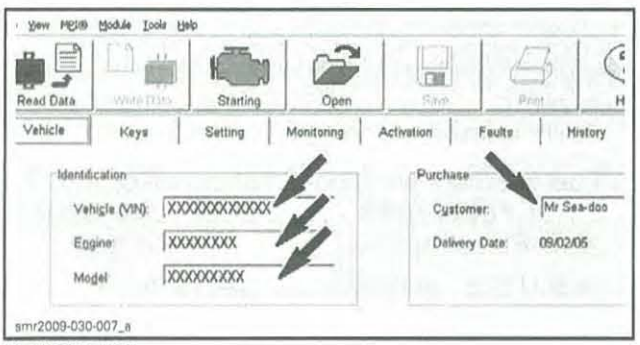


4. Enter the vehicle model number.

NOTICE Enter only the appropriate product model number as obtained when gathering the information.

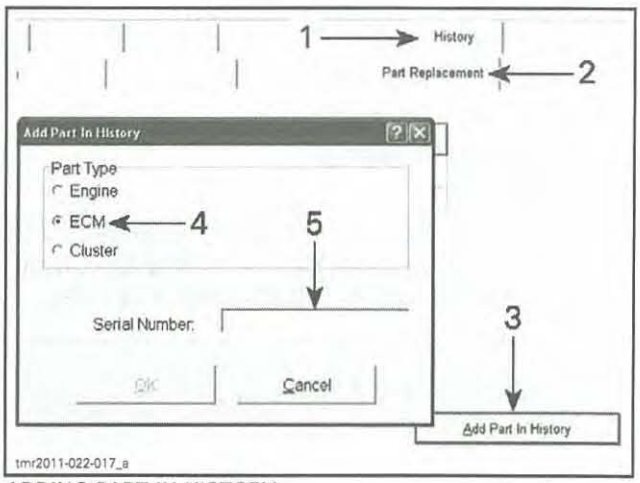


5. Select the **Vehicle** tab and enter the information you recorded previously.
   1. Vehicle serial number
   2. Engine number (do not enter the "M" at the beginning of the engine number)
   3. Customer name.



VEHICLE TAB

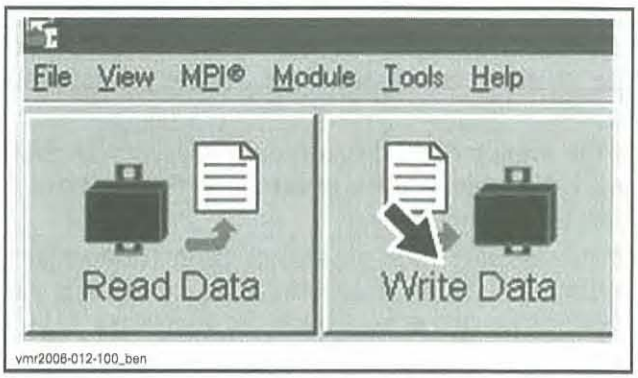
6. Click on the following tabs:
   - **History**
   - **Part Replacement**
   - **Add Part in History.**
7. Enter the **old** ECM serial number in the Add Part In History window.



ADDING PART IN HISTORY
1. **History** *page tab*
2. **Part Replacement** *tab*
3. **Add part in history** *button*
4. **ECM** *selection*
5. *Add ECM serial number here*

NOTE: The ECM serial number can be found on the ECM sticker that also identifies the part number.

8. Click on the **OK** button.
9. Click on the **Write Data** button.



10. Perform the *ECM FIRST INITIALIZATION* reset.
11. Program the vehicle ignition keys into the new ECM, refer to *Digital Encoded Security System (D.E.S.S.)* subsection.
12. Reinstall any remaining removed parts.

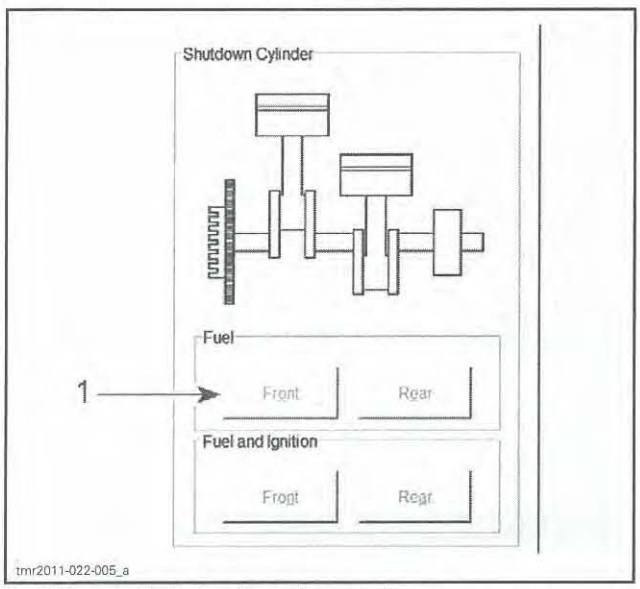
FUEL INJECTOR

Fuel Injector Operation Test Using B.U.D.S. (Dynamic)

NOTE: As a first troubleshooting step, always check for applicable fault codes using B.U.D.S.

1. Connect vehicle to the applicable B.U.D.S. version. Refer to *COMMUNICATION TOOLS AND B.U.D.S.* subsection.

2. Start engine.
3. In B.U.D.S., select the following:
   - **Read Data** button
   - **Monitoring** page tab
   - **ECM** page.
4. Using the B.U.D.S., shut down fuel injection to each engine cylinder one at a time by clicking on the button under the applicable cylinder.



1. Click on cylinder number to be tested

If the engine RPM drops momentarily when clicking on a cylinder, the injector on this cylinder is functioning normally.

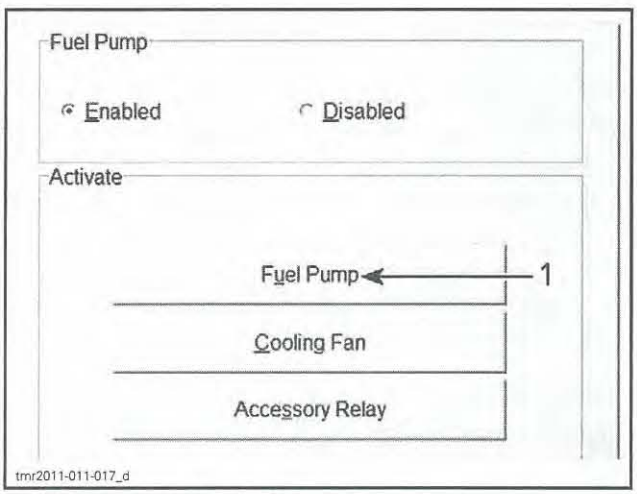
If the engine RPM does not drop momentarily when clicking on a cylinder, this cylinder is not functioning properly. Check the following:

- Fuel injector operation. Refer to *FUEL INJECTOR BALANCE TEST USING B.U.D.S.*
- Spark plug and ignition coil. Refer to *IGNITION SYSTEM* subsection.
- Engine condition.

Fuel Injector Balance Test Using B.U.D.S.

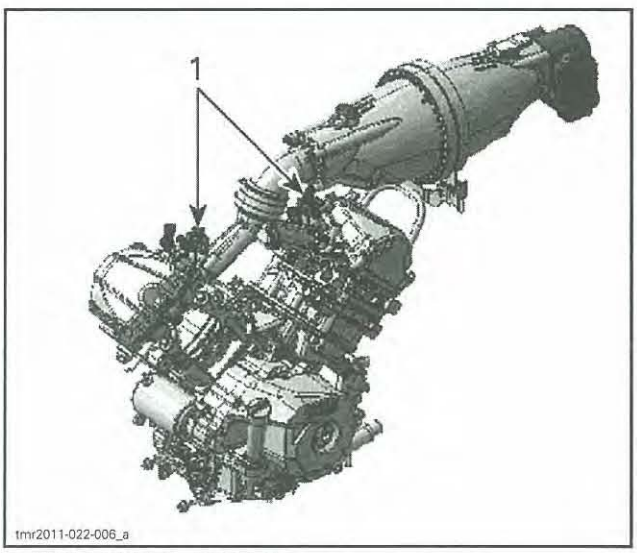
NOTICE After fuel injector activation using B.U.D.S., always crank engine in drowned mode to ventilate engine and prevent a potential backfire due to fuel accumulation in engine.

1. Install a fuel pressure gauge as described in *FUEL PUMP PRESSURE TEST* of *FUEL TANK AND FUEL PUMP* subsection.
2. Connect vehicle to the applicable B.U.D.S. software version. Refer to *COMMUNICATION TOOLS AND B.U.D.S.* subsection.
3. Turn the ignition key to ON.
4. In B.U.D.S., select the following:
   - **Read Data** button
   - **Activation** page tab.
5. In B.U.D.S., click on the **Fuel Pump** button to activate fuel pump.



1. Fuel Pump activation button

6. Fuel pressure must be within specification. Refer to *FUEL TANK AND FUEL PUMP* subsection. Re-activate fuel pump as necessary.
7. In B.U.D.S., energize fuel injector **no. 1**.



1. Click on injector to activate

8. Record the fuel pressure drop for injector **no. 1**.
9. In B.U.D.S., click on the Fuel Pump button to activate fuel pump.

10. Repeat the procedure for fuel injector **no. 2** and record the pressure drop for each injector.
11. The maximum fuel pressure drop between injectors should not exceed the following specification:

MAXIMUM FUEL PRESSURE DROP ALLOWED BETWEEN FUEL INJECTORS
10 kPa (1.5 PSI)

If pressure drop of any fuel injector is greater than the specification, replace that injector then repeat the test.

12. Using the valve on the fuel pressure gauge, release the pressure in the system (if so equipped).
13. Remove fuel pressure gauge and reinstall removed parts.

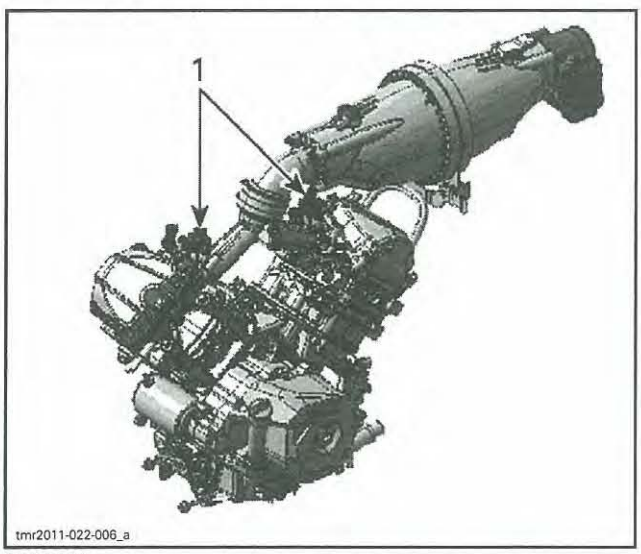
Fuel Injector Leak Test

Carry out the *FUEL PUMP PRESSURE TEST* as detailed in the *FUEL TANK AND FUEL PUMP* subsection.

Fuel Injector Activation Test Using B.U.D.S.

Turn ignition key to ON.

On the **Activation** page of B.U.D.S. software, energize the fuel injector to be tested.



TYPICAL
1. Click on injector to activate

You should hear the injector functioning.

This will validate the injector mechanical and electrical operation.

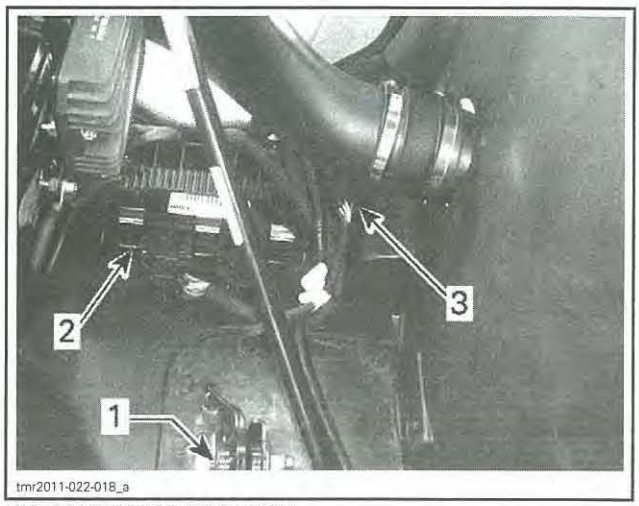
If the injector does not function, carry out the *FUEL INJECTOR RESISTANCE TEST.*

Fuel Injector Resistance Test

Disconnect connector "A" from the ECM.

Disconnect the engine connector (HIC).

NOTE: The HIC connector is located to the right of the ECM.



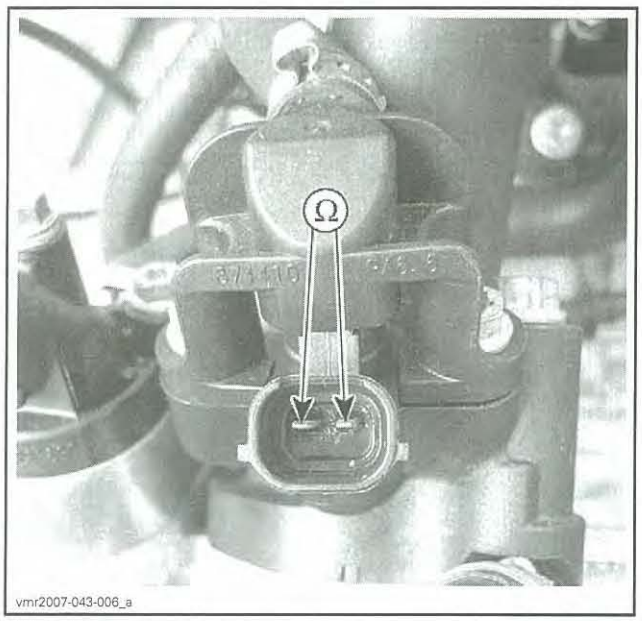
HIC CONNECTOR LOCATION
1. Accelerator pedal (not visible)
2. ECM
3. HIC connector

Using a FLUKE 115 MULTIMETER (P/N 529 035 868), check resistance value between terminals as follows.

FUEL INJECTOR RESISTANCE TEST AT HIC CONNECTOR			
INJECTOR	**HIC CONNECTOR**	**ECM CONNECTOR "A"**	**RESISTANCE @ 20°C (68°F)**
800R and 1000 Engines			
FRONT	D	A-J1	11.4 - 12.6 Ω
REAR		A-K1	

If resistance value obtained is incorrect, remove injector connector and check resistance value between injector pins as follows.

FUEL INJECTOR RESISTANCE TEST AT INJECTOR CONNECTOR			
INJECTOR	**INJECTOR PIN**		**RESISTANCE @ 20°C (68°F)**
800R and 1000 Engines			
FRONT	1	2	11.4 - 12.6 Ω
REAR			



TYPICAL

If readings are out of specifications, replace injector.

If readings are good, carry out a *FUEL INJECTOR INPUT VOLTAGE* test.

Fuel Injector Input Voltage Test

Disconnect the fuel injector connector.

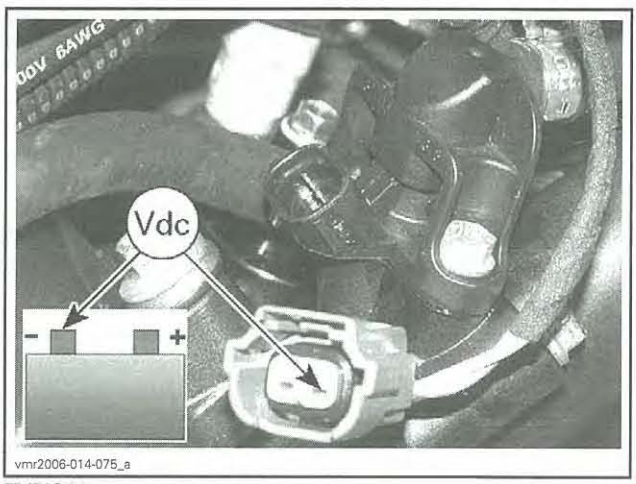
NOTE: If the connector is hard to unlock, gently use a screwdriver to release connector.

TYPICAL

NOTE: It is not necessary to activate the injector since it is continuously powered when the ignition key is set to ON.

Use a multimeter and set it to Vdc. Read voltage.

CYLINDER	INJECTOR CONNECTOR		MEASUREMENT
	WIRE		
FRONT	VIOLET/ BLUE	Battery ground	12 Vdc
REAR			



TYPICAL

If supply voltage is not good, check continuity between fuse F5 and injector (see *WIRING DIAGRAMS*).

NOTE: Probe fuse exactly as shown. This validates fuse at the same time.

Use a multimeter and set it to Ω. Read resistance.

CYLINDER	INJECTOR CIRCUIT		MEASUREMENT
	WIRE		
FRONT	VIOLET/ BLUE	Fuse F5	Close to 0 Ω
REAR			

If continuity is good, check relay and wiring from battery.

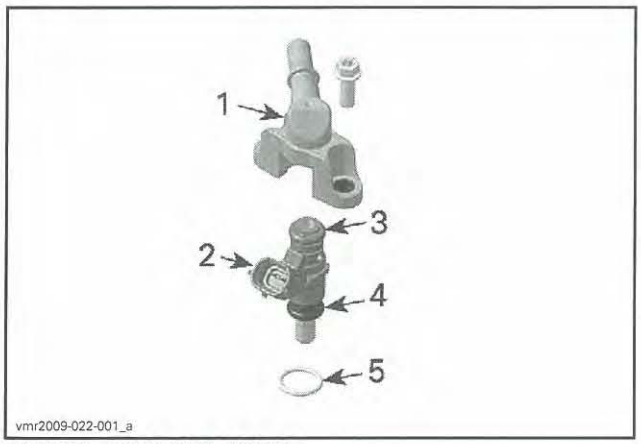
If continuity is faulty, check fuse and if OK, repair/replace wiring going to injector.

If supply voltage is good, check ground circuit between injector and ECM (see *WIRING DIAGRAMS*).

- If ground circuit is faulty, repair/replace wiring and connectors.
- If ground circuit is good, refer to *ECM REPLACEMENT*.

Fuel Injector Removal

To remove the injector, first remove the fuel rail refer to *FUEL RAIL* for the procedure.



TYPICAL - FUEL RAIL ASS'Y
1. *Fuel rail*
2. *Fuel injector*
3. *Injector top O-ring*
4. *Injector bottom O-ring*
5. *Manifold O-ring*

Then pull fuel injector out of the fuel rail.

Fuel Injector Installation

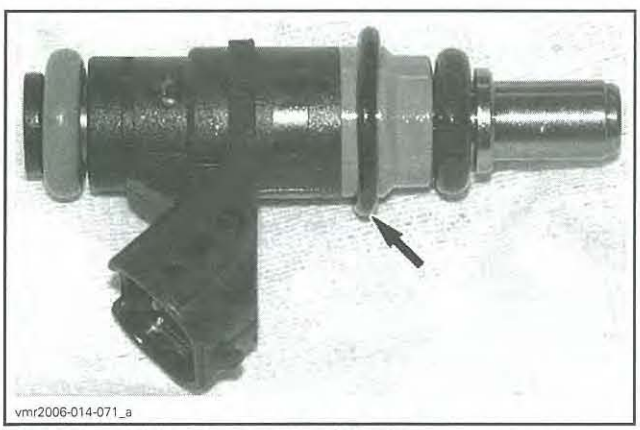
For the installation, reverse the removal procedure. Pay attention to the following details.

Apply a thin film of engine oil to O-rings to ease insertion in rail.

Install fuel injector with your hand. Do not use any tool.

FUEL INJECTOR INSTALLATION		
O-RINGS	New	Lubricate with engine oil

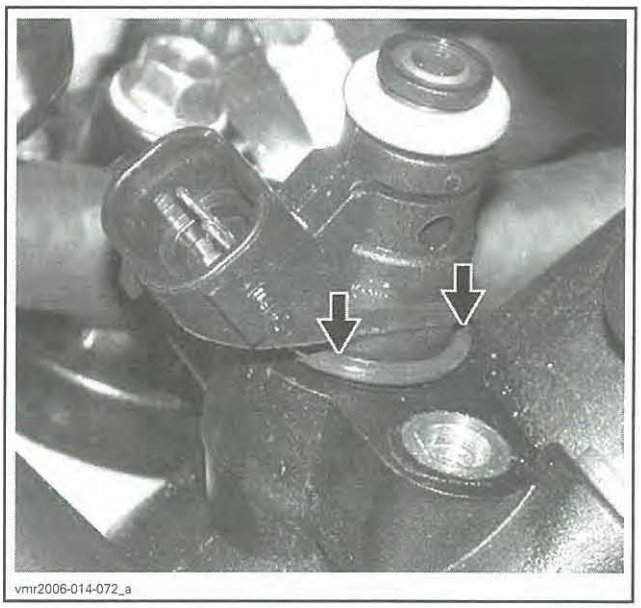
Position the manifold O-ring on injector as in following illustration.



TYPICAL - MANIFOLD O-RING POSITION

Carefully insert injector in manifold paying attention to the manifold O-ring.

NOTICE **Gently push O-ring in evenly all around while inserting injector. O-ring must be completely inserted and not visible, before completing the insertion of the injector.**



Firmly push injector until it bottoms out.

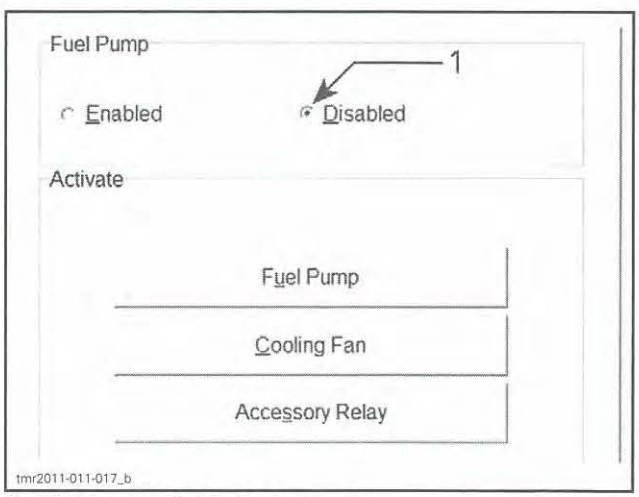
Reinstall fuel rail.

FUEL RAIL

Fuel Rail Replacement

Fuel Rail Removal

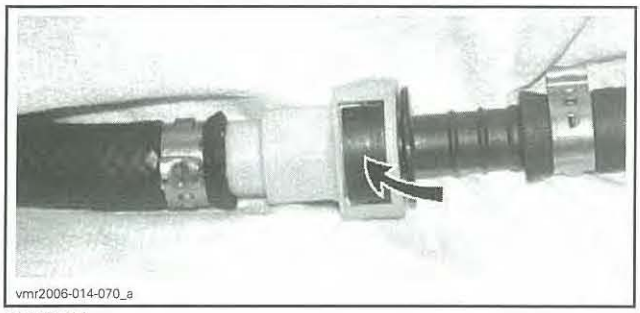
1. Connect vehicle to the applicable B.U.D.S. software version and select the following:
   - **Read Data** button
   - **Activation** page tab
   - **ECM** page tab
   - Fuel pump **Disabled**.



1. *Click here to disable the fuel pump*

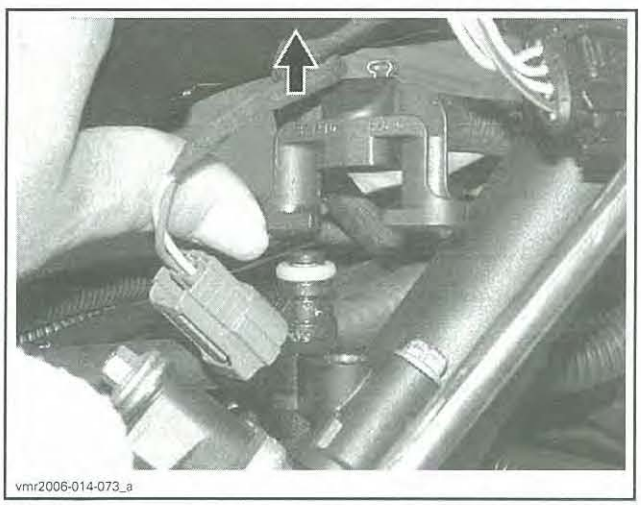
2. Release fuel pressure by running engine until it runs out of gas.
3. Turn ignition key OFF.

4. Wrap a rag around the inlet hose and release the quick fitting.



TYPICAL

5. Unscrew rail retaining screws.
6. Gently pull rail off by hand.



TYPICAL

To disconnect fuel rail from hose, cut clamp on fuel hose using OETIKER PLIERS (P/N 295 000 070). Refer to *FUEL TANK AND FUEL PUMP* for clamp removal/installation procedures.

NOTE: If fuel rail is removed for access to fuel injector, it is not necessary to cut hose clamp. Only to replace fuel rail.

Fuel Rail Installation

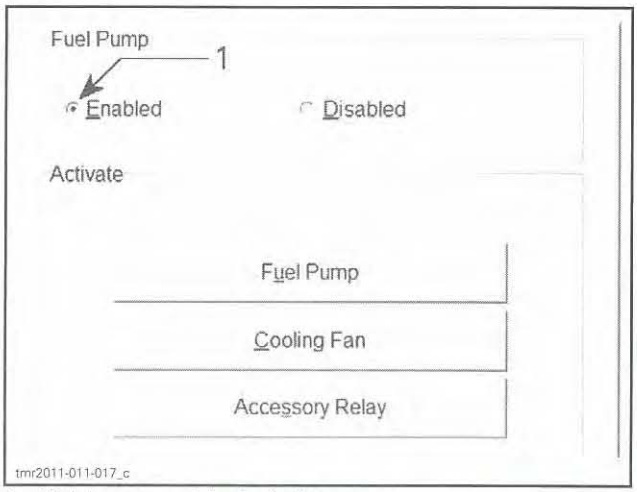
For installation, reverse the removal process however, pay attention to the following.

Install new clamps using pliers as per removal (if fuel rail was replaced).

Install fuel rail and evenly tighten screws a little at a time each side.

FUEL RAIL INSTALLATION	
INJECTOR O-RINGS	RETAINING SCREW TORQUE
NEW (Lubricate with engine oil)	10 N•m ± 1 N•m (89 lbf•**in** ± 9 lbf•**in**)

After securing fuel hose quick fitting to injector, re-enable fuel pump using B.U.D.S.



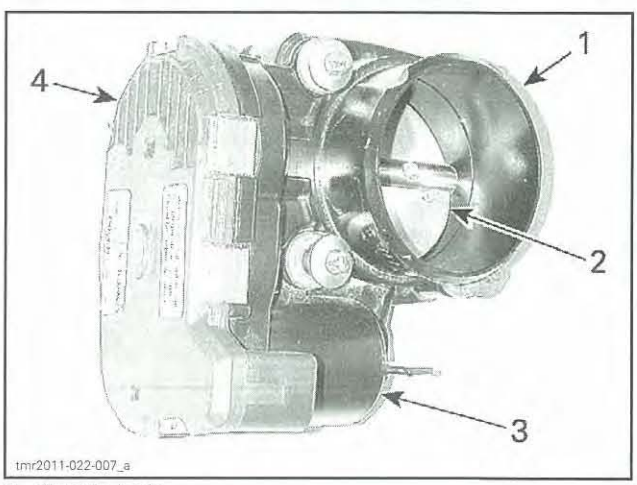
1. Click here to enable the fuel pump

⚠ WARNING

Perform a fuel pressure test and ensure that there is no leak. Refer to *FUEL TANK AND FUEL PUMP*. Run engine and check for leaks.

THROTTLE BODY

Throttle Body Description



1. Throttle body
2. Throttle plate
3. Electric throttle actuator (electric motor inside)
4. Throttle position sensor (TPS) (inside)

Throttle Body Access

Refer to *AIR INTAKE SYSTEM* and remove the following parts:

- Air filter housing
- Air intake adapter.

Throttle Body Lubrication

No lubrication is required.

Throttle Body Cleaning

1. Remove air inlet hose from throttle body.
2. Check throttle body cleanliness using a flashlight. Fully open throttle plate and verify:

- Throttle body bore
- Throttle plate edge.

Look for:

- Dirt
- Oily surfaces
- Carbon and salt deposits on throttle plate and the surrounding bore.

3. Clean as necessary.
4. Use a throttle body cleaner such as GUNK INTAKE MEDIC or an equivalent.

NOTICE **Only use an appropriate throttle body cleaner that will not damage O-rings and EFI sensors.**

⚠ CAUTION **Use the product in a well ventilated area. Refer to product manufacturer's warnings.**

5. To avoid getting dirt into engine, spray cleaner on a clean rag then rub rag against throttle plate and bore. A toothbrush may also be used.

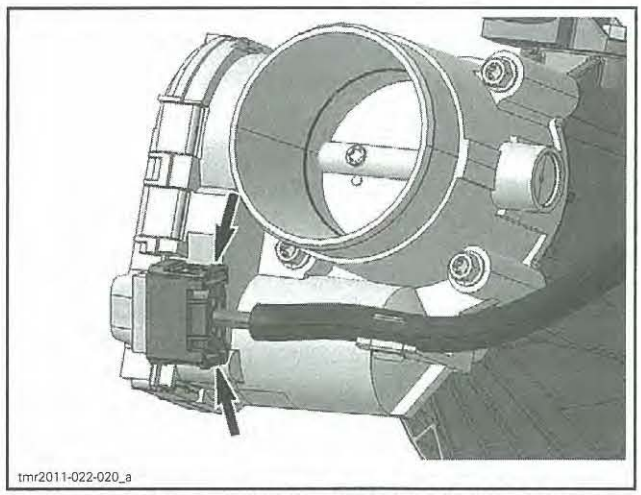
⚠ CAUTION **Ensure ignition key is removed so that nobody can activate the electrical system, otherwise the ECM would turn on and the throttle actuator (ETA) would cycle. This could cause serious finger injury as the throttle plate moves quickly.**

6. Gently open throttle plate and hold fully open to reach all surfaces.
7. To remove residual dirt, spray cleaner on throttle plate and on bore.
8. Reinstall removed parts.

Throttle Body Removal

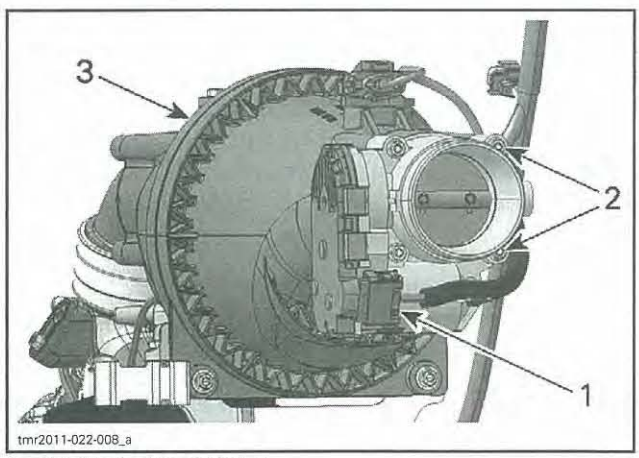
1. Disconnect air inlet hose from throttle body.
2. Disconnect throttle body connector.

To remove connector from throttle body, simultaneously press the end of both connector locking tabs illustrated.



THROTTLE BODY CONNECTOR- PRESS HERE TO UNLOCK

3. Remove screws retaining throttle body to plenum.



1. *Throttle body connector*
2. *Screws (4)*
3. *Plenum*

4. Pull throttle body off plenum.

Throttle Body Installation

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

TORQUE FOR THROTTLE BODY RETAINING SCREWS
10 N•m ± 1.2 N•m (89 lbf•**in** ± 11 lbf•**in**)

1. Perform the *THROTTLE POSITION SENSOR INITIALIZATION* reset procedure. Refer to *THROTTLE POSITION SENSOR (TPS)* in this subsection.

THROTTLE POSITION SENSOR (TPS)

TPS Description

NOTE: The TPS is part of the throttle body.

The throttle position sensor (TPS) is a double potentiometer that sends signals to the ECM that are proportional to the throttle plate angle.

NOTE: As a first troubleshooting step, always check for applicable fault codes using B.U.D.S. software.

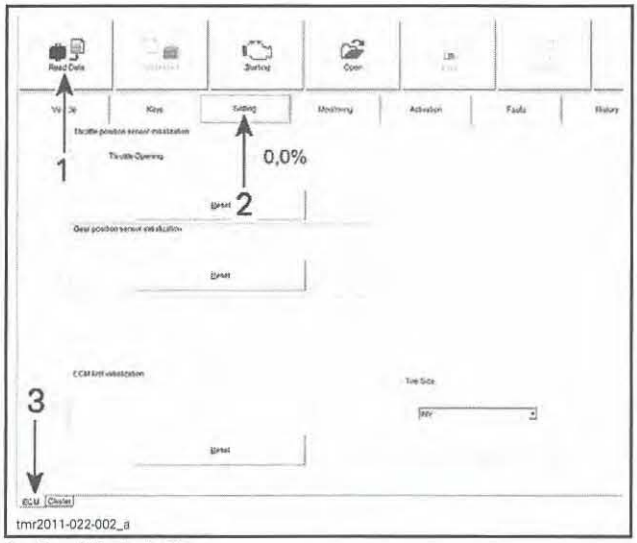
Throttle Position Sensor Initialization

NOTE: The TPS iniatialization procedure **must** be carried out whenever the throttle body is replaced, unless an ECM first initialization reset is carried out.

This operation performs a reset of the TPS basic values in the ECM. This reset is very important as the TPS values are part of the basic parameters for all fuel mapping calculations and control of several settings such as for idle speed, LIMP HOME mode and maximum RPM of the engine.

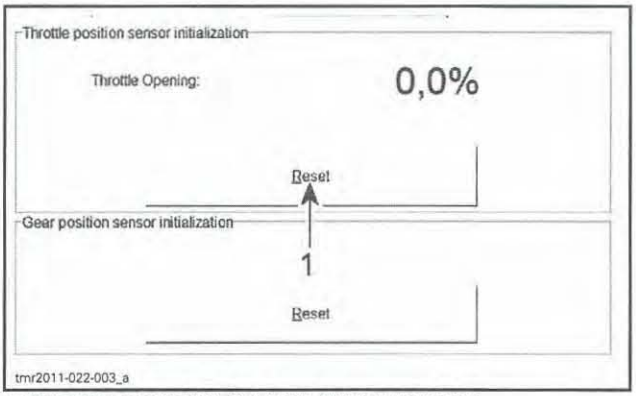
NOTICE **An improperly set TPS may lead to improper idle speed (too low or too high), poor engine performance, poor engine starting and engine stop on deceleration, fault codes and possible engine damage. Emission compliance may also be affected.**

1. Connect vehicle to the applicable B.U.D.S. software version, refer to *COMMUNICATION TOOLS AND B.U.D.S.* subsection.
2. In B.U.D.S., select the following:
   - **Read Data** button
   - **Setting** page tab
   - **ECM** tab.



1. **Read Data** *button*
2. **Setting** *page tab*
3. **ECM** *page tab*

3. Ensure the accelerator pedal is fully released and at the idle position.
4. In the **Throttle position sensor initialization** field, click on the **Throttle Opening Reset** button.



THROTTLE POSITION SENSOR INITIALIZATION
1. **Throttle Opening Reset** *button*

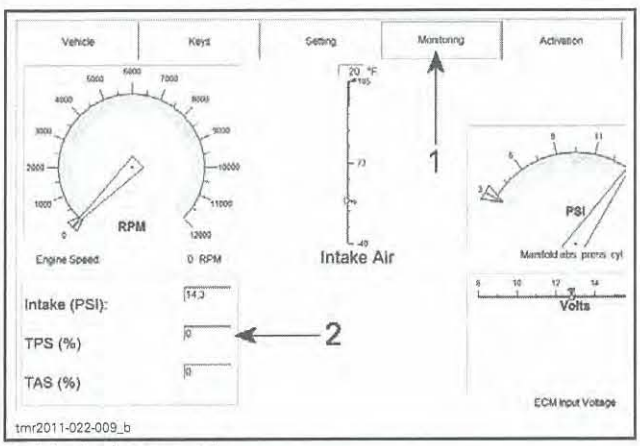
A message will be displayed if the operation is successful.

If an error occurred or the TPS is not within the allowed range while resetting, the ECM will generate a fault code and will not accept the setting.

5. If a fault message is displayed, follow the instructions in the message(s).
6. Check for fault codes.
7. If a fault code is generated,
   - Carry out the service actions
   - Reset the fault
   - Repeat the reset procedure.
8. Start engine and make sure it operates normally throughout its full engine RPM range.

TPS Wear Test

1. With the engine turned off, slowly press on the accelerator pedal and pay attention for smooth operation without physical stops.
2. Activate the electrical system to wake up the ECM.
3. Connect vehicle to the applicable B.U.D.S. software version. Refer to *COMMUNICATION TOOLS AND B.U.D.S.* subsection.
4. In B.U.D.S., select the following:
   - **Monitoring** page tab
   - **ECM** page tab.
5. Slowly and regularly move the accelerator pedal.
6. Observe the Throttle Opening indication movement in B.U.D.S.



1. *Monitoring page tab*
2. *TPS indication*

NOTE: The indication should move gradually and regularly as you move the accelerator pedal. If the TPS indication is erratic or suddenly drops off, it may indicate a worn TPS that needs to be replaced. An initial slight delay after the accelerator pedal is moved and before the indication starts to move is normal.

If the indication behavior is not as expected, proceed with the following steps.

7. Manually move the throttle plate in the throttle body using a blunt tool (without sharp tip).

⚠ CAUTION **Do not move throttle plate with your fingers. Otherwise, if ECM should turn off, it would quickly close the throttle plate which could cause finger injury.**

1. *Push here*

8. Check the indication movement again.

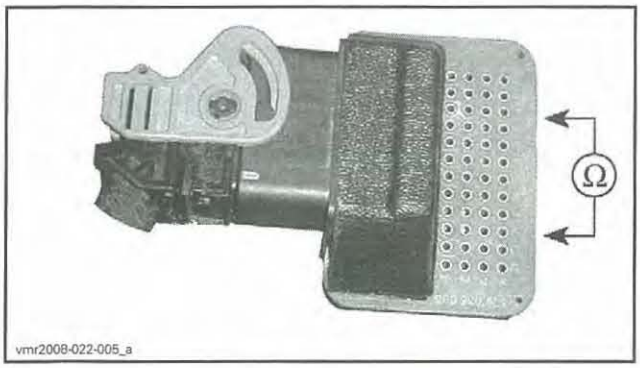
- If the indication moves as expected, check the throttle accelerator sensor (TAS). Refer to *THROTTLE ACCELERATOR SENSOR (TAS)* in this subsection.
- If the indication does not move as expected, perform the *TPS RESISTANCE TEST* in this subsection.

TPS Resistance Test

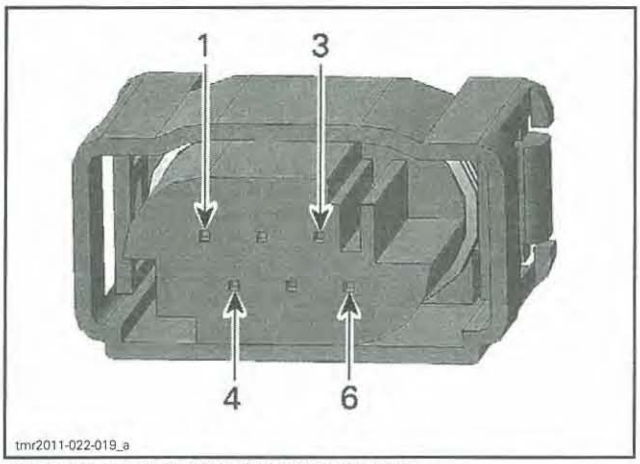
1. Ensure the throttle body connector is properly connected.
2. Disconnect ECM connector A from the ECM and install it on the ECM ADAPTER TOOL (P/N 529 036 166).
3. Use the FLUKE 115 MULTIMETER (P/N 529 035 868) and select Ω.
4. Probe circuit as per following table while using your hand to manually move throttle plate.

ECM ADAPTER		FULLY CLOSED THROTTLE PLATE (1)		FULLY OPEN THROTTLE PLATE	
		RESISTANCE (Ω)			
PIN		MIN.	MAX.	MIN.	MAX.
A-A2	A-K4	875	1625	875	1625
A-A2	A-K3	954	1934	228	585
A-A2	A-F3	254	634	980	1983
A-K3	A-K4	228	585	954	1934
A-K3	A-F3	1385	2315	1385	2315
A-K4	A-F3	980	1983	254	634

(1) To obtain the fully closed position, it is necessary to push against the throttle plate in the throttle body with your hand and hold it in this position for the measurement.



If any resistance value is incorrect, check wire continuity between ECM and throttle body before assuming the TPS is at fault. Refer to *WIRING DIAGRAM* subsection.

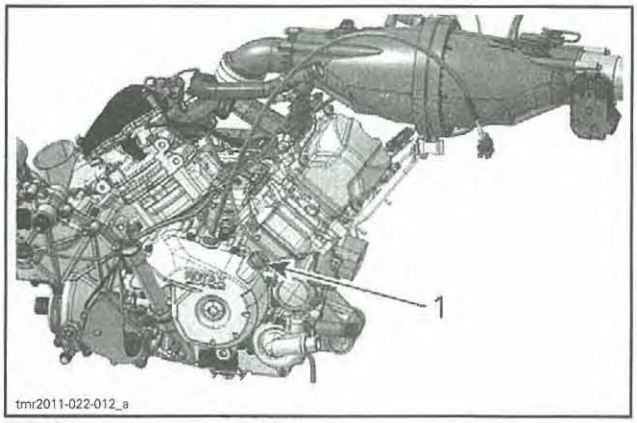


THROTTLE BODY CONNECTOR PIN-OUT

TPS Replacement

Carry out a *THROTTLE POSITION SENSOR INITIALIZATION* procedure as detailed in *THROTTLE BODY* of this subsection.

CRANKSHAFT POSITION SENSOR (CPS)

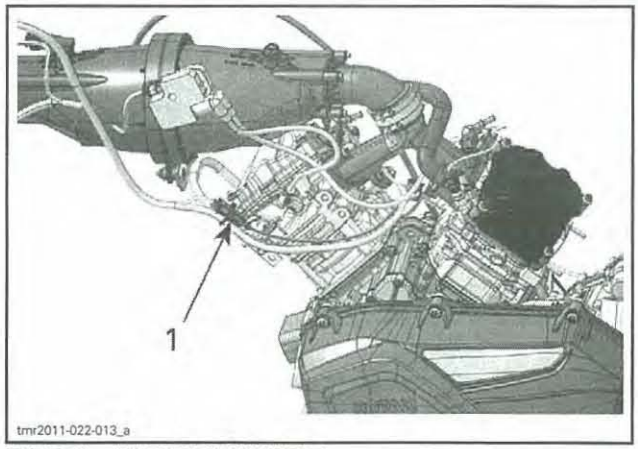


TYPICAL - RH SIDE OF ENGINE
1. CPS location

NOTE: Take into account that a CPS fault can be triggered by bent or missing encoder wheel teeth. First check fault codes using B.U.D.S., then check the encoder wheel teeth condition if necessary (refer to *MAGNETO SYSTEM*).

CPS Resistance Test

Disconnect CPS wiring harness connector.



TYPICAL - LH SIDE OF VEHICLE
1. CPS connector location

Probe terminals as per following table.

CPS CONNECTOR		MEASUREMENT
PIN		RESISTANCE Ω @ 20°C (68°F)
1	2	700 - 900 Ω

If resistance is not within specifications, replace the CPS.

If resistance tests good, **reconnect** the CPS connector and disconnect the connector "A" on the ECM.

Install ECM-A connector on ECM ADAPTER TOOL (P/N 529 036 166).

Using a multimeter, recheck resistance as per table.

ECM CONNECTOR		MEASUREMENT
PIN		RESISTANCE Ω @ 20°C (68°F)
A-H1	A-K2	700 - 900 Ω

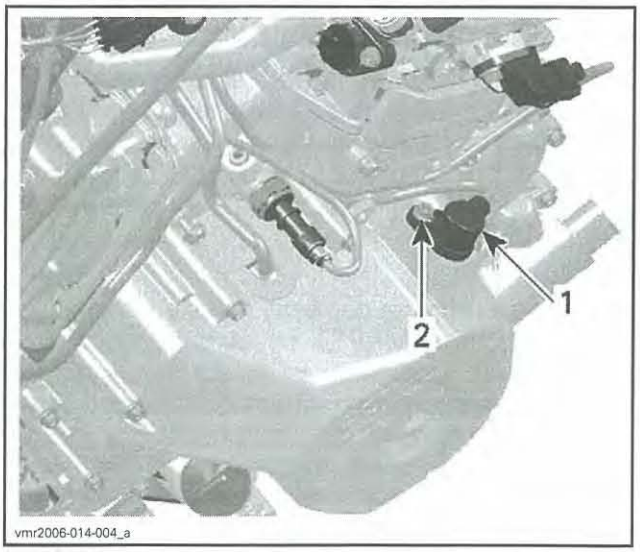
If resistance value is correct, refer to *ECM REPLACEMENT*.

If resistance value is incorrect, repair the connectors or replace the wiring harness between ECM connector and the CPS.

CPS Replacement

Disconnect CPS connector and cut harness locking tie.

Remove CPS retaining screw and pull up on CPS to remove it.

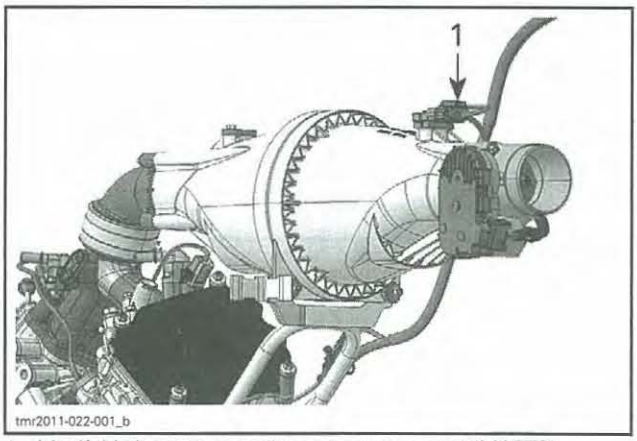


TYPICAL
1. CPS
2. Retaining screw

Install new CPS and secure harness with a new locking tie.

CPS INSTALLATION	
O-RING	PRODUCT
	XPS SYNTHETIC GREASE (P/N 293 550 010)
SENSOR SCREW	TORQUE
	10 N•m ± 1 N•m (89 lbf•**in** ± 9 lbf•**in**)

MANIFOLD AIR PRESSURE AND TEMPERATURE SENSOR (MAPTS)



1. Manifold air pressure and temperature sensor (MAPTS)

NOTE: This sensor is a multifunction device.

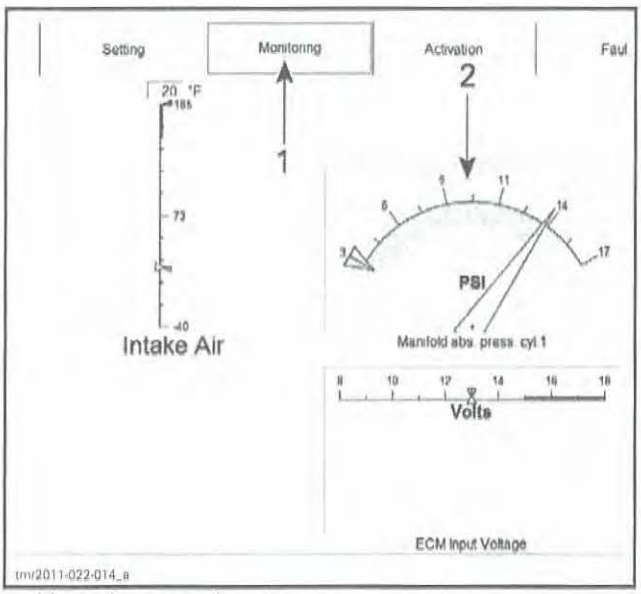
MAPTS Pressure Function

Before the engine is started, when power is applied to the system, the sensor measures the ambient air atmospheric pressure. The ambient pressure is, at that moment, stored in the ECM. Thereafter, once the engine is started, it measures the air pressure in the inlet end of the plenum at operating RPMs.

The sensor must be correctly installed on plenum. Otherwise, the MAPTS could generate a fault code for an unexpected sensor range at idle when it reads the atmospheric pressure. If this is the case, remove sensor and check for oil or dirt on its end and if problem persists, check throttle plate condition/position and the wiring harness. Perform the following tests.

MAPTS Pressure Function Quick Test

1. Connect vehicle to the applicable B.U.D.S. software version.
2. In B.U.D.S., select the following:
   - Read Data
   - Monitoring page tab
   - ECM page.



1. Monitoring page tab
2. MAPTS pressure reading

3. Look for and take note of the MAPTS pressure reading while the engine is stopped.
4. Perform the same test with a new MAPTS and compare both readings.

Values have to be within ± 3.4 kPa (0.5 PSI).

MAPTS PRESSURE FUNCTION QUICK TEST			
RESULT	SERVICE ACTION		
NO READING	Circuit Continuity Test of MAPTS Pressure Function	MAPTS Input Voltage Test	Repair or replace wiring
VALUE IS OUT OF RANGE	Replace MAPTS		

MAPTS Input Voltage Test

Check the voltage output from ECM to the pressure sensor.

1. Turn ignition key ON.
2. Remove electrical connector from MAPTS.
3. Using a FLUKE 115 MULTIMETER (P/N 529 035 868), measure for input voltage as per following table.

MAPTS CONNECTOR		MEASUREMENT
PIN		VOLTAGE
1	3	5 Vdc

If voltage test is good, replace the MAPTS.

If voltage test is not good, carry out the *MAPTS CIRCUIT CONTINUITY TEST (PRESSURE FUNCTION).*

MAPTS Circuit Continuity Test (Pressure Function)

1. Disconnect the ECM "A" connector.
2. Install ECM-A connector on ECM ADAPTER TOOL (P/N 529 036 166).
3. Using a multimeter, check continuity of the following circuits.

MAPTS CIRCUIT CONTINUITY TEST (PRESSURE FUNCTION)		
ECM-A	MAPTS CONNECTOR	RESISTANCE VALUE
Pin B4	Pin 3	Close to 0 Ω
Pin G4	Pin 4	
Pin H2	Pin 1	

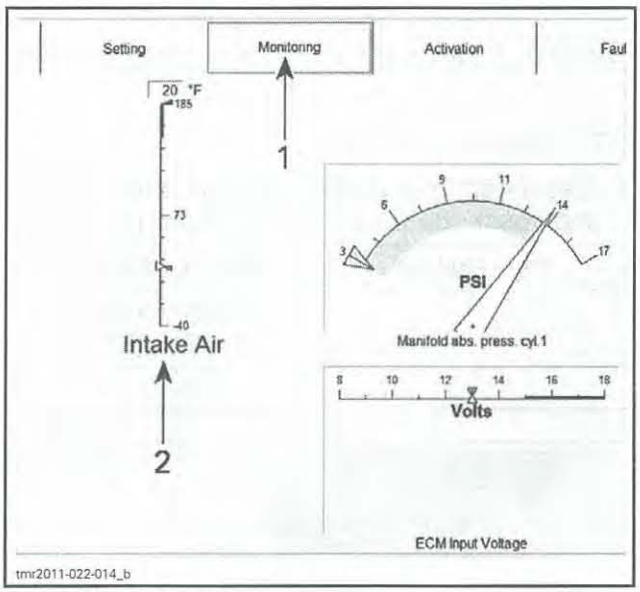
If resistance is not within specification, repair or replace the wiring harness between ECM connector and the MAPTS.

MAPTS Temperature Function

The sensor monitors the temperature in the inlet of the plenum.

MAPTS Quick Test (Temperature Function)

1. Connect vehicle to the applicable B.U.D.S. software version.
2. In B.U.D.S., select the following:
   - **Read Data**
   - **Monitoring** page tab
   - **ECM** page.
3. Look for the **Intake Air** temperature reading while the engine is stopped.



1. Monitoring page tab
2. MAPTS temperature reading

4. Perform the same test with a new MAPTS and compare both readings.

If the engine's MAPTS temperature reading is significantly different than the new MAPTS, replace it.

NOTE: Both sensors must feel same ambient air temperature.

If there is no reading, carry out a *MAPTS RESISTANCE TEST (TEMPERATURE FUNCTION).*

MAPTS Resistance Test (Temperature Function)

Disconnect the connector from the MAPTS.

Using the FLUKE 115 MULTIMETER (P/N 529 035 868), check the resistance of the sensor itself as shown.

MAPTS		MEASUREMENT
PIN		RESISTANCE Ω @ 20°C (68°F)
1	2	2280 - 2740

If resistance is not within specification, replace the MAPTS.

If resistance tests good, **reconnect** the MAPTS and disconnect the connector "A" from the ECM.

Install ECM-A connector on ECM ADAPTER TOOL (P/N 529 036 166).

Using a multimeter, recheck resistance value as per following table.

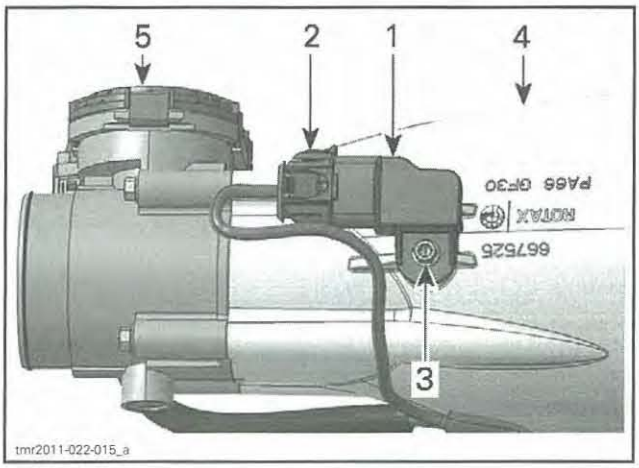
ECM CONNECTOR		MEASUREMENT
PIN		RESISTANCE Ω @ 20°C (68°F)
A-H2	A-H3	2280 - 2740

MAPTS TEMPERATURE SENSOR TEST RESULTS			
RESULT	SERVICE ACTION		
NO READING	Circuit Continuity Test of MAPTS Temperature Function	MAPTS Input Voltage Test	Repair or replace wiring
INCORRECT RESISTANCE VALUE	Replace MAPTS		

MAPTS Circuit Continuity Test (Temperature Function)

MAPTS CIRCUIT CONTINUITY TEST (TEMPERATURE FUNCTION)		
ECM-A	MAPTS CONNECTOR	RESISTANCE VALUE
Pin H2	Pin 1	Close to 0 Ω
Pin H3	Pin 2	

MAPTS Replacement



1. MAPTS
2. MAPTS connector
3. Retaining screw
4. Plenum
5. Throttle body

Disconnect MAPTS connector and remove the MAPTS from the plenum.

Install new MAPTS as per following table.

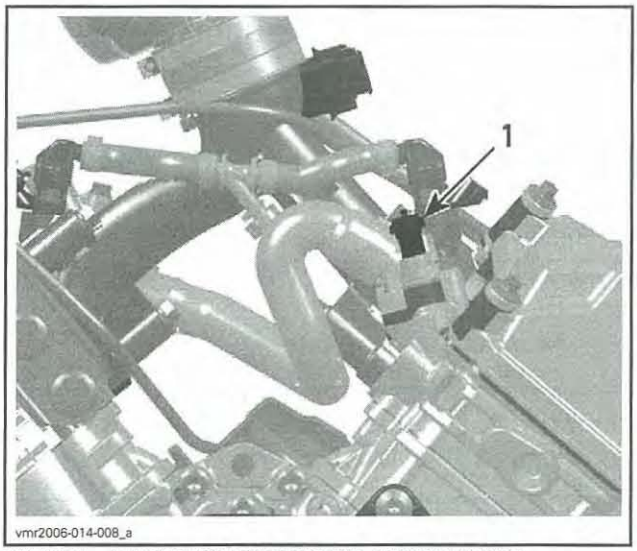
TORQUE	PRODUCT
6 N•m ± 0.7 N•m (53 lbf•**in** ± 6 lbf•**in**)	LOCTITE 243 (BLUE) (P/N 293 800 060)

CTS (COOLANT TEMPERATURE SENSOR)

CTS Access

The CTS is located on the LH of the engine, aft cylinder. To access it, remove the:

– Driver's seat
– LH lateral console panel.

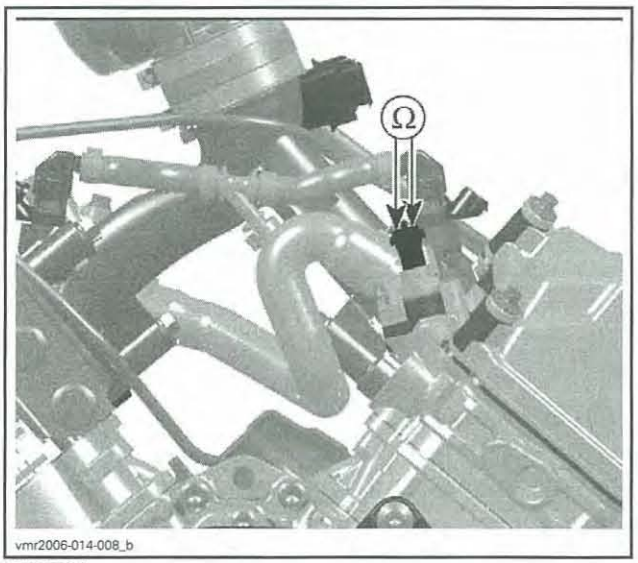


TYPICAL - LH SIDE OF THE ENGINE, AFT CYLINDER
1. Coolant temperature sensor (CTS)

CTS Resistance Test

1. Disconnect the plug connector from the CTS and check the resistance of the sensor itself.

CTS SENSOR		MEASUREMENT
PIN		RESISTANCE Ω @ 20°C (68°F)
1	2	2280 - 2740



TYPICAL

If resistance is out of specification, replace the CTS.

If resistance test is good, **reconnect** the CTS and disconnect the ECM connector "A" from the ECM.

2. Install ECM-A connector on ECM ADAPTER TOOL (P/N 529 036 166).

3. Using a multimeter, recheck resistance from the ECM connector as per table.

ECM "A CONNECTOR		MEASUREMENT
PIN		Resistance Ω @ 20°C (68°F)
A1	J2	2280 - 2736

If resistance value is correct, refer to *ECM REPLACEMENT*.

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

CTS Replacement

1. Disconnect CTS connector and remove CTS.
2. Install the new CTS and torque as specified.

CTS TORQUE
16 N•m ± 2 N•m (142 lbf•**in** ± 18 lbf•**in**)

3. Reinstall remaining removed parts.
4. Refill and bleed the cooling system, refer to *COOLING SYSTEM* subsection.

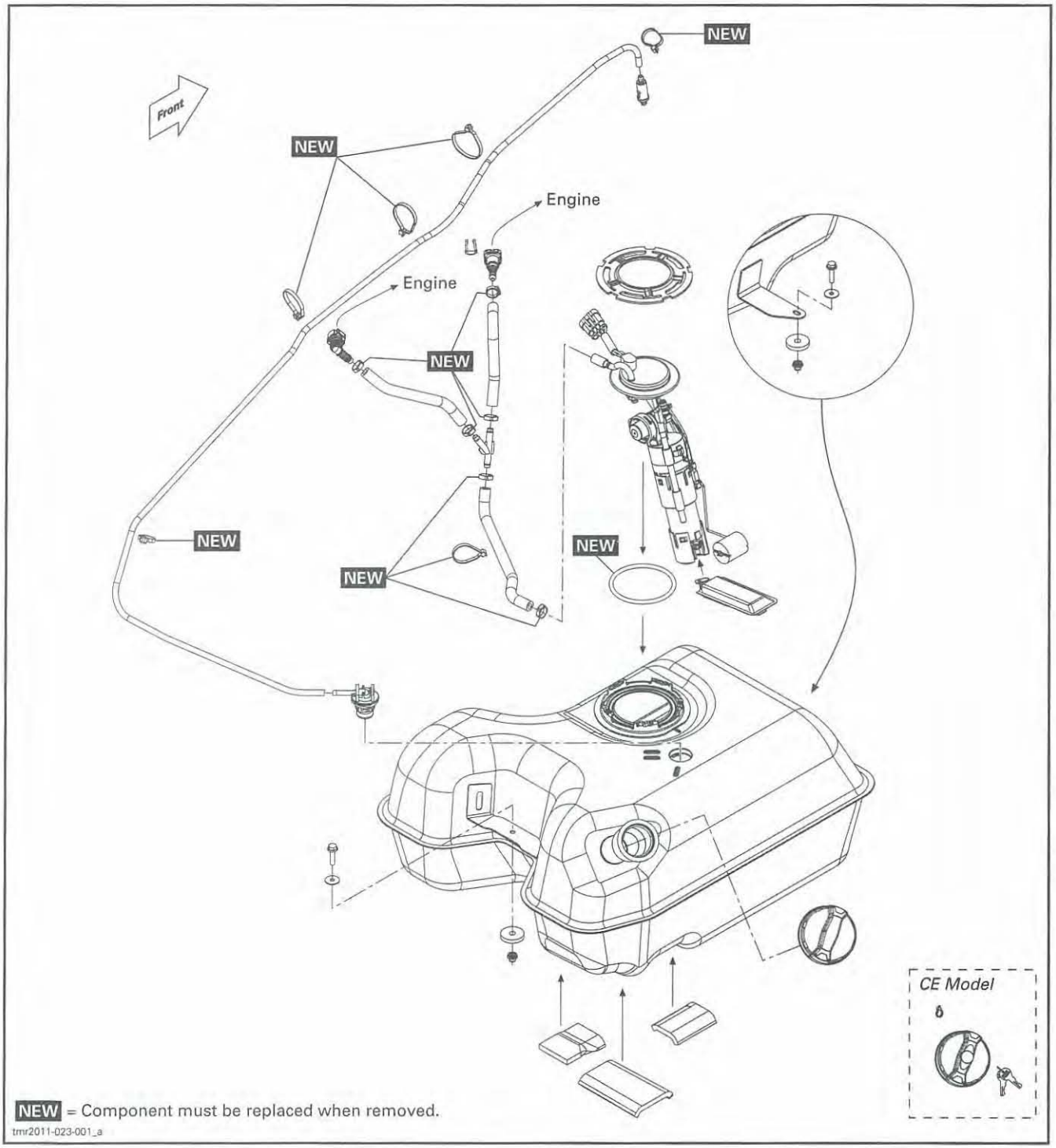
FUEL TANK AND FUEL PUMP

SERVICE TOOLS

Description	Part Number	Page
ECM ADAPTER TOOL	529 036 166	259
FLUKE 115 MULTIMETER	529 035 868	258
FUEL HOSE ADAPTER	529 036 023	253
OETIKER PLIERS	295 000 070	256
PRESSURE GAUGE	529 035 709	253
VACUUM/PRESSURE PUMP	529 021 800	252, 263

SERVICE TOOLS – OTHER SUPPLIER

Description	Part Number	Page
FLUKE RIGID BACK PROBE	TP88	258


NEW
Front
NEW
Engine
Engine
NEW
NEW
NEW
NEW
CE Model
NEW = Component must be replaced when removed.
tmr2011-023-001_a

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.

⚠ WARNING

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

⚠ WARNING

Always proceed with care and use appropriate safety equipment when working on pressurized fuel system. Wear safety glasses.

⚠ WARNING

Do not allow fuel to spill on hot engine parts and/or on electrical connectors.

When the repair is completed, ensure that all hoses are connected and secured. Perform the *FUEL PRESSURE TEST* and the *FUEL TANK LEAK TEST* as explained in this subsection.

Fuel lines remain under pressure at all times. Proceed with care when removing/installing high pressure test equipment.

Use the B.U.D.S. software or disconnect the fuel pump electrical connector to disable fuel pump and crank engine to release fuel pressure prior to disconnecting any fuel hose.

Cover the fuel hose connections with an absorbent shop rag and carefully disconnect them to minimize spilling.

Wipe off any fuel spillage.

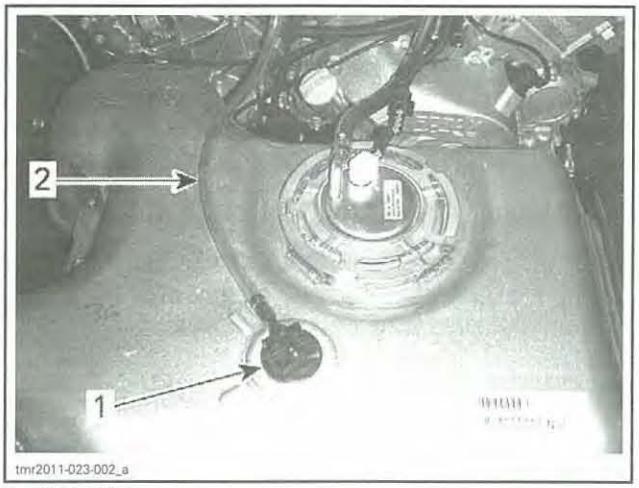
Hoses, cables or locking ties removed during a procedure must be reinstalled as per factory standards.

SYSTEM DESCRIPTION

Fuel Tank Vent System

The fuel tank is equipped with a vent system that ensures the fuel tank remains at ambient pressure.

Air can enter the fuel tank at all times through the fuel tank vent valve. This prevents negative pressure within the fuel tank which could cause fuel starvation.

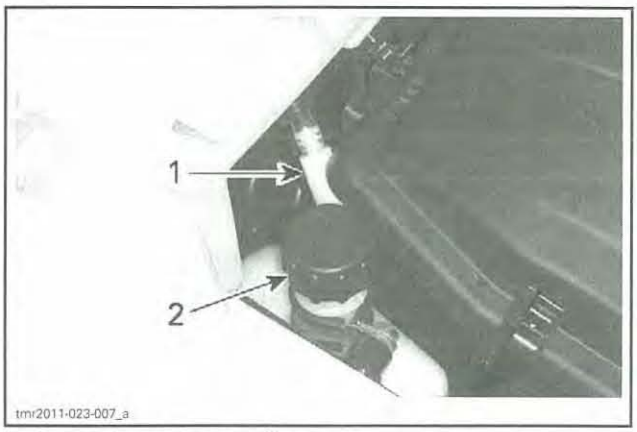


1. *Vent valve*
2. *Air inlet hose*

The vent valve also prevents fuel from flowing out through the inlet of the vent system should the vehicle be overturned.

Fuel Tank Vent Breather Filter

The air inlet hose of the vent system is equipped with an in-line breather filter that prevents entry of particles such as dust or small insects. It is located behind the air filter housing next to the coolant reservoir. To access the breather filter, remove the service cover.



1. *Fuel tank vent breather filter*
2. *Cooling system expansion tank*

Fuel Pump Module

The fuel pump module is inserted in the fuel tank. It provides fuel delivery for the EFI system and encompasses the following components:

- Electric fuel pump
- Fuel pre-filter (replaceable)
- Fuel pressure regulator
- Fuel level sender.

Fuel Filters

The system comprises two levels of filtration.

A replaceable prefilter element attached to the bottom of the pump, and a non-replaceable fine filter element that is integral to the fuel pump module.

Fuel Pump Pressure Regulator

The fuel pressure regulator is integral to the fuel pump module. The pressure regulator maintains proper fuel pressure for the EFI system.

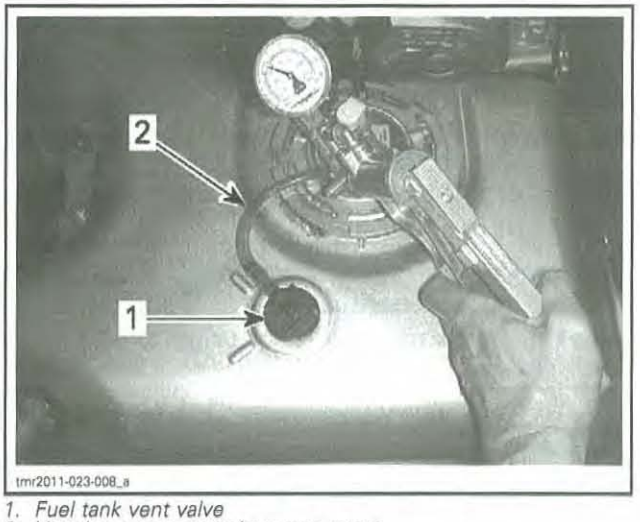
INSPECTION

FUEL TANK LEAK TEST

⚠ WARNING

Always carry out a fuel tank leak test whenever the fuel tank shows signs of wear or damage which may cause a leak, or when the fuel pump has been removed or replaced, or if you suspect a leak. If the fuel tank is damaged, the fuel tank should be replaced even if no leak is present. Do not attempt to repair the fuel tank.

1. Refill fuel tank and ensure fuel tank cap is in good condition and properly installed.
2. Refer to *BODY* subsection and remove the following:
   - RH passenger seat
   - RH lateral console panel
   - Fuel tank cover panel.
3. Remove the vent hose from the fuel tank vent valve.
4. Using the VACUUM/PRESSURE PUMP (P/N 529 021 800) and a short piece of hose, pressurize the fuel tank through the vent valve.



1. *Fuel tank vent valve*
2. *Vent hose to vacuum/pressure pump*

PRESSURE	TIME WITHOUT PRESSURE DROP
14 kPa (2 PSI)	3 minutes

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

To locate a leak, check for a fuel smell or leaking fuel.

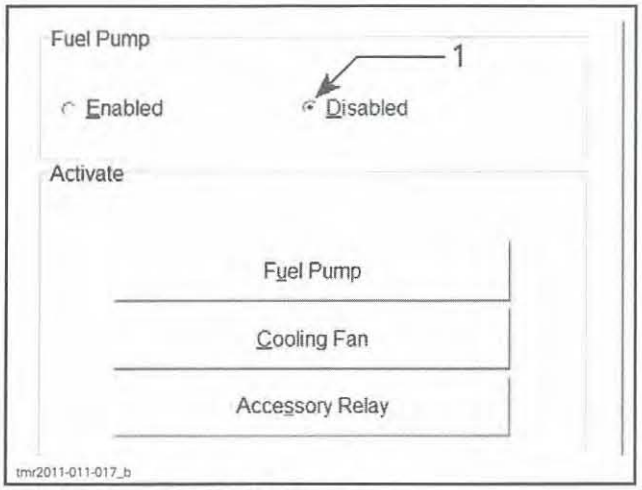
To ease locating leak(s), spray soapy water on all hose connections and components; bubbles will indicate the leak location(s).

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: Refer to the *FUEL SYSTEM DIAGNOSTIC FLOW CHART* to help diagnose a fuel system related problem.

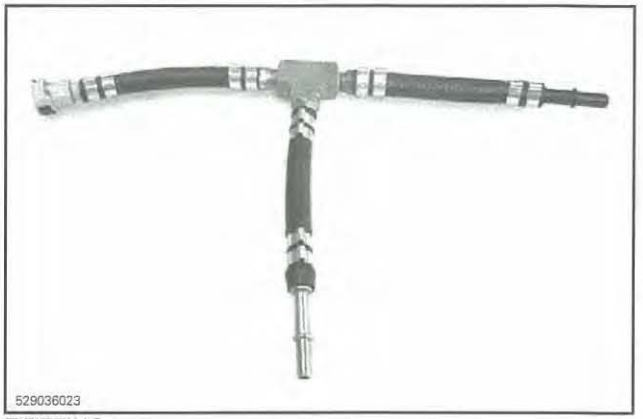
1. Ensure there are no leaks from hoses and fittings. Repair any leak.
2. Ensure the fuel level in the tank is sufficient.
3. Before proceeding with the pressure test ensure the battery is fully charged. Battery voltage must be over 12 volts.
4. Connect vehicle to the applicable B.U.D.S. software version and select the following:
   - **Read Data** button
   - **Activation** page tab
   - **ECM** page tab
   - Fuel pump **Disabled**.



1. Click here to disable the fuel pump

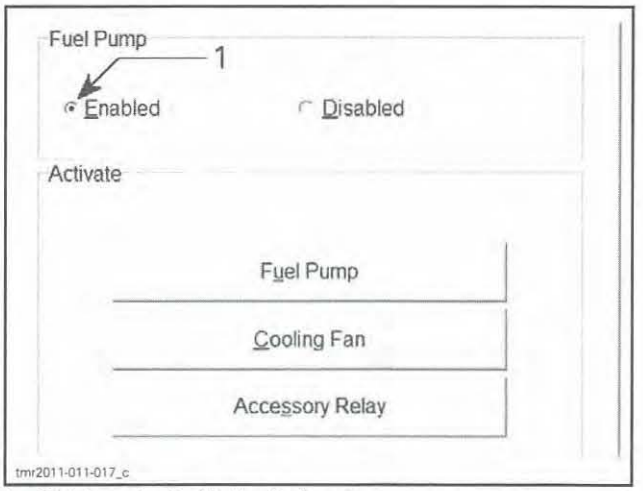
5. Release fuel pressure by running engine until it runs out of gas.
6. Remove the following items, refer to the *BODY* subsection
   - Passenger seat
   - Fuel tank cover
   - RH lateral console panel.
7. Carefully disconnect the fuel pump outlet hose by pressing on the release tab of the quick disconnect fitting.
8. Install fuel PRESSURE GAUGE (P/N 529 035 709) and FUEL HOSE ADAPTER (P/N 529 036 023) between disconnected hose and fuel rail (in-line installation).

PRESSURE GAUGE



T-FITTING

9. Using B.U.D.S., reactivate fuel pump by selecting **Enabled**.



1. Click here to disable the fuel pump

10. Turn ignition key ON and observe fuel pressure.

FUEL PRESSURE	350 kPa (51 PSI)

11. Start engine and observe fuel pressure.
12. Stop engine.
13. In B.U.D.S., select the fuel pump **Disabled** function.
14. Release fuel pressure by running engine until it runs out of gas.
15. Remove tool and connect hose on fuel rail.

Test Conclusion

The fuel pressure should be within specification in static or dynamic tests.

A rapid pressure drop after the engine is stopped indicates leakage either from a fuel hose, fuel rail, or from the fuel pump check valve.

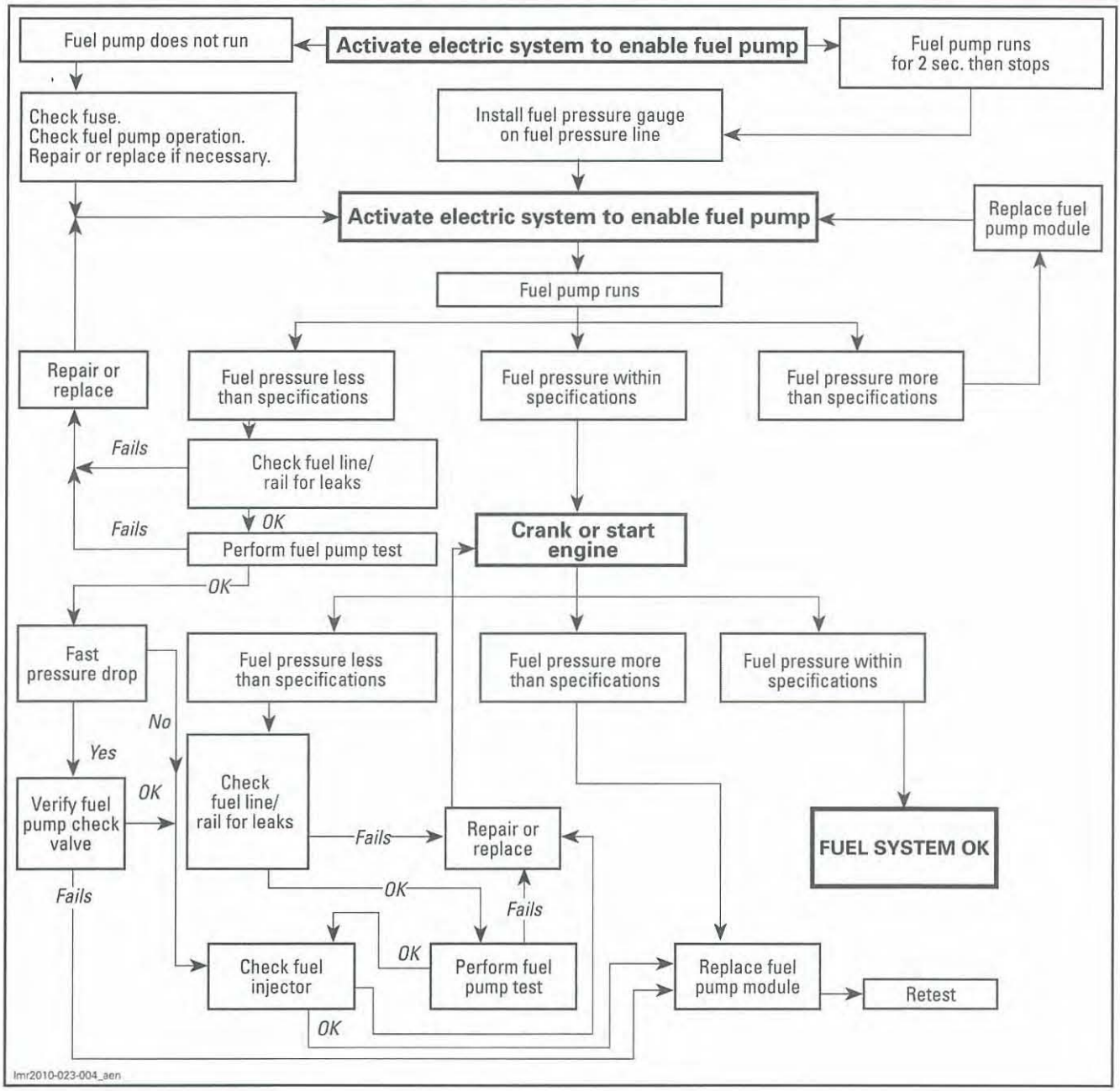
- Check fuel hoses, fuel rail and fittings for leaks. If not leaking, replace fuel pump.

A slow pressure drop after the engine is stopped indicates leakage either from a fuel injector or from the fuel pressure regulator.

– Check fuel injectors for leaks. If not leaking, replace fuel pump.

TROUBLESHOOTING

FUEL SYSTEM DIAGNOSTIC FLOW CHART



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

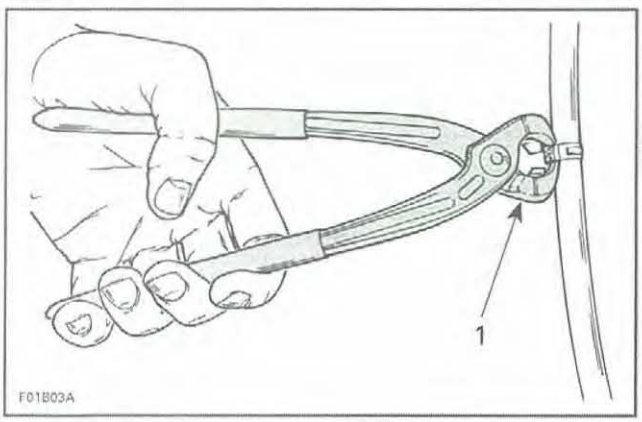
Use of fuel lines other than those recommended by BRP may compromise fuel system integrity.

⚠ WARNING

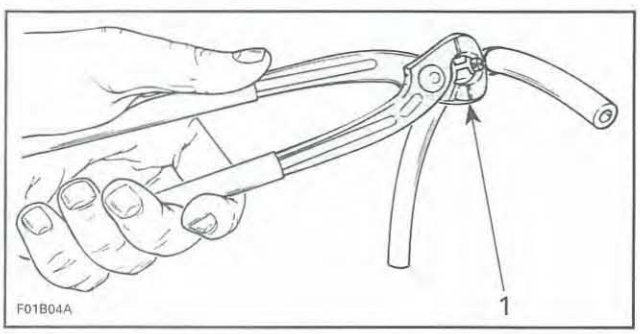
Whenever removing a hose in the fuel system, always use new Oetiker clamps at assembly. Then validate fuel system tightness by performing a fuel pressure test.

Oetiker Clamp Replacement

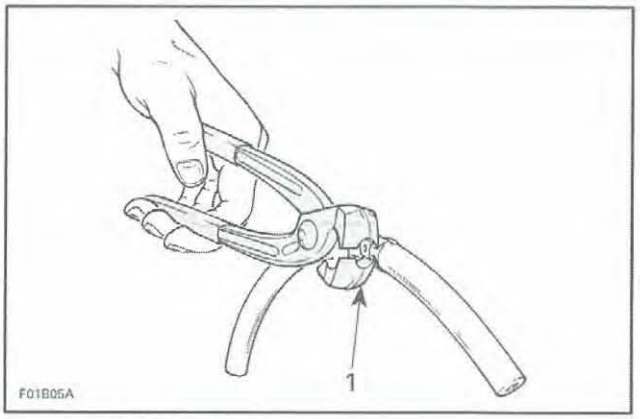
To secure or cut Oetiker clamps on fuel lines, use OETIKER PLIERS (P/N 295 000 070).



1. Cutting clamp



1. Securing clamp



1. Securing clamp in limited access

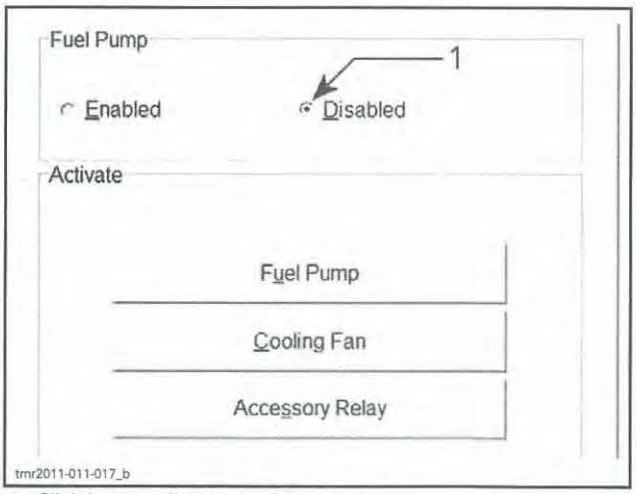
FUEL TANK

Fuel Tank Draining

Remove fuel tank cap and siphon gas into an approved fuel container.

Fuel Tank Removal

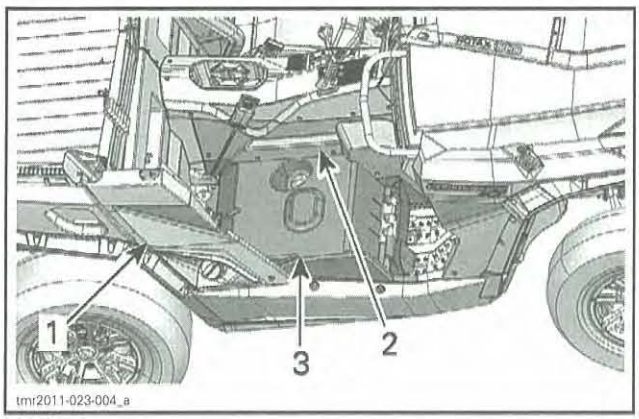
1. Drain fuel tank. Refer to *FUEL TANK DRAINING* above in this subsection.
2. Connect the vehicle to the applicable B.U.D.S. software version.
3. In B.U.D.S., select the following to disable the fuel pump:
   - **Read Data** button
   - **Activation** page tab
   - **ECM** page tab
   - Fuel pump **Disabled**.



1. Click here to disable the fuel pump

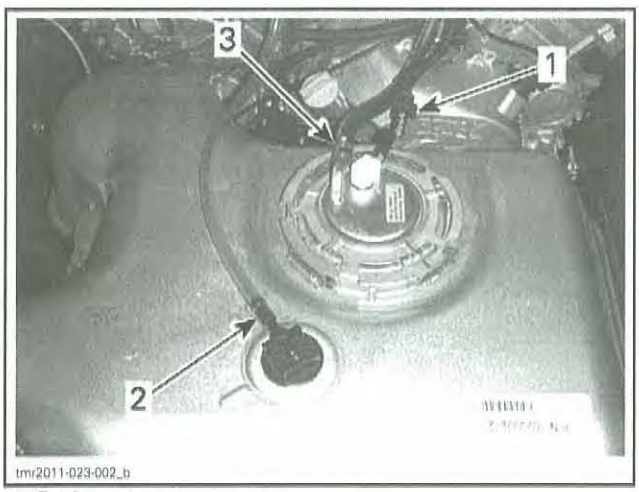
4. Release fuel pressure by running engine until it runs out of gas.
5. Disconnect battery, refer to *CHARGING SYSTEM* subsection.

6. Remove RH passenger seat, refer to the *BODY* subsection.
7. Refer to *BODY* subsection and remove the body parts indicated in the following illustration.



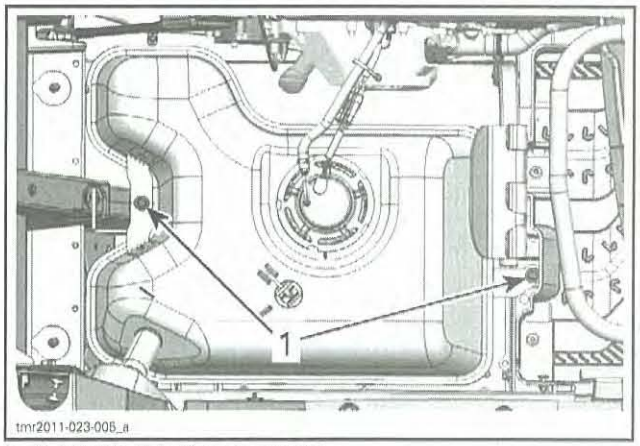
TYPICAL
1. *RH Lateral body panel*
2. *RH side panel on the console*
3. *Fuel tank cover panel*

8. Disconnect the fuel pump connector.
9. Remove the vent hose from the fuel tank valve.
10. Disconnect the high pressure fuel hose at the fuel injectors.



1. *Fuel pump connector*
2. *Vent hose*
3. *High pressure fuel hose*

11. Remove fuel tank retaining screws (2).



1. *Fuel tank mounting screws (2)*

12. Pull fuel tank out from the RH side of vehicle.

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.

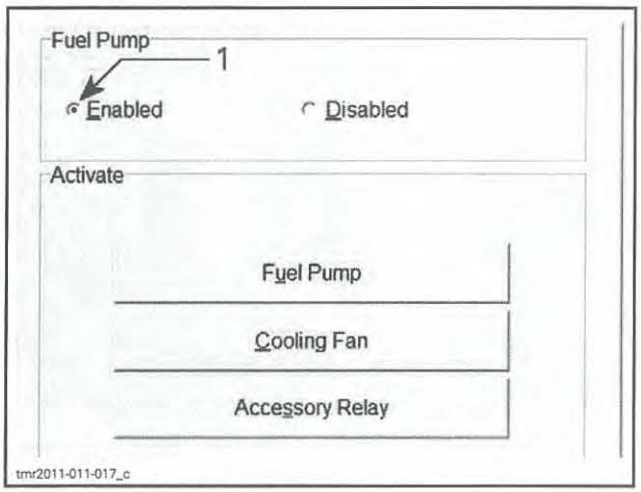
Fuel Tank Installation

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

Be sure to reinstall the 2 rubber washers between the fuel tank and the frame.

Be sure to properly connect and route:
- Fuel tank vent tube
- Fuel pump pressure hose
- Electrical connector.

Using B.U.D.S., reactivate fuel pump by selecting **Enabled**.



1. Click here to enable fuel pump

Refuel tank and ensure there are no leaks by performing a *FUEL TANK LEAK TEST* and a *FUEL PRESSURE TEST* as described in this subsection.

FUEL PUMP

Fuel Pump Pressure Test

Refer to *INSPECTION* in this subsection.

Fuel Pump Quick Test

1. Turn ignition key to ON.
2. Listen for fuel pump operation.
3. Fuel pump should come ON for a few seconds, then stop.

If fuel pump does operate as in previous steps, carry out the following:

- Check fuel pump fuse.
- Check in B.U.D.S. for applicable fault codes. Refer to *COMMUNICATION TOOLS AND B.U.D.S.* subsection.
- Carry out a fuel pump input voltage test.

1. Fuel pump fuse

Fuel Pump Input Voltage Test

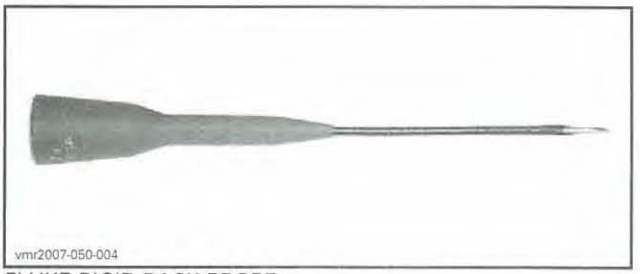
1. Remove RH passenger seat and fuel tank cover, refer to *BODY* subsection.

Disconnect the fuel pump connector.

2. Use the FLUKE 115 MULTIMETER (P/N 529 035 868) with the FLUKE RIGID BACK PROBE (P/N TP88).

Set multimeter to Vdc.

FLUKE 115 MULTIMETER



FLUKE RIGID BACK PROBE

3. Set multimeter to Vdc.
4. Turn ignition key ON.
5. 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

If battery voltage is read, carry out a fuel pump resistance test.

If battery voltage is not read, test fuel pump power input as follows.

FUEL PUMP POWER WIRE TEST		
TEST PROBES		VOLTAGE READING
Fuel pump connector Pin 3	Battery ground	Battery voltage

If battery voltage is now read, check fuel pump ground circuit between fuel pump connector 5-FP-4 and ECM connector 3-B-M1.

If battery voltage is still not read, check fuel pump:
- Fuse (F15)
- Power circuit
- Wiring and connectors.

Fuel Pump Resistance Test

1. Remove the fuel pump fuse.
2. Remove connector B from the ECM and connect it to the ECM ADAPTER TOOL (P/N 529 036 166).

3. Set multimeter to Ω.
4. Measure fuel pump resistance as follows.

FUEL PUMP RESISTANCE TEST (AT ECM AND FUSE)		
TEST PROBES		RESISTANCE Ω @ 20°C (68°F)
Fuse box contact 5D	ECM B-M1	Approximately 2 Ω

If resistance test failed, disconnect fuel pump connector and measure resistance at fuel pump connector.

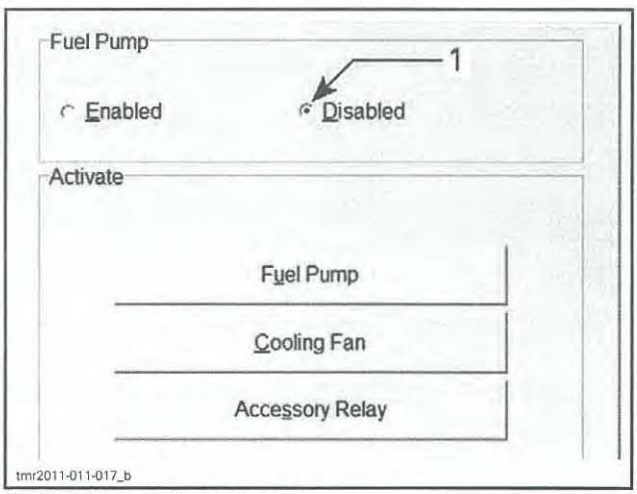
FUEL PUMP RESISTANCE TEST (AT FUEL PUMP CONNECTOR)	
Pins 1 and 2	Approximately 2 Ω

If test failed at pump connector, replace fuel pump.

If test succeeded at pump connector, check wiring and connectors from fuse box to ECM connector. Repair or replace as necessary.

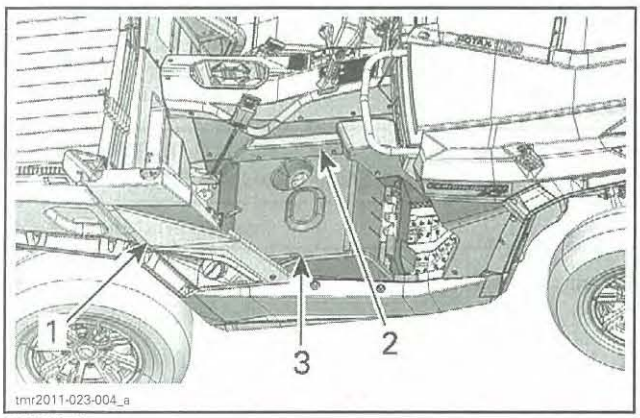
Fuel Pump Removal

1. Using B.U.D.S., select the following to disable the fuel pump:
   - **Read Data** button
   - **Activation** page tab
   - **ECM** page tab
   - Fuel pump **Disabled**.



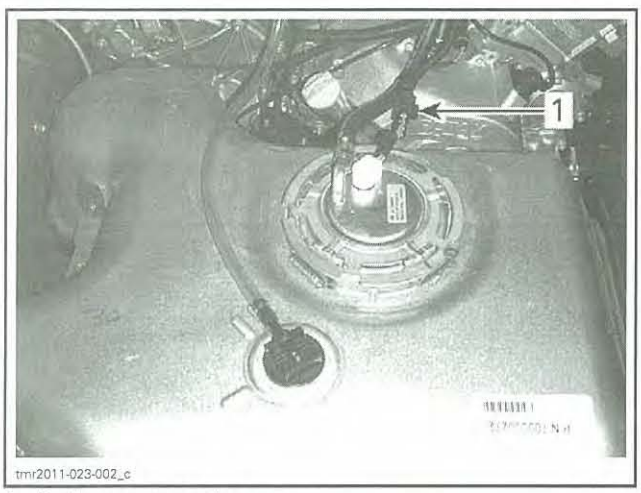
1. Click here to disable the fuel pump

2. Release fuel pressure by running engine until it runs out of gas.
3. Refer to *BODY* subsection and remove the body parts indicated in the following illustration.



TYPICAL
1. *RH Lateral body panel*
2. *RH side panel on the console*
3. *Fuel tank cover panel*

4. Disconnect fuel pump electric connector.



1. *Fuel pump connector*

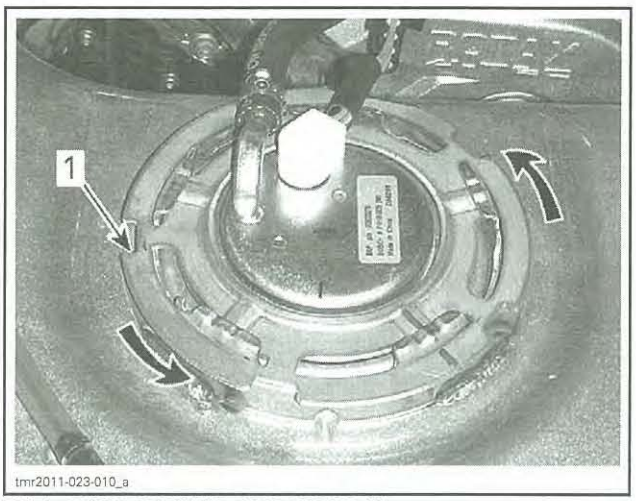
5. Disconnect high pressure fuel hose at fuel rails (2 disconnects).

1. *Fuel rail (1 each cylinder)*
2. *High pressure fuel hose disconnect ((1 each cylinder)*

6. Using a soft face hammer and a brass drift in the notched portion of the locking ring, remove fuel pump locking ring.

⚠ WARNING

Fuel vapors are flammable and explosive under certain conditions. Use only non-sparking tools.



FUEL PUMP LOCKING RING REMOVAL
1. *Notch in fuel pump locking ring*

7. Carefully pull out fuel pump.

⚠ CAUTION While pulling out the fuel pump, pay attention to fuel sender float arm. Float arm can get stuck and bend reducing fuel sender accuracy.

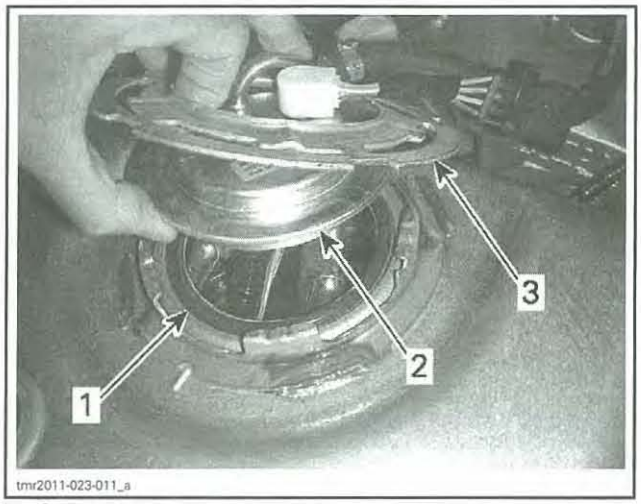
8. Discard gasket ring.

Fuel Pump Installation

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

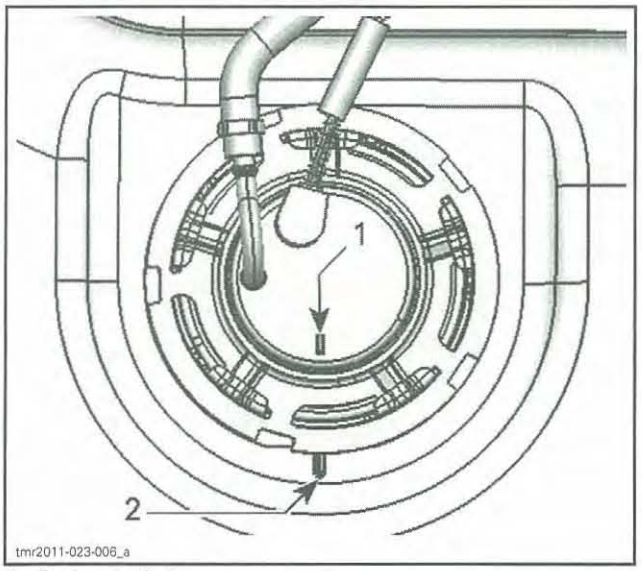
⚠ CAUTION Manipulate fuel pump with care.

1. Install a NEW gasket ring.
2. Place gasket so that it is located between pump and tank mounting surface.



1. *Gasket ring here*
2. *Fuel pump flange*
3. *Pump locking ring*

3. Pay attention to pump orientation as in following illustration.

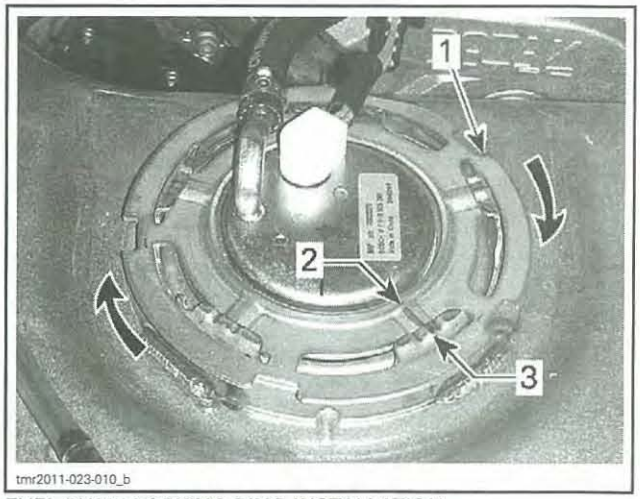


1. *Fuel pump index*
2. *Fuel tank pump index*

4. Insert fuel pump locking ring over the fuel pressure hose and electrical wiring connector.
5. While firmly holding pump against tank, engage fuel pump locking ring on fuel tank flange.
6. Using a soft face hammer and a brass drift in the notched portion of the locking ring, turn locking ring until it is fully engaged.

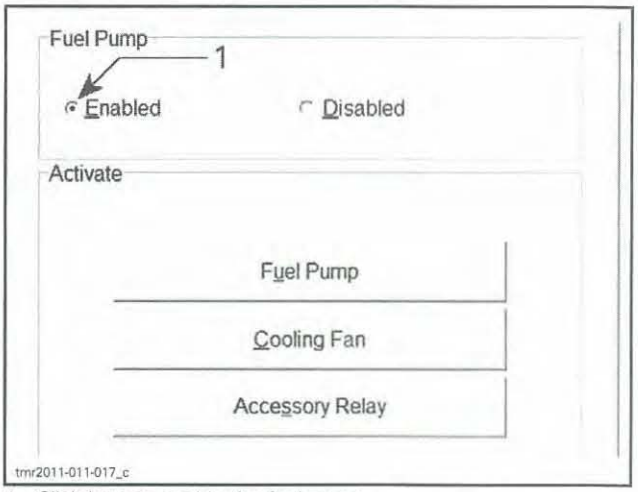
⚠ WARNING

Fuel vapors are flammable and explosive under certain conditions. Use only non-sparking tools. Ensure pump locking ring is fully engaged.



FUEL PUMP LOCKING RING INSTALLATION
1. *Notch in locking ring*
2. *Raised portion in locking ring (5 places)*
3. *Lock position on tank flange (5 places)*

7. Using B.U.D.S., enable the fuel pump.

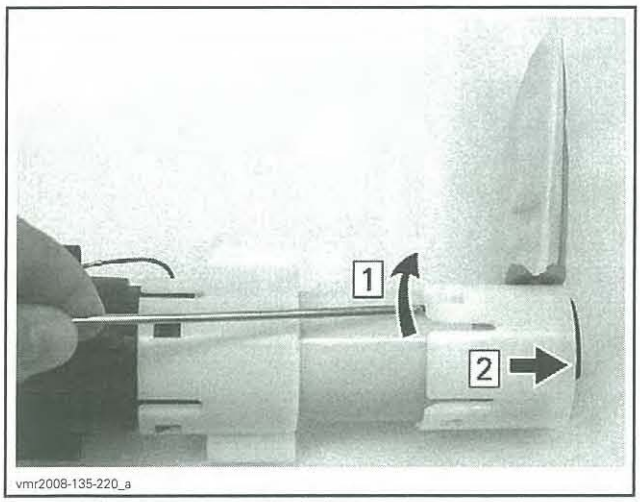


1. *Click here to enable the fuel pump*

8. Refuel tank and ensure there are no leaks by performing a *FUEL TANK LEAK TEST* and a *FUEL PRESSURE TEST* as described in this subsection.
9. Check fuel level sender operation.

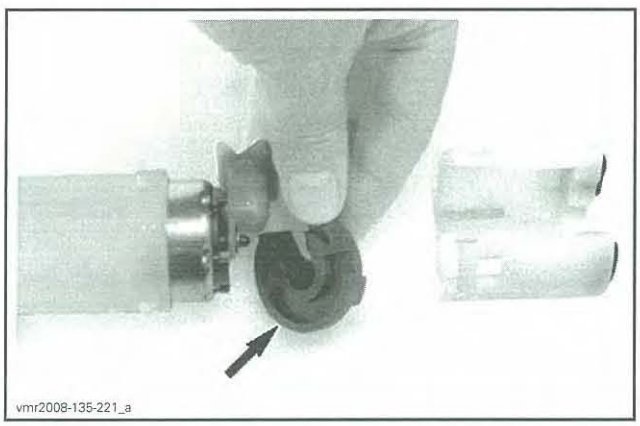
Fuel Pump Strainer Replacement

1. Remove *FUEL PUMP*, see *FUEL PUMP REMOVAL* procedure in this subsection.
2. Unlock 3 tabs on plastic ring.

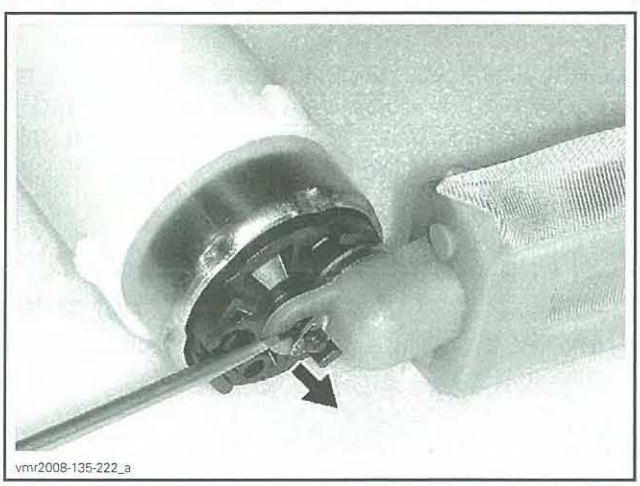


Step 1: Lift these tabs to unlock ring
Step 2: Pull ring off pump inlet

3. Remove rubber pad.



4. Remove push nut securing strainer to fuel pump. Be careful not to break the plastic pin.



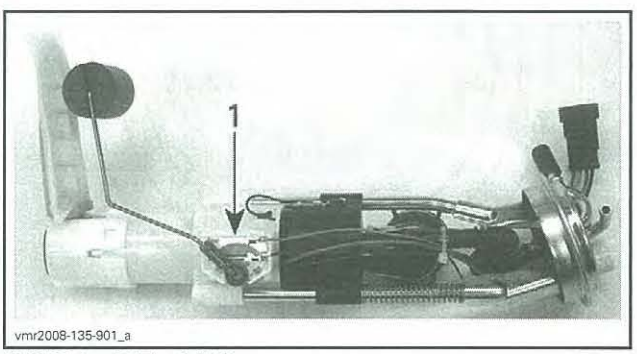
5. Pull strainer off fuel pump.

NOTE: A non serviceable filter is located in fuel pump. If it is clogged, replace fuel pump.

6. Insert the new strainer on fuel pump making sure to press it in tightly against pump face.
7. Press in a NEW push nut to secure strainer.
8. Reinstall remaining removed parts.

FUEL LEVEL SENDER

The fuel level sender is a float actuated variable resistance type that is part of the fuel pump.

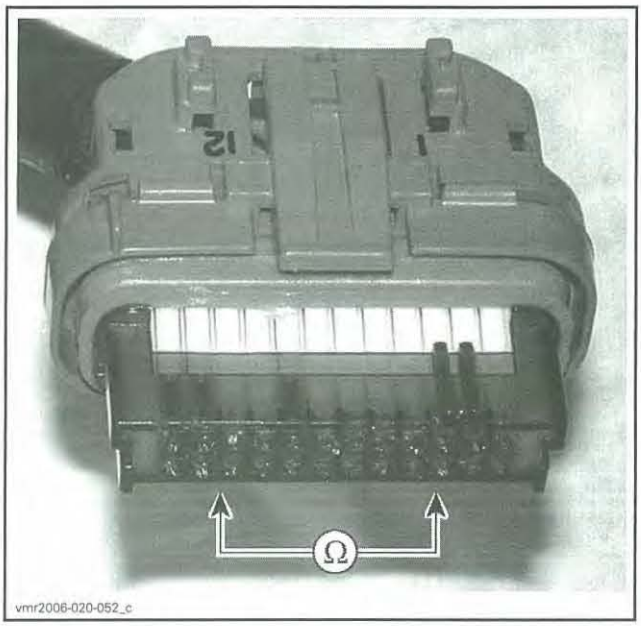


TYPICAL - FUEL PUMP
1. Fuel level sender

Fuel Level Sender Resistance Test

1. Remove and disconnect multifunction gauge, refer to the *LIGHTS/GAUGE/ACCESSORIES* subsection.
2. Use a multimeter and select Ω.
3. Measure the resistance of the sender as follows.

FUEL LEVEL SENDER RESISTANCE TEST		
FUEL LEVEL	GAUGE CONNECTOR	RESISTANCE Ω @ 20°C (68°F)
Full	Pins 4 and 21	5 Ω ± 1
Empty		100 Ω ± 5



If readings are out of specification, repeat test at fuel pump connector. If resistance test at fuel pump connector is not good, replace fuel level sender.

If readings are as specified, carry out a *FUEL LEVEL SENDER INPUT VOLTAGE TEST.*

Fuel Level Sender Input Voltage Test

1. Set ignition switch to ON.
2. Disconnect fuel pump connector.
3. Use a multimeter and select Vdc.
4. Measure the input voltage as follows.

FUEL LEVEL SENDER INPUT VOLTAGE TEST		
FUEL PUMP CONNECTOR	BATTERY	VOLTAGE
Pin 1	Negative terminal	Battery voltage

If battery voltage is not read, test wiring continuity between sender and multifunction gauge.

If wiring continuity is good, replace multifunction gauge.

If continuity is not obtained, repair or replace wiring.

Fuel Level Sender Replacement

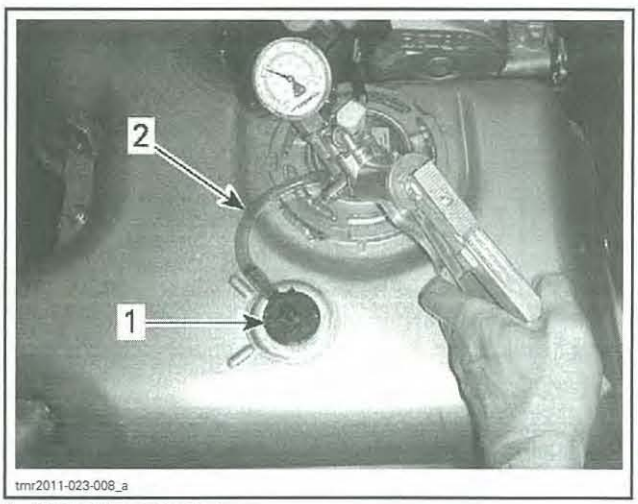
Replace fuel pump. See fuel pump removal and installation procedures in this subsection.

FUEL TANK VENT VALVE

Fuel Tank Vent Valve Test

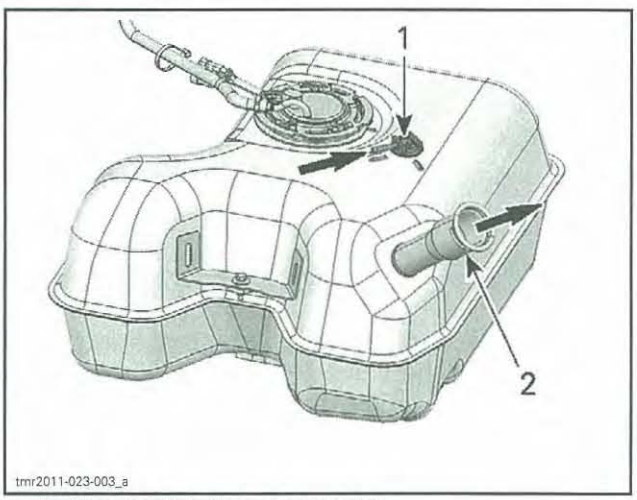
Test for Normal Operation

1. Disconnect vent hose from fuel tank vent valve.
2. Connect the VACUUM/PRESSURE PUMP (P/N 529 021 800) and a short piece of hose to the fuel tank vent valve.



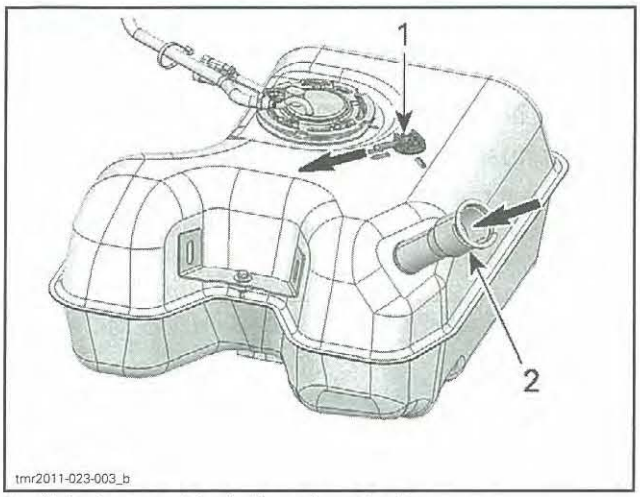
1. Fuel tank vent valve
2. Vent hose to vacuum/pressure pump

3. Remove fuel tank cap.
4. Set vacuum/pressure pump to **PRESSURE** and activate pump. The gauge on the pump **should not change in reading**; air should flow through the vent valve and fuel tank freely.



1. Air flows freely in through vent valve
2. Air flows out of fuel tank

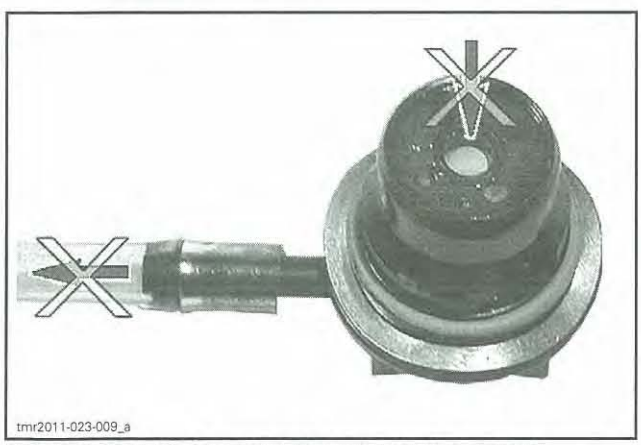
5. Set vacuum/pressure pump to **VACUUM** and activate pump. The **gauge should not change in reading**; air should flow through the vent valve and fuel tank freely.



1. Air is drawn out freely through vent valve
2. Air flows in fuel tank

Test for Rollover Protection

1. Remove the fuel tank valve, refer to *FUEL TANK VALVE REMOVAL AND INSTALLATION* in this subsection.
2. Turn the valve upside down.
3. Set vacuum/pressure pump to **VACUUM** and activate pump. The vacuum **gauge reading should increase**; air should **not flow through** the valve.

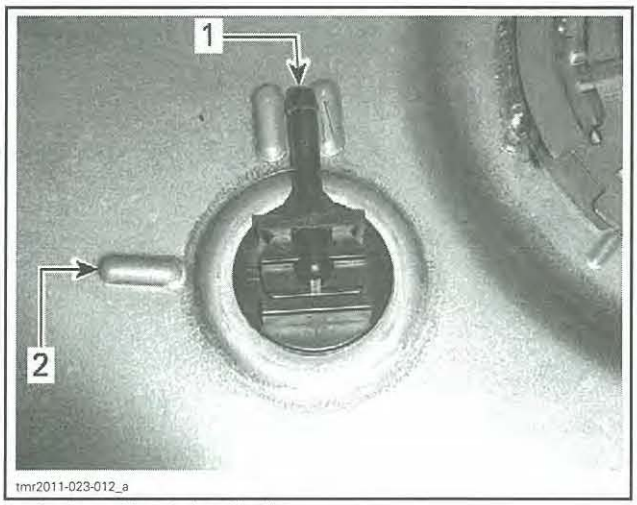


VALVE DOES NOT LET AIR PASS OUT UPSIDE DOWN

The fuel tank vent valve is defective if air flows freely through the valve when upside down and the vacuum indication does not increase on the pump gauge.

Fuel Tank Vent Valve Removal and Installation

1. When removing or installing the fuel tank vent valve, pay attention to the following:
   - Valve lock position index (dual)
   - Valve unlock position index.



1. Lock position index (dual)
2. Unlock position index

2. Remove the vent hose from the valve.
3. Use an open end wrench of the appropriate size on the rectangular portion of the valve to rotate it to the unlock position for removal.
4. Ensure the wave spring and O-ring seal on the valve to be installed are in good condition.

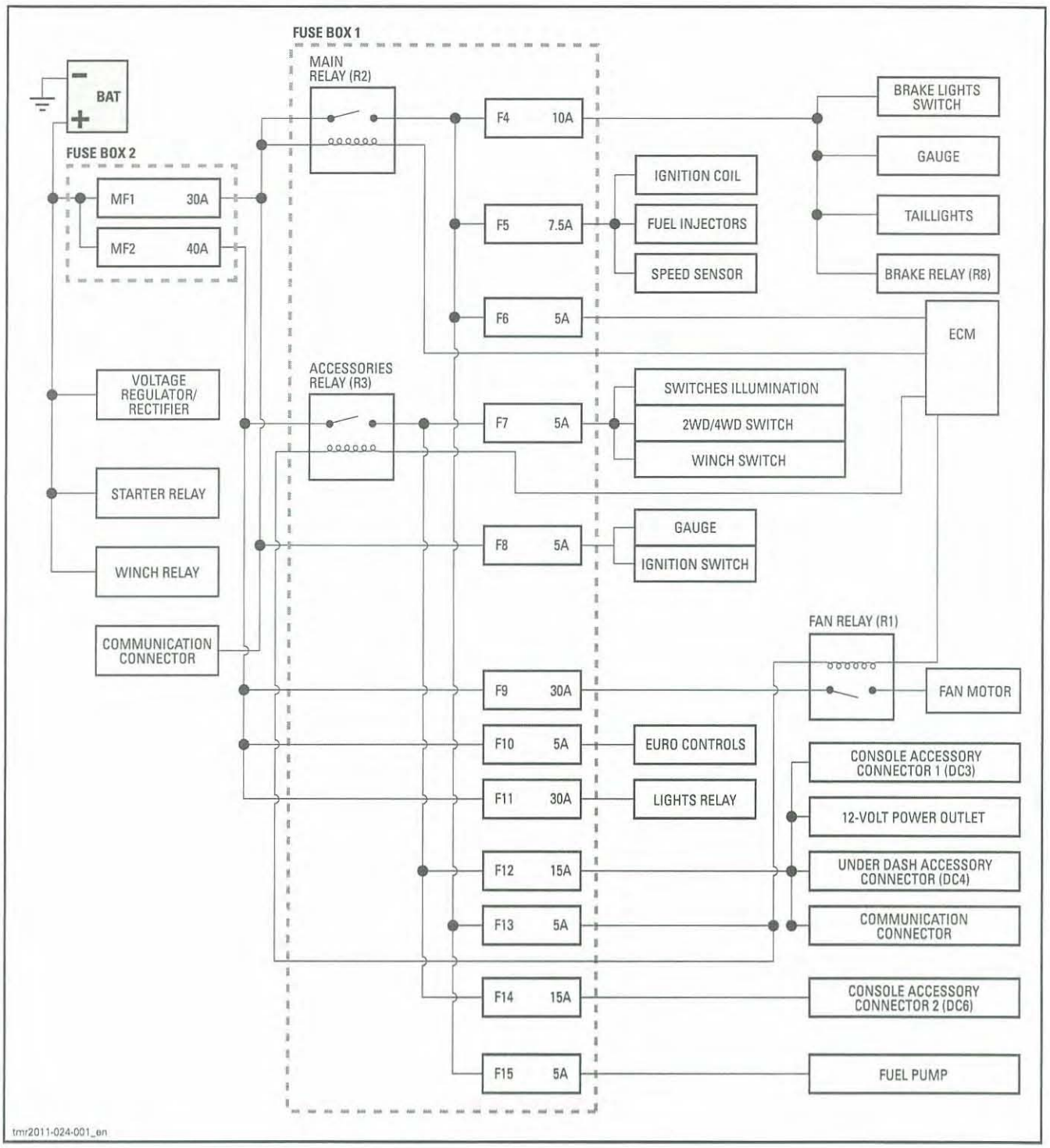
1. O-ring seal
2. Wave spring

5. Insert the valve in the tank.
6. Press down on the valve and rotate it so that its stem rests between the dual valve locking position index (see first illustration).
7. Reconnect the vent hose to the valve stem.

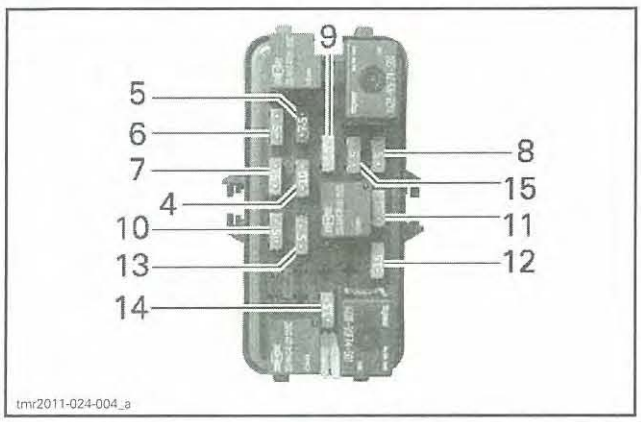
POWER DISTRIBUTION

GENERAL

POWER DISTRIBUTION DIAGRAM



FUSE BOX 1



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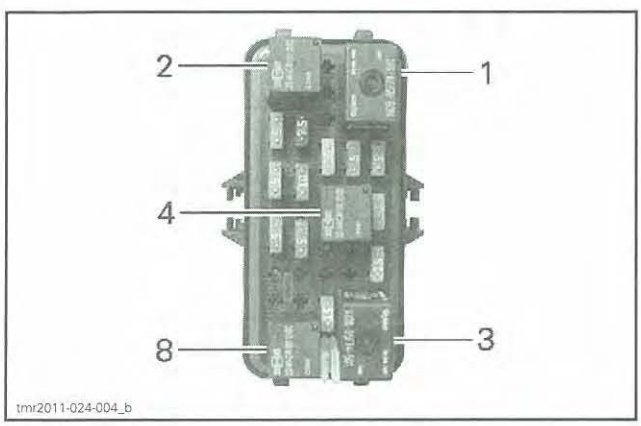
FUSE IDENTIFICATION		
Fuse	4	10 A
	5	7.5 A
	6	5 A
	7	5 A
	8	5 A
	9	30 A
	10	5 A
	11	30 A
	12	15 A
	13	5 A
	14	15 A
	15	5 A



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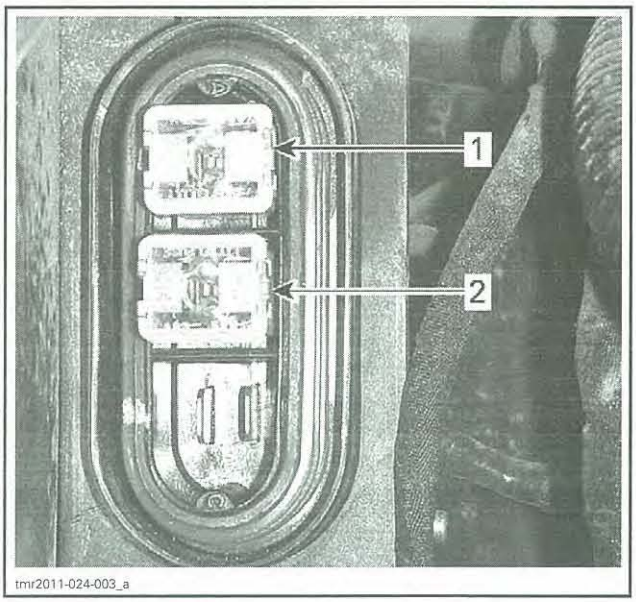
RELAY IDENTIFICATION		
Relays	1	Cooling fan
	2	Main
	3	Accessories
	4	Headlights
	8	Brake lights

FUSE BOX 2



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FUSE IDENTIFICATION			
Fuse	1	Main	30 A
	2	Fan/accessories	40 A

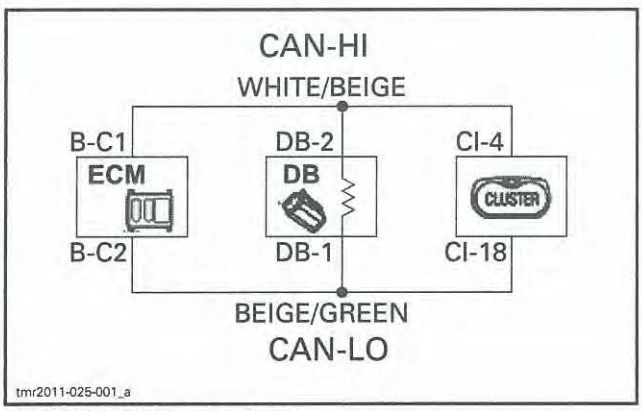
CONTROLLER AREA NETWORK (CAN)

GENERAL

SYSTEM DESCRIPTION

The CAN (Controller Area Network) protocol is an ISO standard for serial data communication. The CAN bus links the ECM and multifunction gauge together so that they communicate to interact as required. The components are connected together by 2 wires and they are in constant communication with each other at a rate of about every 20 milliseconds. CAN lines consist of a pair of wires (WHITE/BEIGE and BEIGE/GREEN).

If a component or system malfunction is detected, a module (ECM or multifunction gauge) may generate a fault code, which it transmits through the CAN bus as a signal. The fault signal may be used for various functions such as triggering the display of an error message in the multifunction gauge cluster, turning on a fault indicator light, limiting or inhibiting vehicle or engine operation, or viewed using the B.U.D.S. software for troubleshooting.



CLUSTER: Multifunction Gauge
DB: Diagnostic Connector
ECM: Engine Control Module
WH/BE: White/Beige
BE/GN: Beige/Green

IGNITION SYSTEM

SERVICE TOOLS

Description	Part Number	Page
ECM ADAPTER TOOL	529 036 166	271
FLUKE 115 MULTIMETER	529 035 868	271

GENERAL

⚠ WARNING

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

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

SYSTEM DESCRIPTION

The battery supplies the primary side of ignition coil through the main relay (R2) while the ECM completes the circuit for each cylinder by switching it to the ground at the right moment. The ECM can detect open and short circuit in the primary winding but it does not check the secondary winding.

The EMS controls the ignition system. For more information, refer to *ENGINE MANAGEMENT* section.

Ignition Timing

Ignition timing is not adjustable.

TROUBLESHOOTING

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

Always refer to the *WIRING DIAGRAM* when troubleshooting an electrical circuit.

Refer to *POWER DISTRIBUTION* for fuse and relay information.

DIAGNOSTIC GUIDELINES

The following is provided to help in diagnosing the probable cause of a problem. It is a guideline and should not be assumed to list all possible causes.

ENGINE WILL NOT START (ENGINE TURNS OVER)

1. Fouled or defective spark plug
   - *Replace.*
2. Defective CPS
   - *Check operation of CPS and replace if necessary. Refer to ELECTRONIC FUEL INJECTION section.*
3. Defective trigger wheel
   - *Check. Refer to PTO HOUSING/MAGNETO.*
4. Defective ignition circuit
   - *Check fuse 5 of fuse box 1, ignition coil and wiring condition.*
5. Defective fuel pump
   - *Check fuel pump, refer to FUEL SYSTEM.*
6. Defective fuel injectors or circuit
   - *Check fuel injectors, refer to ENGINE MANAGEMENT.*

ENGINE HARD TO START

1. Spark plug faulty, fouled or worn out
   - *Check spark plug condition. Replace if necessary.*
2. Low fuel pressure
   - *Test fuel pressure, refer to FUEL SYSTEM.*

ENGINE MISFIRES, RUNS IRREGULARLY

1. Fouled, defective, worn spark plugs
   - *Check/verify heat range/gap/replace.*
2. Damaged trigger wheel/loose CPS
   - *Check. Refer to PTO HOUSING/MAGNETO.*
3. Defective ignition circuit
   - *Check ignition coil, fuse 5, and wiring condition.*
4. Poor engine grounds
   - *Check/clean/repair.*

ENGINE CONTINUALLY BACKFIRES

1. Fouled, defective spark plugs
   - *Clean/replace.*
2. Damaged trigger wheel/defective or loose CPS
   - *Check, refer to ELECTRONIC FUEL INJECTION.*

PROCEDURES

IGNITION SWITCH

Ignition Switch Quick Test

Turn ignition switch to ON position.

If multifunction gauge turns on (assuming it works), the ignition switch is good.

If multifunction gauge does not turn on, check the following in this order:

- Battery
- Fuses 1 and 2 of fuse box 2
- Fuse 4 and 8 of fuse box 1
- ECM is properly powered (refer to *ENGINE MANAGEMENT*)
- Ignition switch.

Ignition Switch Access

Refer to *BODY* and remove upper console.

Ignition Switch Wire Identification

FUNCTION	PIN	WIRE COLOR
12 Vdc output (lights)	A	YELLOW/BLUE
12 Vdc input	B	BEIGE/WHITE
Ground (through ECM)	C	ORANGE/VIOLET
Ground signal to ECM in OFF position	D	YELLOW/ORANGE
D.E.S.S. signal	E	ORANGE/RED
12 Vdc output (ECM, starter solenoid and start switch)	F	BLACK/YELLOW

IGNITION COIL

Ignition Coil Access

Refer to *BODY* and remove upper console.

Ignition Coil Installation

Install a new elastic nut and tighten to the specified torque.

IGNITION COIL RETAINING BOLT TIGHTENING TORQUE
8 N•m ± 1 N•m (71 lbf•**in** ± 9 lbf•**in**)

Quick Test with B.U.D.S.

Connect to the latest applicable B.U.D.S. software. Refer to *COMMUNICATION TOOLS AND B.U.D.S.* section.

In B.U.D.S., select the **Activation** tab and the **ECM** tab.

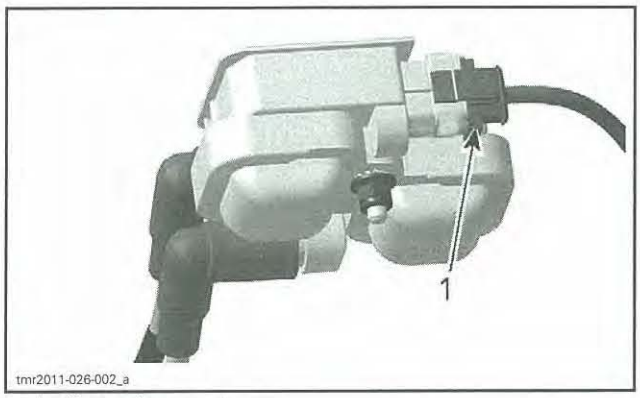
You should hear the spark occurring. In doubt, use an inductive spark tester. If there is no spark, perform the following checks.

NOTE: Keep in mind that even if there is a spark during this static test, voltage requirement is higher to produce a spark in the combustion chamber when engine is running. Ignition coil could be not working in real operation. Replacing ignition coil may be necessary as a test.

NOTE: Ensure spark plug cable is on the appropriate cylinder.

Ignition Coil Input Voltage Test

Disconnect the 3-pin connector from the ignition coil.



1. Ignition coil connector

Turn ignition switch to ON.

Using a the FLUKE 115 MULTIMETER (P/N 529 035 868), read voltage.

IGNITION COIL CONNECTOR	VOLTAGE
Pin 2 with battery ground	Battery voltage

Battery voltage should be read.

If Battery voltage is NOT read, check continuity of ignition coil supply circuit.

Ignition Coil Ground Circuit Continuity Test

Disconnect the ECM connector "A" and connect it to the ECM ADAPTER TOOL (P/N 529 036 166).

Check wiring continuity as per following table.

COMPONENT	PIN (IGNITION COIL CONNECTOR)	PIN (ECM CONNECTOR)
Cylinder 1 (front)	1	A-M1
Cylinder 2 (rear)	3	A-M2

Ignition Coil Resistance Test

An ignition coil with good resistance measurement can still be faulty. Voltage leak can occur at high voltage level which is not detectable with an ohmmeter. Replacing the ignition coil may be necessary as a test.

Disconnect ignition cables from spark plugs.

Primary Windings

Disconnect ECM "A" connector and connect it to the ECM ADAPTER TOOL (P/N 529 036 166).

Using a multimeter, check resistance in primary windings as follows.

PRIMARY CIRCUIT	ENGINE CONNECTOR (HIC)	ECM CONNECTOR "A"	RESISTANCE @ 20°C (68°F)
Cylinder 1 (front)	Pin E	A-M1	.3 - .6 Ω
Cylinder 2 (rear)		A-M2	

If any resistance is not good, measure resistance directly on coil. If second test is ok, check wiring.

Secondary Windings

Due to the integrated diode, it is not possible to take any resistance measurement of the secondary winding.

SPARK PLUG

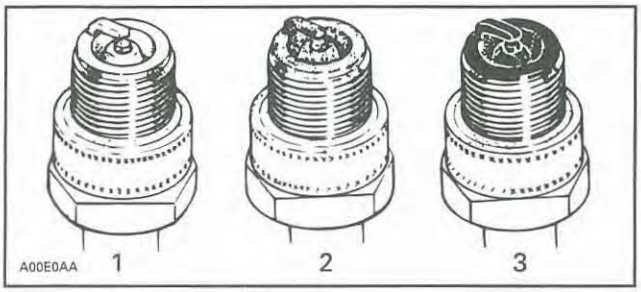
For spark plug replacement procedure, refer to *PERIODIC MAINTENANCE PROCEDURE* subsection.

Troubleshooting Fouled Spark Plug

Fouling of the spark plug is indicated by irregular running of the engine, decreased engine speed due to misfiring, reduced performance, and increased fuel consumption. This is due to a loss of compression. Other possible causes are: prolonged idling or low-speed riding, a clogged air filter, incorrect fuel, defective ignition system, incorrect spark plug gap, lubricating oil entering the combustion chamber, or too cold spark plug. The plug face of a fouled spark plug has either a

wet black deposit or a black carbon fouling. Such coatings form a conductive connection between the center electrode and ground.

Spark Plug Analysis



TYPICAL
1. *Overheated (light grey, white)*
2. *Normal (light brown, brown)*
3. *Fouled (black, wet or dry, dark deposits, grey, melted coating)*

The plug face reveals the condition of the engine, operating condition, method of driving and fuel mixture. For this reason it is advisable to inspect the spark plug at regular intervals, examining the plug face (i.e. the part of the plug projecting into the combustion chamber).

CHARGING SYSTEM

SERVICE TOOLS – OTHER SUPPLIER

Description	Part Number	Page
NAPA ULTRA PRO BATTERY LOAD TESTER	95260	275

SERVICE PRODUCTS

Description	Part Number	Page
DIELECTRIC GREASE	293 550 004	275

GENERAL

SYSTEM DESCRIPTION

The purpose of the charging system is to keep the battery at a full state of charge and to provide the electrical system with the required electrical power for normal vehicle operation.

Magneto

The magneto is the primary source of electrical energy. It transforms magnetic field into electric current (AC).

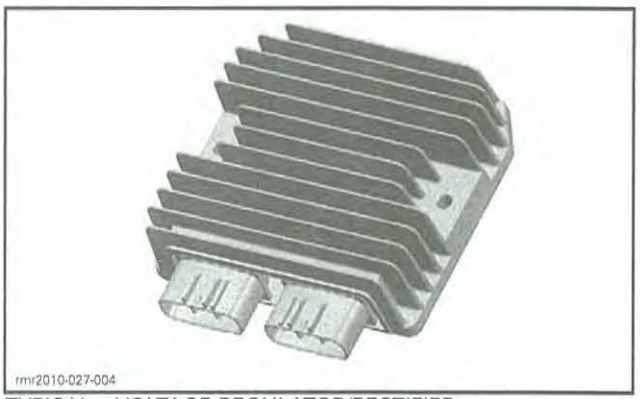
The magneto has a 3 phase series stator.

TYPICAL

Voltage Regulator/Rectifier

The rectifier receives AC current from the magneto and transforms it into direct current (DC).

The voltage regulator, included in the same unit, limits voltage to prevent any damage to electrical components.



TYPICAL – VOLTAGE REGULATOR/RECTIFIER

Battery

The battery supplies DC power to the electric starter for cranking the engine. During engine starting, it also supplies DC power to the entire electrical system.

At low engine RPM operation and high current load conditions, it supplements the magneto output and helps to maintain a steady system voltage.

INSPECTION

CHARGING SYSTEM OUTPUT

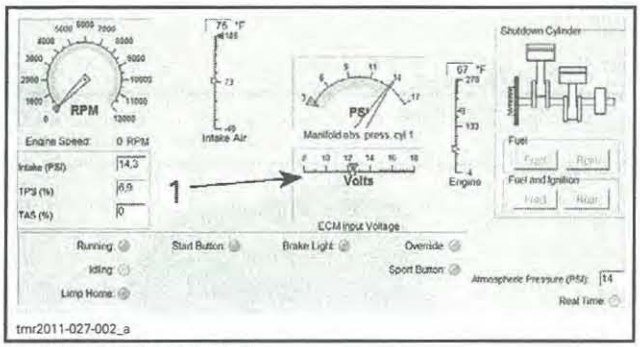
First ensure that battery is in good condition prior to performing the following tests.

Output Voltage Test Using B.U.D.S.

1. Connect to the latest applicable B.U.D.S. software. Refer to *COMMUNICATION TOOLS AND B.U.D.S.* subsection.
2. In B.U.D.S., select the **Monitoring** tab then the **ECM** tab.
3. Start engine.

4. Increase engine RPM as specified in the following table and read voltage in the **ECM Input Voltage** box.

OUTPUT VOLTAGE TEST USING B.U.D.S.	
ENGINE SPEED	VOLTAGE (DC)
4000 RPM	14.8 ± .4 Vdc



1. ECM Input Voltage box

If voltage is above specification, replace voltage regulator/rectifier.

If voltage is below specification, check stator output and wiring harness prior to concluding that voltage regulator/rectifier is defective. Refer to *MAGNETO SYSTEM* subsection.

Output Voltage Test Using a Multimeter

1. Set multimeter to Vdc.
2. Connect multimeter to battery posts.
3. Start engine.
4. Increase engine RPM as specified in the following table and read voltage with the multimeter.

OUTPUT VOLTAGE TEST USING A MULTIMETER	
TEST ENGINE SPEED	VOLTAGE (DC)
4000 RPM	14.8 ± .4 Vdc

If voltage is above specification, replace voltage regulator/rectifier.

If voltage is below specification, check stator and wiring harness prior to concluding that voltage regulator/rectifier is defective. Refer to *MAGNETO SYSTEM* subsection.

TROUBLESHOOTING

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

BATTERY REGULARLY DISCHARGED OR WEAK

1. **Loose or corroded battery cables connections.**
   - *Tighten or repair battery cables connections.*
2. **Worn or defective battery.**
   - *Charge and test battery.*
3. **Defective magneto stator.**
   - *Test stator.*
4. **Defective regulator/rectifier.**
   - *Test system voltage.*
5. **Damaged magneto rotor or Woodruff key.**
   - *Replace magneto rotor or Woodruff key.*

PROCEDURES

VOLTAGE REGULATOR/ RECTIFIER

Voltage Regulator/Rectifier Static Test

Due to internal circuitry, there is no static test available.

Voltage Regulator/Rectifier Access

The voltage regulator/rectifier is located on the LH side, underneath dashboard, on the RH side of the battery rack.

Voltage Regulator/Rectifier Wire Identification

FUNCTION	PIN	COLOR
12 Vdc output	RD1-1	RED
12 Vdc ground	RD1-3	BLACK
12 Vac input	RD2-1	YELLOW
12 Vac input	RD2-2	YELLOW
12 Vac input	RD2-3	YELLOW

BATTERY

Battery Information

These vehicles are equipped with a VRLA battery (Valve Regulated Lead Acid). **It is a maintenance-free type battery.**

Refer to battery manufacturer's instructions for proper filling, activation and routine charging procedures.

Battery Voltage Test (No Load Applied)

NOTE: A voltage test 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 be good, while the battery does not have enough power to crank the engine. A load test gives a more accurate condition of the battery.

A voltage reading provides an instant indication of the state of charge of the battery, not of it's current output capacity. A load test gives a more accurate indication of the battery's condition.

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 to battery terminals. Always respect polarity.

FULLY CHARGED BATTERY VOLTAGE
12.6 Vdc minimum

NOTE: A battery that shows a voltage of 12.0 Vdc is considered completely discharged and need to be recharged.

Battery Load Test

This is the best test to indicate a battery condition. Use a load testing device such as the NAPA ULTRA PRO BATTERY LOAD TESTER (P/N 95260). It has a 500 Amp adjustable load.

Apply a load of 3 times the ampere-hour rating of the battery. At 14 seconds into the test, check battery voltage.

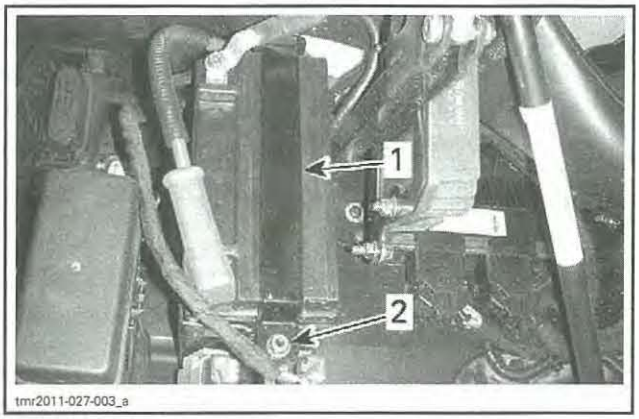
TIME TO MEASURE INTO TEST	VOLTAGE
14 seconds	Min. 10.5 Vdc @ 20°C (68°F)

Battery Removal

1. Disconnect BLACK (-) cable first, then the RED (+) cable.

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

2. Remove battery strap retaining nut.



1. Battery strap
2. Battery strap retaining nut

3. Unhook the top of battery strap.
4. Remove battery.

Battery Cleaning

Clean the battery rack, cables and battery posts using a solution of baking soda and water.

Remove corrosion (if so) from battery cable terminals and battery posts using a firm wire brush. Rinse with clear water and dry well.

Battery Storage

If the battery is in storage or used infrequently, disconnect the battery cables to eliminate drain from electrical equipment.

For extended storage, remove the battery from vehicle.

Clean battery terminals and cable connections using a wire brush. Apply a light coat of DIELECTRIC GREASE (P/N 293 550 004) on terminals.

Clean battery casing using a solution of baking soda and water. Rinse battery with clear water and dry well using a clean cloth.

Regularly charge battery as per manufacturer's recommendations.

For other recommendations during storage, refer to battery manufacturer's instructions.

⚠ WARNING

Ensure to store battery in a safe place, out of reach for children.

Battery Installation

NOTICE **Always connect RED (+) cable first then BLACK (-) cable.**

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

- Install the battery with the positive post down.
- Tighten battery strap retaining nut to the specified torque.

BATTERY STRAP RETAINING NUT TIGHTENING TORQUE
3.4 N•m ± 0.3 N•m (30 lbf•**in** ± 3 lbf•**in**)

STARTING SYSTEM

SERVICE TOOLS

Description	Part Number	Page
ECM ADAPTER TOOL	529 036 166	278
FLUKE 115 MULTIMETER	529 035 868	279

SERVICE PRODUCTS

Description	Part Number	Page
DIELECTRIC GREASE	293 550 004	281

GENERAL

⚠ WARNING

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

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

SYSTEM DESCRIPTION

The starting system is composed of an electric starter supplied in current by the battery through a solenoid.

The starter solenoid receives a 12 volt input from the ignition switch and the ground signal is provided by the ECM when the following engine cranking conditions are met.

- Ignition switch ON.
- Transmission in Park or Neutral position and/or brake pedal held.
- Start button held.

NOTE: If the ignition switch is left ON for more than 15 minutes, engine will not start unless ignition switch is turned OFF, then ON again.

TROUBLESHOOTING

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

NOTE: Clear any fault code after solving a problem.

Always refer to the *WIRING DIAGRAM* when troubleshooting an electrical circuit.

Refer to *POWER DISTRIBUTION* for fuse and relay information.

Check all connections, cables and wires. Tighten any loose connections. Replace any chafed or corroded wires/cables.

DIAGNOSTIC GUIDELINES

FUSE 8 INFUSE BOX 1 BURNS WHILE ATTEMPTING TO CRANK ENGINE

1. **Defective D2 Diode**
   - *Test diode, see procedure in this subsection.*
2. **Defective starter solenoid**
   - *Test starter solenoid, see procedure in this subsection.*
3. **Wiring short to ground**
   - *Check wiring.*

ENGINE DOES NOT CRANK AND GAUGE DOES NOT TURN ON

1. **Burnt main fuse (F1) in fuse box 2**
   - *Check fuse.*
2. **Burnt fuse F8 in fuse box 1**
   - *Check fuse.*
3. **Defective or discharged battery**
   - *Test battery, refer to CHARGING SYSTEM.*
4. **Defective ignition switch or circuit**
   - *Check ignition switch, refer to IGNITION SYSTEM.*

ENGINE DOES NOT CRANK BUT GAUGE TURNS ON

1. Defective brake switch
   - *Check brake switch, refer to BRAKES section.*
2. Defective gearbox position sensor (GPBS)
   - *Check GPBS, refer to GEARBOX AND 4X4 COUPLING UNIT subsection.*
3. Defective start button or circuit
   - *Test start button, see procedure in this subsection.*
4. Defective starter solenoid or circuit
   - *Test starter solenoid, see procedure in this subsection.*
5. Defective starter motor
   - *Check starter motor, see procedure in this subsection.*

PROCEDURES

D2 DIODE (STARTER SOLENOID)

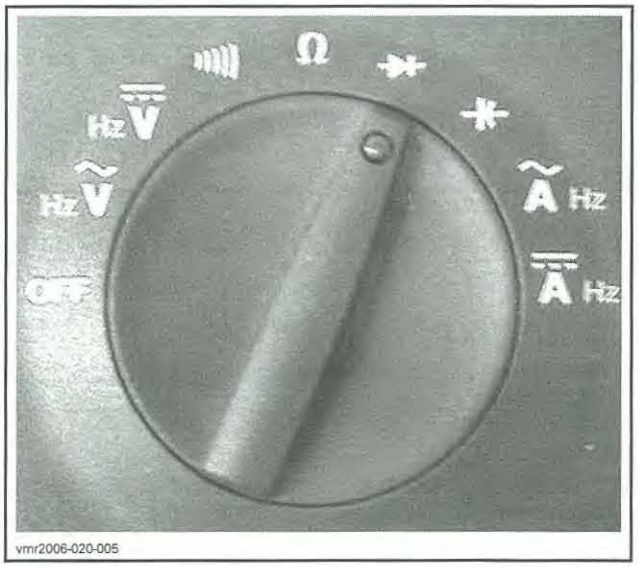
Diode Location

The diode is located in the main harness, near starter solenoid.

Diode Test

1. Make sure ignition switch is OFF.
2. Disconnect pins SS1 and SS2 from starter solenoid.
3. Disconnect ECM connector B.
4. Connect ECM ADAPTER TOOL (P/N 529 036 166) to the ECM connector B.

5. Set multimeter to "diode check".



6. Test diode as per following table.

D2 DIODE TEST		
MULTIMETER POSITIVE PROBE	MULTIMETER NEGATIVE PROBE	RESULT
ECM-B pin A2	ECM-B pin L4	Overload (open)
ECM-B pin L4	ECM-B pin A2	Approximately 0.5 volts

If diode fail any test, replace it.

START BUTTON

Start Button Access

Remove upper console.

Start Button Wire Identification

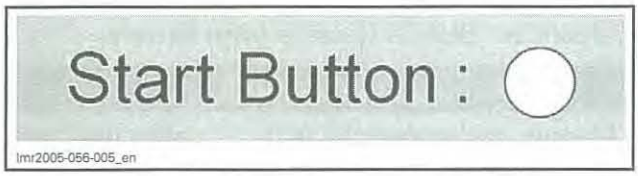
FUNCTION	PIN	COLOR
12 volt input from ignition switch	1	BLACK/YELLOW
12 volt output to ECM-B pin D1	2	YELLOW/RED

Start Button Test with B.U.D.S.

Connect to the latest applicable B.U.D.S. software. Refer to *COMMUNICATION TOOLS AND B.U.D.S.* section.

In B.U.D.S., select the **Monitoring** and **ECM** tabs.

Press the vehicle's start button and look at the **Start Button** LED.



It should turn on, indicating the start signal reaches the ECM.

If it does not turn on, check the start button and wiring.

Start Button Resistance Test

Disconnect start button connector.

Using the FLUKE 115 MULTIMETER (P/N 529 035 868), measure resistance as per the following table.

POSITION	START BUTTON CONNECTOR PIN		RESISTANCE
Switch released	1	2	Infinite (OL)
Switch depressed and held			0.6 Ω max.

Replace start button if defective.

STARTER SOLENOID

Starter Solenoid Access

The starter solenoid is located on the LH side, underneath dashboard, on top of battery rack.

To access starter solenoid, remove the CVT vent inlet tube.

Starter Solenoid Wire Identification

FUNCTION	PIN	WIRE COLOR
12 volt input from ignition switch	SS1	BLACK/ YELLOW
Ground from ECM-B pin L4	SS2	ORANGE/ BROWN

Starter Solenoid Operational Test

1. Disconnect both terminals (SS1 and SS2) from the starter solenoid.
2. Connect SS1 to the positive battery terminal.
3. Momentarily connect SS2 to the chassis ground.

If starter runs, carry out the *STARTER SOLENOID INPUT VOLTAGE TEST.*

If starter does not run, carry out the *STARTER SOLENOID WINDING RESISTANCE TEST.*

Starter Solenoid Input Voltage Test

1. Disconnect connector with BLACK/YELLOW wire.
2. Turn ignition switch ON.
3. Measure voltage as per following table.

STARTER SOLENOID INPUT VOLTAGE TEST		
TEST PROBES		RESULT (START BUTTON RELEASED)
BLACK/ YELLOW wire	Battery ground	Battery voltage

Starter Solenoid Ground Signal Test

1. Disconnect SS2 (ORANGE/BROWN) from solenoid.
2. Turn ignition switch ON.
3. Measure voltage as per following table.

STARTER SOLENOID GROUND SIGNAL TEST		
TEST PROBES		RESULT (START BUTTON DEPRESSED)
ORANGE/ BROWN wire	Battery positive post	Battery voltage

Starter Solenoid Winding Resistance Test

Disconnect terminals from solenoid.

With a multimeter, check primary winding resistance as follows.

STARTER SOLENOID WINDING RESISTANCE TEST		
TEST PROBES		RESULT @ 20°C (68°F)
Starter solenoid SS1 pin	Starter solenoid SS2 pin	Approximately 5 Ω

If measurement is out of specification, replace solenoid.

Starter Solenoid Voltage Drop Test

Turn ignition key ON.

Measure voltage as per following table while cranking engine in **drowned mode** (to prevent engine starting).

NOTE: For drowned mode, refer to *ENGINE MANAGEMENT* subsection.

STARTER SOLENOID VOLTAGE DROP TEST		
TEST PROBES		RESULT (WHILE CRANKING)
Post coming from battery	Post going to starter	0.2 Vdc max.

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If voltage is out of specification, replace solenoid.

ELECTRIC STARTER

Starter Access

To access starter electrical terminal, refer to *BODY* and remove LH seat and LH lateral console panel.

To access starter for removal, remove drive pulley, driven pulley and CVT back cover, refer to *CONTINUOUSLY VARIABLE TRANSMISSION (CVT)* subsection.

Starter Operation Test

Using booster cables, carefully supply current from a 12 volt battery directly to the starter. Connect the BLACK (-) cable first. Then connect the remaining jumper cable from the battery then to the starter.

If starter turns, test other starting system components.

Starter Removal

Turn OFF ignition switch.

Disconnect BLACK (-) cable from battery.

⚠ WARNING

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

Disconnect RED (+) cable from starter.

Clean starter area.

Remove starter retaining screw.

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TYPICAL - SOME PARTS REMOVED FOR CLARITY PURPOSE ONLY

Carefully pry starter out of the engine crankcase.

Starter Installation

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

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

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

Push starter in place and align mounting ear to install screw. Tighten to the specified torque.

STARTER MOUNTING SCREW TIGHTENING TORQUE	
Starter mounting screw	25 N•m (18 lbf•ft)

Connect the RED (+) cable to the starter and tighten nut and apply specified product.

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

STARTER CABLE NUT	
TIGHTENING TORQUE	PRODUCT
6 N•m (53 lbf•**in**)	DIELECTRIC GREASE (P/N 293 550 004)

First connect RED (+) cable to battery then connect the BLACK (-) cable.

Connect battery cables.

⚠ WARNING

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

Test starter operation.

DIGITALLY ENCODED SECURITY SYSTEM (D.E.S.S.)

GENERAL

SYSTEM DESCRIPTION

The ignition key contains a ROM chip with a unique digital code that is the equivalent of a unique teeth pattern on a conventional key.

When the ignition key is turned ON, the ECM reads the ignition key and, if it is not recognized, no engine starting will be possible.

NOTE: When a key is not recognized by the ECM, INVALID KEY will be displayed in the multifunction speedometer.

NOTE: All ignition keys have the same teeth pattern. Therefore, they can be used and turned in the switch of any D.E.S.S.-equipped vehicle. However, unless the D.E.S.S. system recognizes (in the ECM) a valid programmed key, the engine starting will not be allowed.

NOTE: Actually, it is the memory of the ECM that is programmed to recognize the digital code of the ignition key.

Up to 10 ignition keys may be programmed in the memory of the ECM. They can also be erased individually or all at once.

Note that the D.E.S.S. circuitry is already activated on all new ECM.

TROUBLESHOOTING

DIAGNOSTIC TIPS

NOTE: It is a good practice to check for fault codes using B.U.D.S. software as a first troubleshooting step.

If D.E.S.S. key is not recognized by the ECM, key is defective or there is a wiring problem, CHECK ENGINE light will turn on and a message will be displayed in the multifunction speedometer.

PROCEDURES

KEY PROGRAMMING

Use the appropriate B.U.D.S. software version available from BOSSWeb. Refer to *COMMUNICATION TOOLS AND B.U.D.S. SOFTWARE* subsection for proper connection instructions.

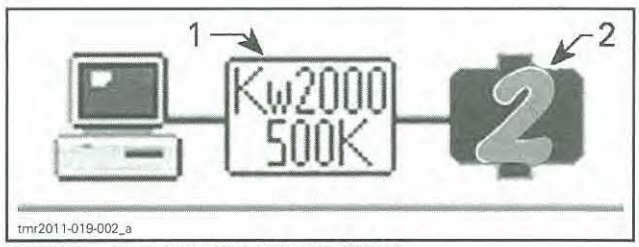
The B.U.D.S. software is designed to allow, among other things, the programming of ignition key(s) and entering customer information.

For more information pertaining to the use of the software B.U.D.S., use its help which contains detailed information on its functions.

⚠ WARNING

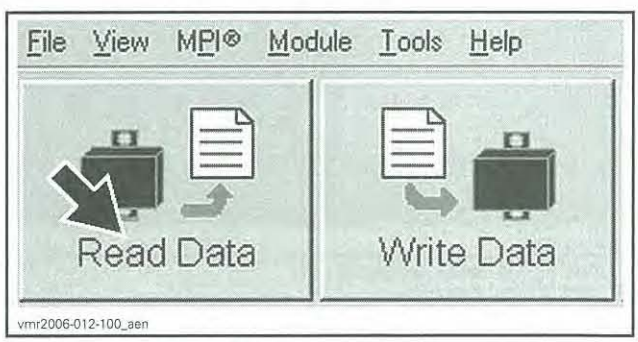
If the computer you are using is connected to the 110 Vac power outlet, there is a potential risk of electrocution when working in contact with water. Be careful not to touch water while working with the VCK.

1. Turn ignition switch to ON using any of the key provided with the vehicle. DO NOT start the engine.
2. Start B.U.D.S. and logon.
3. Wait during detection setup.
4. Ensure the status bar shows the Kw2000 protocol and the appropriate number of modules to its right according to the vehicle model.

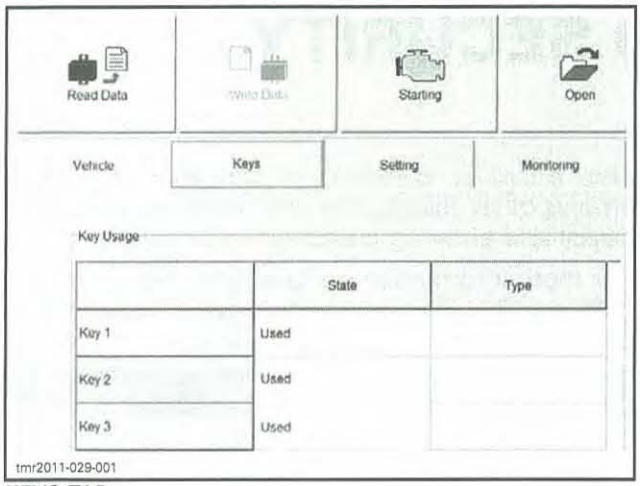


TYPICAL - SUCCESSFUL CONNECTION
1. Connection protocol
2. Number of modules

5. Click the **Read Data** button.

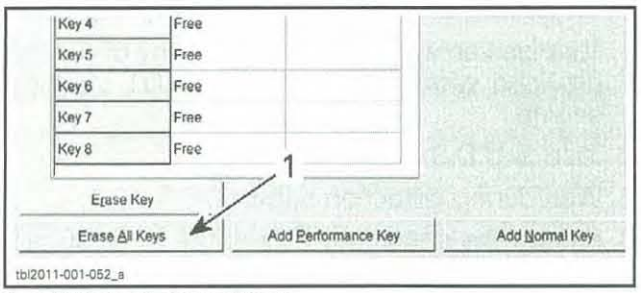


6. Click on **Keys** tab.



KEYS TAB

7. Click on **Erase All Keys** button.

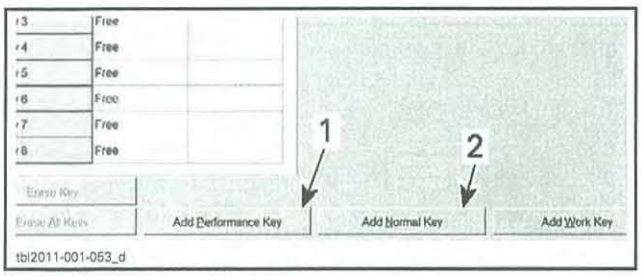


1. Click here to erase all keys

8. Click "YES" to confirm the action.
9. Confirm key color in ignition switch.
10. Program the key by selecting the right type according to chart.

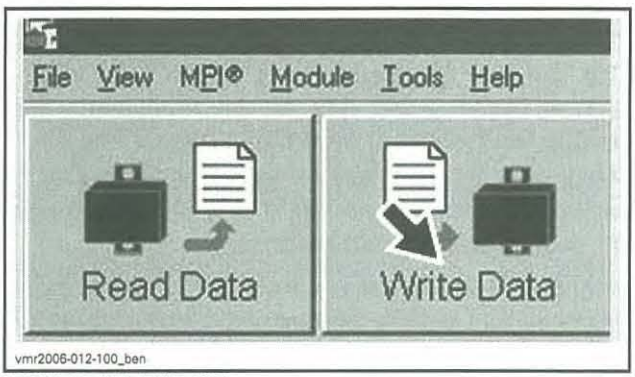
KEY	KEY TYPE
BLACK key	Performance key
GRAY key	Normal key

NOTE: The work key (ORANGE key) is optional.



1. Add Performance Key button
2. Add Normal Key button

11. Turn ignition switch to OFF. Remove the key.
12. Install the other key.
13. Turn ignition key to ON position.
14. Program the other key by selecting the right type according to above chart.
15. Repeat previous steps to program other keys.
16. Click on **Write Data** button to transfer new settings and information to the ECM.



WRITE DATA BUTTON

17. Click on EXIT button to end session.
18. Disconnect all cables and hardware from vehicle.
19. Ensure to reinstall the connector into its housing.

LIGHTS, GAUGE AND ACCESSORIES

SERVICE PRODUCTS

Description	Part Number	Page
DIELECTRIC GREASE	293 550 004	285

GENERAL

NOTICE It is recommended to always disconnect the battery when replacing any electric or electronic parts. Always disconnect battery exactly in the specified order, BLACK (-) cable first.

TROUBLESHOOTING

DIAGNOSTIC TIPS

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

IMPORTANT: When troubleshooting an electrical system fault, check battery condition, cables and connections first.

Circuit Testing

Check the related-circuit fuse condition with a fuse tester or test lamp (a visual inspection could lead to a wrong conclusion).

NOTE: If the ignition switch is left ON for more than 30 minutes, the accessory relay will shut down.

Electrical Connection Inspection

When replacing an electric or electronic component, always check electrical connections. Make sure they are tight, make good contact, and are corrosion-free. Dirty, loose or corroded contacts are poor conductors and are often the source of a system or component malfunction.

Pay particular attention to ensure that pins are not bent or pushed out of their connectors.

Ensure all wire terminals are properly crimped on wires, and connector housings are properly fastened.

Check for signs of moisture, corrosion or dullness. Clean pins properly and coat them with DIELECTRIC GREASE (P/N 293 550 004) or other appropriate lubricant when reassembling them, except if otherwise specified such as for the ECM connectors.

Pay attention to ground wires.

PROCEDURES

CONSOLE SWITCHES

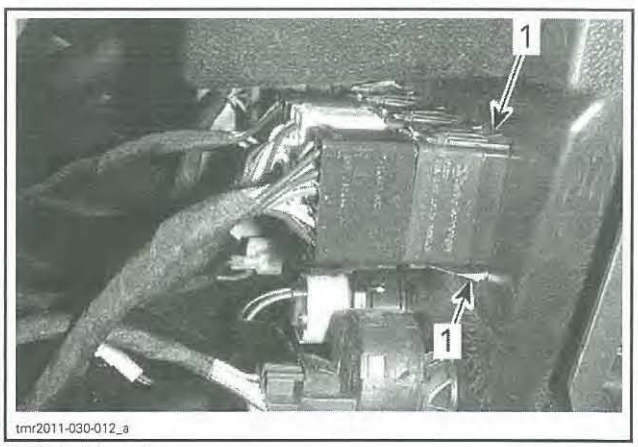
Switches Access

Refer to *BODY* and remove upper console.

Switches Removal and Installation

Disconnect electrical connector.

Release retaining clips, then push switch out of the console.



1. Retaining clips

For installation, reverse removal procedure.

Switches Illumination Wire Identification

FUNCTION	PIN	COLOR
12 volt input from fuse F7	See note	RED/BLACK

NOTE: The illumination circuit of all console switches is supplied by the RED/BLACK wire (except hazard switch if equipped) but the pin location differ from one to another.

Switches Illumination Circuit Protection

CONDITION	CIRCUIT PROTECTION
Supplied with accessories relay activated	Fuse 7 of fuse block 1 (from accessories relay R3)

MULTIFUNCTION GAUGE (LCD AND ANALOG/DIGITAL)

Multifunction Gauge Wire Identification

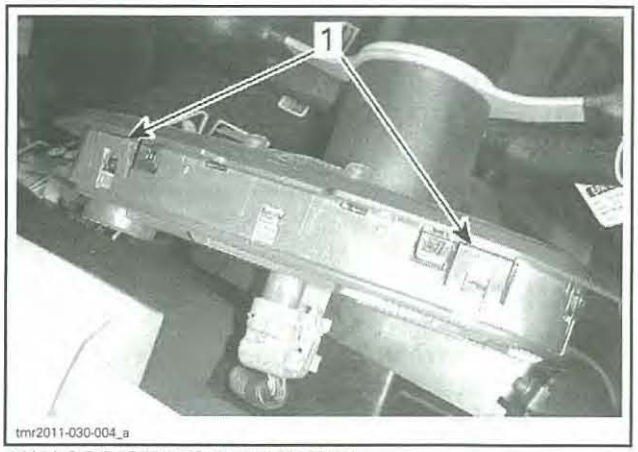
FUNCTION	PIN	COLOR
12 volt input from fuse F4	17	ORANGE/GREEN
12 volt input from fuse F8	16	BEIGE/WHITE
Ground	20	BLACK
CAN LO	18	BEIGE/GREEN
CAN HI	19	WHITE/BEIGE
Fuel level gauge supply	4	BROWN/PINK
Fuel level gauge ground	21	VIOLET/PINK
2WD/4WD switch signal (-)	7	BLACK/BEIGE
HI beam signal (+)	5	BLUE

Multifunction Gauge Circuit Protection

CONDITION	CIRCUIT PROTECTION
Supplied at all times	Fuse 8 of fuse block 1 (from fuse 1 of fuse block 2)
Supplied with main relay activated	Fuse 4 of fuse block 1 (from main relay R2)

Multifunction Gauge Removal

1. Remove gauge cover.
2. Disconnect gauge connector.
3. Release retaining clips at the top of gauge.



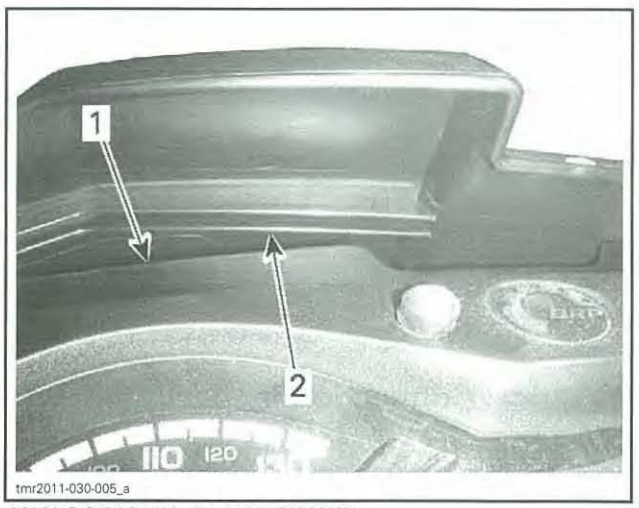
ANALOG/DIGITAL GAUGE SHOWN
1. Retaining clips

4. Tilt top of gauge rearward, then pull it up to remove it from its support.

Multifunction Gauge Installation

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

Align gauge support top in the gauge cover slots on each side.



ANALOG/DIGITAL GAUGE SHOWN
1. Gauge support top
2. Gauge cover slot

Maintenance Soon Message

Maintenance Soon Message Manual Reset

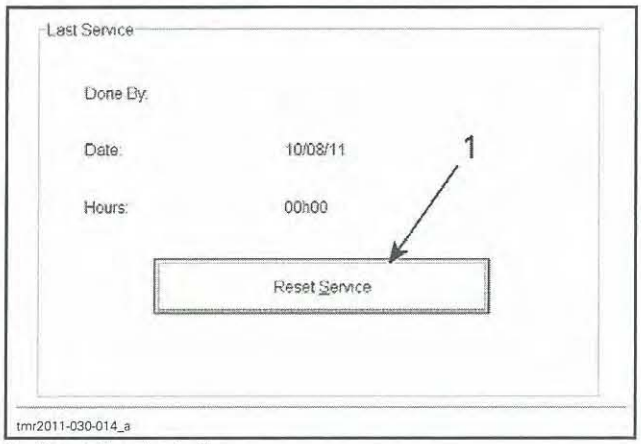
With the ignition switch ON, alternately depress the override button and brake pedal 3 times.

Maintenance Soon Message Reset Using B.U.D.S.

Connect to the applicable B.U.D.S. software. Refer to *COMMUNICATION TOOLS AND B.U.D.S.* subsection.

Select **Vehicle** tab.

Click on the **Reset Service** button.



1. Reset Service button

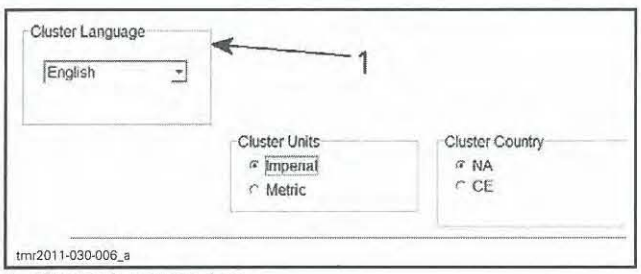
Multifunction Gauge Set-Up Using B.U.D.S.

Connect to the applicable B.U.D.S. software. Refer to *COMMUNICATION TOOLS AND B.U.D.S.* subsection.

Language Selection

Select **Setting** and **Cluster** tabs.

Scroll and select the desired display language in the **Cluster Language** box.

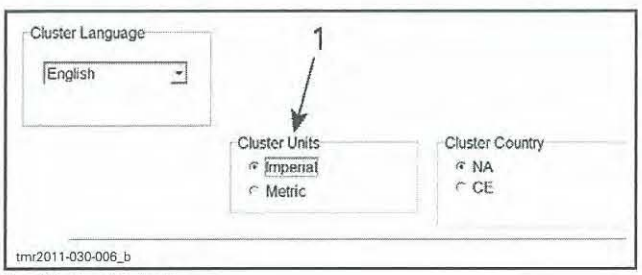


1. Cluster Language box

Units Selection

Select **Setting** and **Cluster** tabs.

Select **Imperial** or **Metric** in the **Cluster Units** box.

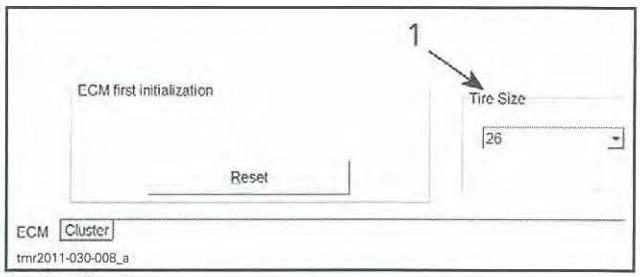


1. Cluster Units box

Tire Size Selection

Select **Setting** and **ECM** tabs.

Scroll and select the appropriate tire diameter (see inscriptions on the tires) in the **Tire Size** box.



1. Tire Size box

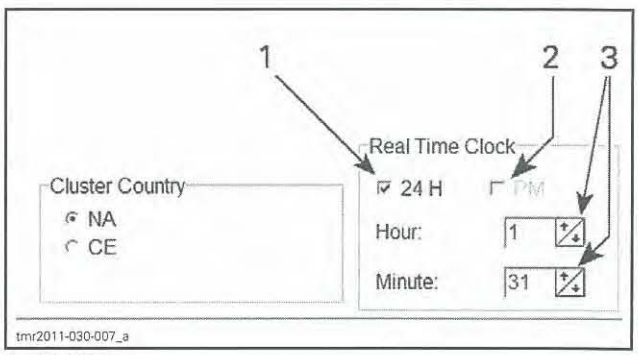
Clock Setting

Select **Setting** and **Cluster** tabs.

To set clock to the 24-hour format, check the **24 H** box. To set it to the 12-hour format, leave the box empty.

If 12-hour format was selected, check the **PM** box if required.

Set hour and minutes using the up or down arrows.

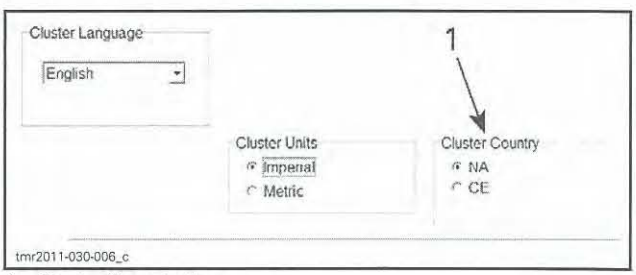


1. 24 H box
2. PM box
3. Arrows

Country Selection

To enable flasher pilot lamp on European Community (CE) models, select **Cluster** and **Setting** tabs.

Select **CE** in the **Cluster Country** box.

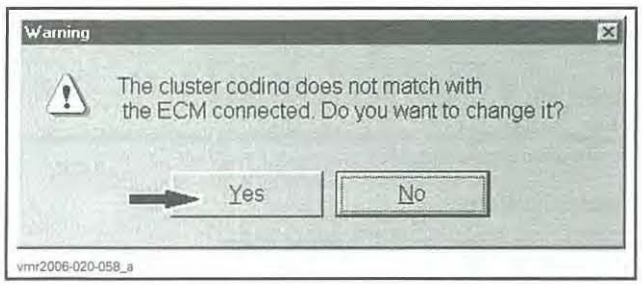


1. Cluster Country box

Outside Europe, select **NA**.

New Multifunction Gauge Registration (coding)

Whenever multifunction gauge is replaced, it is required to use B.U.D.S. to register it in 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 ECM through B.U.D.S., **engine starting will not be allowed until gauge is registered with proper coding.**

Multifunction Gauge Test with B.U.D.S.

Connect to the applicable B.U.D.S. software. Refer to *COMMUNICATION TOOLS AND B.U.D.S.* subsection.

Wow Test

This function is used to check if the indicator lights, display and analog indicators (if applicable) are functional.

NOTE: This function does not test the signals or external circuits.

Select the **Activation** and **Cluster** tabs.

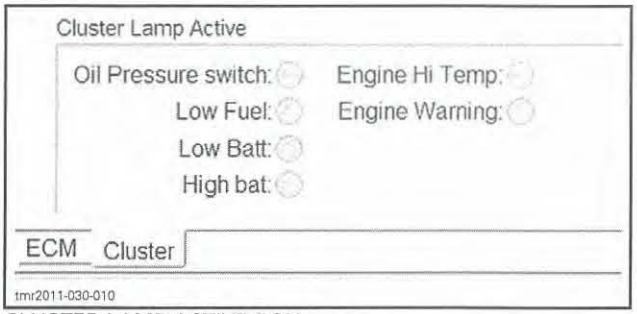
Click on the **WOW Test** button.

TYPICAL
1. WOW Test button

Indicator Lights Monitoring

Select **Monitoring** and **Cluster** tabs.

Use the **Cluster Lamp Active** box to monitor different indicator lights outputs.



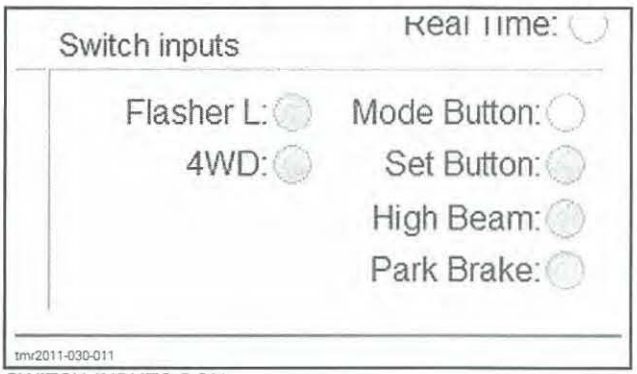
CLUSTER LAMP ACTIVE BOX

This function confirms that the signals are broadcasting and the indicator lights should be ON in the multifunction gauge.

Switches Input Monitoring

Select **Monitoring** and **Cluster** tabs.

Use the **Switch Inputs** box to monitor different switch inputs as you activates the switches.



SWITCH INPUTS BOX

This function confirms that the ECM receives the inputs.

Vehicle Parameters Monitoring

Select **Monitoring** and **Cluster** tabs.

In the upper area, the fuel level, engine speed (RPM), vehicle speed and engine coolant temperature are displayed.

This function confirms that the signals are broadcasting and the information should be displayed on the multifunction gauge.

12 VOLT POWER OUTLET

12 Volt Power Outlet Removal and Installation

Refer to *BODY* and remove upper console.

Unplug the connectors of the power outlet.

Unscrew the retaining nut.

Reverse procedure for installation.

12 Volt Power Outlet Wire Identification

FUNCTION	PIN	COLOR
12 volt input from fuse F12	2	RED/BROWN
Ground (to ground terminal BK3)	1	BLACK

12 Volt Power Outlet Circuit Protection

CONDITION	CIRCUIT PROTECTION
Supplied with accessories relay activated	Fuse 12 of fuse block 1 (from accessories relay R3)

HEADLIGHTS

Headlight Wire Identification

HEADLIGHTS RELAY (R4)		
FUNCTION	PIN	COLOR
12 volt input from fuse F11 (headlights power)	7D	YELLOW/BLACK
12 volt input from ignition switch pin A (relay winding input)	6D	YELLOW/BLUE
12 volt output to headlights low beam and low/high beam switch	6C	GREEN
Relay winding ground (from ECM-B G1)	7C	ORANGE/BLACK

HEADLIGHT LOW/HIGH BEAM SWITCH (EXCEPT EUROPE)		
FUNCTION	PIN	COLOR
12 volt input from headlights relay	2	GREEN
12 volt output to high beam headlights	3	BLUE

HEADLIGHT LOW/HIGH BEAM SWITCH (EUROPE - IN MULTIFUNCTION SWITCH)		
FUNCTION	PIN	COLOR
12 volt input from headlights relay	MGC-4	GREEN
12 volt output to high beam headlights (HI position)	MGC-5	BLUE
12 volt output to high beam headlights (PASS position)	MGC-2	BLUE

Headlights Circuit Protection

CONDITION	CIRCUIT PROTECTION
Supplied at all times	Fuse 11 of fuse block 1 (from fuse 2 of fuse block 2)

Headlight Test

Disconnect headlight connector. Refer to *BULB REPLACEMENT*.

Using a multimeter, measure the voltage on headlight connector as follows.

SWITCH POSITION	WIRE COLOR		VOLTAGE
LO beam/ HI beam	GREEN (Low beam bulb)	BLACK	Battery voltage
HI beam	BLUE (Hi beam bulb)	BLACK	

Headlight Bulb Replacement

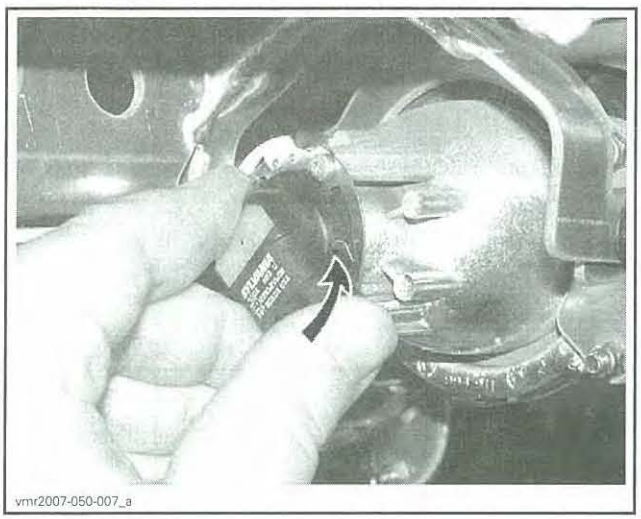
NOTICE **Never touch glass portion of an halogen bulb with bare fingers, it shortens its operating life. If glass is touched, clean it with isopropyl alcohol which will not leave a film on the bulb.**

NOTE: The same bulb type is used for LO and HI beams on both sides of vehicle.

Unplug connector from bulb.

vmr2007-050-006_a

Rotate bulb.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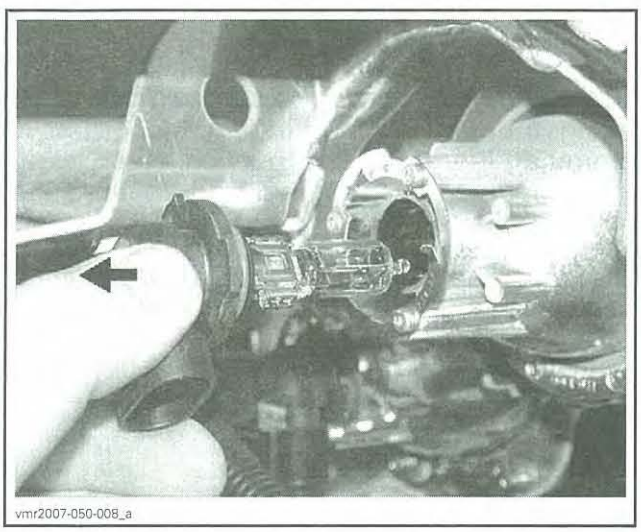
Pull bulb out.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Properly reinstall removed parts in the reverse order of their removal.

Validate headlight operation.

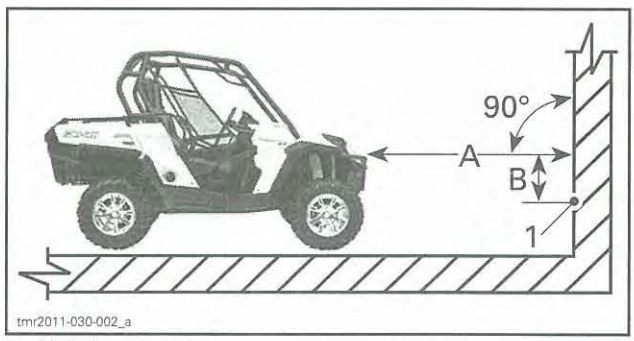
Headlamp Beam Aiming

Select high beam.

Beam aiming is correct when center of high beam is 130 mm (5 in) below the headlight horizontal center line, scribed on a test surface, 5 m (16 ft) away.

NOTE: Load vehicle as per normal use.

Measure headlight center distance from the ground. Scribe a line at this height on test surface (wall or screen). Light beam center should be 130 mm (5 in) below scribed line.



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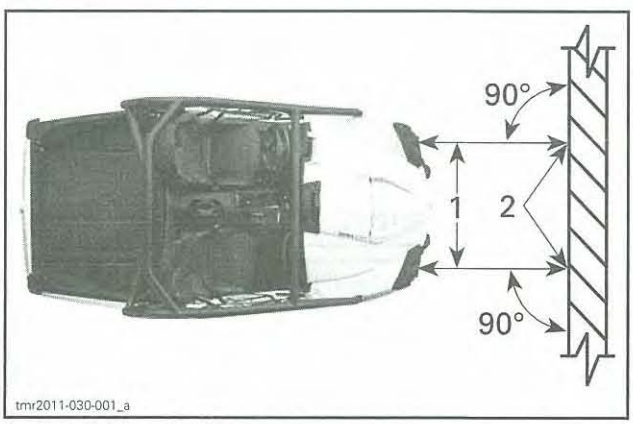
1. Light beam center
A. 5 m (17 ft)
B. 131 mm (5 in)



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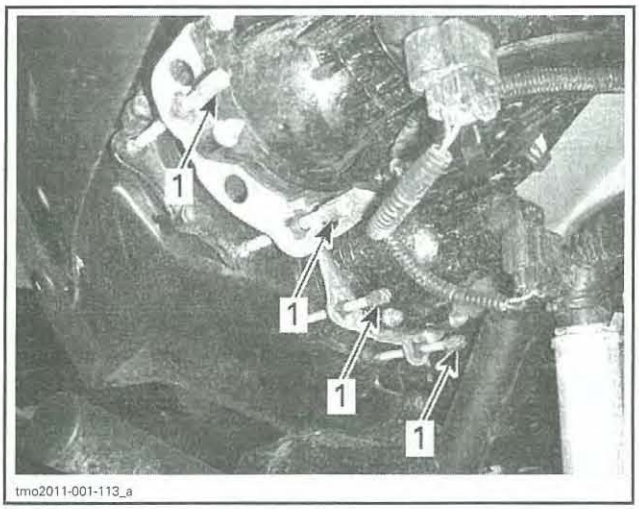
1. Headlight center lines
2. Light beam center

Beam Aiming Adjustment

Turn adjustment screws to adjust beam height and side orientation as described below. Adjust both headlight evenly.



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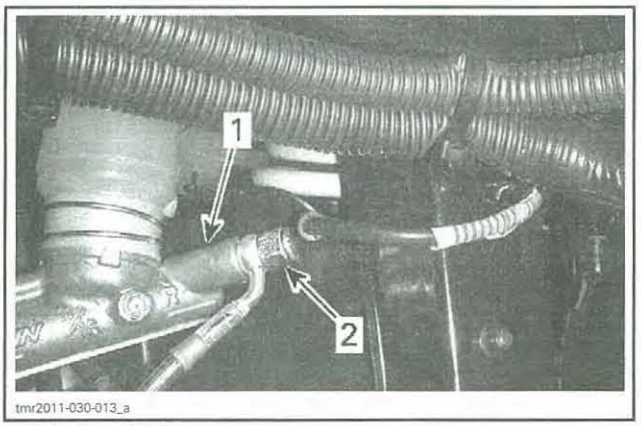
1. Adjustment screws

TAILLIGHTS/BRAKE LIGHTS

Taillight/Brake Light Switch Access

The taillight/brake light switch is located on the brake master cylinder.



tmr2011-030-013_a

1. Master cylinder
2. Taillight/brake light switch

Taillight/Brake Light Wire Identification

BRAKE LIGHT RELAY (R8)		
FUNCTION	PIN	COLOR
12 volt input from fuse F4 (LH brake light power)	12B	ORANGE/GREEN
12 volt input from brake light switch (relay winding input)	11B	RED/ORANGE
12 volt output to LH brake light	11A	WHITE/ORANGE
Relay winding ground (to ground terminal BK2)	12A	BLACK

BRAKE LIGHT SWITCH		
FUNCTION	PIN	COLOR
12 volt input from fuse F4	2	ORANGE/GREEN
12 volt output to RH brake light and R8 relay winding	1	RED/ORANGE

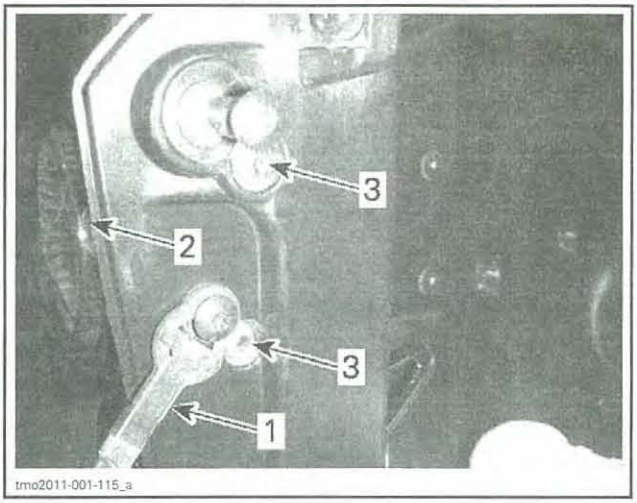
Taillight/Brake Light Circuit Protection

CONDITION	CIRCUIT PROTECTION
Supplied with main relay activated	Fuse 4 of fuse block 1 (from main relay R2)

Taillight/Brake Light Bulb Replacement

Open upper tail gate.

Remove both taillight retaining screws.



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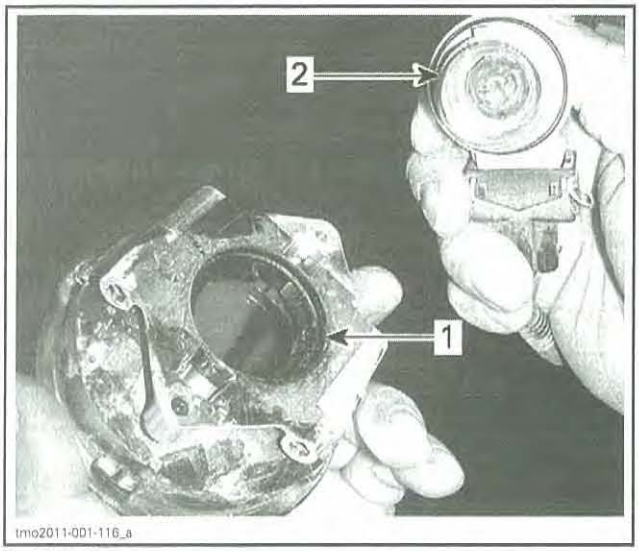
1. Tail gate cable
2. Taillight
3. Retaining screws

Pull taillight out of its location.

Remove bulb socket from taillight.



1. Taillight
2. Light bulb and socket

Push the bulb in and hold while turning counterclockwise to release.

Installation is the reverse of the removal procedure.

WINCH

XT Models Only

Winch Wire Identification

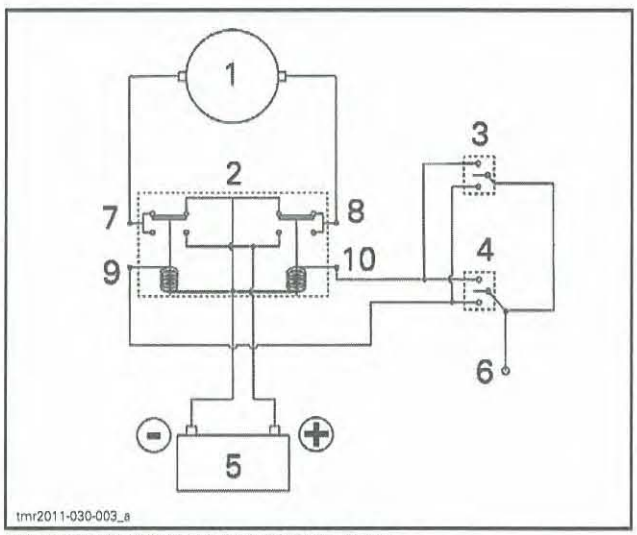
WINCH RELAY		
FUNCTION	PIN	COLOR
12 volt input from battery (winch power)	BP4	RED
Ground	BN4	BLACK
12 volt input from switch ("IN")	SW1	GREEN/BLUE
12 volt input from switch ("OUT")	SW2	LIGHT BLUE
Motor power (switches polarity depending on rotation direction)	SW3	RED (with blue sleeve)
Motor power (switches polarity depending on rotation direction)	SW5	RED (with Yellow sleeve)

NOTE: The small black wire at terminal BN4 is connected to the diodes used to prevent electric arcs in the switch.

WINCH SWITCH		
FUNCTION	PIN	COLOR
12 volt input from fuse 7	2	RED/BLACK
12 volt output to relay winding ("IN")	1	GREEN/BLUE
12 volt output to relay winding ("OUT")	3	LIGHT BLUE

⚠ WARNING

Before testing, make sure the winch is in FREESPOOL mode (Freespool clutch disengaged).



SIMPLIFIED WINCH WIRING DIAGRAM
1. Winch motor
2. Winch relay
3. Winch remote control
4. Winch switch
5. Battery
6. 12 volt input to switch (switch pin 2 - from fuse 7)
7. Winch motor power (SW3)
8. Winch motor power (SW5)
9. 12 volt input to relay winding ("IN" - SW1)
10. 12 volt input to relay winding ("OUT" - SW2)

Winch Switch Circuit Protection

CONDITION	CIRCUIT PROTECTION
Supplied with accessories relay activated	Fuse 7 of fuse block 1 (from accessories relay R3)

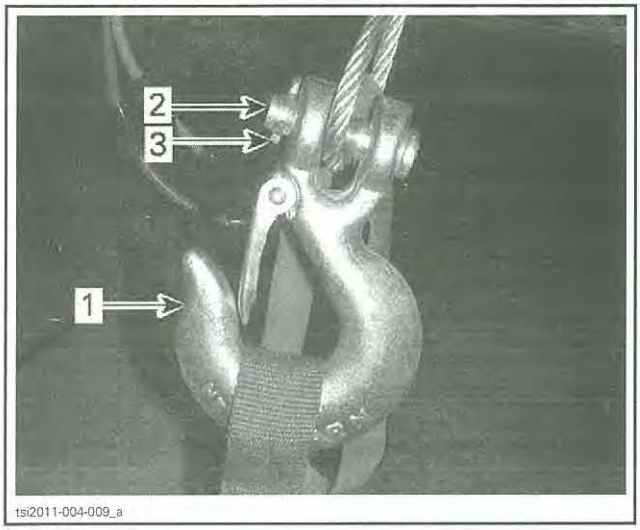
Winch Removal

1. Disconnect, the battery BLACK (-) cable first, then the RED (+) cable.

⚠ WARNING

Always respect this order for disassembly; disconnect BLACK (-) cable first. Electrolyte or fuel vapors can be present in engine compartment and a spark may ignite them and possibly cause personal injuries.

2. Remove the hook.
   2.1 Remove and discard the cotter pin.
   2.2 Remove the hook pin.



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1. Hook
2. Hook pin
3. Cotter pin

3. Remove the four retaining screws from underneath the winch motor.
4. Disconnect both winch power cables.

NOTE: Note the position of the power cables for reinstallation.

5. Protect radiator using strong cardboard.
6. Pass the cable through the roller fairlead.
7. Remove winch.

NOTICE Be careful not to lean on the radiator while removing winch.

Winch Installation

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

Tighten winch retaining screws to 24.5 N•m ± 3.5 N•m (18 lbf•ft ± 3 lbf•ft).

Connect wires the yellow wire at rear and the blue one at front.

Install a **new** cotter pin on the hook pin.

TURN SIGNALS/HAZARD (EC MODELS ONLY)

Turn Signal Wire Identification

FLASHER MODULE		
FUNCTION	PIN	COLOR
12 volt input from fuse F10	MC2-1	RED/WHITE
12 volt input from fuse F4	MC1-5	ORANGE/GREEN
RH turn 12 volt input from turn signal switch	MC1-1	BEIGE/ORANGE
LH turn 12 volt input from turn signal switch	MC1-2	BEIGE/GREY
Output to RH turn signal lights	MC2-2	BROWN
Output to LH turn signal lights	MC2-3	GREY
Output to multifunction gauge (turn signal indicator)	MC2-4	ORANGE
Ground	MC1-4	BLACK
Hazard 12 volt input from hazard switch	MC1-6	GREEN/ORANGE

TURN SIGNAL SWITCH (IN MULTIFUNCTION SWITCH)		
FUNCTION	PIN	COLOR
12 volt input from fuse F4	MGB-3	ORANGE/GREEN
RH turn 12 volt output to flasher module	MGB-4	BEIGE/ORANGE
LH turn 12 volt output to flasher module	MGB-2	BEIGE/GREY

HAZARD SWITCH		
FUNCTION	PIN	COLOR
12 volt input from fuse F10	2	RED/WHITE
12 volt output to flasher module	3	GREEN/ORANGE
Hazard indicator 12 volt input from fuse F4	8	ORANGE/BROWN
Hazard indicator ground (through bulbs)	7	BLACK/ORANGE

Turn Signal/Hazard Circuit Protection

CONDITION	CIRCUIT PROTECTION
Supplied with main relay (R2) activated	Fuse 4 of fuse block 1 (from main relay R2)
Supplied at all times	Fuse 10 of fuse block 1 (from fuse 2 of fuse box 2)

HORN (EC MODELS ONLY)

Horn Wire Identification

HORN SWITCH (IN MULTIFUNCTION SWITCH)		
FUNCTION	PIN	COLOR
12 volt input from fuse F10	MGB-1	ORANGE/GREEN
12 volt output to horn	MGB-6	BEIGE/BLUE

HORN		
FUNCTION	PIN	COLOR
12 volt input from horn switch	2	BEIGE/BLUE
Ground	1	BLACK

Horn Circuit Protection

CONDITION	CIRCUIT PROTECTION
Supplied with main relay (R2) activated	Fuse 4 of fuse block 1 (from main relay R2)

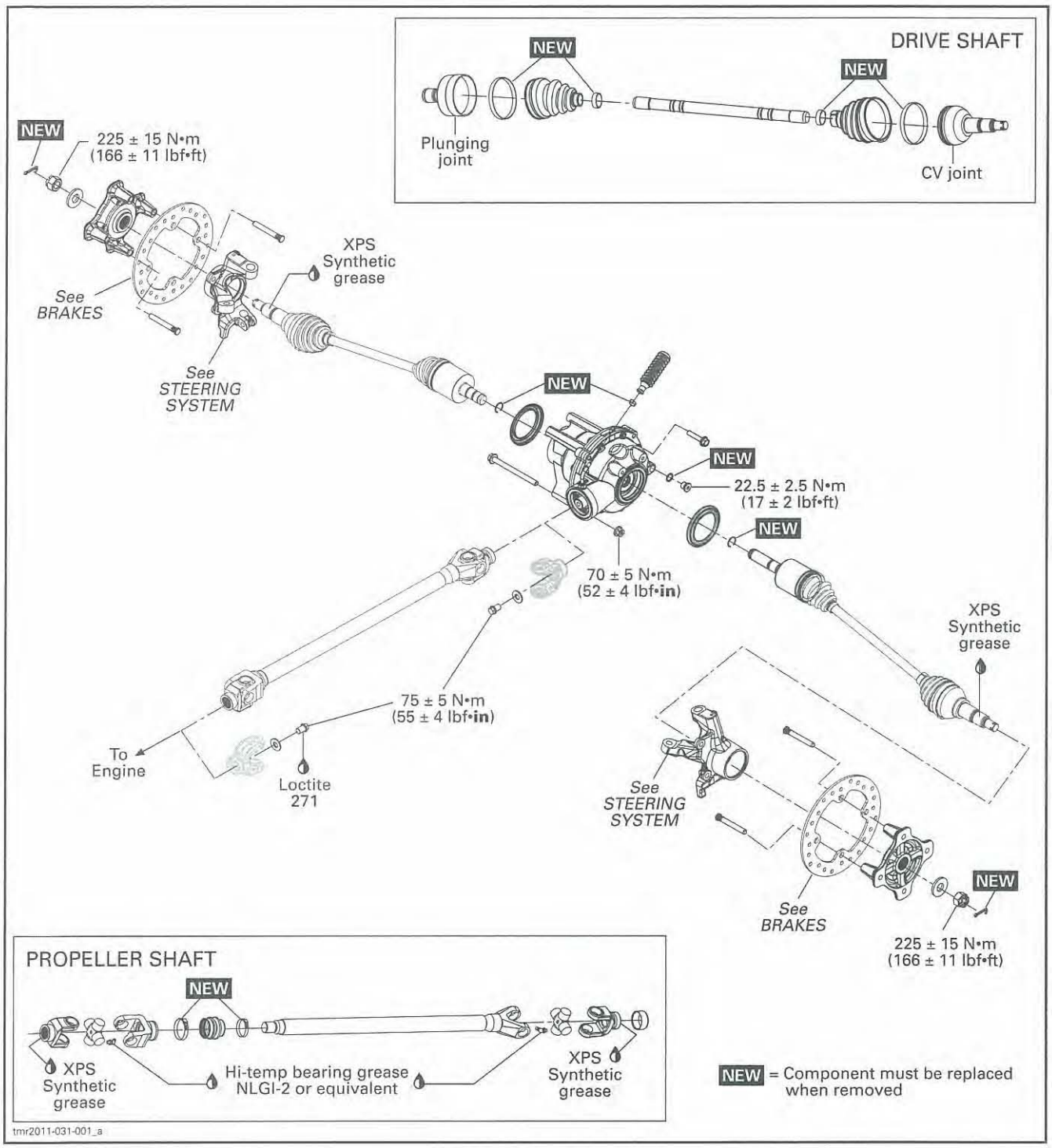
FRONT DRIVE

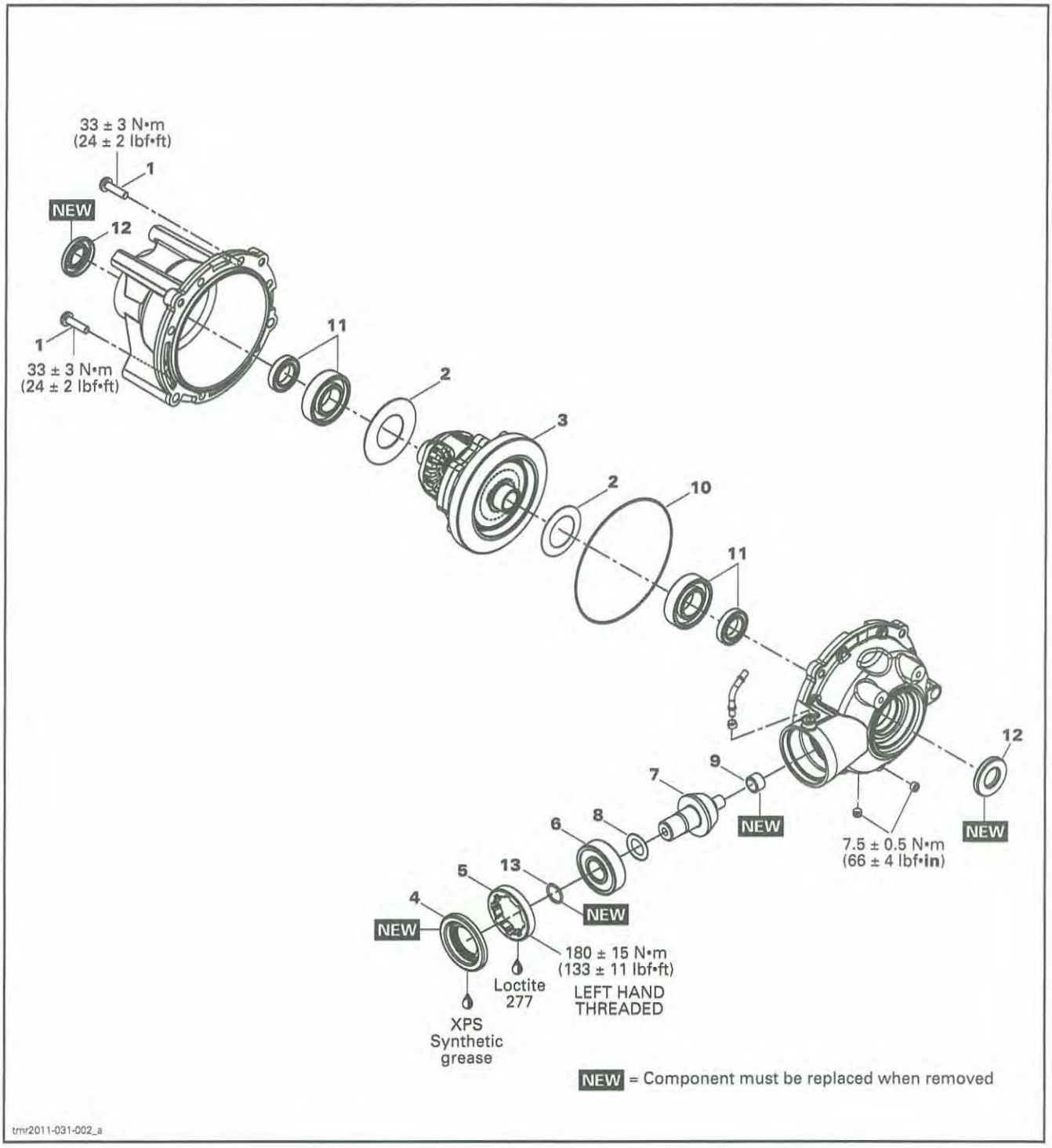
SERVICE TOOLS

Description	Part Number	Page
BACKLASH MEASUREMENT TOOL	529 035 665	301
CV JOINT EXTRACTOR	529 036 005	299
OETIKER PLIERS	295 000 069	299
OETIKER PLIERS	295 000 070	299
SPANNER SOCKET	529 035 649	301

SERVICE PRODUCTS

Description	Part Number	Page
LOCTITE 271 (RED)	293 800 005	303
LOCTITE 277	293 800 073	302
XPS SYNTHETIC GREASE	293 550 010	299, 303


DRIVE SHAFT
NEW
NEW
Plunging joint
CV joint
NEW
225 ± 15 N•m
(166 ± 11 lbf•ft)
XPS Synthetic grease
See BRAKES
See STEERING SYSTEM
NEW
NEW
22.5 ± 2.5 N•m
(17 ± 2 lbf•ft)
NEW
70 ± 5 N•m
(52 ± 4 lbf•in)
XPS Synthetic grease
75 ± 5 N•m
(55 ± 4 lbf•in)
To Engine
Loctite 271
See STEERING SYSTEM
See BRAKES
NEW
225 ± 15 N•m
(166 ± 11 lbf•ft)
PROPELLER SHAFT
NEW
XPS Synthetic grease
Hi-temp bearing grease NLGI-2 or equivalent
XPS Synthetic grease
NEW = Component must be replaced when removed
tmr2011-031-001_a


33 ± 3 N•m
(24 ± 2 lbf•ft)
1
NEW
12
1
33 ± 3 N•m
(24 ± 2 lbf•ft)
11
2
3
2
10
11
12
9
7
8
6
5
13
4
NEW
NEW
NEW
NEW
NEW
7.5 ± 0.5 N•m
(66 ± 4 lbf•in)
180 ± 15 N•m
(133 ± 11 lbf•ft)
LEFT HAND
THREADED
Loctite
277
XPS
Synthetic
grease
NEW = Component must be replaced when removed
tmr2011-031-002_a

GENERAL

The procedure explained 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 views.

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 strictly be adhered to.
Locking devices when removed (e.g.: locking tabs, elastic stop nuts, cotter pins, etc.) must be replaced.

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

SYSTEM DESCRIPTION

The Visco-Lok® system constantly monitors front wheel speed and, if it detects one wheel spinning faster than its mate, it progressively sends more power to the wheel with the better traction.

The Visco-Lok system is comprised of two principal components, a shear pump and the controlled multi-plate clutch.

A unique feature of the shear pump is that it is self-contained and independent. It does not require an external source of hydraulic fluid. The self-contained viscous shear pump generates a pressure proportional to wheel speed differential - meaning the difference in rotational speed between the two wheels. This pressure engages the friction clutch via a piston to transmit the torque.

In the event of a failure, the entire Visco-Lok pump and its carrier will have to be replaced. The Visco-Lok pump itself is a non-serviceable item. If the pump is disassembled, the viscous fluid contained inside will be lost and it cannot be replaced.

PROCEDURES

WHEEL HUB

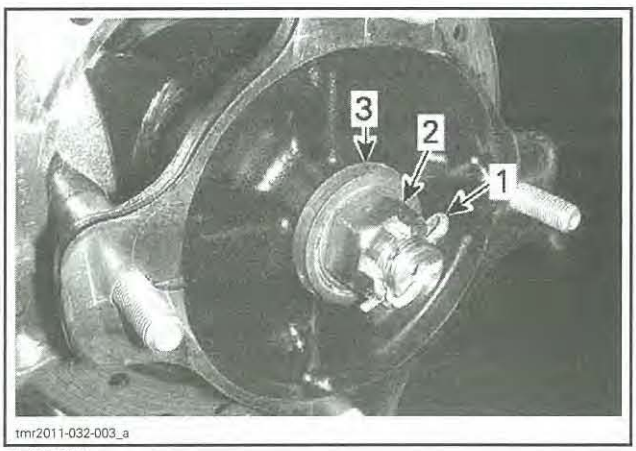
Wheel Hub Removal

Lift and support vehicle. Refer to *INTRODUCTION* section for proper procedure.

Select the 4WD position and place the transmission lever on "P".

Remove caliper from knuckle. Refer to *BRAKES* subsection.

Remove the following parts:
- Wheel
- Cotter pin
- Castellated nut
- Belleville washer.



TYPICAL
1. *Cotter pin*
2. *Castellated nut*
3. *Belleville washer*

Remove wheel hub.

Wheel Hub Inspection

Check wheel hub for cracks or other damages.

Check inner splines for wear or other damages.

If any damage is detected on wheel hub, replace it with a new one.

Wheel Hub Installation

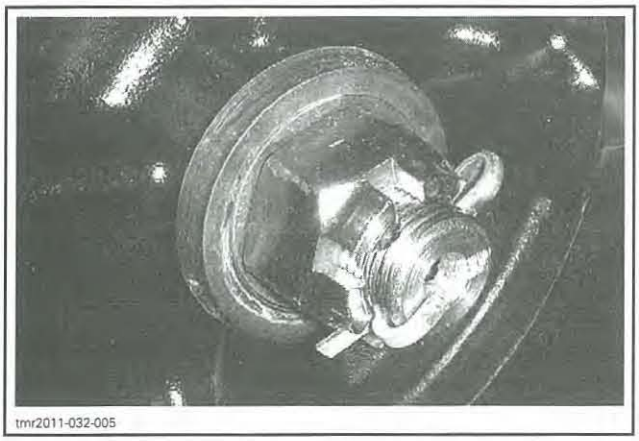
The installation is the reverse of removal procedure. However, pay attention to the following.

Install Belleville washer with its concave side towards outward.

PART	TORQUE
Castellated nut	225 N•m ± 15 N•m (166 lbf•ft ± 11 lbf•ft)

NOTE: Tighten further castellated nut if required to align grooves with drive shaft hole.

Install a NEW cotter pin.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FRONT DRIVE SHAFT

Front Drive Shaft Removal

Lift and support vehicle. Refer to *INTRODUCTION* section for proper procedure.

Remove the wheel hub, see procedure in this subsection.

Remove the knuckle. Refer to *STEERING SYSTEM* subsection.

Strongly pull drive shaft out of differential.

Discard the stop ring at the end of the shaft.

Front Drive Shaft Inspection

Inspect the condition of boots. If there is any damage or evidence of leaking lubricant, replace them. Refer to *DRIVE SHAFT BOOT*.

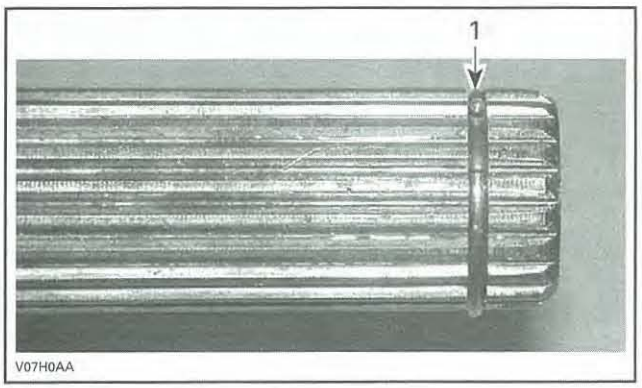
Check splines for excessive wear. Replace if necessary.

NOTE: If the splines on plunging joint are worn, a check of differential inner splines should be done.

Front Drive Shaft Installation

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

Install a NEW stop ring.



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1. Stop ring

Apply XPS SYNTHETIC GREASE (P/N 293 550 010) to the splines.

The wear ring should be closed to the differential.

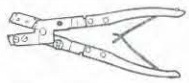
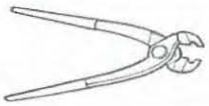
Reinstall all removed parts.

DRIVE SHAFT BOOT

Drive Shaft Boot Removal

Remove the drive shaft from the vehicle.

Remove drive shaft boot clamps using the following tools:

TOOL	
OETIKER PLIERS (P/N 295 000 069)	
OETIKER PLIERS (P/N 295 000 070)	

Dislodge the large boot end.

Separate the joint from the shaft. Two procedures can be done.

Without the Special Tool

Clamp joint housing in a vise.

Align shaft with joint.

Pull hard on shaft to remove from joint.

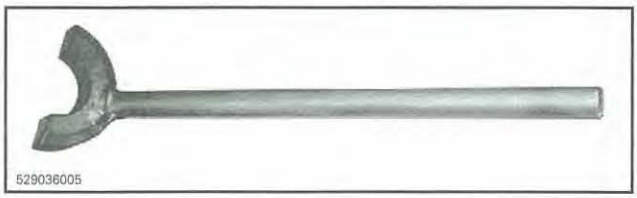
Remove boot from drive shaft.

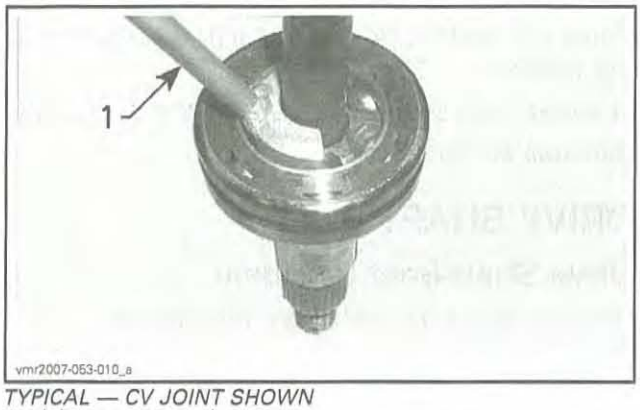
Remove and discard the circlip. A new one is included in the boot kit.

With the Special Tool

Place drive shaft in vice with the joint downward.

Install the CV JOINT EXTRACTOR (P/N 529 036 005) on bearing.


529036005



TYPICAL — CV JOINT SHOWN
1. Joint extractor tool

With an hammer, hit on the tool to separate joint from shaft.

When joint and shaft are separated, remove boot from drive shaft.

Remove and discard the circlip. A new one is included in the boot kit.

Drive Shaft Boot Installation

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

Install the NEW circlip.

Pack bearing area with grease (included with the new boot kit).

NOTE: Do not use or add other grease.

FRONT DIFFERENTIAL

Front Differential Removal

Drain the differential. Refer to *PERIODIC MAINTENANCE PROCEDURES* subsection.

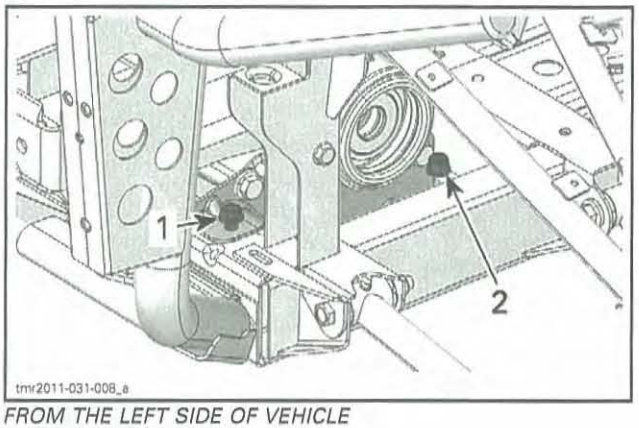
Remove both drive shafts. See procedure in this subsection.

Remove heavy duty front bumper (**X and XT models**) with front fascia.

Remove the radiator. Refer to *COOLING SYSTEM* subsection.

Remove bolts that attach winch bracket to the frame (**XT models**).

Remove front screw and rear nut securing the LH lower differential support.



FROM THE LEFT SIDE OF VEHICLE
1. Front retaining screw
2. Rear retaining nuts

Remove the upper differential bolts.

Remove nuts securing the lower bolts. Pull bolts to free the left support.

NOTE: Differential removal is required to remove lower bolts and LH lower differential support.

Remove the large clamp from the propeller shaft rubber boot.

Remove the differential from the front of vehicle.

Remove yoke if required.

Front Differential Inspection

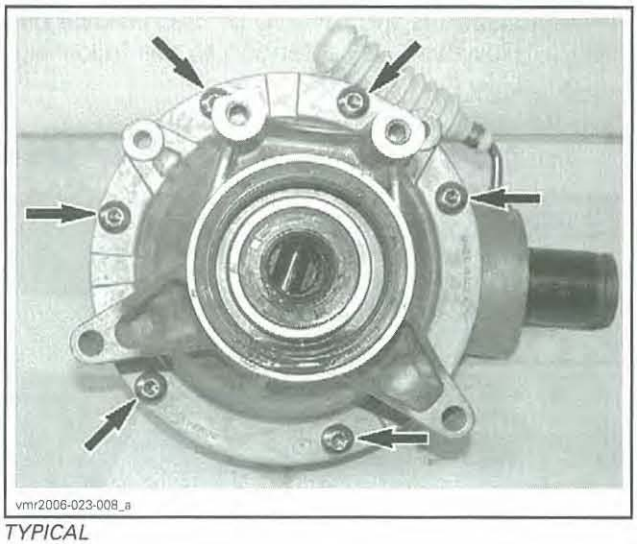
Check backlash and drag torque, see *FRONT DIFFERENTIAL ADJUSTMENT* in this subsection.

Check if oil seals are brittle, hard or damaged. Replace if necessary.

Front Differential Disassembly

Visco-Lok Carrier/Ring Gear

Unscrew the differential housing screws **no. 1**, then separate half housings.



TYPICAL

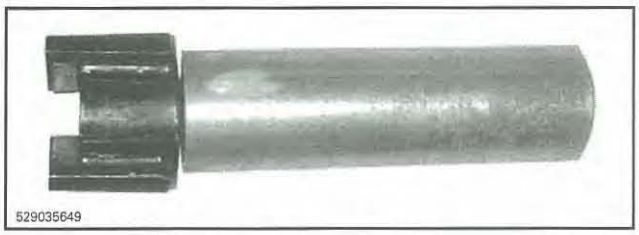
NOTE: Be careful to keep track of shims **no. 2** on each end of the Visco-Lok carrier **no. 3**.

Extract Visco-Lok carrier out of half housing.

Pinion Gear

Remove and discard oil seal **no. 4**.

Unscrew the pinion nut **no. 5**. Use the SPANNER SOCKET (P/N 529 035 649).



NOTE: The pinion nut is left hand threaded. Unscrew by turning clockwise.

Remove the bearing **no. 6** at the same time as the pinion gear **no. 7**. Be careful to keep track of shims **no. 8**.

The pinion gear and bearing can be easily removed using the following suggested tool:

PART	QTY
Pipe: 89 mm (3-1/2 in) diameter x 127 mm (5 in) in length	1
Screwed rod: M12 x 1.25, 178 mm (7 in) length	1
M12 x 1.25 nut	3
Flat bar	1

Remove and discard the needle bearing **no. 9**.

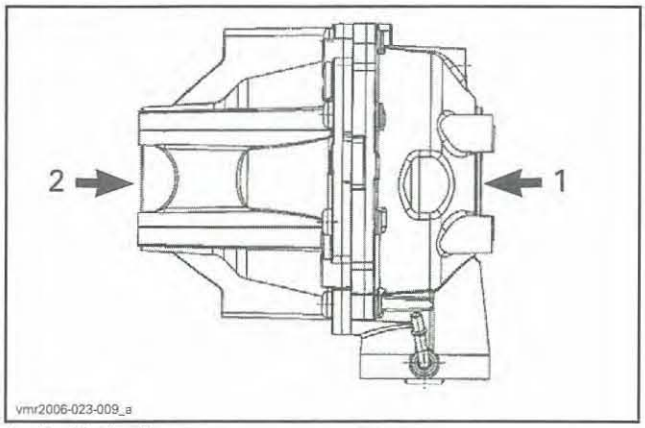
Front Differential Adjustment

A shimming procedure must be done when Visco-Lok carrier, pinion gear or housing is (are) changed.

Install recommended shims accordingly with the following table.

RECOMMENDED SHIMS	
PINION GEAR	1.67 mm ± 0.04 mm (.066 in ± .002 in)
BACKLASH	0.5 mm (.02 in) (for preliminary adjustment)
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).



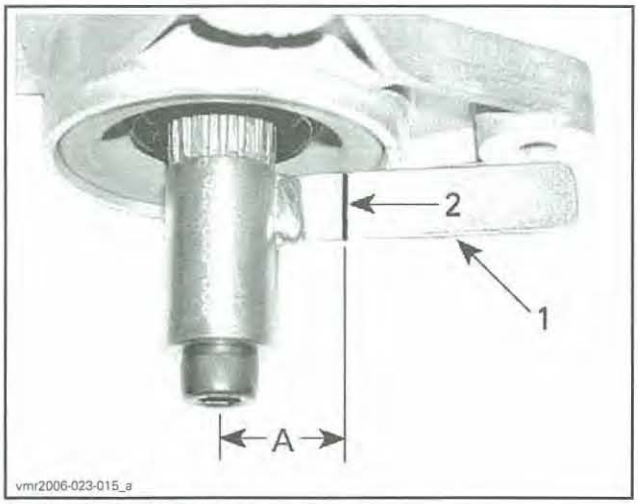
1. Backlash side
2. Preload side

Temporarily assemble the front differential. See procedure in *FRONT DIFFERENTIAL ASSEMBLY* below in this subsection.

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.

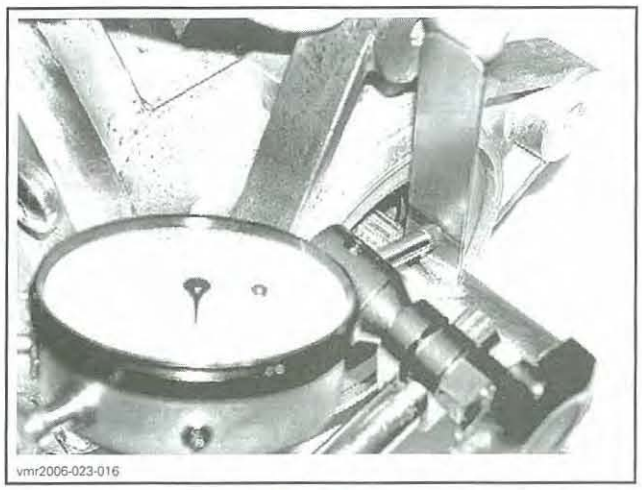
From center of bolt, measure 25.4 mm (1 in) and scribe a mark on the tab.



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.


vmr2006-023-016

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 and check the backlash again.

If backlash is greater than 0.356 mm (.014 in), decrease backlash shim and check the backlash again.

Measure preload.

Preload

Screw the propeller shaft adaptor bolt in pinion gear.

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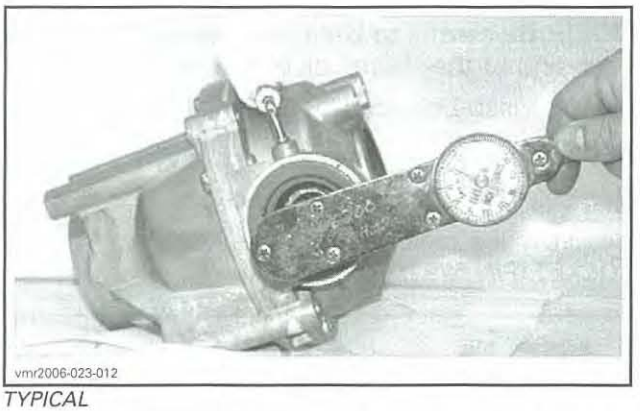
TYPICAL

Using a needle torque wrench, measure the drag torque.


vmr2006-023-012

TYPICAL

If the drag torque is greater than 0.5 N•m (5 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.

Front Differential Assembly

Visco-Lok Carrier/Ring Gear

To assemble, reverse the removal procedure. Pay attention to the following.

Check condition of seal **no. 10**. Replace if damage.

Check bearings **no. 11**. Replace if damage.

Tighten differential housing screws **no. 1**.

PART	TORQUE
Differential housing screws	33 N•m ± 3 N•m (24 lbf•ft ± 2 lbf•ft)

Pinion Gear

To install, reverse the removal procedure. Pay attention to the following details.

Replace the O-ring **no. 13**.

Install the shim(s) **no. 8** then the ball bearing **no. 6**.

Install a new needle bearing **no. 9**.

Apply LOCTITE 277 (P/N 293 800 073) to pinion nut **no. 5**.

NOTE: If a new pinion nut is used, a self-locking product is already applied, do not use Loctite 277.

Install and tighten the pinion nut.

PART	TORQUE
Pinion nut (LEFT HAND THREADED)	180 N•m ± 15 N•m (133 lbf•ft ± 11 lbf•ft)

Front Differential Installation

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

When inserting the small portion of propeller shaft into propeller shaft boot, make sure both parts of propeller shaft are well indexed.

PARTS	TORQUE
Differential retaining nuts	70 N•m ± 5 N•m (52 lbf•ft ± 4 lbf•ft)
Differential upper bolts	24.5 N•m ± 3.5 N•m (18 lbf•ft ± 3 lbf•ft)
Differential support nut	24.5 N•m ± 3.5 N•m (18 lbf•ft ± 3 lbf•ft)
Differential support bolt	24.5 N•m ± 3.5 N•m (18 lbf•ft ± 3 lbf•ft)

Refill the front differential with recommended oil. Refer to *PERIODIC MAINTENANCE PROCEDURES* subsection.

FRONT PROPELLER SHAFT

Front Propeller Shaft Removal

Remove the RH lateral console panel.

Remove propeller shaft screws (on engine and differential).

Remove lower and upper differential bolts.

Move the differential forwards.

Dislodge the propeller shaft from the engine and differential.

Remove front propeller shaft.

Front Propeller Shaft Inspection

Inspect if propeller shaft is not bent or twisted.

Check propeller shaft splines for wear or damage.

Check if propeller shaft bellows is pierced or brittle.

Front Propeller Shaft Installation

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

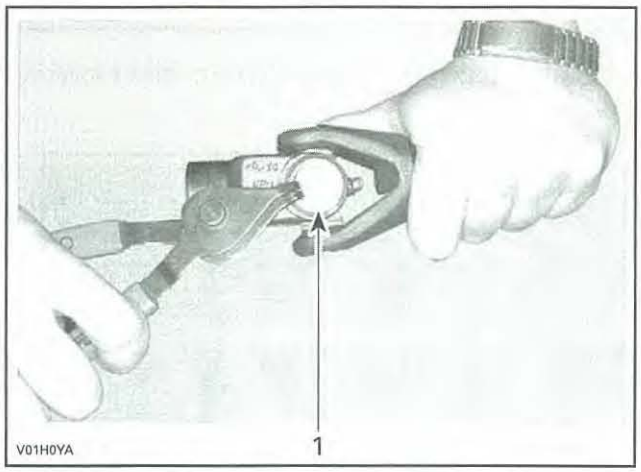
Apply XPS SYNTHETIC GREASE (P/N 293 550 010) to splines on engine side.

PARTS	TORQUE
Propeller shaft screw (differential side)	75 N•m ± 15 N•m (55 lbf•ft ± 11 lbf•ft)
Propeller shaft screw (engine side)	75 N•m ± 15 N•m (55 lbf•ft ± 11 lbf•ft) + LOCTITE 271 (RED) (P/N 293 800 005)

PROPELLER SHAFT U-JOINTS

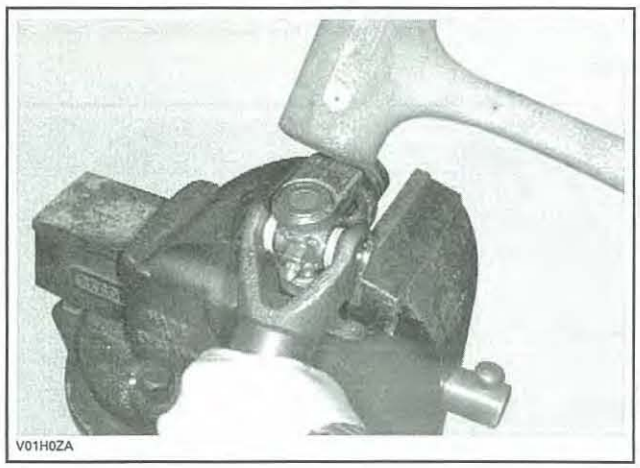
Propeller Shaft U-Joint Removal

Remove internal snap ring from bearing caps.



1. Snap ring

Support inner yoke in vice and drive other yoke down with a soft hammer.



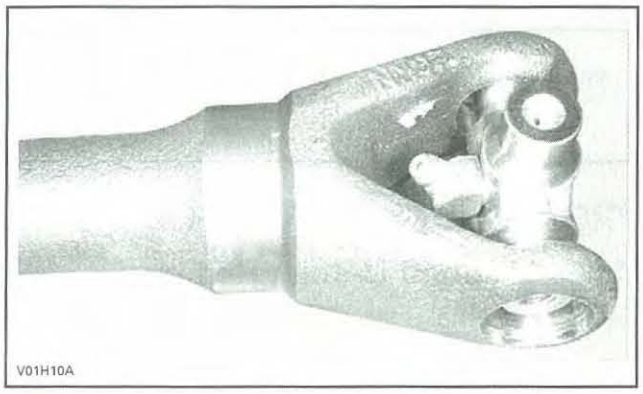
Support U-joint in vice and drive inner yoke down to remove remaining bearing caps.

Remove U-joint cross.

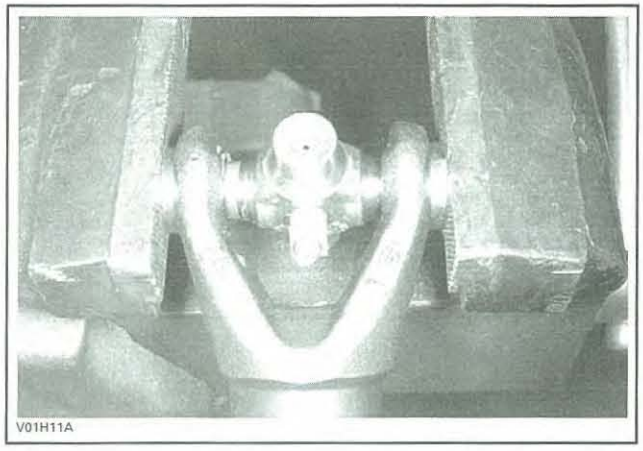
Propeller Shaft U-Joint Installation

Install new U-joint in inner yoke.

NOTE: Position propeller shaft U-joint as shown for proper grease fitting location.


V01H10A

Install bearing caps. Use a vise to insert bearing caps.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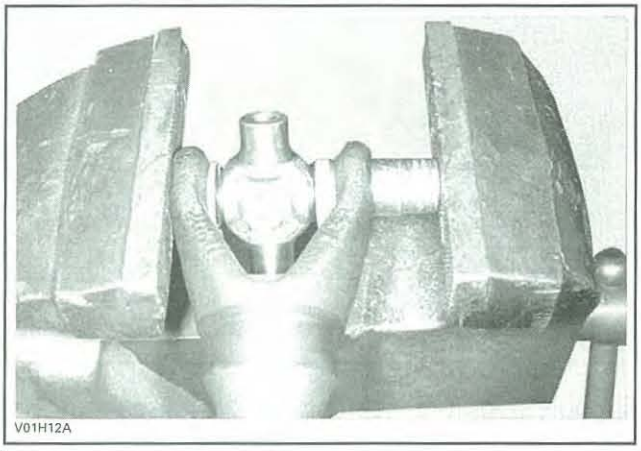
Using a suitable pusher, fully seat bearing cap on one side.


V01H12A

Install snap ring.

Grease U-joints. Refer to *PERIODIC MAINTENANCE PROCEDURES* subsection.

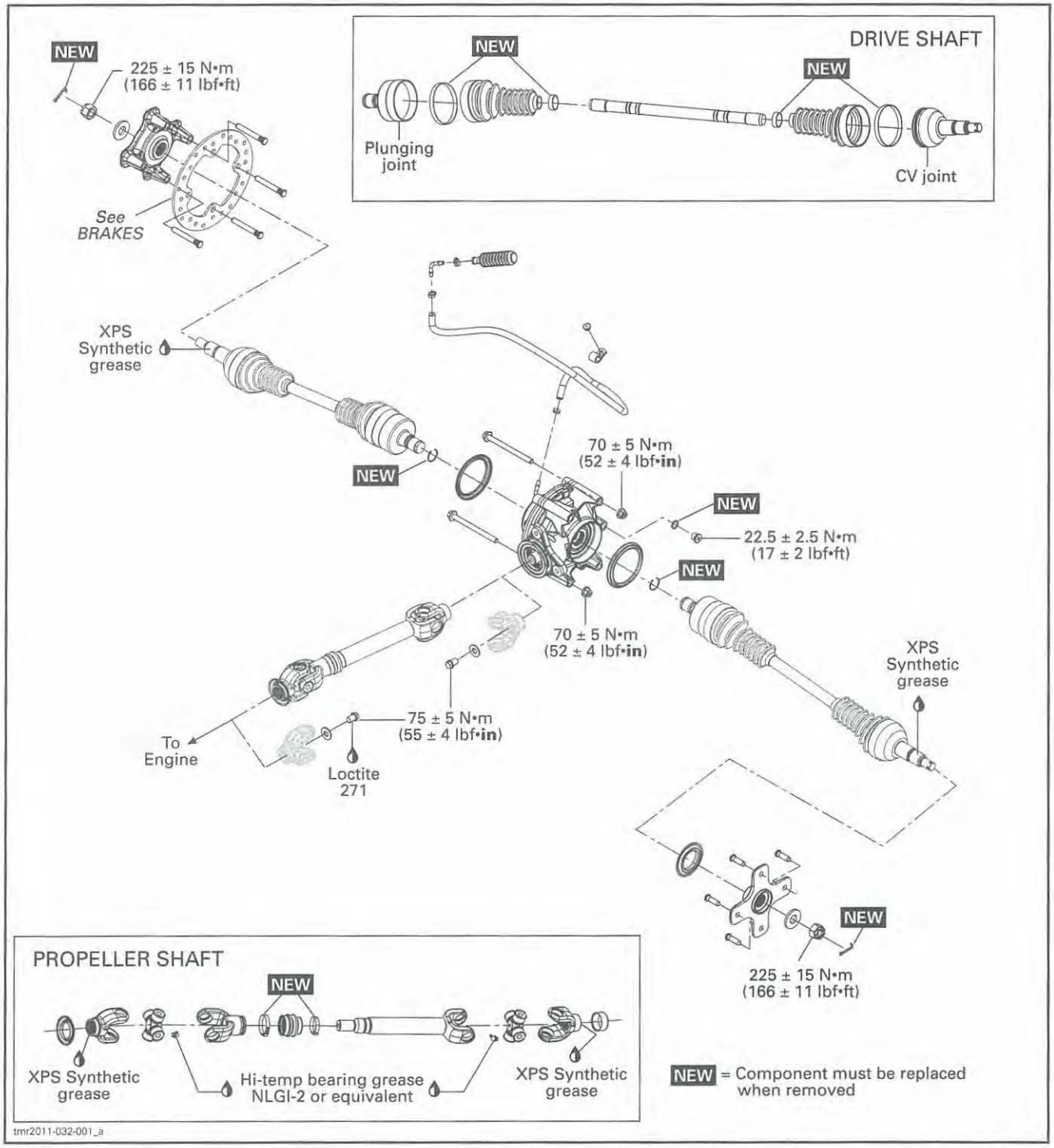
REAR DRIVE

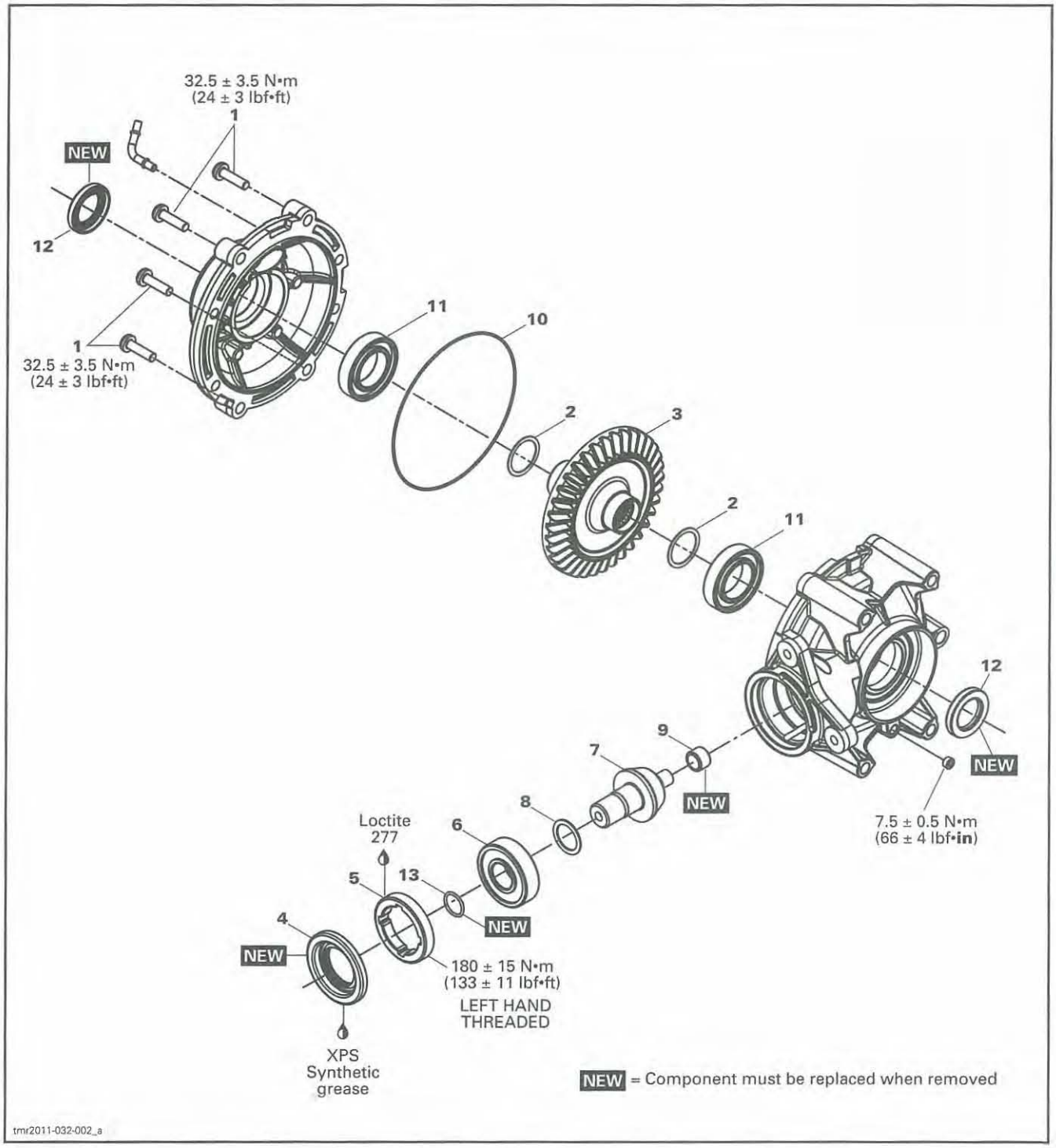
SERVICE TOOLS

Description	Part Number	Page
BACKLASH MEASUREMENT TOOL	529 035 665	313
CV JOINT EXTRACTOR	529 036 005	309
OETIKER PLIERS	295 000 069	309
OETIKER PLIERS	295 000 070	309
SPANNER SOCKET	529 035 649	312

SERVICE PRODUCTS

Description	Part Number	Page
LOCTITE 271 (RED)	293 800 005	310
LOCTITE 277	293 800 073	314
XPS SYNTHETIC GREASE	293 550 010	308, 310


NEW
225 ± 15 N•m
(166 ± 11 lbf•ft)
See BRAKES
DRIVE SHAFT
NEW
NEW
Plunging joint
CV joint
XPS Synthetic grease
NEW
70 ± 5 N•m
(52 ± 4 lbf•in)
NEW
22.5 ± 2.5 N•m
(17 ± 2 lbf•ft)
NEW
70 ± 5 N•m
(52 ± 4 lbf•in)
XPS Synthetic grease
75 ± 5 N•m
(55 ± 4 lbf•in)
To Engine
Loctite 271
NEW
225 ± 15 N•m
(166 ± 11 lbf•ft)
PROPELLER SHAFT
NEW
XPS Synthetic grease
Hi-temp bearing grease NLGI-2 or equivalent
XPS Synthetic grease
NEW = Component must be replaced when removed
tmr2011-032-001_a



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GENERAL

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

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

⚠ WARNING

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

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

PROCEDURES

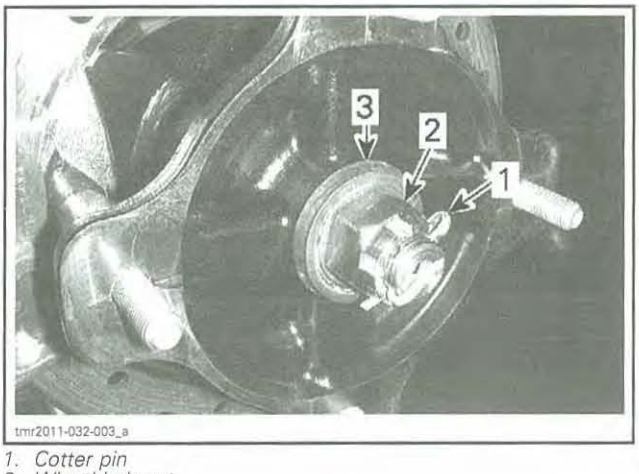
WHEEL HUB

Wheel Hub Removal

Lift and support vehicle. Refer to *INTRODUCTION* section for proper procedure.

Remove the wheel.

Remove the following parts:
- Cotter pin
- Wheel hub nut
- Belleville washer.



1. Cotter pin
2. Wheel hub nut
3. Belleville washer

NOTE: On RH side, remove also the brake caliper.

Remove wheel hub.

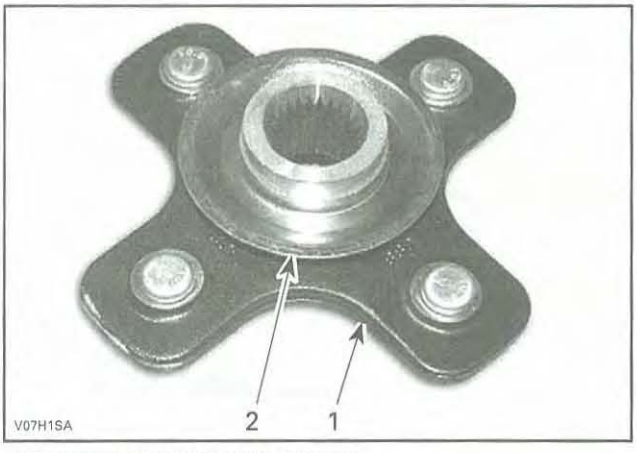
Wheel Hub Inspection

Check wheel hub for cracks or other damages.

Check inner splines for wear or other damages.

If any damage is detected on wheel hub, replace it with a new one.

Check wear ring. If it is loose on hub or deformed, replace the wear ring.



TYPICAL – LH WHEEL HUB SHOWN
1. Wheel hub
2. Wear ring

Wheel Hub Installation

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

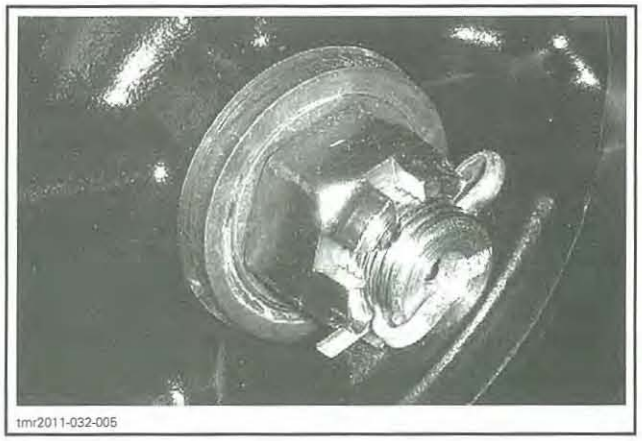
Apply XPS SYNTHETIC GREASE (P/N 293 550 010) on drive shaft splines.

Install Belleville washer with its concave side towards outward.

PART	TORQUE
Wheel hub nut	225 N•m ± 15 N•m (166 lbf•ft ± 11 lbf•ft)

NOTE: Tighten further castellated nut if required to align grooves with drive shaft hole.

Install a NEW cotter pin.



DRIVE SHAFT

Drive Shaft Removal

Lift and support vehicle. Refer to *INTRODUCTION* section for proper procedure.

Remove the wheel hub. See procedure in this subsection.

Remove trailing arm. Refer to *REAR SUSPENSION*.

Strongly pull drive shaft out of final drive.

Drive Shaft Inspection

Inspect the condition of boots. If there is any damage or evidence of leaking lubricant, replace them. Refer to *DRIVE SHAFT BOOT*.

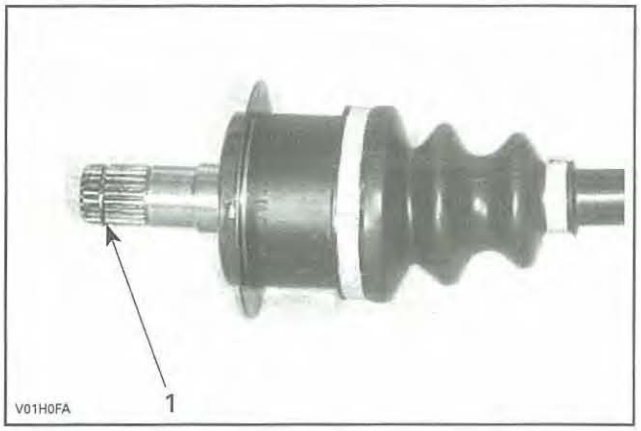
Check shaft splines. Replace drive shaft if necessary.

Check dust shield on drive shaft end. Replace if necessary.

Drive Shaft Installation

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

Install a NEW stop ring.



1. Stop ring

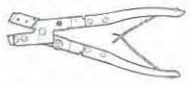
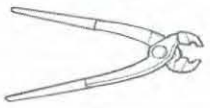
After drive shaft insertion in rear final drive, validate if properly locked.

DRIVE SHAFT BOOT

Drive Shaft Boot Removal

Remove the drive shaft from vehicle. See procedure in this subsection.

Remove drive shaft boot clamps using the following tools:

TOOL	
OETIKER PLIERS (P/N 295 000 069)	
OETIKER PLIERS (P/N 295 000 070)	

Dislodge the large boot end.

Separate the joint from the shaft. Two procedures can be done.

Without the Special Tool

Clamp joint housing in a vise.

Align shaft with joint.

Pull hard on shaft to remove from joint.

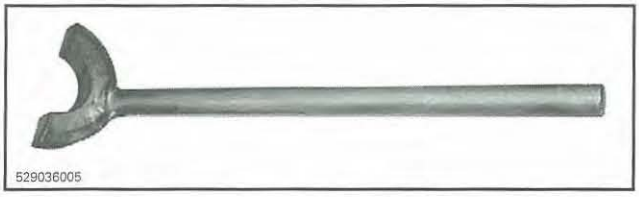
Remove boot from drive shaft.

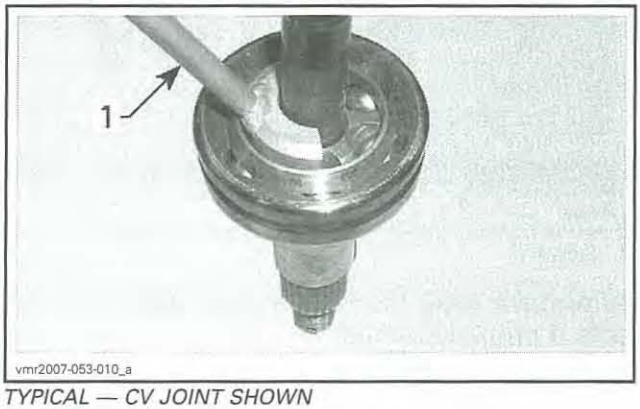
Remove and discard the circlip. A new one is included in the boot kit.

With the Special Tool

Place drive shaft in vice with the joint downward.

Install the CV JOINT EXTRACTOR (P/N 529 036 005) on bearing.





TYPICAL — CV JOINT SHOWN
1. Joint extractor tool

With an hammer, hit on the tool to separate joint from shaft.

When joint and shaft are separated, remove boot from drive shaft.

Remove and discard the circlip. A new one is included in the boot kit.

Remove drive shaft boot.

Drive Shaft Boot Installation

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

Pack bearing area with grease (included with the new boot kit).

NOTE: Do not use any other grease.

PROPELLER SHAFT

Propeller Shaft Removal

1. Remove the fuel tank. Refer to *FUEL TANK* subsection.
2. Remove propeller shaft screw from gearbox output shaft.
3. Lift and support vehicle. Refer to *INTRODUCTION* section for proper procedure.
4. Remove propeller shaft screw from rear final drive yoke.
5. Remove rear final drive bolts. Refer to *REAR FINAL DRIVE* in this subsection.
6. Move the rear final drive rearward to dislodge the propeller shaft.
7. Dislodge the propeller shaft from the engine.
8. Remove the propeller shaft.

Propeller Shaft Inspection

Inspect if propeller shaft is not bent or twisted.

Check propeller shaft splines for wear or damage.

Check if propeller shaft bellows is pierced or brittle.

Propeller Shaft Installation

Installation is essentially the reverse of removal procedure. Pay attention to the following details.

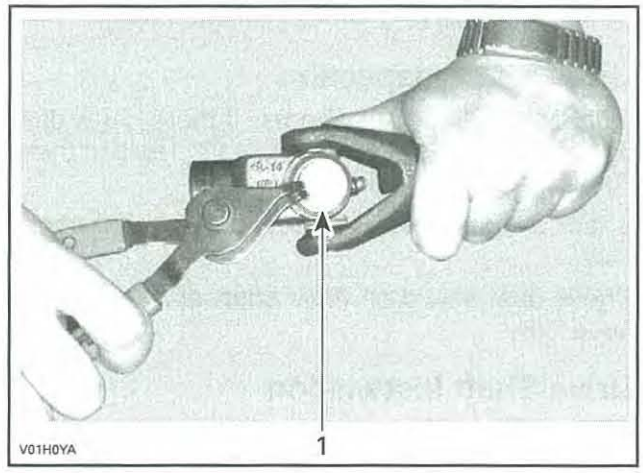
Apply XPS SYNTHETIC GREASE (P/N 293 550 010) to splines.

PARTS	TORQUE
Propeller shaft screw (final drive side)	75 N•m ± 5 N•m (55 lbf•ft ± 4 lbf•ft)
Propeller shaft screw (engine side)	75 N•m ± 5 N•m (55 lbf•ft ± 4 lbf•ft) + LOCTITE 271 (RED) (P/N 293 800 005)

PROPELLER SHAFT U-JOINTS

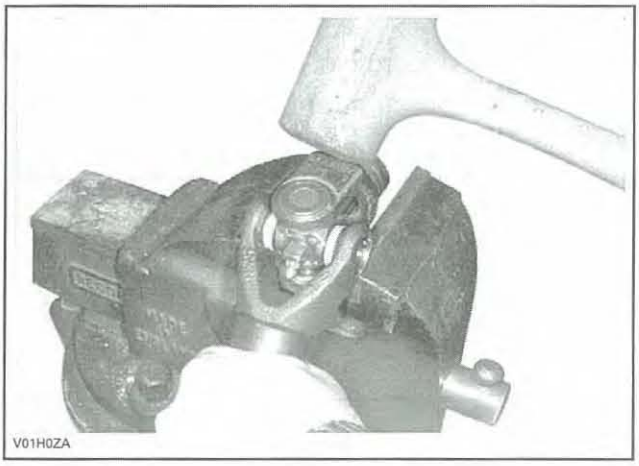
Propeller Shaft U-Joint Removal

Remove internal snap ring from bearing caps.



1. Snap ring

Support inner yoke in vice and drive other yoke down with a soft hammer.


V01H0ZA

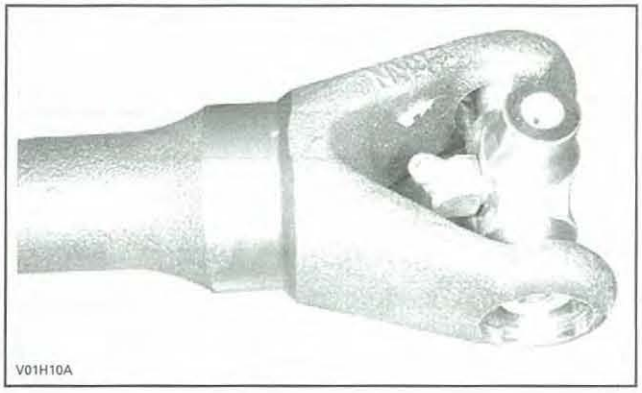
Support U-joint in vice and drive inner yoke down to remove remaining bearing caps.

Remove U-joint cross.

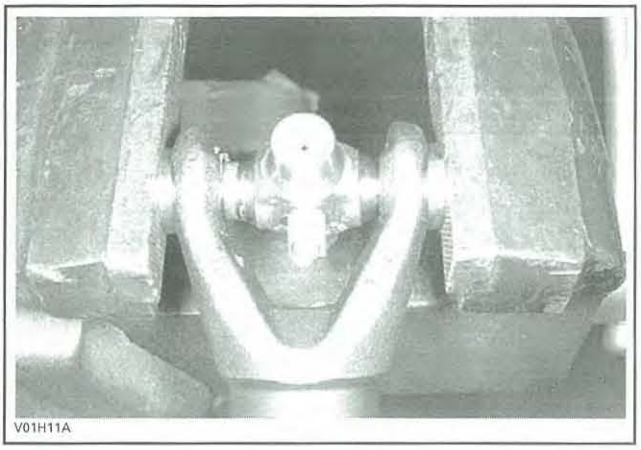
Propeller Shaft U-Joint Installation

Install new U-joint in inner yoke.

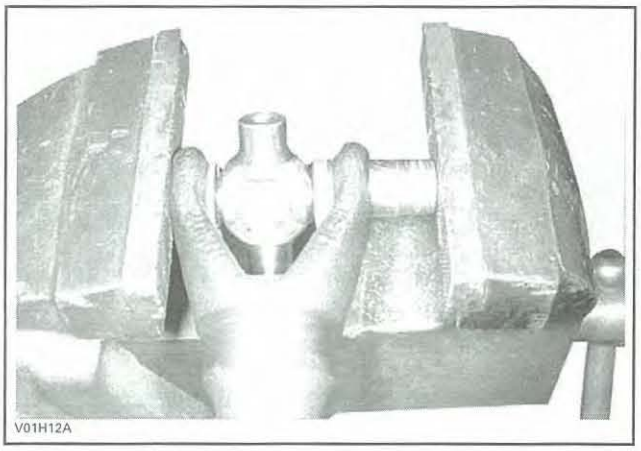
NOTE: Position propeller shaft U-joint as shown for proper grease fitting location.


V01H10A

Install bearing caps. Use a vise to push bearing caps.


V01H11A

Using a suitable pusher, fully seat bearing cap on one side.


V01H12A

Install snap ring.

Complete installation for the other bearing caps.

Grease U-joint. Refer to *PERIODIC MAINTENANCE PROCEDURES* subsection.

REAR FINAL DRIVE

Rear Final Drive Removal

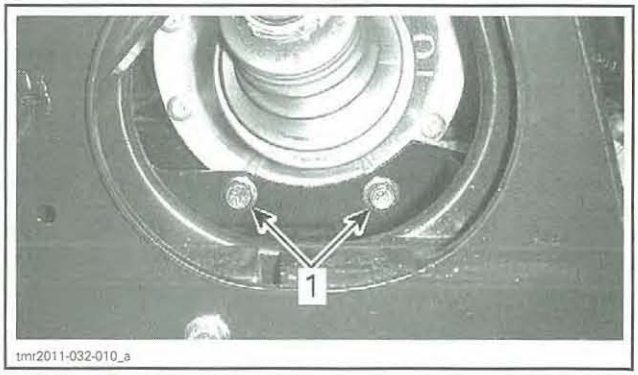
Drain oil. Refer to *PERIODIC MAINTENANCE PROCEDURES* subsection.

Remove drive shafts. See procedure in this subsection.

Remove the rear skid plate.

Remove the propeller shaft screw from the rear final drive yoke.

Remove final drive lower bolts.



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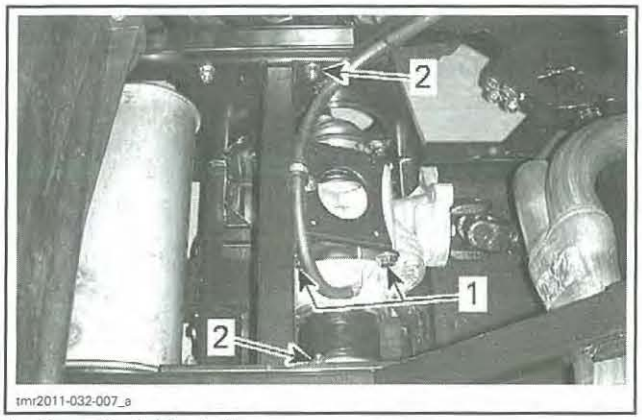
1. Lower final drive bolts

Remove final drive upper bolts and the front bolts of the final drive support.



1. Upper final drive bolts
2. Final drive support front bolts

Unplug the vent hose from final drive.

Loosen rear bolts of the final drive support and tilt the support rearward to make room.

Remove the final drive.

Rear Final Drive Inspection (Assembled)

Turn rear final drive gear with a finger; it should turn smoothly. Replace if necessary.

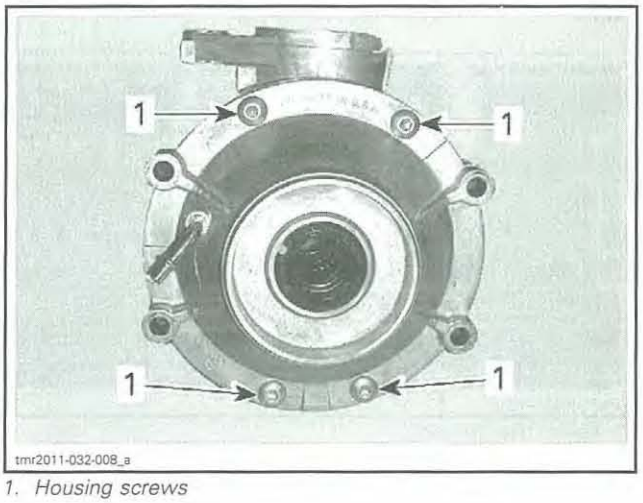
Check backlash and drag torque, see *REAR FINAL DRIVE ADJUSTMENT* in this subsection.

Check if oil seals are brittle, hard or damaged. Replace if necessary.

Rear Final Drive Disassembly

Ring Gear

Unscrew the final drive housing screws **no. 1**.



1. Housing screws

Split final drive housings.

NOTE: Be careful to keep track of shims **no. 2** on ring gear **no. 3**.

Extract ring gear out of half housing.

Pinion Gear

Remove and discard oil seal **no. 4**.

Unscrew the pinion nut **no. 5**. Use the SPANNER SOCKET (P/N 529 035 649).

NOTE: The pinion nut is left hand threaded. Unscrew by turning clockwise.

Remove the bearing **no. 6** at the same time as the pinion gear **no. 7**. Be careful to keep track of shims **no. 8**.

The pinion gear and bearing can be easily removed using the following suggested tool:

PART	QTY
Pipe: 89 mm (3-1/2 in) diameter x 127 mm (5 in) in length	1
Screwed rod: M12 x 1.25, 178 mm (7 in) length	1
M12 x 1.25 nut	3
Flat bar	1

Remove and discard the needle bearing **no. 9**.

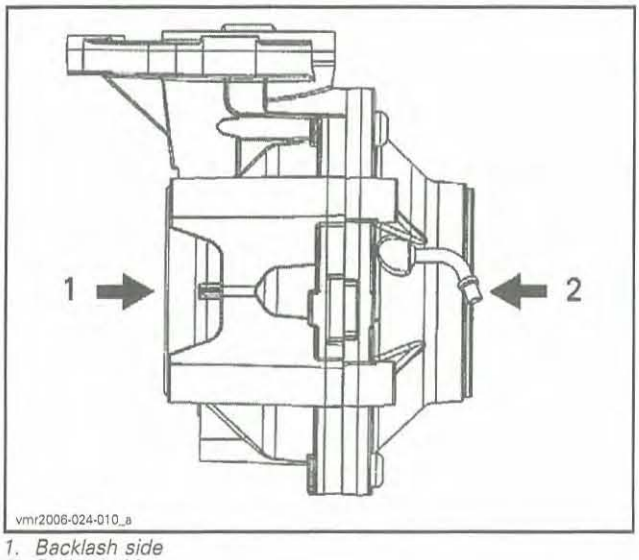
Rear Final Drive Adjustment

A shimming procedure must be done when pinion gear, ring gear or housing is (are) changed.

Install recommended shims accordingly with the following table.

RECOMMENDED SHIMS	
PINION GEAR	1.67 mm ± 0.04 mm (.066 in ± .002 in)
BACKLASH	0.5 mm (.02 in) (for preliminary adjustment)
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).



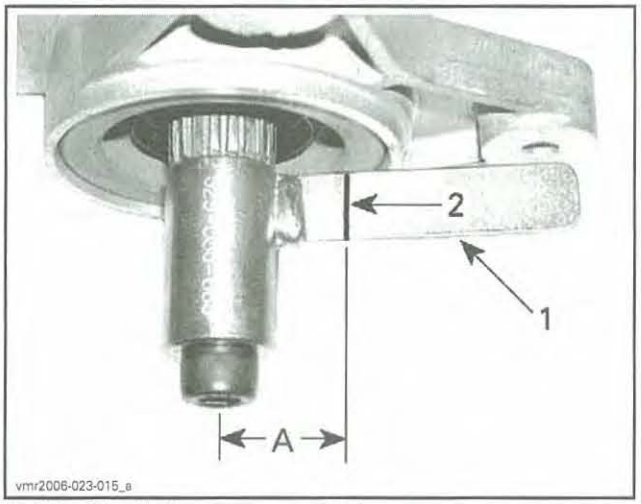
1. Backlash side
2. Preload side

Temporarily assemble the final drive. See procedure in *REAR FINAL DRIVE ASSEMBLY* below in this subsection.

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.

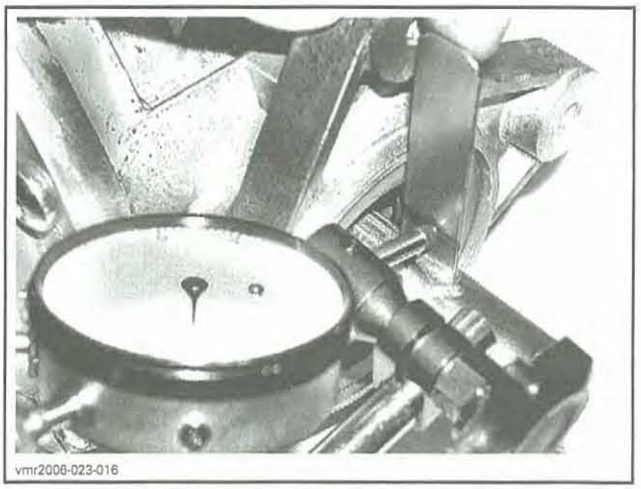
From center of bolt, measure 25.4 mm (1 in) and scribe a mark on the tab.



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.

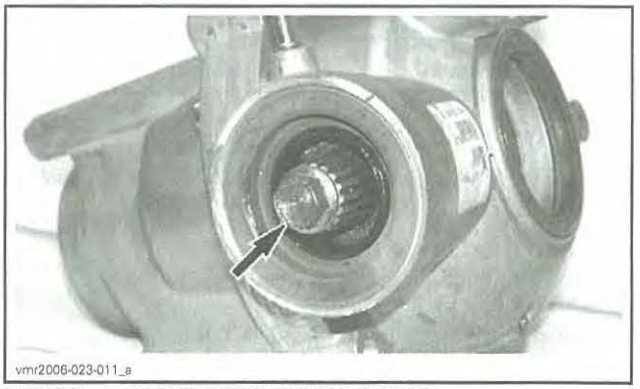
If backlash is below 0.05 mm (.002 in), increase backlash shim and check the backlash again.

If backlash is greater than 0.356 mm (.014 in), decrease backlash shim and check the backlash again.

Measure preload.

Preload

Screw the propeller shaft adaptor bolt in pinion gear.



TYPICAL — FRONT DIFFERENTIAL SHOWN

Using a needle torque wrench, measure the drag torque.

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TYPICAL — FRONT DIFFERENTIAL SHOWN

If the drag torque is greater than 0.5 N•m (5 lbf•**in**), reduce preload shim and check drag torque again.

If the drag torque is less than 0.06 N•m (.5 lbf•**in**), increase preload shim and check drag torque again.

Rear Final Drive Assembly

Ring Gear

To assemble, reverse the removal procedure. Pay attention to the following.

Check condition of seal **no. 10**. Replace if damaged.

Check bearings **no. 11**. Replace if damaged.

Tighten final drive housing screws **no. 1**.

PART	TORQUE
Final drive housing screws	32.5 N•m ± 3.5 N•m (24 lbf•ft ± 3 lbf•ft)

Pinion Gear

To install, reverse the removal procedure. Pay attention to the following.

Replace the O-ring **no. 13**.

Install the shim(s) **no. 8** then the ball bearing **no. 6**.

Install a new needle bearing **no. 9**.

Apply LOCTITE 277 (P/N 293 800 073) to pinion nut **no. 5**.

NOTE: If a new pinion nut is used, a self-locking product is already applied, do not use Loctite 277.

Install and tighten the pinion nut.

PART	TORQUE
Pinion nut (LEFT HAND THREADED)	180 N•m ± 15 N•m (133 lbf•ft ± 11 lbf•ft)

Lubricate oil seal **no. 4**.

Rear Final Drive Installation

The installation is the reverse of the removal procedure.

PART	TORQUE
Final drive retaining nuts	70 N•m ± 5 N•m (52 lbf•ft ± 4 lbf•ft)

Refill the final drive with recommended oil. Refer to *PERIODIC MAINTENANCE PROCEDURES* subsection.

WHEELS AND TIRES

SERVICE PRODUCTS

Description	Part Number	Page
LOCTITE 767 (ANTISEIZE LUBRICANT)	293 800 070	316

GENERAL

⚠ WARNING

Torque wrench tightening specifications must be strictly adhered to.

PROCEDURES

TIRES

⚠ WARNING

Do not rotate tires. The front and rear tires have a different size. Respect direction of rotation when applicable.

Tire Pressure

⚠ WARNING

Tire pressure greatly affects vehicle handling and stability. Insufficient pressure may cause tire to deflate and rotate on wheel. Excessive pressure may burst the tire. Always follow recommended pressure.

Check pressure when tires are **cold** before using the vehicle. Tire pressure changes with temperature and altitude. Recheck pressure if one of these conditions has changed.

TIRE PRESSURE	FRONT	REAR
MIN.	69 kPa (10 PSI)	83 kPa (12 PSI)
MAX. (USE WHEN TOTAL LOAD IS GREATER THAN 180 KG (400 LB))	83 kPa (12 PSI)	152 kPa (22 PSI)

Tire Inspection

Check tire for presence of slits, bulges, wear or other damage. Replace if necessary.

Tire Replacement

Use an automotive tire changer to replace tires.

⚠ WARNING

- Replace tires only with the same type and size as original tires.
- For unidirectional tread pattern, ensure that the tires are installed in the correct direction of rotation.

TYPICAL
1. Direction of rotation

Tire Mounting on Beadlock Wheels

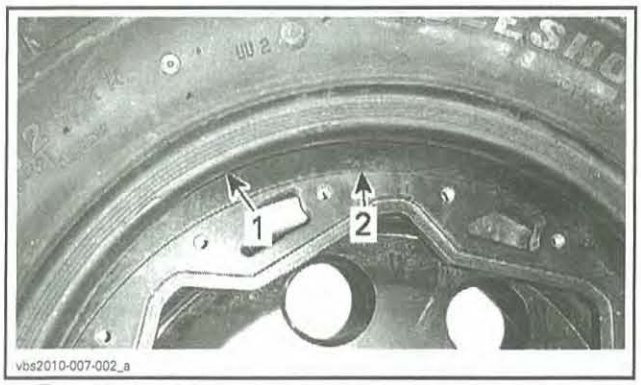
X Models

NOTE: Tires should be mounted, by an experienced person, in accordance to good tire mounting practices using acceptable tire mounting equipment designed for the tire industry.

1. Mount the tire on wheel.
   - 1.1 On the opposite side of beadlock, apply the tire mounting lube on inner bead of tire and wheel to ensure proper seating when inflating.
   - 1.2 Mount the inner bead over the wheel.

     NOTICE Mount tire from beadlock side only.

   - 1.3 Seat the tire outer bead in the shoulder of the beadlock inner ring and center the tire.



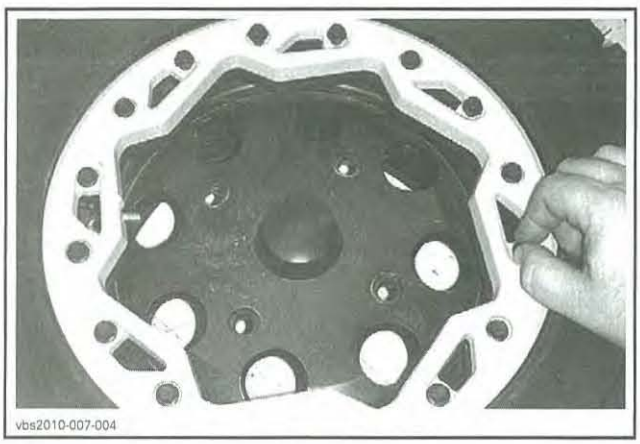
1. Tire outer bead
2. Beadlock inner ring shoulder

2. Place the beadlock clamp ring on the tire. Align the valve opening with valve.

1. Clamp ring valve opening

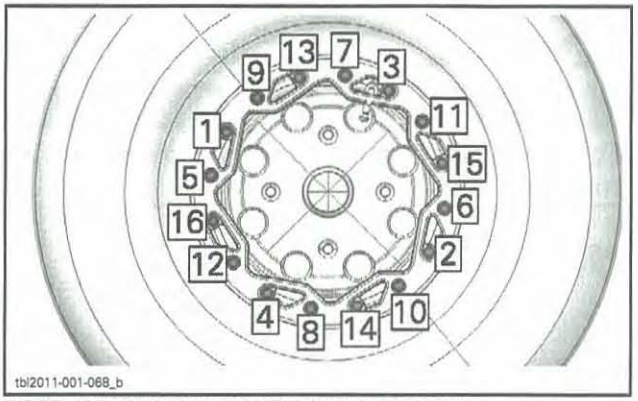
3. Lubricate all beadlock screws with LOCTITE 767 (ANTISEIZE LUBRICANT) (P/N 293 800 070) or an equivalent product to prevent screw sticking.
4. Install all beadlock screws. To avoid cross threading, start all screws by hand.

NOTICE **Do not use an impact wrench for installing beadlock screws. The risk of screw breaking or screw stripping is high when using an impact wrench.**



5. First tightening sequence: Using a torque wrench, tighten beadlock screws at first to 3 N•m ± 1 N•m (27 lbf•**in** ± 9 lbf•**in**) following the illustrated sequence.

NOTE: To ensure even pressure on the beadlock clamp ring, tighten screws **a few turns at a time.**



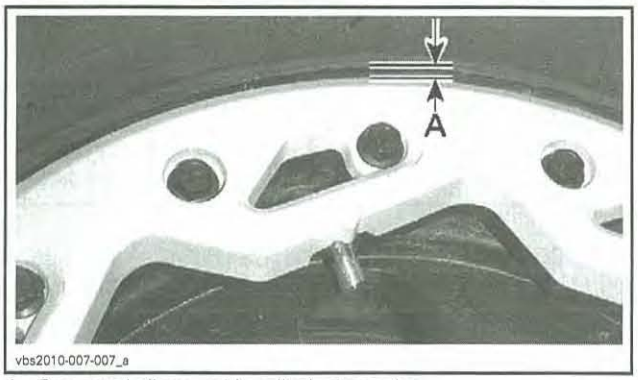
FIRST AND SECOND TIGHTENING SEQUENCE

6. At this time check if the tire is still centered on wheel. Reposition it if necessary.
7. Second tightening sequence: Retighten all screws to 8 N•m ± 1 N•m (71 lbf•**in** ± 9 lbf•**in**) using the same sequence.

The beadlock clamp ring should be in contact the beadlock inner ring.

NOTE: The beadlock clamp ring can flex slightly to match the tire bead. IT IS NORMAL.

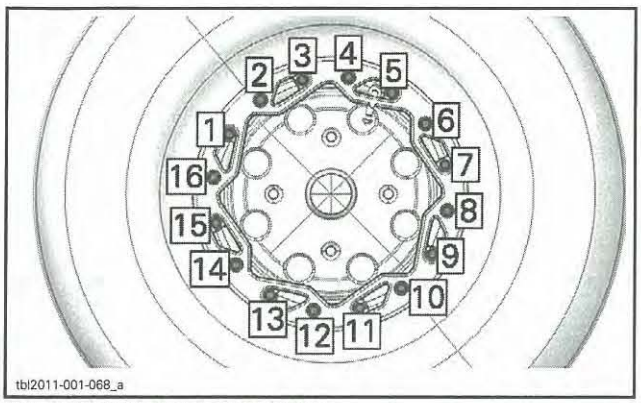
8. Verify the gap between tire and beadlock clamp ring, it should be practically equal all around the ring.



A. Gap equal all around beadlock clamp ring

If the gap is uneven:
- Loosen all screws.
- Check tire position on wheel and reposition it if necessary.
- Restart the tightening sequence from the beginning.

9. Final tightening step: 8 N•m ± 1 N•m (71 lbf•**in** ± 9 lbf•**in**) following the illustrated sequence.



FINAL TIGHTENING SEQUENCE

10. Inflate tire to seat the inner bead on wheel. Always use safe practices, such as a tire safety cage.

⚠ WARNING

Never exceed tire's recommended maximum pressure for seating beads.

WHEELS

Wheel Removal

Loosen nuts just enough to be able to unscrew them once the vehicle will be off the ground.

Lift and support the vehicle. Refer to *INTRODUCTION* subsection.

Remove nuts, then remove wheel.

Wheel Inspection

Inspect wheel for wear or damage especially at the mounting holes.

Wheel Installation

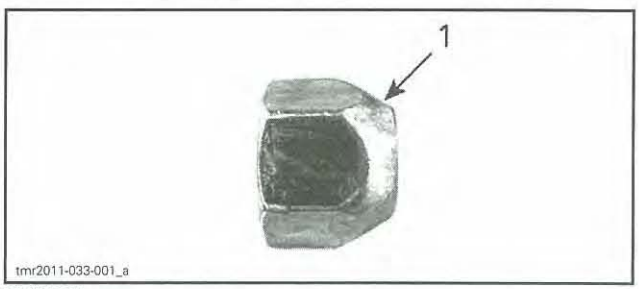
At installation, it is recommended to apply anti-seize lubricant on threads.

Check if tires are unidirectional.

TYPICAL
1. Direction of rotation

Install in the right direction of rotation.

Install lug nuts with the taper towards the wheel.



TYPICAL
1. Taper (towards the wheel)

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

WHEEL LUG NUTS	
TORQUE	100 N•m ± 10 N•m (74 lbf•ft ± 7 lbf•ft)

TIGHTENING SEQUENCE

NOTICE Always use the recommended wheel nuts for the type of wheel. Using a different nut could cause damages to the rim or studs.

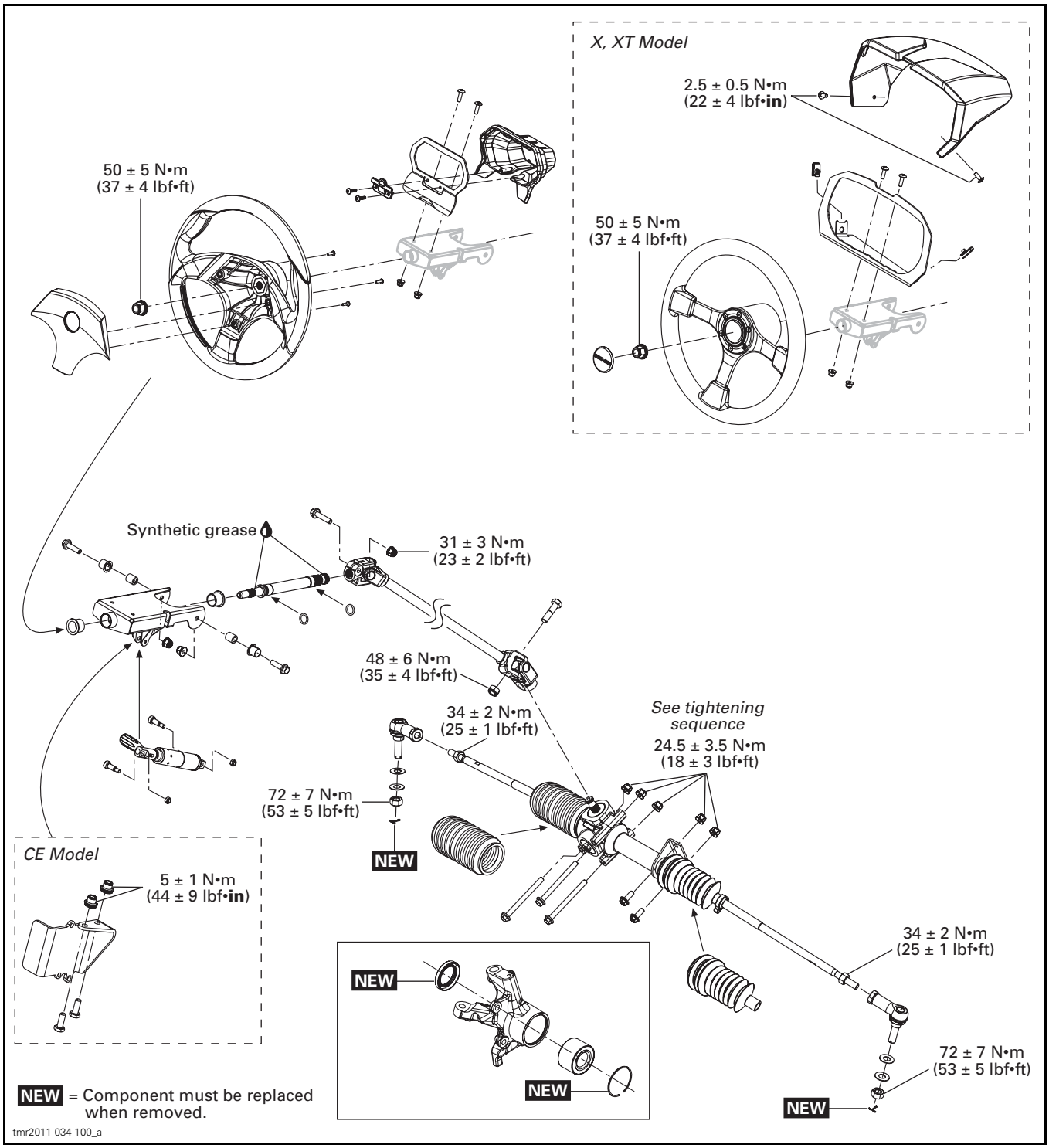
STEERING SYSTEM

SERVICE TOOLS

Description	Part Number	Page
STEERING ALIGNMENT TOOL	529 036 059	3

SERVICE PRODUCTS

Description	Part Number	Page
XPS SYNTHETIC GREASE	293 550 010	7


X, XT Model
2.5 ± 0.5 N•m
(22 ± 4 lbf•in)
50 ± 5 N•m
(37 ± 4 lbf•ft)
50 ± 5 N•m
(37 ± 4 lbf•ft)
Synthetic grease
31 ± 3 N•m
(23 ± 2 lbf•ft)
48 ± 6 N•m
(35 ± 4 lbf•ft)
34 ± 2 N•m
(25 ± 1 lbf•ft)
See tightening sequence
24.5 ± 3.5 N•m
(18 ± 3 lbf•ft)
72 ± 7 N•m
(53 ± 5 lbf•ft)
NEW
CE Model
5 ± 1 N•m
(44 ± 9 lbf•in)
34 ± 2 N•m
(25 ± 1 lbf•ft)
NEW
NEW
72 ± 7 N•m
(53 ± 5 lbf•ft)
NEW
NEW = Component must be replaced when removed.
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GENERAL

The procedures described below are 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 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

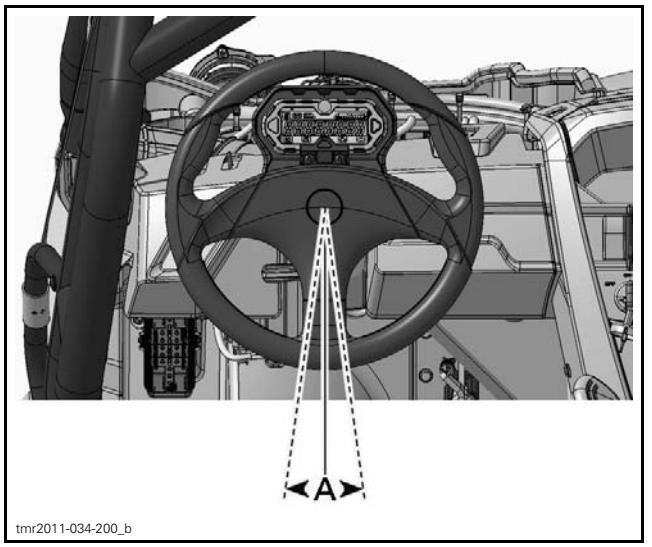
Torque wrench tightening specifications must strictly be adhered to.
Locking devices when removed (e.g.: locking tabs, cotter pins, etc.) must be replaced.

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

ADJUSTMENT

STEERING ALIGNMENT

1. Place vehicle on a level surface.
2. Inflate tires to recommended pressure.
3. Find rack and pinion center to center as follows:
   - 3.1 Calculate the total steering wheel rotations from side to side.
   - 3.2 Position the steering wheel at **half** the total rotations.
4. Check steering wheel position:
   - 4.1 If steering angle is within ± 3°, go to **step 6**.
   - 4.2 If steering angle is above ± 3°, go to **step 5**.

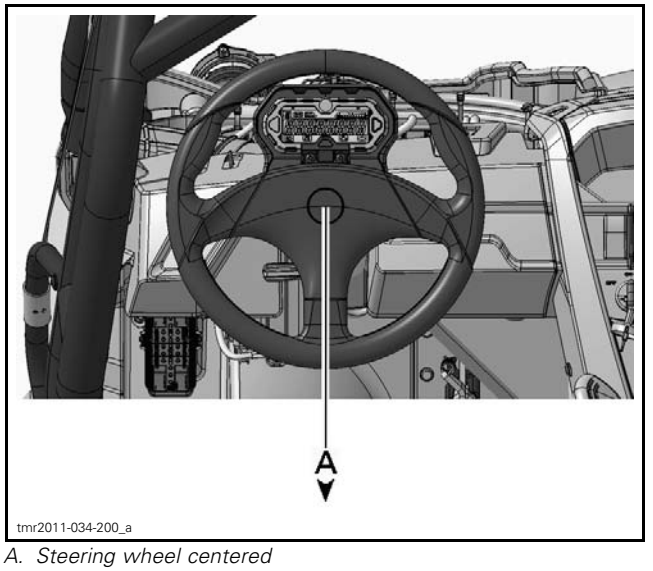


A. Steering wheel angle ± 3°

5. Reposition steering wheel onto steering shaft as follows:

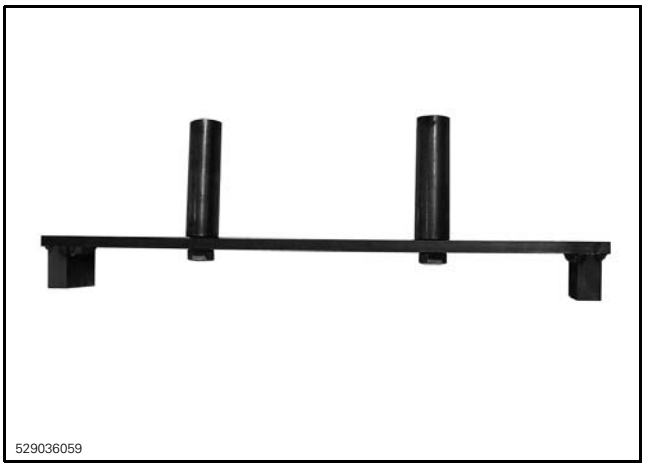
   NOTICE **Make sure rack and pinion does not move during steering wheel repositioning.**

   - 5.1 Remove steering wheel, refer to *STEERING WHEEL REMOVAL*.
   - 5.2 Reinstall steering wheel to the closest centered position (nearest spline).
6. Center steering wheel.



A. Steering wheel centered

7. Remove two wheel lug nuts from a rear wheel.
8. Install STEERING ALIGNMENT TOOL (P/N 529 036 059) using proper spacers.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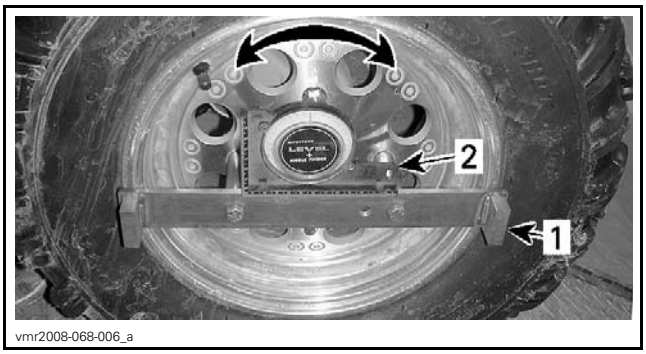
9. Move vehicle to place the tool level with the ground.



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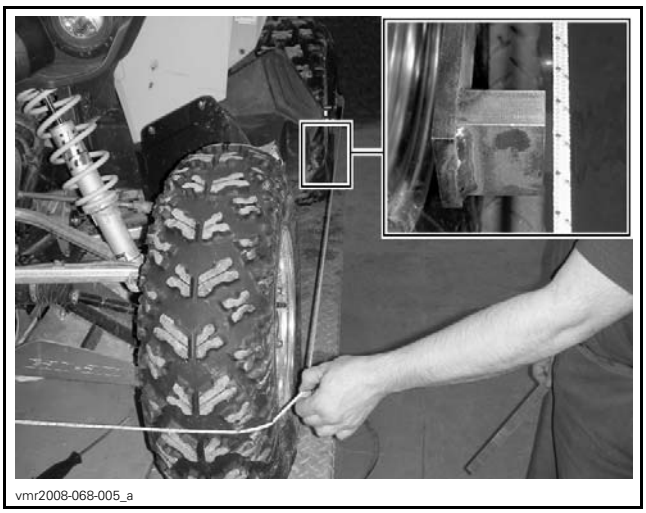
REAR WHEEL
1. Steering adjustment tool
2. Angle gauge or level

10. Place a rope around vehicle tires
11. Using an elastic, link both ends together.
12. Adjust rope at the center of the wheels.
13. From the front of vehicle, near the front of rim, move rope so that it does not touch the first spacer of tool.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TYPICAL

14. Slowly move rope back until it makes contact with spacer.

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TYPICAL

15. Keep rope in this position.
16. Measure distance of the front wheel between rope and rim as follows:
    – At the front of rim
    – At the rear of rim.

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TYPICAL — AT THE FRONT OF RIM

vmr2008-068-009

TYPICAL — AT THE REAR OF RIM

17. Calculate the difference between the rear and the front measurement.
18. The difference must be as per the following specification:

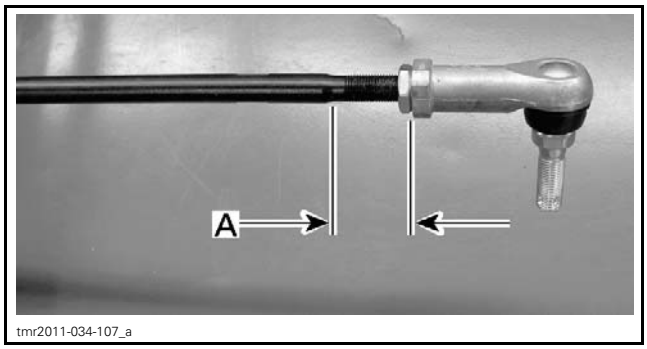
WHEEL TOE
0 mm ± 4 mm (0 in ± .157 in)

19. If the wheel toe measurement is out of specification:

19.1 Adjust tie-rod end.

⚠ WARNING

The maximum tie-rod end length not engaged in the tie rod must not exceed 32 mm (1.26 in).



A. Maximum tie-rod end length

19.2 Tighten tie-rod end locking nut to specification.

TIE-ROD END LOCKING NUT TORQUE
34 N•m ± 2 N•m (25 lbf•ft ± 1 lbf•ft)

20. Repeat procedure for the other wheel.

TROUBLESHOOTING

DIAGNOSTIC TIPS

Turning Radius Unequal

If vehicle turns more on one side than the other, check rack and pinion center to center. Refer to *STEERING ALIGNMENT* in this subsection.

PROCEDURES

STEERING WHEEL

Steering wheel Removal

All Models Except X and XT

1. From underneath steering wheel, unscrew cap retaining screws.
2. Remove steering wheel cap.
3. Remove nut securing steering wheel to shaft.
4. Remove steering wheel by pulling it upwards.

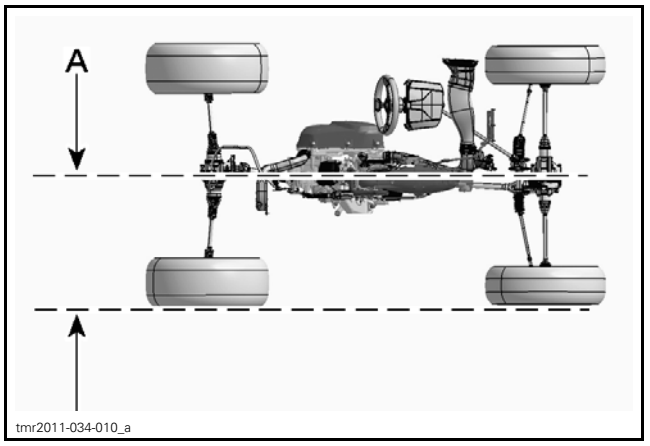
X and XT Models

1. Remove steering wheel cap using a small screwdriver.
2. Remove nut securing steering wheel to shaft.
3. Remove steering wheel by pulling it upwards.

Steering Wheel Installation

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

Prior to installing the steering wheel, place front wheels parallel with longitudinal plane of vehicle.



A. Front wheels parallel

Tighten steering wheel retaining nut to specification.

STEERING WHEEL RETAINING NUT TORQUE
50 N•m ± 5 N•m (37 lbf•ft ± 4 lbf•ft)

Check front wheel alignment. Refer to *STEERING ALIGNMENT* in this subsection.

STEERING COLUMN

Steering Column Removal

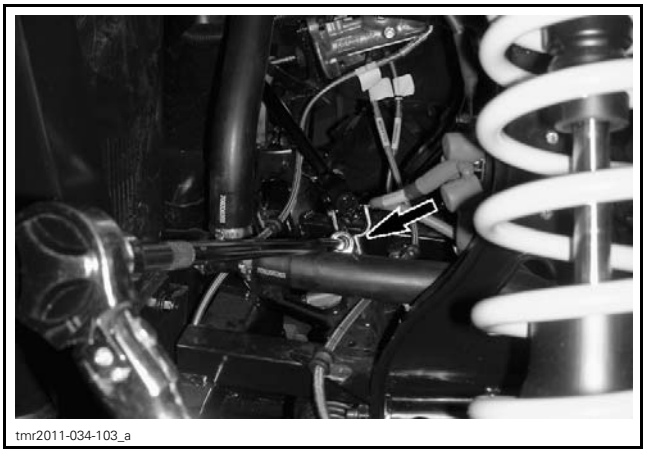
1. Center steering wheel.
2. Remove bolt and nut securing upper universal joint to steering shaft.

tmr2011-034-101_a

3. Remove steering wheel and steering shaft as an assembly.

tmr2011-034-102_a

4. Remove bolt and nut securing lower universal joint to rack and pinion.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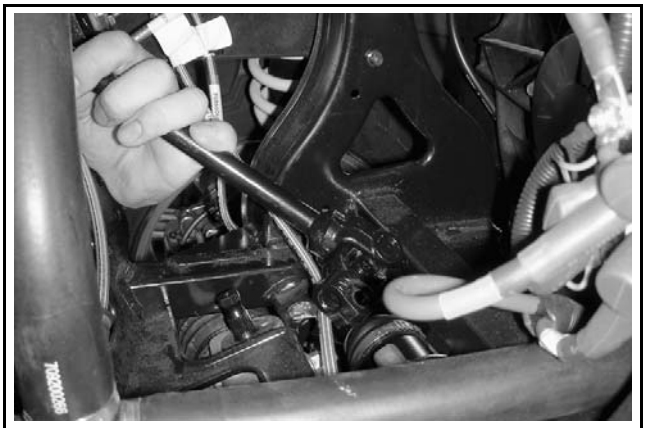
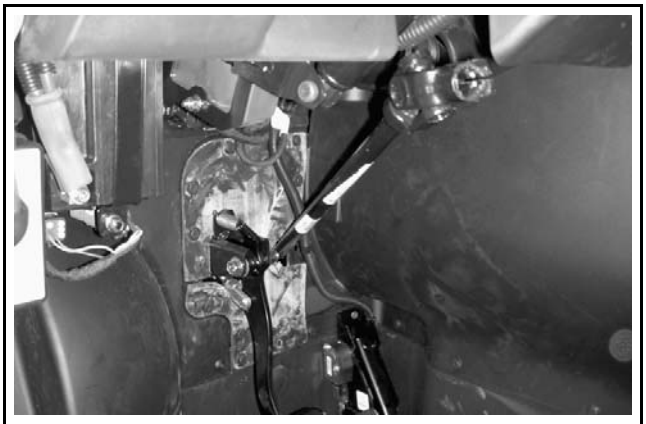
5. Pull steering column upwards to detach it from rack and pinion.


tmr2011-034-104

6. Carefully push steering column downwards to release it from steering support.


tmr2011-034-105

7. Remove steering column from vehicle.

Steering Column Inspection

Check steering column for wear, cracks or bending.

Check steering shaft for wear, cracks or bending.

Check if universal joints move freely.

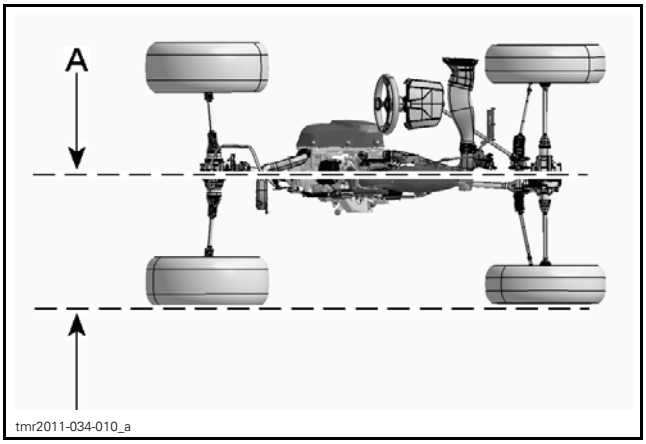
Check if steering shaft O-rings are brittle, hard or otherwise damaged.

Replace if necessary.

Steering Column Installation

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

Prior to installing the steering column, place front wheels parallel with longitudinal plane of vehicle.



A. Front wheels parallel

Lubricate steering shaft.

STEERING SHAFT LUBRICATION
XPS SYNTHETIC GREASE (P/N 293 550 010)

Install steering wheel and steering shaft. Make sure steering wheel is properly centered.

Tighten steering column U-joints to specification.

UPPER U-JOINT NUT TORQUE
31 N•m ± 3 N•m (23 lbf•ft ± 2 lbf•ft)

LOWER U-JOINT NUT TORQUE
48 N•m ± 6 N•m (35 lbf•ft ± 4 lbf•ft)

Check front wheels alignment. Refer to *STEERING ALIGNMENT* in this subsection.

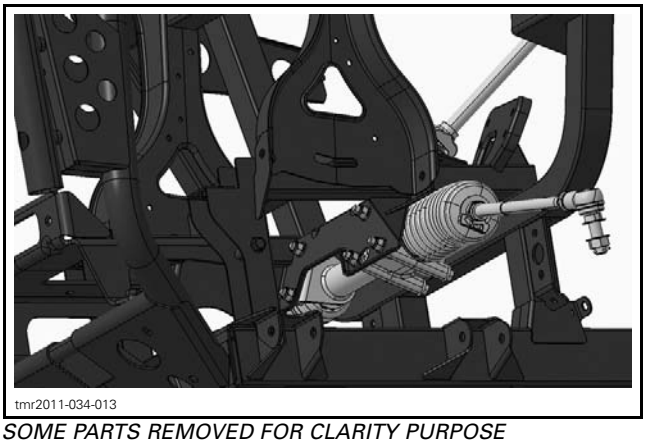
RACK AND PINION

Rack and Pinion Servicing

Rack and pinion is not serviceable except for boots and tie rods replacements.

Rack and Pinion Removal

1. Safely lift and support the front of vehicle. Refer to *INTRODUCTION* subsection.
2. Remove both front wheels.
3. Remove steering column, refer to *STEERING COLUMN REMOVAL* in this subsection.
4. Detach tie-rods from knuckles. Refer to *TIE ROD REPLACEMENT* in this subsection.
5. Remove bolts and nuts securing rack and pinion to frame.



SOME PARTS REMOVED FOR CLARITY PURPOSE

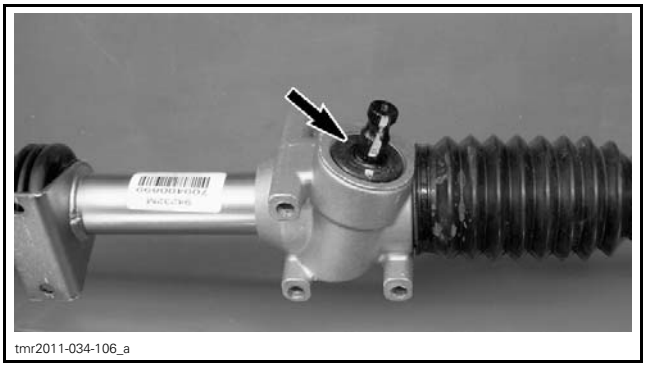
6. From the LH side, remove rack and pinion from vehicle.

Rack and Pinion Installation

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

Find rack and pinion center to center as follows:

– Calculate the total pinion shaft rotations from side to side.
– Position the pinion shaft at **half** the total rotations.
– Align pinion shaft mark onto housing mark.

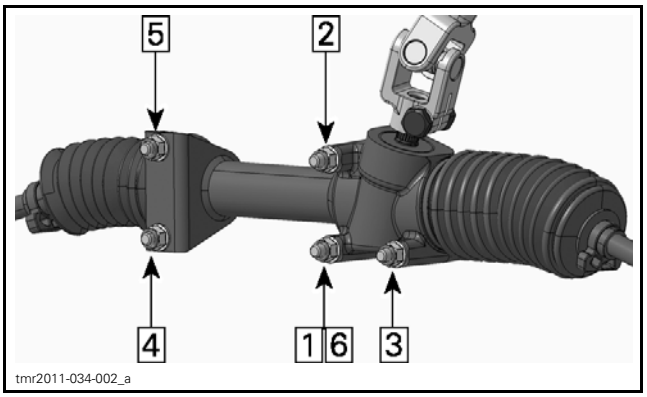


MARKS

Install all retaining bolts and nuts of rack and pinion loosely first.

Torque retaining nuts of rack and pinion according to specification using the following tightening sequence.

RACK AND PINION RETAINING NUTS TORQUE
24.5 N•m ± 3.5 N•m (18 lbf•ft ± 3 lbf•ft)



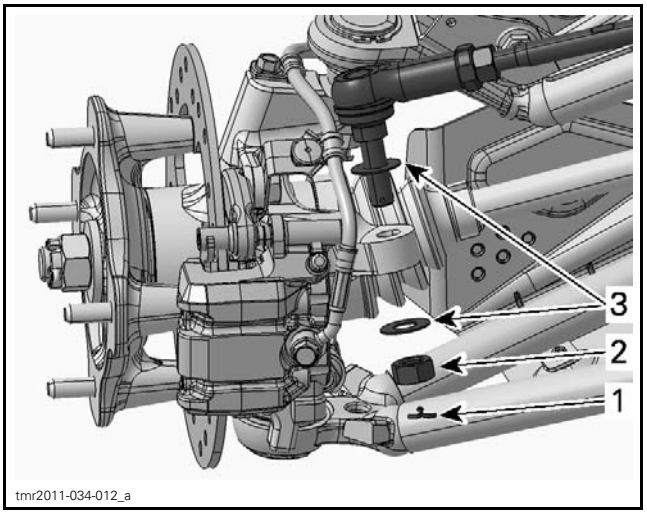
TIGHTENING SEQUENCE

Check the steering alignment, refer to *STEERING ALIGNMENT* in this subsection.

TIE-ROD ENDS

Tie-rod End Replacement

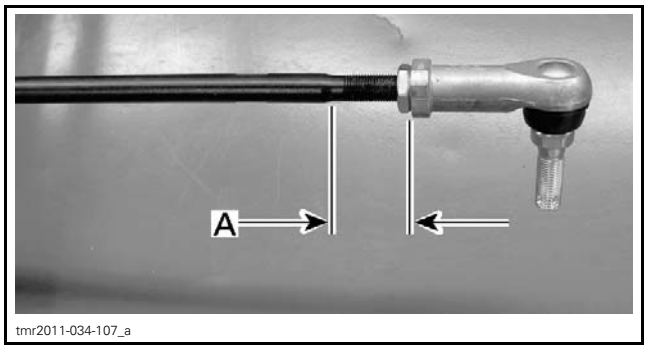
1. Safely lift and support the front of vehicle. Refer to *INTRODUCTION* subsection.
2. Remove front wheel.
3. Detach tie-rod end by removing:
   - Cotter pin
   - Tie-rod end retaining nut
   - Hardened washers.



1. Cotter pin
2. Tie-rod end retaining nut
3. Hardened washers

4. Discard cotter pin.
5. Replace tie-rod end.
6. Adjust tie-rod end to the nominal length.

TIE-ROD END NOMINAL LENGTH
27 mm (1.063 in)



A. Nominal length

⚠ WARNING

The maximum tie-rod end length not engaged in the tie rod must not exceed 32 mm (1.26 in).

7. Tighten tie-rod end **locking** nut to specification.

TIE-ROD END **LOCKING** NUT TORQUE
34 N•m ± 2 N•m (25 lbf•ft ± 1 lbf•ft)

8. Attach tie-rod end on knuckle as the reverse of removal.
9. Tighten tie-rod end **retaining** nut to specification.

TIE-ROD END **RETAINING** NUT TORQUE
72 N•m ± 7 N•m (53 lbf•ft ± 5 lbf•ft)

10. Install **NEW** cotter pin. Both ends of cotter pins must be folded.
11. Install front wheel.
12. Check the steering alignment, refer to *STEERING ALIGNMENT* in this subsection.

KNUCKLES

Knuckle Removal

1. Safely lift and support the front of vehicle. Refer to *INTRODUCTION* subsection.
2. Remove front wheel.
3. Detach tie-rod end from knuckle, refer to *TIE-ROD END* in this subsection.
4. Remove wheel hub, refer to *FRONT DRIVE* subsection.
5. Remove caliper, refer to *BRAKES* subsection.

tmr2011-034-108

6. Detach upper suspension arm from knuckle, refer to *FRONT SUSPENSION*.
7. Detach lower suspension arm from knuckle, refer to *FRONT SUSPENSION*.
8. Remove knuckle from vehicle.

Knuckle Inspection

Check knuckle for cracks or other damages.

Replace if necessary.

Knuckle Installation

The installation is the reverse of the removal procedure.

WHEEL BEARINGS

Wheel Bearing Inspection (Maintenance)

Refer to *PERIODIC MAINTENANCE PROCEDURES* subsection.

Wheel Bearing Inspection (During Component Removal)

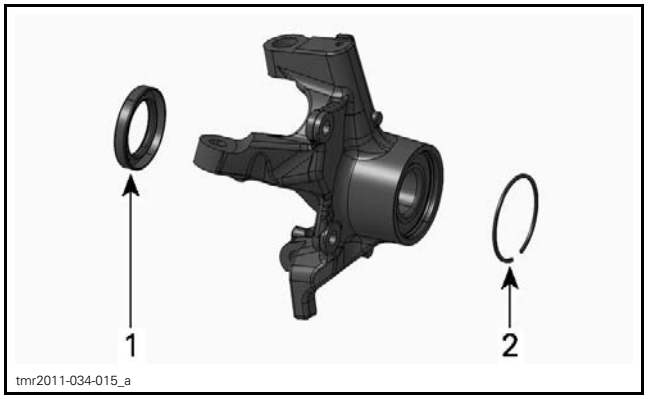
Whenever the drive axle or knuckle is removed, check wheel bearing as follows:

– Check if wheel bearing turns freely and smoothly.
– Check seal condition.

Replace if necessary.

Wheel Bearing Removal

1. Remove knuckle from vehicle, refer to *KNUCKLE REMOVAL* in this subsection.
2. Remove and discard knuckle seal.
3. Remove circlip.



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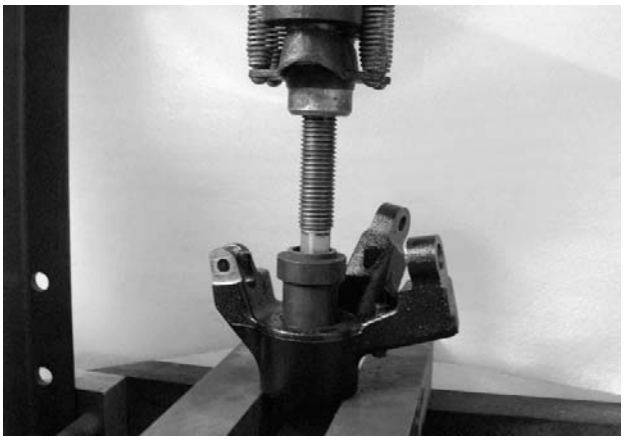
1. Seal
2. Circlip

4. Install knuckle on a press.
5. Use an appropriate bearing remover.
6. Remove bearing from knuckle.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NOTE: It may be necessary to heat the knuckle to remove bearing.

⚠ WARNING

Clean all grease, outside and inside, from knuckle before heating it.

Wheel Bearing Installation

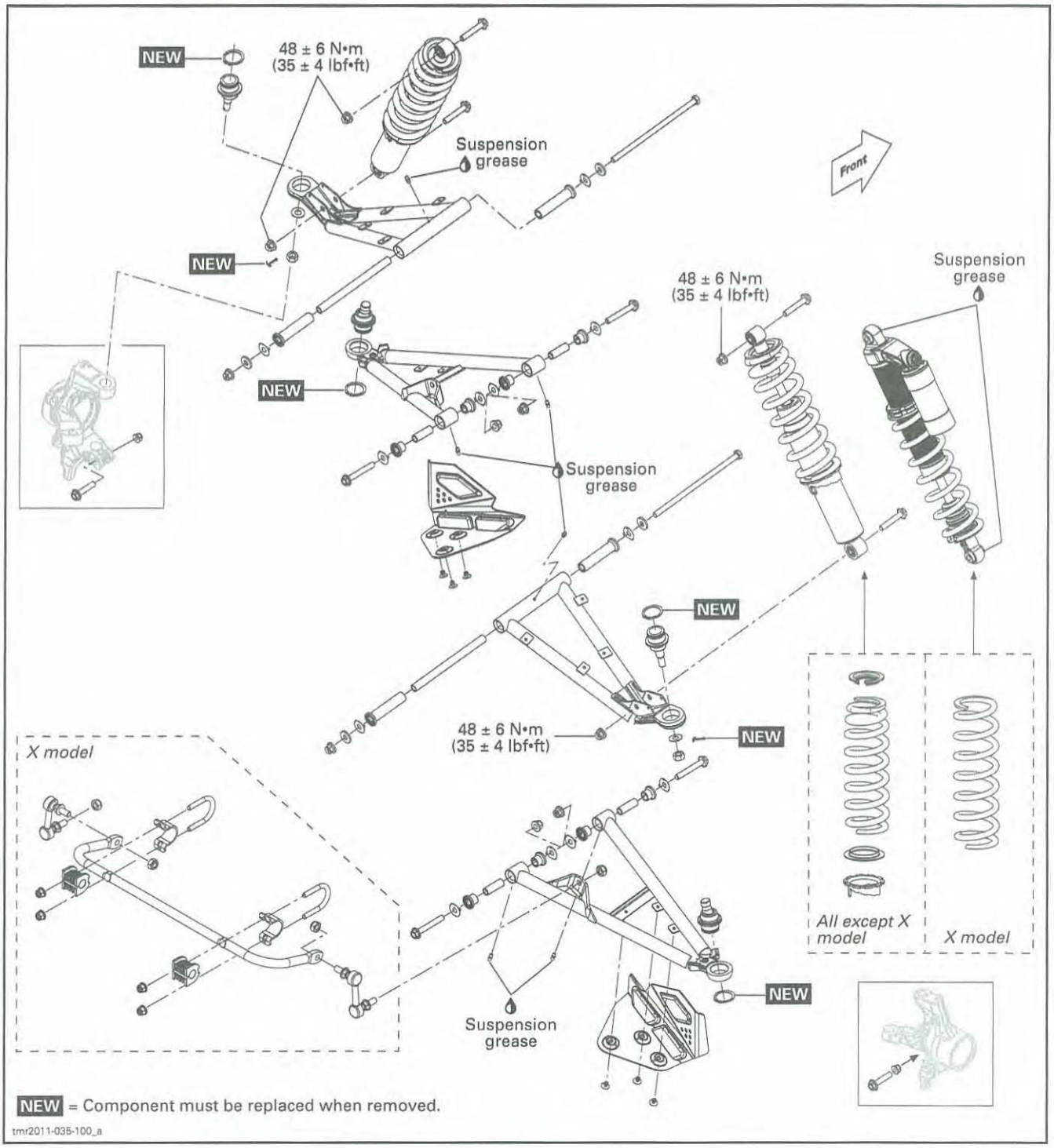
The installation is the reverse of the removal procedure. However, pay attention to the following.

To ease wheel bearing installation:

– Place bearing in a freezer for 10 minutes.
– Place knuckle in oven to 100°C (212°F) for 30 minutes maximum.

When knuckle is cooled down, install NEW circlip and NEW seal.

FRONT SUSPENSION



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 strictly be adhered to.
Locking devices when removed (e.g.: locking tabs, cotter pins, etc.) must be replaced.

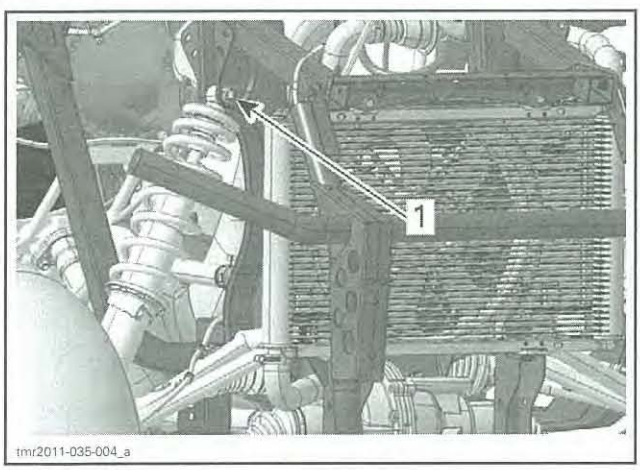
NOTICE **Hoses, cables and locking ties removed during a procedure must be reinstalled as per factory standards.**

PROCEDURES

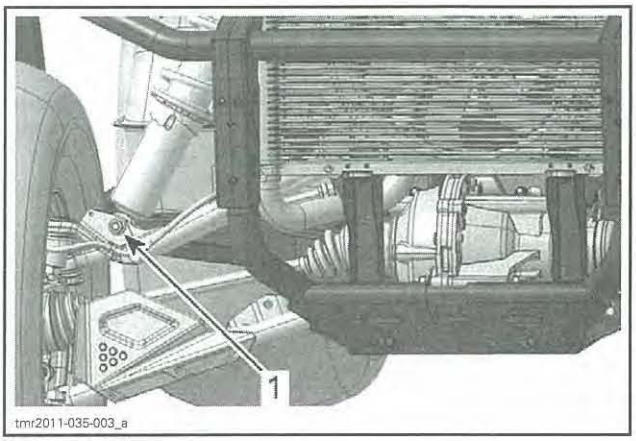
SHOCK ABSORBER

Shock Absorber Removal

1. Safely lift and support the vehicle of the ground. Refer to *INTRODUCTION* subsection.
2. Remove bolts and nuts retaining shock absorber.



1. Upper bolt



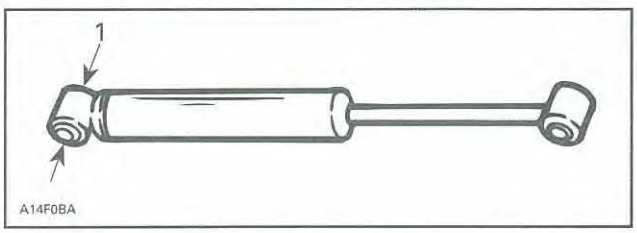
1. Lower bolt

3. Remove shock absorber.

Shock Absorber Inspection

Remove spring from shock absorber. Refer to *SPRINGS* in this subsection.

Secure the end of shock body in a vise with its rod upward.



TYPICAL
1. Clamp here

NOTICE **Do not clamp directly on shock body.**

Extend and compress the piston several times over its entire stroke. Check that it moves smoothly and with uniform resistance with its rod upward.

Check the following conditions that will denote a defective shock:

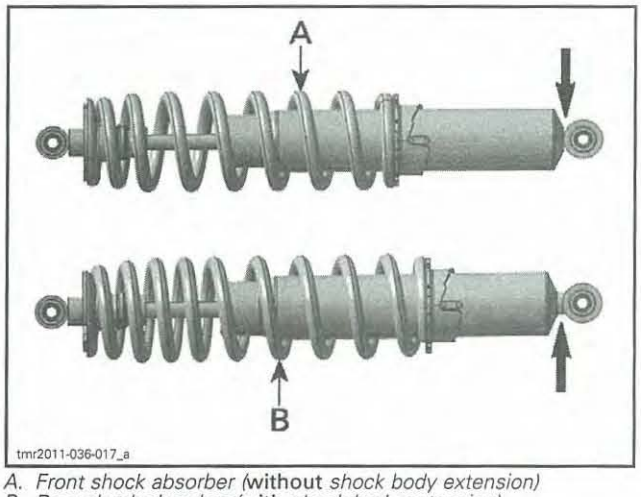
- A skip or a hang back when reversing stroke at mid travel.
- Seizing or binding condition except at extreme end of either stroke.
- Oil leakage.
- A gurgling noise, after completing one full compression and extension stroke.

Replace if any faults are present.

Shock Absorber Installation

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

Make sure to install the proper type of shock absorber **no. A** on the front of vehicle



*A. Front shock absorber (**without** shock body extension)*
*B. Rear shock absorber (**with** shock body extension)*

SHOCK ABSORBER NUTS TORQUE
48 N•m ± 6 N•m (35 lbf•ft ± 4 lbf•ft)

SHOCK ABSORBER BUSHINGS

Refer to *SHOCK ABSORBER BUSHINGS* in *REAR SUSPENSION* subsection for complete procedures.

SPRINGS

Refer to *SPRINGS* in *REAR SUSPENSION* subsection for complete procedures.

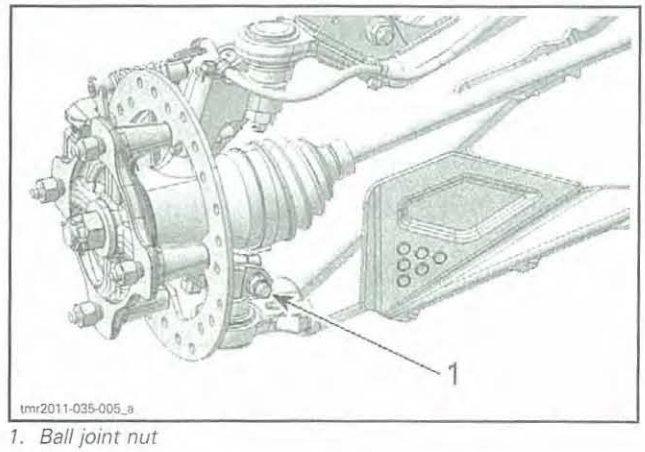
LOWER SUSPENSION ARM

Lower Suspension Arm Removal

1. Safely lift and support the vehicle off the ground. Refer to *INTRODUCTION* subsection.
2. Remove wheel, refer to *WHEELS AND TIRES* subsection.

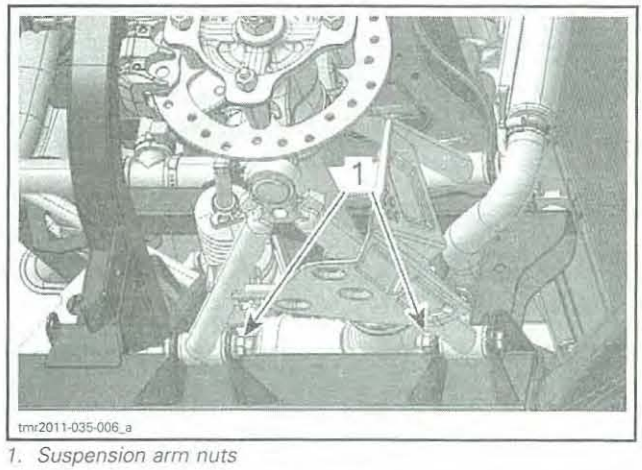
NOTE: For X model, disconnect anti-sway bar from suspension arm.

3. Remove bolt and nut securing lower ball joint to knuckle.



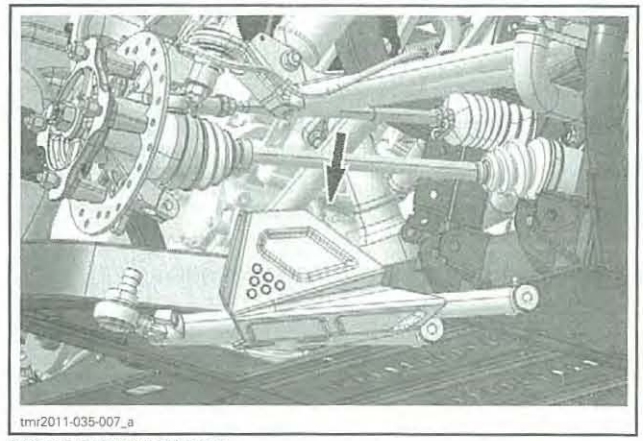
1. Ball joint nut

4. Remove bolts and nuts securing suspension arm to frame.



1. Suspension arm nuts

5. Remove suspension arm.



MOVE DOWNWARDS

Lower Suspension Arm Installation

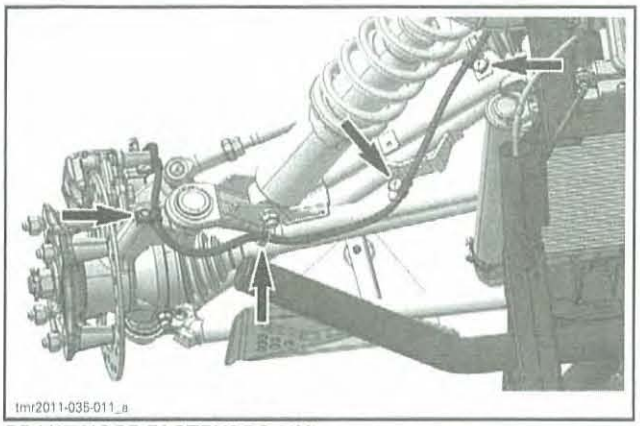
The installation is the reverse of the removal procedure. However, pay attention to the following.

Lubricate suspension arm. Refer to *PERIODIC MAINTENANCE PROCEDURES* subsection.

UPPER SUSPENSION ARM

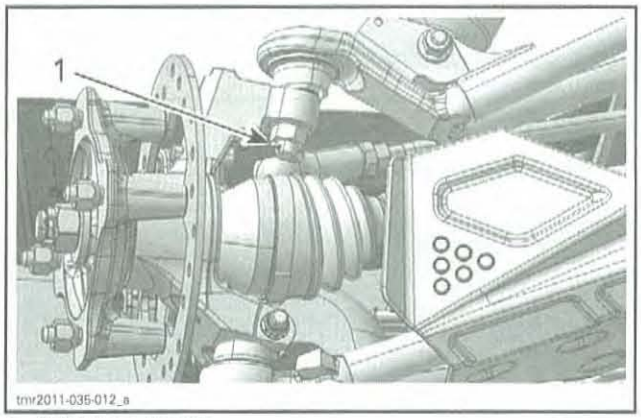
Upper Suspension Arm Removal

1. Safely lift and support the vehicle off the ground. Refer to *INTRODUCTION* subsection.
2. Remove wheel, refer to *WHEELS AND TIRES* subsection.
3. Remove fasteners retaining brake hose to vehicle.



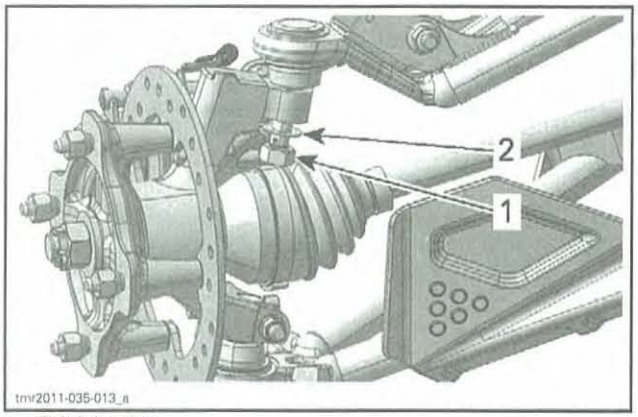
BRAKE HOSE FASTENERS (4X)

4. Remove and discard cotter pin retaining ball joint.



1. Ball joint cotter pin

5. Remove ball joint nut and washer.

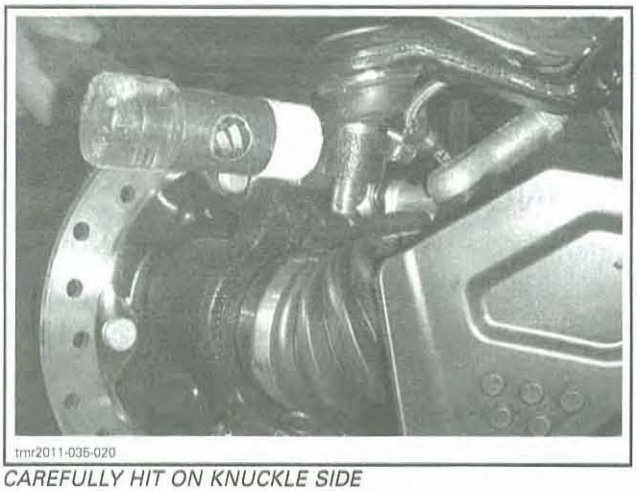


1. Ball joint nut
2. Ball joint hardened washer

6. Carefully move brake hose aside.
7. Using a plastic hammer, carefully hit on the knuckle side to separate ball joint from knuckle.

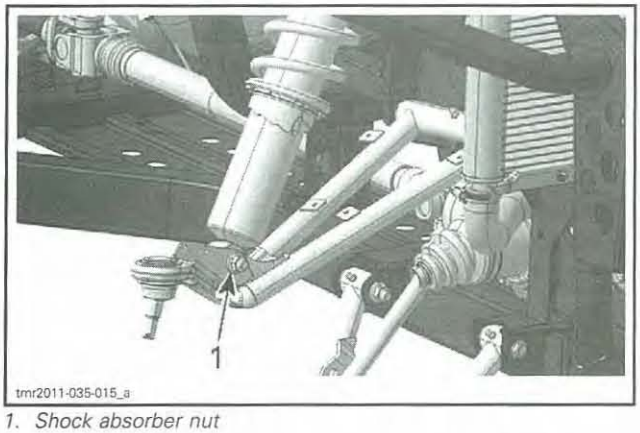
NOTE: A ball joint remover can be used if the ball joint is jammed into knuckle.

NOTICE Never hit on suspension arm to avoid to damage it permanently.



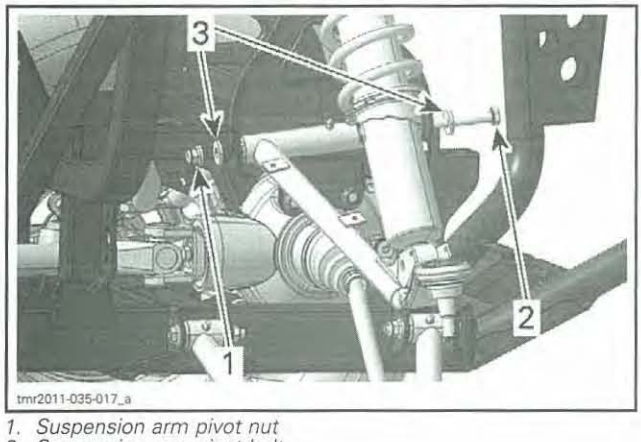
CAREFULLY HIT ON KNUCKLE SIDE

8. Remove bolt and nut securing suspension arm to shock absorber.



1. Shock absorber nut

9. Remove radiator from vehicle. Refer to *RADIATOR* in *COOLING SYSTEM* subsection.
10. Remove fasteners securing suspension arm to frame.



1. Suspension arm pivot nut
2. Suspension arm pivot bolt
3. Suspension arm pivot washers

11. Remove suspension arm.

Upper Suspension Arm Installation

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

Refer to *COOLING SYSTEM* subsection for radiator installation.

NOTICE **Properly bleed cooling system. Refer to *COOLING SYSTEM* subsection.**

Lubricate suspension arm. Refer to *PERIODIC MAINTENANCE PROCEDURES* subsection.

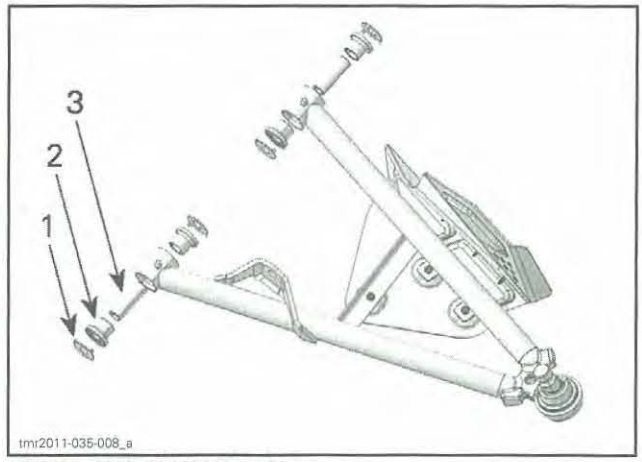
Install a NEW cotter pin to secure ball joint nut. Both end of cotter pin must be folded.

SHOCK ABSORBER NUTS TORQUE
48 N•m ± 6 N•m (35 lbf•ft ± 4 lbf•ft)

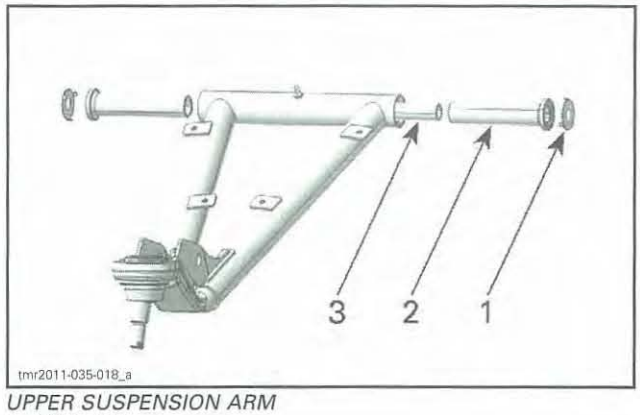
SUSPENSION ARM BUSHINGS

Suspension Arm Bushings Removal

1. Remove wear plates, cushions and inner bushing from suspension arm.



LOWER SUSPENSION ARM
1. Wear plate
2. Cushion
3. Inner bushing



UPPER SUSPENSION ARM
1. Wear plate
2. Cushion
3. Inner bushing

Suspension Arm Bushings Installation

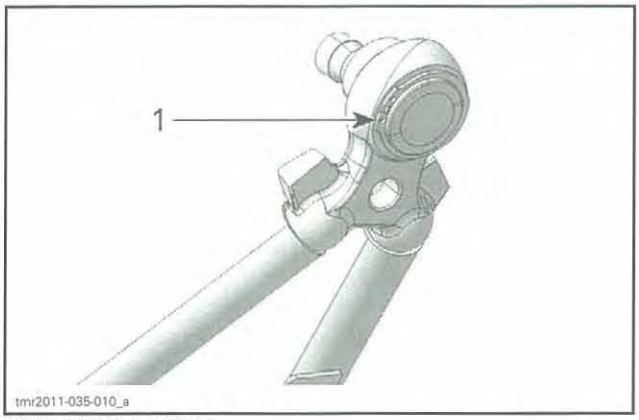
The installation is the reverse of the removal procedure. However, pay attention to the following.

Lubricate suspension arm. Refer to *PERIODIC MAINTENANCE PROCEDURES* subsection.

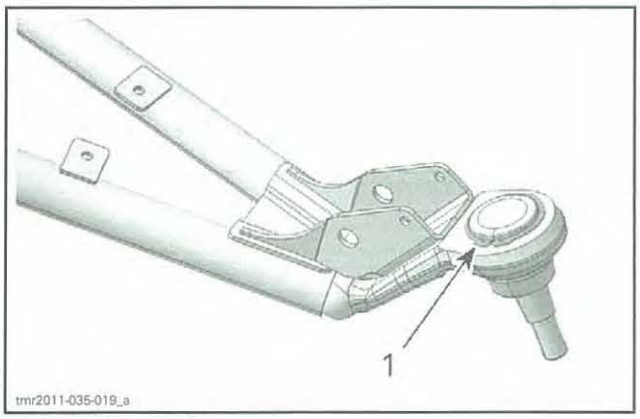
BALL JOINTS

Ball Joint Removal

1. Remove suspension arm from vehicle. Refer to *SUSPENSION ARM REMOVAL* in this subsection.
2. Remove circlip from ball joint.

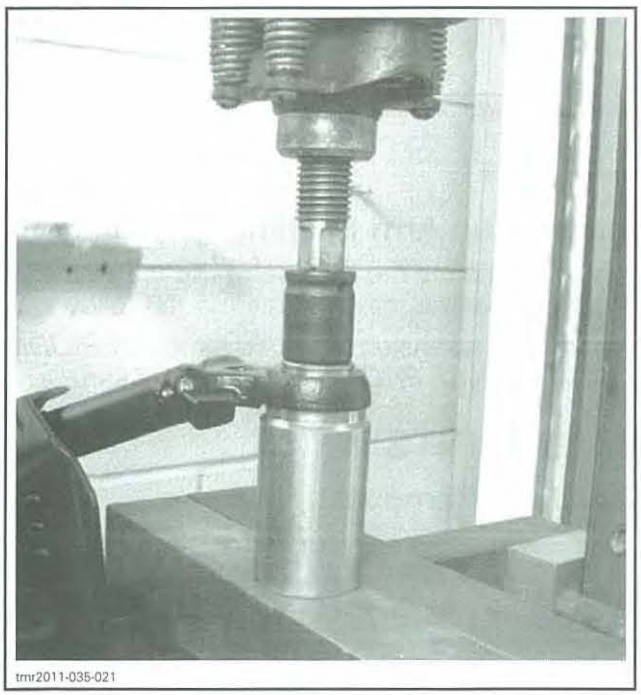


LOWER BALL JOINT
1. Circlip



UPPER BALL JOINT
1. Circlip

3. Install suspension arm on a press.
4. Use an appropriate ball joint remover.



5. Remove ball joint from suspension arm.

NOTICE **Make sure that suspension arm is properly supported on the press during ball joint removal.**

Ball Joint Installation

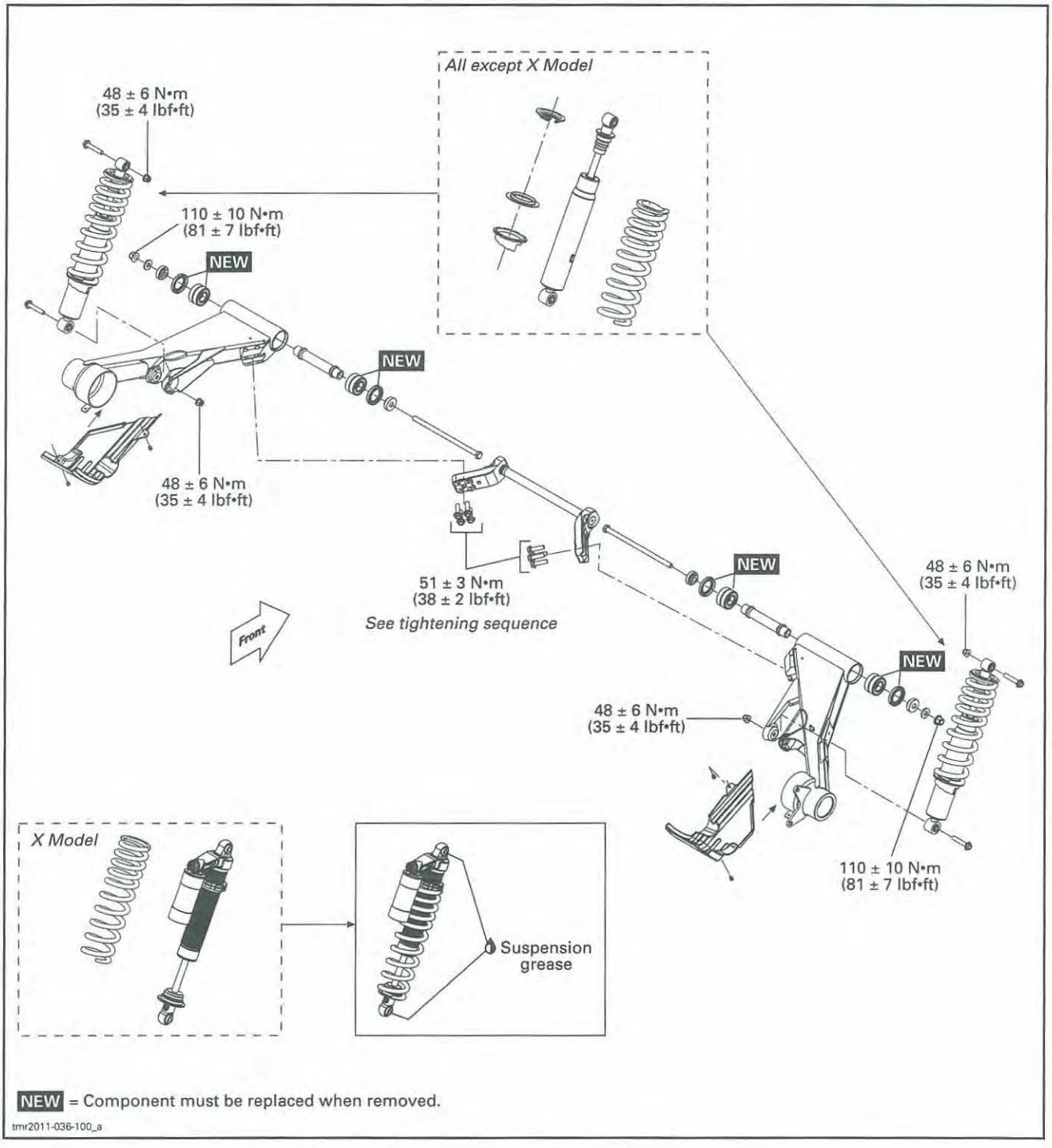
The installation is the reverse of the removal procedure. However, pay attention to the following.

Install a **NEW** circlip to secure ball joint.

REAR SUSPENSION

SERVICE TOOLS

Description	Part Number	Page
SPRING COMPRESSOR	529 036 184	337



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 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 must be replaced when removed (e.g.: locking tabs, cotter pins, etc.).

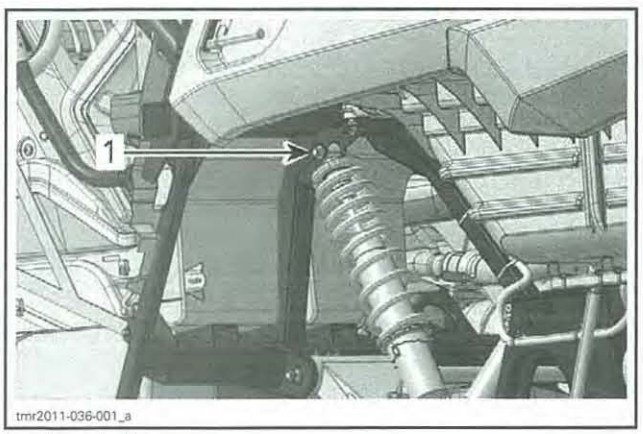
NOTICE **Hoses, cables and locking ties removed during a procedure must be reinstalled as per factory standards.**

PROCEDURES

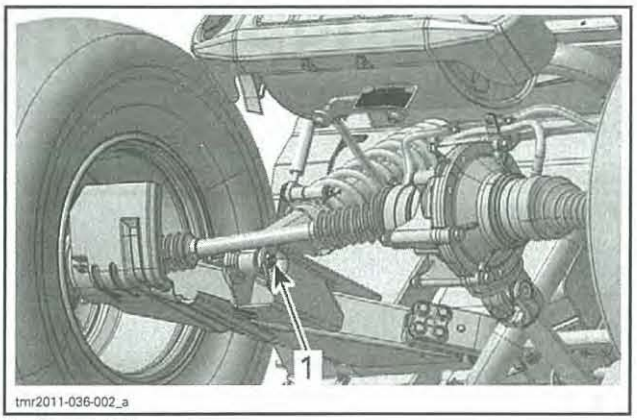
SHOCK ABSORBERS

Shock Absorber Removal

1. Safely lift and support the vehicle off the ground. Refer to *INTRODUCTION* subsection.
2. Open cargo box.
3. Remove bolts and nuts retaining shock absorber.



1. Upper bolt



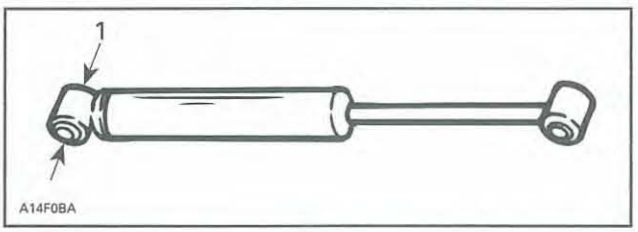
1. Lower bolt

4. Remove shock absorber.

Shock Absorber Inspection

Remove spring from shock absorber. Refer to *SPRINGS* in this subsection.

Secure the end of shock body in a vise with its rod upward.



TYPICAL
1. Clamp here

NOTICE **Do not clamp directly on shock body.**

Extend and compress the piston several times over its entire stroke. Check that it moves smoothly and with uniform resistance with its rod upward.

Check the following conditions that will denote a defective shock:

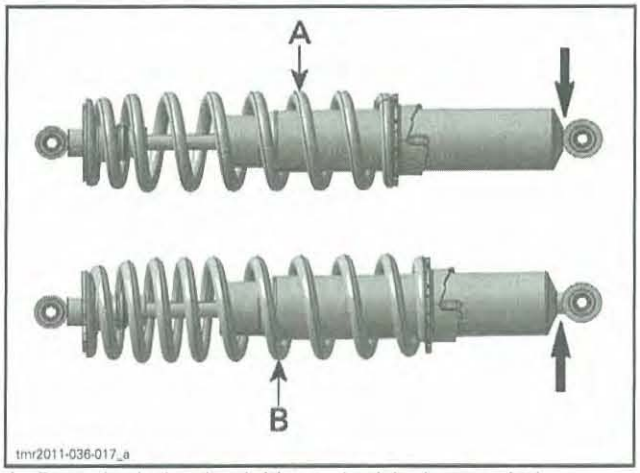
- A skip or a hang back when reversing stroke at mid travel.
- Seizing or binding condition except at extreme end of either stroke.
- Oil leakage.
- A gurgling noise, after completing one full compression and extension stroke.

Replace if any faults are present.

Shock Absorber Installation

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

Make sure to install the proper type of shock absorber **no. B** on the rear of vehicle.



*A. Front shock absorber (*without *shock body extension)*
*B. Rear shock absorber (*with *shock body extension)*

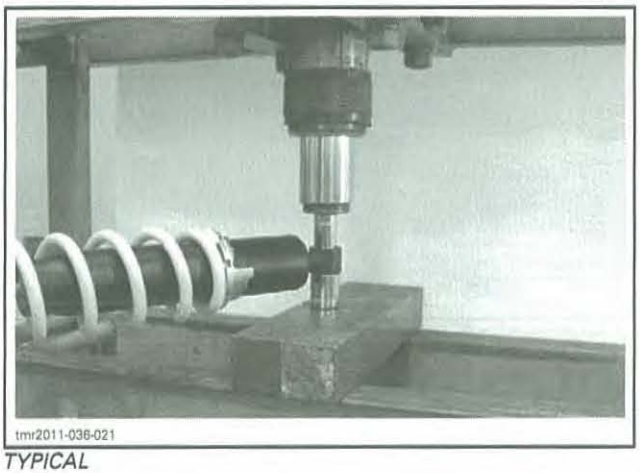
SHOCK ABSORBER NUTS TORQUE
48 N•m ± 6 N•m (35 lbf•ft ± 4 lbf•ft)

SHOCK ABSORBER BUSHINGS

Shock Absorber Bushing Replacement

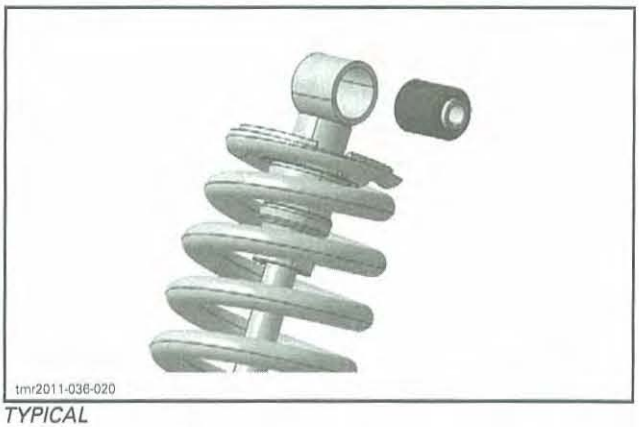
All Shock Absorbers Except HPG with Remote Reservoir

1. Remove shock absorber from vehicle. Refer to *SHOCK ABSORBERS* in this subsection.
2. Install shock absorber on a press.
3. Use an appropriate socket to push bushing.



TYPICAL

4. Remove bushing from shock absorber.



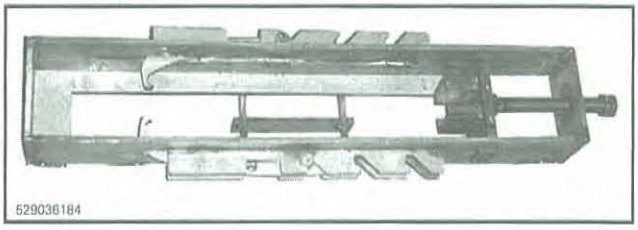
TYPICAL

5. Install a **NEW** bushing as the reverse of removal.
6. Install shock absorber on vehicle.

SPRINGS

Spring Removal

1. Remove shock absorber from vehicle. Refer to *SHOCK ABSORBERS* in this subsection.
2. Use SPRING COMPRESSOR (P/N 529 036 184).



3. Place the tool in a vise.
4. Position the shock absorber in the tool.
5. Install the spring compressor pins.
6. Tighten spring remover screw until the spring is sufficiently compressed to remove spring cap.
7. Remove spring cap from shock absorber.
8. Release spring remover screw.
9. Remove spring from shock absorber.

Spring Inspection

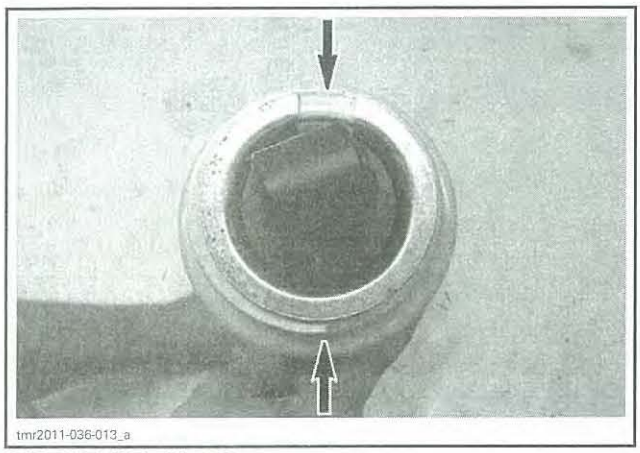
Inspect the spring for damage.

Replace if necessary.

Spring Installation

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

Install spring cap opening at 180° from spring stopper opening.

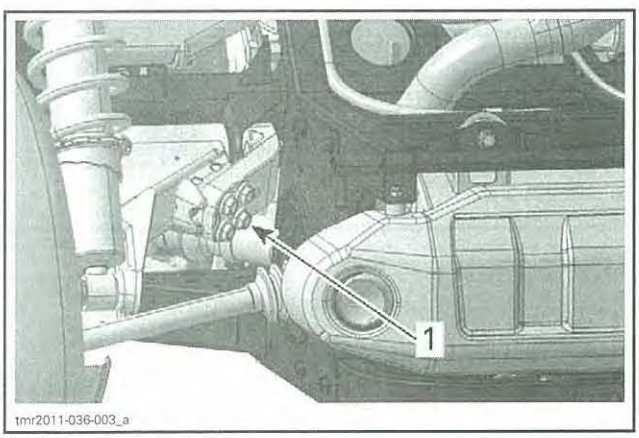


CAP OPENING AT 180°

ANTI-SWAY BAR

Anti-Sway Bar Removal

1. Safely lift and support the vehicle off the ground. Refer to *INTRODUCTION* subsection.
2. Open cargo box.
3. Remove anti-sway bar retaining screws (4 on each side).



1. Anti-sway bar retaining screw

4. Remove anti-sway bar.

Anti-Sway Bar Inspection

Check anti-sway bar for cracks, bending or other damages.

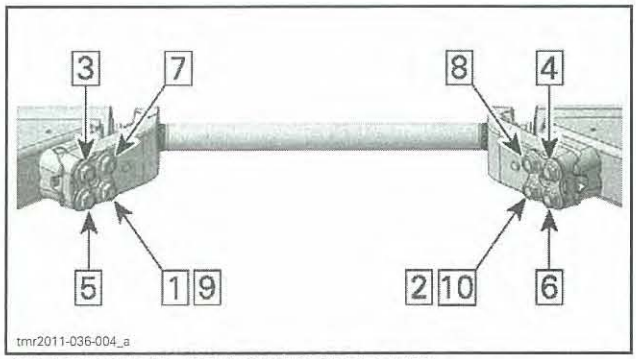
Replace if necessary.

Anti-Sway Bar Installation

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

Install all retaining screws of anti-sway bar loosely first.

Torque retaining screws of anti-sway bar according to the following sequence.



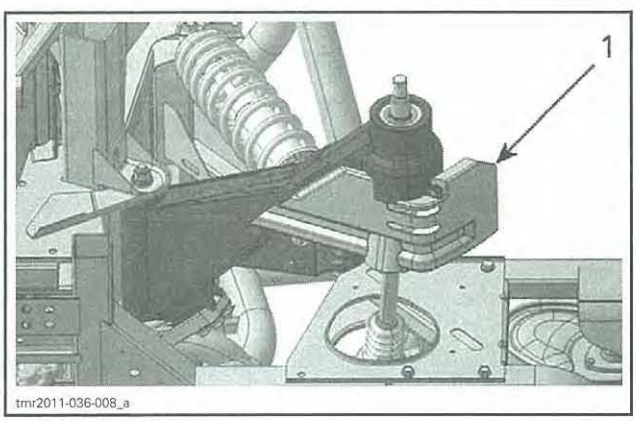
ANTI-SWAY BAR TIGHTENING SEQUENCE

ANTI-SWAY BAR SCREWS TORQUE
51 N•m ± 3 N•m (38 lbf•ft ± 2 lbf•ft)

TRAILING ARM

Trailing Arm Removal

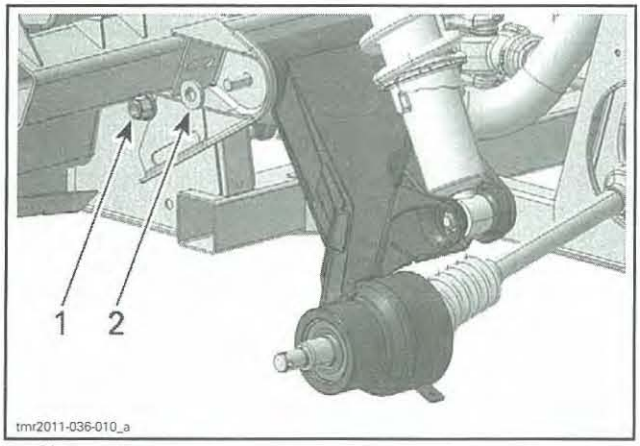
1. Safely lift and support the vehicle off the ground. Refer to *INTRODUCTION* subsection.
2. Remove wheel, refer to *WHEELS AND TIRES* subsection.
3. Open cargo box.
4. Remove anti-sway bar, refer to *ANTI-SWAY BAR REMOVAL* in this subsection.
5. Remove wheel hub, refer to *REAR DRIVE* subsection.
6. Remove protective plate from trailing arm.



1. Protective plate

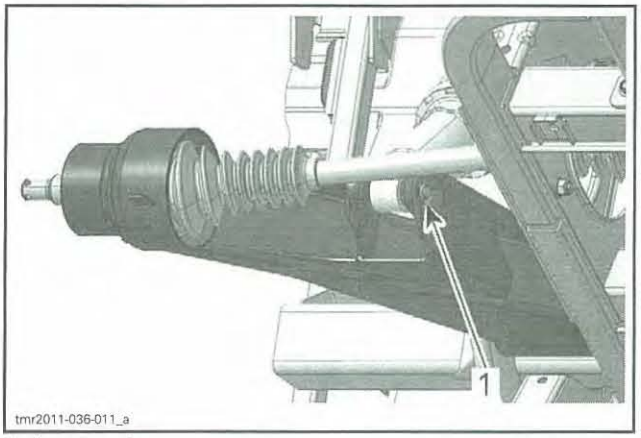
NOTE: If applicable, remove fasteners retaining brake hose to vehicle.

7. Remove nut and washer securing trailing arm pivot.



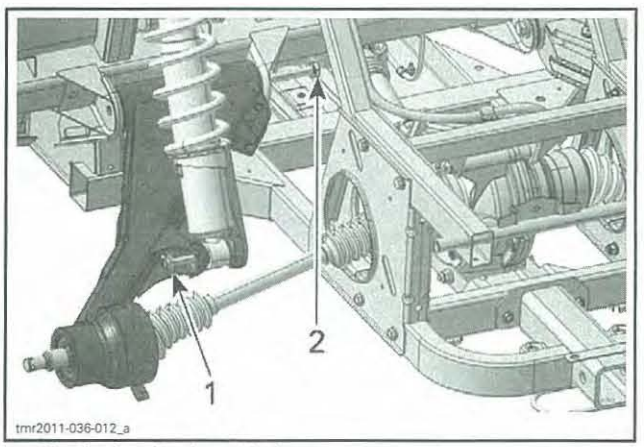
1. Pivot nut
2. Pivot washer

8. Remove lower nut retaining shock absorber.



1. Lower nut

9. Firmly hold trailing arm then remove:
   - Shock absorber lower bolt
   - Trailing arm pivot bolt and washer.



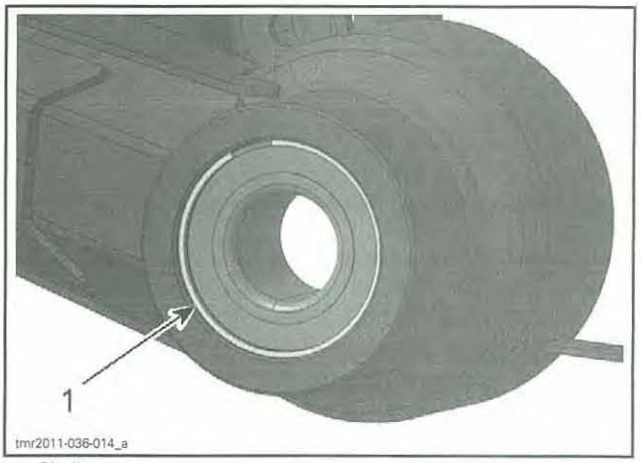
1. Shock absorber lower bolt
2. Trailing arm pivot bolt

10. Remove trailing arm from vehicle.

Trailing Arm Disassembly

Drive Shaft Bearing Removal

1. Remove circlip securing bearing into trailing arm.

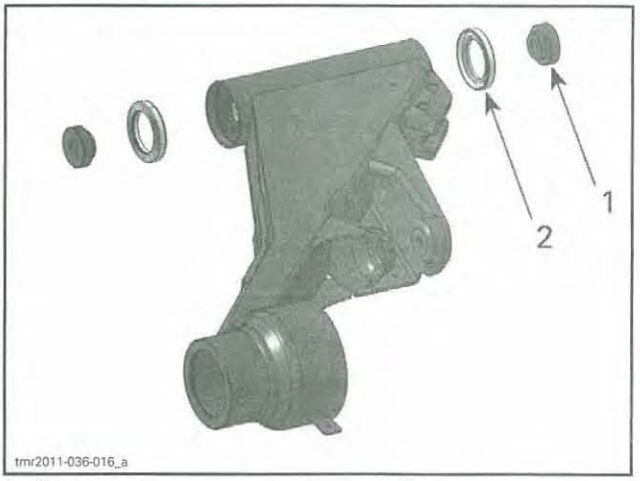


1. Circlip

2. Install trailing arm on a press.
3. Use an appropriate bearing remover.
4. Remove drive shaft bearing from trailing arm.

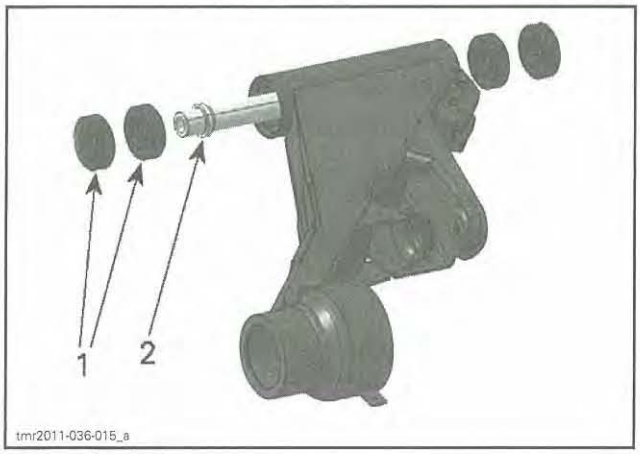
Trailing Arm Pivot Bearing Removal

1. Remove both spacers and seals from trailing arm pivot.



1. Spacer
2. Seal

2. Install trailing arm on a press.
3. Use an appropriate bearing remover.
4. Remove pivot bearings and bushing from trailing arm.



1. Pivot bearings
2. Pivot bushing

Trailing Arm Inspection

Check trailing arms for:
- Cracks
- Bending.

Check seals condition.

Check inner race of each pivot bearing with your finger:
- Bearings should turn smoothly and quietly.

Replace all damaged parts.

Trailing Arm Assembly and Installation

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

Install the following NEW parts:
- Pivot bearings
- Seals
- Circlip.

TRAILING ARM PIVOT NUT TORQUE
110 N•m ± 10 N•m (81 lbf•ft ± 7 lbf•ft)

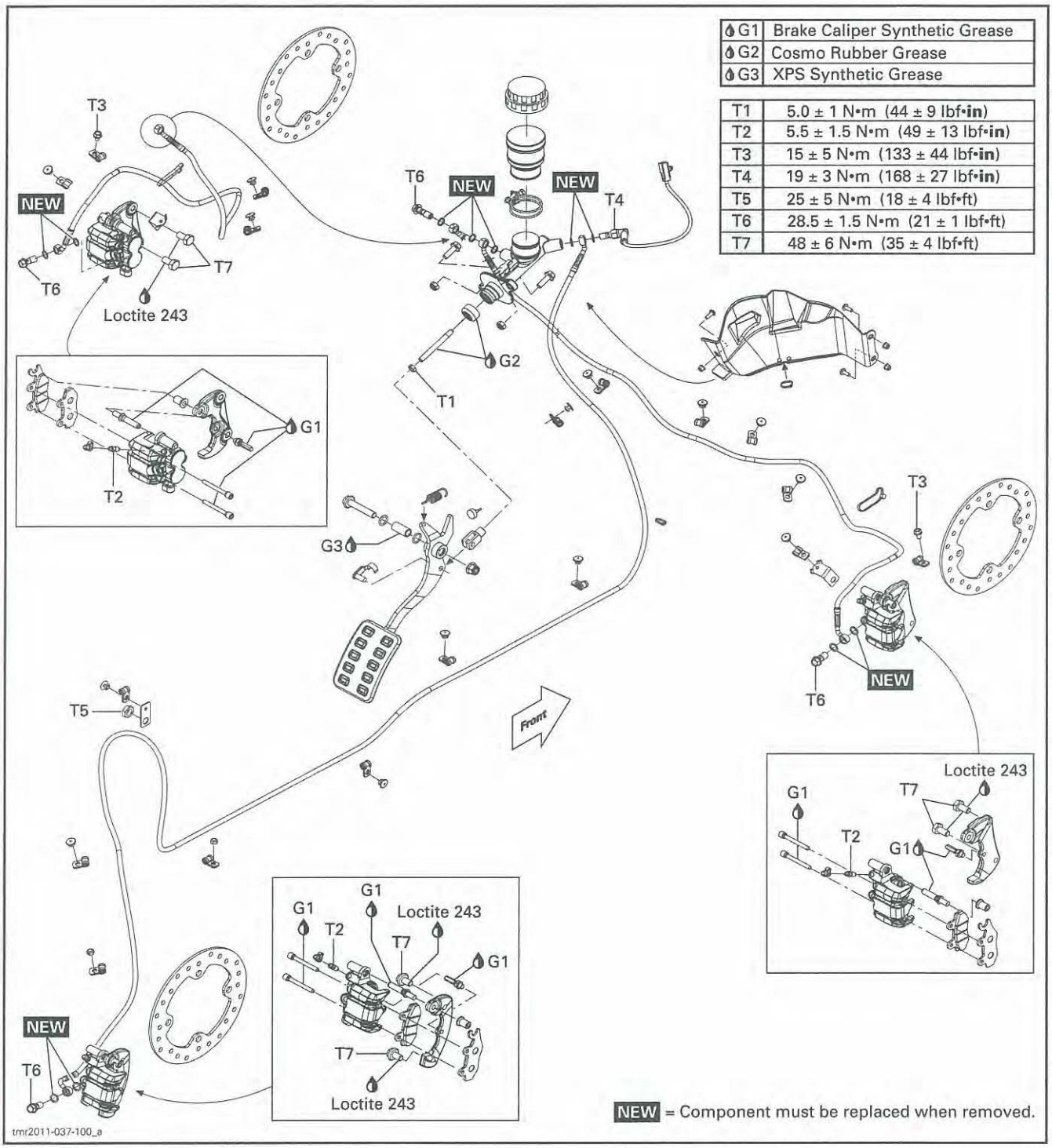
BRAKES

SERVICE TOOLS

Description	Part Number	Page
ECM ADAPTER TOOL	529 036 166	344

SERVICE PRODUCTS

Description	Part Number	Page
COSMO RUBBER GREASE	293 550 055	346
LOCTITE 243 (BLUE)	293 800 060	347
XPS PARTS AND BRAKES CLEANER	219 701 705	347


G1 Brake Caliper Synthetic Grease
G2 Cosmo Rubber Grease
G3 XPS Synthetic Grease
T1 5.0 ± 1 N•m (44 ± 9 lbf•in)
T2 5.5 ± 1.5 N•m (49 ± 13 lbf•in)
T3 15 ± 5 N•m (133 ± 44 lbf•in)
T4 19 ± 3 N•m (168 ± 27 lbf•in)
T5 25 ± 5 N•m (18 ± 4 lbf•ft)
T6 28.5 ± 1.5 N•m (21 ± 1 lbf•ft)
T7 48 ± 6 N•m (35 ± 4 lbf•ft)
NEW
Loctite 243
Front
NEW = Component must be replaced when removed.
tmr2011-037-100_a

GENERAL

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

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 must be replaced when removed (e.g.: locking tabs, cotter pins, etc.).

⚠ WARNING

Always check brake system operation after removing or servicing a brake component. If brake pedal feels spongy, make sure all components are properly installed and system is properly bled.

NOTICE Avoid spilling brake fluid on plastic, rubber or painted parts. Protect these parts with a rag when servicing brake system.

NOTICE Sealing washers must be discarded and replaced with new ones every time a Banjo fitting is unscrewed.

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

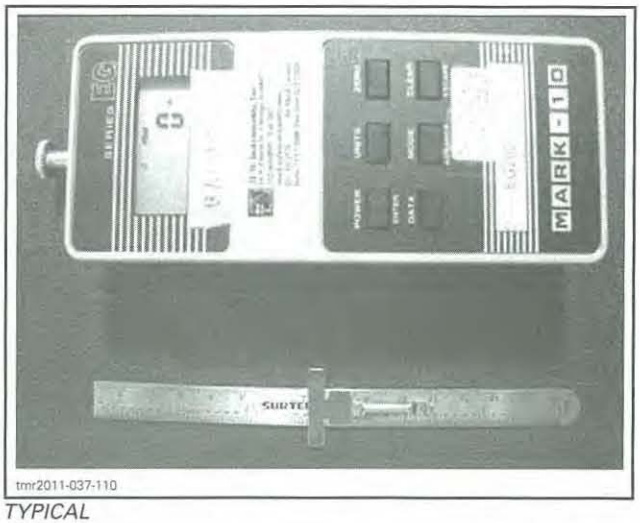
NOTE: Always clean the area around a brake component before servicing.

INSPECTION

BRAKE SYSTEM PRESSURE VALIDATION

NOTICE Do not pump up the brake pedal repeatedly before doing the validation.

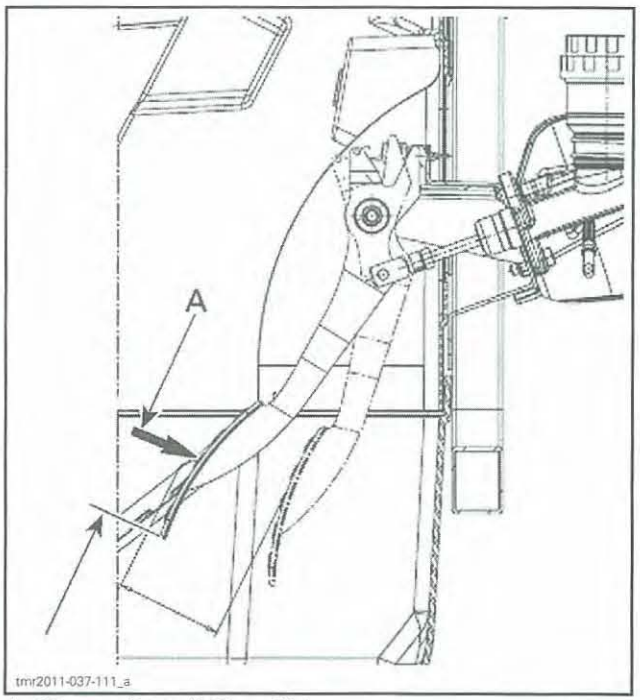
1. Use an appropriate compression force gauge such as *MARK-10 EG-200* and a ruler.



tmr2011-037-110

TYPICAL

2. Position force gauge on brake pedal at 64 mm ± 5 mm (2.5 in ± .2 in) from lower edge.
3. Position a ruler perpendicularly to brake pedal.



tmr2011-037-111_a

A. 64 mm ± 5 mm (2.5 in ± .2 in)

4. Push brake pedal from 70 mm (2-3/4 in) using force gauge.

tmr2011-037-112

TYPICAL

5. Read the load recorded by the force gauge.
6. Load reading must be as per the following table.

BRAKE PEDAL LOAD AT 70 MM
Minimum 250 N (56 lbf)

7. If load reading is not in accordance with the specification:
   - 7.1 Perform a brake system inspection and cleaning.
   - 7.2 Bleed brake system.

   NOTE: Refer to *PERIODIC MAINTENANCE PROCEDURES* subsection.

PROCEDURES

BRAKE LIGHT SWITCH

Brake Light Switch Location

Brake light switch is located underneath LH front fender on master cylinder.

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1. Brake light switch

Brake Light Switch Resistance Test

1. Disconnect brake light switch connector.
2. Check switch operation as follows.

BRAKE LIGHT SWITCH POSITION	PIN		RESISTANCE
Firmly pushed	1	2	Close to 0 Ω
Released			Infinite (OL)

If switch is defective, replace with a new one.

If the switch tests good, verify wire continuity between harness connector and ECM-B connector.

NOTE: Use the ECM ADAPTER TOOL (P/N 529 036 166).

529036166

ECM-B CONNECTOR PIN	HARNESS CONNECTOR WIRES	RESISTANCE
C-3	RED/ORANGE	Close to 0 Ω

NOTE: If only the LH taillight does not work, check brake relay (R8) in fuse box 1.

Brake Light Switch Replacement

1. Disconnect brake light switch connector.
2. Drain rear brake line.
3. Remove brake light switch from master cylinder.

NOTE: Use shop rags to catch any spilled brake fluid.

4. Install NEW sealing washers.
5. Install brake light switch on master cylinder.

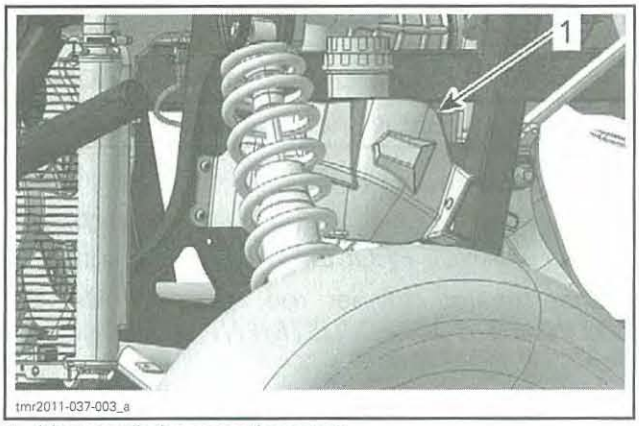
BRAKE LIGHT SWITCH NUT TORQUE
19 N•m ± 3 N•m (168 lbf•**in** ± 27 lbf•**in**)

6. Connect brake light switch connector.
7. Refill and bleed brake system, refer to *PERIODIC MAINTENANCE PROCEDURES* subsection.

MASTER CYLINDER

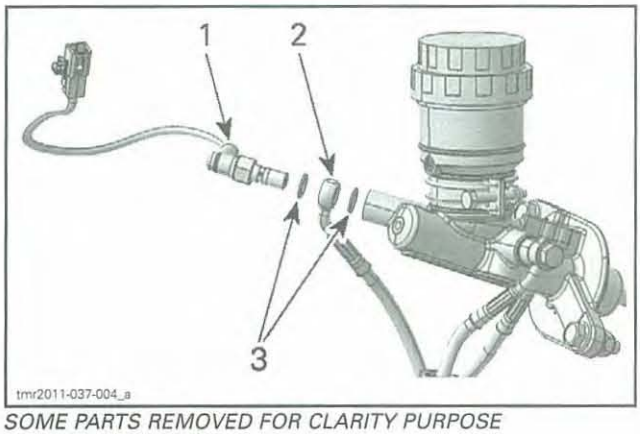
Master Cylinder Removal

1. Drain brake system, refer to *PERIODIC MAINTENANCE PROCEDURES* subsection.
2. Remove master cylinder protective cover.



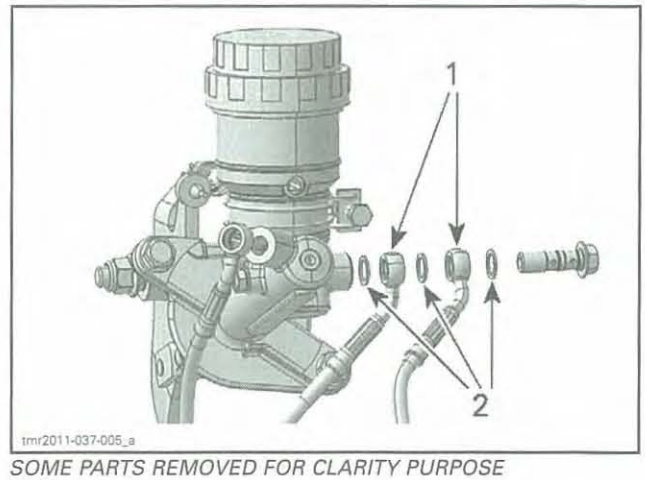
1. Master cylinder protective cover

3. Remove brake light switch retaining rear brake hose.



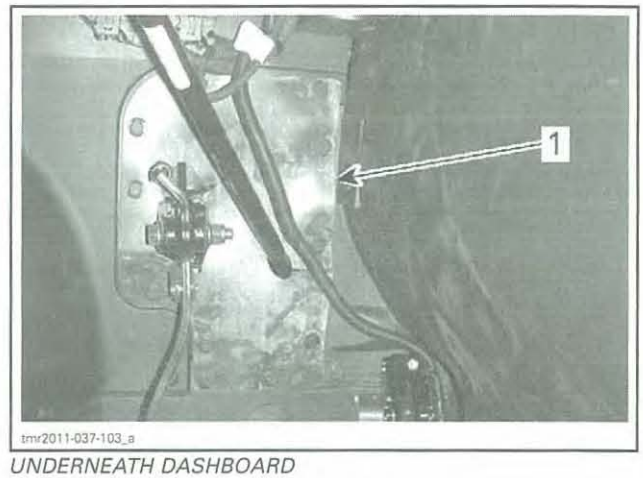
SOME PARTS REMOVED FOR CLARITY PURPOSE
1. Brake light switch
2. Rear brake hose
3. Sealing washers

4. Unscrew front brake hoses from master cylinder.



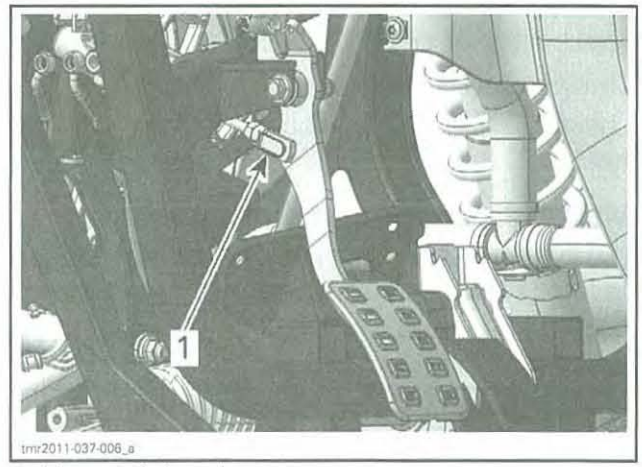
SOME PARTS REMOVED FOR CLARITY PURPOSE
1. Front brake hoses
2. Sealing washers

5. Remove protective rubber from underneath dashboard.



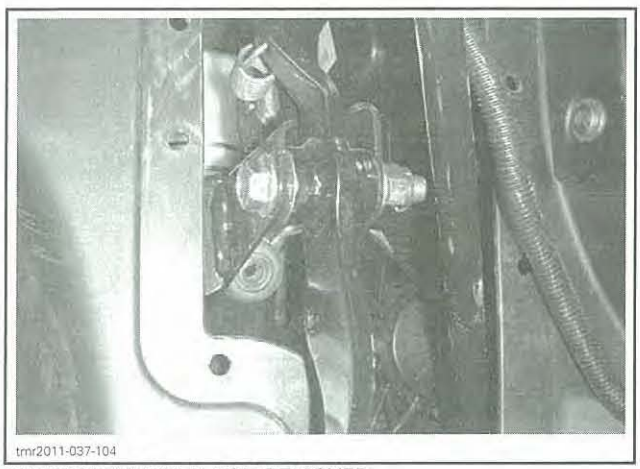
UNDERNEATH DASHBOARD
1. Protective rubber

6. Disconnect master cylinder rod from brake pedal.



1. Master cylinder rod

7. Remove master cylinder rod from master cylinder.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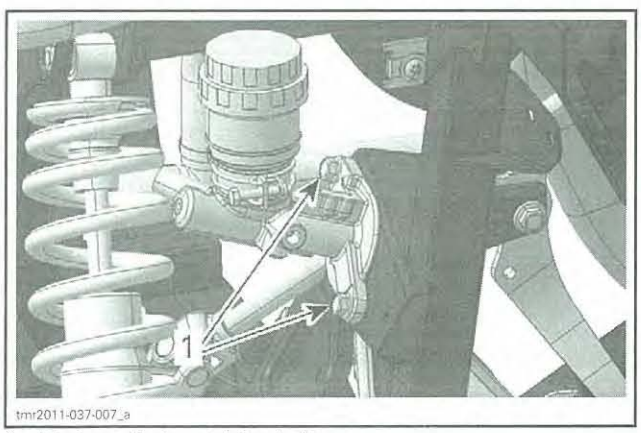
MASTER CYLINDER ROD REMOVED

8. Remove master cylinder retaining bolts and nuts.



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1. Master cylinder retaining bolts

9. Remove master cylinder from vehicle.

Master Cylinder Inspection

Check boot for crack.

Check rod for wear and scratch.

Check master cylinder housing for leak or damage.

Master Cylinder Installation

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

Tighten brake light switch and front brake hoses to specification.

FRONT BRAKE HOSES SCREW TORQUE
28.5 N•m ± 1.5 N•m (21 lbf•ft ± 1 lbf•ft)

BRAKE LIGHT SWITCH NUT TORQUE
19 N•m ± 3 N•m (168 lbf•**in** ± 27 lbf•**in**)

Lubricate push rod end and inside master cylinder boot.

PUSH ROD END LUBRICATION
COSMO RUBBER GREASE (P/N 293 550 055)

MASTER CYLINDER BOOT LUBRICATION
COSMO RUBBER GREASE (P/N 293 550 055)

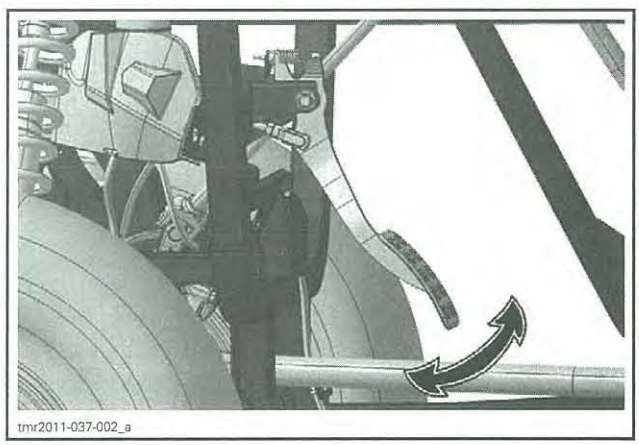
Install **NEW** sealing washers.

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

Adjust master cylinder rod, refer to *MASTER CYLINDER ROD ADJUSTMENT* in this subsection.

Master Cylinder Rod Adjustment

1. Loosen locking nut of master cylinder rod.
2. Move brake pedal up and down to check if there is a free play.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3. Rotate master cylinder rod to generate a free play according to specification.

BRAKE PEDAL FREE PLAY
3.5 mm ± 1.5 mm (1/8 in ± 1/16 in)

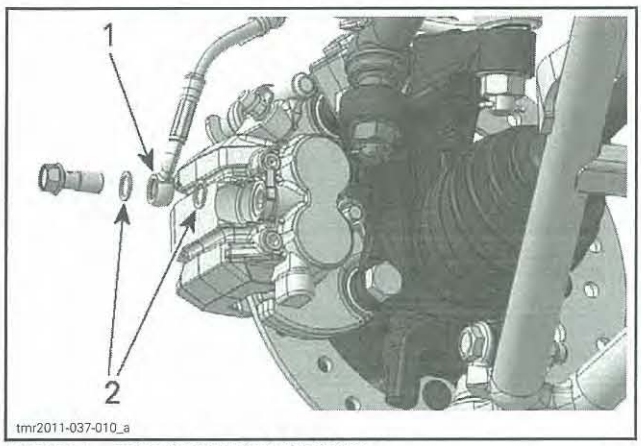
4. Tighten locking nut of master cylinder rod to specification.

ROD LOCKING NUT TORQUE
5 N•m ± 1 N•m (44 lbf•**in** ± 9 lbf•**in**)

CALIPER

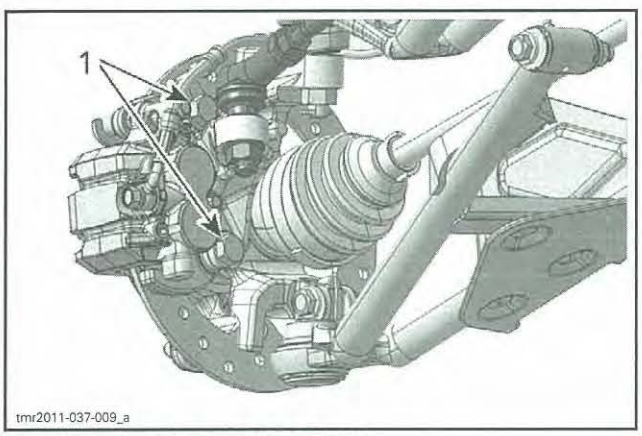
Caliper Removal

1. Safely lift and support the vehicle. Refer to *INTRODUCTION* subsection.
2. Remove wheel, refer to *WHEELS AND TIRES* subsection.
3. If caliper is removed from vehicle for replacement:
   3.1 Drain brake system, refer to *PERIODIC MAINTENANCE PROCEDURES* subsection.
   3.2 Unscrew brake hose from caliper.



TYPICAL - FRONT CALIPER SHOWN
1. Brake hose
2. Sealing washers

4. Remove fasteners retaining brake hose to knuckle.
5. Remove screws securing caliper support to knuckle.



TYPICAL - FRONT CALIPER SHOWN
1. Caliper screws

6. Place caliper assembly onto a support.

NOTICE **Do not let caliper hangs by the hose and do not stretch or twist hose.**

Caliper Installation

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

If caliper was removed for replacement:

- Refill and bleed brake system, refer to *PERIODIC MAINTENANCE PROCEDURES* subsection.
- Install **NEW** sealing washers.

Apply threadlocker on caliper retaining screws.

CALIPER RETAINING SCREWS THREADLOCKER
LOCTITE 243 (BLUE) (P/N 293 800 060)

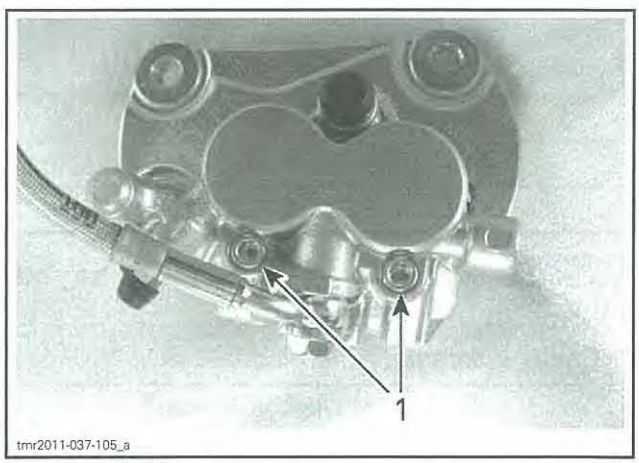
Tighten caliper retaining screws to specification.

CALIPER RETAINING SCREWS TORQUE
48 N•m ± 6 N•m (35 lbf•ft ± 4 lbf•ft)

BRAKE PADS

Brake Pads Replacement

1. Remove caliper from knuckle, refer to *CALIPER REMOVAL* in this subsection.
2. Remove brake pad pins from caliper.

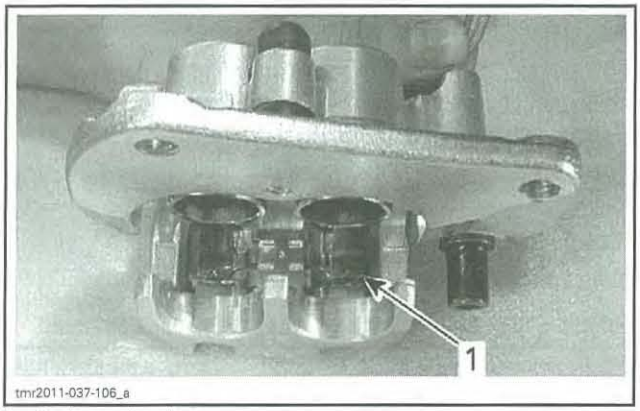


1. Brake pad pins

3. Remove brake pads.
4. Clean pistons end using XPS PARTS AND BRAKES CLEANER (P/N 219 701 705).
5. Push caliper pistons inward.

NOTE: To avoid damaging pistons, use an old pad to push it into the caliper using a C-clamp.

6. Ensure brake pad spring is properly positioned onto caliper.



1. Brake pad spring

7. Install NEW brake pads.
8. Clean then lubricate brake pad pins using an appropriate *BRAKE CALIPER SYNTHETIC GREASE*.
9. Install brake pad pins on caliper.
10. Install caliper on knuckle, refer to *CALIPER INSTALLATION* in this subsection.

BRAKE DISC

Brake Disc Inspection

1. Check disc surfaces for scratches or grooves on both sides.
2. Measure thickness of the disc.

DISC MINIMUM THICKNESS	
FRONT	4.1 mm (.161 in)
REAR	4.1 mm (.161 in)

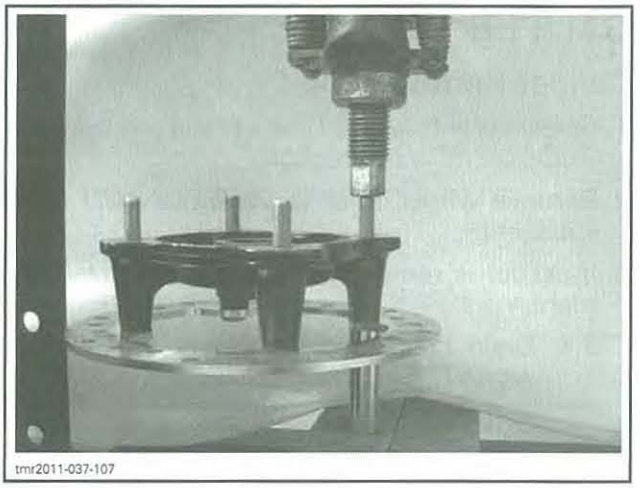
NOTICE Brake discs must never be machined.

3. Check warpage of the disc.

MAXIMUM DISC WARPAGE	
FRONT	0.2 mm (.01 in)
REAR	

Brake Disc Replacement

1. Remove caliper from knuckle, refer to *CALIPER REMOVAL* in this subsection.
2. Remove wheel hub, refer to *FRONT DRIVE* or *REAR DRIVE* subsection.
3. Remove wheel studs using a press.



4. Replace brake disc.
5. Install wheel studs using a press.
6. Align wheel stud knurling into hub grooves.

NOTE: If wheel studs are damaged, replace them.

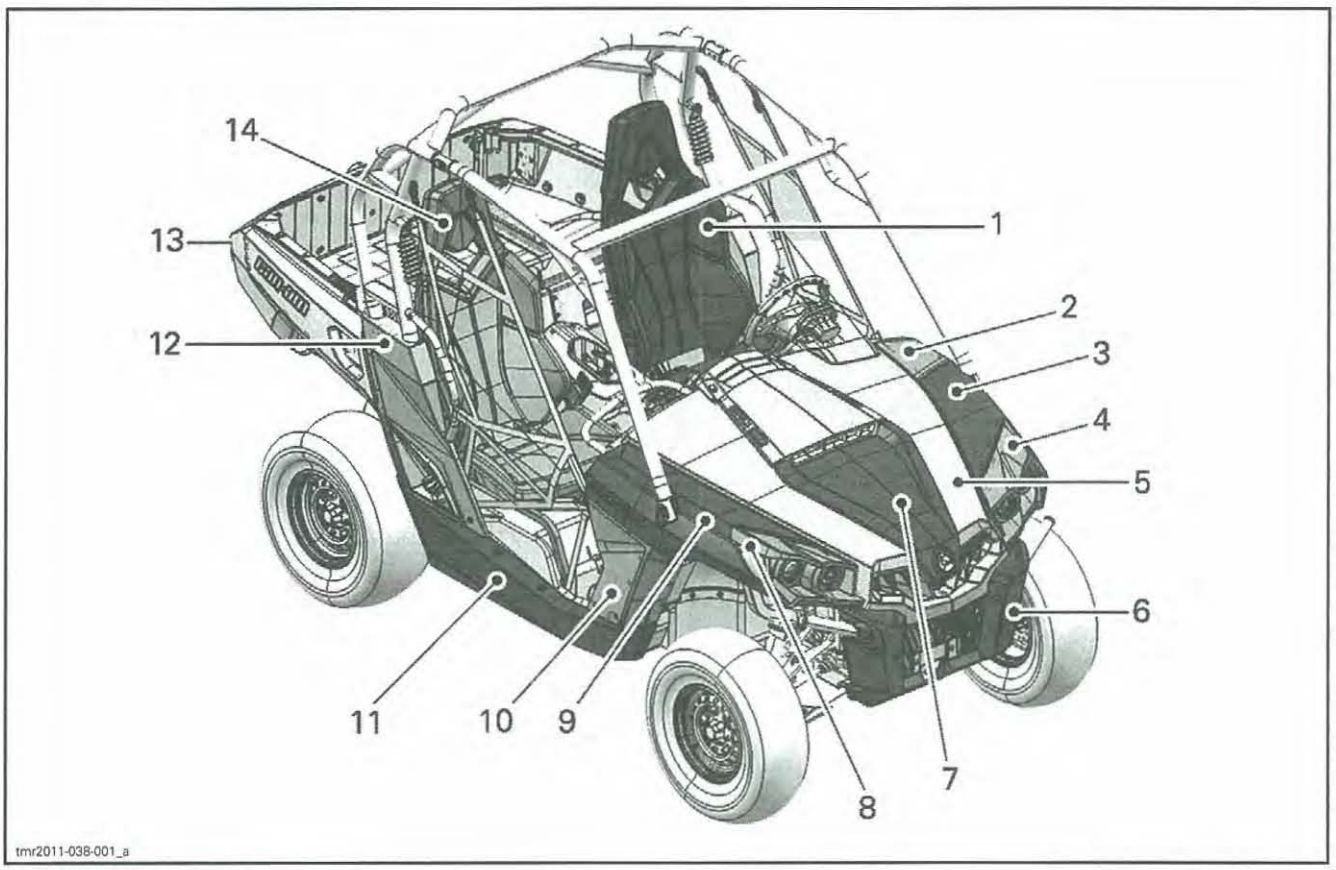
7. Install wheel hub then caliper.
8. Install NEW cotter pin to secure wheel hub nut.

BODY

SERVICE TOOLS

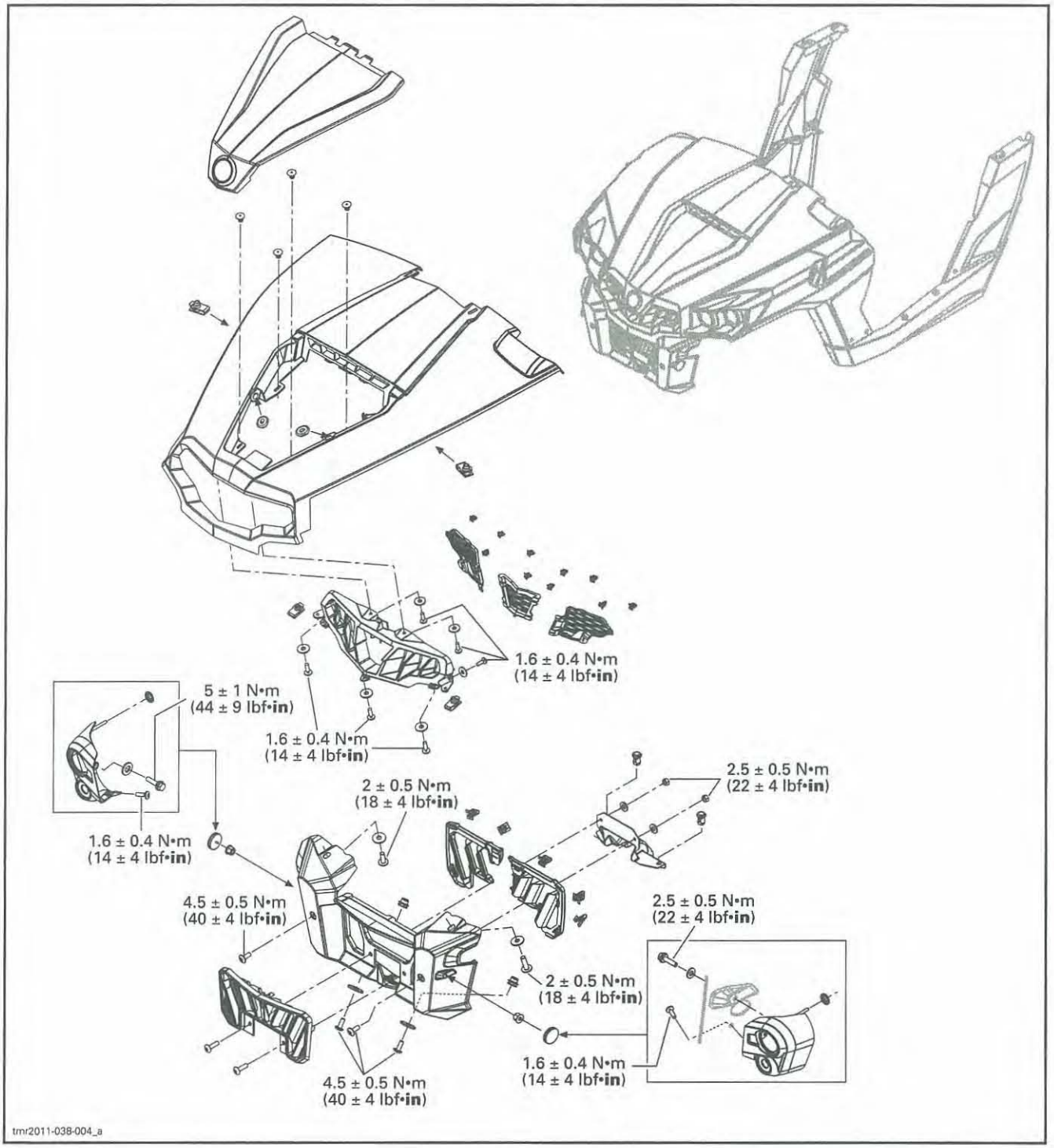
Description	Part Number	Page
OETIKER PLIERS	295 000 070	359

BODY (Parts Nomenclature)

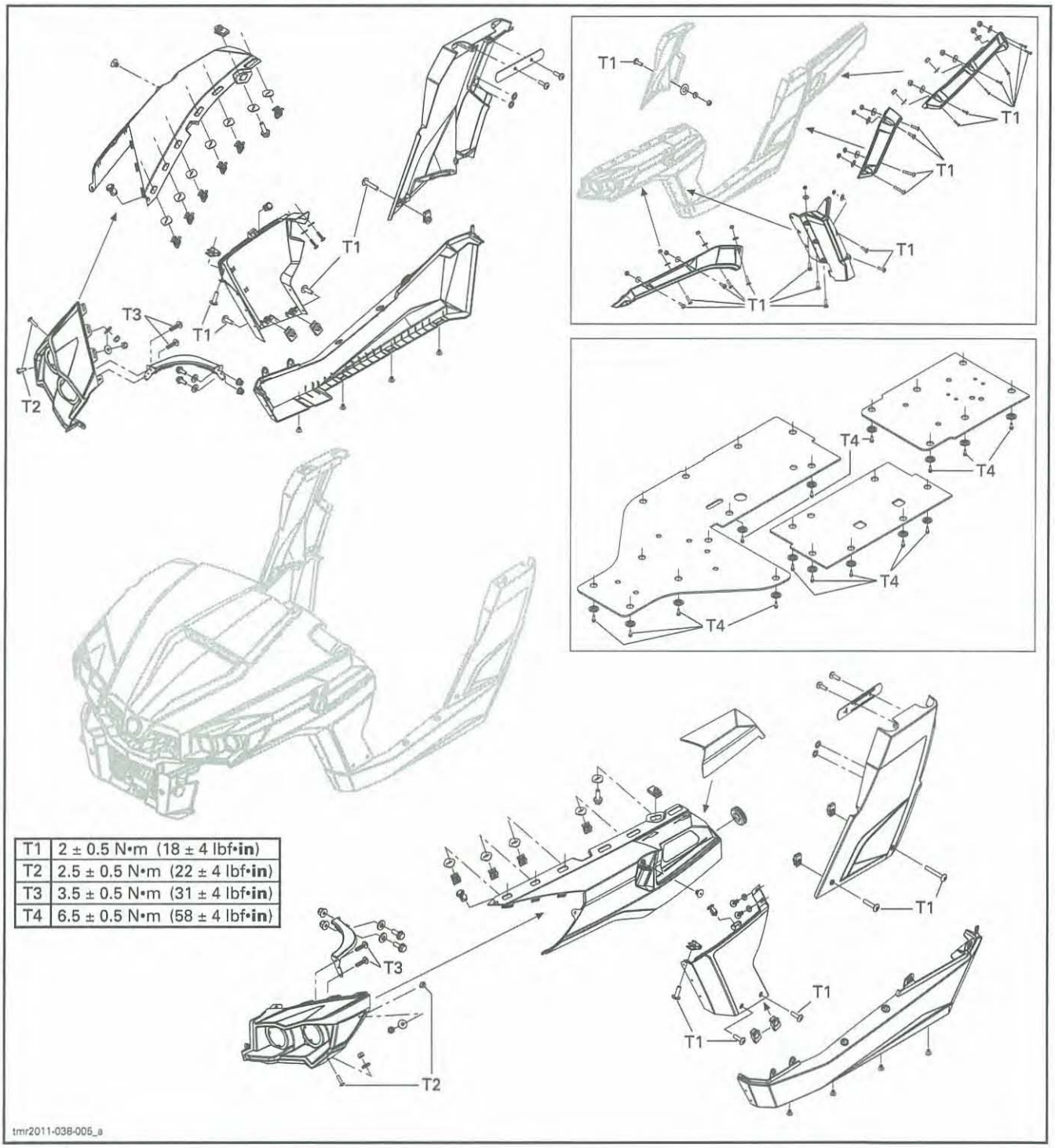


1. *Driver seat*
2. *CVT air inlet cover*
3. *LH front fender*
4. *LH headlight trim*
5. *Hood*
6. *Front fascia*
7. *Service cover*
8. *RH headlight trim*
9. *RH front fender*
10. *Front lateral panel*
11. *Central lateral panel*
12. *Rear lateral panel*
13. *Cargo box*
14. *Passenger seat*

FRONT BODY PARTS (Torques and Service Products)



SIDE BODY PARTS (Torques and Service Products)



T1	2 ± 0.5 N•m (18 ± 4 lbf•**in**)
T2	2.5 ± 0.5 N•m (22 ± 4 lbf•**in**)
T3	3.5 ± 0.5 N•m (31 ± 4 lbf•**in**)
T4	6.5 ± 0.5 N•m (58 ± 4 lbf•**in**)

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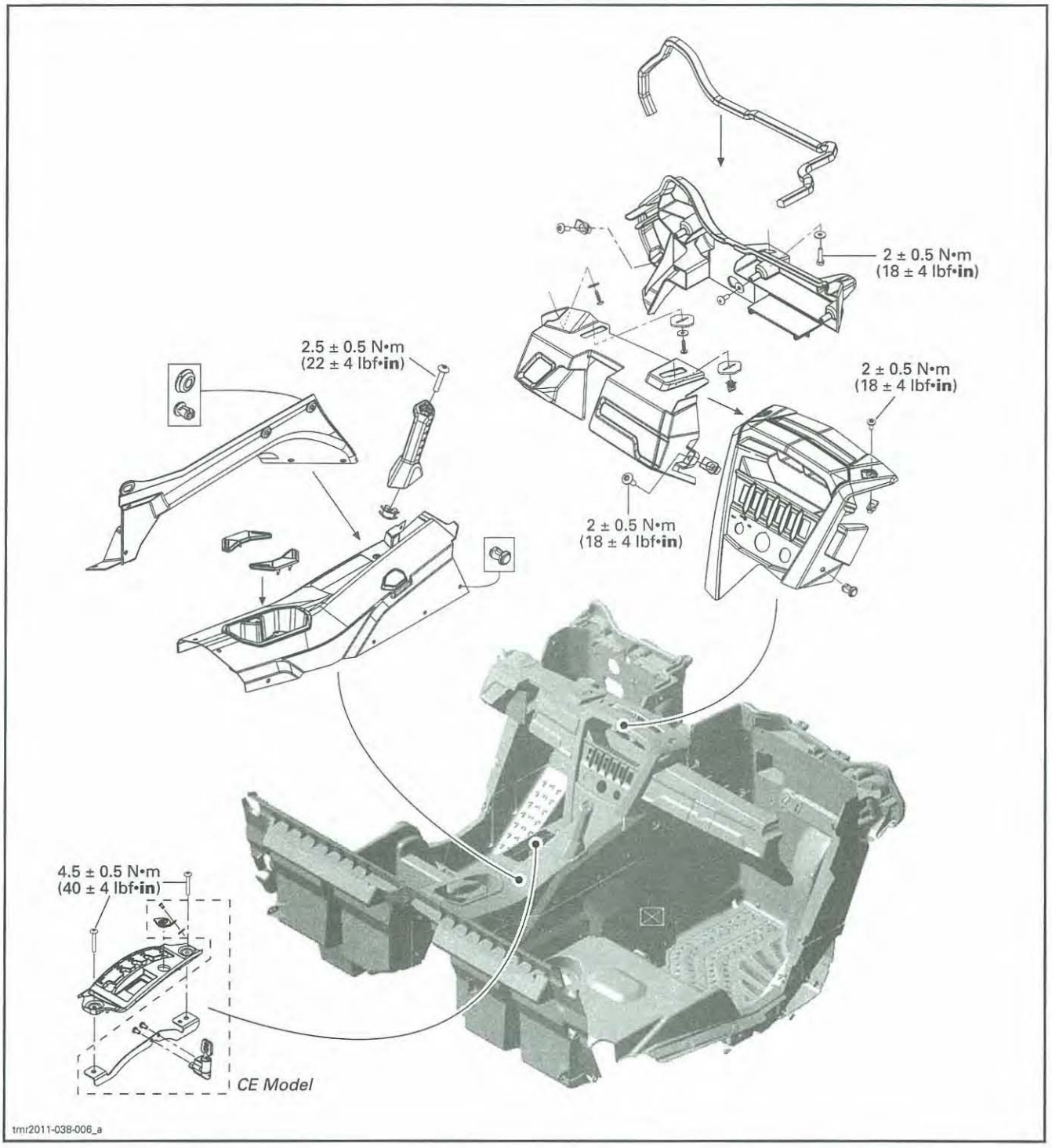
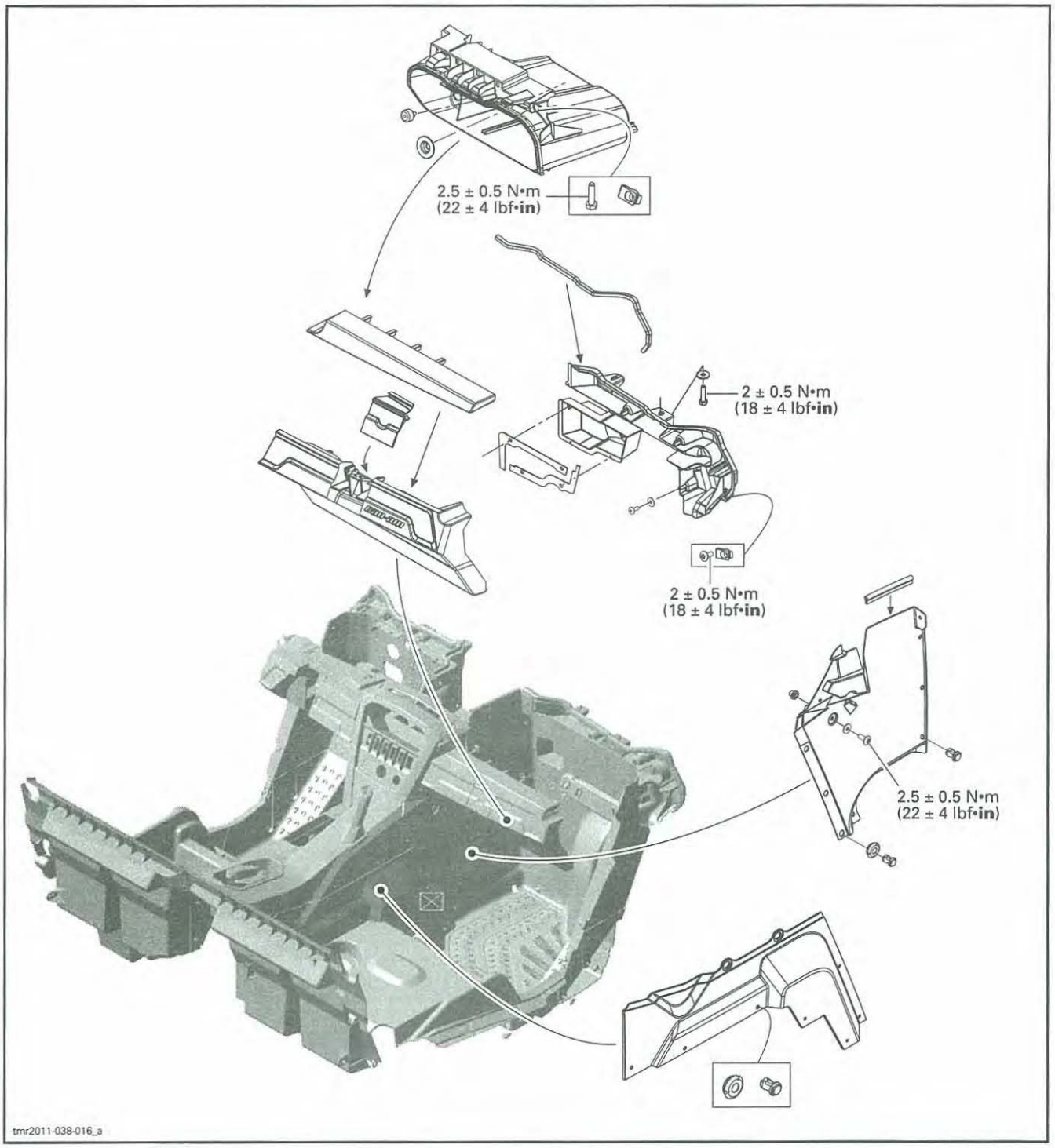
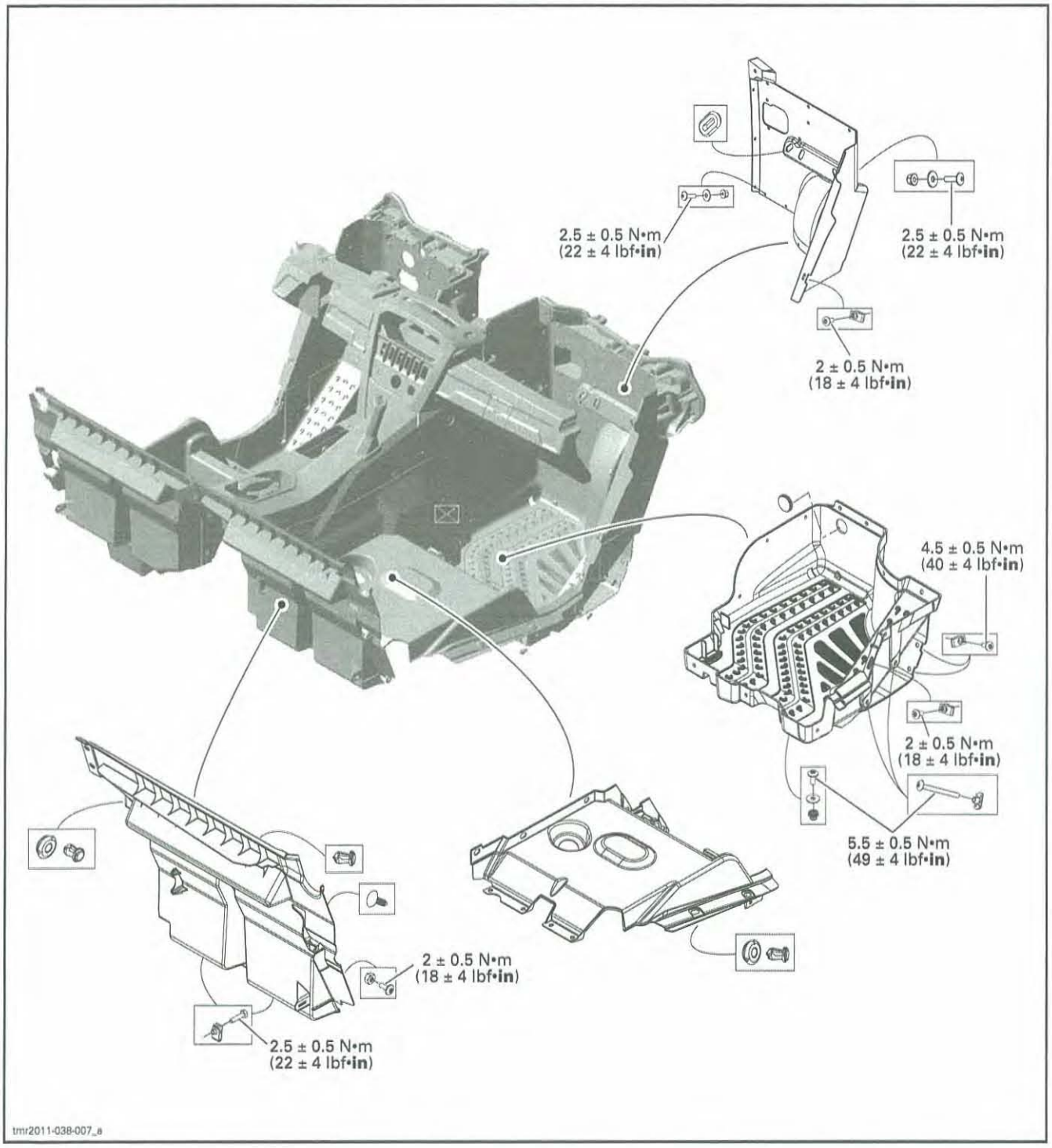
COCKPIT TRIMS – DRIVER SIDE (Torques and Service Products)



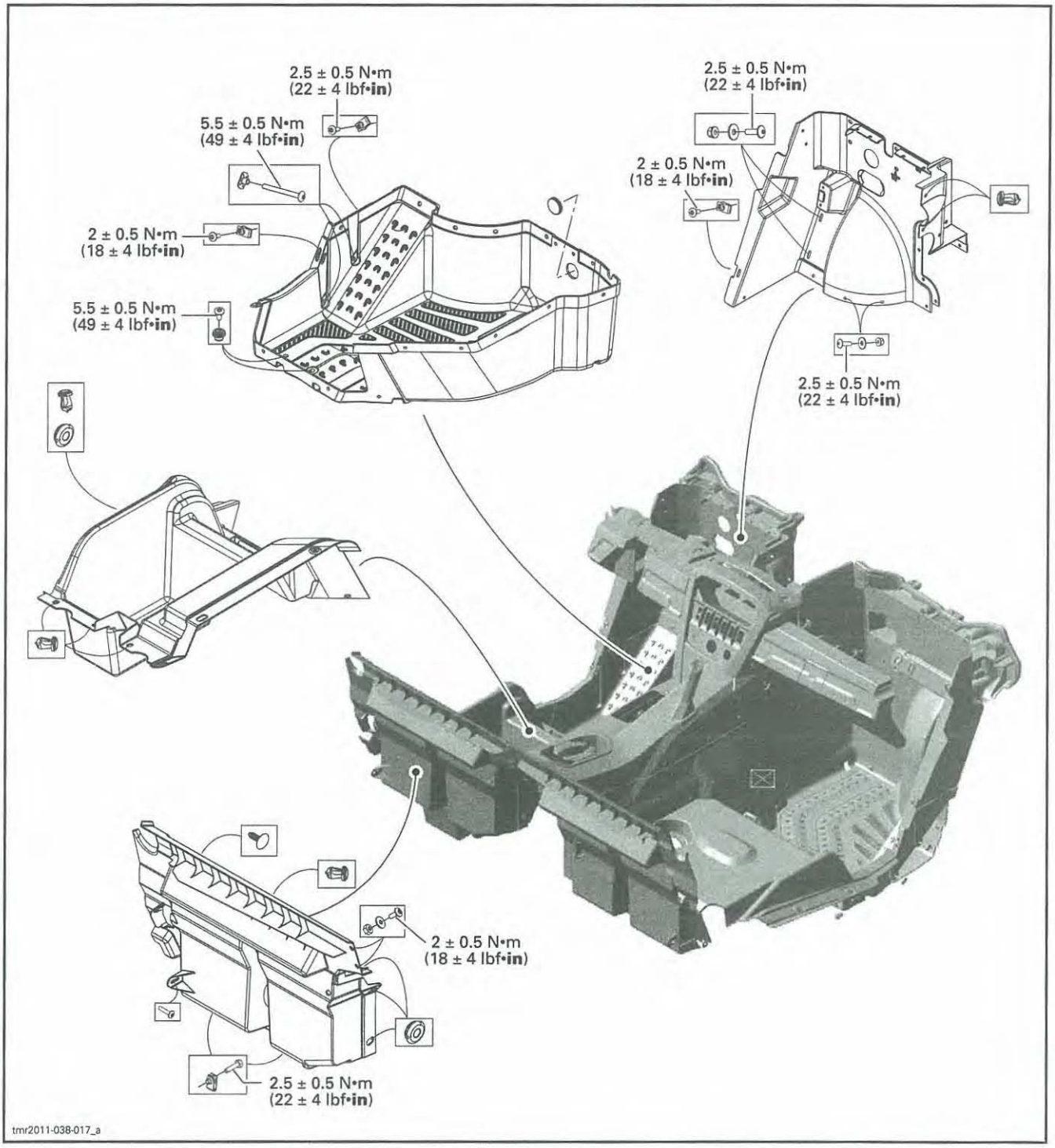
COCKPIT TRIMS – PASSENGER SIDE (Torques and Service Products)



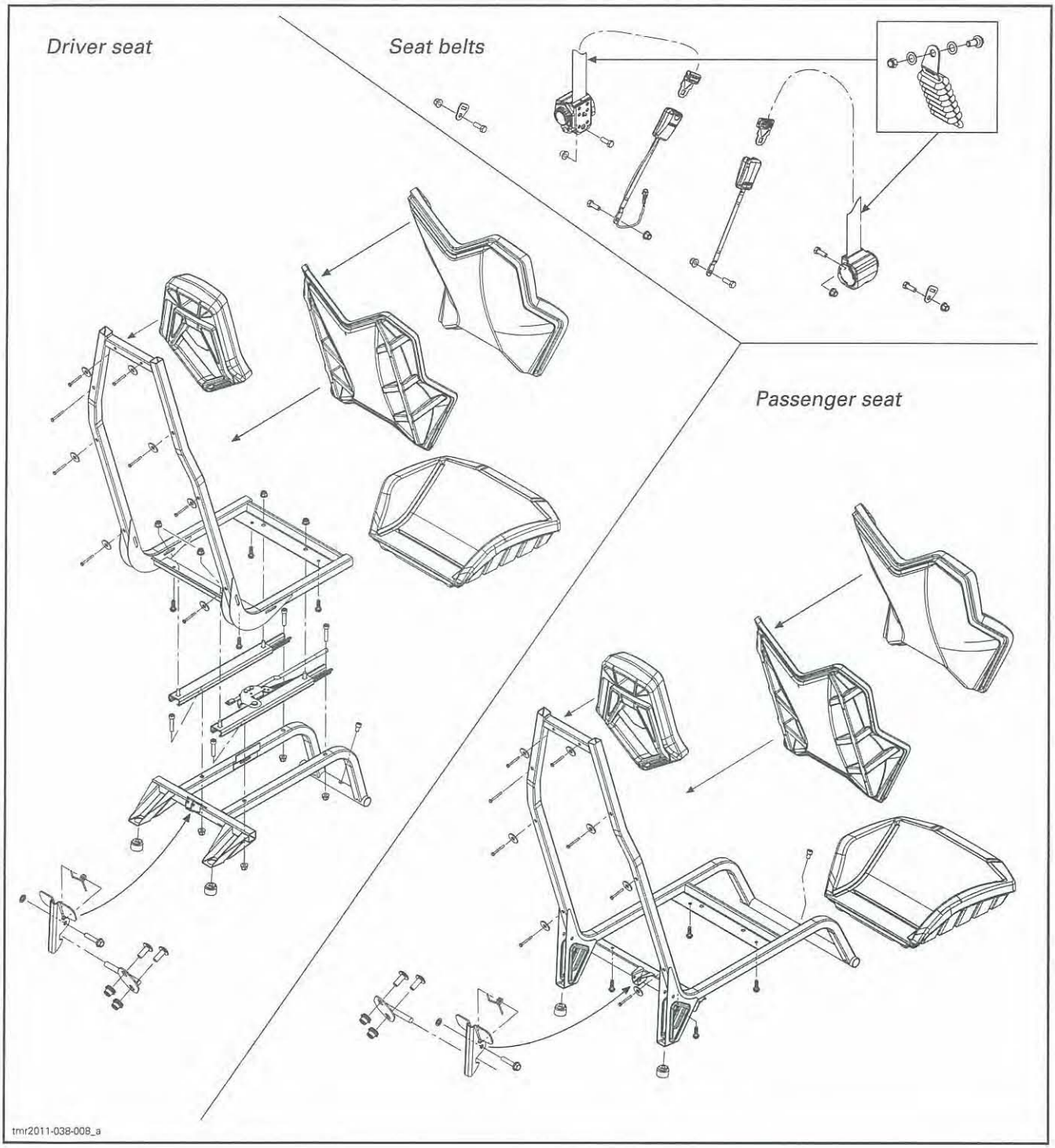
COCKPIT STRUCTURE PANELS – PASSENGER SIDE (Torques and Service Products)



COCKPIT STRUCTURE PANELS – DRIVER SIDE (Torques and Service Products)



SEATS



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

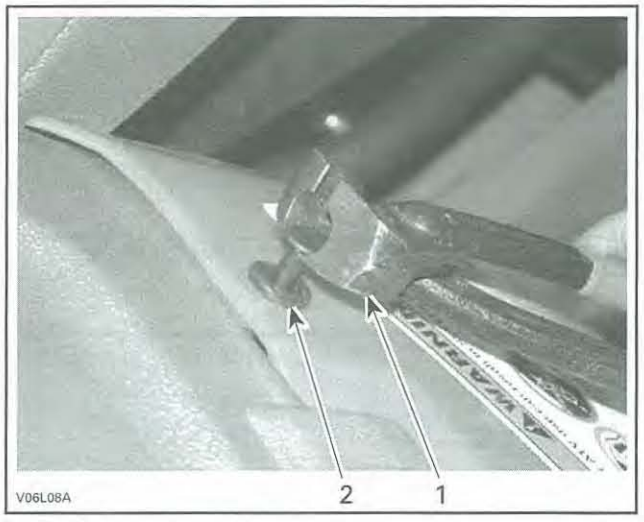
Torque wrench tightening specifications must strictly be adhered to.
Locking devices when removed (e.g.: locking tabs, elastic stop nuts, cotter pins, etc.) must be replaced.

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

PROCEDURES

PLASTIC RIVET

Plastic rivets are used in the riveting of the various body parts. Plastic rivets can be reused many times. Use the OETIKER PLIERS (P/N 295 000 070) to remove them.



TYPICAL
1. *Pliers*
2. *Plastic rivet*

DECALS

Decal Removal

Using a heat gun warm up one end of decal for a few seconds until decal can roll off when rubbing with your finger.

Pull decal slowly and when necessary apply more heat to ease removal on the area that has to be peeled off.

If decal tears while pulling off, it has to be heated for a few seconds longer. If decal tends to stretch while pulling off, stop heating and wait a few seconds to let it cool, then peel it off.

Decal Installation

Using isopropyl alcohol, clean the surface and dry thoroughly.

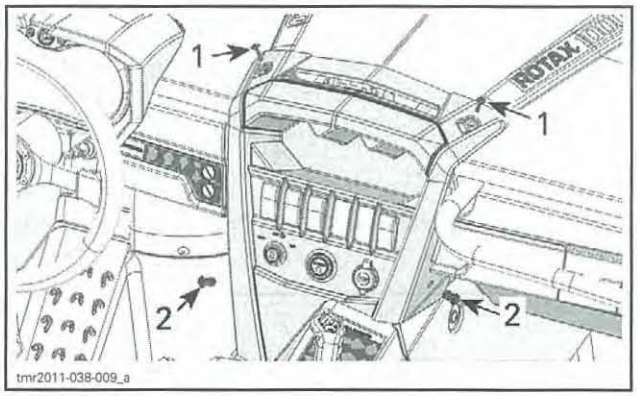
Apply liquid soap to new decal and carefully position it. Using a sponge or a squeegee, remove the air bubbles and surplus water working from the center toward the edges. Allow to air dry.

NOTICE **Do not apply isopropyl alcohol or solvent directly on decals. Use these products in a well ventilated area.**

UPPER CONSOLE

Upper Console Removal and Installation

1. Remove:
   - Screws
   - Plastic rivets.



1. *Top screws*
2. *Plastic rivets*

2. Pull out the upper console and disconnect electrical connectors.
3. Remove the upper console.

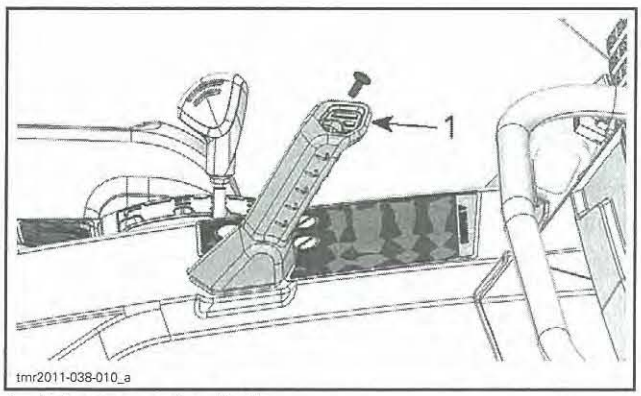
The installation is the reverse of the removal procedure.

LOWER CONSOLE

Lower Console Removal and Installation

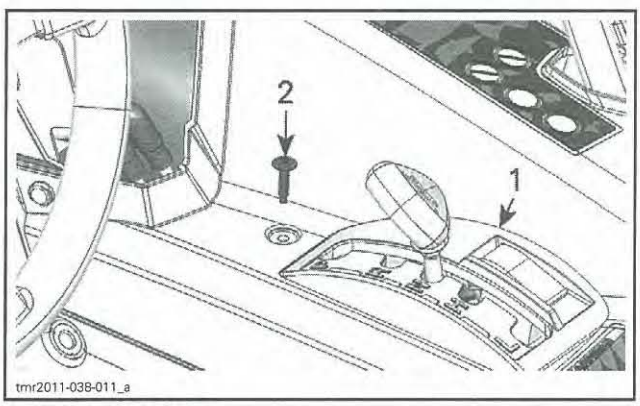
1. Remove both seats.

2. Remove screws and plastic rivets securing the upper console and place it on the hood.
3. Remove the LH passenger handhold screw.



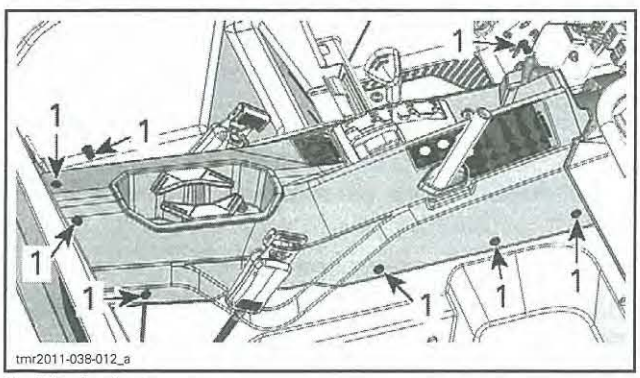
1. LH passenger handhold

4. Remove the front screw of the shift lever indicator.



1. Shift lever indicator
2. Front retaining screw

5. Remove all plastic rivets securing the lower console.



1. Plastic rivets

6. Remove the lower console.

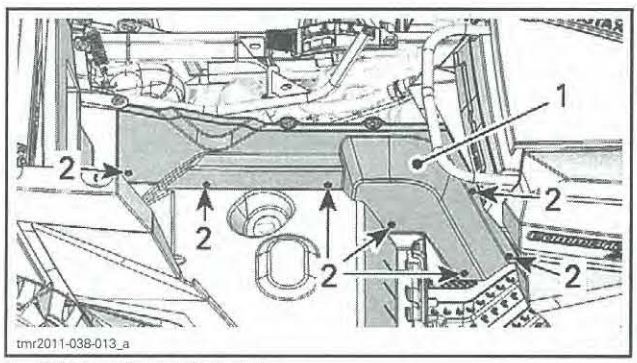
The installation is the reverse of the removal procedure.

LATERAL CONSOLE PANELS

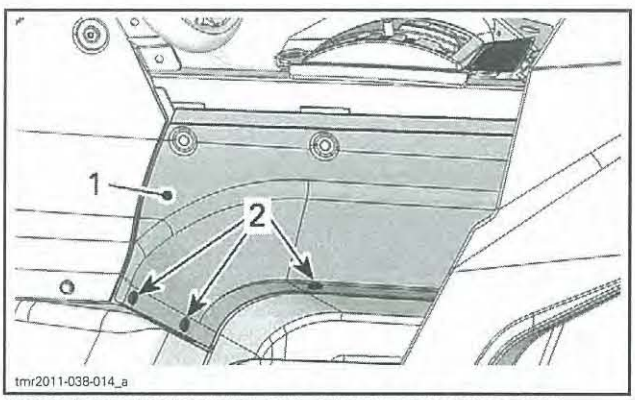
Lateral Console Panels Removal and Installation

1. Remove seat.
2. Remove plastic rivets securing the lateral console panel.
3. Remove the lateral console panel.

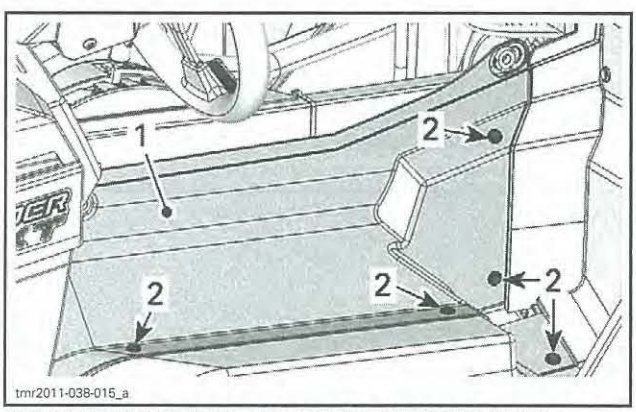
NOTE: On following illustrations, the cage and the side net are removed for clarity purpose.



1. RH lateral console panel
2. Plastic rivets



FRONT PORTION OF THE LH LATERAL CONSOLE PANEL
1. LH lateral console panel
2. Plastic rivets

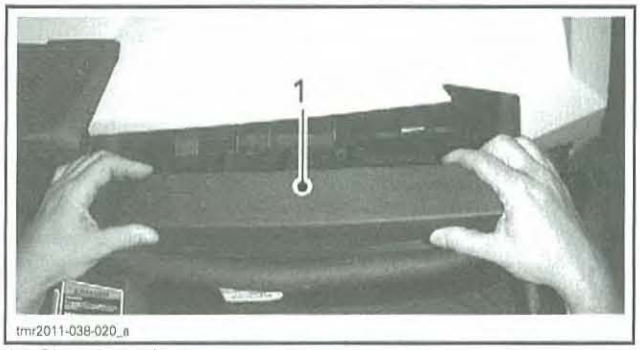


REAR PORTION OF THE LH LATERAL CONSOLE PANEL
1. LH lateral console panel
2. Plastic rivets

The installation of the lateral console panels is the reverse of the removal procedure.

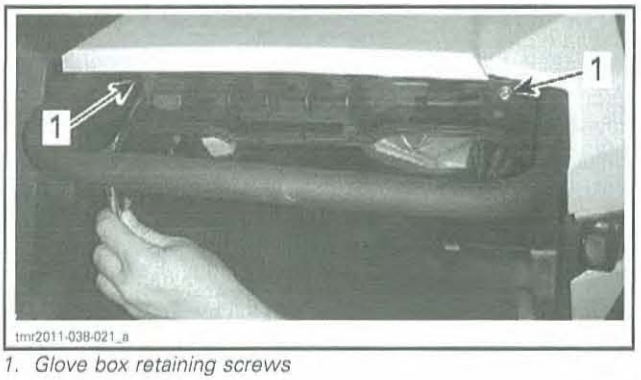
GLOVE BOX REMOVAL AND INSTALLATION

1. Remove the glove box trim.



1. Glove box trim

2. Remove glove box retaining screws.



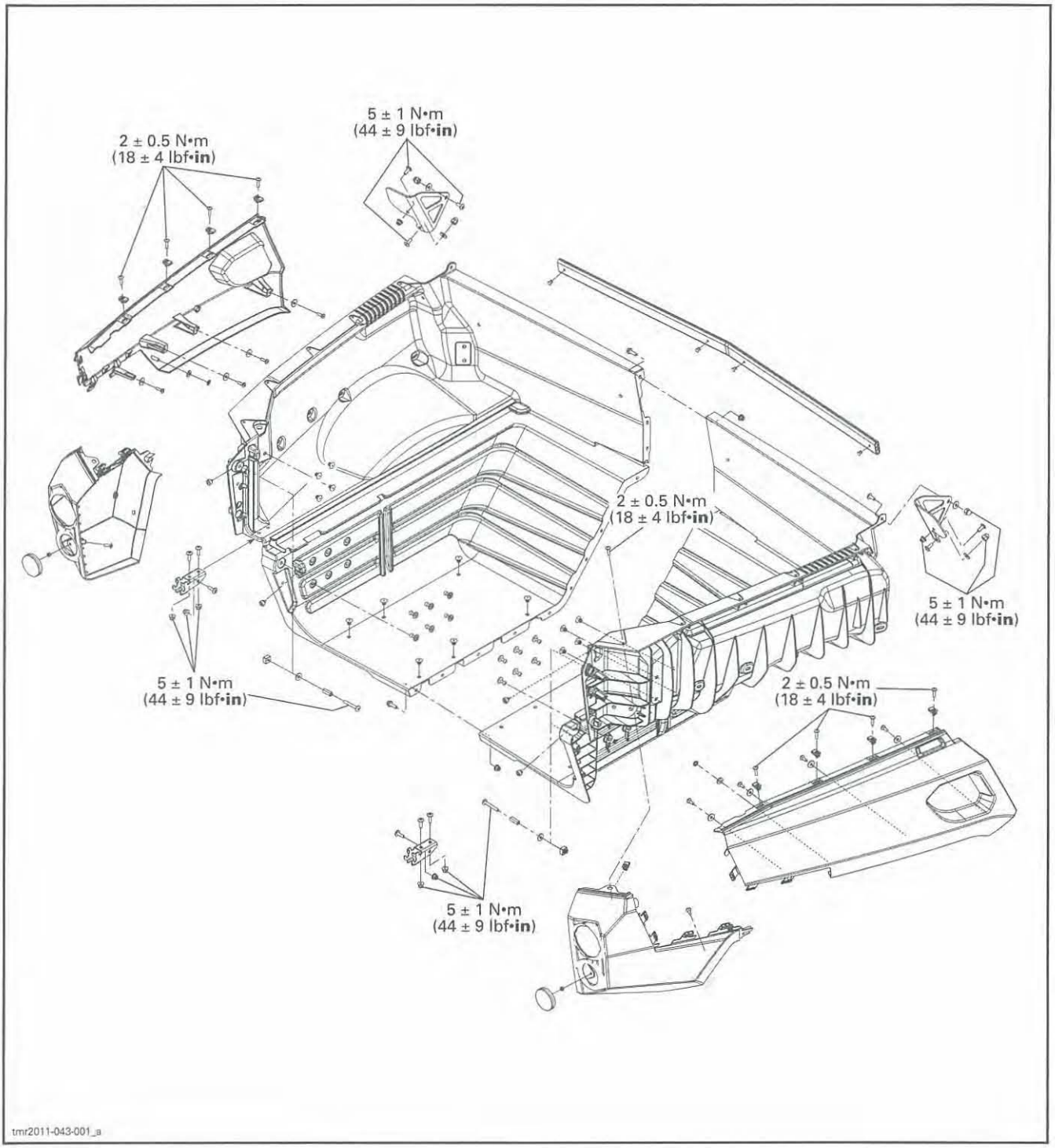
1. Glove box retaining screws

3. Pull glove box to remove it.

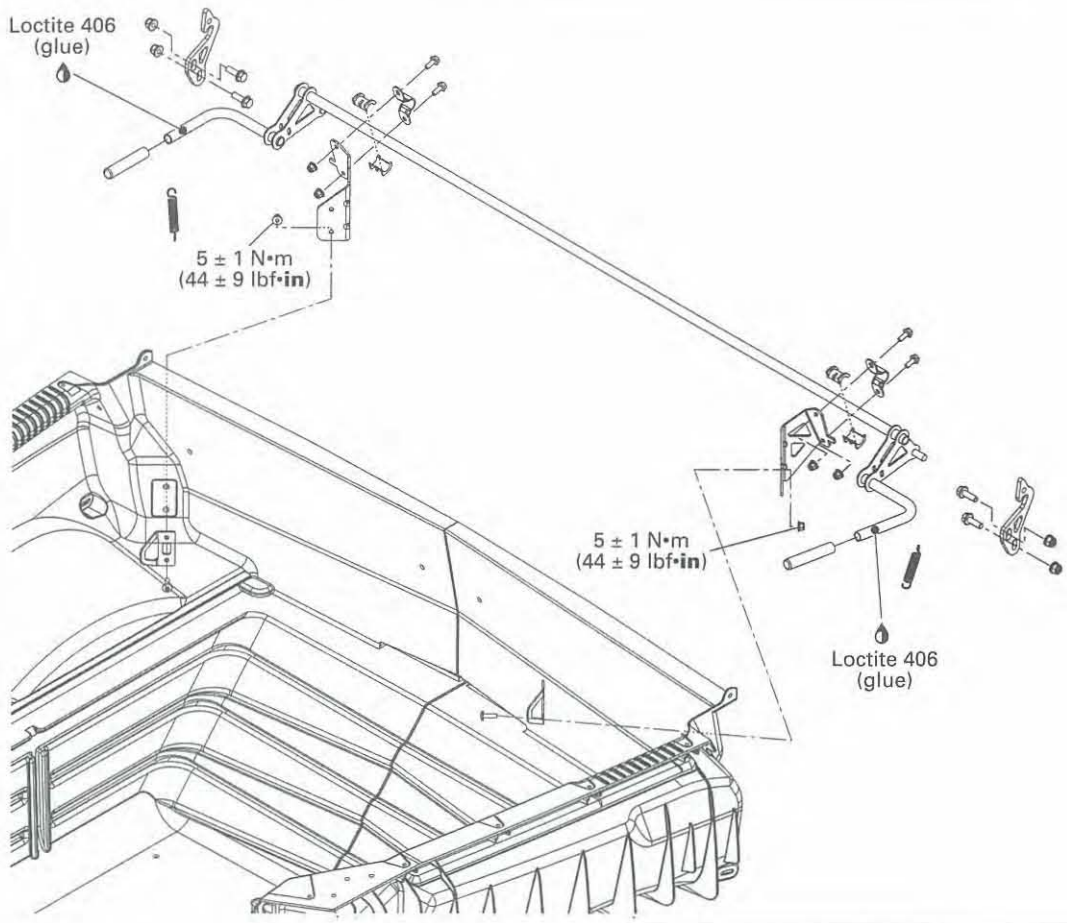
The installation of the glove box is the reverse of the removal procedure.

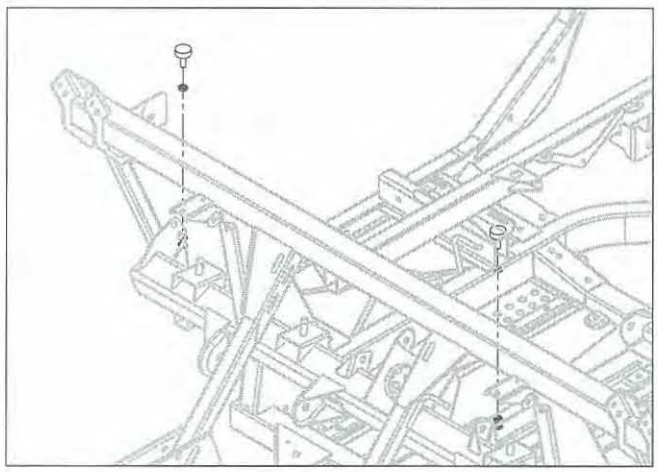
CARGO BOX

CARGO BOX TRIMS



CARGO BOX TILT RELEASE MECHANISM





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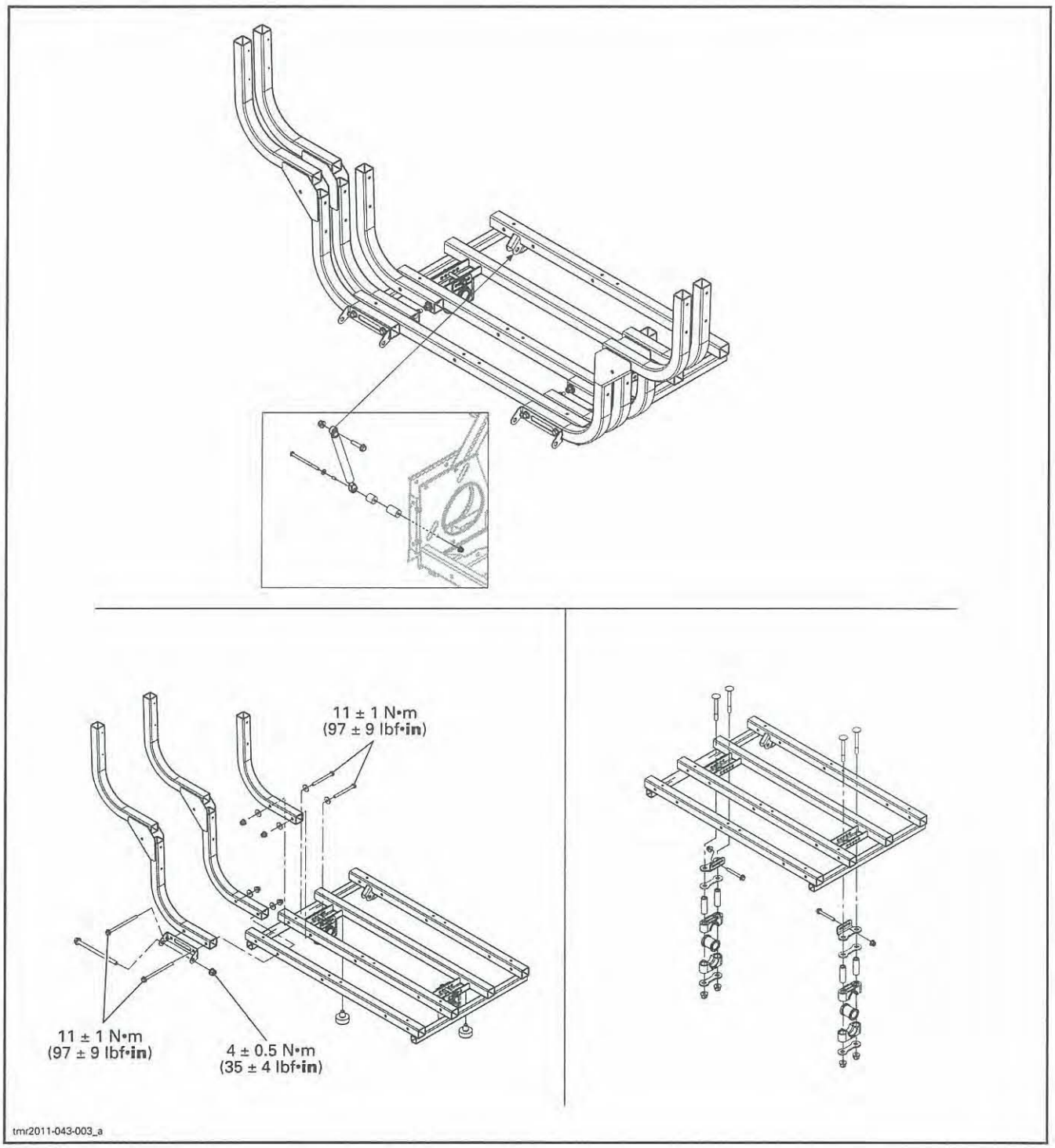
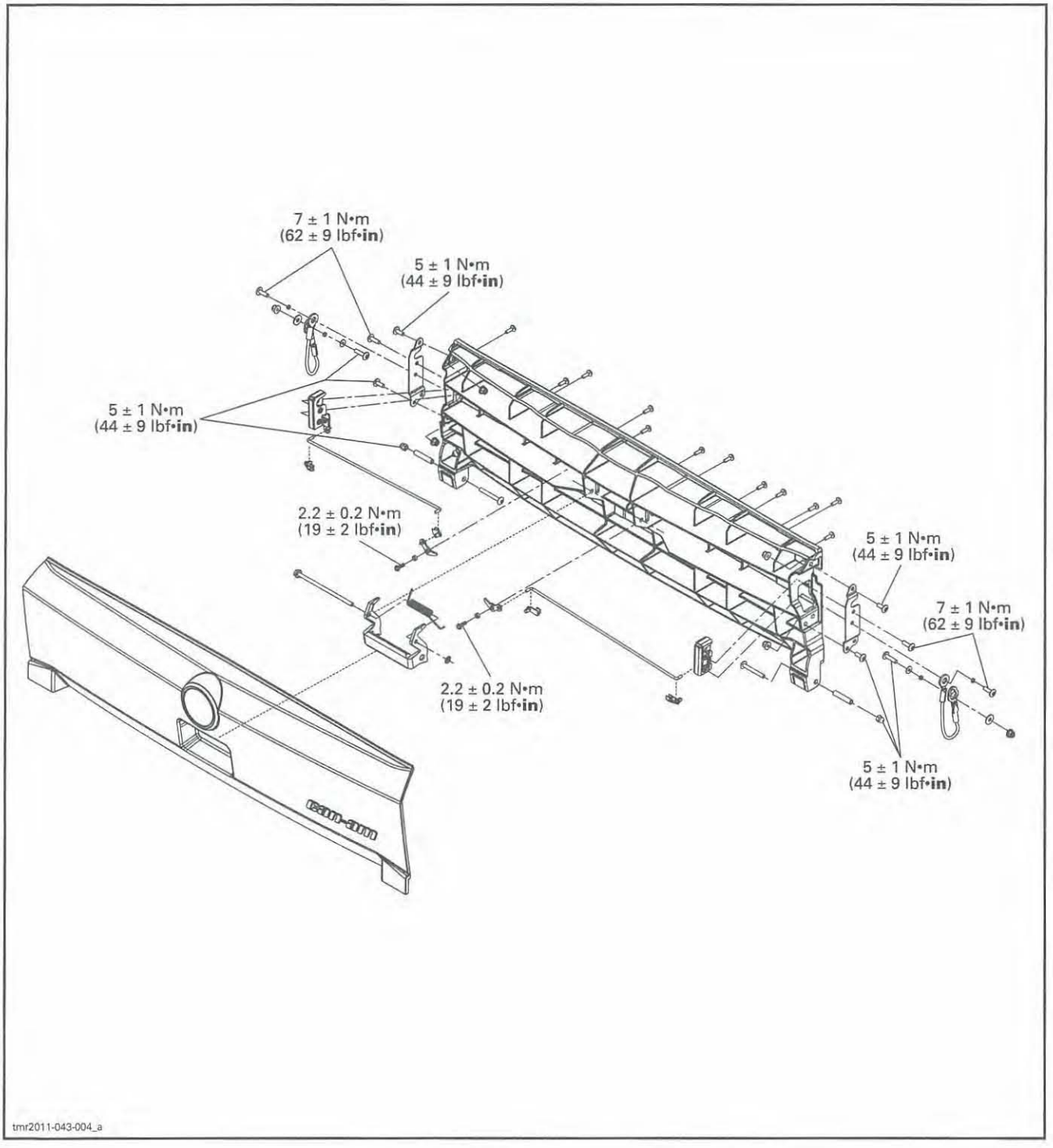
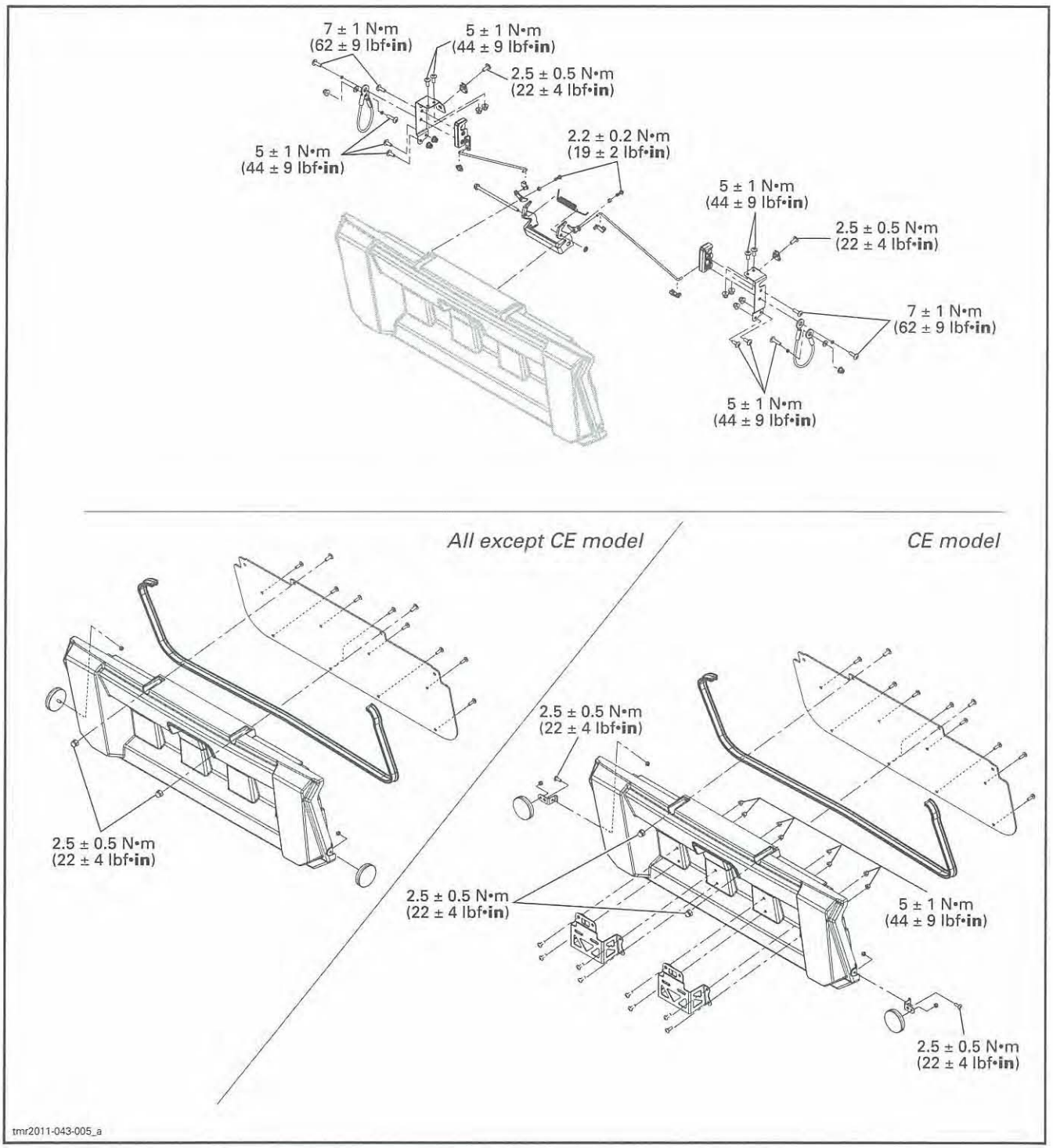
CARGO BOX SUPPORT



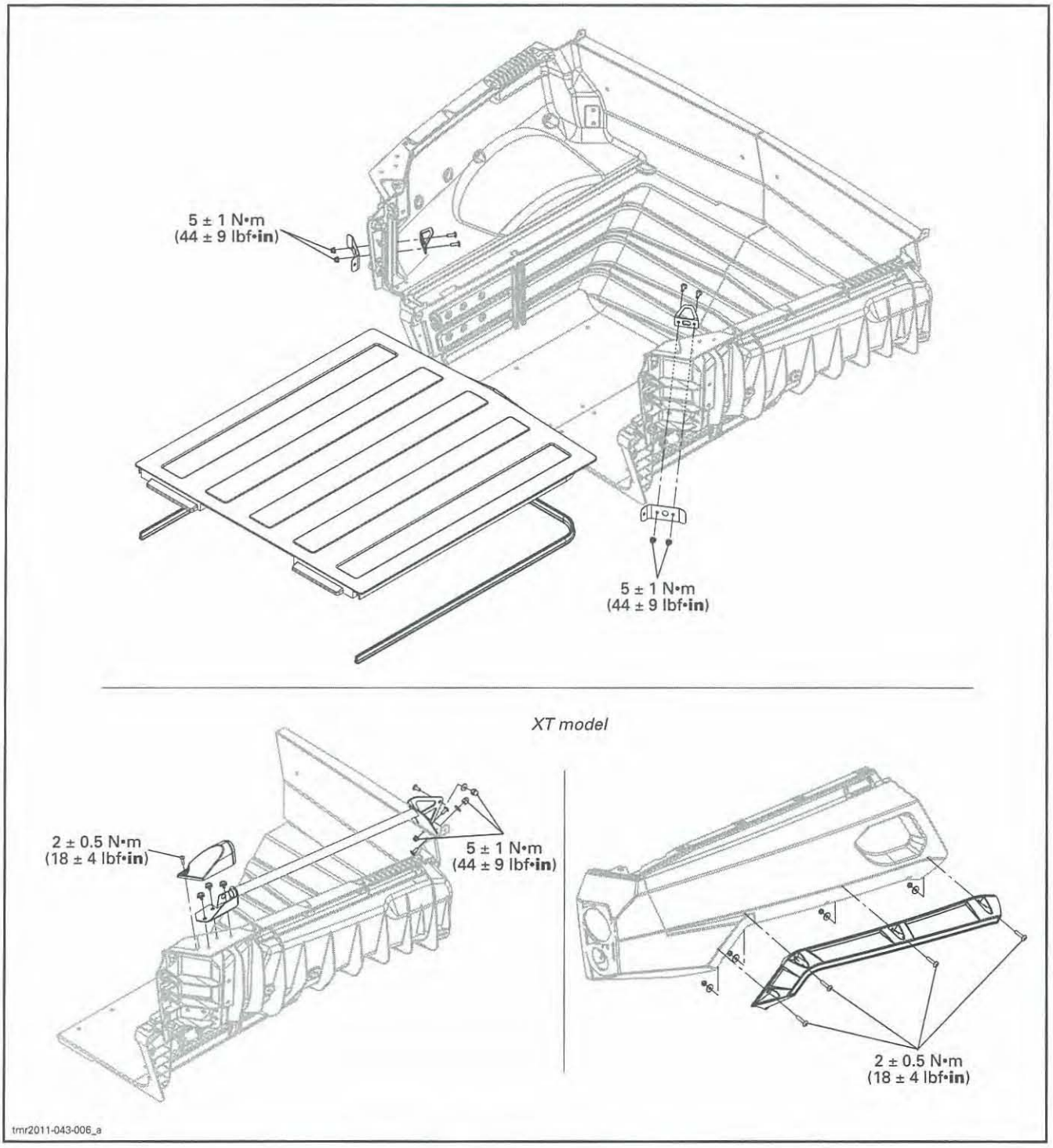
UPPER TAIL GATE



LOWER TAIL GATE



CARGO BOX ACCESSORIES



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

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

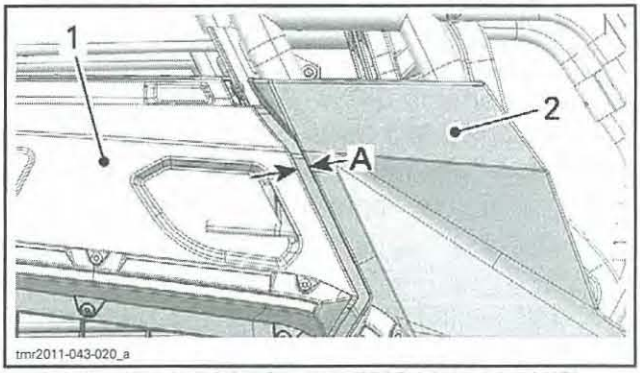
ADJUSTMENT

CARGO BOX ADJUSTMENTS

Cargo Box Alignment

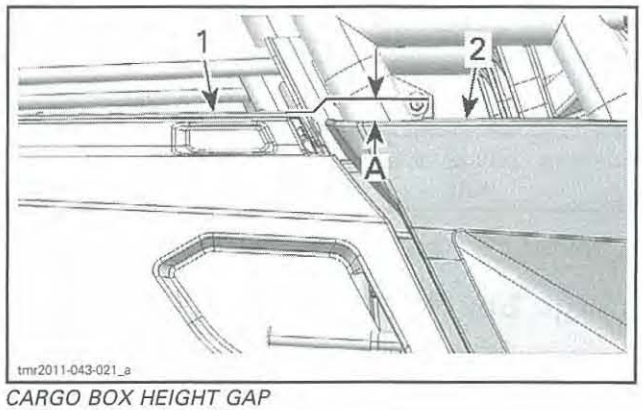
The cargo box is properly aligned when:

- The gap between the cargo box and rear lateral panel is equalled on each side (± 19 mm (3/4 in)).
- Cargo box side and rear lateral panel are flushed. The top of cargo box side may be raised for a maximum of 6 mm (15/64 in) over the top of rear lateral panel.



GAP BETWEEN CARGO BOX AND REAR LATERAL PANEL
1. *Cargo box side*
2. *Rear lateral panel*

A. Approximately 19 mm (3/4 in)

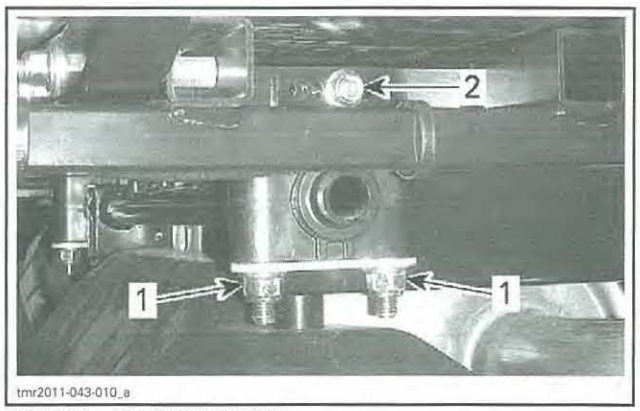


CARGO BOX HEIGHT GAP
1. *Top of cargo box side*
2. *Top of rear lateral panel*

A. Maximum of 6 mm (15/64 in)

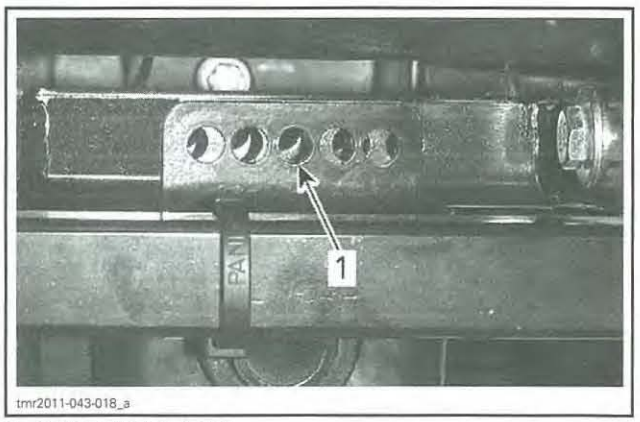
If an adjustment is required, proceed as follows:

1. Loosen cargo box pivot point nuts.
2. Remove adjuster bolts securing the cargo box to cargo box support adjuster.



TYPICAL – RH SIDE SHOWN
1. *Cargo box pivot point nuts*
2. *Adjuster bolt*

3. Position cargo box to align it as described above.
4. Reinstall adjuster bolts in corresponding holes.



1. *Corresponding holes*

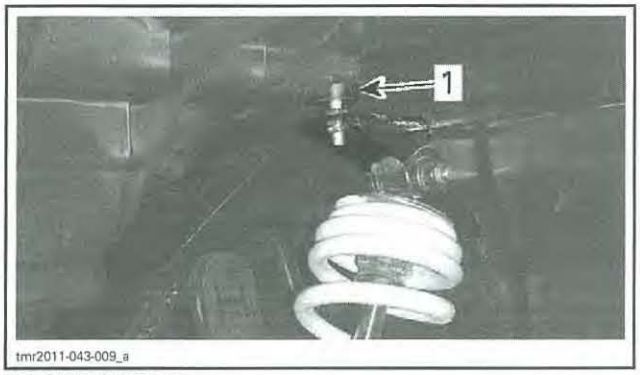
5. Tighten nuts and bolts.

PART	TORQUE
Adjuster bolts	10 N•m ± 2 N•m (89 lbf•**in** ± 18 lbf•**in**)
Cargo box pivot point nuts	24.5 N•m ± 3.5 N•m (18 lbf•ft ± 3 lbf•ft)

6. Verify the cargo box retainer height.

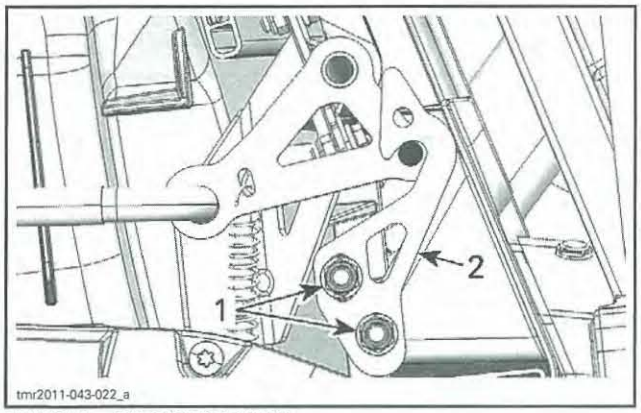
Cargo Box Retainer Height Adjustment

1. Open cargo box.
2. Loosen rubber bumpers.



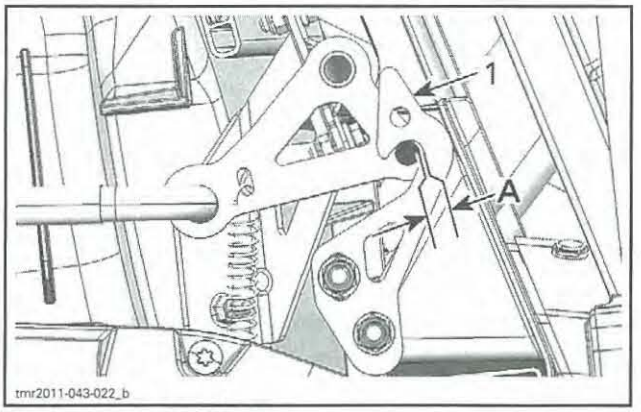
RH SIDE SHOWN
1. Rubber bumper

3. Close the cargo box and check the gap between cargo box retainer and the end of the latch lever.
   3.1 Break torque from cargo box retainer bolts.



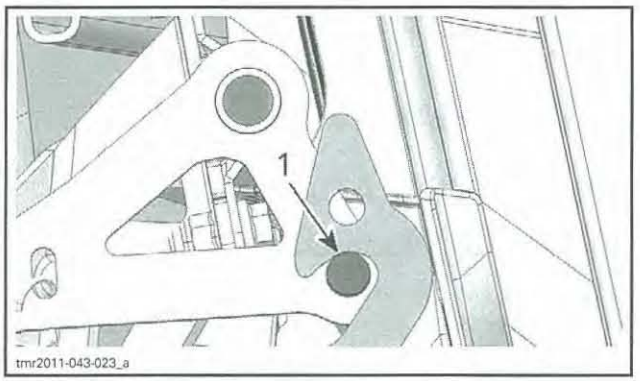
TYPICAL - RH SIDE SHOWN
1. Cargo box retainer nuts
2. Cargo box retainer

   3.2 Using a small hammer, reposition the cargo box retainer. Temporarily retighten bolts.
   3.3 Close the cargo box and check the cargo box retainer gap.



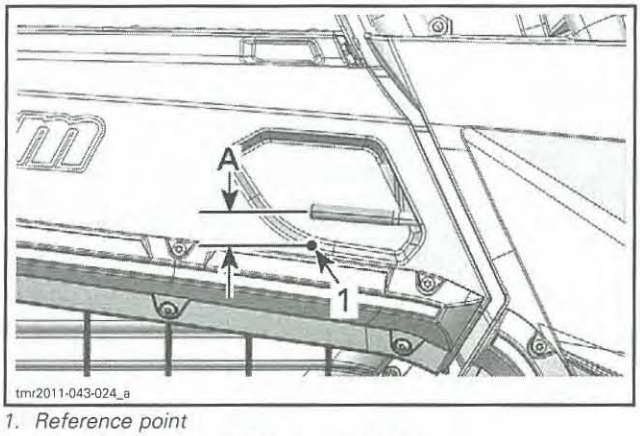
CARGO BOX RETAINER GAP
1. Cargo box retainer
A. 1.5 mm to 3.0 mm (.059 in to .118 in)

NOTE: No vertical gap is permitted between cargo box retainer and the end of the latch lever.



1. No gap here

4. Check the tilt release handle stroke.
   4.1 Determine a reference point on the body.
   4.2 With the cargo box unlatch, measure the distance between the handle and your reference point.
   4.3 Latch the cargo box and repeat the measurement using same reference points (handle and body).
   4.4 The difference between measurements should be approximately 2 mm (.079 in).

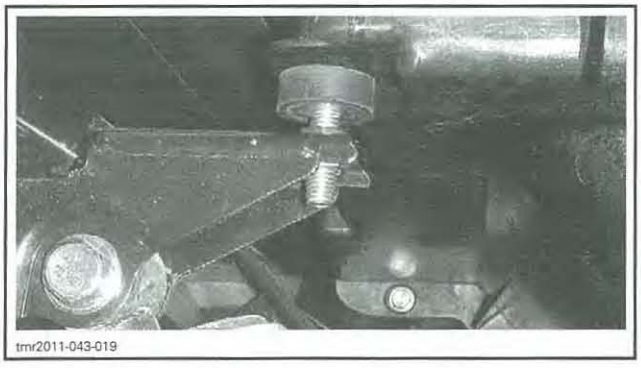


1. Reference point
A. Difference: approximately 2 mm (.079 in)

5. Repeat steps 3 and 4 until cargo box is properly adjusted.
6. Retighten all cargo box retainer bolts.

PART	TORQUE
Cargo box retainer bolts	24.5 N•m ± 3.5 N•m (18 lbf•ft ± 3 lbf•ft)

7. Reposition the rubber bumper against the cargo box without any pressure.



PROCEDURES

CARGO BOX GAS SHOCK

Cargo Box Gas Shock Replacement

1. Unlock and raise the cargo box.
2. Secure the cargo box with wooden blocks (or an equivalent).
3. Remove the upper and lower gas shock bolts.
4. Remove gas shock from vehicle and install the new one.
5. Remove supports and lower cargo box.

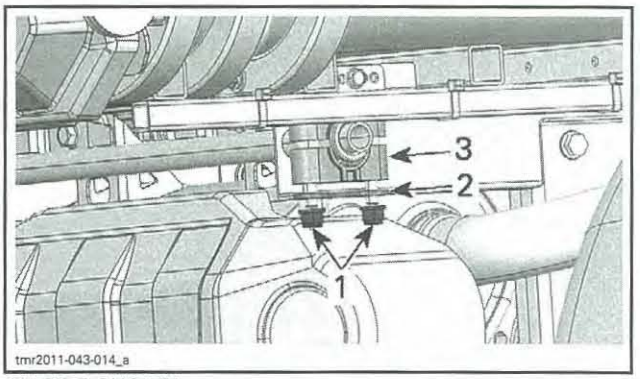
CARGO BOX

Cargo Box Removal

1. Unlock and raise the cargo box.
2. Unplug the cargo box harness connector.

1. Cargo box harness connector

3. From the LH of vehicle, cut all locking ties securing harness to frame.
4. Secure the cargo box with wooden blocks (or an equivalent) and remove the upper gas shock bolt.
5. Remove supports and lower cargo box.
6. From underneath of cargo box, remove nuts, support plates and halve housings.



RH SIDE SHOWN
1. Nuts
2. Support plate
3. Half housing

7. Unlock the cargo box.
8. Using a hoist or with the help of another person, remove the cargo box.

⚠ CAUTION To avoid injury or vehicle damages, never handle the cargo box alone.

Cargo Box Installation

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

If any parts of the locking mechanism have been replaced or loosen, check cargo box adjustments. Refer to *CARGO BOX ADJUSTMENTS*.

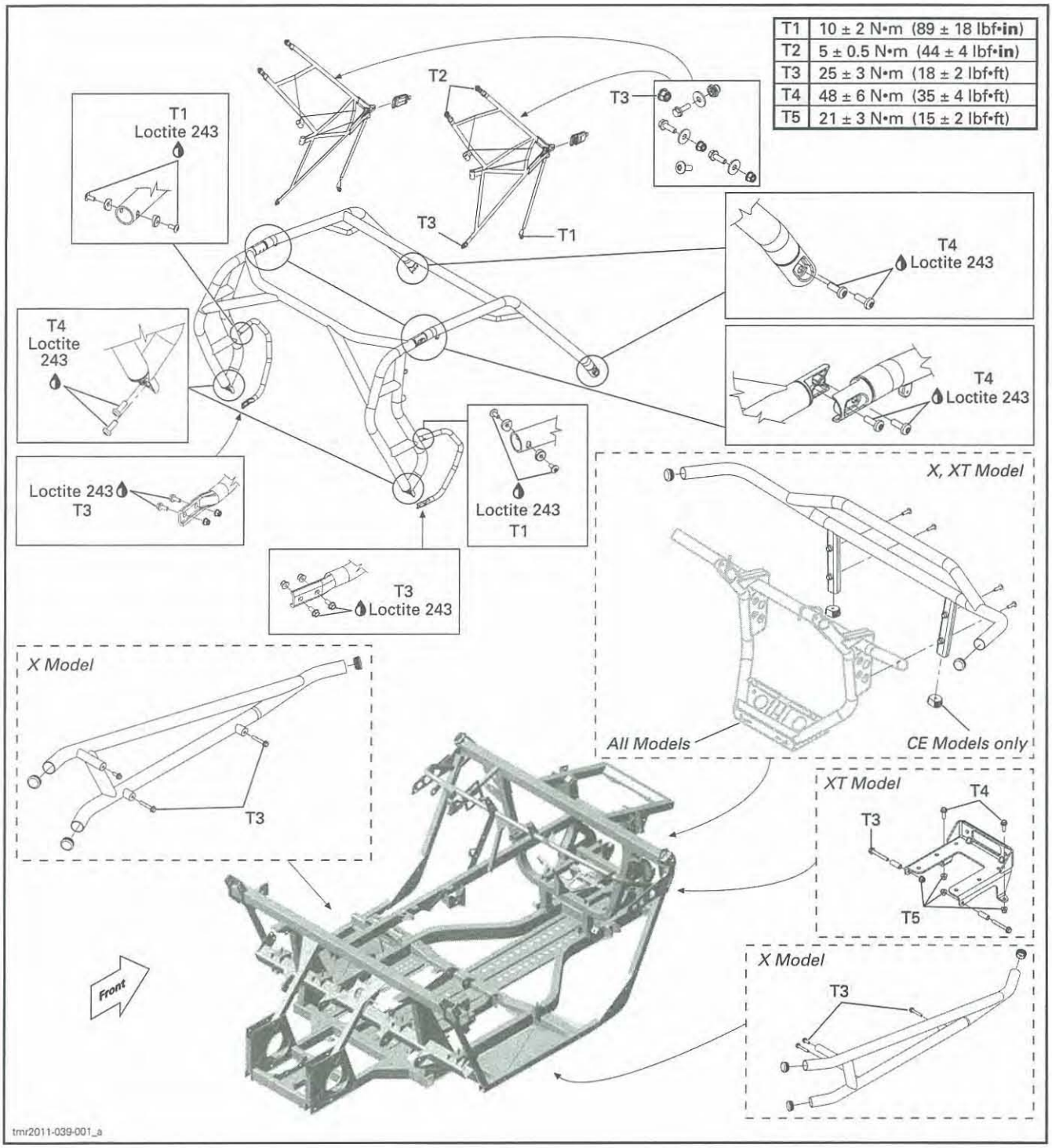
FRAME

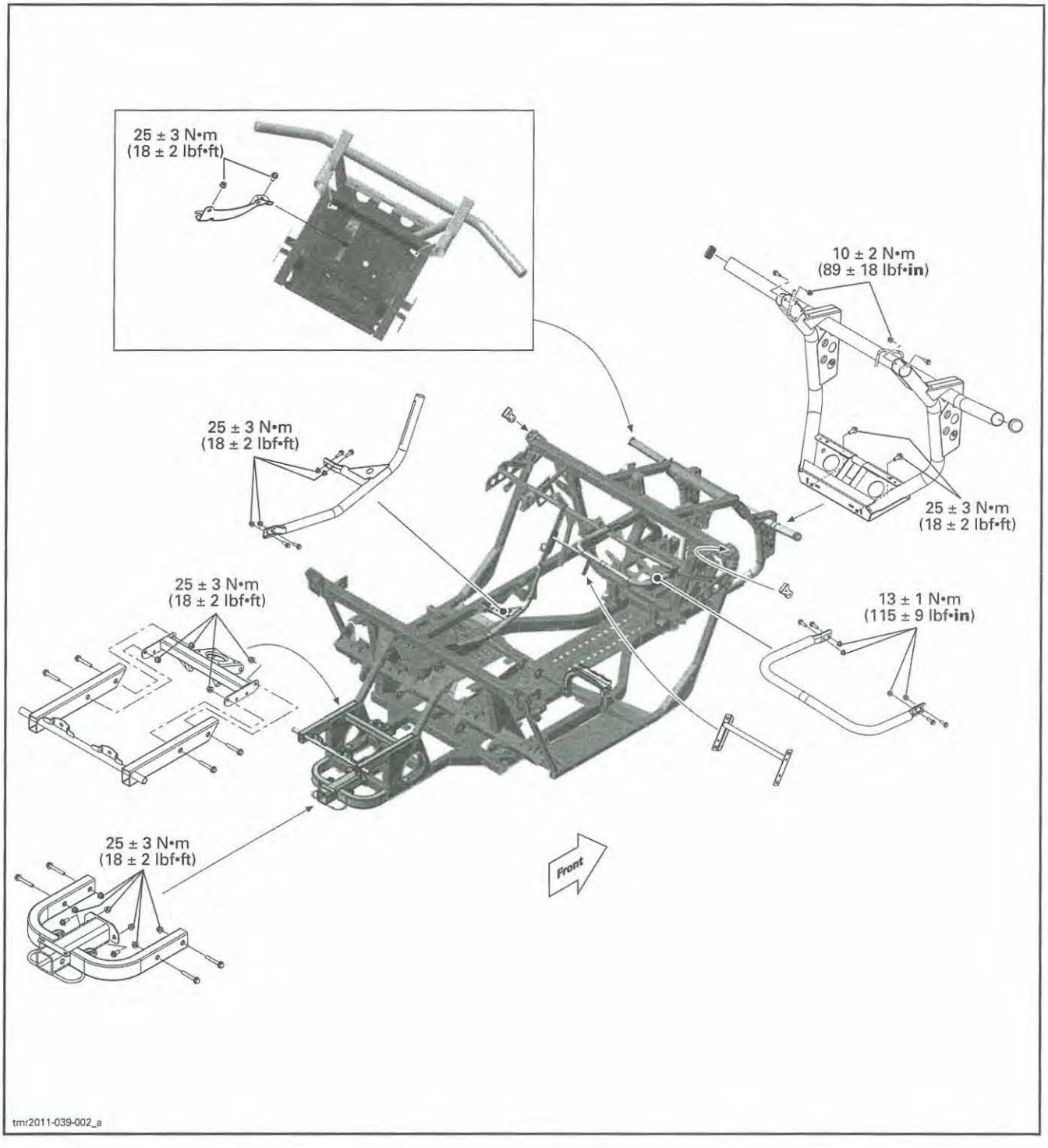
SERVICE TOOLS – OTHER SUPPLIER

Description	Part Number	Page
BLIND THREADED INSERT INSTALLER	model 9600	377

SERVICE PRODUCTS

Description	Part Number	Page
LOCTITE 243 (BLUE)	293 800 060	376


T1 10 ± 2 N•m (89 ± 18 lbf•in)
T2 5 ± 0.5 N•m (44 ± 4 lbf•in)
T3 25 ± 3 N•m (18 ± 2 lbf•ft)
T4 48 ± 6 N•m (35 ± 4 lbf•ft)
T5 21 ± 3 N•m (15 ± 2 lbf•ft)
T1
Loctite 243
T2
T3
T1
T4
Loctite 243
T4
Loctite 243
T4
Loctite 243
Loctite 243
T3
Loctite 243
T1
T3
Loctite 243
X, XT Model
All Models
CE Models only
X Model
T3
XT Model
T4
T3
T5
X Model
T3
Front
tmr2011-039-001_a


25 ± 3 N•m
(18 ± 2 lbf•ft)
10 ± 2 N•m
(89 ± 18 lbf•in)
25 ± 3 N•m
(18 ± 2 lbf•ft)
25 ± 3 N•m
(18 ± 2 lbf•ft)
25 ± 3 N•m
(18 ± 2 lbf•ft)
13 ± 1 N•m
(115 ± 9 lbf•in)
25 ± 3 N•m
(18 ± 2 lbf•ft)
Front
tmr2011-039-002_a

GENERAL

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

NOTE: It is recommended to use new screws and nuts when removed.

If the same fasteners are reused, 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 must be replaced (e.g.: locking tabs, elastic stop nuts, cotter pins, etc.).

PROCEDURES

CAGE

⚠ WARNING

Never modify the mounting points of the shoulder nets and the seat belts. If they are found modified or damaged, contact a BRP service representative.

⚠ WARNING

Never drill holes, weld or modify the cage. Since this is an important protection component, any modification might compromise passenger safety.

Cage Inspection

Check cage for bending, cracks, weld damages or any other damage.

⚠ WARNING

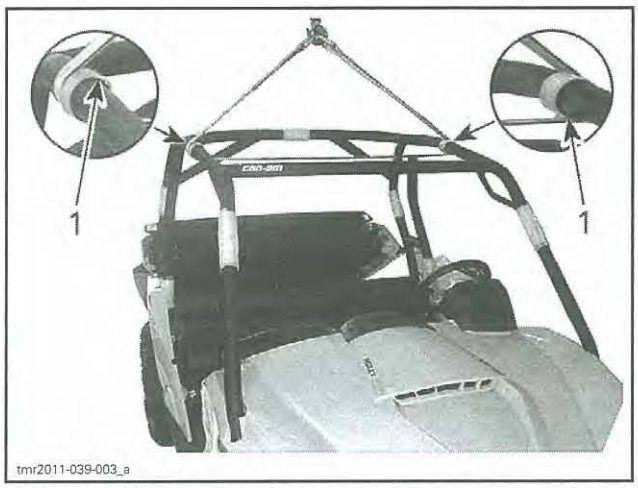
Any damaged cage components must be replaced.

Cage Installation

⚠ WARNING

When the cage mounting bolts are removed, they must be replaced with new ones or have their threads cleaned then have LOCTITE 243 (BLUE) (P/N 293 800 060) applied. Ensure to use only 8.8 grade fasteners.

1. Loosely assemble the cage.
2. Position straps on cage tubes as shown.
3. Install lifting straps to the cage. Make a loop in the strap to prevent the cage to slip while manipulating.



1. Loops in the strap around the cage tubes

4. Using a hoist, lift the cage assembly over the vehicle and carefully position it on vehicle.

⚠ CAUTION **To avoid injury or vehicle damages, never handle the cage alone.**

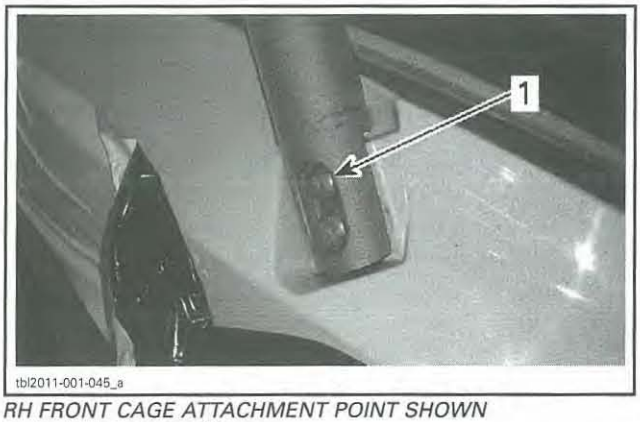
NOTE: As an alternate method, 4 persons at each attachment point can position the cage on the vehicle.

5. Insert the rear of cage first. Loosely install screws.

RH REAR CAGE ATTACHMENT POINT SHOWN
1. Mounting screws

6. Insert the front of cage last. Loosely install screws.

NOTE: Installing the top screw first will ease the assembly.



RH FRONT CAGE ATTACHMENT POINT SHOWN
1. Install top screw first

7. Properly torque all the following cage screws to 48 N•m ± 6 N•m (35 lbf•ft ± 4 lbf•ft) in this order.
   - Rear attachment points
   - Joints between front and rear portion of cage
   - Front attachment points.

FRAME

Frame Inspection

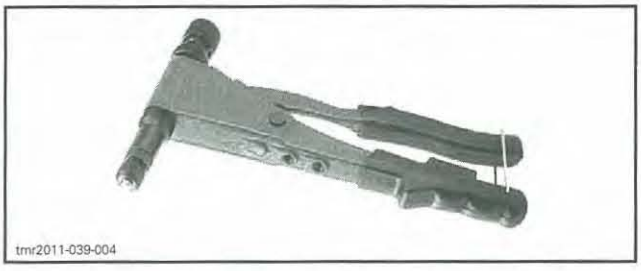
Check frame for bending, cracks, weld damages or any other damage. Replace frame as necessary.

Frame Welding

No welding should be done on frame except if mentioned or required on an approved BRP Bulletin.

Frame Insert Replacement

To install a new blind threaded insert, use the following tool: BLIND THREADED INSERT INSTALLER (P/N MODEL 9600) from Textron. See their web site at: **www.textronfasteningsystems.com**.



After insert installation, ensure insert can hold the torque applied to the screw it retains. Otherwise, install a new insert.

Frame Replacement

NOTE: Blind threaded inserts are not installed on replacement frames. Make sure to order 14 inserts when replacing frame.

COMMANDER 800R AND 1000

MODEL			COMMANDER 800R	COMMANDER 1000
ENGINE				
Engine type			ROTAX® 810	ROTAX® 1010
			4-stroke, Single Over Head Camshaft (SOHC), liquid cooled	
Number of cylinders			2	
Number of valves			8 valves (mechanical adjustment)	
Bore			91 mm (3.58 in)	
Stroke			61.5 mm (2.42 in)	75 mm (2.95 in)
Displacement			799 cm³ (48.8 in³)	976 cm³ (59.6 in³)
Compression ratio			10.3:1	10.5:1
Maximum HP RPM			7250 rpm	7000 rpm
Exhaust system			Spark arrestor approved by USDA Forest Service	
Air filter			Flat corrugated composite fiber	
Intake valve opening			5° BTDC	
Intake valve closing			45° ABDC	60° ABDC
Exhaust valve opening			55° BBDC	65° BBDC
Exhaust valve closing			5° ATDC	- 5° ATDC
Valve clearance	Intake		0.06 mm to 0.14 mm (.0024 in to .0055 in)	
	Exhaust		0.11 mm to 0.19 mm (.0043 in to .0075 in)	
Valve stem diameter	Intake	New	4.966 mm to 4.980 mm (.1955 in to .1961 in)	
		Service limit	4.930 mm (.1941 in)	
	Exhaust	New	4.956 mm to 4.970 mm (.1951 in to .1957 in)	
		Service limit	4.930 mm (.1941 in)	
Valve out of round	Intake and exhaust	New	0.005 mm (.0002 in)	
		Service limit	0.06 mm (.0024 in)	
Valve guide diameter		New	4.998 mm to 5.018 mm (.1968 in to .1976 in)	
		Service limit	5.050 mm (.1988 in)	
Valve spring free length		New	40.81 mm (1.607 in)	
		Service limit	39.00 mm (1.535 in)	
Valve seat contact width	Intake	New	1.05 mm to 1.35 mm (.041 in to .053 in)	
		Service limit	1.8 mm (.071 in)	
	Exhaust	New	1.25 mm to 1.55 mm (.049 in to .061 in)	
		Service limit	2 mm (.079 in)	
Rocker arm bore diameter		New	12.036 mm to 12.050 mm (.4739 in to .4744 in)	
		Service limit	12.060 mm (.4748 in)	
Rocker arm shaft diameter		New	12.000 mm to 12.018 mm (.4724 in to .4731 in)	
		Service limit	11.990 mm (.472 in)	
Piston diameter		New	90.950 mm to 90.966 mm (3.5807 in to 3.5813 in)	
		Service limit	90.900 mm (3.5787 in)	
Piston/cylinder clearance		New	0.027 mm to 0.057 mm (.0011 in to .0022 in)	
		Service limit	0.100 mm (.0039 in)	

MODEL			COMMANDER 800R	COMMANDER 1000
ENGINE (CONT'D)				
Piston ring type		1st	Upper compression ring, rectangular	
		2nd	Lower compression ring, tapered face	
		3rd	Oil scraper ring	
Ring end gap	Rectangular	New	0.20 mm to 0.40 mm (.008 in to .016 in)	
	Tapered face	New	0.20 mm to 0.40 mm (.008 in to .016 in)	
	Oil scraper ring	New	0.20 mm to 0.70 mm (.008 in to .028 in)	
	Rectangular	Service limit	0.60 mm (.024 in)	
	Tapered face	Service limit	0.70 mm (.028 in)	
	Oil scraper ring	Service limit	1.00 mm (.039 in)	
Ring/piston groove clearance	Rectangular	New	0.03 mm to 0.07 mm (.0012 in to .0028 in)	
	Tapered face	New	0.02 mm to 0.06 mm (.0008 in to .0024 in)	
	Oil scraper ring	New	0.01 mm to 0.18 mm (.0004 in to .0071 in)	
	Rectangular	Service limit	0.15 mm (.0059 in)	
	Tapered face	Service limit	0.15 mm (.0059 in)	
	Oil scraper ring	Service limit	0.25 mm (.0098 in)	
Cylinder bore		New	90.993 mm to 91.007 mm (3.5824 in to 3.583 in)	
Cylinder taper		Maximum New	0.038 mm (.0015 in)	
		Service limit	0.090 mm (.0035 in)	
Cylinder out of round		Maximum New	0.015 mm (.0006 in)	
		Service limit	0.020 mm (.0008 in)	
Camshaft main bearing journal	Timing chain side	New	34.959 mm to 34.975 mm (1.3763 in to 1.377 in)	
	Timing chain side	Service limit	34.950 mm (1.376 in)	
	Spark plug side	New	21.959 mm to 21.980 mm (.8645 in to .8654 in)	
	Spark plug side	Service limit	21.950 mm (.8642 in)	
Camshaft main bearing journal bore	Timing chain side	New	35.000 mm to 35.025 mm (1.378 in to 1.3789 in)	
	Timing chain side	Service limit	35.040 mm (1.3795 in)	
	Spark plug side	New	22.000 mm to 22.021 mm (.8661 in to .867 in)	
	Spark plug side	Wear limit	22.040 mm (.8677 in)	
Camshaft lobe	Intake valve	New	32.890 mm to 33.090 mm (1.2949 in to 1.3028 in)	32.960 mm to 33.160 mm (1.2976 in to 1.3055 in)
	Intake valve	Service limit	32.870 mm (1.2941 in)	32.940 mm (1.2969 in)
	Exhaust valve	New	32.950 mm to 33.150 mm (1.2972 in to 1.3051 in)	32.860 mm to 33.060 mm (1.2937 in to 1.3016 in)
	Exhaust valve	Service limit	32.930 mm (1.2965 in)	32.840 mm (1.2929 in)
Crankshaft main bearing journal diameter (MAG/PTO side)		New	42.016 mm to 42.040 mm (1.6542 in to 1.6551 in)	
		Service limit	42.000 mm (1.6535 in)	
Crankshaft radial play (MAG/PTO side)		Service limit	0.07 mm (.0028 in)	
Crankshaft bearing journal diameter (in PTO cover)		New	34.016 mm to 34.040 mm (1.3392 in to 1.3402 in)	
		Service limit	34.010 mm (1.339 in)	
Crankshaft radial play (PTO cover bearing)		Service limit	0.10 mm (.0039 in)	
Crankshaft axial play		New	0.200 mm to 0.500 mm (.0079 in to .0197 in)	
		Service limit	0.600 mm (.0236 in)	

MODEL			COMMANDER 800R	COMMANDER 1000
ENGINE (CONT'D)				
Crankshaft pin diameter		New	40.009 mm to 40.025 mm (1.5752 in to 1.5758 in)	41.986 mm to 42.010 mm (1.653 in to 1.6539 in)
		Service limit	39.990 mm (1.5744 in)	41.967 mm (1.6522 in)
Crankshaft deflection	MAG/PTO side	New	0.050 mm (.002 in)	
Crankcase plain bearing	MAG/PTO side	Service limit	42.100 mm (1.6575 in)	
PTO cover plain bearing		Service limit	34.120 mm (1.3433 in)	
Connecting rod big end diameter		Service limit	40.100 mm (1.579 in)	42.100 mm (1.6575 in)
Connecting rod big end radial play		Service limit	0.09 mm (.0035 in)	
Connecting rod big end axial play		New	0.200 mm to 0.500 mm (.008 in to .02 in)	0.250 mm to 0.550 mm (.0098 in to .0217 in)
		Service limit	0.600 mm (.024 in)	
Connecting rod small end diameter		New	20.010 mm to 20.020 mm (.7878 in to .7882 in)	22.010 mm to 22.020 mm (.8665 in to .8669 in)
		Service limit	20.060 mm (.7898 in)	22.050 mm (.8681 in)
Piston pin diameter		New	19.996 mm to 20.000 mm (.7872 in to .7874 in)	21.996 mm to 22.000 mm (865.984 in to 866.142 in)
		Service limit	19.980 mm (786.614 in)	21.980 mm (.8654 in)
Connecting rod/piston pin clearance (radial play)		Service limit	0.080 mm (.0031 in)	
LUBRICATION SYSTEM				
	Type		Wet sump. Replaceable cartridge oil filter	
	Oil filter		BRP Rotax paper type, replaceable	
	Engine oil pressure	Minimum	300 kPa (44 PSI) at 6000 RPM	
	Engine oil	Capacity (oil change with filter)	2.2 L (2.3 qt (U.S. liq.))	
		Recommended	For the summer season, use XPS synthetic blend oil (summer grade) (P/N 293 600 121). For the winter season, use XPS synthetic oil (winter grade) (P/N 293 600 112). If not available, use a 5W40 motor oil that meets the requirements for API service classification SM, SL or SJ	
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		3.9 L (1 U.S. gal.)	4.3 L (1.1 U.S. gal.)
Thermostat	Starts to open		65°C (149°F)	
	Fully open		75°C (167°F)	88°C (190°F)
Radiator cap opening pressure			110 kPa (16 PSI)	

MODEL		COMMANDER 800R	COMMANDER 1000
TRANSMISSION			
Type		CVT (Continuously Variable Transmission)	
Engagement RPM		1750 ± 100 RPM	
Drive belt width	Service limit	30.00 mm (1.181 in)	
Governor cup roller outer diameter	New	13.70 mm to 13.80 mm (.539 in to .543 in)	
	Service limit	13.20 mm (.52 in)	
Governor cup roller inner diameter	New	8.05 mm to 8.15 mm (.317 in to .321 in)	
	Service limit	9.00 mm (.354 in)	
Centrifugal lever pivot bolt diameter	New	6.078 mm to 6.100 mm (.239 in to .24 in)	
	Service limit	6.000 mm (.236 in)	
Centrifugal lever bore diameter	New	6.035 mm to 6.078 mm (.2376 in to .2393 in)	
	Service limit	6.200 mm (.244 in)	
Drive pulley sliding half centrifugal lever pivot bolt bore diameter	New	6.113 mm to 6.171 mm (.241 in to .243 in)	
	Service limit	6.300 mm (.248 in)	
Drive pulley sliding half large bushing	New	55.000 mm to 55.040 mm (2.165 in to 2.167 in)	
	Service limit	55.200 mm (2.173 in)	
Drive pulley sliding half small bushing	New	32.000 mm to 32.040 mm (1.26 in to 1.261 in)	
	Service limit	32.200 mm (1.268 in)	
Drive pulley spring free length	Service limit	85 mm (3.346 in)	105 mm (4.134 in)
Drive pulley spring free squareness	Service limit	4 mm (.157 in)	
Spring sleeve length	New	9.2 mm to 9.4 mm (.362 in to .37 in)	
	Service limit	9.0 mm (.354 in)	
Driven pulley sliding half bushing	New	30.060 mm to 30.100 mm (1.183 in to 1.185 in)	
	Service limit	30.200 mm (1.189 in)	
Driven pulley sliding fixed bushing	New	30.060 mm to 30.100 mm (1.183 in to 1.185 in)	
	Service limit	30.200 mm (1.189 in)	
Torque gear on driven pulley	Service limit	7.500 mm (.295 in)	
Driven pulley spring free length	Service limit	125 mm (4.921 in)	
Driven pulley spring free squareness	Service limit	3.8 mm (.15 in)	
GEARBOX			
Type		Dual range (HI-LO) with park, neutral and reverse	
Gearbox oil	Capacity	450 ml (15 U.S. oz)	
	Recommended	XPS synthetic gear oil (P/N 293 600 140) or a 75W140 API GL-5 synthetic gear oil	
Coupling sleeve groove width	New	5.25 mm to 5.35 mm (.207 in to .211 in)	
	Service limit	5.50 mm (.217 in)	
Coupling fork claw thickness	New	4.95 mm to 5.05 mm (.195 in to .199 in)	
	Service limit	4.80 mm (.189 in)	
Shift fork claw thickness (high, low and reverse gear shift fork)	New	5.10 mm to 5.20 mm (.201 in to .205 in)	
	Service limit	5.00 mm (.197 in)	
Width of shift fork engagement groove	New	5.30 mm to 5.40 mm (.209 in to .213 in)	
	Service limit	5.50 mm (.217 in)	

MODEL			COMMANDER 800R	COMMANDER 1000
GEARBOX (CONT'D)				
Diameter free pinions		New	29.000 mm to 29.013 mm (1.1417 in to 1.1422 in)	
		Service limit	29.015 mm (1.1423 in)	
Intermediate gear shaft		New	24.987 mm to 25.000 mm (.9837 in to .9843 in)	
		Service limit	24.977 mm (.983 in)	
Countershaft	MAG side	New	19.977 mm to 19.990 mm (.7865 in to .787 in)	
		Service limit	19.973 mm (.7863 in)	
	CVT side	New	24.977 mm to 24.990 mm (.9833 in to .9839 in)	
		Service limit	24.970 mm (.9831 in)	
Main shaft	Free pinion bearing	New	24.987 mm to 25.000 mm (.9837 in to .9843 in)	
		Service limit	24.984 mm (.9836 in)	
	Bearing journal MAG/CVT side	New	16.980 mm to 16.991 mm (.6685 in to .6689 in)	
		Service limit	16.976 mm (.6683 in)	
ELECTRICAL SYSTEM				
Magneto generator output			650 W @ 6000 RPM	
Stator resistance (20C)			0.15 to 0.30 Ω	
Ignition system type			IDI (Inductive Discharge Ignition)	
Ignition timing			Not adjustable	
Spark plug	Quantity		2	
	Make and type		NGK DCPR8E	
	Gap		0.7 mm to 0.8 mm (.028 in to .031 in)	
Engine RPM limiter setting	Forward		8050 rpm	
	Reverse		20 km/h to 25 km/h (12 MPH to 16 MPH) (8050 rpm with Override)	
Battery	Type		Maintenance free	
	Voltage		12 volts	
	Nominal rating		18 A•h	
	Power starter output		0.7 KW	
Headlight			4 x 60 W	
Taillight			2 X 8/21 W	
Turn signals (CE)			10 W	
Position light			LED, 0.7 V approximately (each)	

MODEL			COMMANDER 800R	COMMANDER 1000
ELECTRICAL SYSTEM (CONT'D)				
Fuses	– Main	MF1	30 A	
	– Main accessories	MF2	40 A	
	– Brake lights switch – Gauge – Taillights – Brake relay	F4	10 A	
	– Ignition coils – Fuel injectors – Speed sensor	F5	7.5 A	
	– Engine control module (ECM)	F6	5 A	
	– Handlebar switches	F7	5 A	
	– Gauge – Ignition switch	F8	5 A	
	– Fan motor	F9	30 A	
	– Euro controls	F10	5 A	
	– Lights relay	F11	30 A	
	– Connectors (DC3 and DC4) – 12 V power outlet – Communication connector	F12	15 A	
	– Relays coils (R1 and R3)	F13	5 A	
	– Connector DC6	F14	15 A	
	– Fuel pump	F15	5 A	
FUEL SYSTEM				
Fuel delivery	Type		Electronic Fuel Injection (EFI), 54 mm throttle body with iTC (Intelligent Throttle Control), 1 injector per cylinder	
Fuel pump	Type		Electrical (in fuel tank)	
	Operating pressure		350 kPa (51 PSI)	
Idle speed			1250 rpm ± 100 (not adjustable)	
Fuel	Type		Regular unleaded gasoline	
	Octane rating	Inside North America	87 (R+M)/2 or higher	
		Outside North America	92 RON or higher	
Fuel tank capacity			37.8 L (10 U.S. gal.)	
Fuel remaining when low fuel light turns ON			± 12 L (3.2 U.S. gal.)	

MODEL			COMMANDER 800R	COMMANDER 1000
DRIVE SYSTEM				
Front drive			Visco-lok† front differential	
Front drive ratio			3.6:1	
Rear drive			Shaft driven/spool	
Rear drive ratio			3.6:1	
Front differential oil	Capacity		500 ml (17 U.S. oz)	
	Recommended		XPS synthetic gear oil (P/N 293 600 043) or synthetic gear oil 75W90 API GL-5	
Rear final drive oil	Capacity		350 ml (11.8 U.S. oz)	
	Recommended		XPS synthetic gear oil (P/N 293 600 140) or synthetic gear oil 75W140 API GL-5	
CV joint grease			CV joint grease (P/N 293 550 019)	
Propeller shaft grease			Hi-temp bearing grease NLGI-2 or an equivalent	
STEERING				
Steering wheel			Adjustable tilt steering	
Turning radius			240 cm (94.5 in)	
Total toe (vehicle on ground)			0 mm ± 4 mm (0 in ± .157 in)	
Camber angle (vehicle on ground)			0.7° positive	
Tie-rod maximum length unengaged threads			32 mm (1.26 in)	
FRONT SUSPENSION				
Suspension type			Double suspension-arm with dive-control geometry	
Suspension travel			254 mm (10 in)	
Shock absorber	Qty		2	
	Type	Standard and XT	Oil	
		X	HPG Clicker (gas)	
Spring free length		Standard	355.6 mm (14 in)	
		X	N.A.	350 mm (13.78 in)
		XT	363 mm (14.291 in)	
Spring P/N		Standard	706 200 859 (YL)	
		X	N.A.	706 201 124 (YL)
		XT	706 200 860 (YL) 706 201 369 (BK)	706 200 860 (YL) 706 201 367 (RD) 706 201 369 (BK)
Preload adjustment type		Standard and XT	5 positions cam	
		X	Threaded spring retainer	

MODEL			COMMANDER 800R	COMMANDER 1000
REAR SUSPENSION				
Suspension type			Torsional Trailing arm Independant (TTI) with external sway bar	
Suspension travel			254 mm (10 in)	
Shock absorber	Qty		2	
	Type	Standard and XT	Oil	
		X	HPG Clicker (gas)	
Spring free length		Standard	358 mm (14.094 in)	
		X	N.A.	373 mm (14.685 in)
		XT	358 mm (14.094 in)	
Spring P/N		Standard	706 000 667 (YL)	
		X	N.A.	706 000 821 (YL)
		XT	706 000 667 (YL) 706 001 045 (BK)	706 000 667 (YL) 706 001 043 (RD) 706 001 045 (BK)
Preload adjustment type		Standard and XT	5 positions cam	
		X	Threaded spring retainer	
BRAKES				
Front brake	Qty		2	
	Type		214 mm ventilated disc brakes with hydraulic twin-piston calipers	
Rear brake	Qty		1	
	Type		214 mm ventilated disc brake with hydraulic twin-piston caliper	
Brake fluid	Capacity		125 ml (4.2 U.S. oz)	
	Type		DOT 4	
Caliper			Floating	
Brake pad material	Front		Metallic	
	Rear		Metallic	
Minimum brake pad thickness			1 mm (.04 in)	
Minimum brake disc thickness	Front		4.1 mm (.161 in)	
	Rear		4.1 mm (.161 in)	
Maximum brake disc warpage			0.2 mm (.01 in)	
TIRE				
Pressure	Front		Maximum: 83 kPa (12 PSI) Minimum: 69 kPa (10 PSI)	
	Rear		Maximum: 152 kPa (22 PSI) Minimum: 83 kPa (12 PSI)	
Minimum tire thread depth			3 mm (.118 in)	
Size	Front	Standard	27 x 9 x 12 (in)	
		X	27 X 9 X 12 (in)	
		XT	27 X 9 X 14 (in)	
	Rear	Standard	27 x 11 x 12 (in)	
		X	27 X 11 X 12 (in)	
		XT	27 X 11 X 14 (in)	

MODEL			COMMANDER 800R	COMMANDER 1000
WHEELS				
Type		Standard	Steel	
		X	Aluminum beadlock wheels	
		XT	Cast Aluminum	
Rim size	Front	Standard	12 X 6 (in)	
		X	12 X 6 (in)	
		XT	14 X 7 (in)	
	Rear	Standard	12 X 8 (in)	
		X	12 X 7.5 (in)	
		XT	14 X 8.5 (in)	
Wheel nuts torque			100 N•m ± 10 N•m (74 lbf•ft ± 7 lbf•ft)	
CHASSIS				
Cage type			50 mm (2 in) diameter, high strength steel, ROPS-approved cage	
DIMENSION				
Overall length			300.4 cm (118.3 in)	
Overall width			148.9 cm (58.6 in)	
Overall height			182.9 cm (72 in)	
Wheel base			192.4 cm (75.7 in)	
Wheel track	Front		125.7 cm (49.5 in)	
	Rear		121.9 cm (48 in)	
Ground clearance			27.9 cm (11 in)	
WEIGHT AND LOADING CAPACITY				
Dry weight			584 kg (1,287 lb)	587 kg (1,295 lb)
Weight distribution	Front/rear		44/56	
Cargo box capacity		Total (upper + lower)	272 kg (600 lb)	
		Upper	181 kg (400 lb)	
		Lower	272 kg (600 lb)	
Total vehicle load allowed (including driver, passenger, all other loads and added accessories)			363 kg (800 lb)	
Gross vehicle weight rating			990 kg (2,183 lb)	
Towing capacity	Hitch support	50.8 mm (2 in) X 50.8 mm (2 in)	680 kg (1,500 lb)	
Tongue capacity			68 kg (150 lb)	

N.A.: Not Available

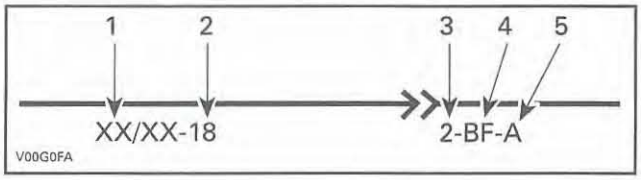
WIRING DIAGRAM INFORMATION

GENERAL

WIRING DIAGRAM LOCATION

The wiring diagram is stored in the back cover pocket.

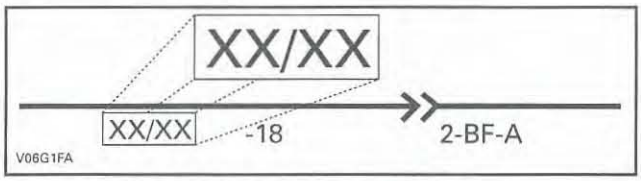
WIRING DIAGRAM CODES



1. *Wire colors*
2. *Wire gauge*
3. *Connector housing area*
4. *Connector identification*
5. *Wire 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.

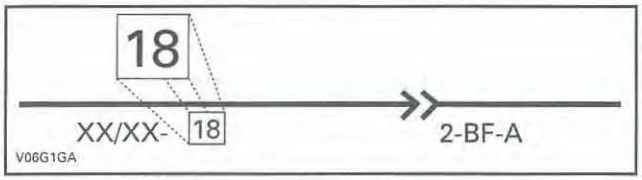


THE SHADED PART INDICATES THE WIRE COLOR

Example: YL/BK is a YELLOW wire with a BLACK stripe.

Wire Gauge

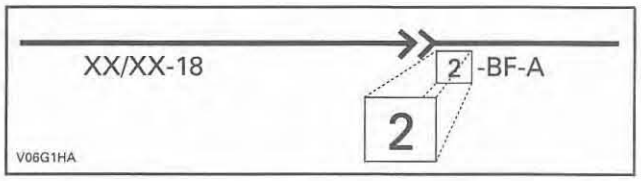
The number after wire color indicates the gauge of a wire.



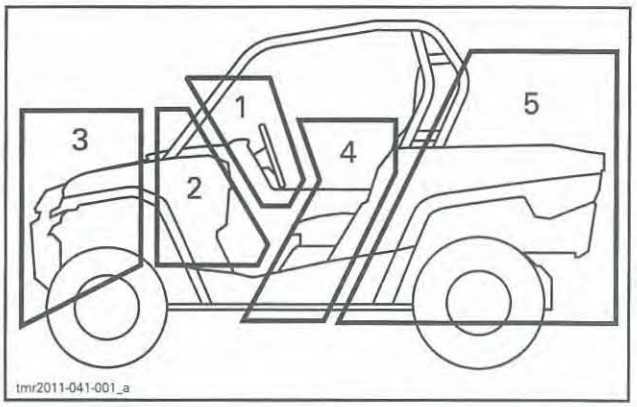
THE SHADED PART INDICATES THE WIRE GAUGE

Example: The number that follows the wire color indicates the wire size used, in this case 18 gauge wire.

Connector Housing Area



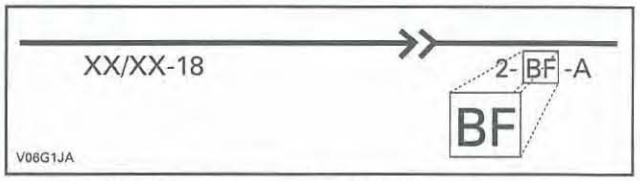
The first number in the connector/pin contact number represents the area in the vehicle where the connector is located.



AREA	LOCATION
1	Steering, dashboard and upper console area
2	Under dashboard and front bulkhead area
3	Front of vehicle
4	Engine, seat and lower console area
5	Rear of vehicle

Connector Identification

The letters in the middle of the connector/pin contact number Indicates the connector's function. If there are many connectors in the same area, this helps to identify which wire is in which connector.



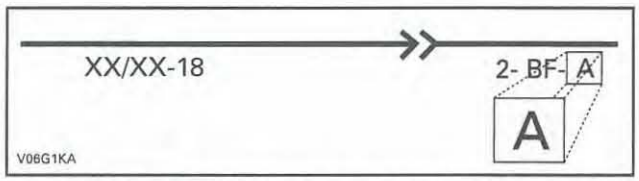
THE SHADED PART INDICATES A CONNECTOR

ABBREVIATION	DESCRIPTION
BA	Ignition coil
BAT	Battery
BD	2WD/4WD switch
BP	Battery power
CA	Magneto
CAPS	Camshaft position sensor
CC	Ignition switch
CI	Multifunction speedometer
CPS	Crankshaft position sensor
CTS	Coolant temperature sensor
CV	Speed sensor
DB	Diagnostic connector
DC	DC outlet
ECM	Engine control module
ETA	Electric throttle actuator
ETC	Electronic throttle control
FP	Fuel pump
FRA	Brake light switch
FT	Cooling fan
GBPS	Gearbox position sensor
HIBM	High beam (headlights)
HIC	Harness interconnect (engine/vehicle)
INJ1 and INJ2	Fuel injector
MAPTS	Manifold air pressure and temperature sensor
MD	2WD/4WD actuator
MG	multifunction switch
OPS	Oil pressure switch
OV	Override button
PD	RH headlight
PF1	Fuse Holder (main)
PF2	Fuse Holder
PG	LH headlight
RD	Voltage regulator/rectifier
SB	Seat belt
SD	2WD/4WD actuator switch
SM	Starter motor
SPK1 and SPK2	Spark plug
SS	Starter solenoid

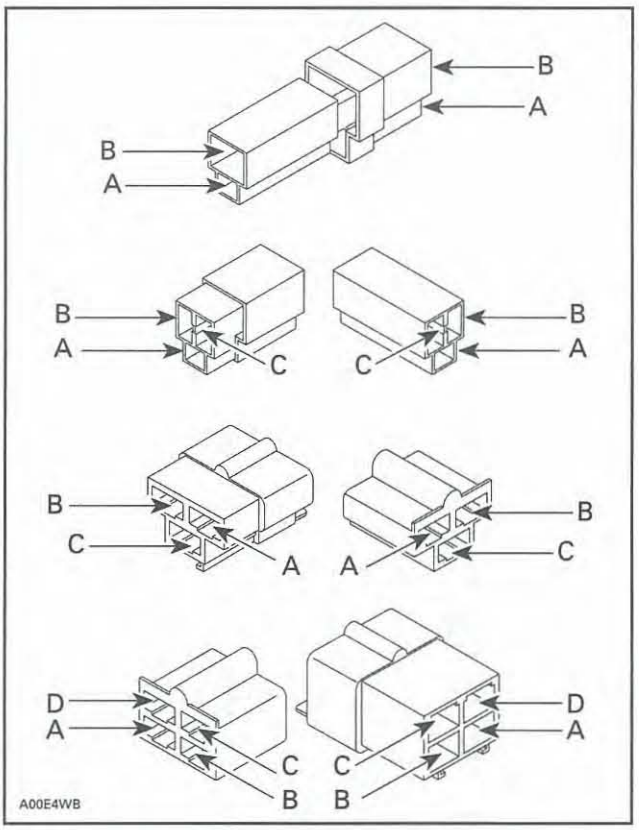
ABBREVIATION	DESCRIPTION
STSW	Start switch
SW	Winch relay
SWW	Winch switch
TPS	Throttle position sensor
TAS	Throttle accelerator sensor
WM	Winch motor

Wire Location in Connector

This is the wire position in the connector. The number or letter given refers to the physical identification stamped or molded on the connector.



THE SHADED PART INDICATES THE CONNECTOR LOCATION IN HOUSING



TYPICAL

CONNECTOR INFORMATION

SERVICE TOOLS

Description	Part Number	Page
CRIMPING TOOL (HEAVY GAUGE WIRE)	529 035 730	399
ECM ADAPTER TOOL	529 036 166	396
ECM TERMINAL REMOVER 2.25	529 036 175	397
ECM TERMINAL REMOVER 3.36	529 036 174	397

SERVICE TOOLS – OTHER SUPPLIER

Description	Part Number	Page
GM TERMINAL EXTRACTOR	12094430	398
SNAP-ON TERMINAL REMOVER TOOL	TT600-4	394

GENERAL

DEUTSCH CONNECTORS

Deutsch Connector Application

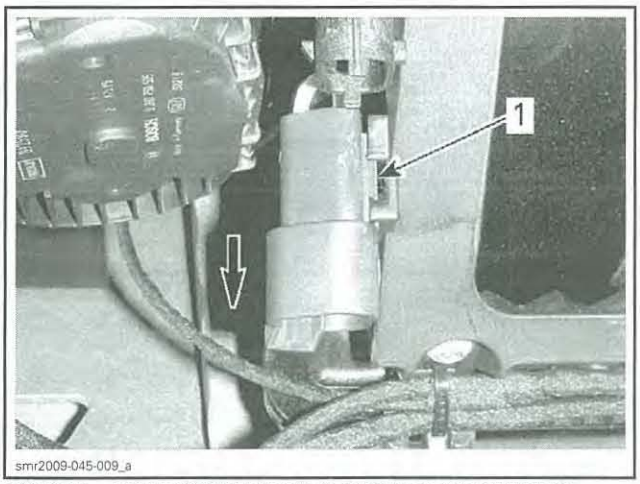
A variety of Deutsch connectors are used on various systems:

- Engine connector
- Magneto connector.

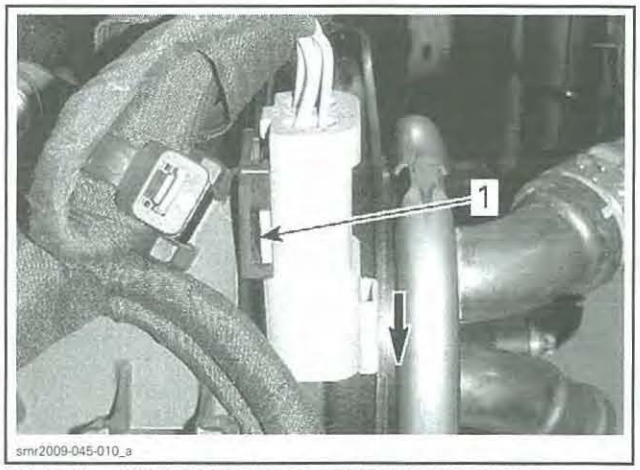
The following procedures may be used on each as they are similar in construction.

Deutsch Connector Removal from its Support

1. Insert a small flat screwdriver between the support and the Deutsch connector.
2. Pry the connector away from the support slightly while sliding it out in the direction shown.



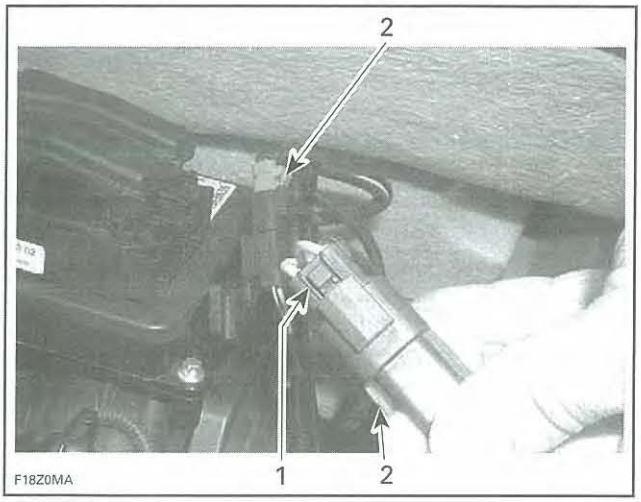
TYPICAL - MALE CONNECTOR REMOVED FOR CLARITY
1. Insert screwdriver here



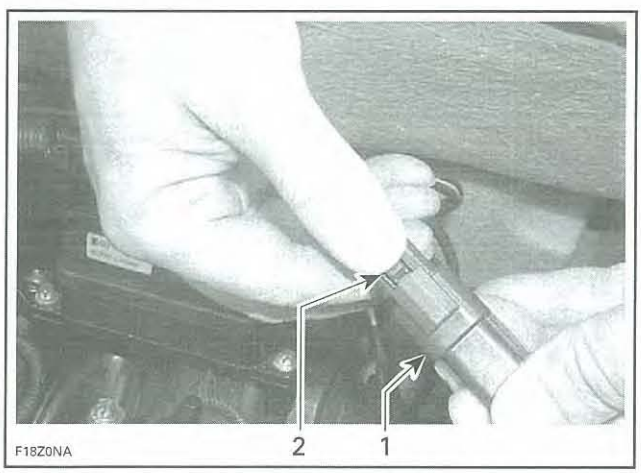
TYPICAL - MALE CONNECTOR REMOVED FOR CLARITY
1. Insert screwdriver here

Deutsch Connector Disconnect

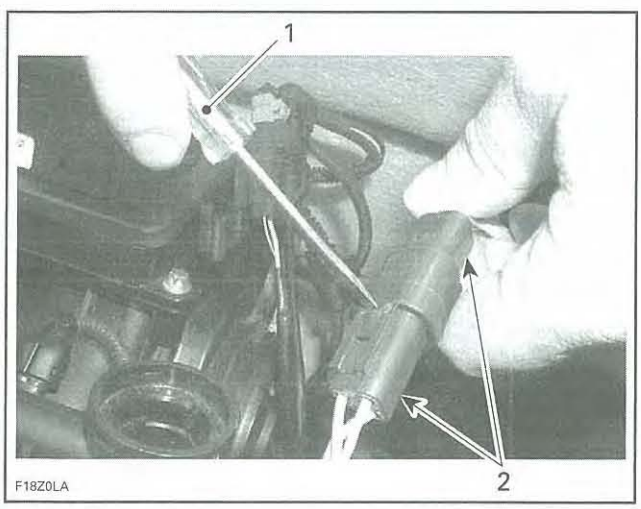
1. To disconnect a Deutsch connector, press the release tab and twist a small flat screwdriver between the male and female housing to disengage and disconnect them.



TYPICAL
1. *Release tab*
2. *Deutsch connector*

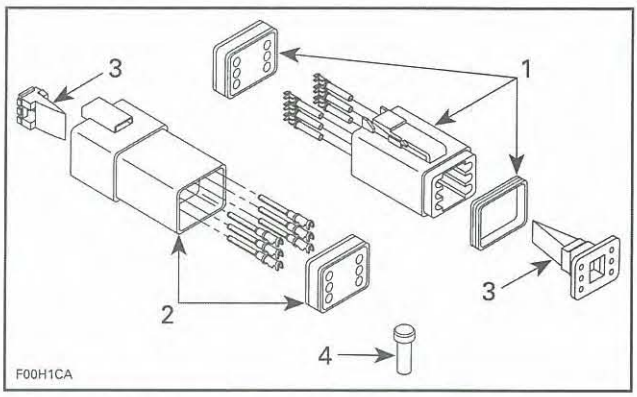


TYPICAL
1. *Deutsch connector*
2. *Press release button*



TYPICAL
1. *Flat screwdriver*
2. *Deutsch connector*

Deutsch Connector Disassembly and Reassembly



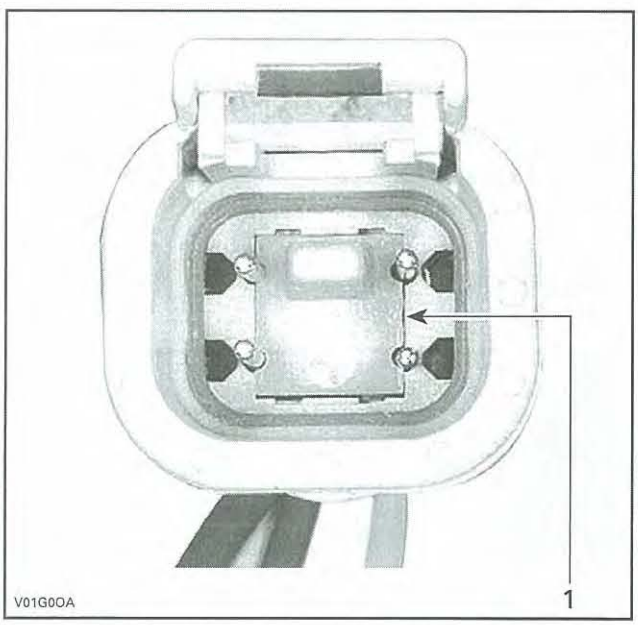
TYPICAL - DEUTSCH CONNECTOR
1. *Male connector*
2. *Female connector*
3. *Secondary lock*
4. *Sealing cap*

NOTICE Do not apply dielectric grease on terminal inside connector.

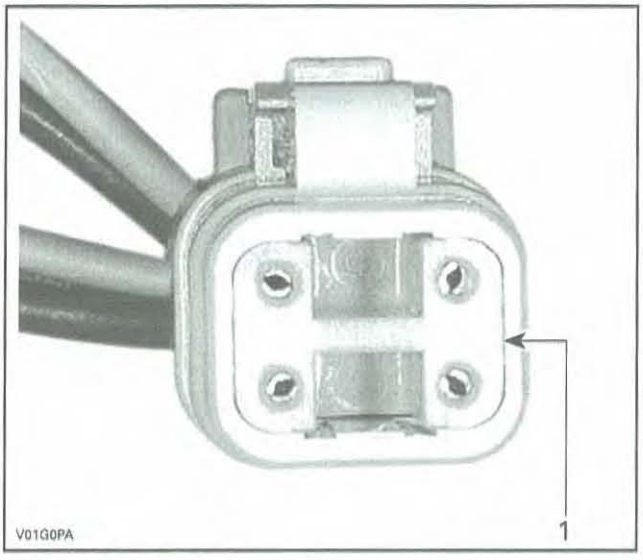
Terminal Removal

To remove terminals from connector, proceed as follows:

1. Using long nose pliers, pull out the secondary plastic lock from between the terminals.



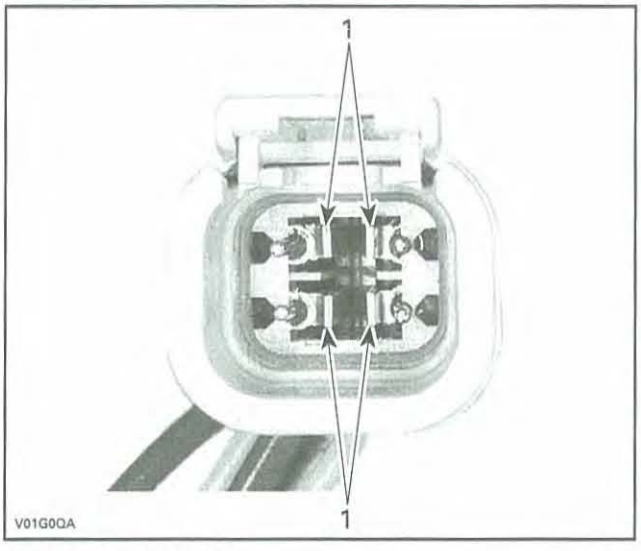
FEMALE CONNECTOR
1. *Female lock*



MALE CONNECTOR
1. Male lock

NOTE: Before pin extraction, push wire forward to relieve pressure on retaining tab.

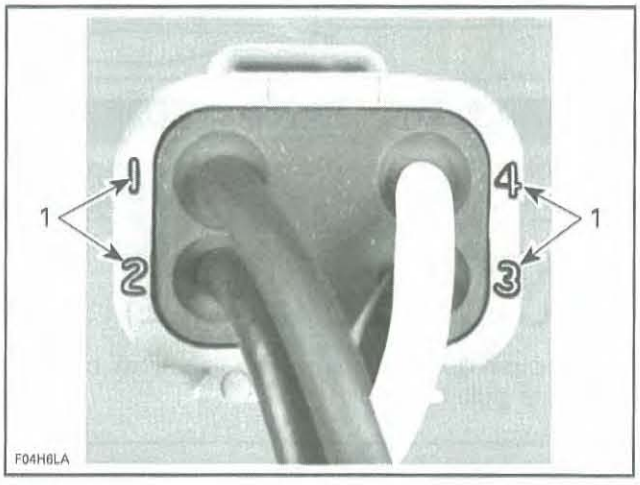
2. Insert a 4.8 mm (.189 in) wide screwdriver blade inside the front of the terminal cavity.
3. Pry the retaining tab away from the terminal while gently pulling the wire and terminal out of the back of the connector.



FEMALE CONNECTOR
1. Retaining tab

Terminal Insertion

1. For insertion of a terminal, ensure the secondary plastic lock is removed.
2. Insert terminal through the back of the connector in the appropriate position, and push it in as far as it will go. You should feel or hear the terminal lock engage.
3. Pull back on the terminal wire to be sure the retention fingers are holding the terminal.
4. After all required terminals have been inserted, the lock must be installed.



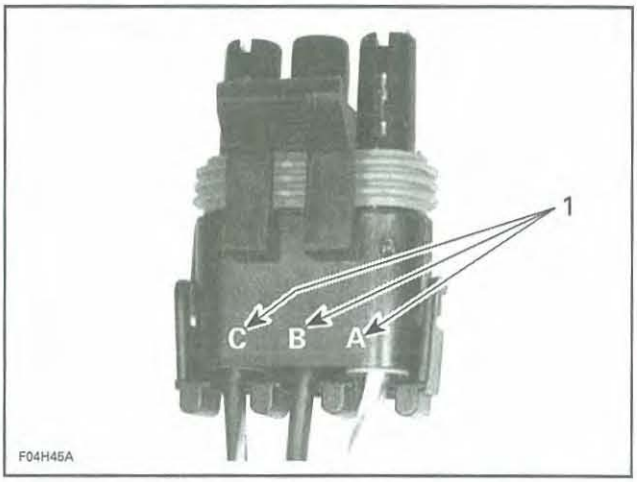
CONNECTOR PIN-OUT
1. Terminal position identification numbers

PACKARD CONNECTORS

Packard Connector Application

Packard connectors are used to connect:
- Electrical harnesses
- Gauges
- VCM
- EFB.

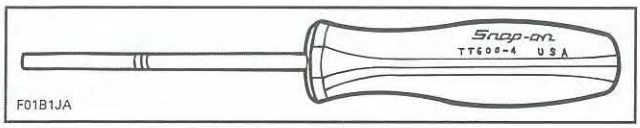
3-Pin Packard Connector



VIEW OF A 3-PIN PACKARD CONNECTOR
1. Identification letters

NOTE: This type of connector also comes in other pin configurations.

To remove a terminal from a 3-pin Packard connector, use the SNAP-ON TERMINAL REMOVER TOOL (P/N TT600-4).

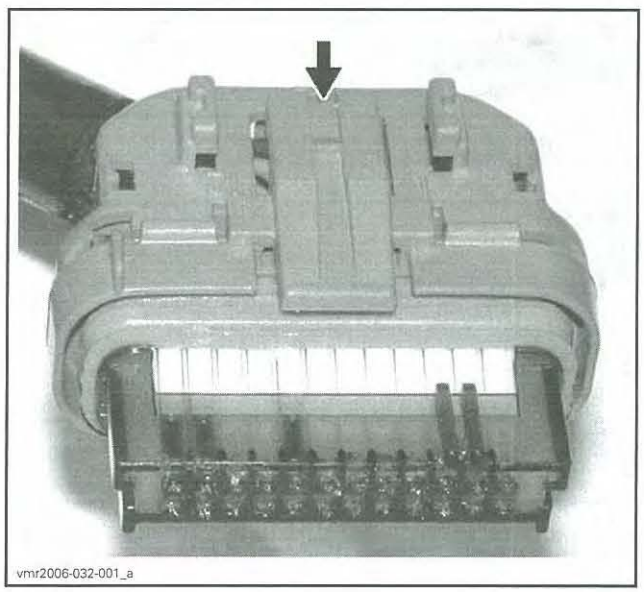


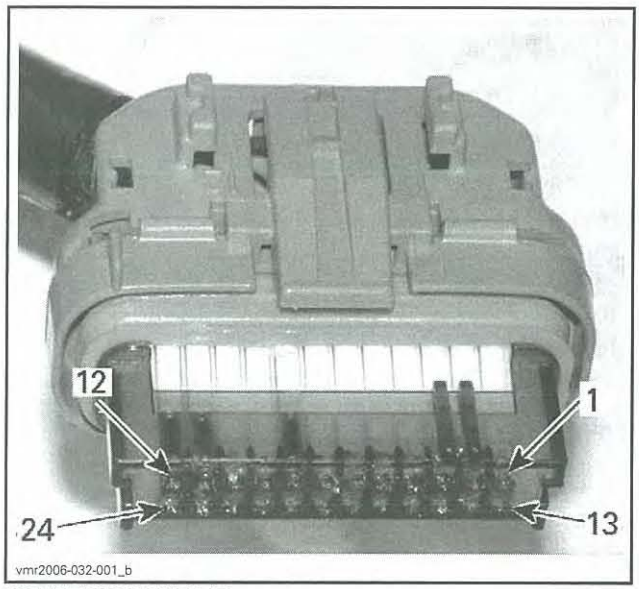
⚠ WARNING

Ensure all terminals are properly crimped on wires and connectors are properly fastened.

PACKARD CONNECTOR (MULTIFUNCTION GAUGE)

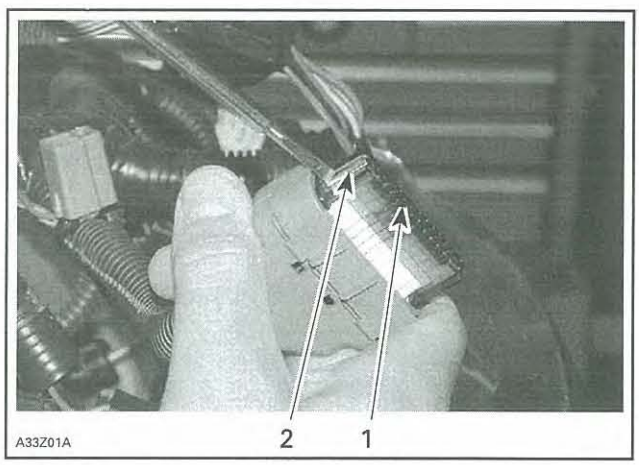
Firmly push down tab and hold to unlock connector while pulling it out.





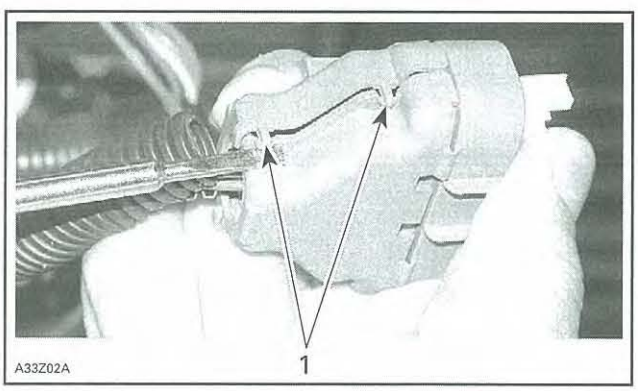
CONNECTOR PINOUT

Push on both tabs to remove retainer.



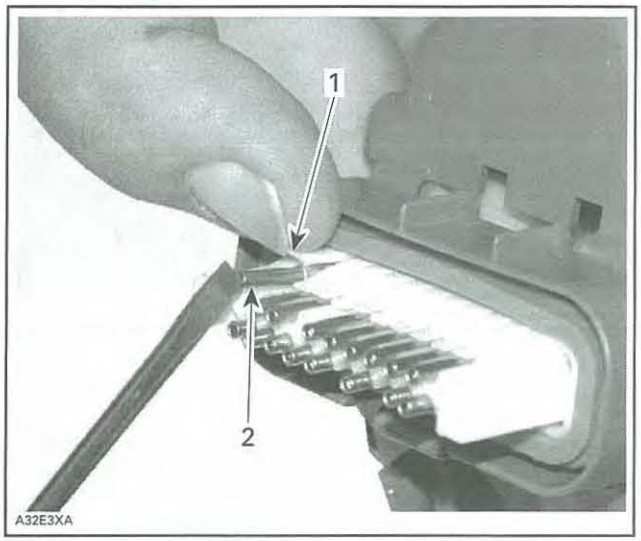
TYPICAL
1. *Retainer*
2. *Tab (one on each side)*

Open housing by lifting 4 tabs.



TYPICAL
1. *Tabs (2 on each side)*

Lift the top plastic lock of the female terminal to be removed and hold in position. Lift the female terminal to unlock from the housing and push out of housing.



TYPICAL
1. *Lift and hold plastic lock*
2. *Lift to unlock and push out*

MOLEX CONNECTOR

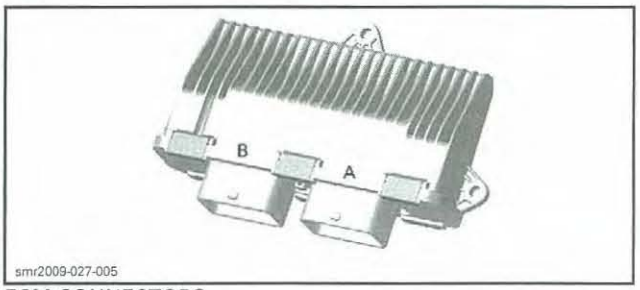
Molex Connector Application

The Molex connector is used on the ECM.

There are 2 MOLEX connectors on the ECM.

The engine wiring harness connector is connected to ECM connector "A". The vehicle wiring harness connector is connected to ECM connector "B".

Each ECM connector has 48 pins.

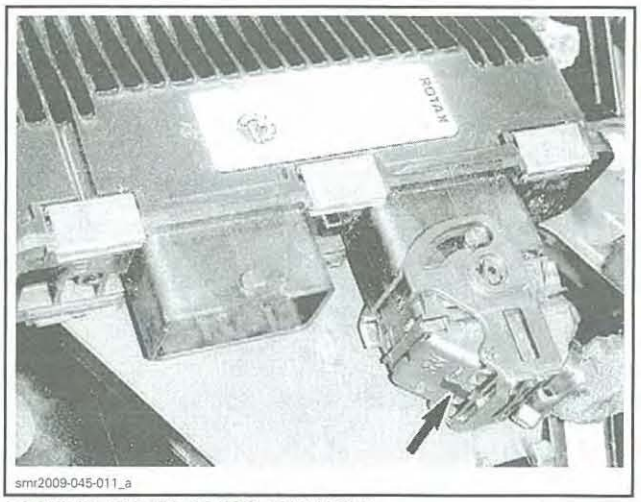


ECM CONNECTORS

Do not apply any product to the pins in the ECM connector.

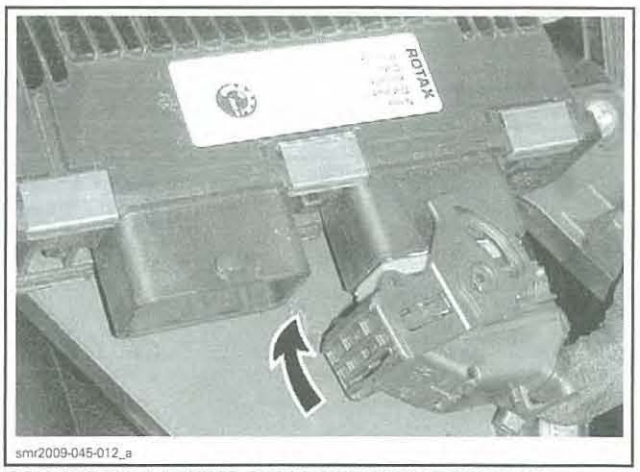
Connector Removal

1. To access the ECM, refer to *ELECTRONIC FUEL INJECTION* subsection.
2. Press and hold the locking tab on the connector to be disconnected.



LOCKING TAB TO PRESS AND HOLD

3. As you hold the locking tab, rotate the connector locking cam until it stops.



CONNECTOR LOCKING CAM ROTATION TO RELEASE

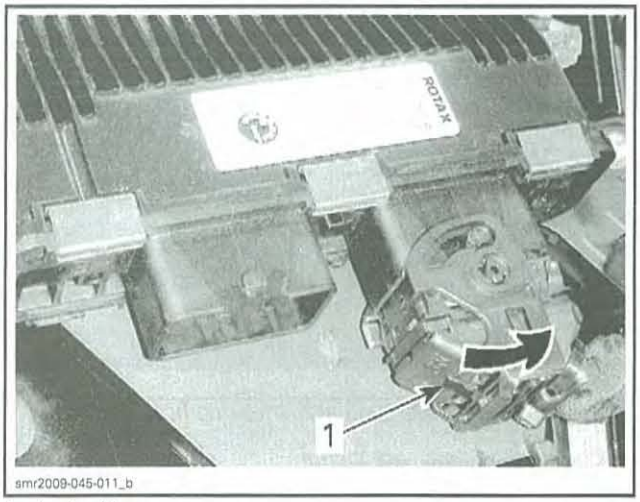
4. Pull connector off ECM.

Connector Installation

1. Fully open connector locking cam.

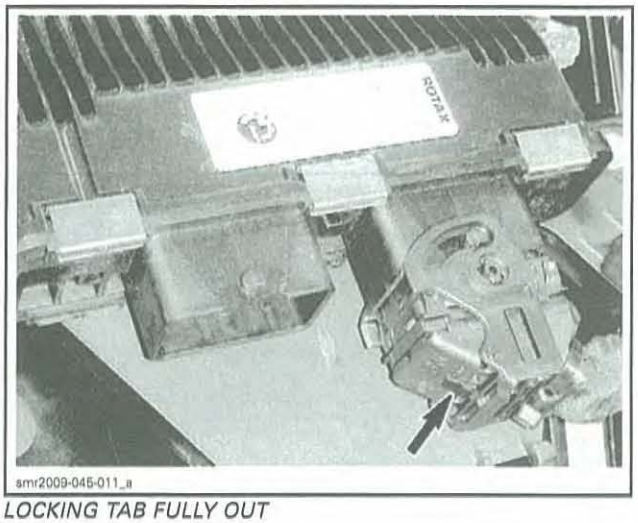
CONNECTOR LOCKING CAM IN RELEASE POSITION

2. Insert connector on ECM.
3. As you push the connector onto the ECM, rotate the connector locking cam until it snaps locked.



1. Locked here

4. Ensure the locking tab is fully out.



LOCKING TAB FULLY OUT

Connector Inspection

Before replacing an ECM, always check electrical connections.

1. Ensure connector locking mechanism is functioning properly.
2. Ensure all wire terminals (pins) are properly locked in the connector.
3. Ensure they are very tight, make good contact with the pins in the ECM.
4. Ensure the pins in the harness connector and the ECM connector are clean, shiny and corrosion-free.
5. Check wiring harness for signs of scoring.

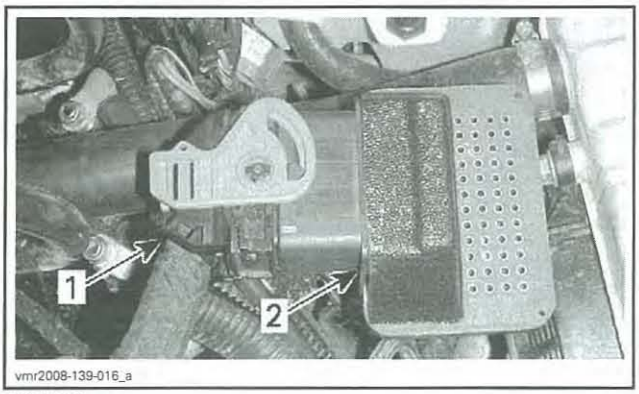
NOTE: A "defective ECM module" could possibly be repaired simply by disconnecting and reconnecting it.

NOTICE **Do not apply any lubricant product to the pins of the ECM connector.**

Connector Probing

The most recommended and safest method to probe the MOLEX (ECM) connector terminals is to use the ECM ADAPTER TOOL (P/N 529 036 166). This tool will prevent deforming or enlarging of the terminals, which would lead to bad ECM terminal contact creating intermittent or permanent problems.

1. Disconnect the ECM connector to be probed, and reconnect it on the ECM adapter.
2. Probe wire terminals of the circuit to be tested directly in the adapter holes.



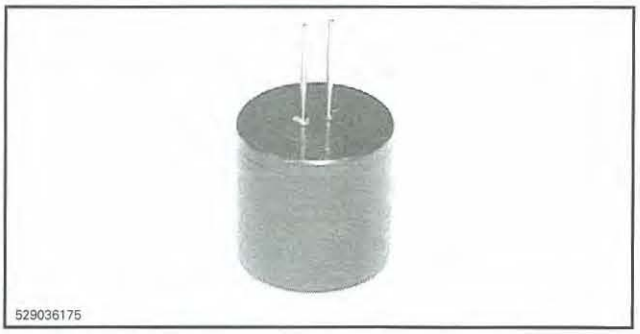
TYPICAL
1. ECM connector
2. ECM adapter

NOTICE Never probe directly on the ECM harness connector. This could change the shape or enlarge the terminals and create intermittent or permanent contact problems.

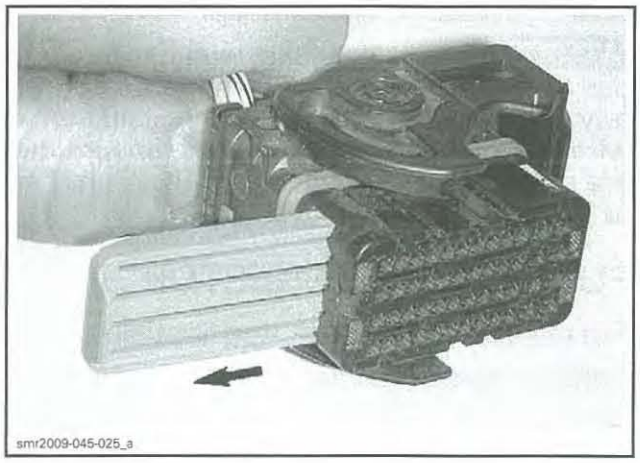
Connector Terminal Removal (Harness Connector)

To remove a signal terminal from the ECM harness connector, use the ECM TERMINAL REMOVER 2.25 (P/N 529 036 175).

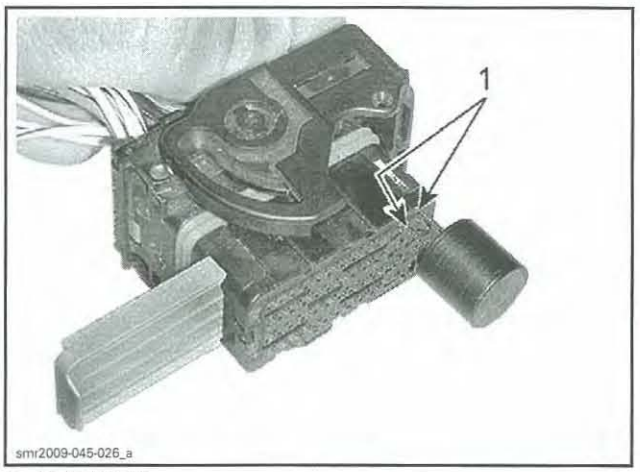
To remove a power terminal, use the ECM TERMINAL REMOVER 3.36 (P/N 529 036 174).



1. Remove rear protector from connector.
2. Pull out the connector lock.

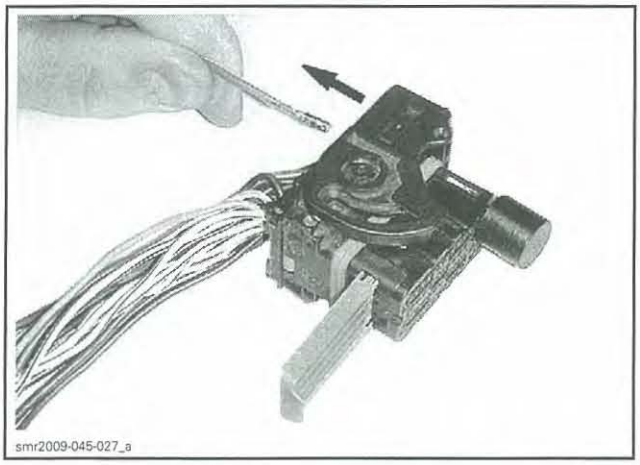


3. Insert tool to unlock terminal.



1. Unlock here

4. Gently pull on the wire to extract the terminal out the back of the connector.


smr2009-045-027_a

NOTICE Before installing wire terminals in the connector, ensure all terminals are properly crimped on wires. After installation of wire terminals in the connectors, ensure they are properly locked by gently pulling on them as if to extract them.

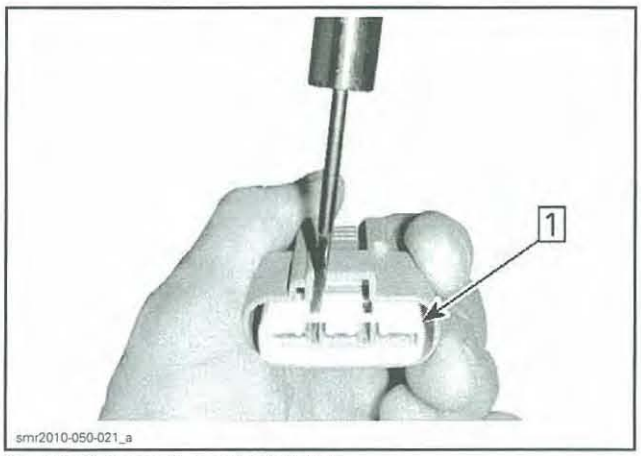
FURUKAWA CONNECTOR

Furukawa Connector Application

Voltage regulator/rectifier.

Terminal Removal

1. Remove the secondary lock (plastic insert).



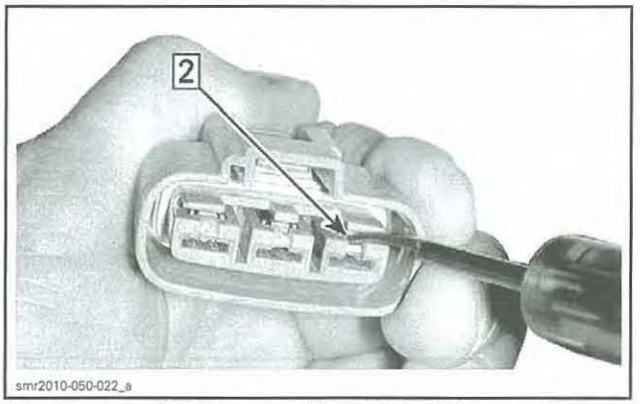
smr2010-050-021_a

Step 1: Remove the secondary lock

2. Carefully insert the GM TERMINAL EXTRACTOR (P/N 12094430) between the lock and the pin to release the pin.

smr2010-052-003

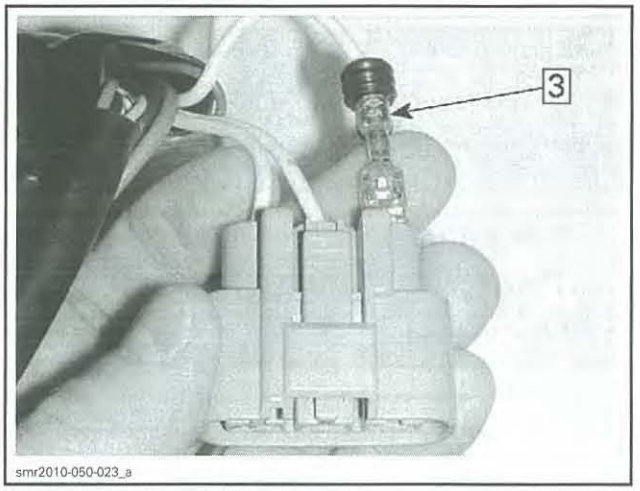
GM TERMINAL EXTRACTOR (P/N 12094430)



smr2010-050-022_a

Step 2: Insert GM extractor tool (P/N 12094430)

3. Gently pull on the wire to extract the pin out the back of the connector.



smr2010-050-023_a

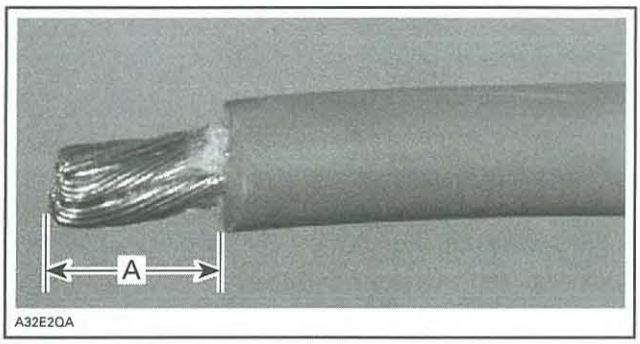
Step 3: Pull wire to extract pin

NOTICE Before installing terminals in the connectors, ensure all terminals are properly crimped on the wires. After installation of the wire terminals in the connectors, ensure they are properly locked by gently pushing on them as if to extract them.

BATTERY AND STARTER CABLE TERMINALS

Cable Crimping

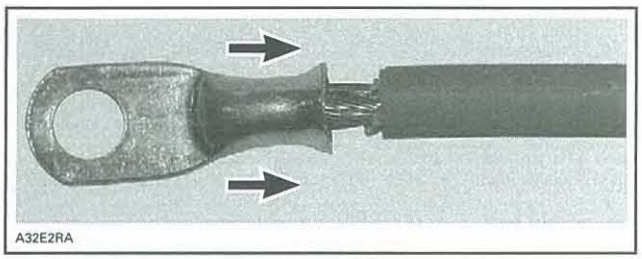
Carefully strip the wire approximately to 10 mm (3/8 in) in length, using a wire stripping tool or sharp blade/knife.



A. 10 mm (3/8 in)

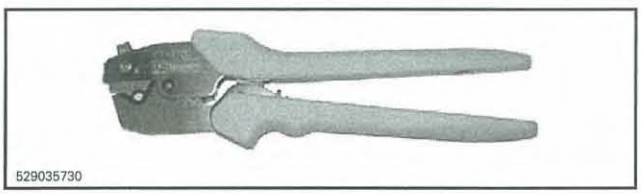
NOTE: Make sure not to cut wire strands while stripping the wire.

Install the appropriate terminal on the wire according to the requirement. Refer to appropriate *PARTS CATALOG*.

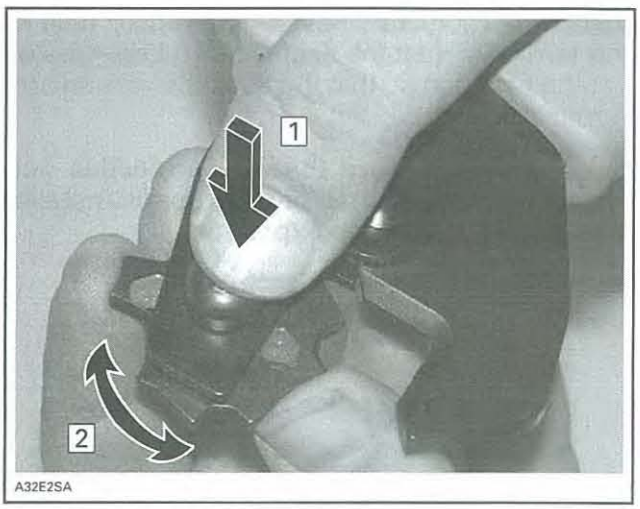


INSTALLATION OF TERMINAL

Follow the instructions provided with the CRIMPING TOOL (HEAVY GAUGE WIRE) (P/N 529 035 730) to select the proper position of the tool.

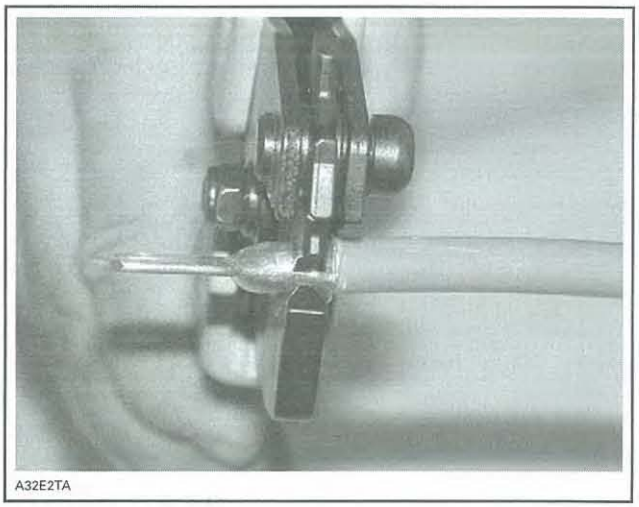


NOTE: Different wires require different crimping pliers settings.

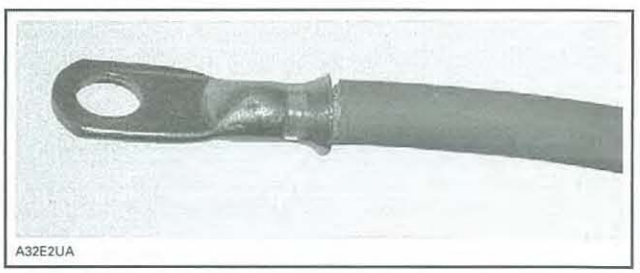


POSITIONING THE CRIMPING PLIERS
Step 1: Step 1: Press
Step 2: Step 2: Rotate

After positioning the crimping pliers, crimp the terminal already installed on wire.



CRIMPING OF WIRE



PROPERLY CRIMPED WIRE

To verify, if the wire is properly crimped, apply some pulling force on wire and the terminal at the same time from both directions.

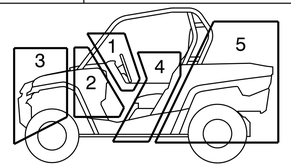
NOTICE Never weld the wire to the terminal. Welding can change the property of the wire and it can become brittle and break.

Install the protective heat shrink rubber tube on the terminal. Heat the heat shrink rubber tube using the heat gun so that it grasps the wire and the terminal.

NOTICE **Make sure that the protective heat shrink rubber tube has been properly installed and no part of wire is exposed.**

COMMANDER 2011

GENERAL SYSTEM



TERMINAL IDENTIFICATION		
	NAME	ZONE-CONNECTOR NAME-TERMINAL #/A
EX:	CI	1 - CI - 15
EX:	CV	4 - CV - A
EX:	ME	2 - ME

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

	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

JT RD/GN
JT RD/GY
JT OR/BE
JT OR/GN
JT RD/BE
JT BK/YL
JT VI/BU
JT BE/GN
JT WH/BE
JT OR/VI
JT RD/YL
JT WH
JT RD/BK
JT RD/VI
JT RD/BR
JT GN
JT BU
JT RD/OR
JT OR/BK
JT BK1
JT BK2
JT BK3
JT BK4
JT BK5

PF2 (1/2) MAIN FUSE (F1) 30 A
PF2 (2/2) FAN / ACCES. FUSE (F2) 40 A
PF1 CONTROL EURO F10 5A
PF1 KEY SWITCH FUSE (F8) 5 A
PF1 MAIN RELAY (R2)
PF1 RELAY SPEEDO FUSE (F4) 10 A
PF1 RELAY DRIVER FUSE (F13) 5 A
PF1 FUEL PUMP (F15) 5 A
PF1 ECM FUSE (F6) 5 A
PF1 INJECTORS IGNITION FUSE (F5) 7.5 A
PF1 LIGHT FUSE (F11) 30A
PF1 ACCESSORIES RELAY (R3)
PF1 WINCH 2WD/4WD FUSE (F7) 5 A
PF1 DC OUTLETS FUSE (F12) 15A
PF1 ACC2 FUSE (F14) 15A
PF1 COOLING FAN FUSE (F9) 30 A
PF1 FAN RELAY (R1)
PF1 LIGHTS RELAY (R4)
PF1 BRK RELAY (R8)
FRA BRAKE LIGHT SWITCH
CC IGNITION KEY (ON & DESS)
CI SPEEDOMETER & PILOT LAMPS
SW WINCH RELAY
SS STARTER SOLENOID
FREE WEELING DIODE (D2)
SM STARTER MOTOR
BAT BATTERY 12 VDC 18 AH
SPORT SWITCH
SEAT BELT
STSW START SWITCH
DB2
RD RECTIFIER
ECM ENGINE CONTROL MODULE
FP (1/2) FUEL PUMP
FP (2/2) FUEL LEVEL SENSOR
BA IGNITION COIL
SPK2 SPARK PLUG (REAR)
SPK1 SPARK PLUG (FRONT)
INJ1 FUEL INJECTOR (FRONT)
INJ2 FUEL INJECTOR (REAR)
DB DIAGNOSTIC CONNECTOR
SD 2WD/4WD ACTUATOR SWITCH
MD 2WD/4WD ACTUATOR
ONE-WAY DIODE (D5)
ONE-WAY DIODE (D4)
WM WINCH MOTOR
SWW WINCH SWITCH
BD
DC6 DC OPTION
DC3 DC OPTION
DC DC OUTLET
DC4
PF1 LIGHTS RELAY (R4)
KEY SWITCH
HIBM
PF1 BRK RELAY (R8)
ETA ELECTRONIC THROTTLE
TPS
CTS COOLANT TEMP SENSOR
VSS VEHICULE SPEED SENSOR
MAPTS MANIFOLD AIR PRESSURE / TEMP SENSOR
GBPS GEAR - BOX POSITION SENSOR
CPS CRANKSHAFT POSITION SENSOR
TAS THROTTLE ACCELERATOR SENSOR
CA MAGNETO 650 WATTS
OPS OIL PRESSURE SWITCH
PRD LEFT TAIL LIGHT
PRG RIGHT TAIL LIGHT
FT COOLING FAN

(05 OCT 2010)
(RÉF. BOSCH 2.5) 710001373F1

SAFETY NOTICE

This manual has been prepared as a guide to correctly service and repair the 2012 Can-Am™ Commander LTD as described in the model list in the *INTRODUCTION*.

This *SHOP MANUAL SUPPLEMENT* must be used in conjunction with the *2011 CAN-AM COMMANDER SHOP MANUAL* (P/N 219 100 452). Refer to this manual when a particular system is not covered in this supplement.

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

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

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

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

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

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

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

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

⚠ WARNING

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

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

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

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

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

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

BRP disclaims liability for all damages and/or injuries resulting from the improper use of the contents. We strongly recommend that any services be carried out and/or verified by a highly skilled professional mechanic.

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INTRODUCTION

This shop manual covers the following BRP made 2012 Can-Am side-by-side vehicles.

MODEL	MODEL NUMBER
Commander 1000 LTD	6GCA, 6GBC, 6GCC, 6GCD

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

Due to late changes, there may be some differences between the manufactured product and the description and/or specifications in this document.

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

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COMMANDER 1000 LIMITED

MODEL			COMMANDER 1000 LTD
ENGINE			
Engine type			ROTAX®1010
			V-twin 4-stroke, Single Over Head Camshaft (SOHC), liquid cooled
Number of cylinders			2
Number of valves			8 valves (mechanical adjustment)
Bore			91 mm (3.583 in)
Stroke			75 mm (2.95 in)
Displacement			976 cm^3 (59.6 in^3)
Compression ratio			10.5:1
Maximum HP RPM			7000 rpm
Exhaust system			Spark arrestor approved by USDA Forest Service
Air filter			Flat corrugated composite fiber
Intake valve opening			5° BTDC
Intake valve closing			60° ABDC
Exhaust valve opening			65° BBDC
Exhaust valve closing			5° BTDC
Valve clearance	Intake		0.06 mm to 0.14 mm (.0024 in to .0055 in)
	Exhaust		0.11 mm to 0.19 mm (.0043 in to .0075 in)
Valve stem diameter	Intake	New	4.966 mm to 4.980 mm (.1955 in to .1961 in)
		Service limit	4.930 mm (.1941 in)
	Exhaust	New	4.956 mm to 4.970 mm (.1951 in to .1957 in)
		Service limit	4.930 mm (.1941 in)
Valve out of round	Intake and exhaust	New	0.005 mm (.0002 in)
		Service limit	0.06 mm (.0024 in)
Valve guide diameter		New	4.998 mm to 5.018 mm (.1968 in to .1976 in)
		Service limit	5.050 mm (.1988 in)
Valve spring free length		New	40.81 mm (1.607 in)
		Service limit	39.00 mm (1.535 in)
Valve seat contact width	Intake	New	1.05 mm to 1.35 mm (.041 in to .053 in)
		Service limit	1.8 mm (.071 in)
	Exhaust	New	1.25 mm to 1.55 mm (.049 in to .061 in)
		Service limit	2 mm (.079 in)
Rocker arm bore diameter		New	12.036 mm to 12.050 mm (.4739 in to .4744 in)
		Service limit	12.060 mm (.4748 in)
Rocker arm shaft diameter		New	12.000 mm to 12.018 mm (.4724 in to .4731 in)
		Service limit	11.990 mm (.472 in)
Piston diameter		New	90.950 mm to 90.966 mm (3.5807 in to 3.5813 in)
		Service limit	90.900 mm (3.5787 in)
Piston/cylinder clearance		New	0.027 mm to 0.057 mm (.0011 in to .0022 in)
		Service limit	0.100 mm (.0039 in)

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MODEL			COMMANDER 1000 LTD
ENGINE (CONT'D)			
Piston ring type		1st	Upper compression ring, rectangular
		2nd	Lower compression ring, tapered face
		3rd	Oil scraper ring
Ring end gap	Rectangular	New	0.20 mm to 0.40 mm (.008 in to .016 in)
	Tapered face		0.20 mm to 0.40 mm (.008 in to .016 in)
	Oil scraper ring		0.20 mm to 0.70 mm (.008 in to .028 in)
	Rectangular	Service limit	0.60 mm (.024 in)
	Tapered face		0.70 mm (.028 in)
	Oil scraper ring		1.00 mm (.039 in)
Ring/piston groove clearance	Rectangular	New	0.03 mm to 0.07 mm (.0012 in to .0028 in)
	Tapered face		0.02 mm to 0.06 mm (.0008 in to .0024 in)
	Oil scraper ring		0.01 mm to 0.18 mm (.0004 in to .0071 in)
	Rectangular	Service limit	0.15 mm (.0059 in)
	Tapered face		0.15 mm (.0059 in)
	Oil scraper ring		0.25 mm (.0098 in)
Cylinder bore		New	90.993 mm to 91.007 mm (3.5824 in to 3.583 in)
Cylinder taper		Maximum New	0.038 mm (.0015 in)
		Service limit	0.090 mm (.0035 in)
Cylinder out of round		Maximum New	0.015 mm (.0006 in)
		Service limit	0.020 mm (.0008 in)
Camshaft main bearing journal	Timing chain side	New	34.959 mm to 34.975 mm (1.3763 in to 1.377 in)
		Service limit	34.950 mm (1.376 in)
	Spark plug side	New	21.959 mm to 21.980 mm (.8645 in to .8654 in)
		Service limit	21.950 mm (.8642 in)
Camshaft main bearing journal bore	Timing chain side	New	35.000 mm to 35.025 mm (1.378 in to 1.3789 in)
		Service limit	35.040 mm (1.3795 in)
	Spark plug side	New	22.000 mm to 22.021 mm (.8661 in to .867 in)
		Wear limit	22.040 mm (.8677 in)
Camshaft lobe	Intake valve	New	32.960 mm to 33.160 mm (1.2976 in to 1.3055 in)
		Service limit	32.940 mm (1.2969 in)
	Exhaust valve	New	32.860 mm to 33.060 mm (1.2937 in to 1.3016 in)
		Service limit	32.840 mm (1.2929 in)
Crankshaft main bearing journal diameter (MAG/PTO side)		New	42.016 mm to 42.040 mm (1.6542 in to 1.6551 in)
		Service limit	42.000 mm (1.6535 in)
Crankshaft radial play (MAG/PTO side)		Service limit	0.07 mm (.0028 in)
Crankshaft bearing journal diameter (in PTO cover)		New	34.004 mm to 34.020 mm (1.3387 in to 1.3394 in)
		Service limit	33.998 mm (1.3385 in)
Crankshaft radial play (PTO cover bearing)		Service limit	0.10 mm (.0039 in)
Crankshaft axial play		New	0.200 mm to 0.500 mm (.0079 in to .0197 in)
		Service limit	0.600 mm (.0236 in)

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MODEL			COMMANDER 1000 LTD
ENGINE (CONT'D)			
Crankshaft pin diameter		New	41.986 mm to 42.010 mm (1.653 in to 1.6539 in)
		Service limit	41.967 mm (1.6522 in)
Crankshaft deflection	MAG/PTO side	New	0.050 mm (.002 in)
Crankcase plain bearing	MAG/PTO side	Service limit	42.100 mm (1.6575 in)
PTO cover plain bearing		Service limit	34.120 mm (1.3433 in)
Connecting rod big end diameter		Service limit	42.100 mm (1.6575 in)
Connecting rod big end radial play		Service limit	0.09 mm (.0035 in)
Connecting rod big end axial play		New	0.250 mm to 0.550 mm (.0098 in to .0217 in)
		Service limit	0.600 mm (.024 in)
Connecting rod small end diameter		New	22.010 mm to 22.020 mm (.8665 in to .8669 in)
		Service limit	22.050 mm (.8681 in)
Piston pin diameter		New	21.996 mm to 22.000 mm (865.984 in to 866.142 in)
		Service limit	21.980 mm (.8654 in)
Connecting rod/piston pin clearance (radial play)		Service limit	0.080 mm (.0031 in)
LUBRICATION SYSTEM			
Lubrication	Type		Wet sump. Replaceable cartridge oil filter
	Oil filter		BRP Rotax paper type, replaceable
	Engine oil pressure	Minimum	300 kPa (44 PSI) at 6000 RPM
	Engine oil	Capacity (oil change with filter)	2.2 L (2.3 qt (U.S. liq.))
		Recommended	For the summer season, use XPS synthetic blend oil (summer grade) (P/N 293 600 121). For the winter season, use XPS synthetic oil (winter grade) (P/N 293 600 112). If not available, use a 5W40 motor oil that meets the requirements for API service classification SM, SL or SJ
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		4.3 L (1.1 U.S. gal.)
Thermostat	Starts to open		65°C (149°F)
	Fully open		88°C (190°F)
Radiator cap opening pressure			110 kPa (16 PSI)

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MODEL		COMMANDER 1000 LTD
TRANSMISSION		
Type		CVT (Continuously Variable Transmission)
Engagement RPM		1750 ± 100 RPM
Drive belt width	Service limit	30.00 mm (1.181 in)
Governor cup roller outer diameter	New	13.70 mm to 13.80 mm (.539 in to .543 in)
	Service limit	13.20 mm (.52 in)
Governor cup roller inner diameter	New	8.05 mm to 8.15 mm (.317 in to .321 in)
	Service limit	9.00 mm (.354 in)
Centrifugal lever pivot bolt diameter	New	6.078 mm to 6.100 mm (.239 in to .24 in)
	Service limit	6.000 mm (.236 in)
Centrifugal lever bore diameter	New	6.035 mm to 6.078 mm (.2376 in to .2393 in)
	Service limit	6.200 mm (.244 in)
Drive pulley sliding half centrifugal lever pivot bolt bore diameter	New	6.113 mm to 6.171 mm (.241 in to .243 in)
	Service limit	6.300 mm (.248 in)
Drive pulley sliding half large bushing	New	55.000 mm to 55.040 mm (2.165 in to 2.167 in)
	Service limit	55.200 mm (2.173 in)
Drive pulley sliding half small bushing	New	32.000 mm to 32.040 mm (1.26 in to 1.261 in)
	Service limit	32.200 mm (1.268 in)
Drive pulley spring free length	Service limit	105 mm (4.134 in)
Drive pulley spring free squareness	Service limit	4 mm (.157 in)
Spring sleeve length	New	9.2 mm to 9.4 mm (.362 in to .37 in)
	Service limit	9.0 mm (.354 in)
Driven pulley sliding half bushing	New	30.060 mm to 30.100 mm (1.183 in to 1.185 in)
	Service limit	30.200 mm (1.189 in)
Driven pulley sliding fixed bushing	New	30.060 mm to 30.100 mm (1.183 in to 1.185 in)
	Service limit	30.200 mm (1.189 in)
Torque gear on driven pulley	Service limit	7.500 mm (.295 in)
Driven pulley spring free length	Service limit	125 mm (4.921 in)
Driven pulley spring free squareness	Service limit	3.8 mm (.15 in)
GEARBOX		
Type		Dual range (HI-LO) with park, neutral and reverse
Gearbox oil	Capacity	450 ml (15 U.S. oz)
	Recommended	XPS synthetic gear oil (P/N 293 600 140) or a 75W140 API GL-5 synthetic gear oil
Coupling sleeve groove width	New	5.25 mm to 5.35 mm (.207 in to .211 in)
	Service limit	5.50 mm (.217 in)
Coupling fork claw thickness	New	4.95 mm to 5.05 mm (.195 in to .199 in)
	Service limit	4.80 mm (.189 in)
Shift fork claw thickness (high, low and reverse gear shift fork)	New	5.10 mm to 5.20 mm (.201 in to .205 in)
	Service limit	5.00 mm (.197 in)
Width of shift fork engagement groove	New	5.30 mm to 5.40 mm (.209 in to .213 in)
	Service limit	5.50 mm (.217 in)

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MODEL			COMMANDER 1000 LTD
GEARBOX (CONT'D)			
Diameter free pinions		New	29.000 mm to 29.013 mm (1.1417 in to 1.1422 in)
		Service limit	29.015 mm (1.1423 in)
Intermediate gear shaft		New	24.987 mm to 25.000 mm (.9837 in to .9843 in)
		Service limit	24.977 mm (.983 in)
Countershaft	MAG side	New	19.977 mm to 19.990 mm (.7865 in to .787 in)
		Service limit	19.973 mm (.7863 in)
	CVT side	New	24.977 mm to 24.990 mm (.9833 in to .9839 in)
		Service limit	24.970 mm (.9831 in)
Main shaft	Free pinion bearing	New	24.987 mm to 25.000 mm (.9837 in to .9843 in)
		Service limit	24.984 mm (.9836 in)
	Bearing journal MAG/CVT side	New	16.980 mm to 16.991 mm (.6685 in to .6689 in)
		Service limit	16.976 mm (.6683 in)
ELECTRICAL SYSTEM			
Magneto generator output			650 W @ 6000 RPM
Stator resistance (20C)			0.15 to 0.30 Ω
Ignition system type			IDI (Inductive Discharge Ignition)
Ignition timing			Not adjustable
Spark plug	Quantity		2
	Make and type		NGK DCPR8E
	Gap		0.7 mm to 0.8 mm (.028 in to .031 in)
Engine RPM limiter setting	Forward		8000 rpm
	Reverse		20 km/h to 25 km/h (12 MPH to 16 MPH) (8000 rpm with Override)
Battery	Type		Maintenance free
	Voltage		12 volts
	Nominal rating		18 A•h
	Power starter output		0.7 KW
Headlight			4 x 60 W
Taillight			2 X 8/27 W
Turn signals (CE)			10 W
Position light			LED, 0.7 V approximately (each)

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MODEL			COMMANDER 1000 LTD
ELECTRICAL SYSTEM (CONT'D)			
Fuses (fuse block #2)	F1: Main		30 A
	F2: Main accessories		50 A
	F3: ACS suspension		60 A
Fuses (fuse block #1)	F4: Speedometer and brake relay		10 A
	F5: Fuel injectors and ignition coils		7.5 A
	F6: Engine control module (ECM)		5 A
	F7: Winch and 2WD/4WD switches		5 A
	F8: Ignition switch and gauge		5 A
	F9: Cooling fan		25 A
	F10: Euro controls		5 A
	F11: Lights		30 A
	F12: 12V power outlet		15 A
	F13: Cooling fan relay (R1) and Accessories relay (R3)		5 A
	F14: 12V power (connector DC6)		15 A
	F15: Fuel pump		5 A
Relays			Cooling fan relay (R1)
			Main relay (R2)
			Accessories relay (R3)
			Lights relay(R4)
			ACS suspension relay (R5)
			Brake relay (R8)
FUEL SYSTEM			
Fuel delivery	Type		Electronic Fuel Injection (EFI), 54 mm throttle body with iTC (Intelligent Throttle Control), 1 injector per cylinder
Fuel pump	Type		Electrical (in fuel tank)
	Operating pressure		350 kPa (51 PSI)
Idle speed			1250 rpm ± 50 (not adjustable)
Fuel	Type		Regular unleaded gasoline
	Octane rating	Inside North America	87 (R+M)/2 or higher
		Outside North America	92 RON or higher
Fuel tank capacity			38 L (10 U.S. gal.)
Fuel remaining when low fuel light turns ON			± 12 L (3.2 U.S. gal.)

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MODEL		COMMANDER 1000 LTD
DRIVE SYSTEM		
Front drive		Visco-lok† front differential
Front drive ratio		3.6:1
Rear drive		Shaft driven/spool
Rear drive ratio		3.6:1
Front differential oil	Capacity	500 ml (17 U.S. oz)
	Recommended	XPS synthetic gear oil (P/N 293 600 043) or synthetic gear oil 75W90 API GL-5
Rear final drive oil	Capacity	350 ml (11.8 U.S. oz)
	Recommended	XPS synthetic gear oil (P/N 293 600 140) or synthetic gear oil 75W140 API GL-5
CV joint grease		CV joint grease (P/N 293 550 019)
Propeller shaft grease		Hi-temp bearing grease NLGI-2 or an equivalent
STEERING		
Steering wheel		Adjustable tilt steering
Turning radius		240 cm (94.5 in)
Total toe (vehicle on ground)		0 mm ± 4 mm (0 in ± .157 in)
Camber angle (vehicle on ground)		0.7° positive
Tie-rod maximum length unengaged threads		32 mm (1.26 in)
FRONT SUSPENSION		
Suspension type		Double suspension-arm with dive-control geometry with ACS
Suspension travel		254 mm (10 in)
Shock absorber	Qty	2
	Type	HPG clicker with air
Spring free length		358.7 mm (14.122 in)
Preload adjustment type		Automatic mode: 6 positions air compression settings Manual mode: limitless between position 1 and position 6 of automatic mode

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MODEL		COMMANDER 1000 LTD
REAR SUSPENSION		
Suspension type		Torsional Trailing arm Independant (TTI) with external sway bar with ACS
Suspension travel		254 mm (10 in)
Shock absorber	Qty	2
	Type	HPG clicker with air
Spring free length		355.6 mm (14 in)
Preload adjustment type		Automatic mode: 6 positions air compression settings Manual mode: limitless between position 1 and position 6 of automatic mode
BRAKES		
Front brake	Qty	2
	Type	214 mm cross-drilled disc brakes with hydraulic twin-piston calipers
Rear brake	Qty	1
	Type	214 mm cross-drilled disc brake with hydraulic twin-piston caliper
Brake fluid	Capacity	250 ml (8.5 U.S. oz)
	Type	DOT 4
Caliper		Floating
Brake pad material	Front	Metallic
	Rear	Metallic
Minimum brake pad thickness		1 mm (.04 in)
Minimum brake disc thickness	Front	4.3 mm (11/64 in)
	Rear	4.3 mm (11/64 in)
Maximum brake disc warpage		0.2 mm (.01 in)
TIRE		
Pressure	Front	Maximum: 83 kPa (12 PSI) Minimum: 69 kPa (10 PSI)
	Rear	Maximum: 152 kPa (22 PSI) Minimum: 83 kPa (12 PSI)
Minimum tire thread depth		3 mm (.118 in)
Size	Front	27 x 9 x 14 (in)
	Rear	27 x 11 x 14 (in)
WHEELS		
Type		Cast aluminum
Rim size	Front	14 X 7 (in)
	Rear	14 X 8.5 (in)
Wheel nuts torque		100 N•m ± 10 N•m (74 lbf•ft ± 7 lbf•ft)
CHASSIS		
Cage type		50 mm (2 in) diameter, high strength steel, ROPS-approved cage

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MODEL			COMMANDER 1000 LTD
DIMENSION			
Overall length			300.4 cm (118.3 in)
Overall width			148.9 cm (58.6 in)
Overall height			182.9 cm (72 in)
Wheel base			192.4 cm (75.7 in)
Wheel track	Front		125.7 cm (49.5 in)
	Rear		121.9 cm (48 in)
Ground clearance			27.9 cm (11 in)
WEIGHT AND LOADING CAPACITY			
Dry weight			587 kg (1,295 lb)
Weight distribution	Front/rear		44/56
Cargo box capacity (Distribute load evenly in upper and lower cargo boxes without exceeding 181 kg (400 lb) in the upper cargo box.)		Total (upper + lower)	272 kg (600 lb)
		Upper	181 kg (400 lb)
		Lower	272 kg (600 lb)
Total vehicle load allowed (including driver, passenger, all other loads and added accessories)			363 kg (800 lb)
Gross vehicle weight rating			990 kg (2,183 lb)
Towing capacity (Hitch support of 50.8 mm (2 in) X 50.8 mm (2 in))			680 kg (1,500 lb) CE Model: 270 kg (600 lb)
Tongue capacity			68 kg (150 lb)

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AIR CONTROLLED SUSPENSION (ACS)

SERVICE TOOLS

Description	Part Number	Page
FLUKE 115 MULTIMETER	529 035 868	13–15, 17, 20–22

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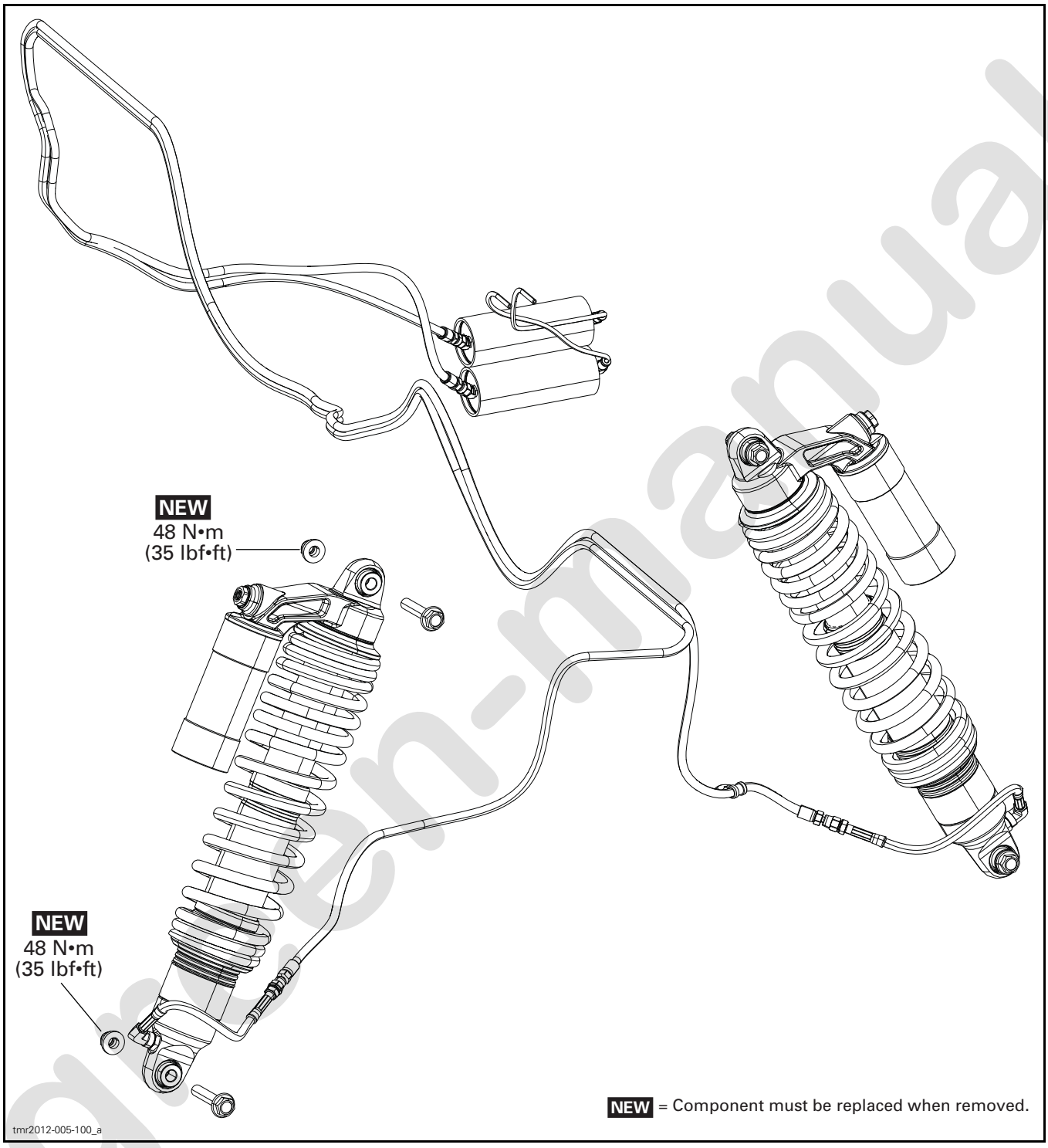
ACS FRONT SUSPENSION



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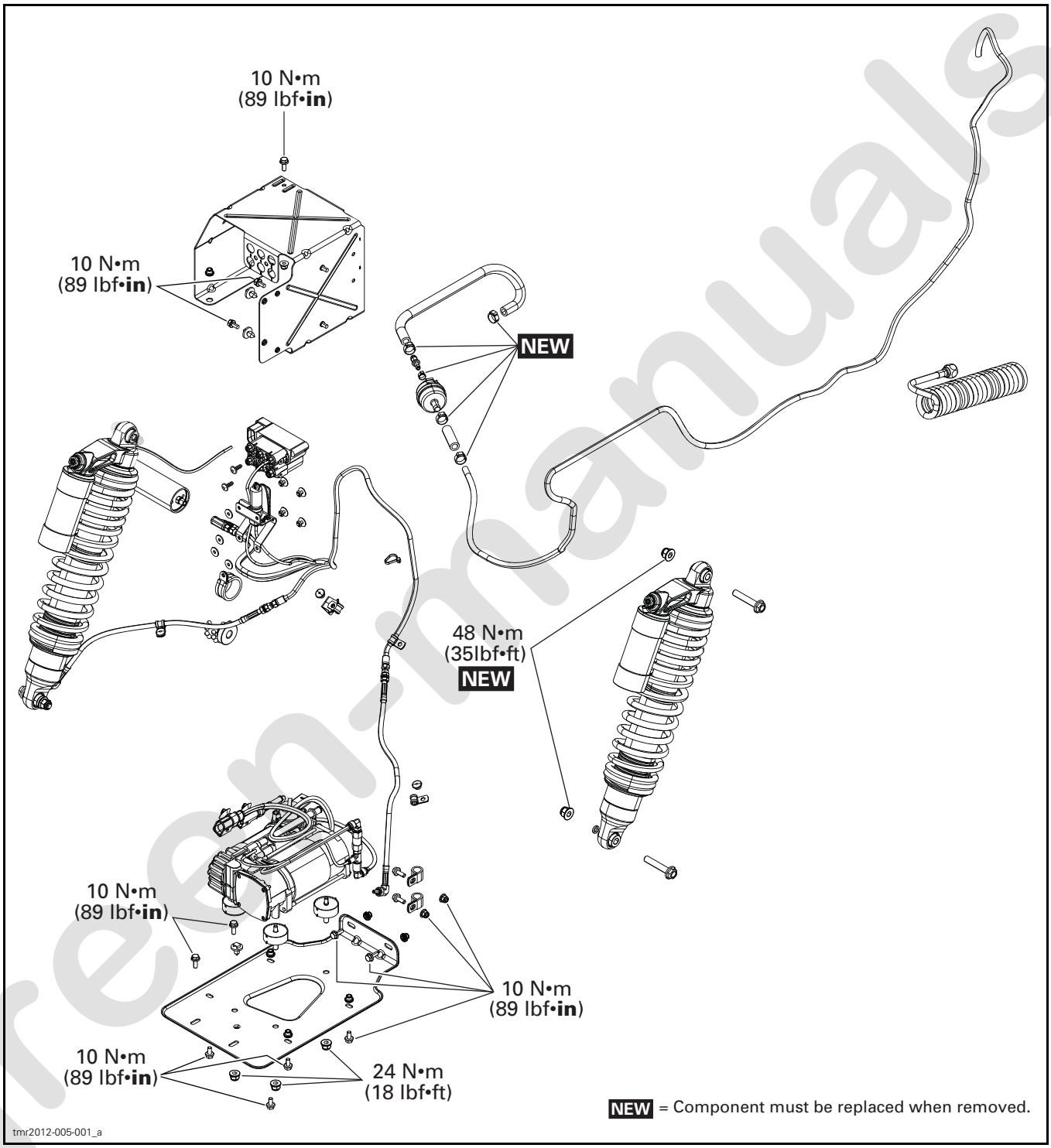
ACS REAR SUSPENSION



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GENERAL

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

⚠ WARNING

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

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

Be careful while manipulating nylon hoses, they must not be kinked.

⚠ **CAUTION** Always wear safety goggles when working with pressurized air system.

⚠ **CAUTION** The ACS suspension system may be under high pressure (over 900 kPa (130 PSI)). Release air pressure prior to working on the system. Refer to *AIR PRESSURE RELEASE FOR SERVICING*.

SYSTEM DESCRIPTION (OPERATION)

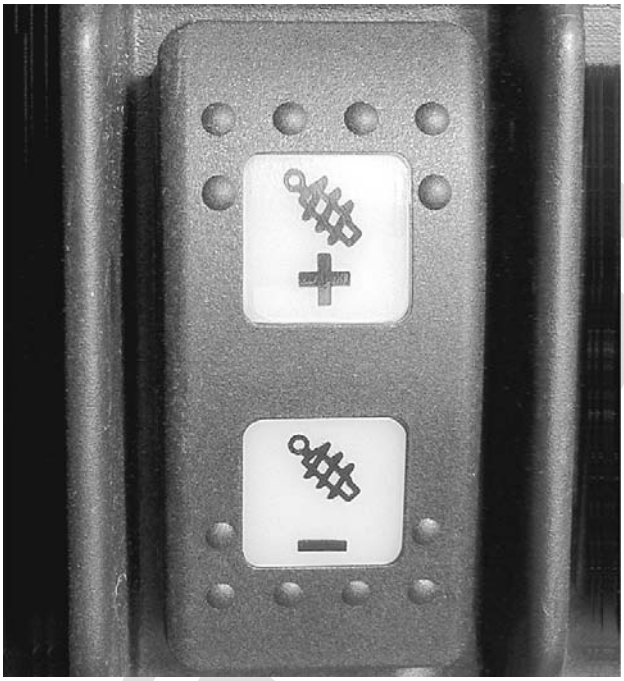
The Commander LTD comes equipped with front and rear air-controlled suspension and HPG shocks with remote reservoir (piggyback).

By changing the ACS setting, air pressure in the front and rear shocks absorbers will change to provide a multitude of different suspension adjustments.

The ACS adjusts the front and rear shocks to 6 rider selectable levels depending on trail conditions or riders preference.

The front shocks pressure is lower than the rear shocks. The pressure are determined by the setting position.

This system allows the operator to adjust the front and rear suspension by pressing the suspension button.



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⚠ WARNING

Always adjust the ACS suspension setting according to load, riding condition, and speed.

NOTE: The ACS suspension will NOT self-adjust unless the engine is running, even when key switch is set to on.

The ACS has 2 modes for suspension adjustment:
– ACS auto mode
– ACS manual mode.

ACS AUTO Mode

The automatic mode allows for simultaneous adjustments on the front and rear suspensions.

In auto mode, the suspension will automatically be adjusted to the preselected riding comfort position.

ACS SUSPENSION SETTINGS		
SETTING	RIDING COMFORT	RECOMMENDED LOAD
ACS 1	Softest	Operator only
ACS 2	Soft	
ACS 3	Semi-soft	Transporting a passenger OR a cargo
ACS 4	Semi-firm	
ACS 5	Firm with high ground clearance	Transporting a passenger AND a cargo
ACS 6	Firmest and highest ground clearance	

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ACS AUTO MODE

Use ACS 1 to ACS 4 for trail riding.

Use the ACS 5 or ACS 6 settings to maximize ground clearance and increase performance while riding in the following environments:

– Muddy
– Watery
– Obstacles.

Use the ACS 6 setting is to maximize ground clearance and increase performance while carrying heavy loads:

⚠ WARNING

Always adjust the ACS suspension setting according to load, riding condition, and speed.

To Enter ACS Automatic Mode:

Press the MODE button until either ACS AUTO or ACS MAN is displayed.

Press SET button to have current ACS mode blink on screen

Press SET button to select ACS AUTO mode.

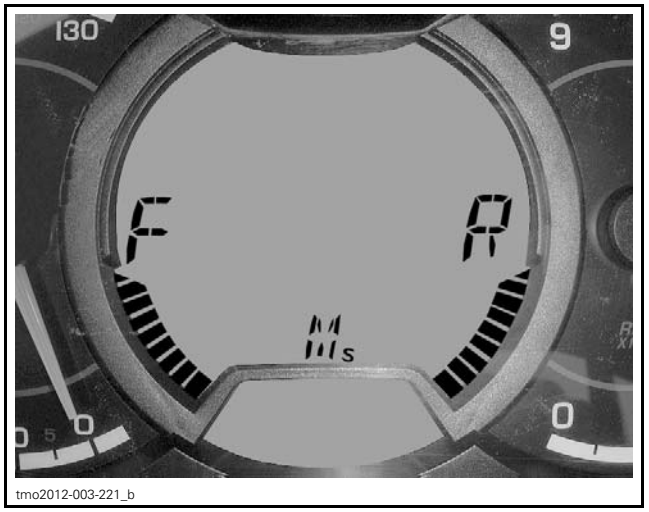
NOTE: Selected ACS Setting from ACS1 to ACS6 displayed through gearbox position indicator.

tmo2012-003-221_c

Press and hold SET button to confirm selection.

ACS MANUAL Mode

In manual mode the front and rear shock pressures can be adjusted independently. The fuel and temperature indicators will respectively become front and rear ACS pressure setting indicators.



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ACS MANUAL MODE

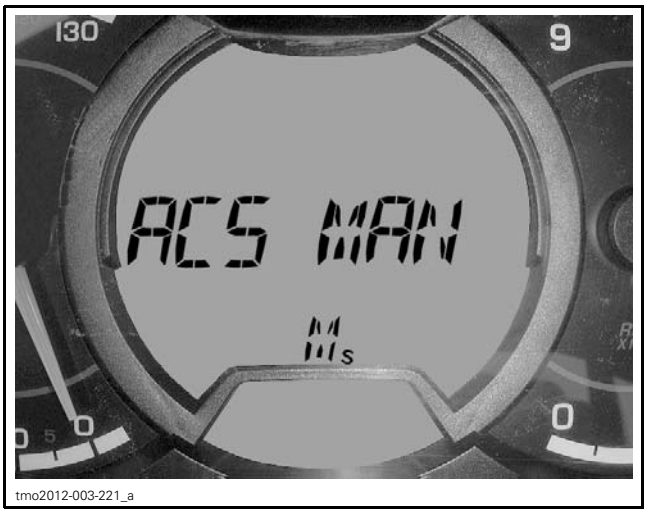
To Enter ACS Manual Mode:

Press the MODE button until either ACS AUTO or ACS MAN is displayed.

Press SET button to have current ACS mode blink on screen.

Press SET button to select ACS MAN mode.

NOTE: ACS set points and actual settings displayed through fuel, temp and gearbox position indicators.



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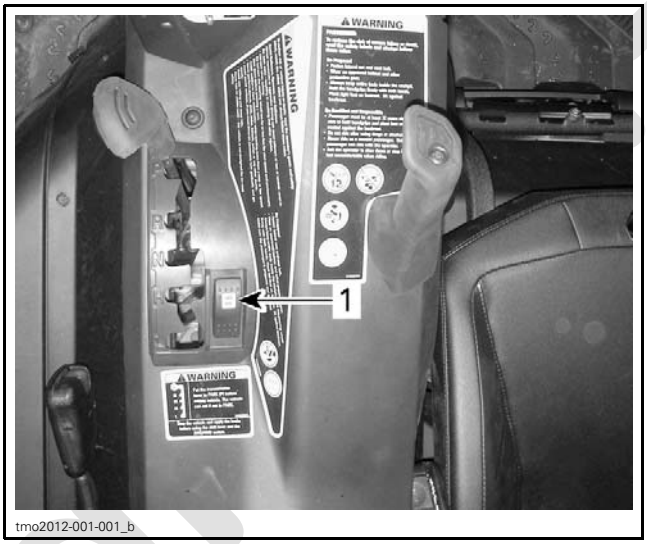
Press and hold SET button to confirm selection.

To Adjust Front Suspension:

Press on the OVERRIDE button until front (F) is blinking to select front (F) suspension setting.



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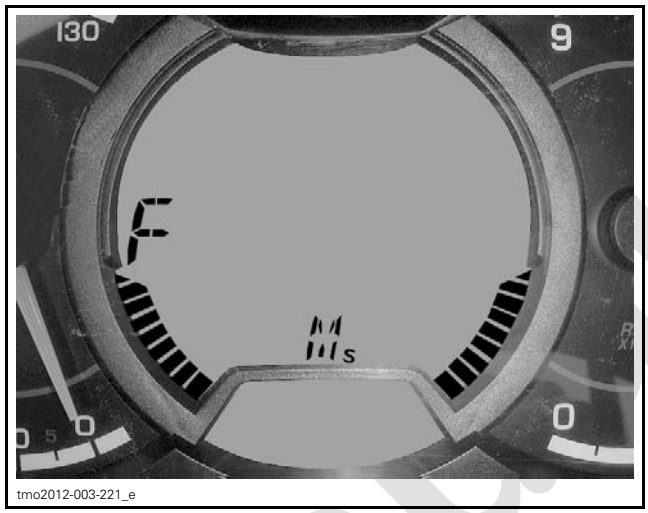
1. Override switch



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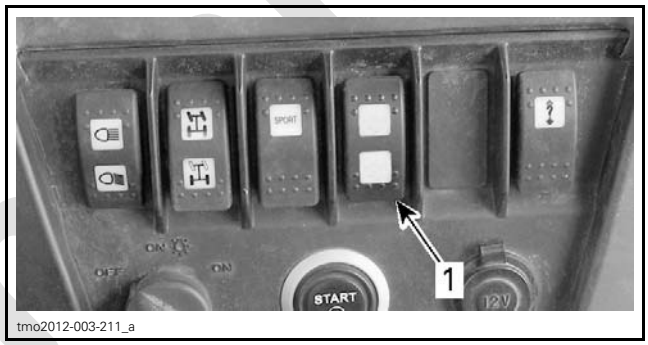
Press and hold ACS button to lower or raise the front suspension until desired setting is achieved.



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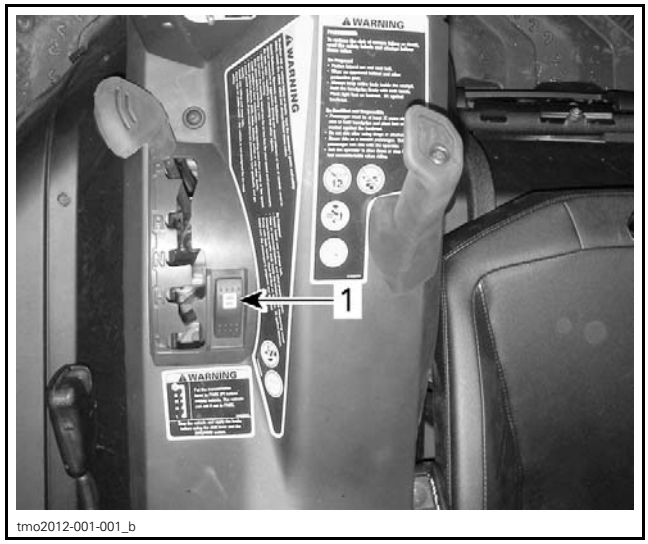
1. ACS button

To Adjust Rear Suspension:

Press on the OVERRIDE button until rear (R) is blinking to select rear (R) suspension setting.



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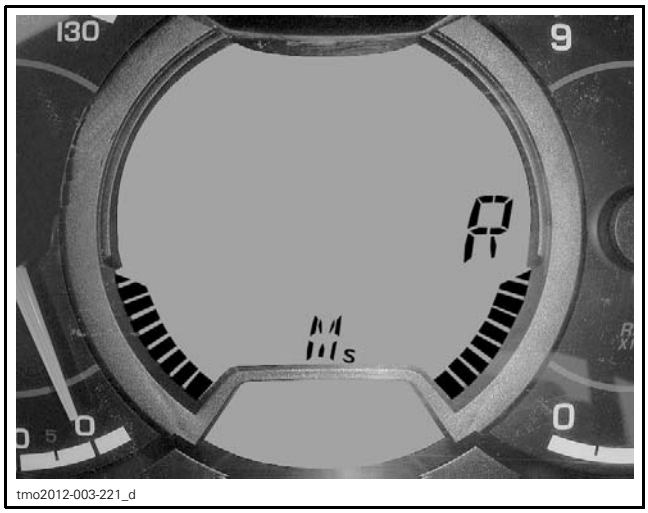
1. Override switch



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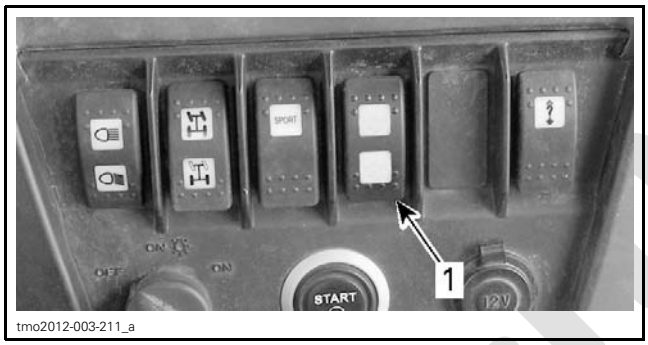
Use the ACS button to lower or raise the rear suspension.



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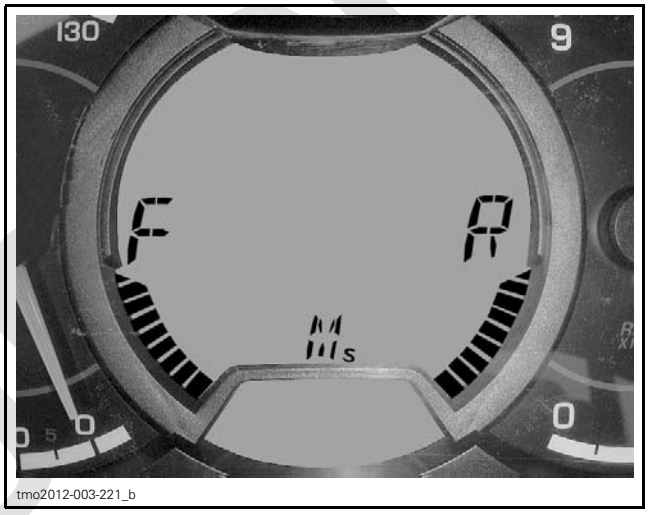
1. ACS button

NOTE: Fuel and temperature indicators will respectively become front and rear ACS setting indicators.



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Quick Mode Selection

The last setting utilized in each mode is stored in the system. This allows for quick selections between the stored automatic mode setting and the stored manual mode setting.

To Enter Quick Mode Selection:

Press the MODE button until either ACS AUTO or ACS MAN is displayed.

Press SET button to have current ACS mode blink on screen.

Press SET button to select desired mode.

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tmo2012-003-221_c

Press and hold SET button to confirm selection.

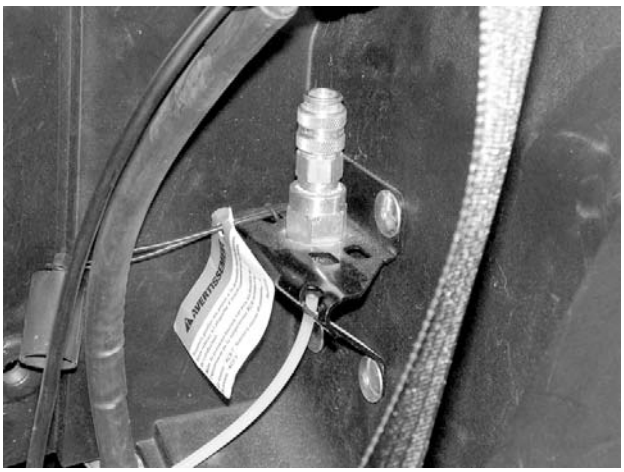
ACS system will adjust to the last settings.

SYSTEM DESCRIPTION (FEATURES)

Tire Inflation Using the ACS Compressor

The ACS compressor also comes with an auxiliary hose that can be used to inflate tires out on the trail.

The air outlet fitting is located behind the driver's seat.



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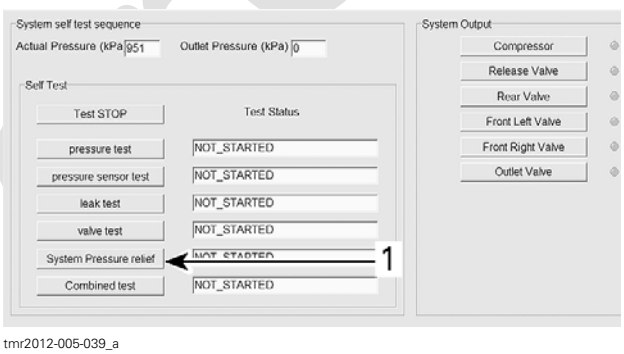
Air Pressure Release for Servicing

It is recommended to release air pressure in the system before servicing any components.

1. Connect vehicle to the latest appropriate version of B.U.D.S. Refer to *COMMUNICATION TOOLS AND B.U.D.S. SOFTWARE* subsection in the *2011 CAN-AM SIDE-BY-SIDE SHOP MANUAL*.
2. Select **Activation** page.
3. Select **ACS** folder.
4. Press the **System Pressure relief** button to proceed.



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1. **System Pressure relief** *button*

NOTE: After activating the **System Pressure relief** button the system is not completely empty. The compressor setting does not allowed to drop pressure under 207 kPa (30 PSI).

SYSTEM DESCRIPTION (COMPONENTS)

Fuse and Relay

ACS Fuse

The ACS system is protected by the fuse F3 (60 A) located in the fuse block no.2. This fuse powered the ACS compressor through the ACS relay (R5).

ACS Compressor Relay (R5)

ACS compressor relay (R5) is located near ACS compressor, under driver's seat.

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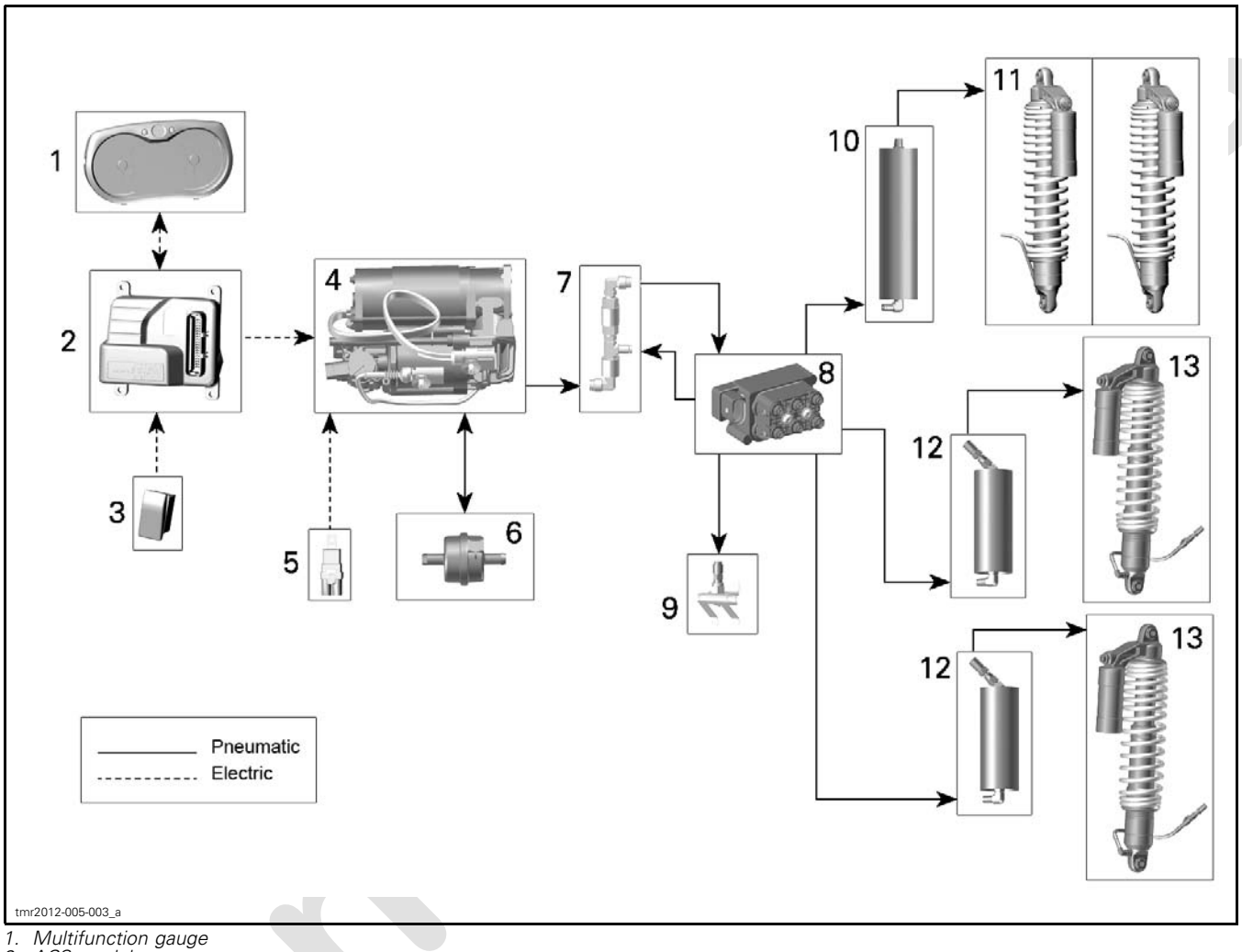
ACS Main Components



1. *Multifunction gauge*
2. *ACS module*
3. *ACS button*
4. *ACS compressor (including temperature sensor)*
5. *ACS relay (R5)*
6. *Air filter*
7. *Pressure distributor*
8. *ACS solenoid valve (including pressure sensor)*
9. *Outlet fitting*
10. *Rear air reservoir*
11. *Rear shock absorbers*
12. *Front air reservoirs*
13. *Front shock absorbers*

TROUBLESHOOTING

DIAGNOSTIC TIPS

Error Message Displayed in Multifunction Gauge

Two error messages can appear in the multifunction gauge and they are not necessarily related to a failure of the ACS system.

AIR FAULT

If this message appears, it indicates a disparity between the requested and the actual suspension settings. The system should react to correct this situation and the message will disappear.

If the message remains active for a long period, it may indicates a major leak in the system. In this case, the module will automatically shut down the compressor to prevent it from overheating. The shut down procedure of the compressor will stay active until the next restart of the vehicle (key OFF, key ON).

If there is a major leak in the system, check the system for leakage, refer to *ACS SYSTEM LEAK TEST*.

If there is no leak, the problem can be electrical or mechanical. In this case, an electrical failure of the compressor or the solenoid valve will result in the impossibility to change the actual suspension setting; a mechanical failure of the solenoid valve will create the same situation.

After multiple attempts to change suspension setting, the module will activate error message AIR FAULT. Refer to *TROUBLESHOOTING GUIDELINES* for further troubleshooting procedure.

COMPRESSOR TEMPERATURE OVERHEAT

This message appears when the compressor temperature is over the calibrated value.

This situation can occur if the compressor or the solenoid valves are used during a long period of time (continually or with brief halts).

Let the compressor cool down before using it again.

TROUBLESHOOTING GUIDELINES

In AUTO Mode

GAUGE DISPLAY SETTING (S1 TO S6) CHANGED BUT SUSPENSION DOES NOT WORKED

1. Burn fuse F3 (60 A).
   - *Replace*
2. Faulty compressor.
   - *Carry out a compressor operation test. Refer to ACS COMPRESSOR OPERATION TEST.*
3. Faulty solenoid valve
   - *Carry out a solenoid valve operation test. Refer to ACS SOLENOID VALVE OPERATION TEST.*
4. Faulty ACS module
   - *Check the ACS module. Refer to ACS MODULE.*

GAUGE DISPLAY SETTING (S1 TO S6) DOES NOT CHANGED BUT SUSPENSION WORKED

1. Faulty ACS module
   - *Check the ACS module. Refer to ACS MODULE.*
2. Faulty multifunction gauge
   - *Check the multifunction gauge.*

GAUGE DISPLAY DOES NOT CHANGED AND SUSPENSION DOES NOT WORKED

1. Make sure engine is running
   - *Start engine.*
2. Burn fuse F3 (60 A).
   - *Replace*
3. Faulty ACS module
   - *Check the ACS module. Refer to ACS MODULE.*
4. Faulty ACS button or wiring
   - *Check ACS button continuity.*
   - *Check ACS button control circuit.*

In Manual Mode

GAUGE DISPLAY SETTING (F OR R) DOES NOT CHANGED

1. Faulty Override button
   - *Check the Override button.*
2. Faulty multifunction gauge
   - *Check the multifunction gauge.*

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AUTO and MANUAL Mode

SUSPENSION PRESSURE CAN BE INCREASED ONLY

1. Faulty solenoid valve
   - *Carry out a release valve operation test. Refer to ACS RELEASE VALVE OPERATION TEST.*
2. Faulty ACS release valve
   - *Carry out a solenoid valve operation test. Refer to ACS SOLENOID VALVE OPERATION TEST.*
3. Faulty ACS button or wiring
   - *Check ACS button continuity. Refer to ACS BUTTON.*
   - *Check ACS button control circuit. Refer to ACS BUTTON.*
4. Faulty ACS module
   - *Check the ACS module. Refer to ACS MODULE.*

SUSPENSION PRESSURE CAN BE DECREASED ONLY

1. Faulty relay (R5)
   - *Check the ACS relay. Refer to ACS RELAY.*
2. Faulty compressor.
   - *Carry out a compressor operation test. Refer to ACS COMPRESSOR OPERATION TEST.*
3. Faulty solenoid valve
   - *Carry out a solenoid valve operation test. Refer to ACS SOLENOID VALVE OPERATION TEST.*
4. Faulty ACS button or wiring
   - *Check ACS button continuity. Refer to ACS BUTTON.*
   - *Check ACS button control circuit. Refer to ACS BUTTON.*
5. Faulty ACS module
   - *Check the ACS module. Refer to ACS MODULE.*

SUSPENSION PRESSURE CAN NOT BE CHANGED

1. Make sure engine is running
   - *Start engine.*
2. Burn fuse F3 (60 A).
   - *Replace*
3. Faulty relay (R5)
   - *Check the ACS relay. Refer to ACS RELAY.*
4. Faulty compressor.
   - *Carry out a compressor operation test. Refer to ACS COMPRESSOR OPERATION TEST.*
5. Faulty solenoid valve
   - *Carry out a solenoid valve operation test. Refer to ACS SOLENOID VALVE OPERATION TEST.*
6. Faulty ACS button or wiring
   - *Check ACS button continuity. Refer to ACS BUTTON.*
   - *Check ACS button control circuit. Refer to ACS BUTTON.*
7. Faulty ACS module
   - *Check the ACS module. Refer to ACS MODULE.*

AIR OUTLET FITTING DOES NOT WORKS

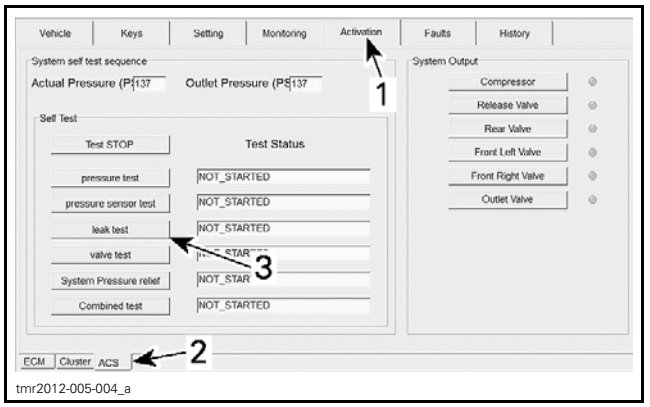
1. Make sure engine is running
   - *Start engine.*
2. Faulty solenoid valve
   - *Carry out a solenoid valve operation test. Refer to ACS SOLENOID VALVE OPERATION TEST.*

TROUBLESHOOTING WITH B.U.D.S.

Check battery voltage before performing any B.U.D.S. test. Battery must be fully charged or use a power pack to ensure adequate power for all required tests.

ACS System Leak Test

1. Connect vehicle to the latest appropriate version of B.U.D.S. Refer to *COMMUNICATION TOOLS AND B.U.D.S. SOFTWARE* subsection in the *2011 CAN-AM SIDE-BY-SIDE SHOP MANUAL*.
2. Select **Activation** page.
3. Select **ACS** folder.
4. In **Self Test** region, press the **leak test** button to proceed.



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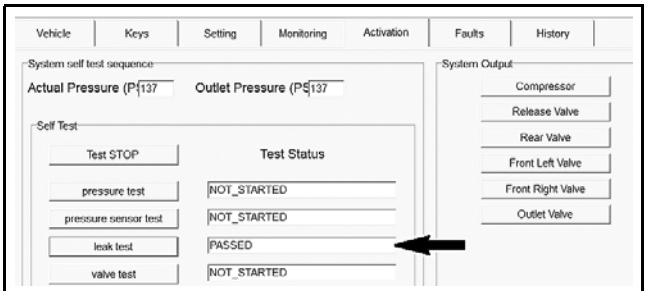
1. Activation page
2. ACS folder
3. Leak test button

The result will be indicated in the TEST STATUS box beside the **leak test** button.



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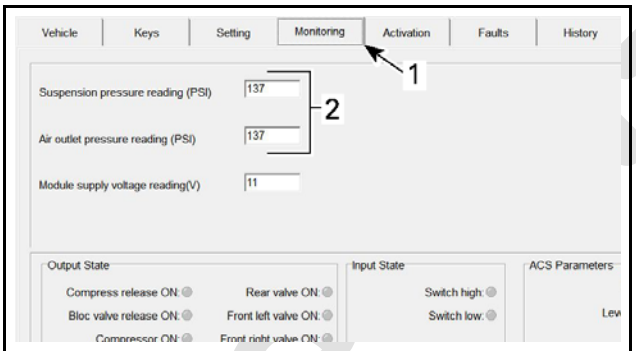
If a leak is detected, pressurize the system again and inspect hoses and fittings with soapy water to locate the faulty component.

ACS Air Pressure Monitoring

To monitor air pressure in the system during troubleshooting operation, proceed as follows:

1. Connect vehicle to the latest appropriate version of B.U.D.S. Refer to *COMMUNICATION TOOLS AND B.U.D.S. SOFTWARE* subsection in the *2011 CAN-AM SIDE-BY-SIDE SHOP MANUAL*.
2. Select **Monitoring** page.
3. Select **ACS** folder.



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1. *Monitoring page*
2. *Suspension pressure*

PROCEDURES

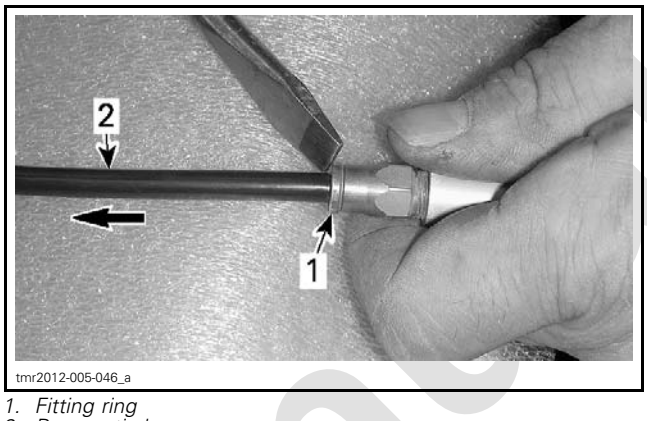
PNEUMATIC HOSE

NOTICE **Do not attempt to disconnect pneumatic hoses from ACS manifold or ACS exhaust compressor valve.**

Pneumatic Hose Removal

Release air pressure from the ACS system. Refer to *AIR PRESSURE RELEASE FOR SERVICING* in this subsection.

Pneumatic hoses may be disconnected by pushing inwards on the air fitting ring (towards the air fitting) while pulling outwards on the hose.



tmr2012-005-046_a

1. *Fitting ring*
2. *Pneumatic hose*

NOTE: Pull the hose slightly and wait during the release of the remaining air. When all air is released, remove pneumatic hose from its fitting.

Pneumatic hose Installation

Before installing the hose, verify the end of the pneumatic hose.

If deep nicks are found, cut a small portion of the hose end.

HOSE END LENGTH TO BE CUT
3.18 mm to 6.35 mm (1/8 in to 1/4 in)

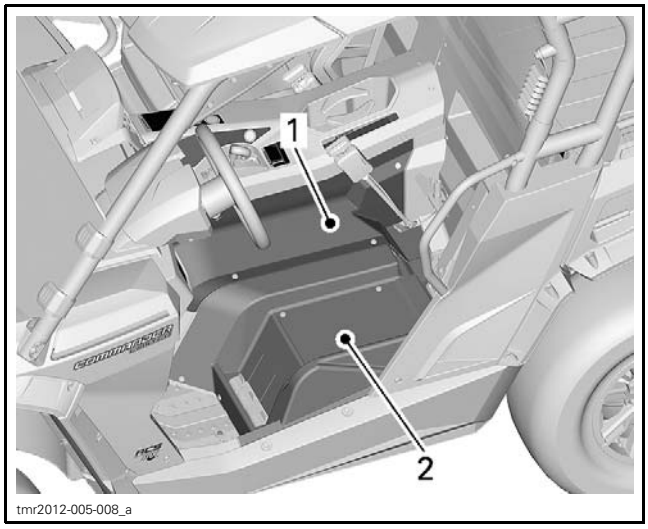
Push the hose inwards then pull the air fitting ring outwards to reestablish a good seal and lock the hose in place.

ACS RELEASE VALVE

ACS Release Valve Access

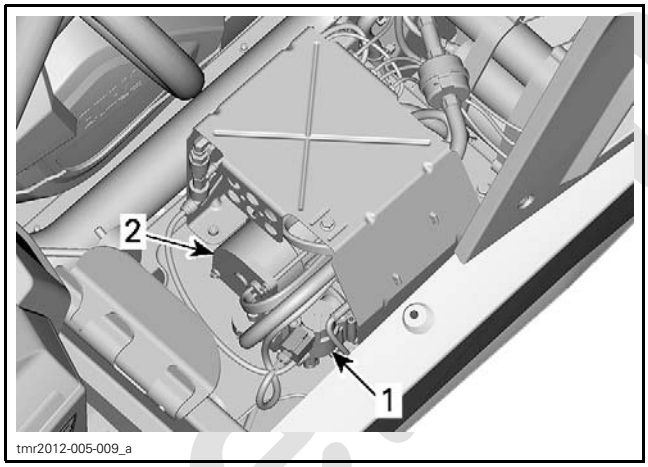
To access to ACS release valve, remove the following:

– Driver's seat
– LH lateral console panel
– Floor panel.



SIDE NET REMOVED FOR CLARITY
1. *LH lateral console panel*
2. *Floor panel*

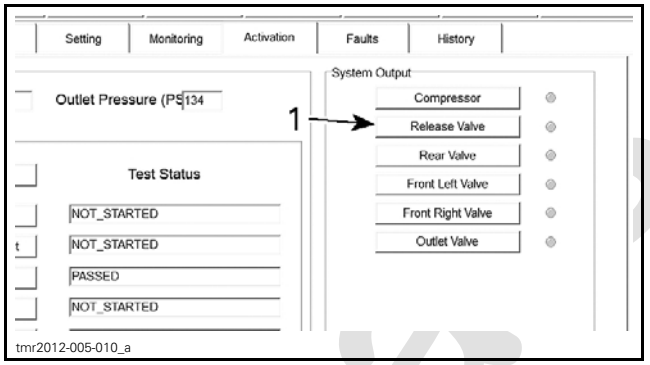
The ACS release valve is a component of the ACS compressor. The release valve is located at the left of compressor



1. *ACS release valve*
2. *ACS compressor*

ACS Release Valve Operation Test

1. Connect vehicle to the latest appropriate version of B.U.D.S. Refer to *COMMUNICATION TOOLS AND B.U.D.S. SOFTWARE* subsection in the *2011 CAN-AM SIDE-BY-SIDE SHOP MANUAL*.
2. Select **Activation** page.
3. Select **ACS** folder.
4. Press the **Release Valve** button to proceed.

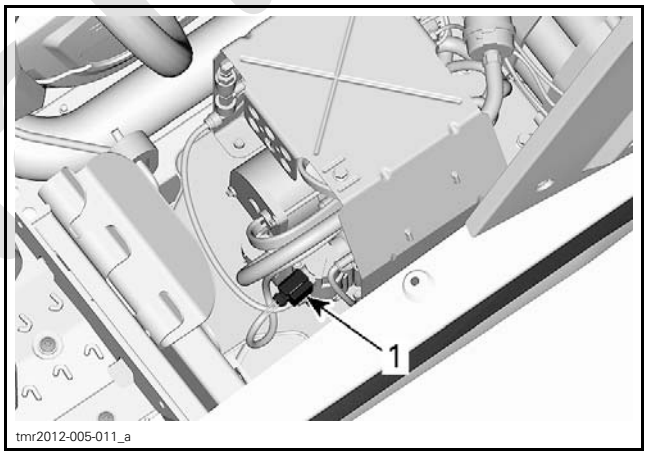


1. *Release valve button*

5. Listen for air exits from underneath dash and around valve to confirm proper operation.

ACS Release Valve Input Voltage Test

1. Unplug the ACS release valve connector.



1. *ACS release valve connector*

2. Start engine.
3. Measure voltage as per the following table.

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

TEST PROBES		VOLTAGE
Pin 1 (release valve connector)	Battery negative (–) post	Battery voltage

ACS Release Valve Ground Test

1. With ACS release valve connector unplugged and engine running, measure voltage as per the following table.

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

TEST PROBES		VOLTAGE
Pin 2 (release valve connector)	Battery negative (+) post	Battery voltage

ACS Release Valve Replacement

The ACS release valve is not available separately.

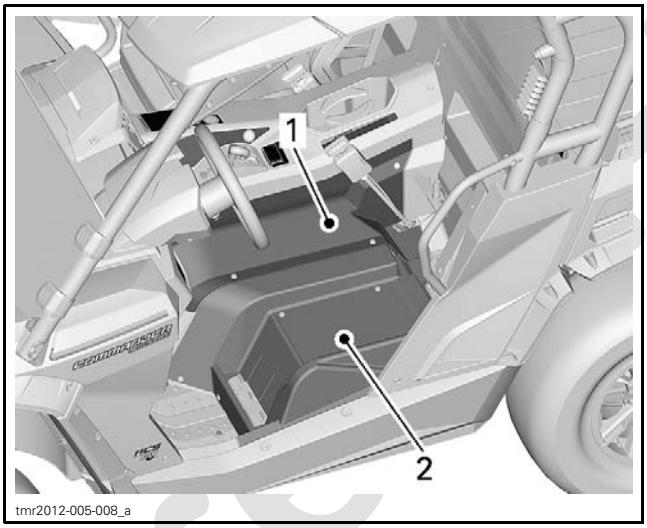
Replace the ACS compressor. Refer to *ACS COMPRESSOR* for complete procedure.

ACS SOLENOID VALVE

ACS Solenoid Valve Access

To access to ACS solenoid valve, remove the following:

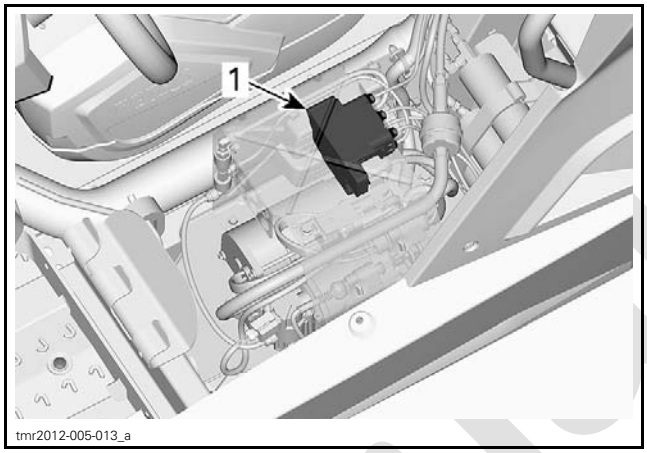
– Driver's seat
– LH lateral console panel
– Floor panel.



tmr2012-005-008_a

SIDE NET REMOVED FOR CLARITY
1. LH lateral console panel
2. Floor panel

The ACS solenoid valve is mounted on the rear side of the ACS compressor protector.

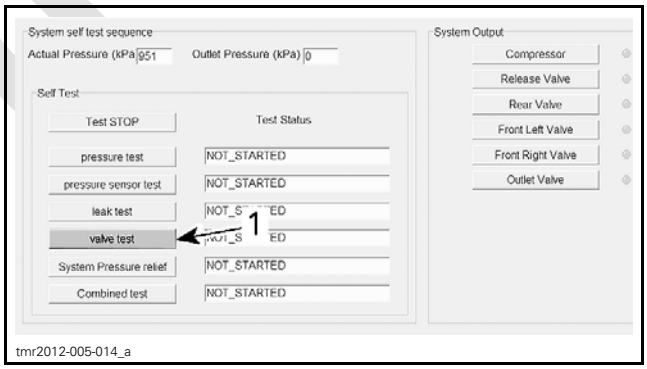


tmr2012-005-013_a

1. ACS solenoid valve

ACS Solenoid Valve Operation Test

1. Connect vehicle to the latest appropriate version of B.U.D.S. Refer to *COMMUNICATION TOOLS AND B.U.D.S. SOFTWARE* subsection in the *2011 CAN-AM SIDE-BY-SIDE SHOP MANUAL*.
2. Select **Activation** page.
3. Select **ACS** folder.
4. Press the **valve test** button to proceed.



tmr2012-005-014_a

1. Valve test button

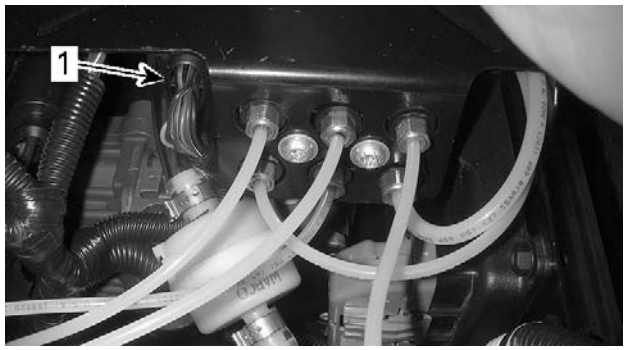
The result will be indicated in the TEST STATUS box beside the **valve test** button.

If test fails, carry out the *ACS SOLENOID VALVE INPUT VOLTAGE TEST*.

If the ACS solenoid valve passed the test, check the ACS button.

ACS Solenoid Valve Input Voltage Test

1. Unplug the ACS solenoid valve connector.



1. ACS solenoid valve connector

2. Start engine.
3. Measure voltage as per the following table.

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

TEST PROBES		VOLTAGE
Pin 5 (solenoid valve connector)	Battery negative (–) post	Battery voltage
Pin 6 (solenoid valve connector)		

If the test fails, carry out an *ACS SOLENOID VALVE POWER WIRE CONTINUITY TEST*.

If result is within specification, continue the test with the *ACS SOLENOID VALVE GROUND TEST*.

ACS Solenoid Valve Ground Test

With ACS solenoid valve connector unplugged and engine running, measure voltage as per the following table.

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

TEST PROBES		VOLTAGE
Pin 7 (solenoid valve connector)	Battery negative (+) post	Battery voltage

If the test fails, carry out an *ACS SOLENOID VALVE GROUND WIRE CONTINUITY TEST*.

If result is within specification, check the ACS button.

ACS Solenoid Valve Power Wire Continuity Test

1. Unplug the relay R5.
2. Check the continuity between ACS solenoid valve connector and relay R5 holder as per the following table.

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

TEST PROBES		RESISTANCE
Pin 5 (solenoid valve connector)	Position 85	Close to 0 Ω
Pin 6 (solenoid valve connector)		

ACS Solenoid Valve Ground Wire Continuity Test

1. Unplug the ACS module connector.
2. Check the continuity between ACS solenoid valve connector and ACS module connector as per the following table.

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

TEST PROBES		RESISTANCE
Pin 7 (solenoid valve connector)	Pin 14 (module)	Close to 0 Ω

ACS Solenoid Valve Removal

1. Remove bolts retaining the air pressure distributor.

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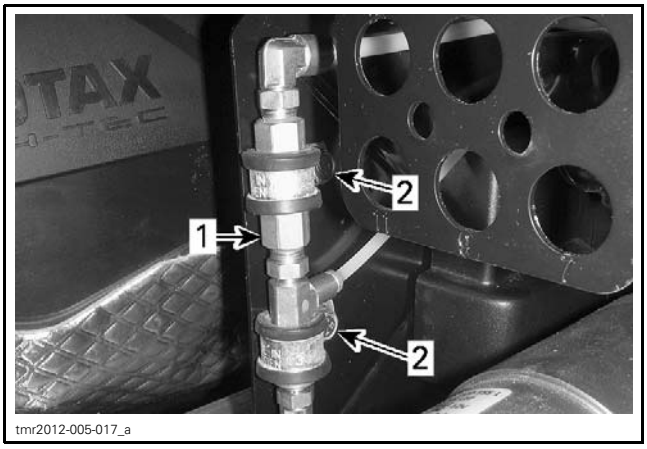
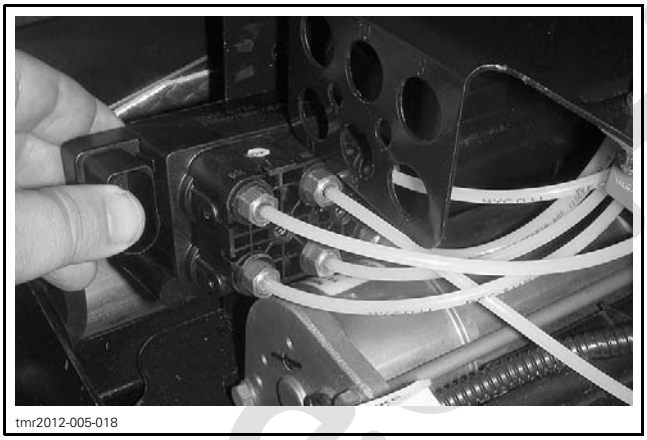


tmr2012-005-017_a

1. Air pressure distributor
2. Retaining bolts

2. Disconnect pneumatic hoses from:
   – Air outlet fitting
   – Air reservoirs
   – Pressure distributor (except the lower one).
3. Unplug ACS solenoid valve connector.
4. Remove screws securing the ACS solenoid valve to compressor protector.
5. Remove the ACS solenoid valve from the vehicle.


tmr2012-005-018

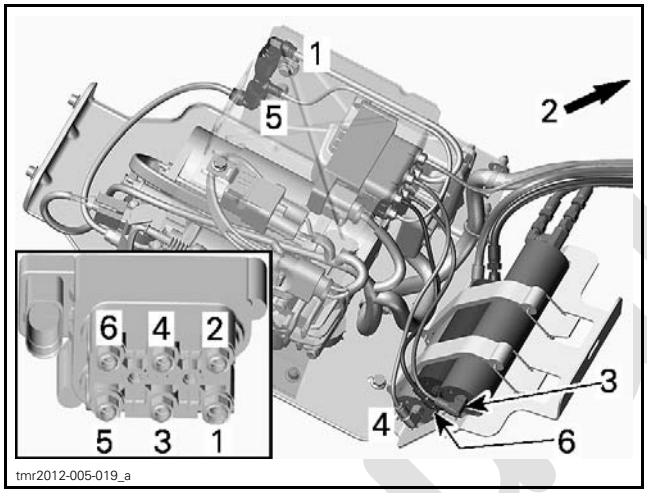
ACS Solenoid Valve Installation

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

Position the ACS solenoid valve on the compressor and route all pneumatic hoses through corresponding support holes.

Secure the ACS solenoid valve to its support.

Connect pneumatic hoses as per the following illustration.



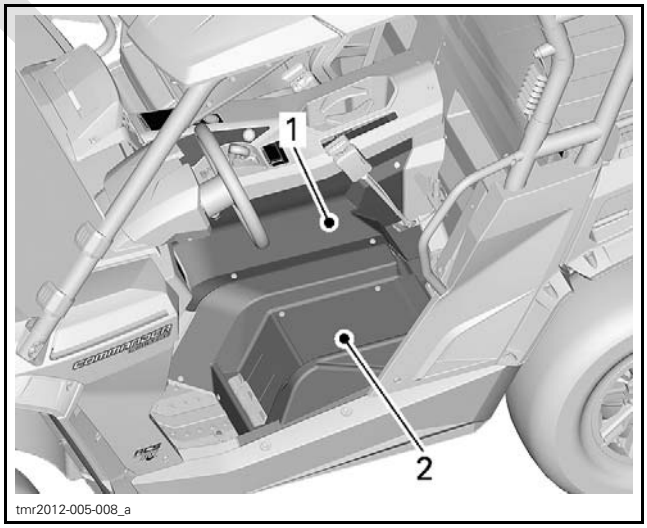
tmr2012-005-019_a

1. Air pressure distributor
2. Air outlet fitting
3. Rear air reservoir
4. Front RH air reservoir
5. Air pressure distributor
6. Front LH air reservoir

ACS MODULE

ACS Module Access

To access to ACS module, remove the following:
– Driver's seat
– LH lateral console panel
– Floor panel.

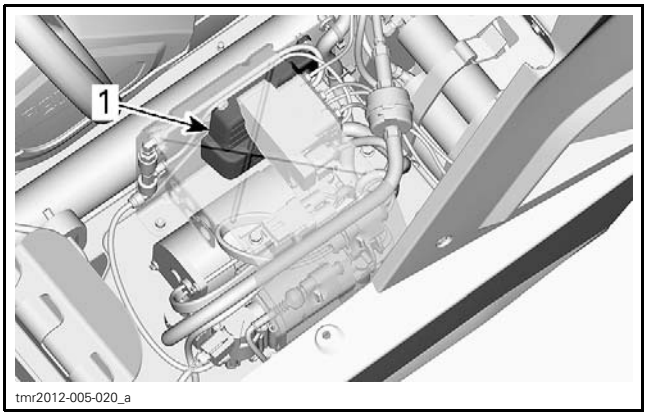


tmr2012-005-008_a

SIDE NET REMOVED FOR CLARITY
1. LH lateral console panel
2. Floor panel

The ACS module is mounted on the wall of the ACS compressor protector.

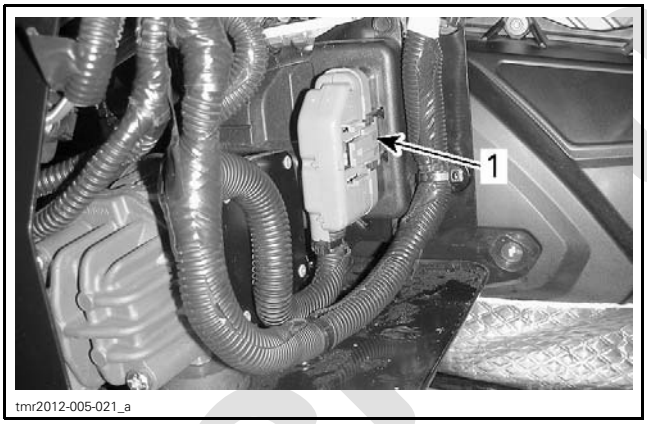
greenmanuals



1. ACS module

ACS Module Signal Circuit Continuity Test

1. Unplug multifunction gauge connector. Refer to *LIGHTS, GAUGE AND ACCESSORIES* subsection in the *2011 CAN-AM SIDE-BY-SIDE SHOP MANUAL*.
2. Unplug ACS module connector.



1. ACS module connector

3. Measure resistance as per the following tables.

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

ACS MODULE CONNECTOR	GAUGE CONNECTOR	RESISTANCE
Pin 1	Pin 19	Close to 0 Ω
Pin 2	Pin 18	

If the test fails, repair or replace wires and connectors.

If result is within specification, continue the test with the *ACS MODULE INPUT VOLTAGE TEST*.

ACS Module Input Voltage Test

1. Turn ignition switch to ON position.
2. Measure voltage as per the following table.

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

TEST PROBES		VOLTAGE
Pin 17 (ACS module connector)	Battery negative (–) post	Battery voltage
Pin 18 (ACS module connector)		

If the test fails, repair or replace wires and connectors.

If result is within specification, continue the test with the *ACS MODULE GROUND TEST*.

ACS Module Ground Test

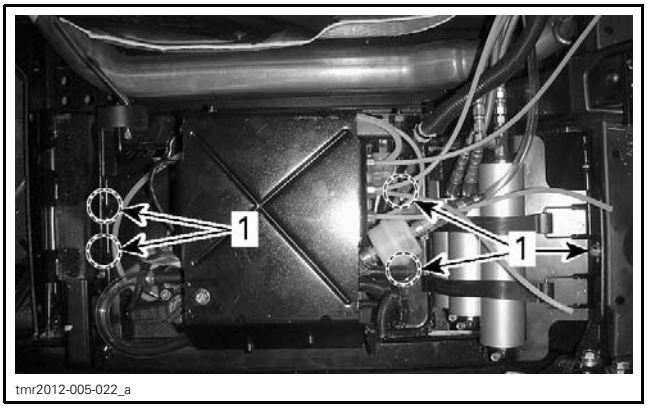
1. Turn ignition switch to ON position.
2. Measure voltage as per the following table.

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

TEST PROBES		VOLTAGE
Pin 31 (ACS module connector)	Battery positive (+) post	Battery voltage
Pin 32 (ACS module connector)		
Pin 33 (ACS module connector)		

ACS Module Removal

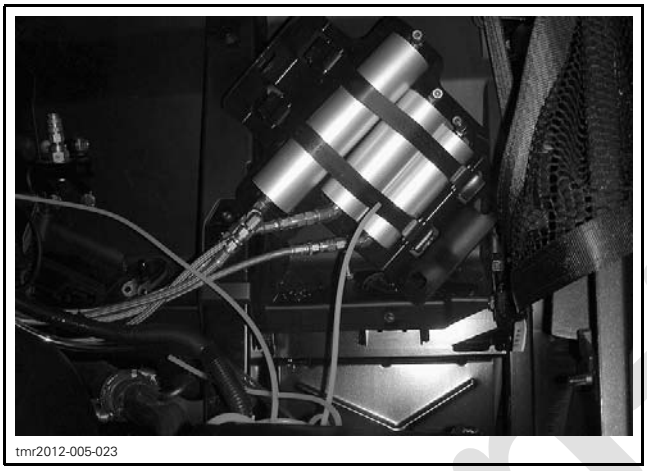
1. Remove screws retaining the air reservoir support and the compressor support.



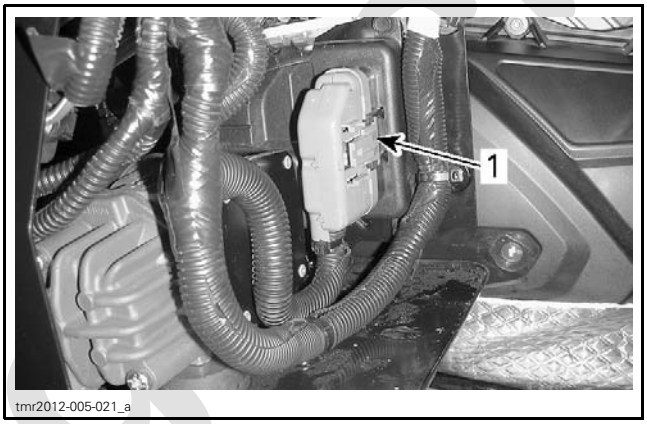
tmr2012-005-022_a

1. Screws to be removed

2. Disconnect pneumatic hoses from air reservoirs and air outlet fitting.
3. Place the air reservoir support aside to make room.


tmr2012-005-023

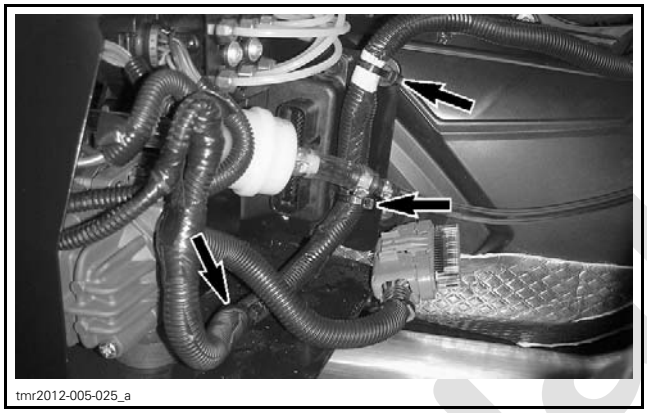
4. Unplug the ACS module connector.



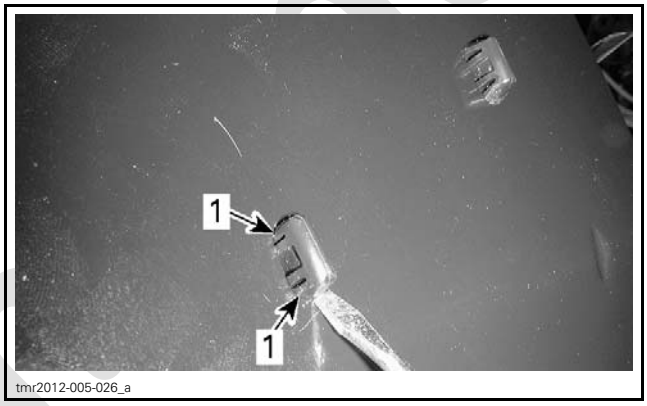
tmr2012-005-021_a

1. ACS module connector

5. Cut locking ties securing the wiring harness.


tmr2012-005-025_a

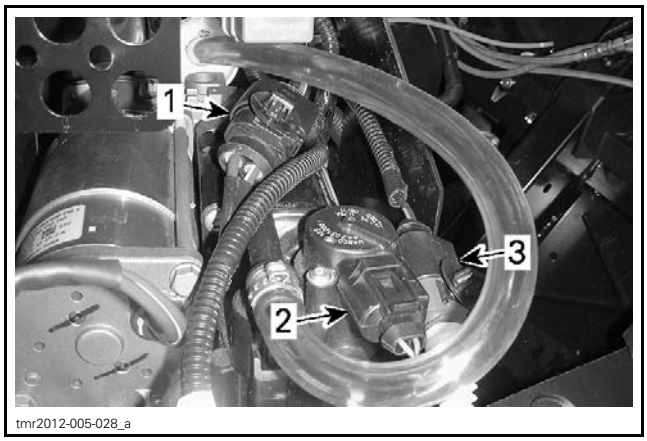
6. Using a small screwdriver, detach both connector housings from the compressor protector wall.



tmr2012-005-026_a

1. Press these tabs inside

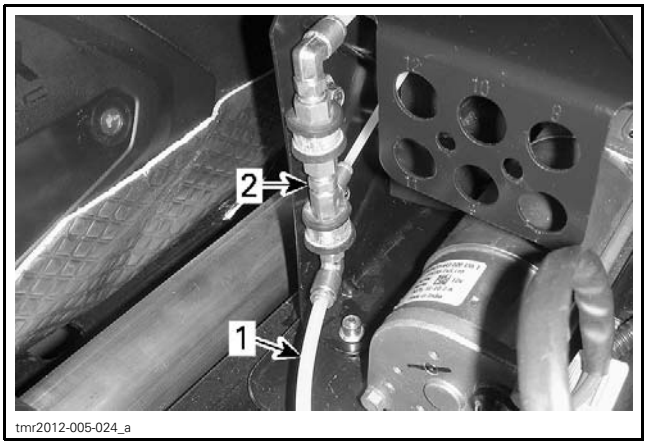
7. Unplug the following connectors:
   - Compressor connector
   - Release valve connector
   - Pressure sensor connector.



tmr2012-005-028_a

1. Compressor connector
2. Release valve connector
3. Pressure sensor connector.

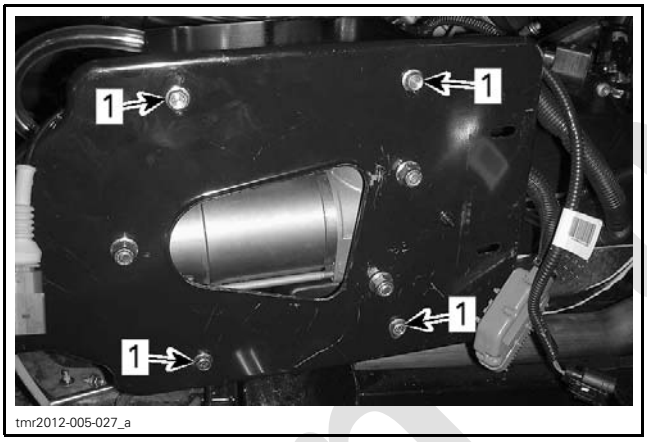
8. Disconnect the lower pneumatic hose from the pressure distributor.



tmr2012-005-024_a

1. *Disconnect this hose*
2. *Pressure distributor*

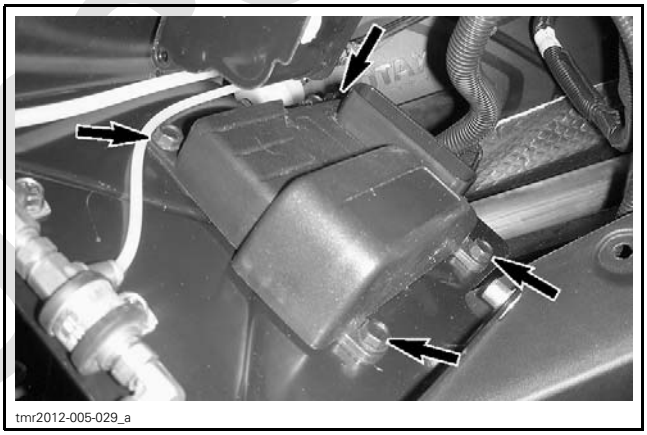
9. Turn the compressor support on the side to remove screws retaining the compressor protector.



tmr2012-005-027_a

1. *Compressor protector retaining screws*

10. Separate compressor protector from the compressor support.
11. Remove screws securing the ACS module on the wall of the compressor protector.


tmr2012-005-029_a

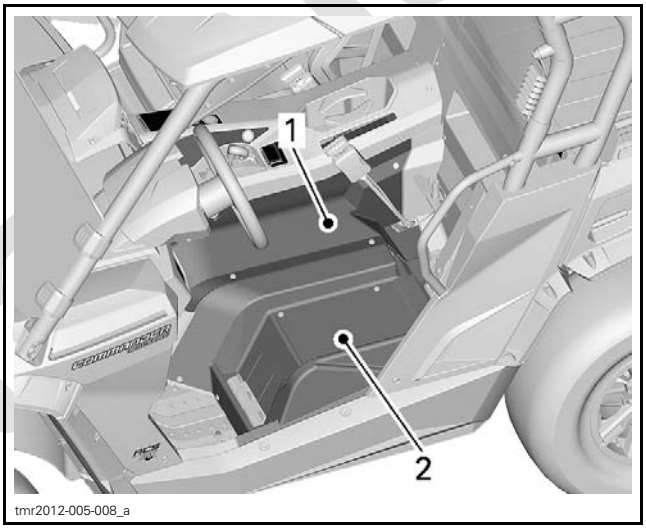
ACS Module Installation

The installation procedure is the reverse of removal procedure.

ACS RELAY (R5)

ACS Relay (R5) Access

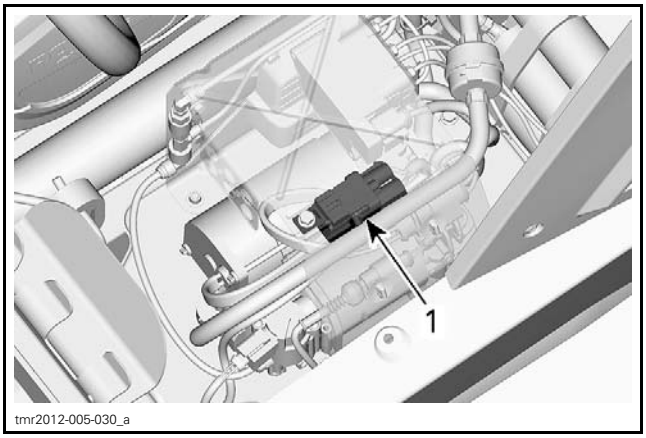
To access to ACS relay, remove the following:
- Driver's seat
- LH lateral console panel
- Floor panel.



tmr2012-005-008_a

SIDE NET REMOVED FOR CLARITY
1. *LH lateral console panel*
2. *Floor panel*

The ACS relay is mounted under the top of the ACS compressor protector.

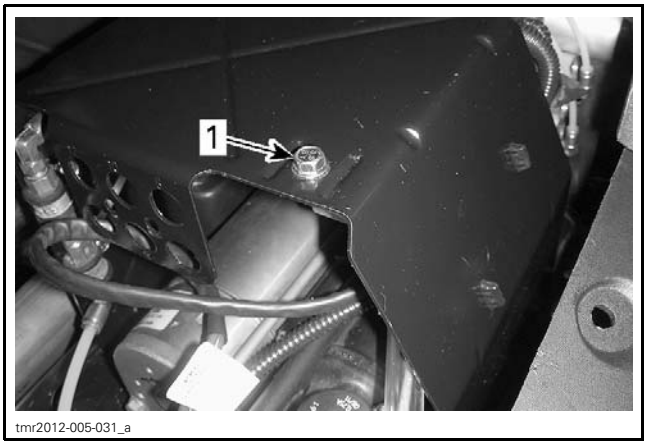


tmr2012-005-030_a

1. *ACS relay (R5)*

ACS Relay Continuity Test

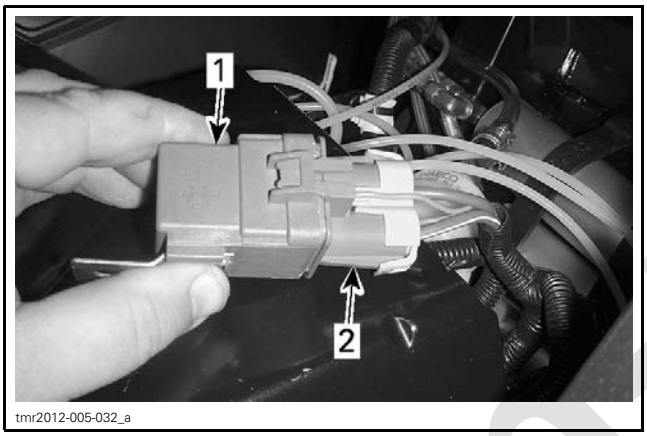
1. Remove relay (R5).
   1.1 Remove bolt and nut retaining the relay holder on the top of the compressor protector.



1. Relay retaining bolt

1.2 From the rear, pull relay out from underneath of compressor protector.

1.3 Remove the relay from its holder holder.



1. Relay
2. Relay holder

2. Measure resistance as per the following table.

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

TEST PROBES		RESISTANCE
Terminal 30 (relay holder)	Terminal 87 (relay holder)	Open (OL)

3. Apply 12 volts on terminals 86 and 85 and measure resistance again as per the following table.

TEST PROBES		RESISTANCE
Terminal 30 (relay holder)	Terminal 87 (relay holder)	Close to 0 Ω

If results are not as per the above tables, replace relay.

ACS Relay Input Voltage Test

1. Measure voltage as per the following table.

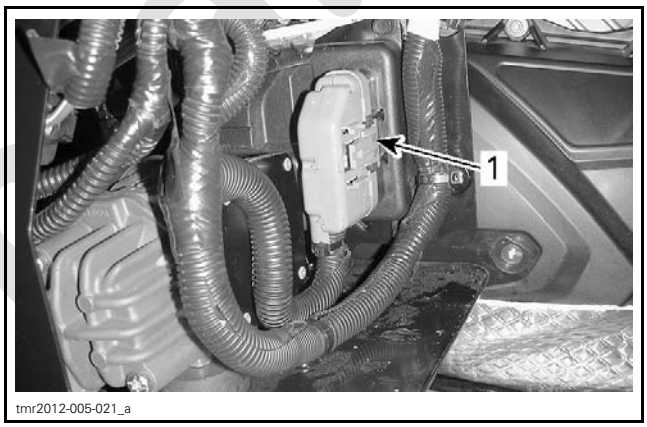
REQUIRED TOOL
FLUKE 115 MULTIMETER (P/N 529 035 868)

TEST PROBES		VOLTAGE
Pin 87 (relay holder)	Battery negative (–) post	Battery voltage

If voltage is not as specified, check wiring, connector and terminal condition.

ACS Relay Ground Wire Continuity Test

1. Unplug ACS module connector.



1. ACS module connector

2. Measure resistance as per the following table.

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

TEST PROBES		RESISTANCE
Pin 86 (relay holder)	Pin 28 (ACS module connector)	Close to 0 Ω

ACS COMPRESSOR

ACS Compressor Access

To access to ACS compressor, remove the following:

– Driver's seat
– LH lateral console panel
– Floor panel.

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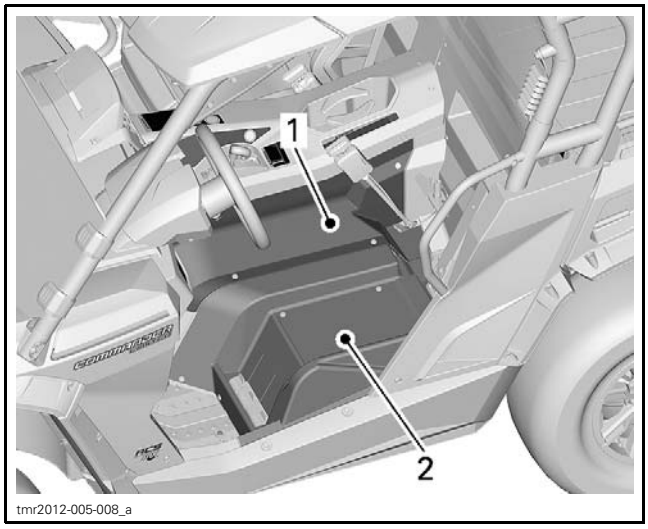
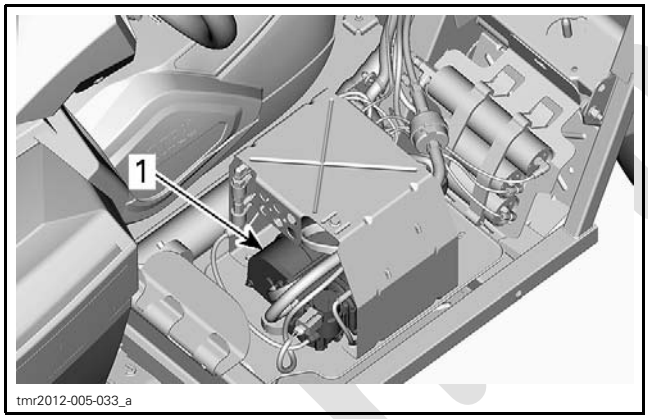


SIDE NET REMOVED FOR CLARITY
1. *LH lateral console panel*
2. *Floor panel*

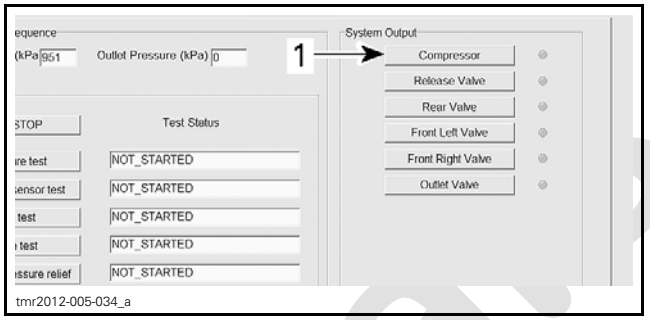
The ACS compressor is mounted on the ACS compressor support.



1. *ACS compressor*

ACS Compressor Operation Test

1. Connect vehicle to the latest appropriate version of B.U.D.S. Refer to *COMMUNICATION TOOLS AND B.U.D.S. SOFTWARE* subsection in the *2011 CAN-AM SIDE-BY-SIDE SHOP MANUAL*.
2. Select **Activation** page.
3. Select **ACS** folder.
4. Press **Compressor** button to proceed.

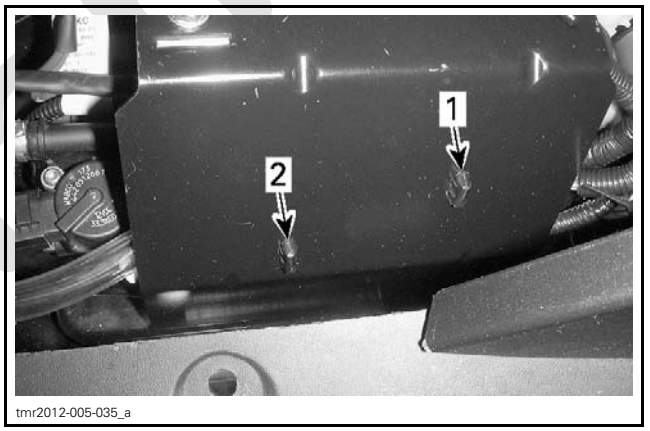


1. *Compressor operation test button*

5. Verify if compressor works properly.

ACS Compressor Input Voltage Test

1. Using a small screwdriver, detach the ACS compressor connector housings from the compressor protector wall.



1. *ACS compressor connector*
2. *ACS compressor pressure sensor*

2. Unplug ACS compressor connector.
3. Place ignition switch to ON position.
4. Measure voltage as per the following table.

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

TEST PROBES		VOLTAGE
Pin 1 (ACS compressor connector)	Battery negative (–) post	Battery voltage

ACS Compressor Ground Test

1. Place ignition switch to ON position.
2. Measure voltage as per the following table.

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

TEST PROBES		VOLTAGE
Pin 2 (ACS compressor connector)	Battery positive (+) post	Battery voltage

ACS Compressor Power Wire Continuity Test (from Relay)

1. Remove relay (R5).
2. Measure resistance as per the following table.

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

TEST PROBES		RESISTANCE
Pin 30 (relay holder)	Pin 1 (ACS compressor connector)	Close to 1 Ω

ACS Compressor Ground Wire Continuity Test

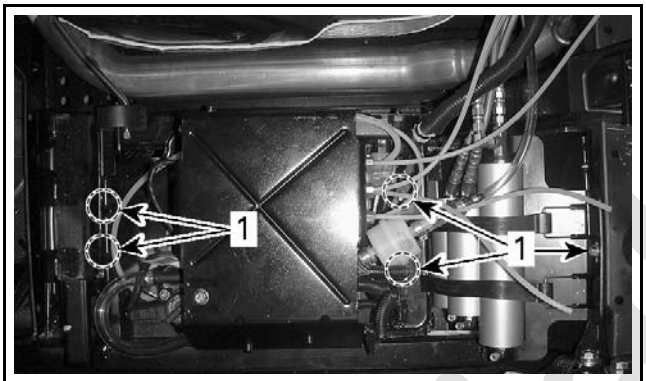
1. Reconnect the relay (R5).
2. Check the continuity as per the following table.

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

TEST PROBES		RESISTANCE
Pin 2 (ACS compressor connector)	Battery negative (–) post	Close to 1 Ω

ACS Compressor Removal

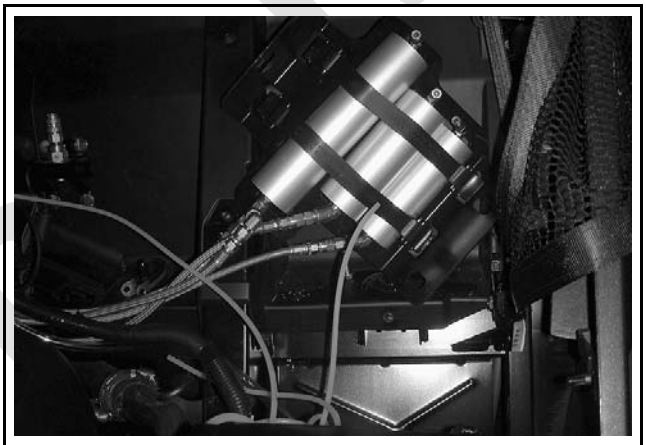
1. Remove screws retaining the air reservoir support and the compressor support.



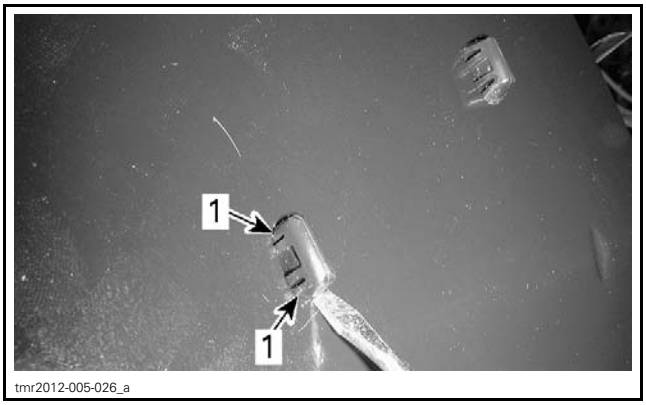
tmr2012-005-022_a

1. Screws to be removed

2. Disconnect pneumatic hoses from air reservoirs and air outlet fitting.
3. Place the air reservoir support aside to make room.


tmr2012-005-023

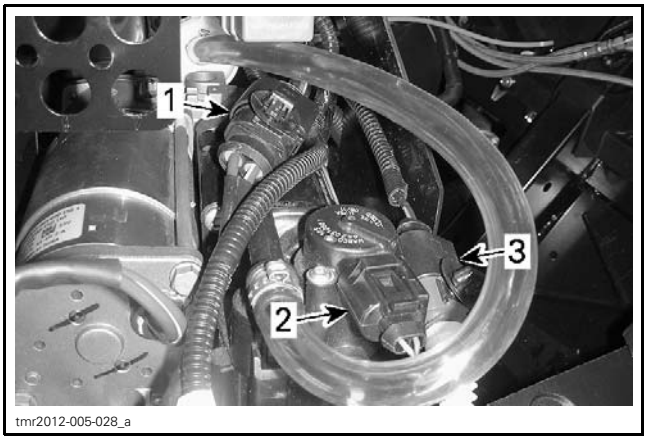
4. Using a small screwdriver, detach both connector housings from the compressor protector wall.



tmr2012-005-026_a

1. Press these tabs inside

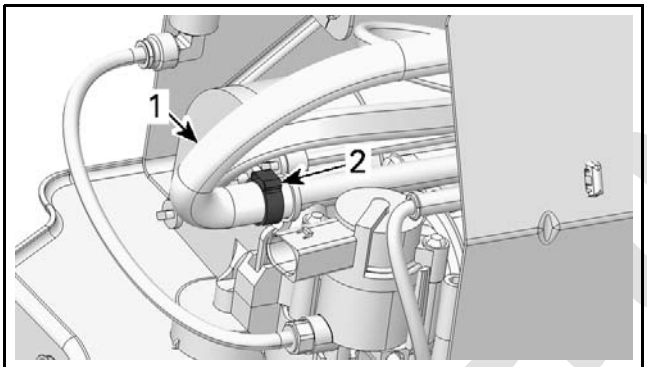
5. Unplug the following connectors:
   - Compressor connector
   - Release valve connector
   - Pressure sensor connector.



tmr2012-005-028_a

1. *Compressor connector*
2. *Release valve connector*
3. *Pressure sensor connector.*

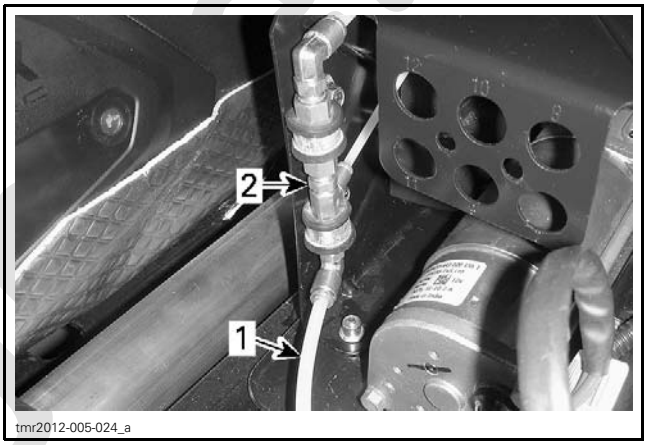
6. Detach the filter hose from the compressor intake/outlet fitting.



tmr2012-005-036_a

1. *Air filter hose*
2. *Clamp to be removed*

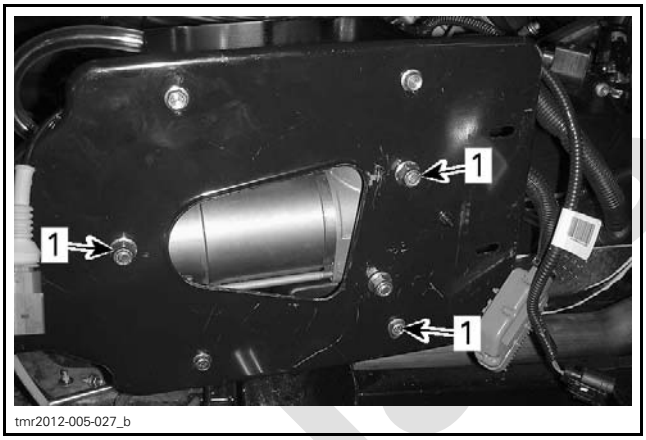
7. Disconnect the lower pneumatic hose from the pressure distributor.



tmr2012-005-024_a

1. *Disconnect this hose*
2. *Pressure distributor*

8. Turn the compressor support on the side to remove screws retaining the compressor.



tmr2012-005-027_b

1. *Compressor retaining screws*

9. Remove the ACS compressor.

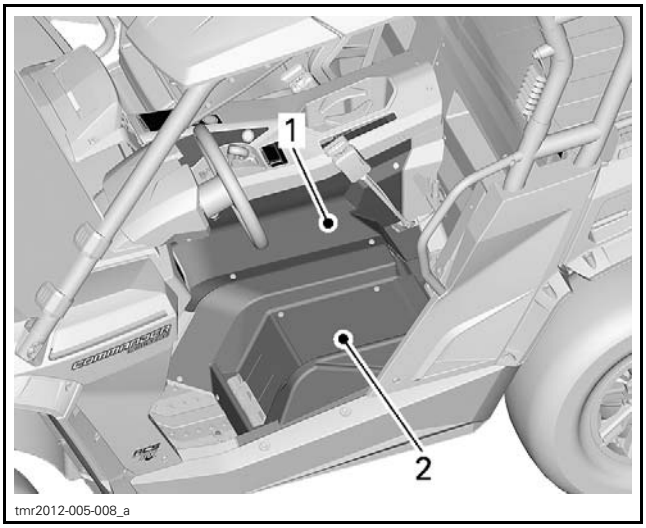
ACS Compressor Installation

The installation is the reverse of removal procedure.

ACS AIR FILTER

ACS Air Filter Access

To access to ACS air filter, remove the following:
– Driver's seat
– LH lateral console panel
– Floor panel.



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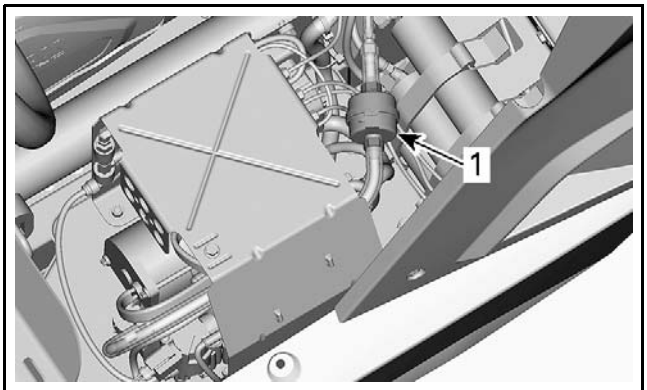
SIDE NET REMOVED FOR CLARITY
1. *LH lateral console panel*
2. *Floor panel*

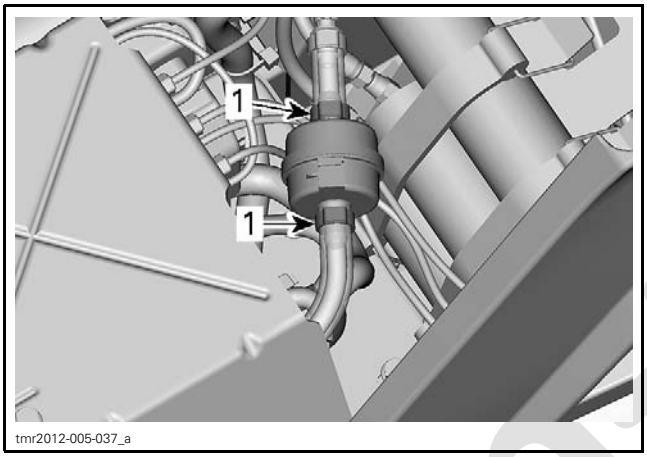
The ACS compressor is located in front of air reservoirs.



1. ACS air filter

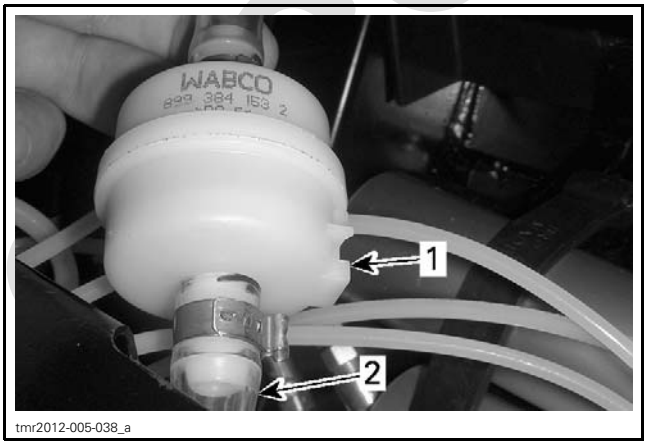
ACS Air Filter Replacement

1. Remove and discard clamps securing hoses to air filter.



1. Clamps to be removed

2. Remove the air filter.
3. Install the new air filter with its attachment towards the compressor.
4. Secure air filter using **new** clamps.



1. Air filter attachment
2. Air hose from compressor

SHOCK ABSORBERS

Shock Absorbers Identification

When installing shock absorbers, make sure not to mix front and rear shock absorbers.

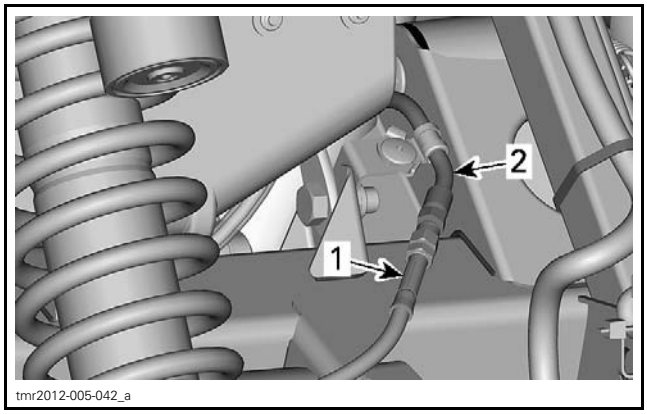
Front and rear shock absorbers can be easily identified by comparing the length of air hoses.

FRONT SHOCK ABSORBER	
Shock absorber with a short air hose on reservoir side	

REAR SHOCK ABSORBER	
Shock absorber with a long air hose on the opposite side of reservoir	

Rear Shock Absorber Removal

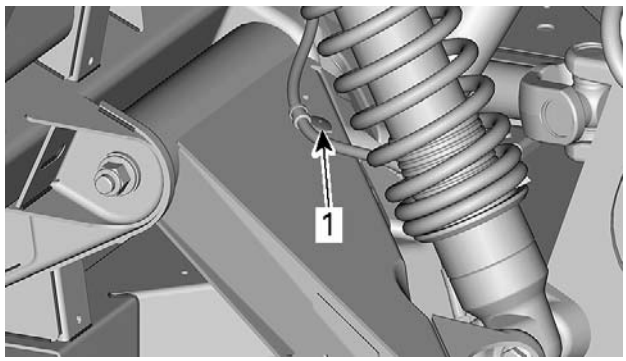
1. Block front wheels.
2. Loosen wheel lug nuts.
3. Open cargo box.
4. Place the jack under the hitch and lift the rear of vehicle.
5. Install jack stands to support the vehicle.
6. Remove wheel.
7. Disconnect shock absorber hose from vehicle air supply hose.



1. Shock absorber hose
2. Vehicle air supply hose

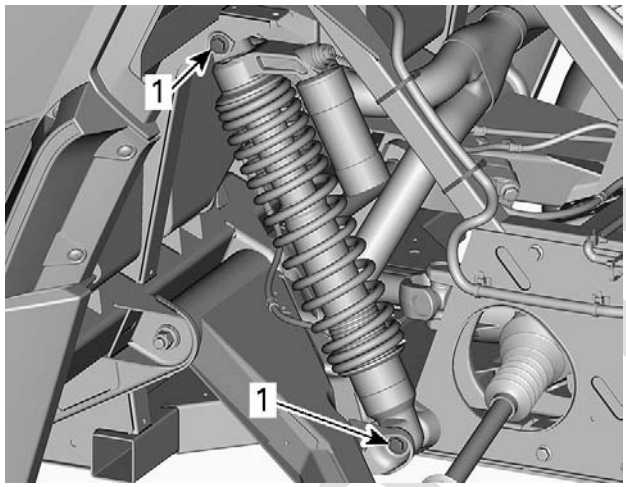
8. Drill the rivet securing the shock absorber hose to trailing arm.

Peterbilt Parts



REAR LH SIDE OF VEHICLE SHOWN
1. Rivet to be drilled

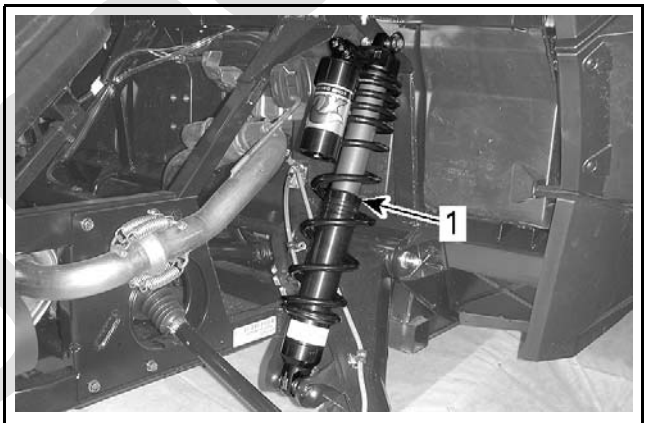
9. Remove upper and lower bolts retaining the shock absorber. Discard nuts.



1. Shock absorber retaining bolts

Rear Shock Absorber Installation

Install shock absorbers with the reservoir rearwards.

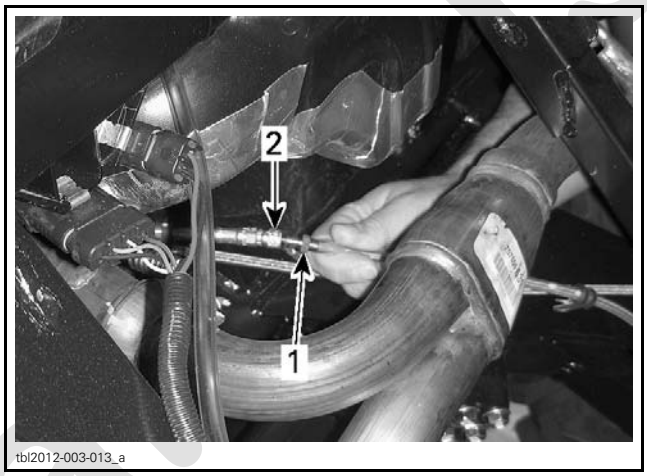


TYPICAL – RH REAR SHOCK ABSORBER

Secure with new nuts.

TIGHTENING TORQUE	
Shock absorber nuts	48 N•m (35 lbf•ft)

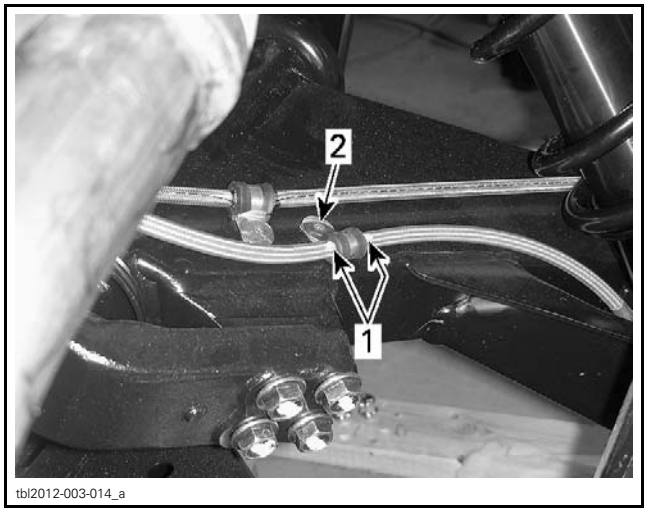
Connect shock absorber hoses to vehicle air supply hoses.



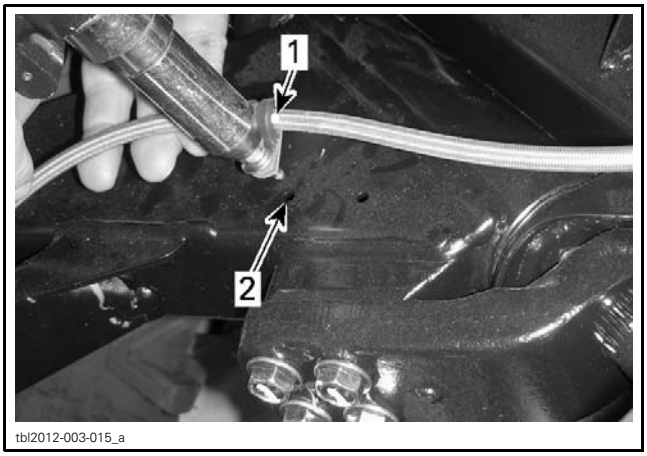
TYPICAL
1. RH shock absorber hose
2. Vehicle air supply hose

TIGHTENING TORQUE	
Air supply hose	6 N•m ± 0.5 N•m (53 lbf•**in** ± 4 lbf•**in**)

Secure shock absorber hoses to trailing arms. Ensure to position hose clamp between YELLOW dots.



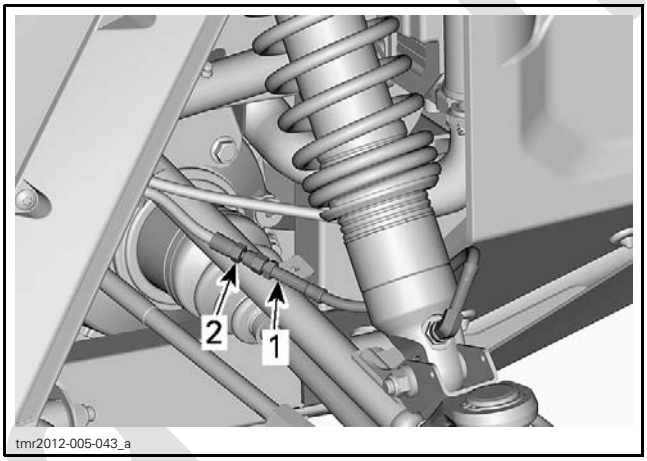
RH SIDE OF VEHICLE
1. YELLOW dots
2. Rivet



LH SIDE OF VEHICLE
1. *YELLOW dot*
2. *Install the rivet in this hole*

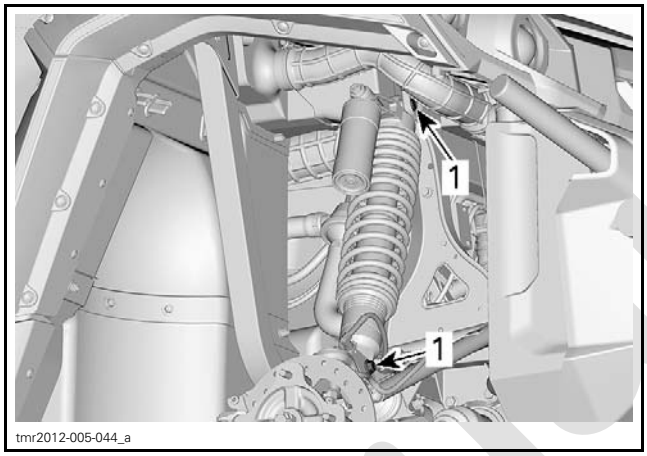
Front Shock Absorber Removal

1. Block rear wheels.
2. Loosen wheel lug nuts.
3. Lift the front of vehicle and support it securely.
   - 3.1 Insert the jack under the vehicle by the side, behind front wheels.
   - 3.2 Place the jack under the central beam.
   - 3.3 Lift the front of vehicle.
4. Remove front wheels.
5. Cut locking ties securing shock absorber hose to suspension arm.
6. Disconnect shock absorber hose from vehicle air supply hose.



TYPICAL
1. *RH shock absorber hose*
2. *Vehicle air supply hose*

7. Remove upper and lower bolts retaining the shock absorber. Discard nuts.



1. *Shock absorber retaining bolts*

8. Remove shock absorber from vehicle.

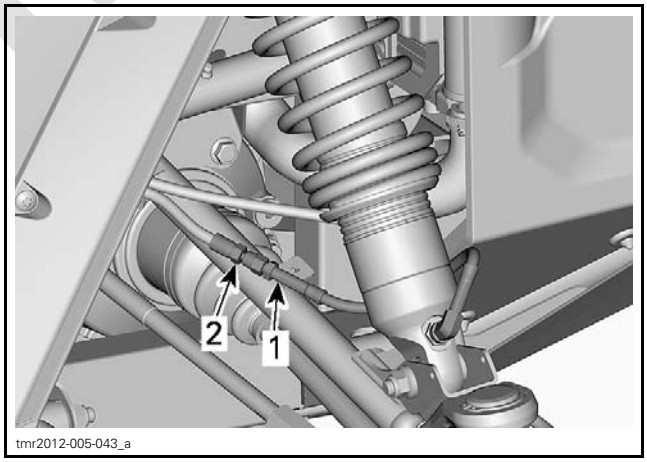
Front Shock Absorber Installation

Install shock absorbers with the reservoir outwards.

Secure it using previously removed bolts and new nuts. Tighten nuts to specification.

TIGHTENING TORQUE	
Shock absorber nuts	48 N•m (35 lbf•ft)

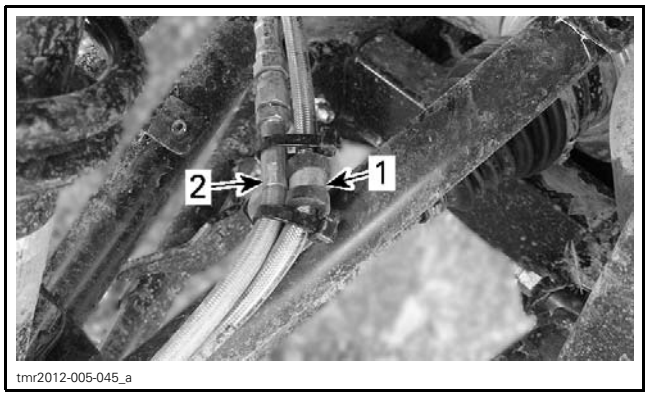
Route the hose in front of the shock absorber.



TYPICAL
1. *RH shock absorber hose*
2. *Vehicle air supply hose*

TIGHTENING TORQUE	
Air supply hose	6 N•m ± 0.5 N•m (53 lbf•**in** ± 4 lbf•**in**)

Secure the shock absorber hose to brake hose. Install a locking tie each side of the brake hose retaining clamp.



1. *Brake hose retaining clamp*
2. *Shock absorber hose*

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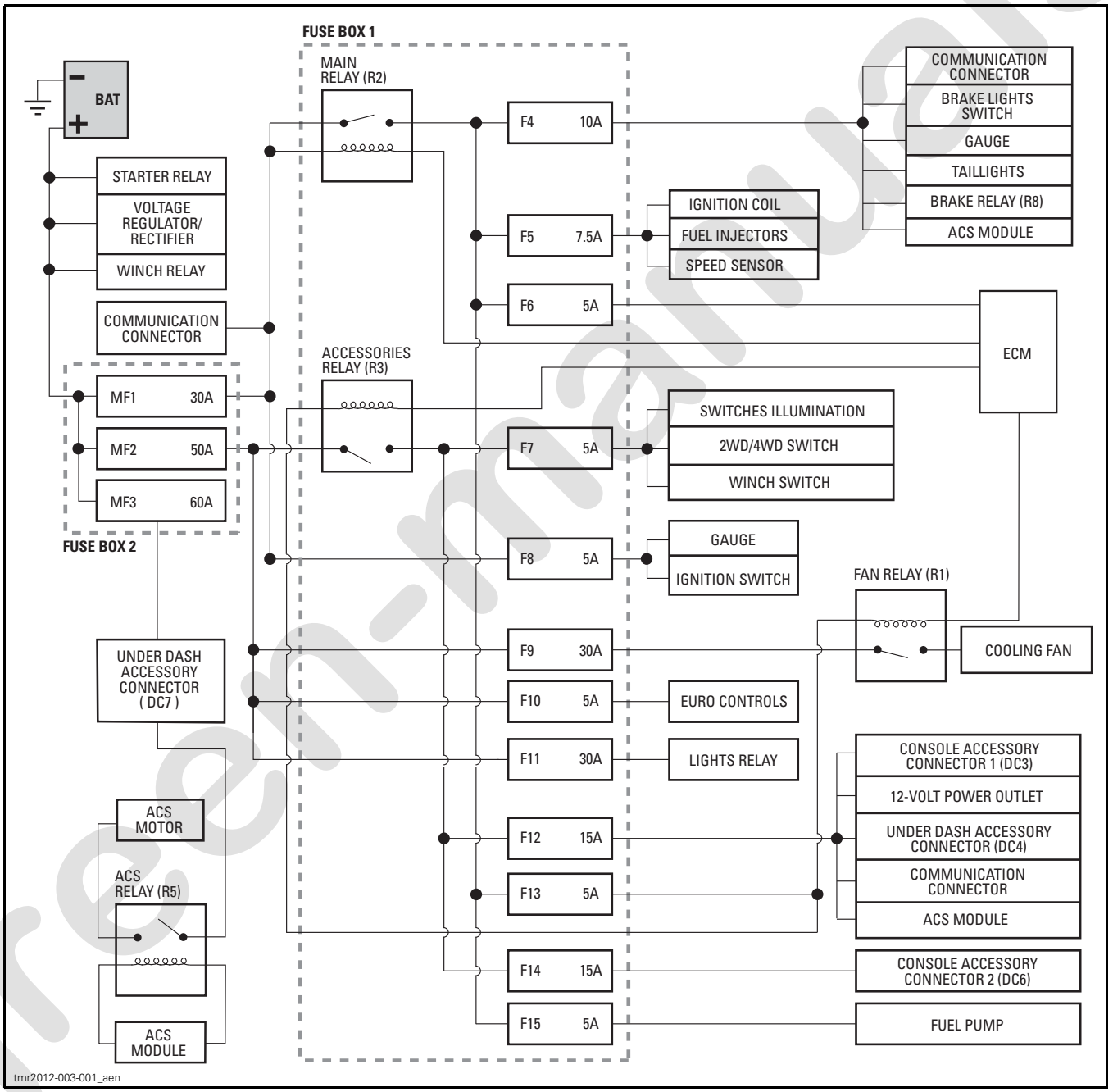
POWER DISTRIBUTION

GENERAL

POWER DISTRIBUTION DIAGRAM



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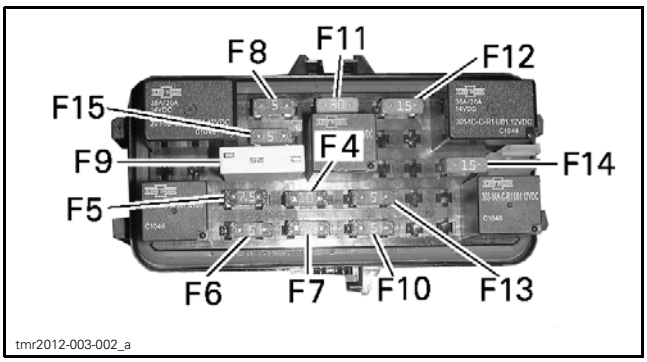
FUSE BOX 1



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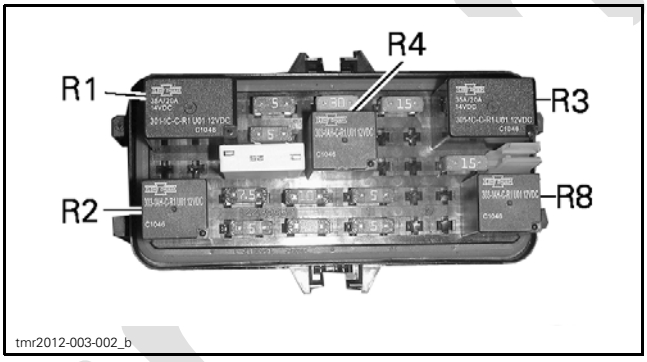
FUSE IDENTIFICATION		
Fuse	4	10 A
	5	7.5 A
	6	5 A
	7	5 A
	8	5 A
	9	30 A
	10	5 A
	11	30 A
	12	15 A
	13	5 A
	14	15 A
	15	5 A



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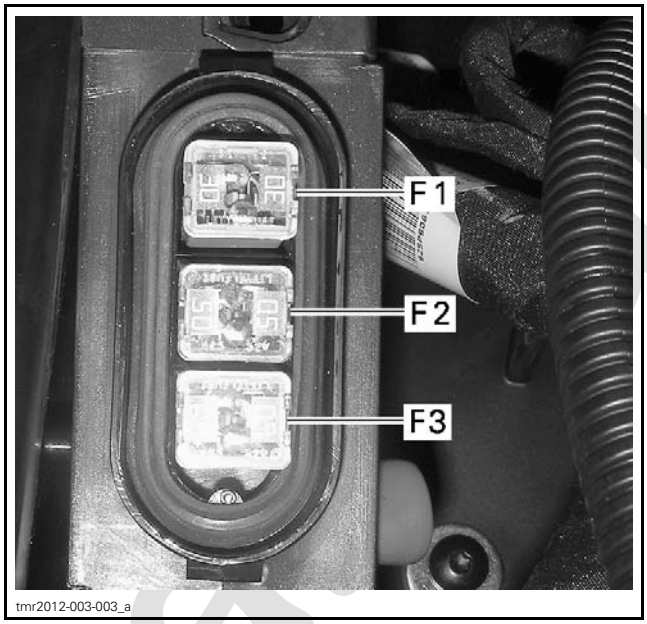
RELAY IDENTIFICATION		
Relays	1	Cooling fan
	2	Main
	3	Accessories
	4	Headlights
	8	Brake lights

FUSE BOX 2



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FUSE IDENTIFICATION			
Fuse	1	Main	30 A
	2	Fan/accessories	50 A
	3	ACS/accessories	60 A

LIGHTS, GAUGE AND ACCESSORIES

SERVICE TOOLS

Description	Part Number	Page
FLUKE 115 MULTIMETER	529 035 868	4

GENERAL

NOTICE It is recommended to always disconnect the battery when replacing any electric or electronic parts. Always disconnect battery exactly in the specified order, BLACK (-) cable first.

TROUBLESHOOTING

RADIO AND AMPLIFIER

NO POWER

1. Fuse is blown
   - *In the fuse block #1, check the fuse 14. Replace if required.*
   - *Remove the glove box and check the in-line fuse (15A). Replace if required.*
2. No Voltage
   - *Perform the AMPLIFIER POWER VOLTAGE TEST, refer to AMPLIFIER.*

NO SOUND

1. Fuse is burn
   - *See NO POWER above.*
2. Wiring is not properly connected or damaged
   - *Check all wires and connectors. See AMPLIFIER CONNECTOR IDENTIFICATION.*
3. Faulty amplifier
   - *Replace the amplifier.*

RADIO CONTROL BUTTONS DO NOT WORK

1. Radio control need to be reset.
   - *Press the RESET button to the back of the amplifier.*

CANNOT TUNE A RADIO STATION OR THE AUTO-SEEK DOES NOT WORK

1. The antenna is not connected
   - *Insert the antenna cable firmly.*
2. The signals are too weak.
   - *Select a station manually.*

PROCEDURES

CONSOLE SWITCHES

Switches Access

Refer to *BODY* and remove upper console.

MULTIFUNCTION GAUGE (LCD AND ANALOG/DIGITAL)

Multifunction Gauge Wire Identification

FUNCTION	PIN	COLOR
12 volt input from fuse F4	17	ORANGE/GREEN
12 volt input from fuse F8	16	BEIGE/WHITE
Ground	20	BLACK
CAN LO	18	BEIGE/GREEN
CAN HI	19	WHITE/BEIGE
Fuel level gauge supply	4	BROWN/PINK
Fuel level gauge ground	21	VIOLET/PINK
2WD/4WD switch signal (-)	7	BLACK/BEIGE
HI beam signal (+)	5	BLUE

TURN SIGNALS/HAZARD (EC MODELS ONLY)

Turn Signal Wire Identification

FLASHER MODULE		
FUNCTION	PIN	COLOR
12 volt input from fuse F10	MC2-1	RED/WHITE
12 volt input from fuse F4	MC1-5	ORANGE/GREEN
RH turn 12 volt input from turn signal switch	MC1-1	BEIGE/ORANGE
LH turn 12 volt input from turn signal switch	MC1-2	BEIGE/GREY

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FLASHER MODULE		
FUNCTION	PIN	COLOR
Output to RH turn signal lights	MC2-2	BROWN
Output to LH turn signal lights	MC2-3	GREY
Output to multifunction gauge (turn signal indicator)	MC2-4	ORANGE
Ground	MC1-4	BLACK
Hazard 12 volt input from hazard switch	MC1-6	GREEN/ORANGE

TURN SIGNAL SWITCH (IN MULTIFUNCTION SWITCH)		
FUNCTION	PIN	COLOR
12 volt input from fuse F4	MGB-3	ORANGE/GREEN
RH turn 12 volt output to flasher module	MGB-4	BEIGE/ORANGE
LH turn 12 volt output to flasher module	MGB-2	BEIGE/GREY

HAZARD SWITCH		
FUNCTION	PIN	COLOR
12 volt input from fuse F10	2	RED/WHITE
12 volt output to flasher module	3	GREEN/ORANGE
Hazard indicator 12 volt input from fuse F4	8	ORANGE/BROWN
Hazard indicator ground (through bulbs)	7	BLACK/ORANGE

Turn Signal/Hazard Circuit Protection

CONDITION	CIRCUIT PROTECTION
Supplied with main relay (R2) activated	Fuse 4 of fuse block 1 (from main relay R2)
Supplied at all times	Fuse 10 of fuse block 1 (from fuse 2 of fuse box 2)

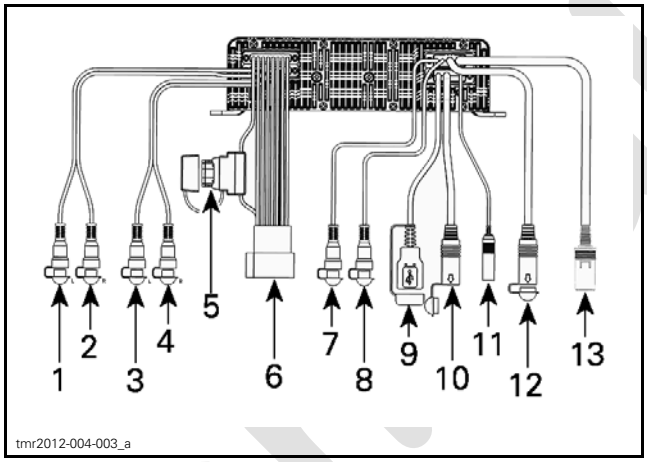
AMPLIFIER

Amplifier Access

The amplifier is attached on the top of the glove box.

Go to *BODY* subsection for glove box removal procedure.

Amplifier Connector Identification



AMPLIFIER CONNECTOR IDENTIFICATION	
1	Front LH RCA line out (WHITE female RCA connector)
2	Front RH RCA line out (RED female RCA connector)
3	Rear LH RCA line out (WHITE female RCA connector)
4	Rear RH RCA line out (RED female RCA connector)
5	In-line fuse (15 A)
6	Power/audio 16-pin connector
7	AUX in (WHITE female RCA connector)
8	AUX in (RED female RCA connector)
9	USB 2.0 connector
10	Wired audio control, 4-pin mini DIN connector
11	Antenna connector

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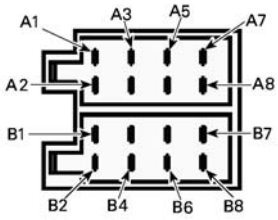
AMPLIFIER CONNECTOR IDENTIFICATION	
12	SIRIUS connector, 8-pin mini DIN connector
13	iPod‡ connector, 8-pin mini DIN locking connector

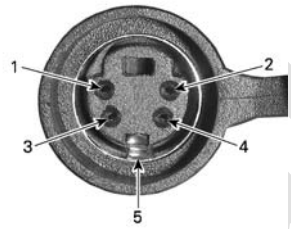
‡ Made for iPod iPhone iPhone, iPod, iPod nano and iPod touch are trademarks of Apple Inc. registered in U.S.A. and other countries. "Made for iPod" and "Made for iPhone" mean that an electronic accessory has been designed to connect specifically to iPod or iPhone, respectively, and has been certified by the developer to meet Apple performance standards. Apple is not responsible for the operation of this device or its compliance with safety and regulatory standards. Please note that the use of this accessory with iPod or iPhone may affect wireless performance.

Power/Audio 16-pin Connector Pins Identification (Radio Side)



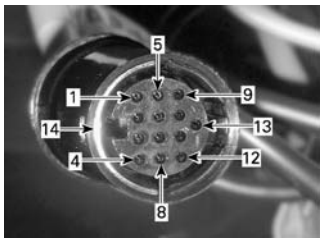
A1	Right rear speaker (+)
A2	Right rear speaker (–)
A3	Right front speaker (+)
A4	Right front speaker (–)
A5	Left front speaker (+)
A6	Left front speaker (–)
A7	Left rear speaker (+)
A8	Left rear speaker (–)
B1	No connection
B2	No connection
B3	No connection
B4	+ 12V ACC switched
B5	Power antenna
B6	No connection
B7	No connection
B8	Ground

Wired Audio Control Connector Pins Identification



1	DC +12V (RED)
2	Data (BLUE)
3	No connection
4	Power ground (BLACK)
5	Ground shield

iPOD Connector Pins Identification



1	Left channel
2	Audio ground
3	USB B +
4	Video out
5	Right channel
6	Power ground
7	USB D +
8	Remote
9	ACC – ID
10	ACC – detect
11	USB D –
12	iPOD detect
13	ACC – power
14	Ground

Amplifier Circuit Protection

The amplifier is protected by 2 fuses:
– In-line fuse (15A) on amplifier
– Fuse 14 (15 A) inside vehicle fuse block #1.

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Amplifier Tests Guidelines

Make sure F14 of fuse box #1 is in good condition and powered before beginning any voltage test.

If radio does not work, check the radio control before testing the amplifier.

Amplifier Input Voltage Test

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

Remove glove box.

Unplug the power/audio 16-pin connector.

Turn ignition key to ON position

TEST PROBE		VOLTAGE DC
Pin 13	Pin 15	Close to battery voltage

If voltage is within specification, check the in-line fuse (15 A).

If the voltage is out of specification, carry out *AMPLIFIER POWER CONTINUITY TEST*

Amplifier Power Continuity Test

Test the amplifier power continuity between the fuse box #1 and the power/audio 16-pin connector as per the following table.

FUSE BOX #1 (RED PROBE)	POWER/AUDIO CONNECTOR (BLACK PROBE)	CONTINUITY
C10	Pin 13	Close to 6 MΩ
C11	Pin 15	Close to 0 Ω

If continuity is out of specification, repair or replace wiring harness and connectors.

If continuity is within specification, replace the amplifier.

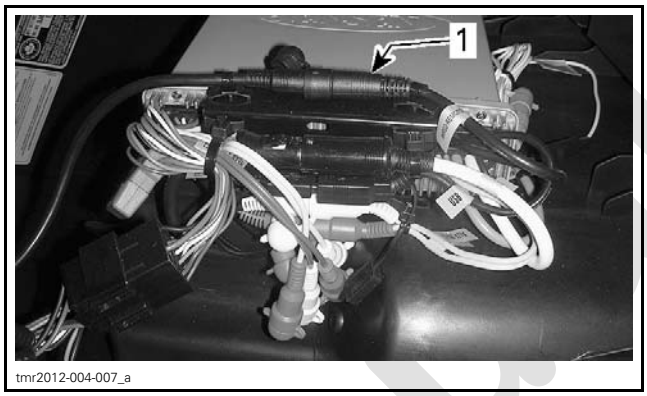
RADIO CONTROL

Radio Control Input Voltage Test

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

The radio control receives its power through the amplifier.

Unplug the audio control connector (4-pin mini DIN) from the amplifier.



tmr2012-004-007_a

1. Audio control connector (4-pin mini DIN)

Turn ignition key to ON position.

Check voltage as per the following table.

AUDIO CONTROL CONNECTOR (AMPLIFIER SIDE)		VOLTAGE DC
Pin 1	Pin 4	Close to battery voltage

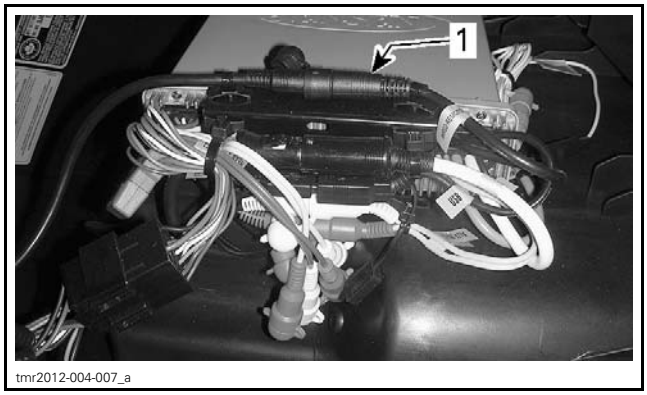
If voltage is within specification, replace the radio control.

If voltage is out of specification, check the amplifier and connections.

Radio Control Removal

Refer to *BODY* and remove the following parts:
- Upper console
- Glove box.

Unplug the audio control connector (4-pin mini DIN) from the amplifier.



tmr2012-004-007_a

1. Audio control connector (4-pin mini DIN)

Cut or release all locking ties retaining the radio control harness.

Unscrew radio control retaining ring.

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tmr2012-004-008_a

1. Radio control retaining ring

Remove radio control from upper console. Check cable routing for reinstallation.

Radio Control Installation

The installation is the reverse of the removal procedure.

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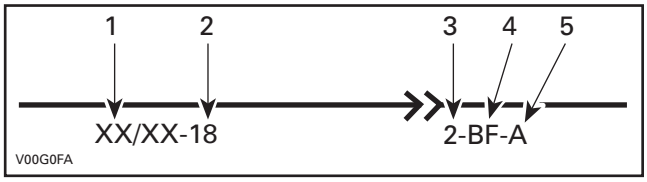
WIRING DIAGRAM INFORMATION

GENERAL

WIRING DIAGRAM LOCATION

The wiring diagram is stored in the back cover pocket.

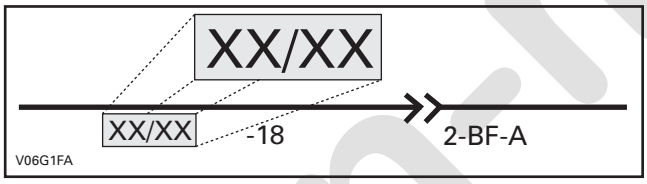
WIRING DIAGRAM CODES



1. *Wire colors*
2. *Wire gauge*
3. *Connector housing area*
4. *Connector identification*
5. *Wire 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.

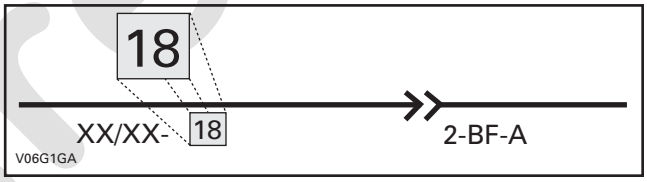


THE SHADED PART INDICATES THE WIRE COLOR

Example: YL/BK is a YELLOW wire with a BLACK stripe.

Wire Gauge

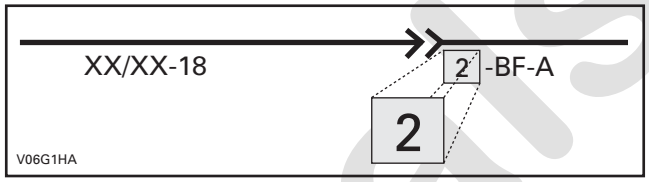
The number after wire color indicates the gauge of a wire.



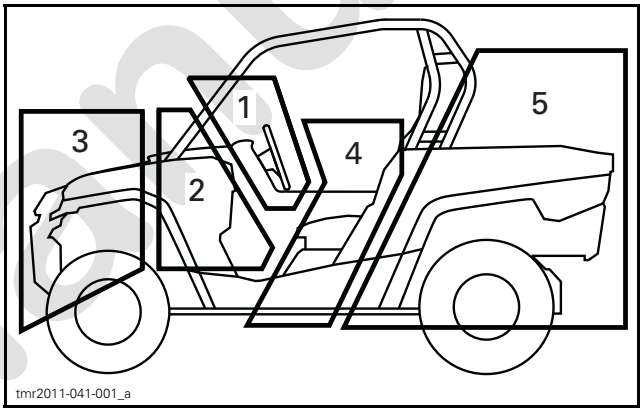
THE SHADED PART INDICATES THE WIRE GAUGE

Example: The number that follows the wire color indicates the wire size used, in this case 18 gauge wire.

Connector Housing Area



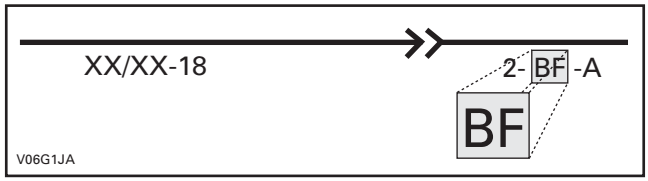
The first number in the connector/pin contact number represents the area in the vehicle where the connector is located.



AREA	LOCATION
1	Steering, dashboard and upper console area
2	Under dashboard and front bulkhead area
3	Front of vehicle
4	Engine, seat and lower console area
5	Rear of vehicle

Connector Identification

The letters in the middle of the connector/pin contact number Indicates the connector's function. 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

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ABBREVIATION	DESCRIPTION	ABBREVIATION	DESCRIPTION
ACS	Air Controlled Suspension	M1	ACS compressor
BA	Ignition coil	MAPTS	Manifold air pressure and temperature sensor
BAT	Battery	MD	2WD/4WD actuator
BD	2WD/4WD switch	OPS	Oil pressure switch
BN	Ground post	OV	Override button
BP	Battery power	PDH	RH headlight (high beam)
BV1	ACS solenoid valve	PDL	RH headlight (low beam)
BV3	ACS release valve	PF1	Fuse Holder (main)
CA	Magneto	PF2	Fuse Holder
CAPS	Camshaft position sensor	PGH	LH headlight (high beam)
CC	Ignition switch	PGL	LH headlight (low beam)
CI	Multifunction gauge	PRD	RH tail light
CPS	Crankshaft position sensor	PRG	LH tail light
CTS	Coolant temperature sensor	RD	Voltage regulator/rectifier
CV	Speed sensor	S1	ACS button
DB	Diagnostic connector	SB	Seat belt
DC	DC outlet	SD	2WD/4WD actuator switch
DC3/DC5 DC6/DC7	Accessories connector	SM	Starter motor
ECM	Engine control module	SPK1 and SPK2	Spark plug
ETA	Electric throttle actuator	SPSW	Sport switch
ETC	Electronic throttle control	SS	Starter solenoid
FP	Fuel pump	STSW	Start switch
FRA	Brake light switch	SW	Winch relay
FT	Cooling fan	SWW	Winch switch
GBPS	Gearbox position sensor	T1	Temperature sensor (ACS compressor)
HIBM	High beam (headlights)	TPS	Throttle position sensor
HIC	Harness interconnect (engine/vehicle)	TAS	Throttle accelerator sensor
INJ1 and INJ2	Fuel injector		

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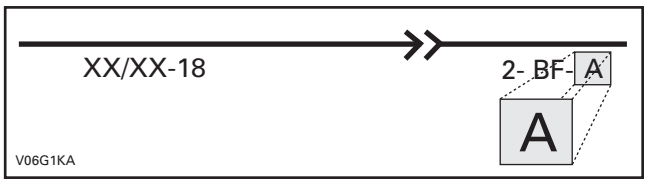
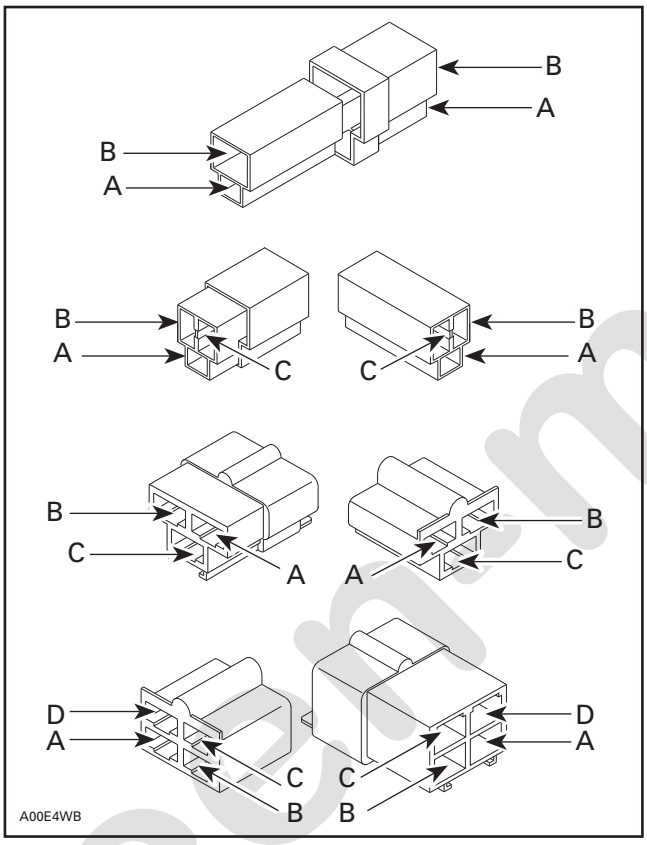
Wire Location in Connector

This is the wire position in the connector. The number or letter given refers to the physical identification stamped or molded on the connector.



THE SHADED PART INDICATES THE CONNECTOR LOCATION IN HOUSING



TYPICAL

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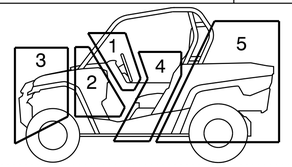
COMMANDER 2012

GENERAL SYSTEM



ACCESSORY CONNECTOR

DC3 GPS
DC5 TRUNK BOX
DC6 RADIO
DC7 LTD

TERMINAL IDENTIFICATION						
	NAME	ZONE-	CONNECTOR NAME-	TERMINAL #/A
EX:	CI	1	-	CI	-	15
EX:	CV	4	-	CV	-	A
EX:	ME	2	-	ME		

ZONE #	ZONE DESCRIPTION
1	STEERING AREA
2	MODULE AREA
3	FRONT OF VEHICLE
4	ENGINE AREA
5	REAR OF VEHICLE

	WELDED JOINT
	SHRINKED JOINT
	CROSSED WIRE
	WIRE BUS
	SIMPLE CONDUCTOR WIRE
	FEMALE TERMINAL
	MALE TERMINAL
	STEEL LINK (FRAME)
	TERMINAL

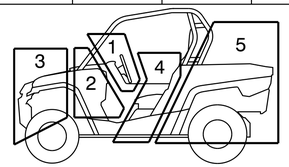
COLOR CODE	
BE	BEIGE
BK	BLACK
BU	BLUE
BR	BROWN
GN	GREEN
GY	GREY
OR	ORANGE
RD	RED
VI	VIOLET
WH	WHITE
YL	YELLOW
PK	PINK
LT BU	LIGHT BLUE

JT RD/GN
JT RD/GY
JT OR/BE
JT OR/GN
JT RD/BE
JT BE/WH
JT BK/YL
JT VI/BU
JT VI/BU
JT OR/VI
JT BE/GN
JT WH
JT WH/BE
JT RD/YL
JT RD/BK
JT RD/VI
JT RD/OR
JT OR/BK
JT RD/BR
JT GN
JT BU
JT BK1
JT BK2
JT BK3
JT BK4
JT BK5

PF2 (1/3)(2/3) MAIN FUSE (F1) 30 A / FAN / ACCES. FUSE (F2) 50 A
PF2 (3/3) HP ACC F3 60 A
PF1 CONTROL EURO F10 5A
1-HIBM-4
PF1 KEY SWITCH FUSE (F8) 5 A
PF1 MAIN RELAY (R2)
PF1 RELAY SPEEDO FUSE (F4) 10 A
PF1 RELAY DRIVER FUSE (F13) 5 A
DC7 DC OPTION
CI SPEEDOMETER & PILOT LAMPS
FUEL
ENGINE
4WD
HI BEAM
2-HIBM-6
SW WINCH RELAY
PF1 LIGHT FUSE (F11) 30A
FRA BRAKE LIGHT SWITCH
PF1 COOLING FAN FUSE (F9) 30 A
PF1 ACCESSORIES RELAY (R3)
WM WINCH MOTOR
CC IGNITION KEY (ON & DESS)
OFF
ON W/LIGHT
ON WO/LIGHT
SS STARTER SOLENOID
FREE WEELING DIODE (D2)
ONE-WAY DIODE (D5)
ONE-WAY DIODE (D4)
MD 2WD/4WD ACTUATOR
FP (2/2) FUEL LEVEL SENSOR
SD 2WD/4WD ACTUATOR SWITCH
SPORT SWITCH
FREE
SPORT
SM STARTER MOTOR
BAT BATTERY 12 VDC 18 AH
SEAT BELT
FREE
LOCK
STSW START SWITCH
FREE
START
DB2
FP (1/2) FUEL PUMP
PF1 FUEL PUMP (F15) 5 A
PF1 ECM FUSE (F6) 5 A
PF1 INJECTORS IGNITION FUSE (F5) 7.5 A
BA IGNITION COIL
SPK2 SPARK PLUG (REAR)
SPK1 SPARK PLUG (FRONT)
INJ1 FUEL INJECTOR (FRONT)
INJ2 FUEL INJECTOR (REAR)
DB DIAGNOSTIC CONNECTOR
BD 2WD/4WD SWITCH
2WD
4WD
SWW WINCH SWITCH
OUT
FREE
IN
PF1 WINCH 2WD/4WD FUSE (F7) 5 A
PF1 DC OUTLETS FUSE (F12) 15A
PF1 ACC2 FUSE (F14) 15A
PF1 FAN RELAY (R1)
FT COOLING FAN
PF1 LIGHTS RELAY (R4)
HIBM HI- BEAM SWITCH
HI
LOBM
PF1 BRK RELAY (R8)
DC6 DC OPTION
DC5 DC OPTION
DC3 DC OPTION
DC DC OUTLET
DC4
OPS OIL PRESSURE SWITCH
PRD RIGHT TAIL LIGHT
PRG LEFT TAIL LIGHT
RD RECTIFIER
U V W –
CA MAGNETO 650 WATTS
ETA ELECTRONIC THROTTLE
TPS
OVR OVERRIDE
FREE
OVER RIDE
CTS COOLANT TEMP SENSOR
VSS VEHICULE SPEED SENSOR
MAPTS MANIFOLD AIR PRESSURE / TEMP SENSOR
GBPS GEAR - BOX POSITION SENSOR
CPS CRANKSHAFT POSITION SENSOR
TAS THROTTLE ACCELERATOR SENSOR
ECM ENGINE CONTROL MODULE

COMMANDER

ACS SYSTEM



MAIN HARNESS SIDE

ACS HARNESS SIDE

TERMINAL IDENTIFICATION						
	NAME	ZONE-	CONNECTOR NAME-		TERMINAL #/A	
EX:	CI	1	-	CI	-	15
EX:	CV	4	-	CV	-	A
EX:	ME	2	-	ME		

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

	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

DC7 FROM MAIN HARNESS
HIGH POWER ACC

DB1 FROM MAIN HARNESS
DIAGNOSTIC CONNECTOR

SEE MAIN HARNESS DIAGRAM
FOR DETAILS ON DB1 AND DC7

JT RD/BR — 2-DB1-6

RD/PK — 2-DC7-B

JT RD/GY

JT OR/GN — 2-DB2-6

RD/GN

RD/BR — JT RD/BR

BR/PK — JT BR/PK

PF2 (1/3) MAIN FUSE (F1) 30 A

PF2 (2/3) FAN / ACCES. FUSE (F2) 50 A

PF2 (3/3) HP ACCES. FUSE (F3) 60 A

RD/GY-12 — RD-12

CI SPEEDOM ETER & PILOT LAMPS

OR/GN-18 — 1-CI-17

1-CI-21 VI/PK-18 — 1-CI-4 BR/PK-18 — 1-CI-19 WH/BE-18 — 1-CI-18 BE/GN-18 — 1-CI-7 BK/BE-18 — 1-CI-20 BK-18 — 1-CI-5 BU-18

P — RD FUEL — YL ENGINE — 4WD — BU HI BEAM

4-R5-87 — 4-R5-85 — **R5** — 4-R5-30 — 4-R5-88

RD/WH

M1-1 — **AIR COMPRESSOR** — M1-2

OR/PK

TEMPERATURE SENSOR

RD/GY — 2-DB1-5 — RD/GY — 2-DB2-5

BK

4-T1-1 — 4-PCM-13 — BK

4-T1-2 — 4-PCM-9 — VI/PK

4-PCM-28 — 4-PCM-17 — 4-PCM-35

4-PCM-16

4-PCM-34

BV3-1 — 4-BV1-6 — 4-BV1-5

OR/GN — 2-DB1-4 — OR/GN — 4-PCM-18 — 2-DB2-4

4-PCM-36

BR/BE — 4-BV3-2 — 4-PCM-27 — (VALVE POMPE VENT)

BK/GN — 4-BV1-8 — 4-PCM-26 — (VALVE VENT)

BK/YL — 4-BV1-1 — 4-PCM-23 — (VALVE AVANT- DROIT)

BR/YL — 4-BV1-3 — 4-PCM-24 — (VALVE AVANT- GAUCHE)

BK/BE — 4-BV1-2 — 4-PCM-22 — (VALVE USER)

BK/BU — 4-BV1-4 — 4-PCM-25 — (VALVE ARRIERE)

JT BE/GN

CAN LOW — BE/GN — 2-DB1-2 — BE/GN — 4-PCM-2 — 2-DB2-2

SCM SUSPENSION CONTROL MODULE

JT WH/BE

CAN HI — WH/BE — 2-DB1-1 — WH/BE — 4-PCM-1 — 2-DB2-1

BK/VI — 4-PCM-6

BK/GY — 4-PCM-7

4-PCM-31

4-PCM-32

4-PCM-33

4-PCM-10 — PK/OR — 4-PCM-3 — PK/BR — 4-PCM-14

4-BV1-10 — 4-BV1-9

+ P — U P — 4-BV1-7

BK

PRESSURE SENSOR

1-S1-3 — 1-S1-1

UP — FREE — DOWN — **S1 (1/2)**

1-S1-2

BK

1-S1-10 — 1-S1-8 — **S1 (2/2)** — 1-S1-9 — 1-S1-7

SS STARTER SOLENOID

5-BP2 — 5-BP1 — 5-SS1 — OR/GN-18

5-BP3 — 5-SS2 — OR/BR-18

RD-12 — RD-6 — RD-6

WH/BE-18 — BE/GN-18

BAT BATTERY 12 VDC 18 AH

5-BAT1 — 5-BAT2 — BK-6

SM STARTER MOTOR

4-SM

RD-12 — 5-RD1-1

RD RECTIFIER

U V W –

5-RD2-1 — 5-RD2-2 — 5-RD2-3 — 5-RD1-3

YL-12 — YL-12 — YL-12 — BK-12 — BK-6

CA-1 — CA-2 — CA-3

YL-14 — YL-14 — YL-14

CA MAGNETO 650 WATTS

BK-12 — BK-6

BK-6 — 4-BN5 — 5-BN4 — 5-BN3 — 5-BN1

BK-12 — BK-12

JT BK1

JT BK2

JT BK3

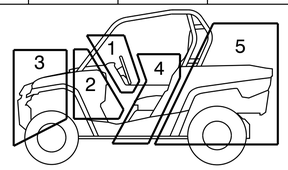
JT BK4

2-DB1-3 — JT BK — 2-DB2-3

2-DC7-A

COMMANDER

RADIO SYSTEM



MAIN HARNESS SIDE

RADIO SIDE

TERMINAL IDENTIFICATION						
	NAME	ZONE-	CONNECTOR NAME-	TERMINAL #/A
EX:	CI	1	-	CI	-	15
EX:	CV	4	-	CV	-	A
EX:	ME	2	-	ME		

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

●	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

JT RD/VI

JT RD/GN

JT RD/GY

JT OR/GN

SEE MAIN HARNESS

2- DC6- B

RD/VI

BK

RD/GY-12

RD/GN-12

PF2 (1/2) MAIN FUSE (F1) 30 A

PF2 (2/2) FAN / ACCES. FUSE (F2) 40 A

RD-12

OR/GN-18

1-CI-17

CI
SPEEDOMETER & PILOT LAMPS

P

RD FUEL

YL ENGINE

YL 4WD

BU HI BEAM

1-CI-21 VI/PK-18

1-CI-4 BR/PK-18

1-CI-19 WH/BE-18

1-CI-18 BE/GN-18

1-CI-7 BK/BE-18

1-CI-20 BK-18

1-CI-5 BU-18

OR/GN-18

5-BP2

5-BP1

5-SS1

SS
STARTER SOLENOID

5-BP3

5-SS2

OR/BR-18

RD-12

RD-6

RD-6

5-BAT1

4-SM

BAT
BATTERY
12 VDC
18 AH

M

SM
STARTER MOTOR

5-BAT2

BK-6

RD-12

4-RD1-1

RD
RECTIFIER

U V W –

5-RD2-1 5-RD2-2 5-RD2-3 5-RD1-3

YL-12 YL-12 YL-12 BK-12 BK-6

CA-1 CA-2 CA-3

YL-14 YL-14 YL-14

CA
MAGNETO
650 WATTS

BK-12

BK-6

BK-6

4-BN5

5-BN4

5-BN3

5-BN1

BK-12

BK-12

BK-12

BK-12 BK-12

JT BK1

JT BK2

JT BK3

JT BK4

SEE MAIN HARNESS

2- DC6- A

AM / FM ANTENNA

RADIO

R01

13 BK

15 A FUSE

15 RD/VI

VI 4 VI

BK/VI 8 BK/VI

GY 3 GY

BK/GY 7 BK/GY

GN 1 GN

BK/GN 5 BK/GN

WH 2 WH

BK/WH 6 BK/WH

RR

B RD + A BK -

SPEAKER REAR RIGHT

FR

B WH + A BK -

SPEAKER FRONT RIGHT

RL

B RD + A BK -

SPEAKER REAR LEFT

FL

B WH + A BK -

SPEAKER FRONT LEFT

DC6 ACCESSORY POWER CONNECTOR

DASH REMOTE

IPOD GLOVE BOX

GLOVE BOX USB / AUX IN

30 SEPT. 2011

710002553F4

SAFETY NOTICE

This manual has been prepared as a guide to correctly service and repair the 2012 Can-Am™ Commander LTD as described in the model list in the *INTRODUCTION*.

This *SHOP MANUAL SUPPLEMENT* must be used in conjunction with the *2011 CAN-AM COMMANDER SHOP MANUAL* (P/N 219 100 452). Refer to this manual when a particular system is not covered in this supplement.

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

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

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

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

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

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

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

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

⚠ WARNING

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

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

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

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

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

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

BRP disclaims liability for all damages and/or injuries resulting from the improper use of the contents. We strongly recommend that any services be carried out and/or verified by a highly skilled professional mechanic.

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INTRODUCTION

This shop manual covers the following BRP made 2012 Can-Am side-by-side vehicles.

MODEL	MODEL NUMBER
Commander 1000 LTD	6GCA, 6GBC, 6GCC, 6GCD

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

Due to late changes, there may be some differences between the manufactured product and the description and/or specifications in this document.

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

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COMMANDER 1000 LIMITED

MODEL			COMMANDER 1000 LTD
ENGINE			
Engine type			ROTAX®1010
			V-twin 4-stroke, Single Over Head Camshaft (SOHC), liquid cooled
Number of cylinders			2
Number of valves			8 valves (mechanical adjustment)
Bore			91 mm (3.583 in)
Stroke			75 mm (2.95 in)
Displacement			976 cm^3 (59.6 in^3)
Compression ratio			10.5:1
Maximum HP RPM			7000 rpm
Exhaust system			Spark arrestor approved by USDA Forest Service
Air filter			Flat corrugated composite fiber
Intake valve opening			5° BTDC
Intake valve closing			60° ABDC
Exhaust valve opening			65° BBDC
Exhaust valve closing			5° BTDC
Valve clearance	Intake		0.06 mm to 0.14 mm (.0024 in to .0055 in)
	Exhaust		0.11 mm to 0.19 mm (.0043 in to .0075 in)
Valve stem diameter	Intake	New	4.966 mm to 4.980 mm (.1955 in to .1961 in)
		Service limit	4.930 mm (.1941 in)
	Exhaust	New	4.956 mm to 4.970 mm (.1951 in to .1957 in)
		Service limit	4.930 mm (.1941 in)
Valve out of round	Intake and exhaust	New	0.005 mm (.0002 in)
		Service limit	0.06 mm (.0024 in)
Valve guide diameter		New	4.998 mm to 5.018 mm (.1968 in to .1976 in)
		Service limit	5.050 mm (.1988 in)
Valve spring free length		New	40.81 mm (1.607 in)
		Service limit	39.00 mm (1.535 in)
Valve seat contact width	Intake	New	1.05 mm to 1.35 mm (.041 in to .053 in)
		Service limit	1.8 mm (.071 in)
	Exhaust	New	1.25 mm to 1.55 mm (.049 in to .061 in)
		Service limit	2 mm (.079 in)
Rocker arm bore diameter		New	12.036 mm to 12.050 mm (.4739 in to .4744 in)
		Service limit	12.060 mm (.4748 in)
Rocker arm shaft diameter		New	12.000 mm to 12.018 mm (.4724 in to .4731 in)
		Service limit	11.990 mm (.472 in)
Piston diameter		New	90.950 mm to 90.966 mm (3.5807 in to 3.5813 in)
		Service limit	90.900 mm (3.5787 in)
Piston/cylinder clearance		New	0.027 mm to 0.057 mm (.0011 in to .0022 in)
		Service limit	0.100 mm (.0039 in)

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MODEL			COMMANDER 1000 LTD
ENGINE (CONT'D)			
Piston ring type		1st	Upper compression ring, rectangular
		2nd	Lower compression ring, tapered face
		3rd	Oil scraper ring
Ring end gap	Rectangular	New	0.20 mm to 0.40 mm (.008 in to .016 in)
	Tapered face		0.20 mm to 0.40 mm (.008 in to .016 in)
	Oil scraper ring		0.20 mm to 0.70 mm (.008 in to .028 in)
	Rectangular	Service limit	0.60 mm (.024 in)
	Tapered face		0.70 mm (.028 in)
	Oil scraper ring		1.00 mm (.039 in)
Ring/piston groove clearance	Rectangular	New	0.03 mm to 0.07 mm (.0012 in to .0028 in)
	Tapered face		0.02 mm to 0.06 mm (.0008 in to .0024 in)
	Oil scraper ring		0.01 mm to 0.18 mm (.0004 in to .0071 in)
	Rectangular	Service limit	0.15 mm (.0059 in)
	Tapered face		0.15 mm (.0059 in)
	Oil scraper ring		0.25 mm (.0098 in)
Cylinder bore		New	90.993 mm to 91.007 mm (3.5824 in to 3.583 in)
Cylinder taper		Maximum New	0.038 mm (.0015 in)
		Service limit	0.090 mm (.0035 in)
Cylinder out of round		Maximum New	0.015 mm (.0006 in)
		Service limit	0.020 mm (.0008 in)
Camshaft main bearing journal	Timing chain side	New	34.959 mm to 34.975 mm (1.3763 in to 1.377 in)
		Service limit	34.950 mm (1.376 in)
	Spark plug side	New	21.959 mm to 21.980 mm (.8645 in to .8654 in)
		Service limit	21.950 mm (.8642 in)
Camshaft main bearing journal bore	Timing chain side	New	35.000 mm to 35.025 mm (1.378 in to 1.3789 in)
		Service limit	35.040 mm (1.3795 in)
	Spark plug side	New	22.000 mm to 22.021 mm (.8661 in to .867 in)
		Wear limit	22.040 mm (.8677 in)
Camshaft lobe	Intake valve	New	32.960 mm to 33.160 mm (1.2976 in to 1.3055 in)
		Service limit	32.940 mm (1.2969 in)
	Exhaust valve	New	32.860 mm to 33.060 mm (1.2937 in to 1.3016 in)
		Service limit	32.840 mm (1.2929 in)
Crankshaft main bearing journal diameter (MAG/PTO side)		New	42.016 mm to 42.040 mm (1.6542 in to 1.6551 in)
		Service limit	42.000 mm (1.6535 in)
Crankshaft radial play (MAG/PTO side)		Service limit	0.07 mm (.0028 in)
Crankshaft bearing journal diameter (in PTO cover)		New	34.004 mm to 34.020 mm (1.3387 in to 1.3394 in)
		Service limit	33.998 mm (1.3385 in)
Crankshaft radial play (PTO cover bearing)		Service limit	0.10 mm (.0039 in)
Crankshaft axial play		New	0.200 mm to 0.500 mm (.0079 in to .0197 in)
		Service limit	0.600 mm (.0236 in)

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MODEL			COMMANDER 1000 LTD
ENGINE (CONT'D)			
Crankshaft pin diameter		New	41.986 mm to 42.010 mm (1.653 in to 1.6539 in)
		Service limit	41.967 mm (1.6522 in)
Crankshaft deflection	MAG/PTO side	New	0.050 mm (.002 in)
Crankcase plain bearing	MAG/PTO side	Service limit	42.100 mm (1.6575 in)
PTO cover plain bearing		Service limit	34.120 mm (1.3433 in)
Connecting rod big end diameter		Service limit	42.100 mm (1.6575 in)
Connecting rod big end radial play		Service limit	0.09 mm (.0035 in)
Connecting rod big end axial play		New	0.250 mm to 0.550 mm (.0098 in to .0217 in)
		Service limit	0.600 mm (.024 in)
Connecting rod small end diameter		New	22.010 mm to 22.020 mm (.8665 in to .8669 in)
		Service limit	22.050 mm (.8681 in)
Piston pin diameter		New	21.996 mm to 22.000 mm (865.984 in to 866.142 in)
		Service limit	21.980 mm (.8654 in)
Connecting rod/piston pin clearance (radial play)		Service limit	0.080 mm (.0031 in)
LUBRICATION SYSTEM			
Lubrication	Type		Wet sump. Replaceable cartridge oil filter
	Oil filter		BRP Rotax paper type, replaceable
	Engine oil pressure	Minimum	300 kPa (44 PSI) at 6000 RPM
	Engine oil	Capacity (oil change with filter)	2.2 L (2.3 qt (U.S. liq.))
		Recommended	For the summer season, use XPS synthetic blend oil (summer grade) (P/N 293 600 121). For the winter season, use XPS synthetic oil (winter grade) (P/N 293 600 112). If not available, use a 5W40 motor oil that meets the requirements for API service classification SM, SL or SJ
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		4.3 L (1.1 U.S. gal.)
Thermostat	Starts to open		65°C (149°F)
	Fully open		88°C (190°F)
Radiator cap opening pressure			110 kPa (16 PSI)

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MODEL		COMMANDER 1000 LTD
TRANSMISSION		
Type		CVT (Continuously Variable Transmission)
Engagement RPM		1750 ± 100 RPM
Drive belt width	Service limit	30.00 mm (1.181 in)
Governor cup roller outer diameter	New	13.70 mm to 13.80 mm (.539 in to .543 in)
	Service limit	13.20 mm (.52 in)
Governor cup roller inner diameter	New	8.05 mm to 8.15 mm (.317 in to .321 in)
	Service limit	9.00 mm (.354 in)
Centrifugal lever pivot bolt diameter	New	6.078 mm to 6.100 mm (.239 in to .24 in)
	Service limit	6.000 mm (.236 in)
Centrifugal lever bore diameter	New	6.035 mm to 6.078 mm (.2376 in to .2393 in)
	Service limit	6.200 mm (.244 in)
Drive pulley sliding half centrifugal lever pivot bolt bore diameter	New	6.113 mm to 6.171 mm (.241 in to .243 in)
	Service limit	6.300 mm (.248 in)
Drive pulley sliding half large bushing	New	55.000 mm to 55.040 mm (2.165 in to 2.167 in)
	Service limit	55.200 mm (2.173 in)
Drive pulley sliding half small bushing	New	32.000 mm to 32.040 mm (1.26 in to 1.261 in)
	Service limit	32.200 mm (1.268 in)
Drive pulley spring free length	Service limit	105 mm (4.134 in)
Drive pulley spring free squareness	Service limit	4 mm (.157 in)
Spring sleeve length	New	9.2 mm to 9.4 mm (.362 in to .37 in)
	Service limit	9.0 mm (.354 in)
Driven pulley sliding half bushing	New	30.060 mm to 30.100 mm (1.183 in to 1.185 in)
	Service limit	30.200 mm (1.189 in)
Driven pulley sliding fixed bushing	New	30.060 mm to 30.100 mm (1.183 in to 1.185 in)
	Service limit	30.200 mm (1.189 in)
Torque gear on driven pulley	Service limit	7.500 mm (.295 in)
Driven pulley spring free length	Service limit	125 mm (4.921 in)
Driven pulley spring free squareness	Service limit	3.8 mm (.15 in)
GEARBOX		
Type		Dual range (HI-LO) with park, neutral and reverse
Gearbox oil	Capacity	450 ml (15 U.S. oz)
	Recommended	XPS synthetic gear oil (P/N 293 600 140) or a 75W140 API GL-5 synthetic gear oil
Coupling sleeve groove width	New	5.25 mm to 5.35 mm (.207 in to .211 in)
	Service limit	5.50 mm (.217 in)
Coupling fork claw thickness	New	4.95 mm to 5.05 mm (.195 in to .199 in)
	Service limit	4.80 mm (.189 in)
Shift fork claw thickness (high, low and reverse gear shift fork)	New	5.10 mm to 5.20 mm (.201 in to .205 in)
	Service limit	5.00 mm (.197 in)
Width of shift fork engagement groove	New	5.30 mm to 5.40 mm (.209 in to .213 in)
	Service limit	5.50 mm (.217 in)

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MODEL			COMMANDER 1000 LTD
GEARBOX (CONT'D)			
Diameter free pinions		New	29.000 mm to 29.013 mm (1.1417 in to 1.1422 in)
		Service limit	29.015 mm (1.1423 in)
Intermediate gear shaft		New	24.987 mm to 25.000 mm (.9837 in to .9843 in)
		Service limit	24.977 mm (.983 in)
Countershaft	MAG side	New	19.977 mm to 19.990 mm (.7865 in to .787 in)
		Service limit	19.973 mm (.7863 in)
	CVT side	New	24.977 mm to 24.990 mm (.9833 in to .9839 in)
		Service limit	24.970 mm (.9831 in)
Main shaft	Free pinion bearing	New	24.987 mm to 25.000 mm (.9837 in to .9843 in)
		Service limit	24.984 mm (.9836 in)
	Bearing journal MAG/CVT side	New	16.980 mm to 16.991 mm (.6685 in to .6689 in)
		Service limit	16.976 mm (.6683 in)
ELECTRICAL SYSTEM			
Magneto generator output			650 W @ 6000 RPM
Stator resistance (20C)			0.15 to 0.30 Ω
Ignition system type			IDI (Inductive Discharge Ignition)
Ignition timing			Not adjustable
Spark plug	Quantity		2
	Make and type		NGK DCPR8E
	Gap		0.7 mm to 0.8 mm (.028 in to .031 in)
Engine RPM limiter setting	Forward		8000 rpm
	Reverse		20 km/h to 25 km/h (12 MPH to 16 MPH) (8000 rpm with Override)
Battery	Type		Maintenance free
	Voltage		12 volts
	Nominal rating		18 A•h
	Power starter output		0.7 KW
Headlight			4 x 60 W
Taillight			2 X 8/27 W
Turn signals (CE)			10 W
Position light			LED, 0.7 V approximately (each)

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MODEL			COMMANDER 1000 LTD
ELECTRICAL SYSTEM (CONT'D)			
Fuses (fuse block #2)	F1: Main		30 A
	F2: Main accessories		50 A
	F3: ACS suspension		60 A
Fuses (fuse block #1)	F4: Speedometer and brake relay		10 A
	F5: Fuel injectors and ignition coils		7.5 A
	F6: Engine control module (ECM)		5 A
	F7: Winch and 2WD/4WD switches		5 A
	F8: Ignition switch and gauge		5 A
	F9: Cooling fan		25 A
	F10: Euro controls		5 A
	F11: Lights		30 A
	F12: 12V power outlet		15 A
	F13: Cooling fan relay (R1) and Accessories relay (R3)		5 A
	F14: 12V power (connector DC6)		15 A
	F15: Fuel pump		5 A
Relays			Cooling fan relay (R1)
			Main relay (R2)
			Accessories relay (R3)
			Lights relay(R4)
			ACS suspension relay (R5)
			Brake relay (R8)
FUEL SYSTEM			
Fuel delivery	Type		Electronic Fuel Injection (EFI), 54 mm throttle body with iTC (Intelligent Throttle Control), 1 injector per cylinder
Fuel pump	Type		Electrical (in fuel tank)
	Operating pressure		350 kPa (51 PSI)
Idle speed			1250 rpm ± 50 (not adjustable)
Fuel	Type		Regular unleaded gasoline
	Octane rating	Inside North America	87 (R+M)/2 or higher
		Outside North America	92 RON or higher
Fuel tank capacity			38 L (10 U.S. gal.)
Fuel remaining when low fuel light turns ON			± 12 L (3.2 U.S. gal.)

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MODEL		COMMANDER 1000 LTD
DRIVE SYSTEM		
Front drive		Visco-lok† front differential
Front drive ratio		3.6:1
Rear drive		Shaft driven/spool
Rear drive ratio		3.6:1
Front differential oil	Capacity	500 ml (17 U.S. oz)
	Recommended	XPS synthetic gear oil (P/N 293 600 043) or synthetic gear oil 75W90 API GL-5
Rear final drive oil	Capacity	350 ml (11.8 U.S. oz)
	Recommended	XPS synthetic gear oil (P/N 293 600 140) or synthetic gear oil 75W140 API GL-5
CV joint grease		CV joint grease (P/N 293 550 019)
Propeller shaft grease		Hi-temp bearing grease NLGI-2 or an equivalent
STEERING		
Steering wheel		Adjustable tilt steering
Turning radius		240 cm (94.5 in)
Total toe (vehicle on ground)		0 mm ± 4 mm (0 in ± .157 in)
Camber angle (vehicle on ground)		0.7° positive
Tie-rod maximum length unengaged threads		32 mm (1.26 in)
FRONT SUSPENSION		
Suspension type		Double suspension-arm with dive-control geometry with ACS
Suspension travel		254 mm (10 in)
Shock absorber	Qty	2
	Type	HPG clicker with air
Spring free length		358.7 mm (14.122 in)
Preload adjustment type		Automatic mode: 6 positions air compression settings Manual mode: limitless between position 1 and position 6 of automatic mode

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MODEL		COMMANDER 1000 LTD
REAR SUSPENSION		
Suspension type		Torsional Trailing arm Independant (TTI) with external sway bar with ACS
Suspension travel		254 mm (10 in)
Shock absorber	Qty	2
	Type	HPG clicker with air
Spring free length		355.6 mm (14 in)
Preload adjustment type		Automatic mode: 6 positions air compression settings Manual mode: limitless between position 1 and position 6 of automatic mode
BRAKES		
Front brake	Qty	2
	Type	214 mm cross-drilled disc brakes with hydraulic twin-piston calipers
Rear brake	Qty	1
	Type	214 mm cross-drilled disc brake with hydraulic twin-piston caliper
Brake fluid	Capacity	250 ml (8.5 U.S. oz)
	Type	DOT 4
Caliper		Floating
Brake pad material	Front	Metallic
	Rear	Metallic
Minimum brake pad thickness		1 mm (.04 in)
Minimum brake disc thickness	Front	4.3 mm (11/64 in)
	Rear	4.3 mm (11/64 in)
Maximum brake disc warpage		0.2 mm (.01 in)
TIRE		
Pressure	Front	Maximum: 83 kPa (12 PSI) Minimum: 69 kPa (10 PSI)
	Rear	Maximum: 152 kPa (22 PSI) Minimum: 83 kPa (12 PSI)
Minimum tire thread depth		3 mm (.118 in)
Size	Front	27 x 9 x 14 (in)
	Rear	27 x 11 x 14 (in)
WHEELS		
Type		Cast aluminum
Rim size	Front	14 X 7 (in)
	Rear	14 X 8.5 (in)
Wheel nuts torque		100 N•m ± 10 N•m (74 lbf•ft ± 7 lbf•ft)
CHASSIS		
Cage type		50 mm (2 in) diameter, high strength steel, ROPS-approved cage

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MODEL			COMMANDER 1000 LTD
DIMENSION			
Overall length			300.4 cm (118.3 in)
Overall width			148.9 cm (58.6 in)
Overall height			182.9 cm (72 in)
Wheel base			192.4 cm (75.7 in)
Wheel track	Front		125.7 cm (49.5 in)
	Rear		121.9 cm (48 in)
Ground clearance			27.9 cm (11 in)
WEIGHT AND LOADING CAPACITY			
Dry weight			587 kg (1,295 lb)
Weight distribution	Front/rear		44/56
Cargo box capacity (Distribute load evenly in upper and lower cargo boxes without exceeding 181 kg (400 lb) in the upper cargo box.)		Total (upper + lower)	272 kg (600 lb)
		Upper	181 kg (400 lb)
		Lower	272 kg (600 lb)
Total vehicle load allowed (including driver, passenger, all other loads and added accessories)			363 kg (800 lb)
Gross vehicle weight rating			990 kg (2,183 lb)
Towing capacity (Hitch support of 50.8 mm (2 in) X 50.8 mm (2 in))			680 kg (1,500 lb) CE Model: 270 kg (600 lb)
Tongue capacity			68 kg (150 lb)

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AIR CONTROLLED SUSPENSION (ACS)

SERVICE TOOLS

Description	Part Number	Page
FLUKE 115 MULTIMETER	529 035 868	13–15, 17, 20–22

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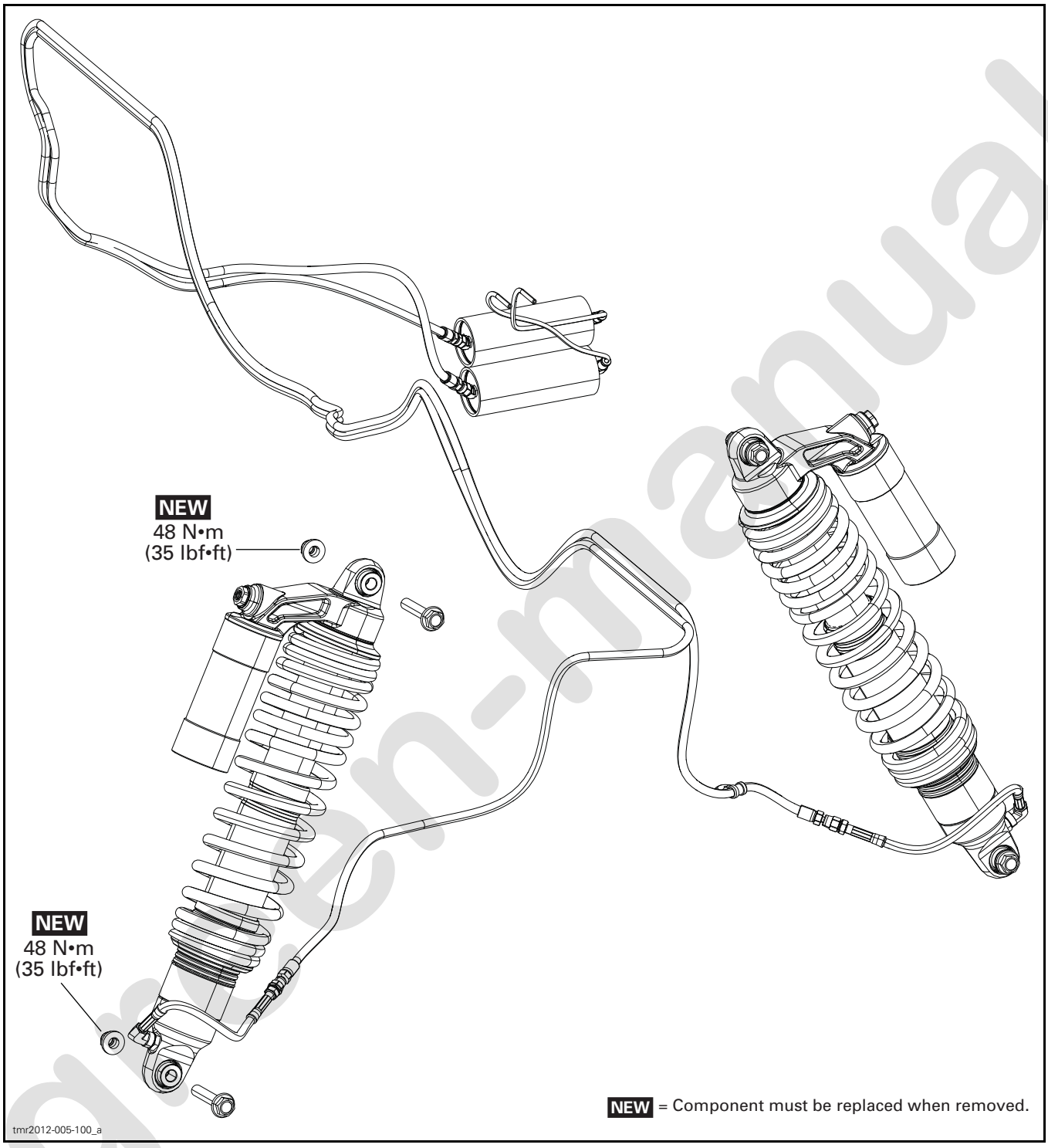
ACS FRONT SUSPENSION



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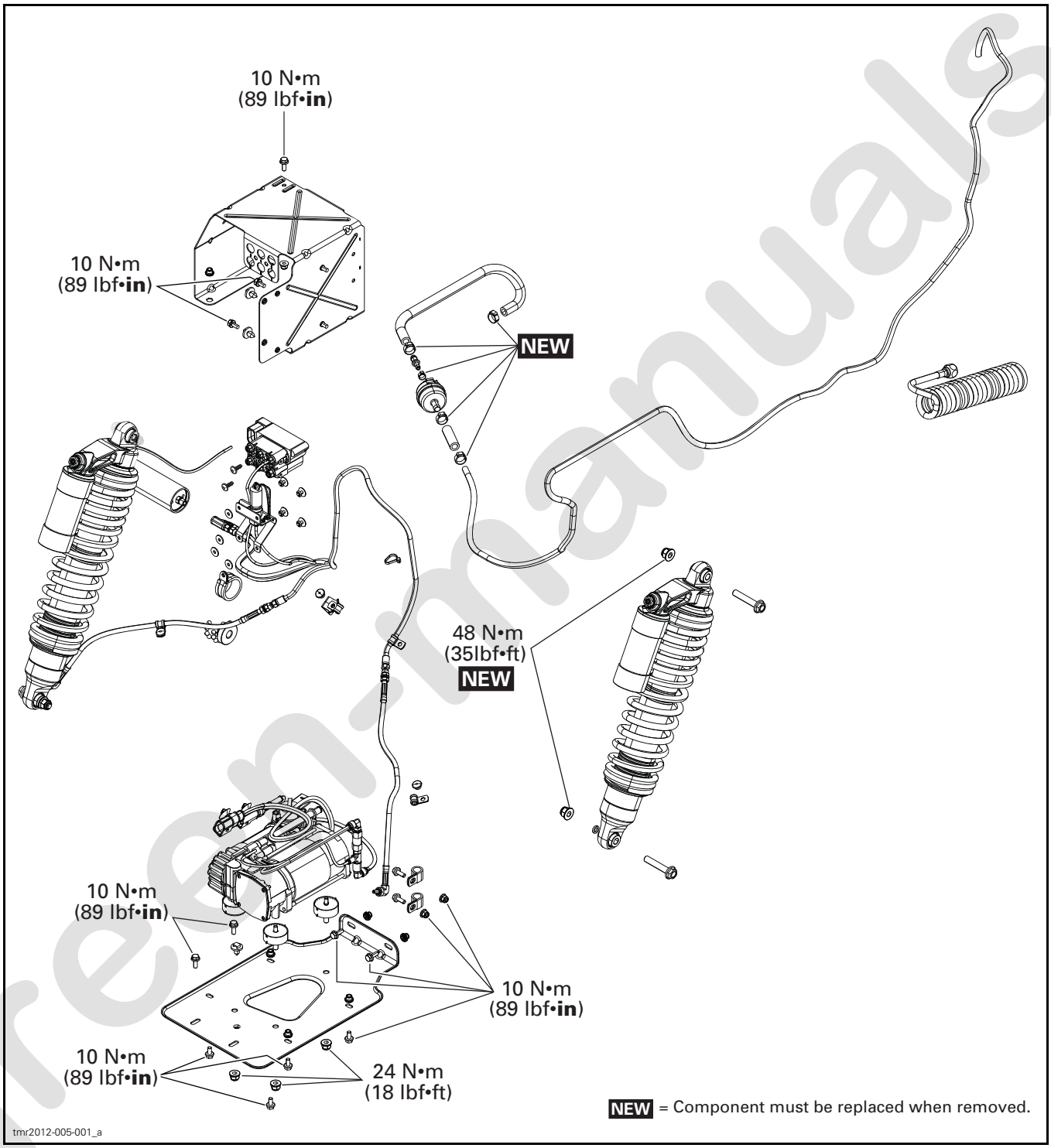
ACS REAR SUSPENSION



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GENERAL

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

⚠ WARNING

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

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

Be careful while manipulating nylon hoses, they must not be kinked.

⚠ **CAUTION** Always wear safety goggles when working with pressurized air system.

⚠ **CAUTION** The ACS suspension system may be under high pressure (over 900 kPa (130 PSI)). Release air pressure prior to working on the system. Refer to *AIR PRESSURE RELEASE FOR SERVICING*.

SYSTEM DESCRIPTION (OPERATION)

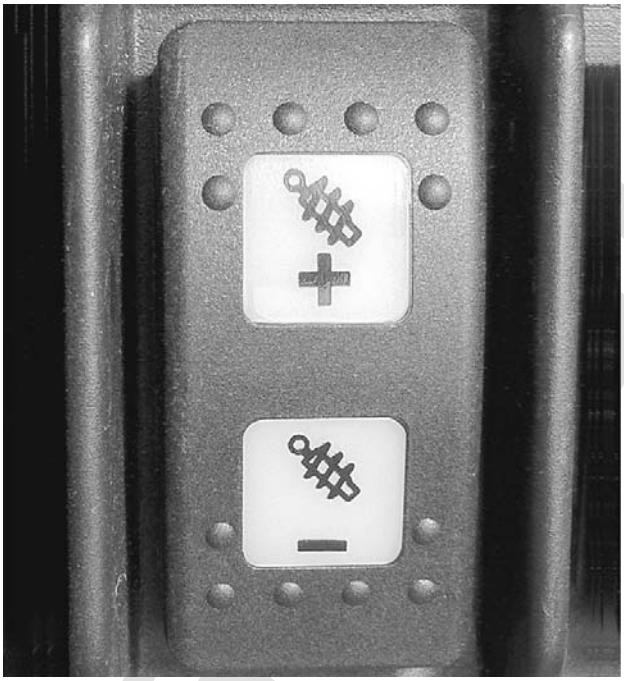
The Commander LTD comes equipped with front and rear air-controlled suspension and HPG shocks with remote reservoir (piggyback).

By changing the ACS setting, air pressure in the front and rear shocks absorbers will change to provide a multitude of different suspension adjustments.

The ACS adjusts the front and rear shocks to 6 rider selectable levels depending on trail conditions or riders preference.

The front shocks pressure is lower than the rear shocks. The pressure are determined by the setting position.

This system allows the operator to adjust the front and rear suspension by pressing the suspension button.



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⚠ WARNING

Always adjust the ACS suspension setting according to load, riding condition, and speed.

NOTE: The ACS suspension will NOT self-adjust unless the engine is running, even when key switch is set to on.

The ACS has 2 modes for suspension adjustment:
– ACS auto mode
– ACS manual mode.

ACS AUTO Mode

The automatic mode allows for simultaneous adjustments on the front and rear suspensions.

In auto mode, the suspension will automatically be adjusted to the preselected riding comfort position.

ACS SUSPENSION SETTINGS		
SETTING	RIDING COMFORT	RECOMMENDED LOAD
ACS 1	Softest	Operator only
ACS 2	Soft	
ACS 3	Semi-soft	Transporting a passenger OR a cargo
ACS 4	Semi-firm	
ACS 5	Firm with high ground clearance	Transporting a passenger AND a cargo
ACS 6	Firmest and highest ground clearance	

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ACS AUTO MODE

Use ACS 1 to ACS 4 for trail riding.

Use the ACS 5 or ACS 6 settings to maximize ground clearance and increase performance while riding in the following environments:

– Muddy
– Watery
– Obstacles.

Use the ACS 6 setting is to maximize ground clearance and increase performance while carrying heavy loads:

⚠ WARNING

Always adjust the ACS suspension setting according to load, riding condition, and speed.

To Enter ACS Automatic Mode:

Press the MODE button until either ACS AUTO or ACS MAN is displayed.

Press SET button to have current ACS mode blink on screen

Press SET button to select ACS AUTO mode.

NOTE: Selected ACS Setting from ACS1 to ACS6 displayed through gearbox position indicator.

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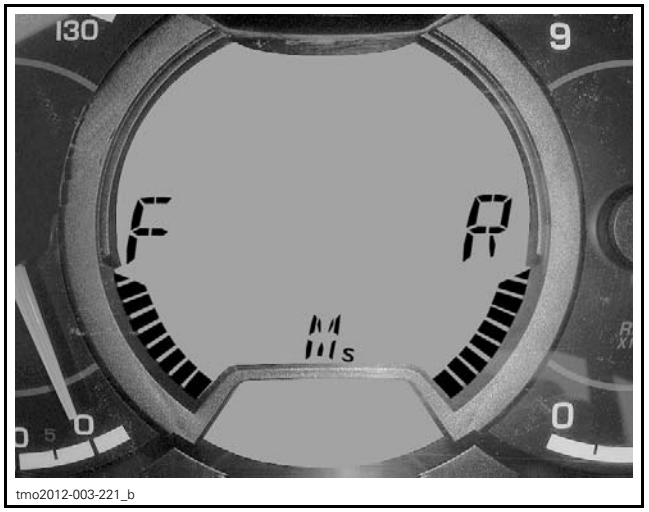
Press and hold SET button to confirm selection.

ACS MANUAL Mode

In manual mode the front and rear shock pressures can be adjusted independently. The fuel and temperature indicators will respectively become front and rear ACS pressure setting indicators.



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ACS MANUAL MODE

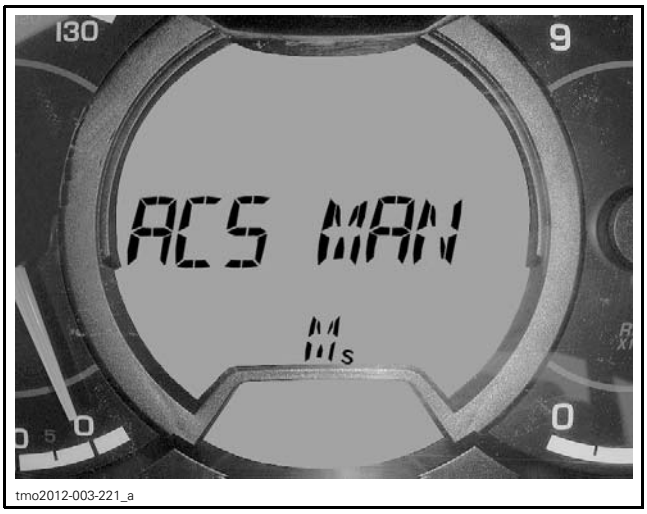
To Enter ACS Manual Mode:

Press the MODE button until either ACS AUTO or ACS MAN is displayed.

Press SET button to have current ACS mode blink on screen.

Press SET button to select ACS MAN mode.

NOTE: ACS set points and actual settings displayed through fuel, temp and gearbox position indicators.

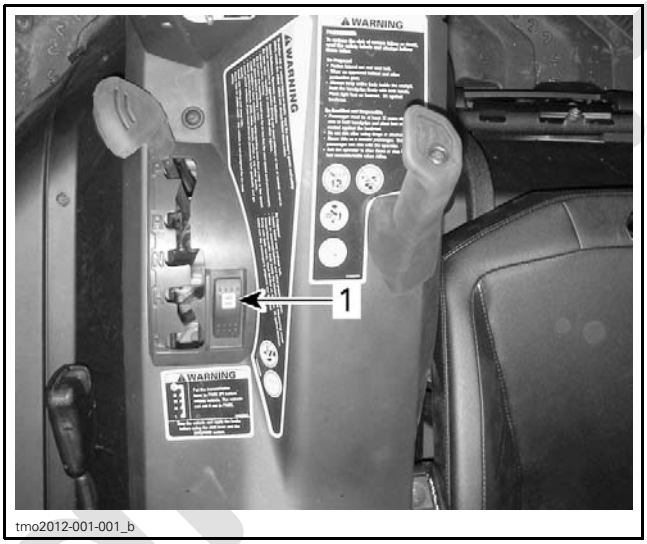


tmo2012-003-221_a

Press and hold SET button to confirm selection.

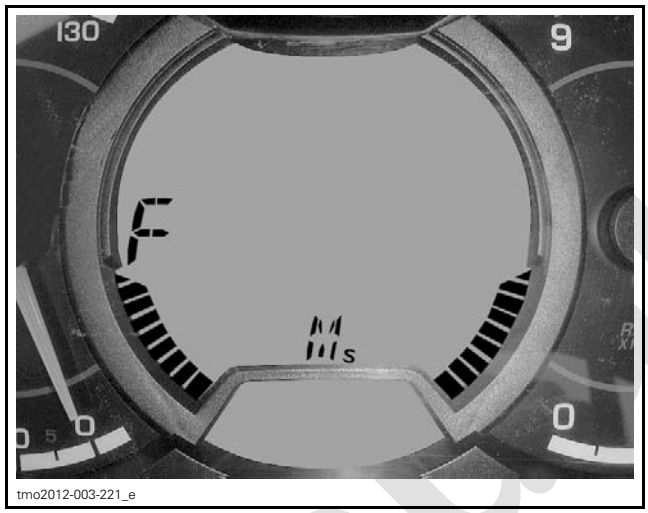
To Adjust Front Suspension:

Press on the OVERRIDE button until front (F) is blinking to select front (F) suspension setting.



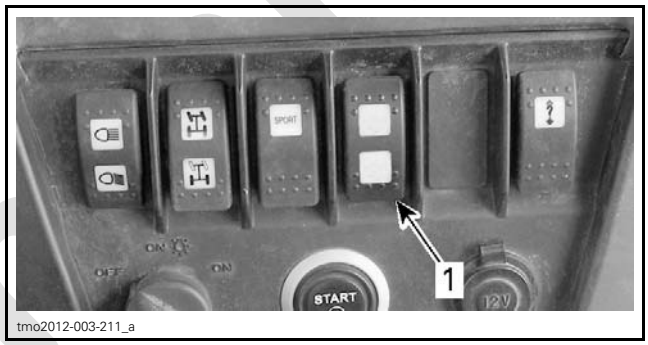
tmo2012-001-001_b

1. Override switch



tmo2012-003-221_e

Press and hold ACS button to lower or raise the front suspension until desired setting is achieved.

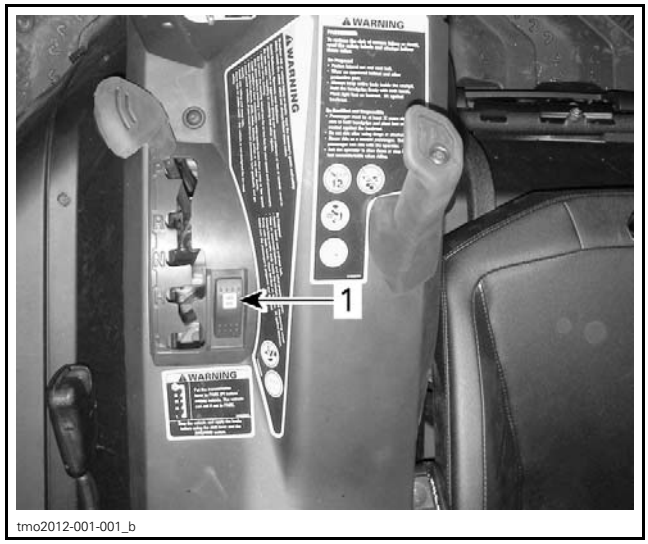


tmo2012-003-211_a

1. ACS button

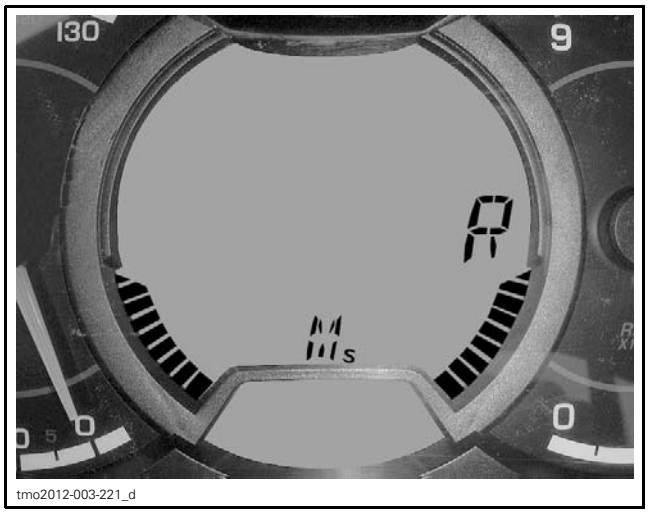
To Adjust Rear Suspension:

Press on the OVERRIDE button until rear (R) is blinking to select rear (R) suspension setting.



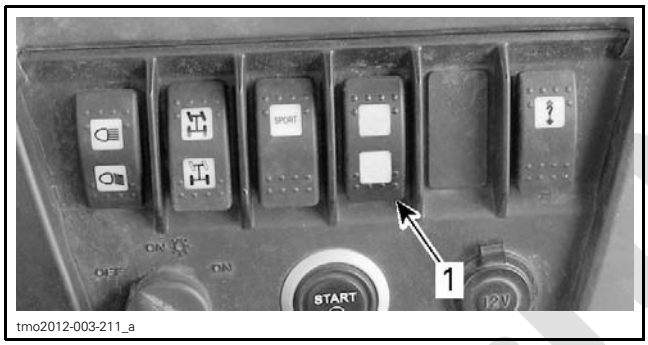
tmo2012-001-001_b

1. Override switch



tmo2012-003-221_d

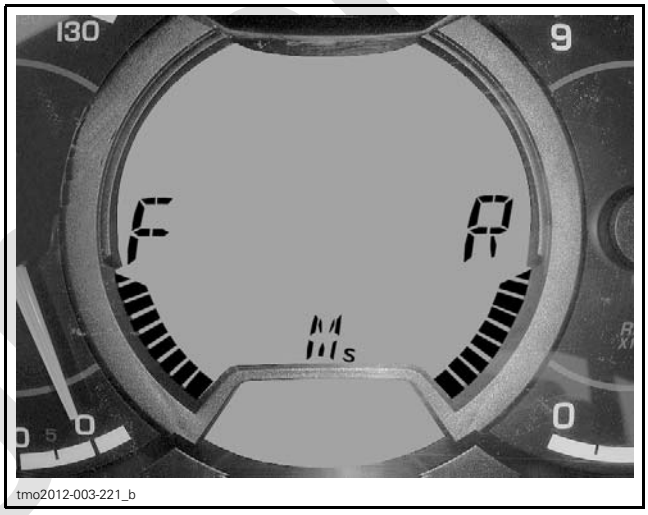
Use the ACS button to lower or raise the rear suspension.



tmo2012-003-211_a

1. ACS button

NOTE: Fuel and temperature indicators will respectively become front and rear ACS setting indicators.



tmo2012-003-221_b

Quick Mode Selection

The last setting utilized in each mode is stored in the system. This allows for quick selections between the stored automatic mode setting and the stored manual mode setting.

To Enter Quick Mode Selection:

Press the MODE button until either ACS AUTO or ACS MAN is displayed.

Press SET button to have current ACS mode blink on screen.

Press SET button to select desired mode.

tmo2012-003-221_a

tmo2012-003-221_c

Press and hold SET button to confirm selection.

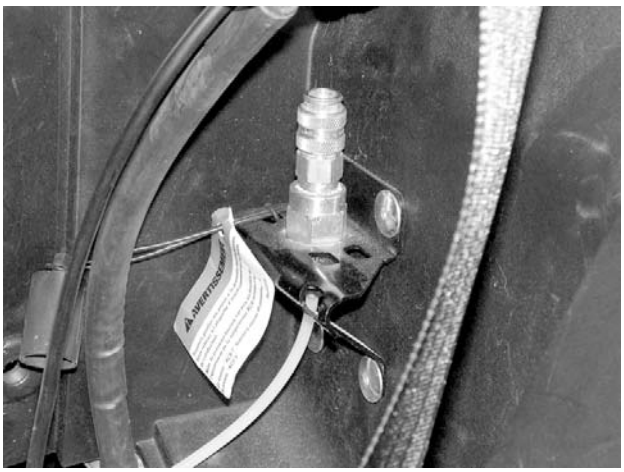
ACS system will adjust to the last settings.

SYSTEM DESCRIPTION (FEATURES)

Tire Inflation Using the ACS Compressor

The ACS compressor also comes with an auxiliary hose that can be used to inflate tires out on the trail.

The air outlet fitting is located behind the driver's seat.

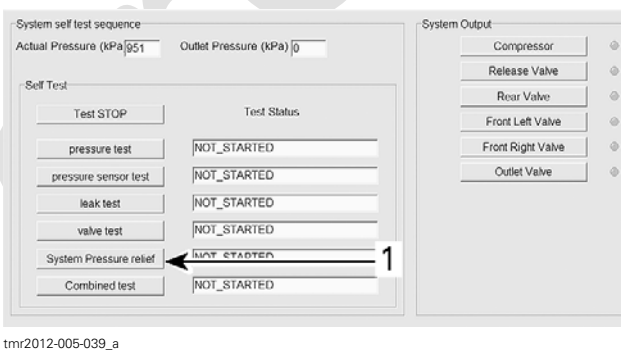


vdd2012-001-717

Air Pressure Release for Servicing

It is recommended to release air pressure in the system before servicing any components.

1. Connect vehicle to the latest appropriate version of B.U.D.S. Refer to *COMMUNICATION TOOLS AND B.U.D.S. SOFTWARE* subsection in the *2011 CAN-AM SIDE-BY-SIDE SHOP MANUAL*.
2. Select **Activation** page.
3. Select **ACS** folder.
4. Press the **System Pressure relief** button to proceed.



tmr2012-005-039_a

1. **System Pressure relief** *button*

NOTE: After activating the **System Pressure relief** button the system is not completely empty. The compressor setting does not allowed to drop pressure under 207 kPa (30 PSI).

SYSTEM DESCRIPTION (COMPONENTS)

Fuse and Relay

ACS Fuse

The ACS system is protected by the fuse F3 (60 A) located in the fuse block no.2. This fuse powered the ACS compressor through the ACS relay (R5).

ACS Compressor Relay (R5)

ACS compressor relay (R5) is located near ACS compressor, under driver's seat.

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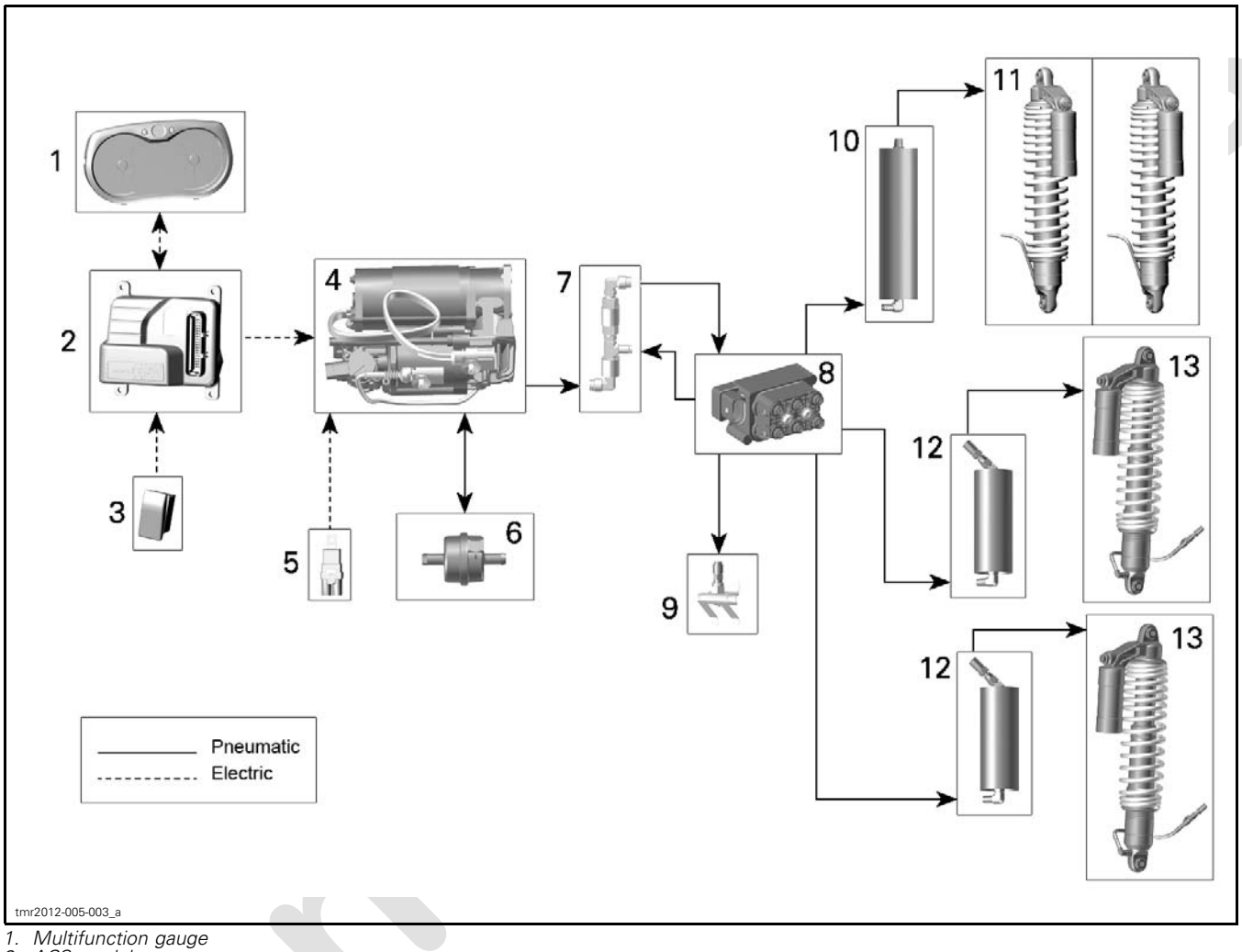
ACS Main Components



1. *Multifunction gauge*
2. *ACS module*
3. *ACS button*
4. *ACS compressor (including temperature sensor)*
5. *ACS relay (R5)*
6. *Air filter*
7. *Pressure distributor*
8. *ACS solenoid valve (including pressure sensor)*
9. *Outlet fitting*
10. *Rear air reservoir*
11. *Rear shock absorbers*
12. *Front air reservoirs*
13. *Front shock absorbers*

TROUBLESHOOTING

DIAGNOSTIC TIPS

Error Message Displayed in Multifunction Gauge

Two error messages can appear in the multifunction gauge and they are not necessarily related to a failure of the ACS system.

AIR FAULT

If this message appears, it indicates a disparity between the requested and the actual suspension settings. The system should react to correct this situation and the message will disappear.

If the message remains active for a long period, it may indicates a major leak in the system. In this case, the module will automatically shut down the compressor to prevent it from overheating. The shut down procedure of the compressor will stay active until the next restart of the vehicle (key OFF, key ON).

If there is a major leak in the system, check the system for leakage, refer to *ACS SYSTEM LEAK TEST*.

If there is no leak, the problem can be electrical or mechanical. In this case, an electrical failure of the compressor or the solenoid valve will result in the impossibility to change the actual suspension setting; a mechanical failure of the solenoid valve will create the same situation.

After multiple attempts to change suspension setting, the module will activate error message AIR FAULT. Refer to *TROUBLESHOOTING GUIDELINES* for further troubleshooting procedure.

COMPRESSOR TEMPERATURE OVERHEAT

This message appears when the compressor temperature is over the calibrated value.

This situation can occur if the compressor or the solenoid valves are used during a long period of time (continually or with brief halts).

Let the compressor cool down before using it again.

TROUBLESHOOTING GUIDELINES

In AUTO Mode

GAUGE DISPLAY SETTING (S1 TO S6) CHANGED BUT SUSPENSION DOES NOT WORKED

1. Burn fuse F3 (60 A).
   - *Replace*
2. Faulty compressor.
   - *Carry out a compressor operation test. Refer to ACS COMPRESSOR OPERATION TEST.*
3. Faulty solenoid valve
   - *Carry out a solenoid valve operation test. Refer to ACS SOLENOID VALVE OPERATION TEST.*
4. Faulty ACS module
   - *Check the ACS module. Refer to ACS MODULE.*

GAUGE DISPLAY SETTING (S1 TO S6) DOES NOT CHANGED BUT SUSPENSION WORKED

1. Faulty ACS module
   - *Check the ACS module. Refer to ACS MODULE.*
2. Faulty multifunction gauge
   - *Check the multifunction gauge.*

GAUGE DISPLAY DOES NOT CHANGED AND SUSPENSION DOES NOT WORKED

1. Make sure engine is running
   - *Start engine.*
2. Burn fuse F3 (60 A).
   - *Replace*
3. Faulty ACS module
   - *Check the ACS module. Refer to ACS MODULE.*
4. Faulty ACS button or wiring
   - *Check ACS button continuity.*
   - *Check ACS button control circuit.*

In Manual Mode

GAUGE DISPLAY SETTING (F OR R) DOES NOT CHANGED

1. Faulty Override button
   - *Check the Override button.*
2. Faulty multifunction gauge
   - *Check the multifunction gauge.*

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AUTO and MANUAL Mode

SUSPENSION PRESSURE CAN BE INCREASED ONLY

1. Faulty solenoid valve
   - *Carry out a release valve operation test. Refer to ACS RELEASE VALVE OPERATION TEST.*
2. Faulty ACS release valve
   - *Carry out a solenoid valve operation test. Refer to ACS SOLENOID VALVE OPERATION TEST.*
3. Faulty ACS button or wiring
   - *Check ACS button continuity. Refer to ACS BUTTON.*
   - *Check ACS button control circuit. Refer to ACS BUTTON.*
4. Faulty ACS module
   - *Check the ACS module. Refer to ACS MODULE.*

SUSPENSION PRESSURE CAN BE DECREASED ONLY

1. Faulty relay (R5)
   - *Check the ACS relay. Refer to ACS RELAY.*
2. Faulty compressor.
   - *Carry out a compressor operation test. Refer to ACS COMPRESSOR OPERATION TEST.*
3. Faulty solenoid valve
   - *Carry out a solenoid valve operation test. Refer to ACS SOLENOID VALVE OPERATION TEST.*
4. Faulty ACS button or wiring
   - *Check ACS button continuity. Refer to ACS BUTTON.*
   - *Check ACS button control circuit. Refer to ACS BUTTON.*
5. Faulty ACS module
   - *Check the ACS module. Refer to ACS MODULE.*

SUSPENSION PRESSURE CAN NOT BE CHANGED

1. Make sure engine is running
   - *Start engine.*
2. Burn fuse F3 (60 A).
   - *Replace*
3. Faulty relay (R5)
   - *Check the ACS relay. Refer to ACS RELAY.*
4. Faulty compressor.
   - *Carry out a compressor operation test. Refer to ACS COMPRESSOR OPERATION TEST.*
5. Faulty solenoid valve
   - *Carry out a solenoid valve operation test. Refer to ACS SOLENOID VALVE OPERATION TEST.*
6. Faulty ACS button or wiring
   - *Check ACS button continuity. Refer to ACS BUTTON.*
   - *Check ACS button control circuit. Refer to ACS BUTTON.*
7. Faulty ACS module
   - *Check the ACS module. Refer to ACS MODULE.*

AIR OUTLET FITTING DOES NOT WORKS

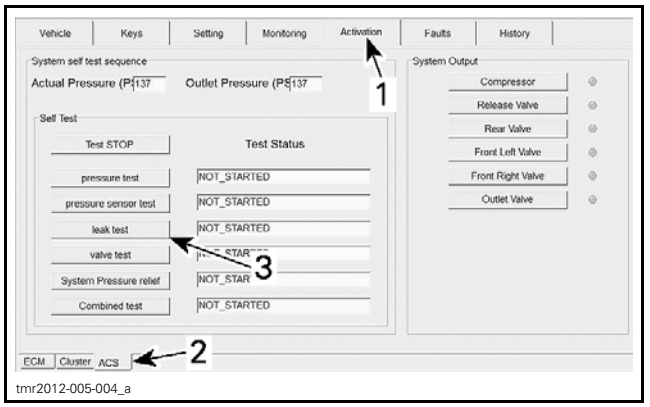
1. Make sure engine is running
   - *Start engine.*
2. Faulty solenoid valve
   - *Carry out a solenoid valve operation test. Refer to ACS SOLENOID VALVE OPERATION TEST.*

TROUBLESHOOTING WITH B.U.D.S.

Check battery voltage before performing any B.U.D.S. test. Battery must be fully charged or use a power pack to ensure adequate power for all required tests.

ACS System Leak Test

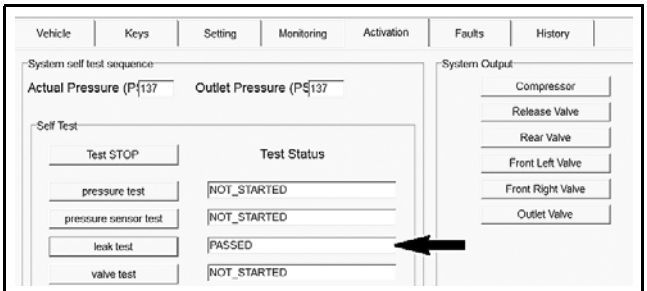
1. Connect vehicle to the latest appropriate version of B.U.D.S. Refer to *COMMUNICATION TOOLS AND B.U.D.S. SOFTWARE* subsection in the *2011 CAN-AM SIDE-BY-SIDE SHOP MANUAL*.
2. Select **Activation** page.
3. Select **ACS** folder.
4. In **Self Test** region, press the **leak test** button to proceed.



tmr2012-005-004_a

1. Activation page
2. ACS folder
3. Leak test button

The result will be indicated in the TEST STATUS box beside the **leak test** button.



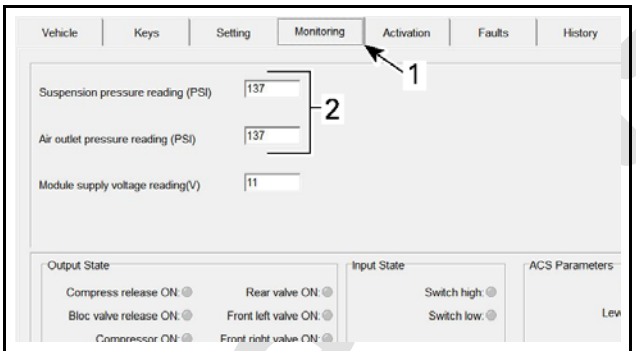
tmr2012-005-012_a

If a leak is detected, pressurize the system again and inspect hoses and fittings with soapy water to locate the faulty component.

ACS Air Pressure Monitoring

To monitor air pressure in the system during troubleshooting operation, proceed as follows:

1. Connect vehicle to the latest appropriate version of B.U.D.S. Refer to *COMMUNICATION TOOLS AND B.U.D.S. SOFTWARE* subsection in the *2011 CAN-AM SIDE-BY-SIDE SHOP MANUAL*.
2. Select **Monitoring** page.
3. Select **ACS** folder.



tmr2012-005-005_a

1. *Monitoring page*
2. *Suspension pressure*

PROCEDURES

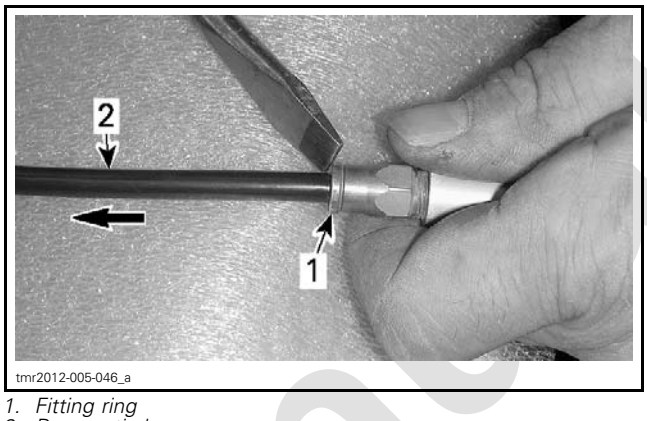
PNEUMATIC HOSE

NOTICE **Do not attempt to disconnect pneumatic hoses from ACS manifold or ACS exhaust compressor valve.**

Pneumatic Hose Removal

Release air pressure from the ACS system. Refer to *AIR PRESSURE RELEASE FOR SERVICING* in this subsection.

Pneumatic hoses may be disconnected by pushing inwards on the air fitting ring (towards the air fitting) while pulling outwards on the hose.



tmr2012-005-046_a

1. *Fitting ring*
2. *Pneumatic hose*

NOTE: Pull the hose slightly and wait during the release of the remaining air. When all air is released, remove pneumatic hose from its fitting.

Pneumatic hose Installation

Before installing the hose, verify the end of the pneumatic hose.

If deep nicks are found, cut a small portion of the hose end.

HOSE END LENGTH TO BE CUT
3.18 mm to 6.35 mm (1/8 in to 1/4 in)

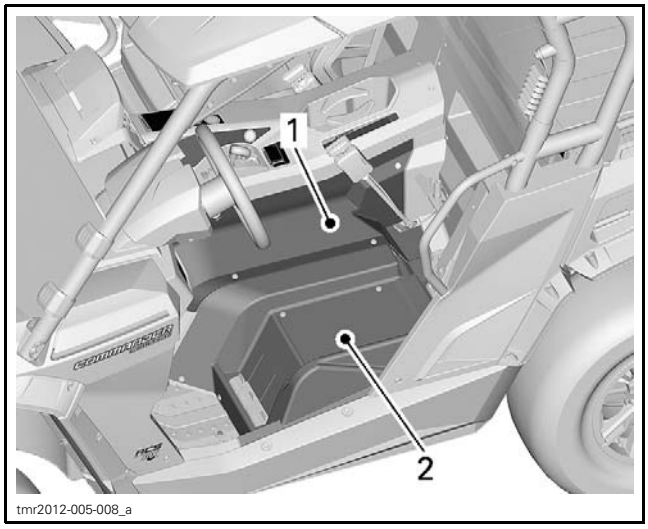
Push the hose inwards then pull the air fitting ring outwards to reestablish a good seal and lock the hose in place.

ACS RELEASE VALVE

ACS Release Valve Access

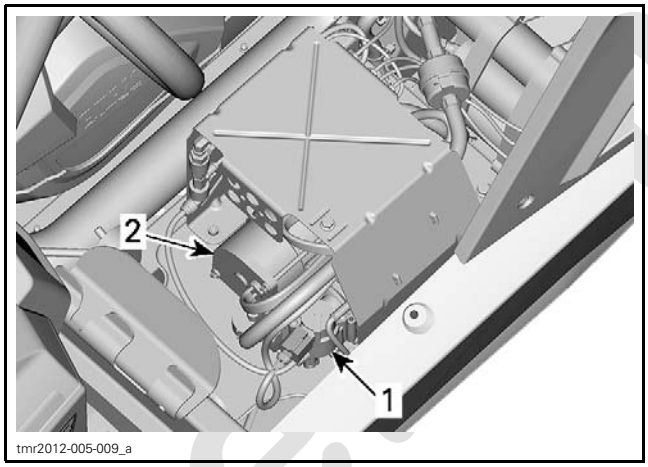
To access to ACS release valve, remove the following:

– Driver's seat
– LH lateral console panel
– Floor panel.



SIDE NET REMOVED FOR CLARITY
1. *LH lateral console panel*
2. *Floor panel*

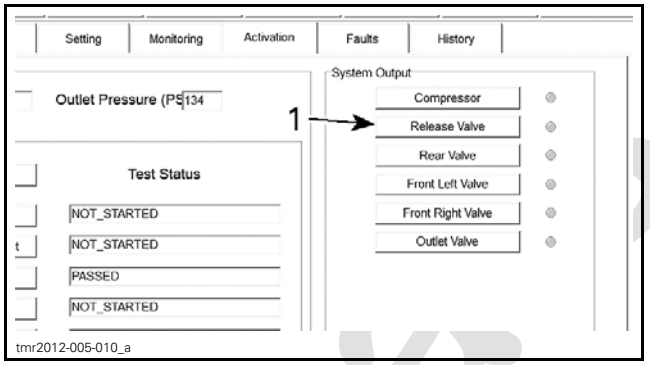
The ACS release valve is a component of the ACS compressor. The release valve is located at the left of compressor



1. *ACS release valve*
2. *ACS compressor*

ACS Release Valve Operation Test

1. Connect vehicle to the latest appropriate version of B.U.D.S. Refer to *COMMUNICATION TOOLS AND B.U.D.S. SOFTWARE* subsection in the *2011 CAN-AM SIDE-BY-SIDE SHOP MANUAL*.
2. Select **Activation** page.
3. Select **ACS** folder.
4. Press the **Release Valve** button to proceed.

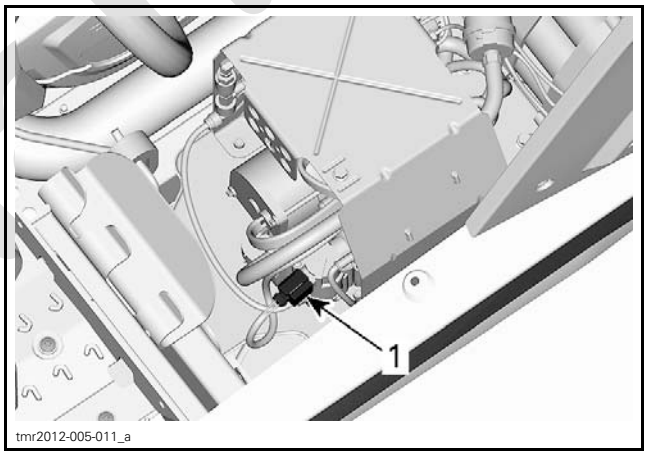


1. *Release valve button*

5. Listen for air exits from underneath dash and around valve to confirm proper operation.

ACS Release Valve Input Voltage Test

1. Unplug the ACS release valve connector.



1. *ACS release valve connector*

2. Start engine.
3. Measure voltage as per the following table.

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

TEST PROBES		VOLTAGE
Pin 1 (release valve connector)	Battery negative (–) post	Battery voltage

ACS Release Valve Ground Test

1. With ACS release valve connector unplugged and engine running, measure voltage as per the following table.

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

TEST PROBES		VOLTAGE
Pin 2 (release valve connector)	Battery negative (+) post	Battery voltage

ACS Release Valve Replacement

The ACS release valve is not available separately.

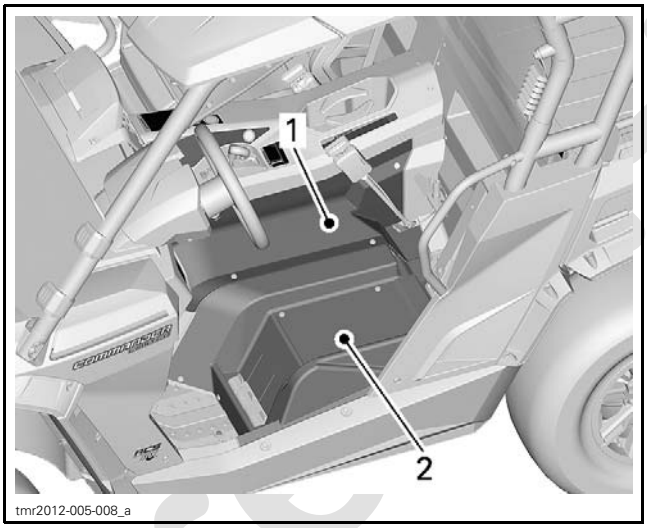
Replace the ACS compressor. Refer to *ACS COMPRESSOR* for complete procedure.

ACS SOLENOID VALVE

ACS Solenoid Valve Access

To access to ACS solenoid valve, remove the following:

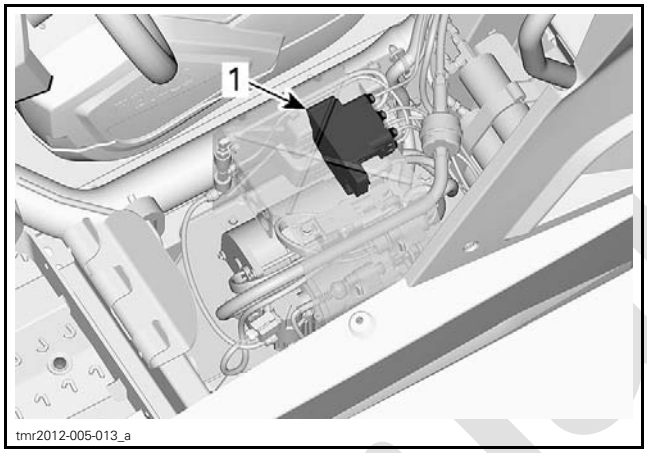
– Driver's seat
– LH lateral console panel
– Floor panel.



tmr2012-005-008_a

SIDE NET REMOVED FOR CLARITY
1. LH lateral console panel
2. Floor panel

The ACS solenoid valve is mounted on the rear side of the ACS compressor protector.

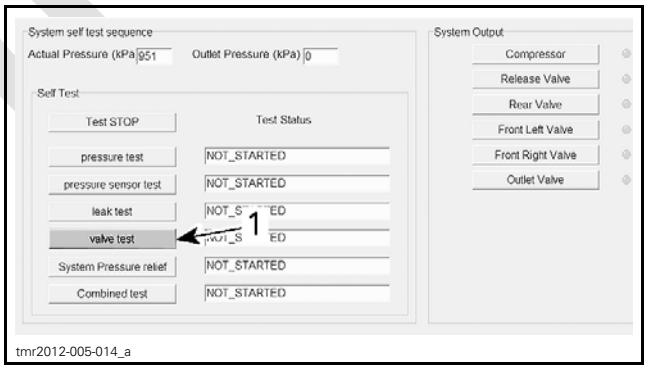


tmr2012-005-013_a

1. ACS solenoid valve

ACS Solenoid Valve Operation Test

1. Connect vehicle to the latest appropriate version of B.U.D.S. Refer to *COMMUNICATION TOOLS AND B.U.D.S. SOFTWARE* subsection in the *2011 CAN-AM SIDE-BY-SIDE SHOP MANUAL*.
2. Select **Activation** page.
3. Select **ACS** folder.
4. Press the **valve test** button to proceed.



tmr2012-005-014_a

1. Valve test button

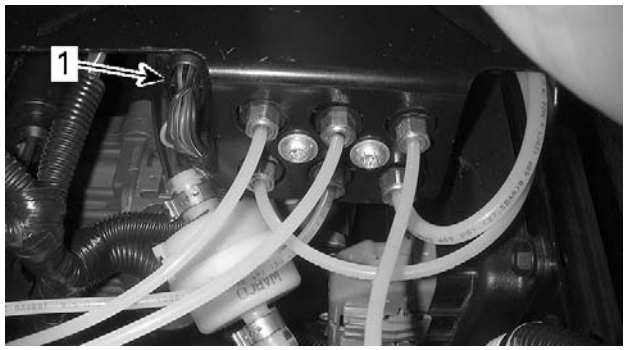
The result will be indicated in the TEST STATUS box beside the **valve test** button.

If test fails, carry out the *ACS SOLENOID VALVE INPUT VOLTAGE TEST*.

If the ACS solenoid valve passed the test, check the ACS button.

ACS Solenoid Valve Input Voltage Test

1. Unplug the ACS solenoid valve connector.



1. ACS solenoid valve connector

2. Start engine.
3. Measure voltage as per the following table.

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

TEST PROBES		VOLTAGE
Pin 5 (solenoid valve connector)	Battery negative (–) post	Battery voltage
Pin 6 (solenoid valve connector)		

If the test fails, carry out an *ACS SOLENOID VALVE POWER WIRE CONTINUITY TEST*.

If result is within specification, continue the test with the *ACS SOLENOID VALVE GROUND TEST*.

ACS Solenoid Valve Ground Test

With ACS solenoid valve connector unplugged and engine running, measure voltage as per the following table.

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

TEST PROBES		VOLTAGE
Pin 7 (solenoid valve connector)	Battery negative (+) post	Battery voltage

If the test fails, carry out an *ACS SOLENOID VALVE GROUND WIRE CONTINUITY TEST*.

If result is within specification, check the ACS button.

ACS Solenoid Valve Power Wire Continuity Test

1. Unplug the relay R5.
2. Check the continuity between ACS solenoid valve connector and relay R5 holder as per the following table.

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

TEST PROBES		RESISTANCE
Pin 5 (solenoid valve connector)	Position 85	Close to 0 Ω
Pin 6 (solenoid valve connector)		

ACS Solenoid Valve Ground Wire Continuity Test

1. Unplug the ACS module connector.
2. Check the continuity between ACS solenoid valve connector and ACS module connector as per the following table.

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

TEST PROBES		RESISTANCE
Pin 7 (solenoid valve connector)	Pin 14 (module)	Close to 0 Ω

ACS Solenoid Valve Removal

1. Remove bolts retaining the air pressure distributor.

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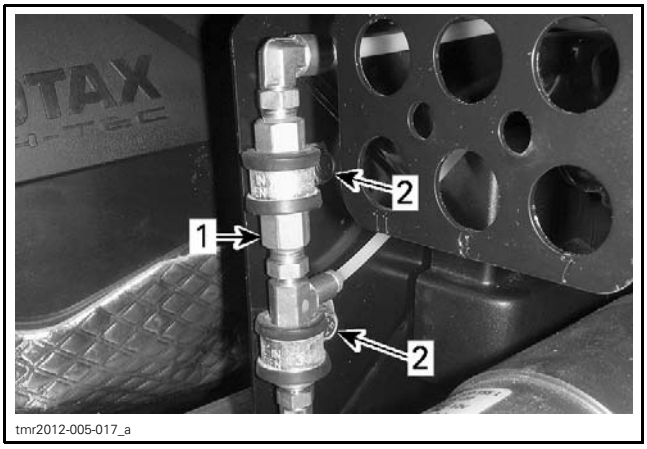
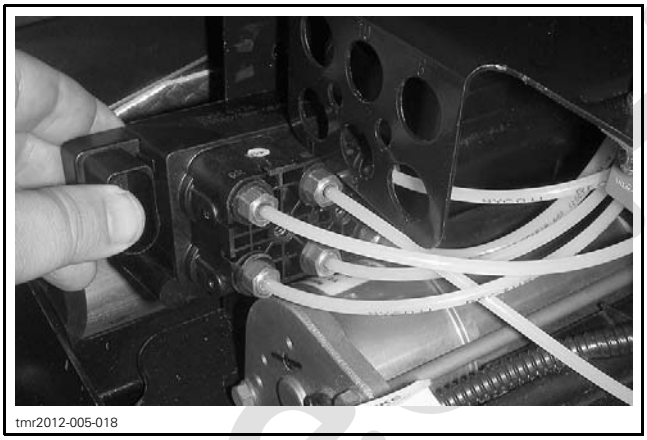


tmr2012-005-017_a

1. Air pressure distributor
2. Retaining bolts

2. Disconnect pneumatic hoses from:
   – Air outlet fitting
   – Air reservoirs
   – Pressure distributor (except the lower one).
3. Unplug ACS solenoid valve connector.
4. Remove screws securing the ACS solenoid valve to compressor protector.
5. Remove the ACS solenoid valve from the vehicle.


tmr2012-005-018

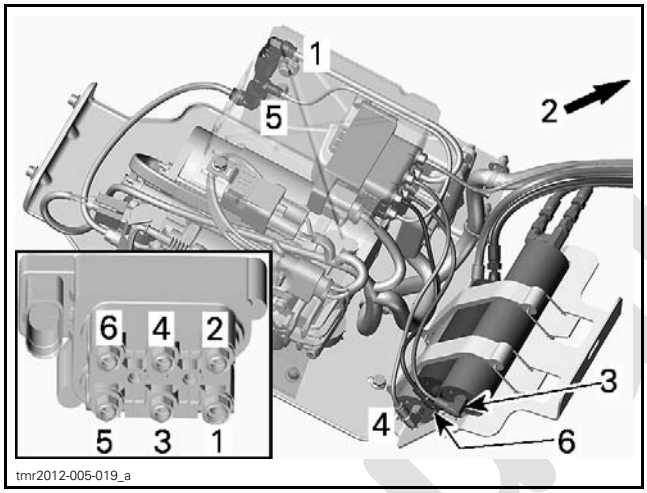
ACS Solenoid Valve Installation

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

Position the ACS solenoid valve on the compressor and route all pneumatic hoses through corresponding support holes.

Secure the ACS solenoid valve to its support.

Connect pneumatic hoses as per the following illustration.



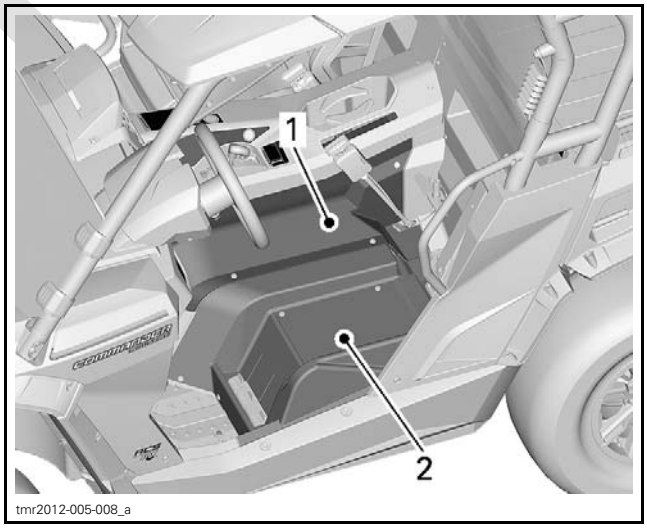
tmr2012-005-019_a

1. Air pressure distributor
2. Air outlet fitting
3. Rear air reservoir
4. Front RH air reservoir
5. Air pressure distributor
6. Front LH air reservoir

ACS MODULE

ACS Module Access

To access to ACS module, remove the following:
– Driver's seat
– LH lateral console panel
– Floor panel.

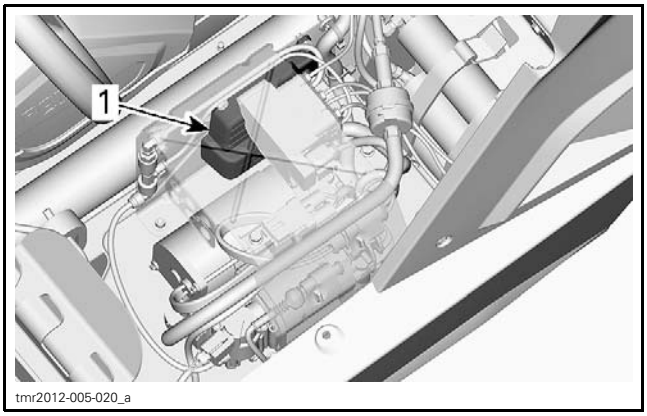


tmr2012-005-008_a

SIDE NET REMOVED FOR CLARITY
1. LH lateral console panel
2. Floor panel

The ACS module is mounted on the wall of the ACS compressor protector.

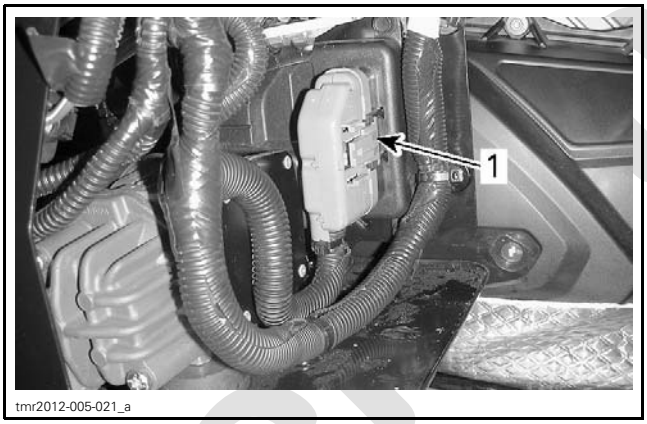
greenmanuals



1. ACS module

ACS Module Signal Circuit Continuity Test

1. Unplug multifunction gauge connector. Refer to *LIGHTS, GAUGE AND ACCESSORIES* subsection in the *2011 CAN-AM SIDE-BY-SIDE SHOP MANUAL*.
2. Unplug ACS module connector.



1. ACS module connector

3. Measure resistance as per the following tables.

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

ACS MODULE CONNECTOR	GAUGE CONNECTOR	RESISTANCE
Pin 1	Pin 19	Close to 0 Ω
Pin 2	Pin 18	

If the test fails, repair or replace wires and connectors.

If result is within specification, continue the test with the *ACS MODULE INPUT VOLTAGE TEST*.

ACS Module Input Voltage Test

1. Turn ignition switch to ON position.
2. Measure voltage as per the following table.

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

TEST PROBES		VOLTAGE
Pin 17 (ACS module connector)	Battery negative (–) post	Battery voltage
Pin 18 (ACS module connector)		

If the test fails, repair or replace wires and connectors.

If result is within specification, continue the test with the *ACS MODULE GROUND TEST*.

ACS Module Ground Test

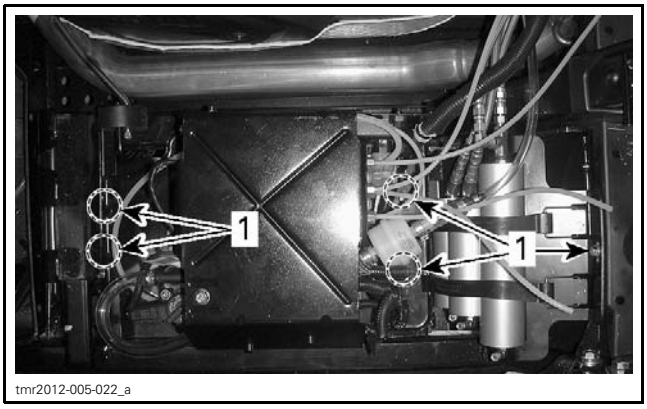
1. Turn ignition switch to ON position.
2. Measure voltage as per the following table.

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

TEST PROBES		VOLTAGE
Pin 31 (ACS module connector)	Battery positive (+) post	Battery voltage
Pin 32 (ACS module connector)		
Pin 33 (ACS module connector)		

ACS Module Removal

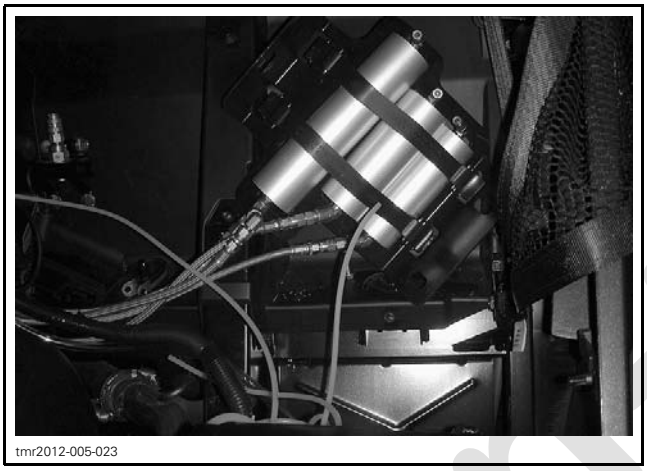
1. Remove screws retaining the air reservoir support and the compressor support.



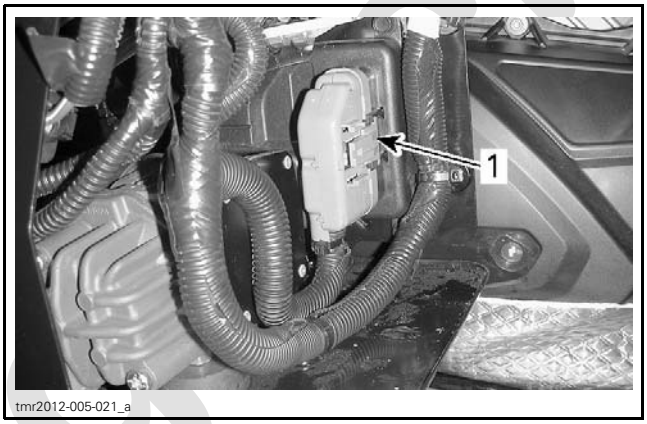
tmr2012-005-022_a

1. Screws to be removed

2. Disconnect pneumatic hoses from air reservoirs and air outlet fitting.
3. Place the air reservoir support aside to make room.


tmr2012-005-023

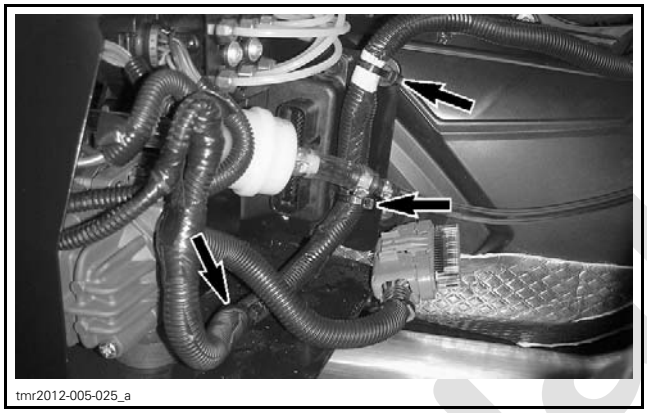
4. Unplug the ACS module connector.



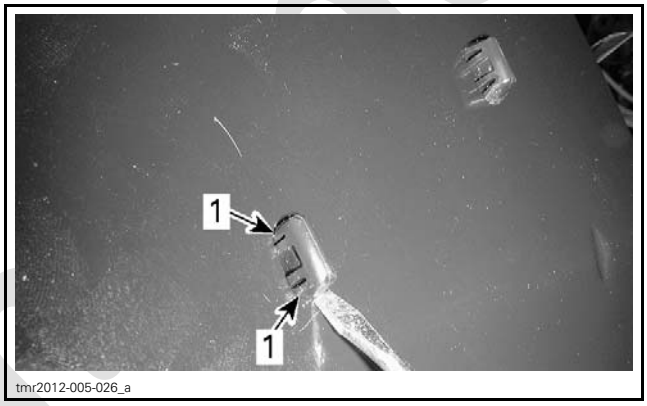
tmr2012-005-021_a

1. ACS module connector

5. Cut locking ties securing the wiring harness.


tmr2012-005-025_a

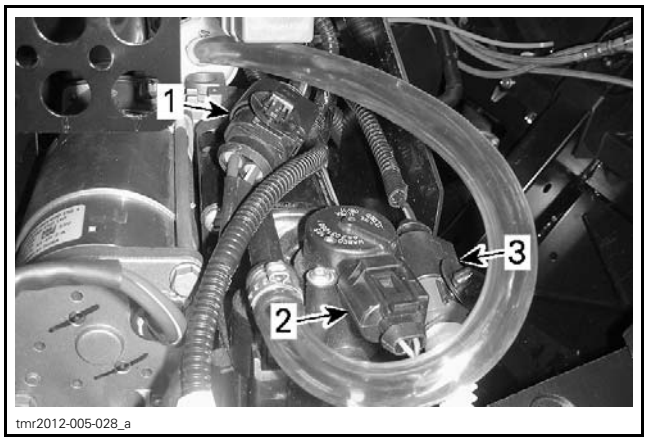
6. Using a small screwdriver, detach both connector housings from the compressor protector wall.



tmr2012-005-026_a

1. Press these tabs inside

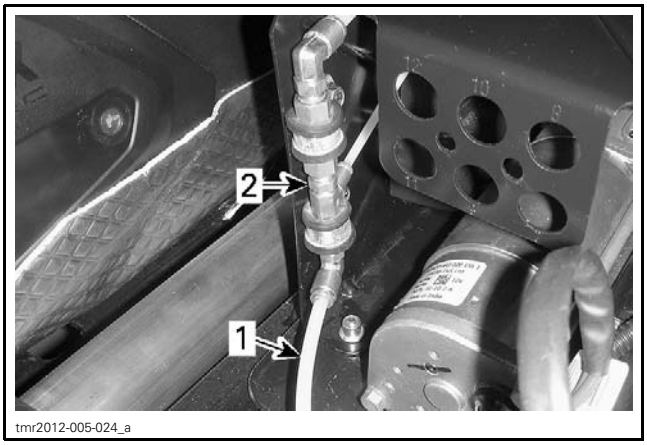
7. Unplug the following connectors:
   - Compressor connector
   - Release valve connector
   - Pressure sensor connector.



tmr2012-005-028_a

1. Compressor connector
2. Release valve connector
3. Pressure sensor connector.

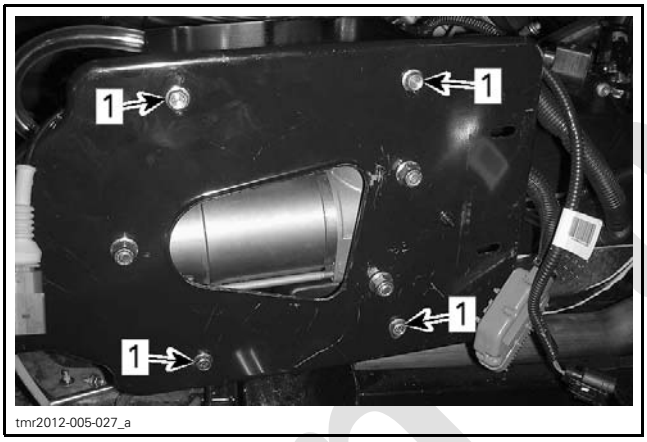
8. Disconnect the lower pneumatic hose from the pressure distributor.



tmr2012-005-024_a

1. *Disconnect this hose*
2. *Pressure distributor*

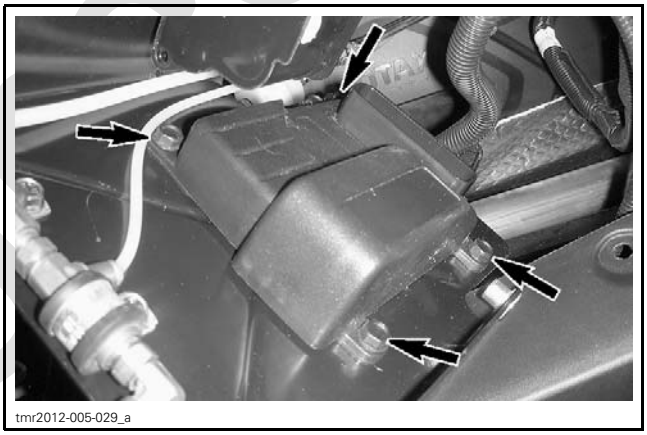
9. Turn the compressor support on the side to remove screws retaining the compressor protector.



tmr2012-005-027_a

1. *Compressor protector retaining screws*

10. Separate compressor protector from the compressor support.
11. Remove screws securing the ACS module on the wall of the compressor protector.


tmr2012-005-029_a

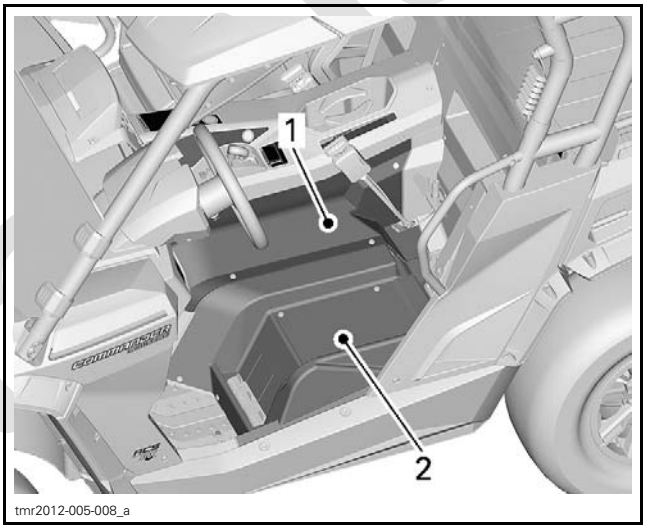
ACS Module Installation

The installation procedure is the reverse of removal procedure.

ACS RELAY (R5)

ACS Relay (R5) Access

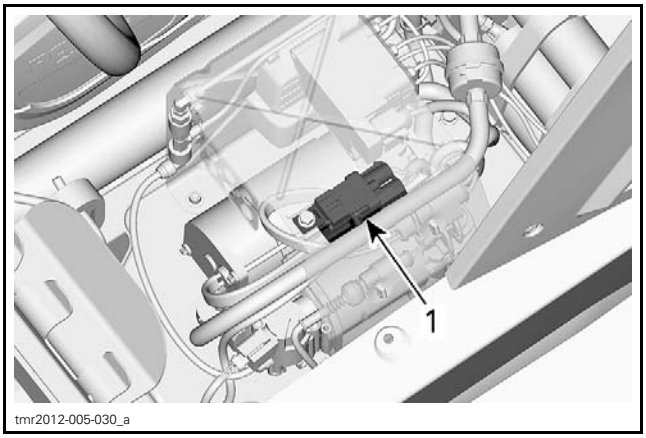
To access to ACS relay, remove the following:
- Driver's seat
- LH lateral console panel
- Floor panel.



tmr2012-005-008_a

SIDE NET REMOVED FOR CLARITY
1. *LH lateral console panel*
2. *Floor panel*

The ACS relay is mounted under the top of the ACS compressor protector.

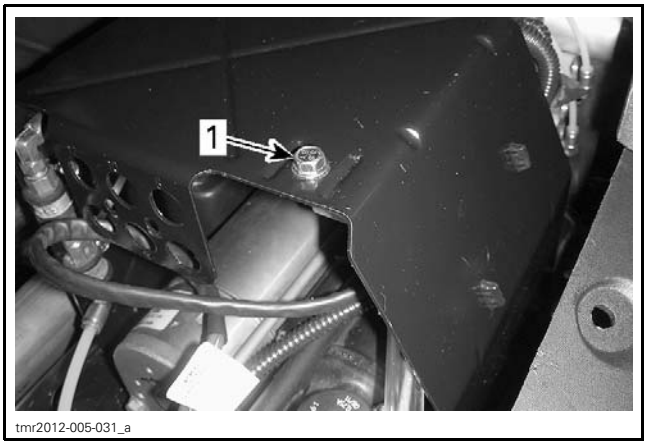


tmr2012-005-030_a

1. *ACS relay (R5)*

ACS Relay Continuity Test

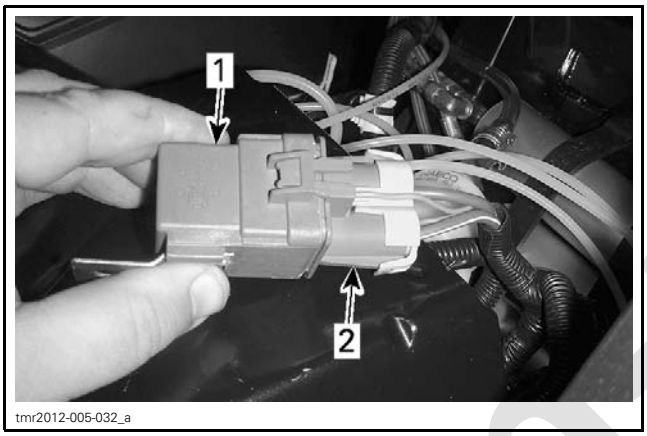
1. Remove relay (R5).
   1.1 Remove bolt and nut retaining the relay holder on the top of the compressor protector.



1. Relay retaining bolt

1.2 From the rear, pull relay out from underneath of compressor protector.

1.3 Remove the relay from its holder holder.



1. Relay
2. Relay holder

2. Measure resistance as per the following table.

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

TEST PROBES		RESISTANCE
Terminal 30 (relay holder)	Terminal 87 (relay holder)	Open (OL)

3. Apply 12 volts on terminals 86 and 85 and measure resistance again as per the following table.

TEST PROBES		RESISTANCE
Terminal 30 (relay holder)	Terminal 87 (relay holder)	Close to 0 Ω

If results are not as per the above tables, replace relay.

ACS Relay Input Voltage Test

1. Measure voltage as per the following table.

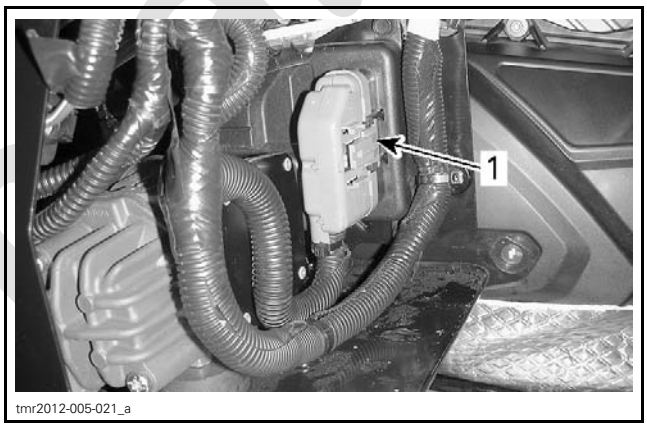
REQUIRED TOOL
FLUKE 115 MULTIMETER (P/N 529 035 868)

TEST PROBES		VOLTAGE
Pin 87 (relay holder)	Battery negative (–) post	Battery voltage

If voltage is not as specified, check wiring, connector and terminal condition.

ACS Relay Ground Wire Continuity Test

1. Unplug ACS module connector.



1. ACS module connector

2. Measure resistance as per the following table.

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

TEST PROBES		RESISTANCE
Pin 86 (relay holder)	Pin 28 (ACS module connector)	Close to 0 Ω

ACS COMPRESSOR

ACS Compressor Access

To access to ACS compressor, remove the following:

– Driver's seat
– LH lateral console panel
– Floor panel.

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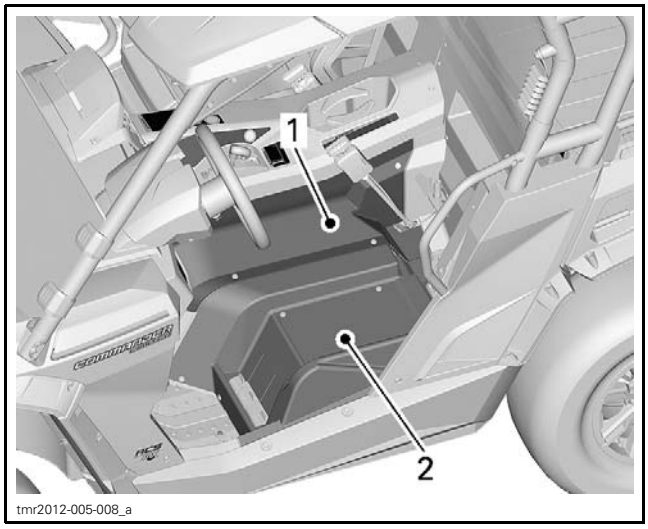
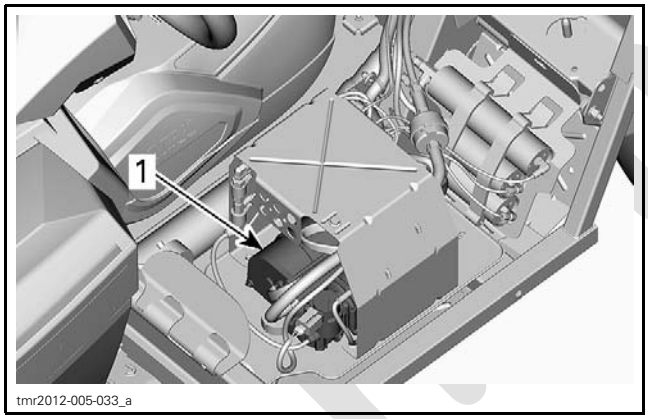


SIDE NET REMOVED FOR CLARITY
1. *LH lateral console panel*
2. *Floor panel*

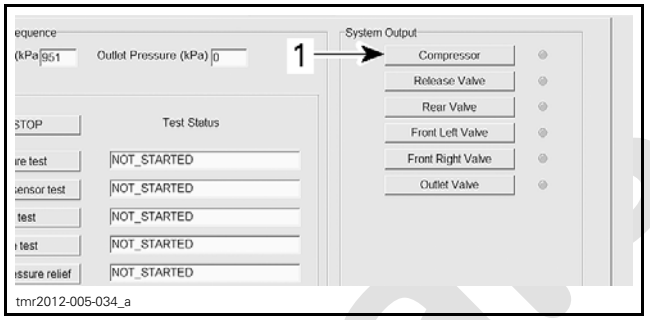
The ACS compressor is mounted on the ACS compressor support.



1. *ACS compressor*

ACS Compressor Operation Test

1. Connect vehicle to the latest appropriate version of B.U.D.S. Refer to *COMMUNICATION TOOLS AND B.U.D.S. SOFTWARE* subsection in the *2011 CAN-AM SIDE-BY-SIDE SHOP MANUAL*.
2. Select **Activation** page.
3. Select **ACS** folder.
4. Press **Compressor** button to proceed.

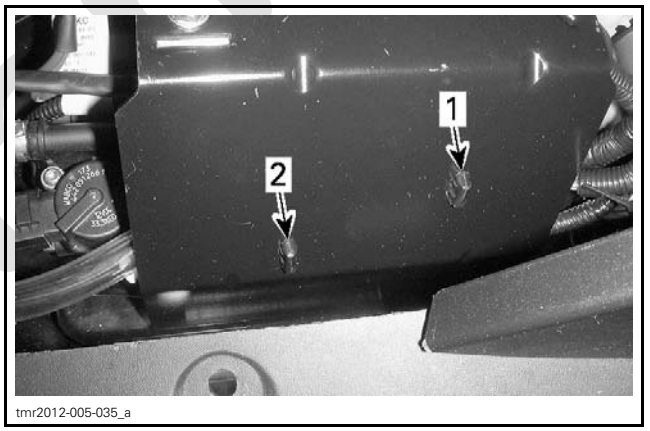


1. *Compressor operation test button*

5. Verify if compressor works properly.

ACS Compressor Input Voltage Test

1. Using a small screwdriver, detach the ACS compressor connector housings from the compressor protector wall.



1. *ACS compressor connector*
2. *ACS compressor pressure sensor*

2. Unplug ACS compressor connector.
3. Place ignition switch to ON position.
4. Measure voltage as per the following table.

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

TEST PROBES		VOLTAGE
Pin 1 (ACS compressor connector)	Battery negative (–) post	Battery voltage

ACS Compressor Ground Test

1. Place ignition switch to ON position.
2. Measure voltage as per the following table.

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

TEST PROBES		VOLTAGE
Pin 2 (ACS compressor connector)	Battery positive (+) post	Battery voltage

ACS Compressor Power Wire Continuity Test (from Relay)

1. Remove relay (R5).
2. Measure resistance as per the following table.

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

TEST PROBES		RESISTANCE
Pin 30 (relay holder)	Pin 1 (ACS compressor connector)	Close to 1 Ω

ACS Compressor Ground Wire Continuity Test

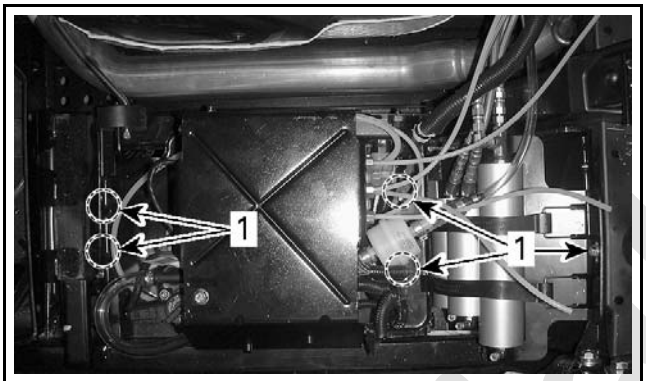
1. Reconnect the relay (R5).
2. Check the continuity as per the following table.

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

TEST PROBES		RESISTANCE
Pin 2 (ACS compressor connector)	Battery negative (–) post	Close to 1 Ω

ACS Compressor Removal

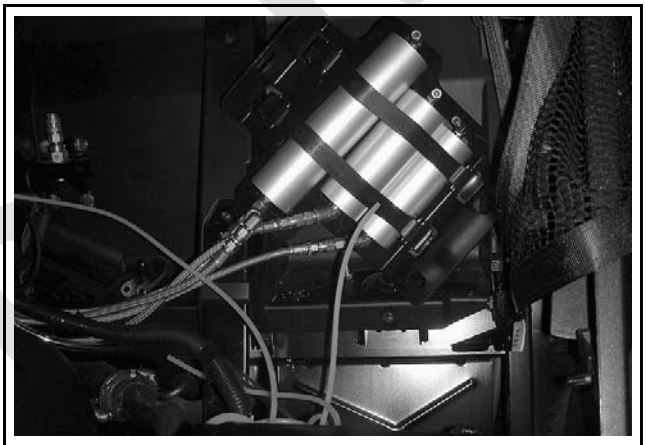
1. Remove screws retaining the air reservoir support and the compressor support.



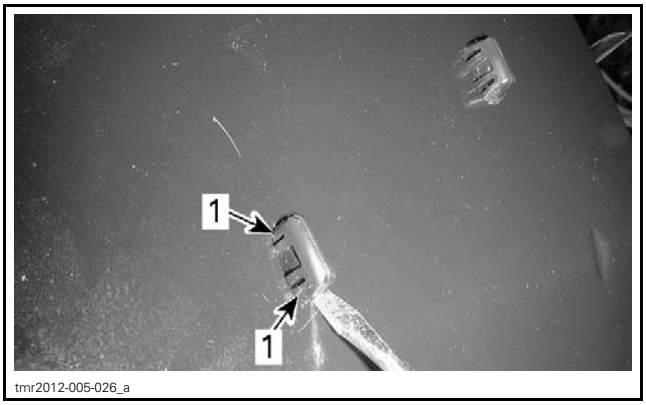
tmr2012-005-022_a

1. Screws to be removed

2. Disconnect pneumatic hoses from air reservoirs and air outlet fitting.
3. Place the air reservoir support aside to make room.


tmr2012-005-023

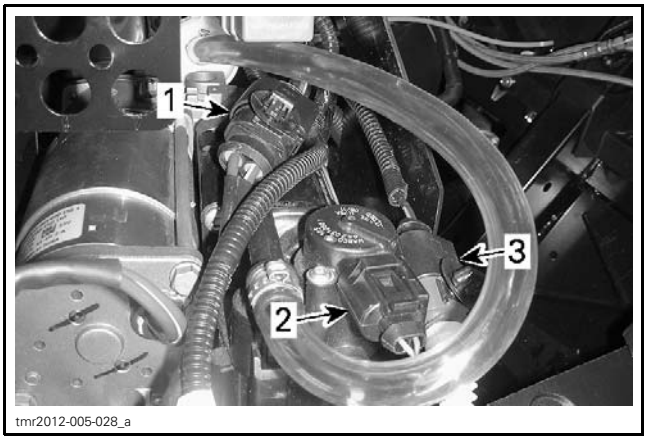
4. Using a small screwdriver, detach both connector housings from the compressor protector wall.



tmr2012-005-026_a

1. Press these tabs inside

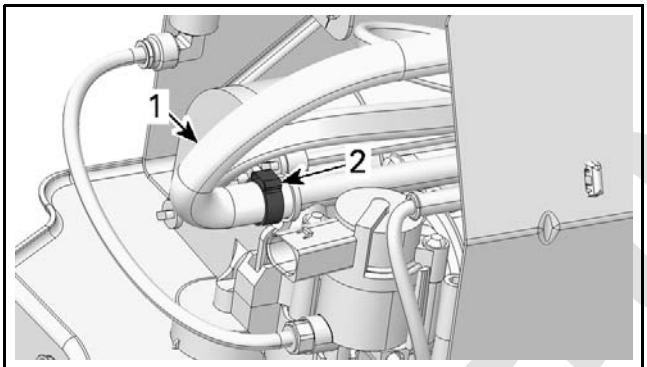
5. Unplug the following connectors:
   - Compressor connector
   - Release valve connector
   - Pressure sensor connector.



tmr2012-005-028_a

1. *Compressor connector*
2. *Release valve connector*
3. *Pressure sensor connector.*

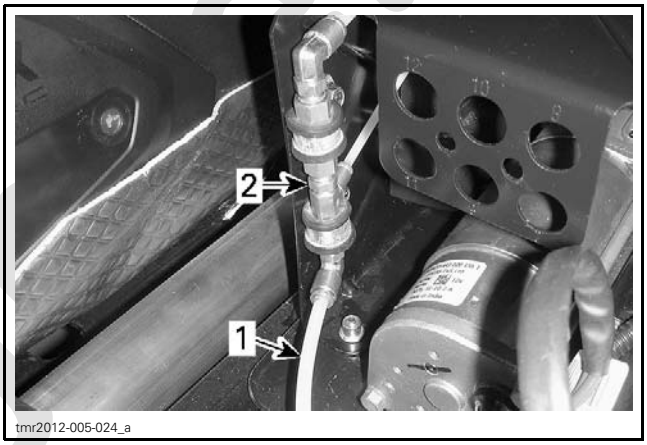
6. Detach the filter hose from the compressor intake/outlet fitting.



tmr2012-005-036_a

1. *Air filter hose*
2. *Clamp to be removed*

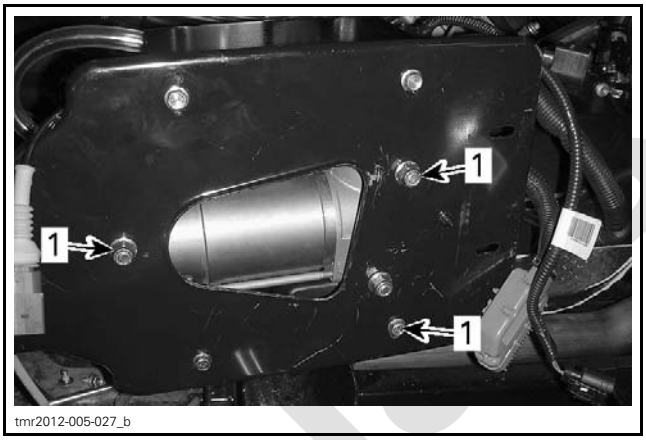
7. Disconnect the lower pneumatic hose from the pressure distributor.



tmr2012-005-024_a

1. *Disconnect this hose*
2. *Pressure distributor*

8. Turn the compressor support on the side to remove screws retaining the compressor.



tmr2012-005-027_b

1. *Compressor retaining screws*

9. Remove the ACS compressor.

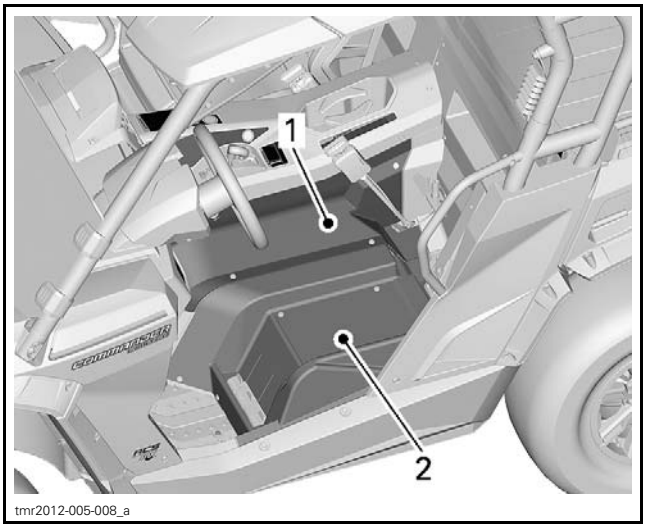
ACS Compressor Installation

The installation is the reverse of removal procedure.

ACS AIR FILTER

ACS Air Filter Access

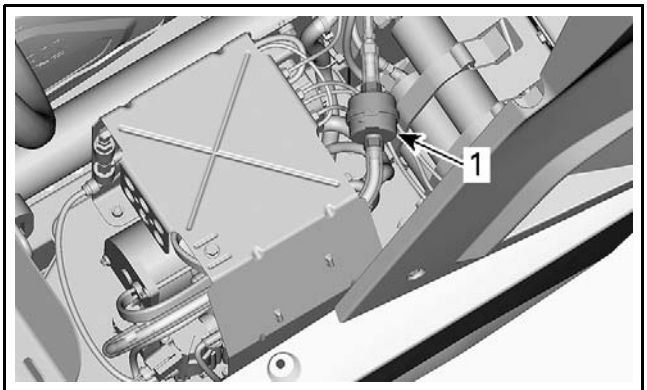
To access to ACS air filter, remove the following:
– Driver's seat
– LH lateral console panel
– Floor panel.



tmr2012-005-008_a

SIDE NET REMOVED FOR CLARITY
1. *LH lateral console panel*
2. *Floor panel*

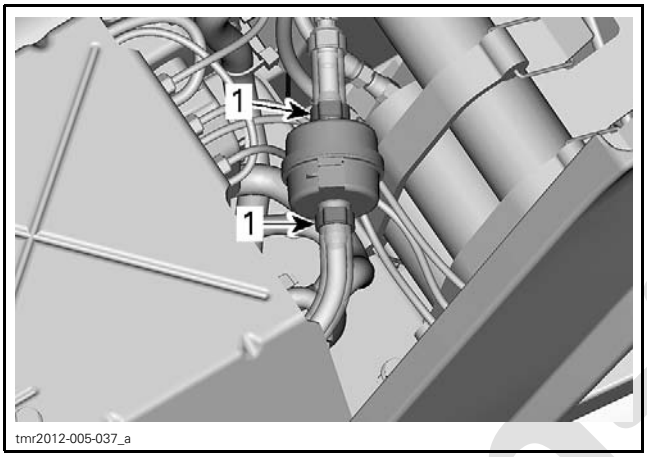
The ACS compressor is located in front of air reservoirs.



1. ACS air filter

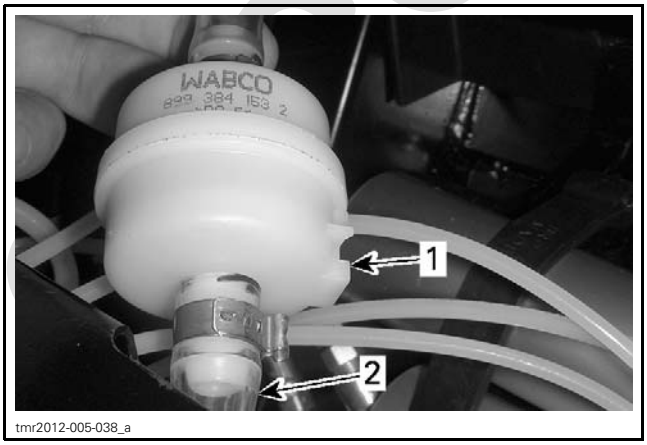
ACS Air Filter Replacement

1. Remove and discard clamps securing hoses to air filter.



1. Clamps to be removed

2. Remove the air filter.
3. Install the new air filter with its attachment towards the compressor.
4. Secure air filter using **new** clamps.



1. Air filter attachment
2. Air hose from compressor

SHOCK ABSORBERS

Shock Absorbers Identification

When installing shock absorbers, make sure not to mix front and rear shock absorbers.

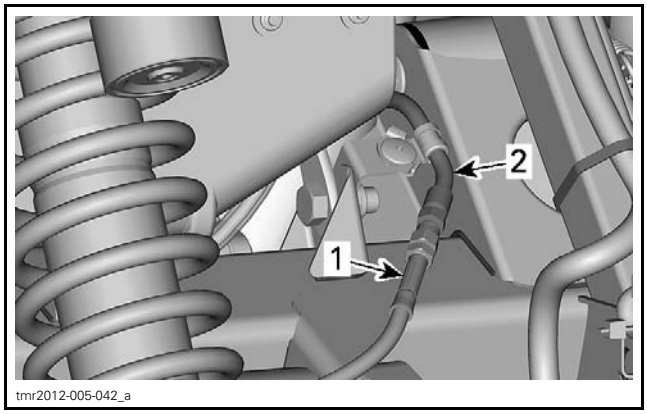
Front and rear shock absorbers can be easily identified by comparing the length of air hoses.

FRONT SHOCK ABSORBER	
Shock absorber with a short air hose on reservoir side	

REAR SHOCK ABSORBER	
Shock absorber with a long air hose on the opposite side of reservoir	

Rear Shock Absorber Removal

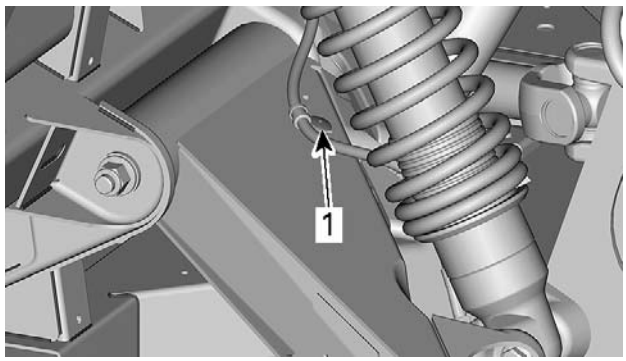
1. Block front wheels.
2. Loosen wheel lug nuts.
3. Open cargo box.
4. Place the jack under the hitch and lift the rear of vehicle.
5. Install jack stands to support the vehicle.
6. Remove wheel.
7. Disconnect shock absorber hose from vehicle air supply hose.



1. Shock absorber hose
2. Vehicle air supply hose

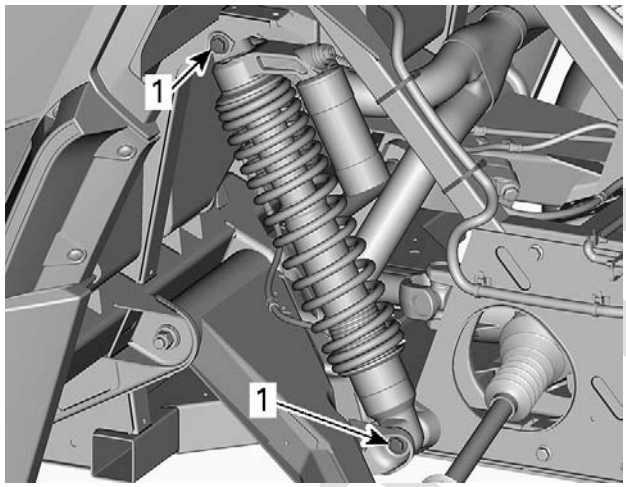
8. Drill the rivet securing the shock absorber hose to trailing arm.

Peterbilt Parts



REAR LH SIDE OF VEHICLE SHOWN
1. Rivet to be drilled

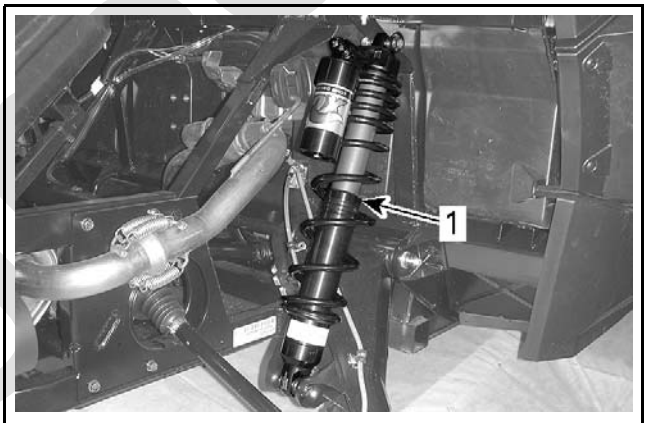
9. Remove upper and lower bolts retaining the shock absorber. Discard nuts.



1. Shock absorber retaining bolts

Rear Shock Absorber Installation

Install shock absorbers with the reservoir rearwards.

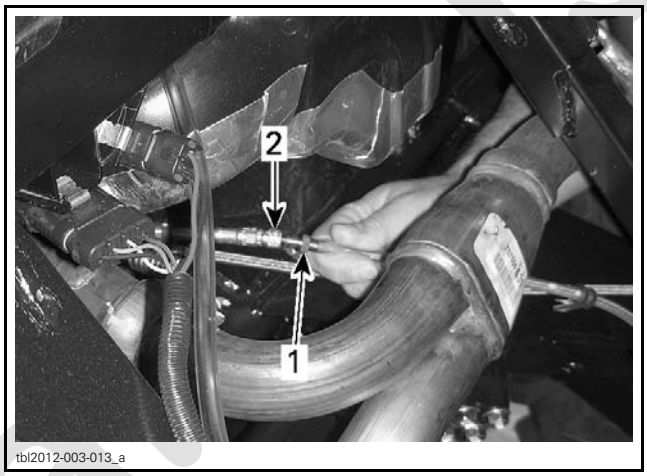


TYPICAL – RH REAR SHOCK ABSORBER

Secure with new nuts.

TIGHTENING TORQUE	
Shock absorber nuts	48 N•m (35 lbf•ft)

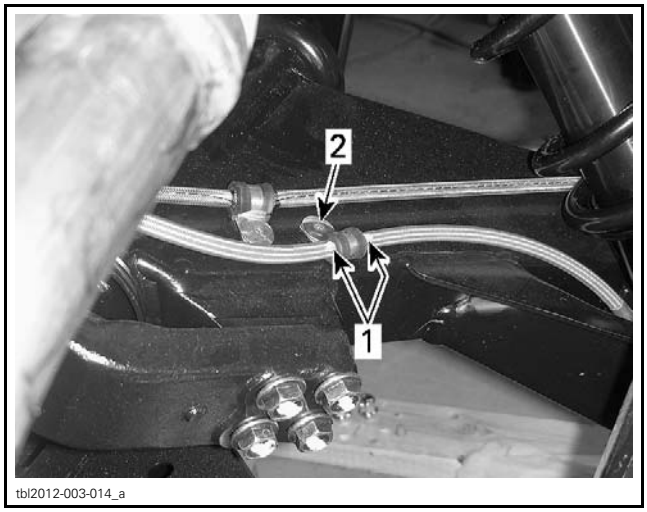
Connect shock absorber hoses to vehicle air supply hoses.



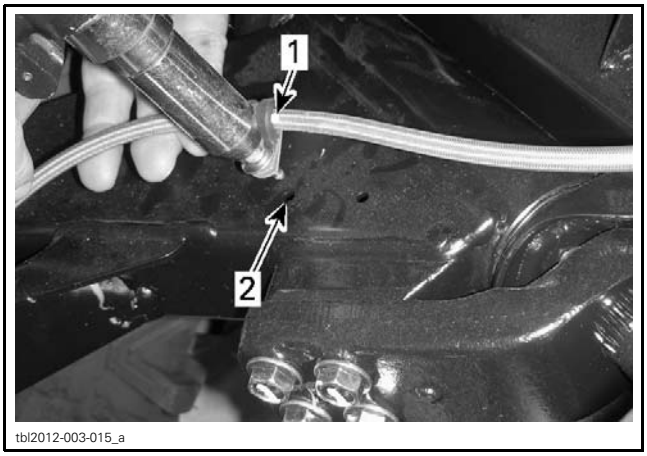
TYPICAL
1. RH shock absorber hose
2. Vehicle air supply hose

TIGHTENING TORQUE	
Air supply hose	6 N•m ± 0.5 N•m (53 lbf•**in** ± 4 lbf•**in**)

Secure shock absorber hoses to trailing arms. Ensure to position hose clamp between YELLOW dots.



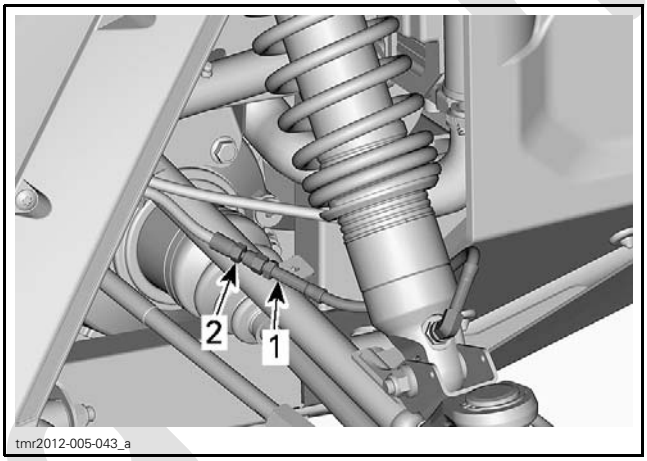
RH SIDE OF VEHICLE
1. YELLOW dots
2. Rivet



LH SIDE OF VEHICLE
1. *YELLOW dot*
2. *Install the rivet in this hole*

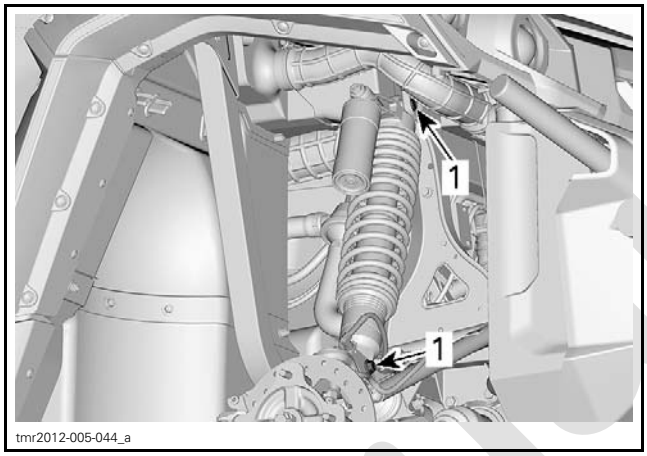
Front Shock Absorber Removal

1. Block rear wheels.
2. Loosen wheel lug nuts.
3. Lift the front of vehicle and support it securely.
   - 3.1 Insert the jack under the vehicle by the side, behind front wheels.
   - 3.2 Place the jack under the central beam.
   - 3.3 Lift the front of vehicle.
4. Remove front wheels.
5. Cut locking ties securing shock absorber hose to suspension arm.
6. Disconnect shock absorber hose from vehicle air supply hose.



TYPICAL
1. *RH shock absorber hose*
2. *Vehicle air supply hose*

7. Remove upper and lower bolts retaining the shock absorber. Discard nuts.



1. *Shock absorber retaining bolts*

8. Remove shock absorber from vehicle.

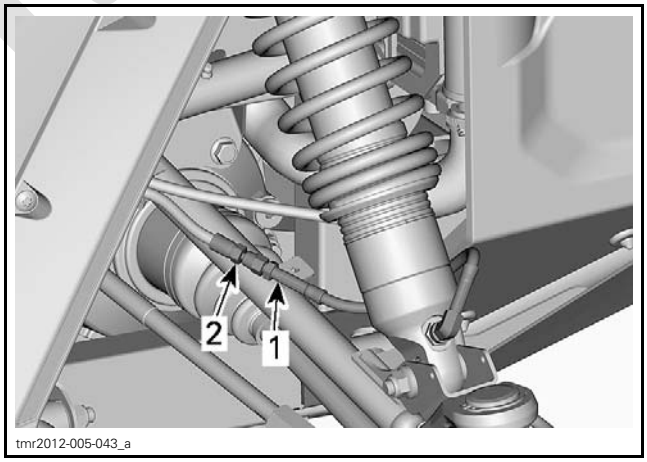
Front Shock Absorber Installation

Install shock absorbers with the reservoir outwards.

Secure it using previously removed bolts and new nuts. Tighten nuts to specification.

TIGHTENING TORQUE	
Shock absorber nuts	48 N•m (35 lbf•ft)

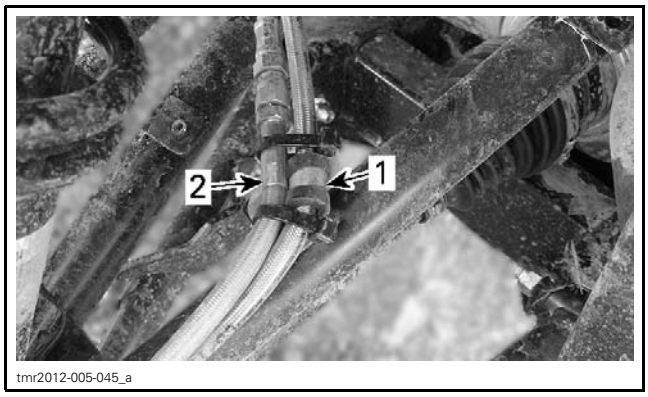
Route the hose in front of the shock absorber.



TYPICAL
1. *RH shock absorber hose*
2. *Vehicle air supply hose*

TIGHTENING TORQUE	
Air supply hose	6 N•m ± 0.5 N•m (53 lbf•**in** ± 4 lbf•**in**)

Secure the shock absorber hose to brake hose. Install a locking tie each side of the brake hose retaining clamp.



1. *Brake hose retaining clamp*
2. *Shock absorber hose*

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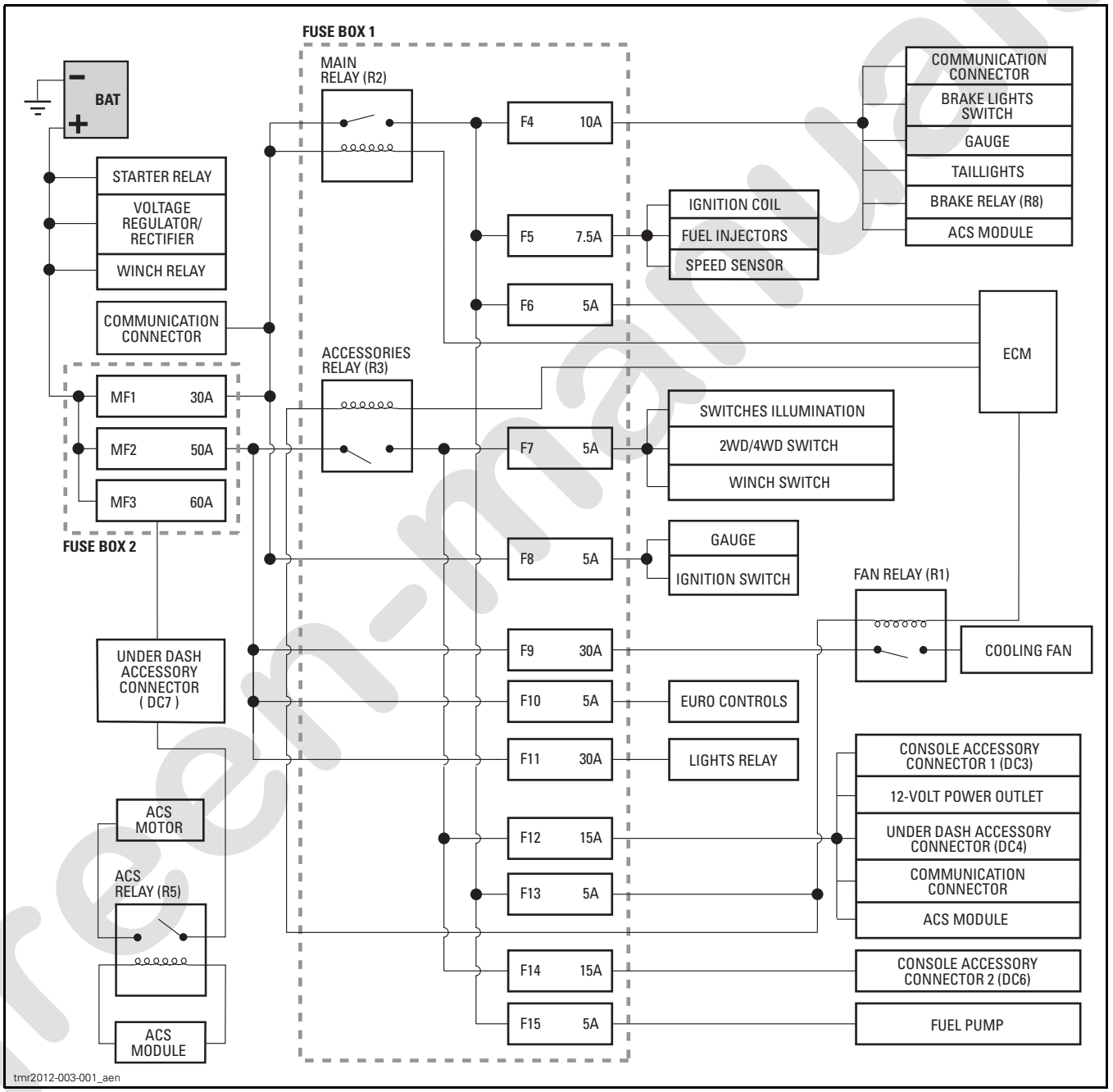
POWER DISTRIBUTION

GENERAL

POWER DISTRIBUTION DIAGRAM



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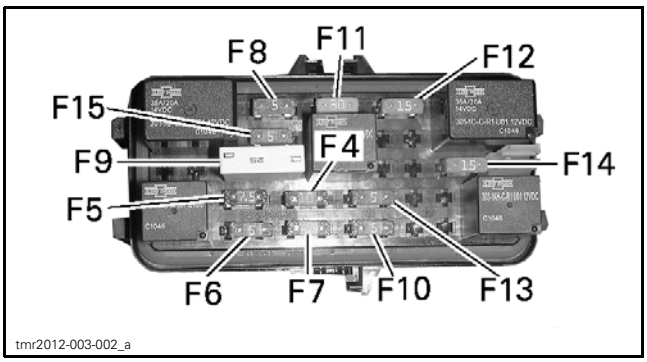
FUSE BOX 1



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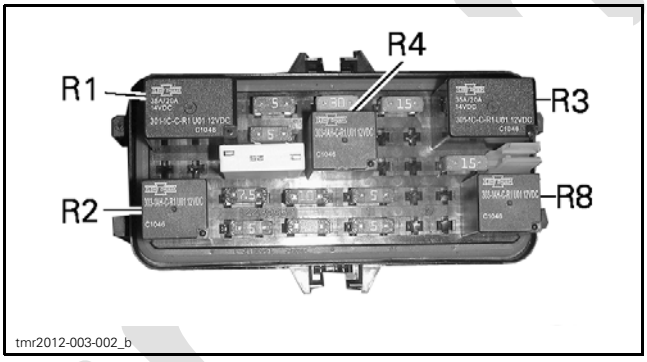
FUSE IDENTIFICATION		
Fuse	4	10 A
	5	7.5 A
	6	5 A
	7	5 A
	8	5 A
	9	30 A
	10	5 A
	11	30 A
	12	15 A
	13	5 A
	14	15 A
	15	5 A



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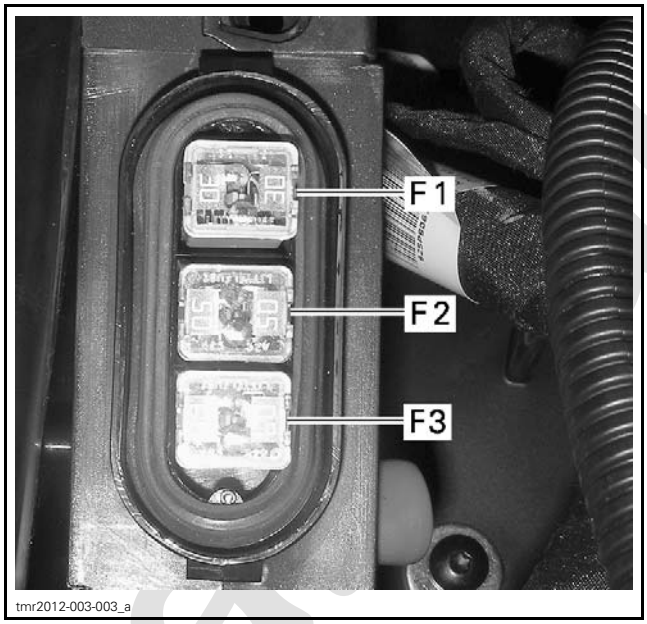
RELAY IDENTIFICATION		
Relays	1	Cooling fan
	2	Main
	3	Accessories
	4	Headlights
	8	Brake lights

FUSE BOX 2



tmr2012-003-003_a

FUSE IDENTIFICATION			
Fuse	1	Main	30 A
	2	Fan/accessories	50 A
	3	ACS/accessories	60 A

LIGHTS, GAUGE AND ACCESSORIES

SERVICE TOOLS

Description	Part Number	Page
FLUKE 115 MULTIMETER	529 035 868	4

GENERAL

NOTICE It is recommended to always disconnect the battery when replacing any electric or electronic parts. Always disconnect battery exactly in the specified order, BLACK (-) cable first.

TROUBLESHOOTING

RADIO AND AMPLIFIER

NO POWER

1. Fuse is blown
   - *In the fuse block #1, check the fuse 14. Replace if required.*
   - *Remove the glove box and check the in-line fuse (15A). Replace if required.*
2. No Voltage
   - *Perform the AMPLIFIER POWER VOLTAGE TEST, refer to AMPLIFIER.*

NO SOUND

1. Fuse is burn
   - *See NO POWER above.*
2. Wiring is not properly connected or damaged
   - *Check all wires and connectors. See AMPLIFIER CONNECTOR IDENTIFICATION.*
3. Faulty amplifier
   - *Replace the amplifier.*

RADIO CONTROL BUTTONS DO NOT WORK

1. Radio control need to be reset.
   - *Press the RESET button to the back of the amplifier.*

CANNOT TUNE A RADIO STATION OR THE AUTO-SEEK DOES NOT WORK

1. The antenna is not connected
   - *Insert the antenna cable firmly.*
2. The signals are too weak.
   - *Select a station manually.*

PROCEDURES

CONSOLE SWITCHES

Switches Access

Refer to *BODY* and remove upper console.

MULTIFUNCTION GAUGE (LCD AND ANALOG/DIGITAL)

Multifunction Gauge Wire Identification

FUNCTION	PIN	COLOR
12 volt input from fuse F4	17	ORANGE/GREEN
12 volt input from fuse F8	16	BEIGE/WHITE
Ground	20	BLACK
CAN LO	18	BEIGE/GREEN
CAN HI	19	WHITE/BEIGE
Fuel level gauge supply	4	BROWN/PINK
Fuel level gauge ground	21	VIOLET/PINK
2WD/4WD switch signal (-)	7	BLACK/BEIGE
HI beam signal (+)	5	BLUE

TURN SIGNALS/HAZARD (EC MODELS ONLY)

Turn Signal Wire Identification

FLASHER MODULE		
FUNCTION	PIN	COLOR
12 volt input from fuse F10	MC2-1	RED/WHITE
12 volt input from fuse F4	MC1-5	ORANGE/GREEN
RH turn 12 volt input from turn signal switch	MC1-1	BEIGE/ORANGE
LH turn 12 volt input from turn signal switch	MC1-2	BEIGE/GREY

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FLASHER MODULE		
FUNCTION	PIN	COLOR
Output to RH turn signal lights	MC2-2	BROWN
Output to LH turn signal lights	MC2-3	GREY
Output to multifunction gauge (turn signal indicator)	MC2-4	ORANGE
Ground	MC1-4	BLACK
Hazard 12 volt input from hazard switch	MC1-6	GREEN/ORANGE

TURN SIGNAL SWITCH (IN MULTIFUNCTION SWITCH)		
FUNCTION	PIN	COLOR
12 volt input from fuse F4	MGB-3	ORANGE/GREEN
RH turn 12 volt output to flasher module	MGB-4	BEIGE/ORANGE
LH turn 12 volt output to flasher module	MGB-2	BEIGE/GREY

HAZARD SWITCH		
FUNCTION	PIN	COLOR
12 volt input from fuse F10	2	RED/WHITE
12 volt output to flasher module	3	GREEN/ORANGE
Hazard indicator 12 volt input from fuse F4	8	ORANGE/BROWN
Hazard indicator ground (through bulbs)	7	BLACK/ORANGE

Turn Signal/Hazard Circuit Protection

CONDITION	CIRCUIT PROTECTION
Supplied with main relay (R2) activated	Fuse 4 of fuse block 1 (from main relay R2)
Supplied at all times	Fuse 10 of fuse block 1 (from fuse 2 of fuse box 2)

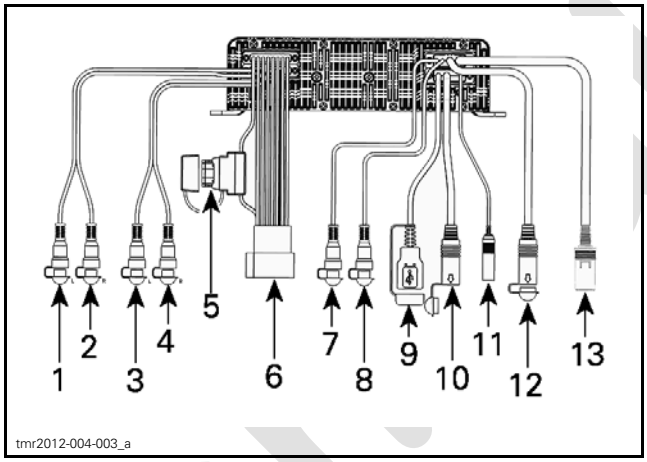
AMPLIFIER

Amplifier Access

The amplifier is attached on the top of the glove box.

Go to *BODY* subsection for glove box removal procedure.

Amplifier Connector Identification



AMPLIFIER CONNECTOR IDENTIFICATION	
1	Front LH RCA line out (WHITE female RCA connector)
2	Front RH RCA line out (RED female RCA connector)
3	Rear LH RCA line out (WHITE female RCA connector)
4	Rear RH RCA line out (RED female RCA connector)
5	In-line fuse (15 A)
6	Power/audio 16-pin connector
7	AUX in (WHITE female RCA connector)
8	AUX in (RED female RCA connector)
9	USB 2.0 connector
10	Wired audio control, 4-pin mini DIN connector
11	Antenna connector

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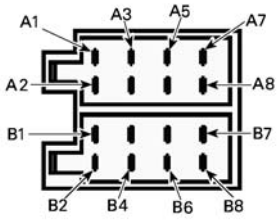
AMPLIFIER CONNECTOR IDENTIFICATION	
12	SIRIUS connector, 8-pin mini DIN connector
13	iPod‡ connector, 8-pin mini DIN locking connector

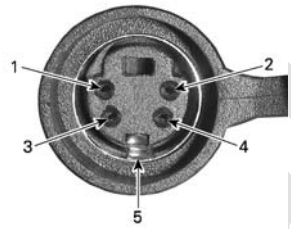
‡ Made for iPod iPhone iPhone, iPod, iPod nano and iPod touch are trademarks of Apple Inc. registered in U.S.A. and other countries. "Made for iPod" and "Made for iPhone" mean that an electronic accessory has been designed to connect specifically to iPod or iPhone, respectively, and has been certified by the developer to meet Apple performance standards. Apple is not responsible for the operation of this device or its compliance with safety and regulatory standards. Please note that the use of this accessory with iPod or iPhone may affect wireless performance.

Power/Audio 16-pin Connector Pins Identification (Radio Side)



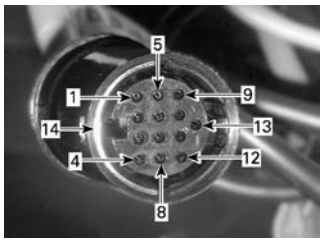
A1	Right rear speaker (+)
A2	Right rear speaker (–)
A3	Right front speaker (+)
A4	Right front speaker (–)
A5	Left front speaker (+)
A6	Left front speaker (–)
A7	Left rear speaker (+)
A8	Left rear speaker (–)
B1	No connection
B2	No connection
B3	No connection
B4	+ 12V ACC switched
B5	Power antenna
B6	No connection
B7	No connection
B8	Ground

Wired Audio Control Connector Pins Identification



1	DC +12V (RED)
2	Data (BLUE)
3	No connection
4	Power ground (BLACK)
5	Ground shield

iPOD Connector Pins Identification



1	Left channel
2	Audio ground
3	USB B +
4	Video out
5	Right channel
6	Power ground
7	USB D +
8	Remote
9	ACC – ID
10	ACC – detect
11	USB D –
12	iPOD detect
13	ACC – power
14	Ground

Amplifier Circuit Protection

The amplifier is protected by 2 fuses:
– In-line fuse (15A) on amplifier
– Fuse 14 (15 A) inside vehicle fuse block #1.

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Amplifier Tests Guidelines

Make sure F14 of fuse box #1 is in good condition and powered before beginning any voltage test.

If radio does not work, check the radio control before testing the amplifier.

Amplifier Input Voltage Test

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

Remove glove box.

Unplug the power/audio 16-pin connector.

Turn ignition key to ON position

TEST PROBE		VOLTAGE DC
Pin 13	Pin 15	Close to battery voltage

If voltage is within specification, check the in-line fuse (15 A).

If the voltage is out of specification, carry out *AMPLIFIER POWER CONTINUITY TEST*

Amplifier Power Continuity Test

Test the amplifier power continuity between the fuse box #1 and the power/audio 16-pin connector as per the following table.

FUSE BOX #1 (RED PROBE)	POWER/AUDIO CONNECTOR (BLACK PROBE)	CONTINUITY
C10	Pin 13	Close to 6 MΩ
C11	Pin 15	Close to 0 Ω

If continuity is out of specification, repair or replace wiring harness and connectors.

If continuity is within specification, replace the amplifier.

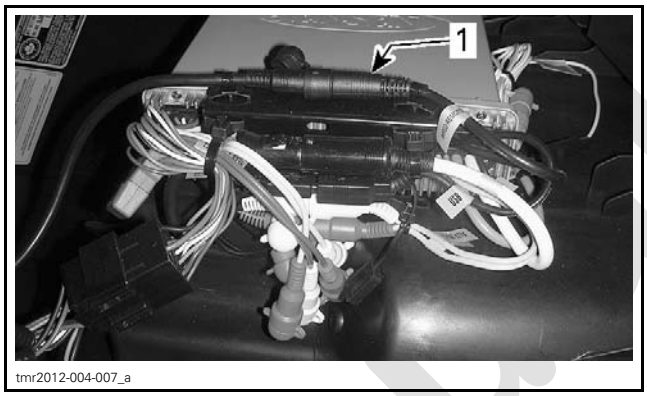
RADIO CONTROL

Radio Control Input Voltage Test

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

The radio control receives its power through the amplifier.

Unplug the audio control connector (4-pin mini DIN) from the amplifier.



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1. Audio control connector (4-pin mini DIN)

Turn ignition key to ON position.

Check voltage as per the following table.

AUDIO CONTROL CONNECTOR (AMPLIFIER SIDE)		VOLTAGE DC
Pin 1	Pin 4	Close to battery voltage

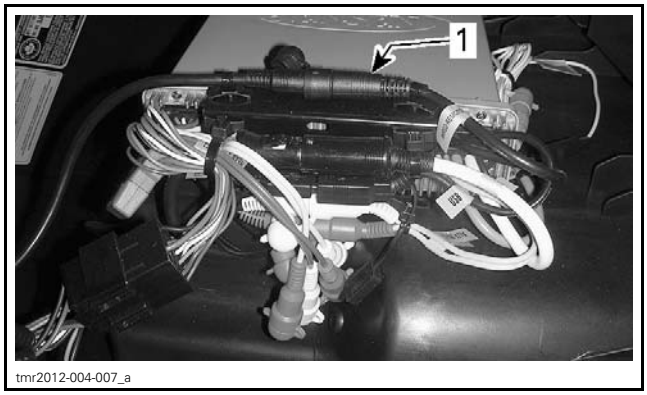
If voltage is within specification, replace the radio control.

If voltage is out of specification, check the amplifier and connections.

Radio Control Removal

Refer to *BODY* and remove the following parts:
- Upper console
- Glove box.

Unplug the audio control connector (4-pin mini DIN) from the amplifier.



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1. Audio control connector (4-pin mini DIN)

Cut or release all locking ties retaining the radio control harness.

Unscrew radio control retaining ring.

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1. Radio control retaining ring

Remove radio control from upper console. Check cable routing for reinstallation.

Radio Control Installation

The installation is the reverse of the removal procedure.

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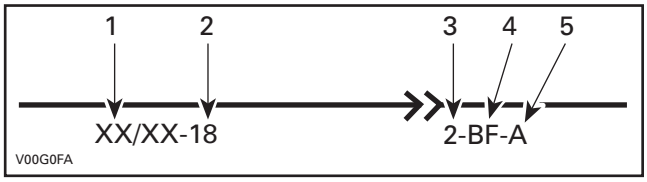
WIRING DIAGRAM INFORMATION

GENERAL

WIRING DIAGRAM LOCATION

The wiring diagram is stored in the back cover pocket.

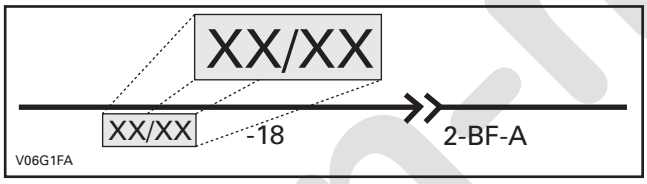
WIRING DIAGRAM CODES



1. *Wire colors*
2. *Wire gauge*
3. *Connector housing area*
4. *Connector identification*
5. *Wire 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.

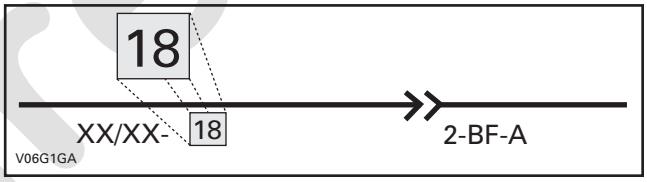


THE SHADED PART INDICATES THE WIRE COLOR

Example: YL/BK is a YELLOW wire with a BLACK stripe.

Wire Gauge

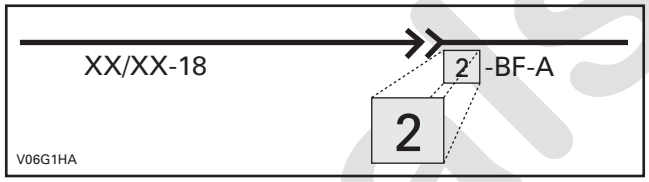
The number after wire color indicates the gauge of a wire.



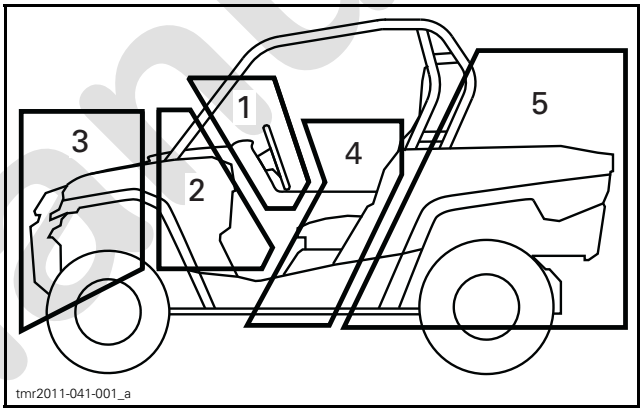
THE SHADED PART INDICATES THE WIRE GAUGE

Example: The number that follows the wire color indicates the wire size used, in this case 18 gauge wire.

Connector Housing Area



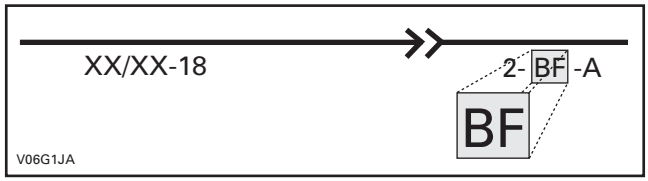
The first number in the connector/pin contact number represents the area in the vehicle where the connector is located.



AREA	LOCATION
1	Steering, dashboard and upper console area
2	Under dashboard and front bulkhead area
3	Front of vehicle
4	Engine, seat and lower console area
5	Rear of vehicle

Connector Identification

The letters in the middle of the connector/pin contact number Indicates the connector's function. 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

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ABBREVIATION	DESCRIPTION	ABBREVIATION	DESCRIPTION
ACS	Air Controlled Suspension	M1	ACS compressor
BA	Ignition coil	MAPTS	Manifold air pressure and temperature sensor
BAT	Battery	MD	2WD/4WD actuator
BD	2WD/4WD switch	OPS	Oil pressure switch
BN	Ground post	OV	Override button
BP	Battery power	PDH	RH headlight (high beam)
BV1	ACS solenoid valve	PDL	RH headlight (low beam)
BV3	ACS release valve	PF1	Fuse Holder (main)
CA	Magneto	PF2	Fuse Holder
CAPS	Camshaft position sensor	PGH	LH headlight (high beam)
CC	Ignition switch	PGL	LH headlight (low beam)
CI	Multifunction gauge	PRD	RH tail light
CPS	Crankshaft position sensor	PRG	LH tail light
CTS	Coolant temperature sensor	RD	Voltage regulator/rectifier
CV	Speed sensor	S1	ACS button
DB	Diagnostic connector	SB	Seat belt
DC	DC outlet	SD	2WD/4WD actuator switch
DC3/DC5 DC6/DC7	Accessories connector	SM	Starter motor
ECM	Engine control module	SPK1 and SPK2	Spark plug
ETA	Electric throttle actuator	SPSW	Sport switch
ETC	Electronic throttle control	SS	Starter solenoid
FP	Fuel pump	STSW	Start switch
FRA	Brake light switch	SW	Winch relay
FT	Cooling fan	SWW	Winch switch
GBPS	Gearbox position sensor	T1	Temperature sensor (ACS compressor)
HIBM	High beam (headlights)	TPS	Throttle position sensor
HIC	Harness interconnect (engine/vehicle)	TAS	Throttle accelerator sensor
INJ1 and INJ2	Fuel injector		

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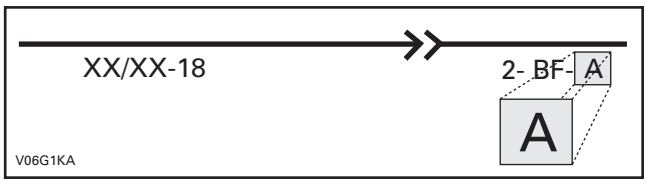
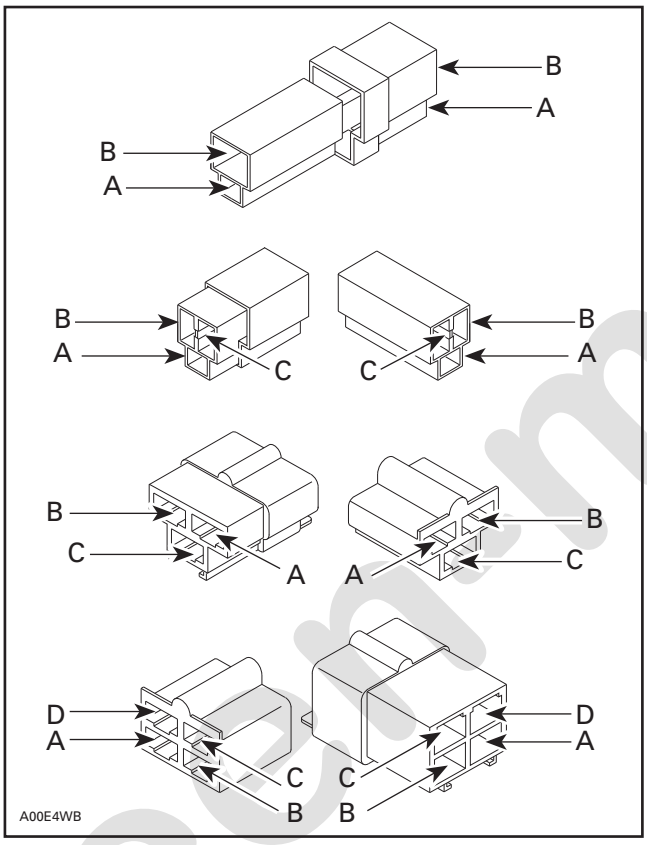
Wire Location in Connector

This is the wire position in the connector. The number or letter given refers to the physical identification stamped or molded on the connector.



THE SHADED PART INDICATES THE CONNECTOR LOCATION IN HOUSING



TYPICAL

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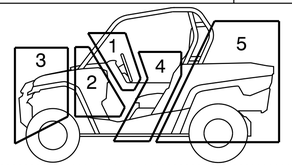
GENERAL SYSTEM



ACCESSORY CONNECTOR

DC3 GPS
DC5 TRUNK BOX
DC6 RADIO
DC7 LTD

TERMINAL IDENTIFICATION						
	NAME	ZONE-	CONNECTOR NAME-	TERMINAL #/A
EX:	CI	1	-	CI	-	15
EX:	CV	4	-	CV	-	A
EX:	ME	2	-	ME		

ZONE #	ZONE DESCRIPTION
1	STEERING AREA
2	MODULE AREA
3	FRONT OF VEHICLE
4	ENGINE AREA
5	REAR OF VEHICLE

	WELDED JOINT
	SHRINKED JOINT
	CROSSED WIRE
	WIRE BUS
	SIMPLE CONDUCTOR WIRE
	FEMALE TERMINAL
	MALE TERMINAL
	STEEL LINK (FRAME)
	TERMINAL

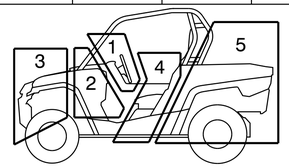
COLOR CODE	
BE	BEIGE
BK	BLACK
BU	BLUE
BR	BROWN
GN	GREEN
GY	GREY
OR	ORANGE
RD	RED
VI	VIOLET
WH	WHITE
YL	YELLOW
PK	PINK
LT BU	LIGHT BLUE

JT RD/GN
JT RD/GY
JT OR/BE
JT OR/GN
JT RD/BE
JT BE/WH
JT BK/YL
JT VI/BU
JT VI/BU
JT OR/VI
JT BE/GN
JT WH
JT WH/BE
JT RD/YL
JT RD/BK
JT RD/VI
JT RD/OR
JT OR/BK
JT RD/BR
JT GN
JT BU
JT BK1
JT BK2
JT BK3
JT BK4
JT BK5

PF2 (1/3)(2/3) MAIN FUSE (F1) 30 A / FAN / ACCES. FUSE (F2) 50 A
PF2 (3/3) HP ACC F3 60 A
PF1 CONTROL EURO F10 5A
1-HIBM-4
PF1 KEY SWITCH FUSE (F8) 5 A
PF1 MAIN RELAY (R2)
PF1 RELAY SPEEDO FUSE (F4) 10 A
PF1 RELAY DRIVER FUSE (F13) 5 A
DC7 DC OPTION
CI SPEEDOMETER & PILOT LAMPS
FUEL
ENGINE
4WD
HI BEAM
2-HIBM-6
SW WINCH RELAY
PF1 LIGHT FUSE (F11) 30A
FRA BRAKE LIGHT SWITCH
PF1 COOLING FAN FUSE (F9) 30 A
PF1 ACCESSORIES RELAY (R3)
WM WINCH MOTOR
CC IGNITION KEY (ON & DESS)
OFF
ON W/LIGHT
ON WO/LIGHT
SS STARTER SOLENOID
FREE WEELING DIODE (D2)
ONE-WAY DIODE (D5)
ONE-WAY DIODE (D4)
MD 2WD/4WD ACTUATOR
FP (2/2) FUEL LEVEL SENSOR
SD 2WD/4WD ACTUATOR SWITCH
SPORT SWITCH
FREE
SPORT
SM STARTER MOTOR
BAT BATTERY 12 VDC 18 AH
SEAT BELT
FREE
LOCK
STSW START SWITCH
FREE
START
DB2
FP (1/2) FUEL PUMP
PF1 FUEL PUMP (F15) 5 A
PF1 ECM FUSE (F6) 5 A
PF1 INJECTORS IGNITION FUSE (F5) 7.5 A
BA IGNITION COIL
SPK2 SPARK PLUG (REAR)
SPK1 SPARK PLUG (FRONT)
INJ1 FUEL INJECTOR (FRONT)
INJ2 FUEL INJECTOR (REAR)
DB DIAGNOSTIC CONNECTOR
BD 2WD/4WD SWITCH
2WD
4WD
SWW WINCH SWITCH
OUT
FREE
IN
PF1 WINCH 2WD/4WD FUSE (F7) 5 A
PF1 DC OUTLETS FUSE (F12) 15A
PF1 ACC2 FUSE (F14) 15A
PF1 FAN RELAY (R1)
FT COOLING FAN
PF1 LIGHTS RELAY (R4)
HIBM HI- BEAM SWITCH
HI
LOBM
PF1 BRK RELAY (R8)
DC6 DC OPTION
DC5 DC OPTION
DC3 DC OPTION
DC DC OUTLET
DC4
OPS OIL PRESSURE SWITCH
PRD RIGHT TAIL LIGHT
PRG LEFT TAIL LIGHT
RD RECTIFIER
U V W –
CA MAGNETO 650 WATTS
ETA ELECTRONIC THROTTLE
TPS
OVR OVERRIDE
FREE
OVER RIDE
CTS COOLANT TEMP SENSOR
VSS VEHICULE SPEED SENSOR
MAPTS MANIFOLD AIR PRESSURE / TEMP SENSOR
GBPS GEAR - BOX POSITION SENSOR
CPS CRANKSHAFT POSITION SENSOR
TAS THROTTLE ACCELERATOR SENSOR
ECM ENGINE CONTROL MODULE

COMMANDER

ACS SYSTEM



MAIN HARNESS SIDE

ACS HARNESS SIDE

TERMINAL IDENTIFICATION						
	NAME	ZONE-	CONNECTOR NAME-		TERMINAL #/A	
EX:	CI	1	-	CI	-	15
EX:	CV	4	-	CV	-	A
EX:	ME	2	-	ME		

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

	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

DC7 FROM MAIN HARNESS
HIGH POWER ACC

DB1 FROM MAIN HARNESS
DIAGNOSTIC CONNECTOR

SEE MAIN HARNESS DIAGRAM
FOR DETAILS ON DB1 AND DC7

JT RD/BR — 2-DB1-6

RD/PK — 2-DC7-B

JT RD/GY

JT OR/GN — 2-DB2-6

RD/GN

RD/BR — JT RD/BR

BR/PK — JT BR/PK

PF2 (1/3) MAIN FUSE (F1) 30 A

PF2 (2/3) FAN / ACCES. FUSE (F2) 50 A

PF2 (3/3) HP ACCES. FUSE (F3) 60 A

RD/GY-12 — RD-12

CI SPEEDOM ETER & PILOT LAMPS

OR/GN-18 — 1-CI-17

1-CI-21 VI/PK-18 — 1-CI-4 BR/PK-18 — 1-CI-19 WH/BE-18 — 1-CI-18 BE/GN-18 — 1-CI-7 BK/BE-18 — 1-CI-20 BK-18 — 1-CI-5 BU-18

P — RD FUEL — YL ENGINE — 4WD — BU HI BEAM

4-R5-87 — 4-R5-85 — **R5** — 4-R5-30 — 4-R5-88

RD/WH

M1-1 — **AIR COMPRESSOR** — M1-2

OR/PK

TEMPERATURE SENSOR

RD/GY — 2-DB1-5 — RD/GY — 2-DB2-5

BK

4-T1-1 — 4-PCM-13 — BK

4-T1-2 — 4-PCM-9 — VI/PK

4-PCM-28 — 4-PCM-17 — 4-PCM-35

4-PCM-16

4-PCM-34

BV3-1 — 4-BV1-6 — 4-BV1-5

OR/GN — 2-DB1-4 — OR/GN — 4-PCM-18 — 2-DB2-4

4-PCM-36

BR/BE — 4-BV3-2 — 4-PCM-27 — (VALVE POMPE VENT)

BK/GN — 4-BV1-8 — 4-PCM-26 — (VALVE VENT)

BK/YL — 4-BV1-1 — 4-PCM-23 — (VALVE AVANT- DROIT)

BR/YL — 4-BV1-3 — 4-PCM-24 — (VALVE AVANT- GAUCHE)

BK/BE — 4-BV1-2 — 4-PCM-22 — (VALVE USER)

BK/BU — 4-BV1-4 — 4-PCM-25 — (VALVE ARRIERE)

JT BE/GN

CAN LOW — BE/GN — 2-DB1-2 — BE/GN — 4-PCM-2 — 2-DB2-2

SCM SUSPENSION CONTROL MODULE

JT WH/BE

CAN HI — WH/BE — 2-DB1-1 — WH/BE — 4-PCM-1 — 2-DB2-1

BK/VI — 4-PCM-6

BK/GY — 4-PCM-7

4-PCM-31

4-PCM-32

4-PCM-33

4-PCM-10 — PK/OR — 4-PCM-3 — PK/BR — 4-PCM-14

4-BV1-10 — 4-BV1-9

+ P — U P — 4-BV1-7

BK

PRESSURE SENSOR

1-S1-3 — 1-S1-1

UP — FREE — DOWN — **S1 (1/2)**

1-S1-2

BK

1-S1-10 — 1-S1-8 — **S1 (2/2)** — 1-S1-9 — 1-S1-7

SS STARTER SOLENOID

5-BP2 — 5-BP1 — 5-SS1 — OR/GN-18

5-BP3 — 5-SS2 — OR/BR-18

RD-12 — RD-6 — RD-6

WH/BE-18 — BE/GN-18

BAT BATTERY 12 VDC 18 AH

5-BAT1 — 5-BAT2 — BK-6

SM STARTER MOTOR

4-SM

RD-12 — 5-RD1-1

RD RECTIFIER

U V W –

5-RD2-1 — 5-RD2-2 — 5-RD2-3 — 5-RD1-3

YL-12 — YL-12 — YL-12 — BK-12 — BK-6

CA-1 — CA-2 — CA-3

YL-14 — YL-14 — YL-14

CA MAGNETO 650 WATTS

BK-12 — BK-6

BK-6 — 4-BN5 — 5-BN4 — 5-BN3 — 5-BN1

BK-12 — BK-12

JT BK1

JT BK2

JT BK3

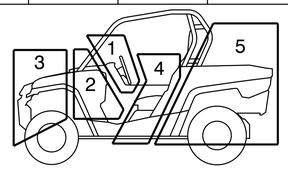
JT BK4

2-DB1-3 — JT BK — 2-DB2-3

2-DC7-A

COMMANDER

RADIO SYSTEM



MAIN HARNESS SIDE

RADIO SIDE

TERMINAL IDENTIFICATION						
	NAME	ZONE-	CONNECTOR NAME-	TERMINAL #/A
EX:	CI	1	-	CI	-	15
EX:	CV	4	-	CV	-	A
EX:	ME	2	-	ME		

AWG	MAX. CURRENT	MAX. FUSE CURRENT	MAX. WATT
# 6	100 amps	125 amps	1450 watts
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ZONE #	ZONE DESCRIPTION
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2	MODULE AREA
3	FRONT OF VEHICLE
4	ENGINE AREA
5	REAR OF VEHICLE

●	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

JT RD/VI

JT RD/GN

JT RD/GY

JT OR/GN

SEE MAIN HARNESS

2- DC6- B

RD/VI

BK

RD/GY-12

RD/GN-12

PF2 (1/2) MAIN FUSE (F1) 30 A

PF2 (2/2) FAN / ACCES. FUSE (F2) 40 A

RD-12

OR/GN-18

1-CI-17

CI
SPEEDOMETER & PILOT LAMPS

P

RD FUEL

YL ENGINE

YL 4WD

BU HI BEAM

1-CI-21 VI/PK-18

1-CI-4 BR/PK-18

1-CI-19 WH/BE-18

1-CI-18 BE/GN-18

1-CI-7 BK/BE-18

1-CI-20 BK-18

1-CI-5 BU-18

OR/GN-18

5-BP2

5-BP1

5-SS1

SS
STARTER SOLENOID

5-BP3

5-SS2

OR/BR-18

RD-12

RD-6

RD-6

5-BAT1

4-SM

BAT
BATTERY
12 VDC
18 AH

M

SM
STARTER MOTOR

5-BAT2

BK-6

RD-12

4-RD1-1

RD
RECTIFIER

U V W –

5-RD2-1 5-RD2-2 5-RD2-3 5-RD1-3

YL-12 YL-12 YL-12 BK-12 BK-6

CA-1 CA-2 CA-3

YL-14 YL-14 YL-14

CA
MAGNETO
650 WATTS

BK-12

BK-6

BK-6

4-BN5

5-BN4

5-BN3

5-BN1

BK-12

BK-12

BK-12

BK-12 BK-12

JT BK1

JT BK2

JT BK3

JT BK4

SEE MAIN HARNESS

2- DC6- A

AM / FM ANTENNA

RADIO

R01

13 BK

15 A FUSE

15 RD/VI

VI 4 VI

BK/VI 8 BK/VI

GY 3 GY

BK/GY 7 BK/GY

GN 1 GN

BK/GN 5 BK/GN

WH 2 WH

BK/WH 6 BK/WH

RR

B RD + A BK -

SPEAKER REAR RIGHT

FR

B WH + A BK -

SPEAKER FRONT RIGHT

RL

B RD + A BK -

SPEAKER REAR LEFT

FL

B WH + A BK -

SPEAKER FRONT LEFT

DC6 ACCESSORY POWER CONNECTOR

DASH REMOTE

IPOD GLOVE BOX

GLOVE BOX USB / AUX IN

30 SEPT. 2011

710002553F4

SIDE-BY-SIDE VEHICLES
SERVICE Bulletin

Date : **October 13 2010** Subject : **Service Tools** No **2011-5**

Year	Model
All	All

BRP is proud to introduce its latest Service Tools Bulletin. These special tools were designed to help you efficiently service BRP vehicles.
Please always make sure to use special tools along with the appropriate Shop Manual(s) and respect all safety measures.

Mandatory Tools: These tools are absolutely needed to perform certain service procedures. They will be automatically shipped to dealerships. They do not need to be ordered separately.

Recommended Tools: These tools will facilitate the Technicians work. They will not be automatically shipped to dealerships. They need to be ordered separately.

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Tools by System:

Engine ..... P 2
Fuel ..... P 4
Cooling ..... P 4
Electrical ..... P 4
Lubrication ..... P 5
Transmission / Propulsion ..... P 5
Steering ..... P 6
Suspension ..... P 6
Various ..... P 7

Index of tools by Part Number: ..... P 8

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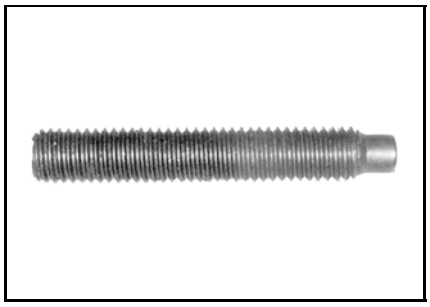
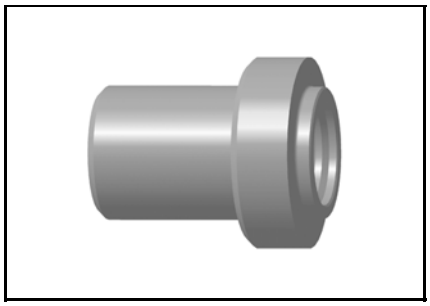
Engine



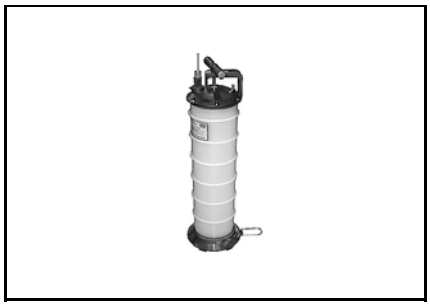
Crankshaft locking bolt
P/N 529 035 617 **Mandatory**
Quest 500/610,
DS650/Outlander/Renegade

Valve spring compressor
P/N 529 035 724 Recommended
4-TEC engines
To be used with valve spring compressor cup 529 035 764 and 529 036 073

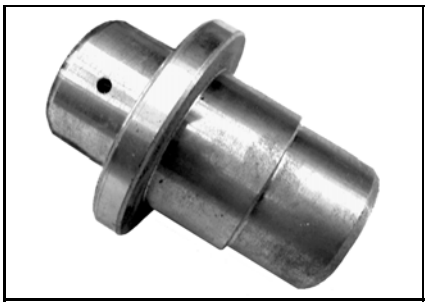
Valve spring compressor cup
P/N 529 035 764 Recommended
330/400/490/660/810/1004
To be used with valve spring compressor 529 035 724.



Seal pusher
P/N 529 035 766 Recommended
All V-twin, 330/400, 610/500, 500 eng.
Use with 529 036 130

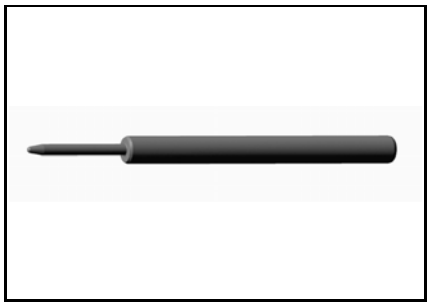


Suction pump
P/N 529 035 880 Recommended

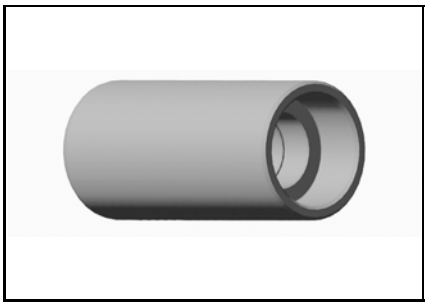


Plain bearing remover/installer
P/N 529 035 917 Recommended
610, 500, 650, 800 engines

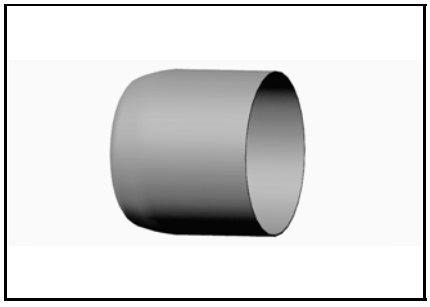
Piston ring compressor
P/N 529 035 919 Recommended
V-800 engine



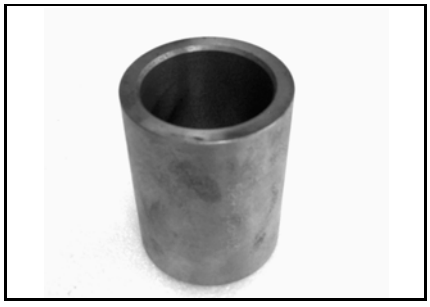
Valve guide remover 5 mm
P/N 529 035 924 Recommended
400, 500, 650, 800 engines



Drive shaft oil seal installer
P/N 529 036 028 Recommended
V-490, V-660 and V-810 engines



Drive shaft oil seal protector
P/N 529 036 029 Recommended
V-490, V-660 and V-810 engines



Crankcase support MAG/PTO
P/N 529 036 031 Recommended
V-490, V-660 and V-810 engines

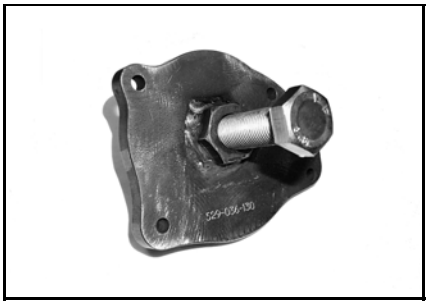
Plain bearing remover/installer
P/N 529 036 032 Recommended
V-490, V-660 and V-810 engines

Engine

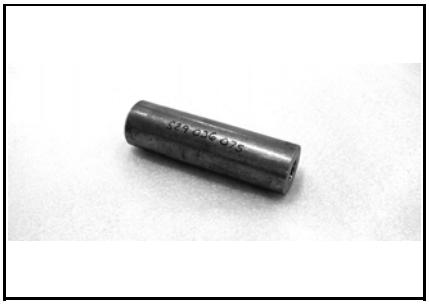
PTO cover oil seal installer
P/N 529 036 033 Recommended
V-490, V-660 and V-810 engines

Crankshaft protector
P/N 529 036 034 Recommended
V-490, V-660 and V-810 engines

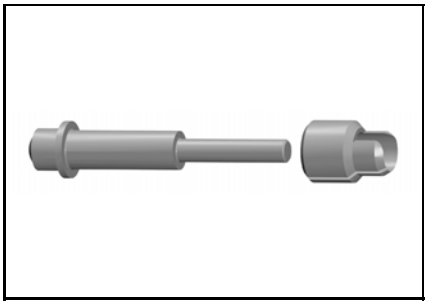
Puller/locking tool
P/N 529 036 098 **Mandatory**
610/500, 991, V-490, V-660, V-810



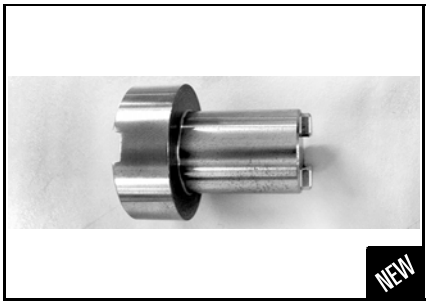
Rotary seal pusher plate
P/N 529 036 130 Recommended
V-490, V-660 and V-810 engines
Use with seal installer 529035766



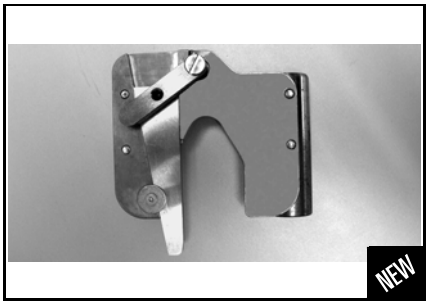
Valve guide installer
P/N 529 036 140 Recommended
V-490, V-660 and V-810 engines
replace 529035853



Piston circlip installer
P/N 529 036 153 Recommended
1203



Crankshaft TDC position tool
P/N 529 036 200 **Mandatory**
V1010



Camshaft timing tool
P/N 529 036 201 **Mandatory**
V1010

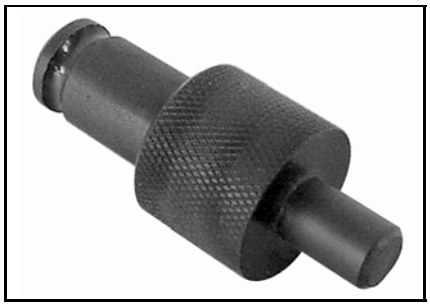
Fuel

Pressure gauge
P/N 529 035 709 **Mandatory**
Injection type engines
Use with 529035652, 529035714 and 529036023

Disconnect tool
P/N 529 035 714 **Mandatory**
Injection models
Used also with gauge P/N 529 035 709, 529 035 652 and 529 036 023

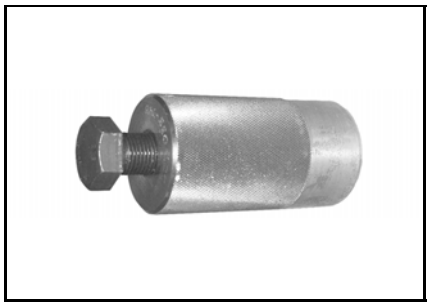
Extractor adaptor
P/N 529 036 136 Recommended
E-TEC, V-twin

Cooling

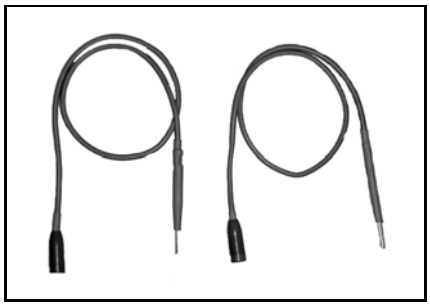


Oil seal pusher
P/N 529 035 757 Recommended
Outlander 330/400

Electrical



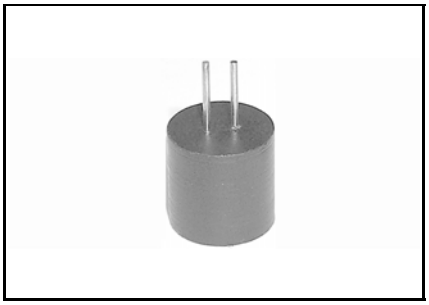
Magneto puller
P/N 529 035 748 **Mandatory**
All V-twin



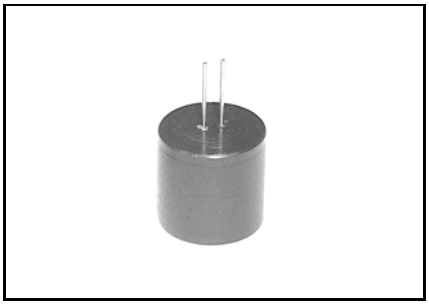
Back probe test wires
P/N 529 036 063 Recommended
All models
To back probe various connectors.

ECM adapter tool
P/N 529 036 166 **Mandatory**
RXT iS and GTX iS

Electrical



ECM terminal remover 3.36
P/N 529 036 174 Recommended
All models



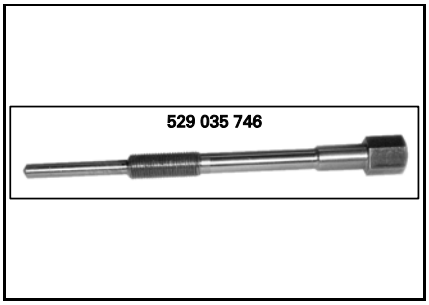
ECM terminal remover 2.25
P/N 529 036 175 Recommended
All models

Lubrication

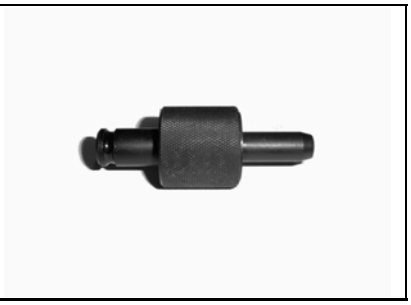
Adapter hose
P/N 529 035 652 **Mandatory**
4-stroke engines
Used with 529 035 709.

Transmission / Propulsion

Drive pulley holder (CVT)
P/N 529 006 400 Recommended



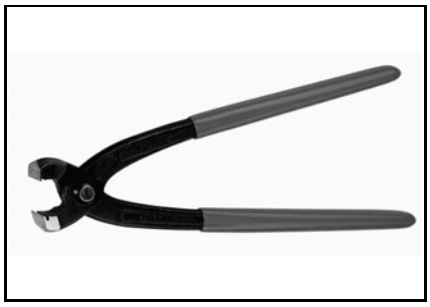
Clutch puller
P/N 529 035 746 **Mandatory**
610/500, V-490, V-660, V-810 engines



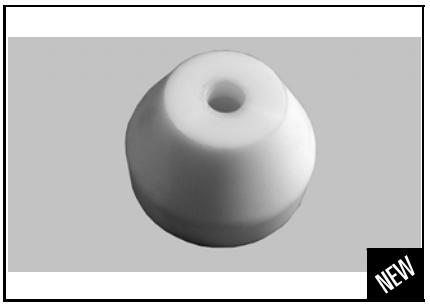
Oil seal installer (gearbox)
P/N 529 035 758 Recommended
V-490, V-660, V-810 engines
Use with handle 420 877 650

Transmission / Propulsion

Driven clutch holder
P/N 529 035 771 Recommended
330/400, 610/500, V-490, V-660, V-810

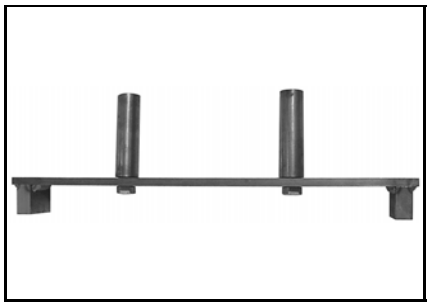


CV boot clamp plier
P/N 529 036 120 Recommended
All models
For stepless low profile clamps 192
Clamp pincer with special jaw form



Oil seal installer
P/N 529 036 204 Recommended
All V-Twin

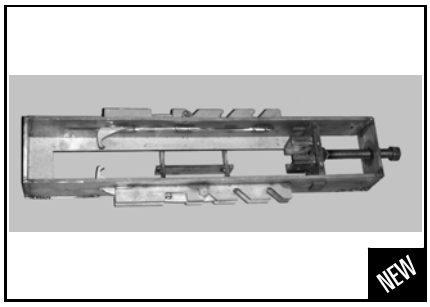
Steering



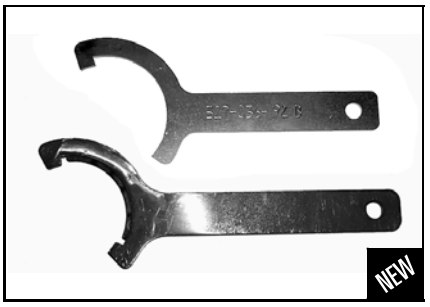
Steering alignment tool
P/N 529 036 059 Recommended
All except DS 450

Suspension

Ball joint remover support
P/N 529 036 121 Recommended
REV, RT, Outlander, roadsters



Spring compressor
P/N 529 036 184 Recommended
All models
To remove coil spring from shock.



Key ajustment suspension
P/N 529 036 192 Recommended
X package

Various

Handle

P/N 420 877 650 Recommended

All models

Can be used with many types of pushers.

Blind hole bearing puller set

P/N 529 036 117 Recommended

All models

Replaced by 529036056

Index

Tool Part Numbers ... Page

These tools are mandatory

420877650 7
529006400 5
529035617 2
529035652 5
529035709 4
529035714 4
529035724 2
529035746 5
529035748 4
529035757 4
529035758 5
529035764 2
529035766 2
529035771 6
529035880 2
529035917 2
529035919 2
529035924 2
529036028 2
529036029 2
529036031 2
529036032 2
529036033 3
529036034 3
529036059 6
529036063 4
529036098 3
529036117 7
529036120 6
529036121 6
529036130 3
529036136 4
529036140 3
529036153 3
529036166 4
529036174 5
529036175 5
529036184 6
529036192 6
529036200 3
529036201 3
529036204 6

July 9, 2010 Subject: **Can-Am High Altitude** No. **2011-4**

YEAR	MODEL NAME	MODEL NUMBER	SERIAL NUMBER
2011	Commander 1000	6ABA, 6ABC	All
	Commander 1000 X	6EBA, 6EBC	
	Commander 1000 XT	6BBA, 6BBB, 6BBC 6BBD, 6BBE, 6BBF	

HIGH ALTITUDE PARTS RETURN PROGRAM

Purchase from BRP the necessary parts for high altitude application. Anything other than a BRP part will not be accepted.

Submit via BOSSWeb a Return Authorization Request and once approved by BRP, return the original UNUSED centrifugal levers (complete with bolts and nuts), with a copy of the Return Order Confirmation form. 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 that a 30$ handling fee plus freight charge could be applied to dealer account.

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.

Be sure to match and ship all centrifugal levers with the same form.

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.

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BOSSWEB RETURN AUTHORIZATION REQUEST

NOTICE In our continuing efforts to improve our return process, as we announced in our *WHAT'S NEWS* Dealer Support Group journal July 2009, all authorization numbers have to be requested via BOSSWeb to return the parts that were removed. To proceed, please follow these quick and easy steps:

1. From the home page, choose the "Parts" menu, and select Return Entry.
2. For "Return Type", select Return Program.
3. For "Return Reason", select High Altitude exchange.
4. For "Your Return Number" write the unit serial number: <<_____>>.
5. For "Product Line" select: Side-by-Side.
6. Click the blue forward arrow to go to next step.
7. Enter part number for the centrifugal lever kit that was removed from the unit; the return quantity should always be 1 kit per return request.
8. Once you are sure that all information is correct, click the blue forward arrow to submit.

NOTE: Once your return request has been submitted via BOSSWeb, please allow **1 to 3 days** to receive the approval to return the items. The items can only be returned after having received the return authorization number via BOSSWeb (this number will appear in the return status screen on BOSSWeb).

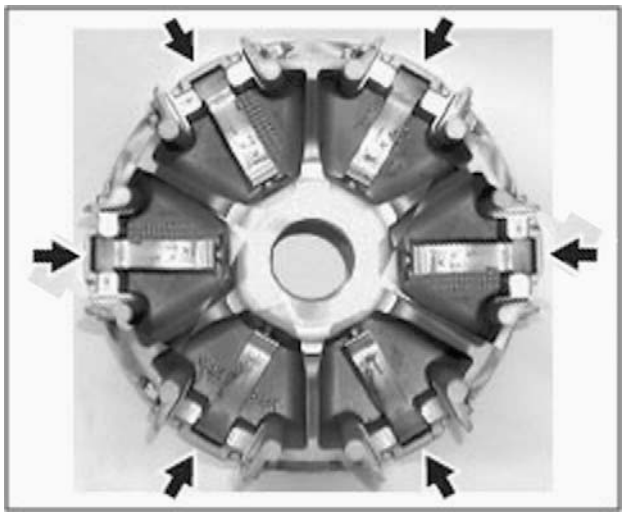
HIGH ALTITUDE SPECIFICATIONS

In the tables throughout this document, the shaded column gives factory setting.

Commander™ 1000 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				
Altitude	Sea Level	1 200 m (4,000 ft)	2 400 m (8,000 ft)	Qty
Centrifugal Lever	420 248 495	715 500 351 (10.8 mm (.425 in))	715 500 352 (10 mm (.394 in))	1 (set of 6)
Drive pulley spring	420 238 617	420 238 617	420 238 610	1



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.

QUALITY

SIDE-BY-SIDE VEHICLES

WARRANTY Bulletin

NOTE: Repair only if described symptoms exist or are noticed.

Campaign no.: 2011–0001

October 15, 2010 Subject: **Gearbox Clunking Noise at CVT Engagement** No. **2011-1**

YEAR	MODEL	MODEL NUMBER	SERIAL NUMBER
2011	Commander™ 1000 Series	6ABA, 6ABC 6BBA, 6BBC, 6BBE 6EBA	See list enclosed

PROBLEM

After making a gear selection, gearbox may have a clunking noise (**louder than expected**).

This situation happened only on vehicles built before September. All vehicles produced since the beginning of September have the new parts.

SOLUTION

Replace ramps and spring into drive pulley.

The combination of the new spring calibration and new ramps profile, reduce the clunking noise to a normal level and provide a smoother engagement.

REQUIRED PARTS

DESCRIPTION	PART NUMBER	QTY
Drive pulley spring	(P/N 420 238 615)	1
Drive pulley ramps	(P/N 420 248 496)	1 (pack of 6)

PROCEDURES

Refer to proper shop manual for complete removal and installation procedures.

2011 Shop manual: Commander 800R/1000 (P/N 219 100 452)

If the shop manual is not available, an electronic version of the required sections have been placed on BOSSWeb, go to:

– www.bossweb.brp.com
– ComCenter = Document
– Document type = Shop Manual
– Product Line = Side-by-Side
– Document Year = 2011

Select the following documents:

– Continuously Variable Transmission (CVT)
– Body

WARRANTY

Submit a warranty claim using the following information:

CAMPAIGN NUMBER	2011-0001
Claim Type	Campaign claim
Action	Repair
Flat Rate Time	1.3 hour

Click in the REPAIR BOX while completing your claim on BOSSWeb.

REPAIR	✔

For claiming procedure, refer to the *DEALER/DISTRIBUTOR WARRANTY GUIDE*.

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SERIAL NUMBERS LISTING OF INVOLVED VEHICLES

Model: 6ABA
From 000022 to 000032
From 000040 to 000046

Model: 6ABC
From 000011 to 000021
From 000033 to 000039

Model: 6BBA
From 000021 to 000069
From 000081 to 000128
From 000136 to 000188

Model: 6BBC
From 000070 to 000080
From 000129 to 000135

Model: 6BBE
000006

Model: 6EBA
From 000013 to 000014

INTRODUCTION

This publication governs all warranty labor allowances for 2011 Can-Am SSV COMMANDER models.

1. HOW DOES IT WORK

We follow the procedures detailed in the *Can-Am SSV Shop Manual*. The flat rate time is the maximum time allowed for a repair involving any given part. FLAT RATE TIME IS NOT CUMULATIVE. You must use the flat rate time given for the longest lasting operation.

NOTE: The *Flat Rate Time Schedule* was prepared by skilled mechanics using the hand tool usually found in workshops and all the special tools mentioned in the *Shop Manual*.

2. COMPILATION

The *Flat Rate Time Schedule* is compiled as follows:

The actual required time to perform the repair plus (+) 30% correction factor up to 3.0 hours or (+) 15% over 3.0 hours time to take into account, among others:

- Vehicle handling
- Obtaining the parts
- Diagnosis
- Cleaning
- Special compensation (rusted bolts).

3. HOW TO USE IT

Refer to the system you need, locate part of series of parts replaced. List JOB CODE in the appropriate column on claim.

SYSTEM		PAGE
01	ENGINE SYSTEM	4
02	INTAKE AND FUEL SYSTEM	16
03	IGNITION SYSTEM	20
04	STARTER SYSTEM	22
05	TRANSMISSION AND LINKAGE SYSTEM	23
06	BRAKE SYSTEM	29

SYSTEM		PAGE
07	STEERING - FRONT DRIVE SYSTEM AND SUSPENSION	31
08	REAR DRIVE SYSTEM AND SUSPENSION	36
09	BODY AND ACCESSORIES	39
10	ELECTRICAL SYSTEM	51
11	CLAIM TYPE 02	55

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 VCC Can-Am 2011 modèle COMMANDER.

1. UTILISATION DU MANUEL

En procédant de la façon indiquée dans le *Manuel de réparation Can-Am VCC*, 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.

SYSTÈME		PAGE
01	SYSTÈME MOTEUR	4
02	ADMISSION ET SYSTÈME D'ALIMENTATION D'ESSENCE	16
03	SYSTÈME D'ALLUMAGE	20
04	SYSTÈME DE DÉMARREUR	22
05	SYSTÈME DE TRANSMISSION ET DE TRINGLERIE	23
06	SYSTÈME DE FREIN	29

SYSTÈME		PAGE
07	DIRECTION - SYSTÈME D'ENTRAÎNEMENT AVANT ET SUSPENSION	31
08	SYSTÈME D'ENTRAÎNEMENT ARRIÈRE ET SUSPENSION	36
09	CARROSSERIE ET ACCESSOIRES	39
10	SYSTÈME ÉLECTRIQUE	51
11	RÉCLAMATION DE TYPE 02	55

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)

2011
SSV / VCC

TABLE	DESCRIPTION	MODEL/MODÈLE	ENGINE TYPE/ TYPE DE MOTEUR	CARBURETOR/ CARBURATEUR	COOLING SYSTEM/ SYSTÈME DE REFROIDISSEMENT
1	COMMANDER 800R	6CBA/6CBC	800R CVT	BOSCH ETC 54 mm	Liquid cooled/ Refroidi par liquide
	COMMANDER XT 800R	6DBA/6DBD			
2	COMMANDER 1000	6ABA/6ABC	1000 CVT	BOSCH ETC 54 mm	Liquid cooled/ Refroidi par liquide
	COMMANDER XT 1000	6BBA/6BBB 6BBC/6BBD 6BBE/6BBF			
	COMMANDER X 1000	6EBA/6EBC			

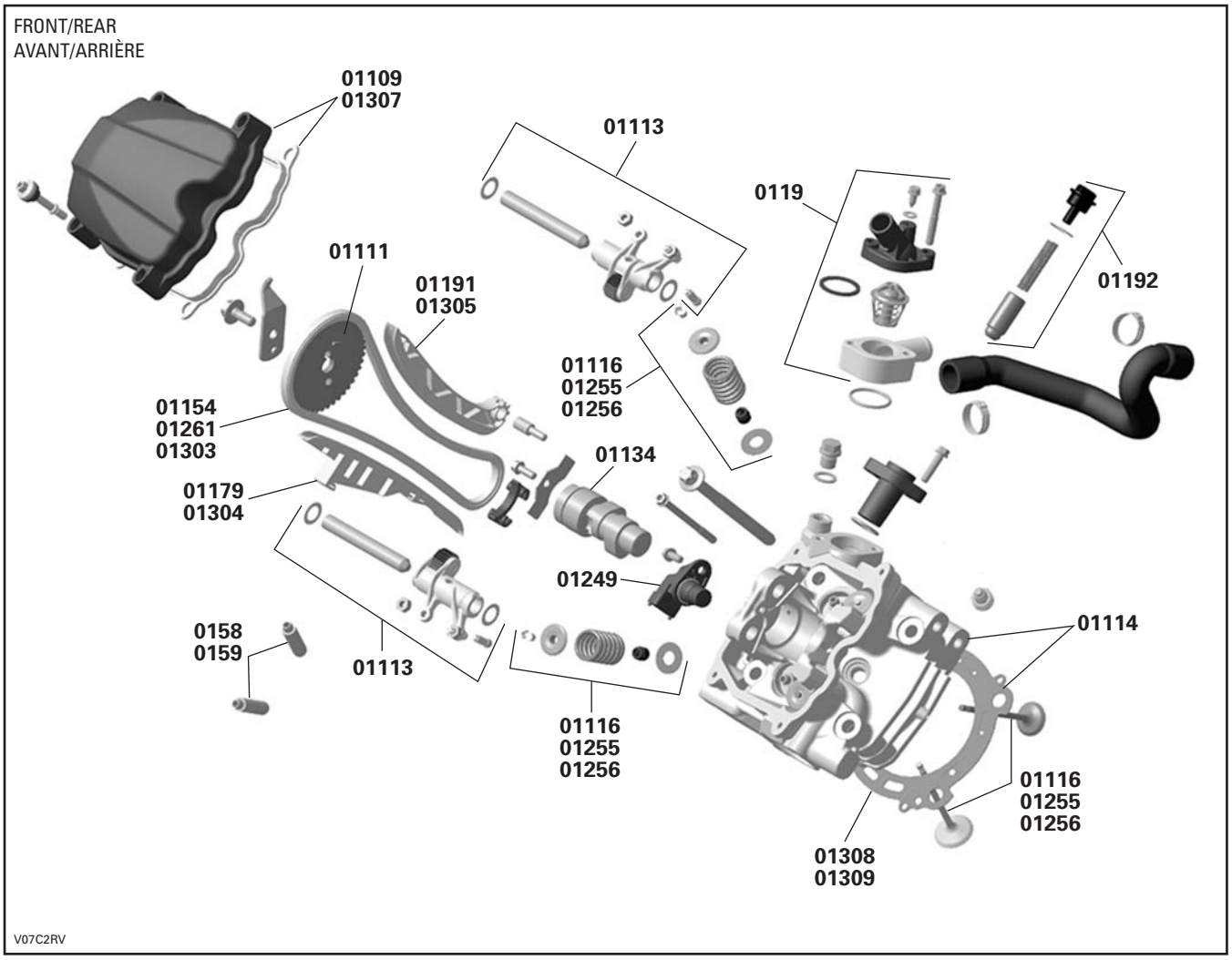
SYSTEM SYSTÈME	CODE	DESCRIPTION	COMMANDER 800	COMMANDER 1000
			1	2
01	**00**	**NO LABOR INVOLVED AUCUNE MAIN D'OEUVRE**	**0**	**0**
01 *	01	REMOVE AND REPLACE ENGINE (ASS'Y) REMPLACEMENT DU MOTEUR (COMPLET)	5.5	5.5
01	03	OIL PRESSURE SWITCH INTERRUPTEUR DE PRESSION D'HUILE	0.4	0.4
01	08	FAN AND/OR FAN SUPPORT VENTILATEUR ET/OU SUPPORT DE VENTILATEUR	0.5	0.5
01	18	SENDER TEMPERATURE (ENGINE) CAPTEUR DE TEMPÉRATURE (MOTEUR)	0.4	0.4
01	19	THERMOSTAT THERMOSTAT	1.0	1.0
01	21	COOLANT HOSE T-FITTING (ONE OR TWO) BOYAU DE LIQUIDE DE REFROIDISSEMENT RACCORD EN T (1 OU 2)	1.0	1.0
01	37	RADIATOR INLET HOSE BOYAU D'ENTRÉE DU RADIATEUR	0.6	0.6
01	38	WATER PUMP SHAFT (ALL PARTS) ARBRE DE POMPE À L'EAU (TOUTES LES PIÈCES)	6.4	6.4
01	45	ENGINE RUBBER MOUNT TAMPONS D'ANCRAGE DU MOTEUR	5.6	5.6
01	46	RADIATOR AND/OR GROMMMET RADIATEUR ET/OU PASSE-FILS	1.1	1.1
01	50	CRANKSHAFT AND/OR BEARINGS (FRONT/REAR) VILEBREQUIN ET/OU ROULEMENTS (AVANT/ARRIÈRE)	7.5	7.5
01	56	CRANKCASE COVER GASKET JOINT DE COUVERCLE DE CARTER	2.0	2.0
01	57	PTO CRANKCASE COVER COUVERCLE DE CARTER PDM	2.0	2.0
01	58	INTAKE OR EXHAUST VALVE GUIDE (1) GUIDE DE SOUPAPE D'ADMISSION OU D'ÉCHAPPEMENT (1)	3.1	3.1
01	59	INTAKE OR EXHAUST VALVE GUIDE (2) GUIDE DE SOUPAPE D'ADMISSION OU D'ÉCHAPPEMENT (2)	3.2	3.2
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
01	71	EXHAUST MANIFOLD COLLECTEUR D'ÉCHAPPEMENT	0.8	0.8
01	73	EXHAUST MANIFOLD (REAR) CONNECTEUR D'ÉCHAPPEMENT (ARRIÈRE)	0.6	0.6
01	77	ANTI-VIBRATION RUBBER MOUNT (1 OR 2) (TOP) TAMPON D'ANCRAGE ANTI-VIBRATION (1 OU 2) (HAUT)	0.5	0.5

SYSTEM SYSTÈME	CODE	DESCRIPTION	COMMANDER 800	COMMANDER 1000
			1	2
01	79	COOLANT HOSE (RADIATOR TO TANK) BOYAU DU SYSTÈME DE REFROIDISSEMENT (RÉSERVOIR AU RADIATEUR)	0.3	0.3
01	83	EXHAUST MANIFOLD (FRONT) CONNECTEUR D'ÉCHAPPEMENT (AVANT)	0.7	0.7
01	88	RUBBER MOUNT (MUFFLER) TAMPON D'ANCRAGE (SILENCIEUX)	0.3	0.3
01	90	ENGINE OIL FILTER FILTRE À HUILE DU MOTEUR	0.4	0.4
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	7.5	7.5
01	98	COOLING RESERVOIR RÉSERVOIR D'ANTIGEL	0.4	0.4
01	100	RADIATOR OUTLET HOSE BOYAU DE SORTIE DU RADIATEUR	0.6	0.6
01	101	PISTON, PIN, CIRCLIP, RINGS (1) PISTON, GOUPILLE, CIRCLIP, SEGMENTS (1)	3.1	3.1
01	102	PISTONS, PINS, CIRCLIPS, RINGS (2) PISTONS, GOUPILLES, CIRCLIPS, SEGMENTS (2)	4.9	4.9
01	109	VALVE COVER AND/OR GASKET COUVERCLE DE SOUPAPE ET/OU JOINT D'ÉTANCHÉITÉ	0.4	0.4
01	111	TIMING GEAR PIGNON DE DISTRIBUTION	1.6	1.6
01	113	ROCKER ARM AND/OR PUSH ROD AND/OR ROCKER ARM SHAFT CULBUTEUR ET/OU TIGE POUSSOIR ET/OU ARBRE DE CULBUTEUR	1.7	1.7
01	114	CYLINDER HEAD AND/OR GASKET CULASSE ET/OU JOINT D'ÉTANCHÉITÉ	3.8	3.8
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	3.0	3.0
01	117	CYLINDER AND/OR GASKET CYLINDRE ET/OU JOINT D'ÉTANCHÉITÉ	3.0	3.0
01	119	WATER PUMP HOUSING AND/OR IMPELLER CARTER DE LA POMPE À EAU ET/OU ROUE À AILETTES	0.7	0.7
01	132	OIL PUMP GEAR ENGRENAGE DE LA POMPE À HUILE	2.1	2.1
01	133	OIL PIPE TUYAU À L'HUILE	0.4	0.4
01	134	CAMSHAFT ARBRE À CAME	2.6	2.6
01	137	OIL PUMP COVER AND/OR SHAFT AND/OR ROTOR COUVERCLE DE LA POMPE À HUILE ET/OU ARBRE ET/OU ROTOR	2.1	2.1

SYSTEM SYSTÈME	CODE	DESCRIPTION	COMMANDER 800	COMMANDER 1000
			1	2
01	138	CRANKCASE RESEAL OR GASKET RECELLEMENT DU CARTER ET/OU JOINT D'ÉTANCHÉITÉ	7.5	7.5
01	139	CRANKCASE REPLACEMENT REMPLACEMENT DU CARTER	8.0	8.0
01	152	DRIVE SHAFT AND/OR BEARINGS AND/OR SEALS ARBRE D'ENTRAÎNEMENT ET/OU ROULEMENT À BILLES ET/OU ANNEAUX D'ÉTANCHÉITÉ	6.5	6.5
01	154	TIMING CHAIN CHAÎNE D'ENGRENAGE	3.4	3.4
01	179	CHAIN GUIDE GUIDE DE CHAÎNE	1.4	1.4
01	182	OIL RADIATOR AND/OR O-RING RADIATEUR D'HUILE ET/OU JOINT D'ÉTANCHÉITÉ		2.0
01	191	CHAIN TENSION GUIDE GUIDE DE TENSION DE CHAÎNE	3.4	3.4
01	192	CHAIN TENSIONER (ASS'Y) TENDEUR DE CHAÎNE (COMPLET)	0.4	0.4
01	200	WATER PUMP GEAR ENGRENAGE DE LA POMPE À EAU	2.1	2.1
01	201	PLUG, COMPRESSION SPRING, PRESSURE RETAINER AND BALL VIS, RESSORT DE COMPRESSION, SOUPAPE DE RETENUE ET BILLE	2.0	2.0
01	205	REAR OUTPUT SHAFT SEAL ANNEAU D'ÉTANCHÉITÉ DE L'ARBRE DE SORTIE ARRIÈRE	6.0	6.0
01	215	OIL DIPSTICK JAUGE À HUILE	0.3	0.3
01	216	PRESSURE CAP BOUCHON À PRESSION	0.3	0.3
01	217	ENGINE BRACKET AND/OR RUBBER MOUNT ATTACHE MOTEUR ET/OU TAMPON D'ANCRAGE	0.4	0.4
01	220	MAIN DRIVE GEAR AND/OR PIN ROUAGE D'ENTRAÎNEMENT PRINCIPALE ET/OU GOUPILLE	2.1	2.1
01	221	INTERMEDIATE GEAR AND/OR PIN AND/OR THRUST WASHER ROUAGE INTERMEDIAIRE ET/OU GOUPILLE ET/OU RONDELLE D'APPUI	2.1	2.1
01	223	FRONT OUTPUT SHAFT SEAL ANNEAU ÉTANCHÉITÉ ARBRE SORTIE AVANT	6.0	6.0
01	245	OUTPUT CRANKSHAFT SEAL (PTO SIDE) ANNEAU ÉTANCHÉITÉ SORTIE VILEBREQUIN (CÔTÉ PDM)	1.3	1.3
01	246	WATER PUMP GEAR AND/OR SEAL ARBRE POMPE À EAU ET/OU JOINT ÉTANCHÉITÉ	6.4	6.4
01	247	REED VALVE AND/OR STOPPER SOUPAPE À CLAPET ET/OU BUTOIR	2.1	2.1
01	248	BREATHER GEAR AND/OR V-RING RENIFLARD ET/OU ANNEAU ÉTANCHÉITÉ EN «V»	2.1	2.1

SYSTEM SYSTÈME	CODE	DESCRIPTION	COMMANDER 800	COMMANDER 1000
			1	2
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)	3.6	3.6
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)	6.2	6.2
01	261	TIMING CHAIN (MAG SIDE) CHAÎNE D'ENGRENAGE (CÔTÉ MAG)	3.2	3.2
01	264	LONG BLOCK ENSEMBLE CARTER - CYLINDRE - CULASSE	7.4	7.4
01	301	WATER PUMP DYNAMIC SEAL AND/OR OIL SEAL ANNEAU D'ÉTANCHÉITÉ DYNAMIQUE DE LA POMPE À EAU	2.5	2.5
01	303	TIMING CHAINS (ALL) CHAÎNES D'ENGRENAGE (TOUTES)	5.5	5.5
01	304	CHAINS TENSION GUIDE (ALL) GUIDE DE TENSION DE CHAÎNES (TOUS)	5.5	5.5
01	305	CHAINS GUIDE (ALL) GUIDE DE CHAÎNES (TOUS)	2.1	2.1
01	307	VALVE COVERS AND/OR GASKETS (2) COUVERCLES SOUPAPE ET/OU JOINTS D'ÉTANCHÉITÉ (2)	0.7	0.7
01	308	CYLINDER HEAD GASKET (1) JOINT D'ÉTANCHÉITÉ DE LA CULASSE (1)	2.0	2.0
01	309	CYLINDER HEAD GASKETS (2) JOINTS D'ÉTANCHÉITÉ DE LA CULASSE (2)	2.7	2.7
01	319	MUFFLER COVER COUVRE SILENCIEUX	0.3	0.3

800/1000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AVANT/ARRIÈRE
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01261
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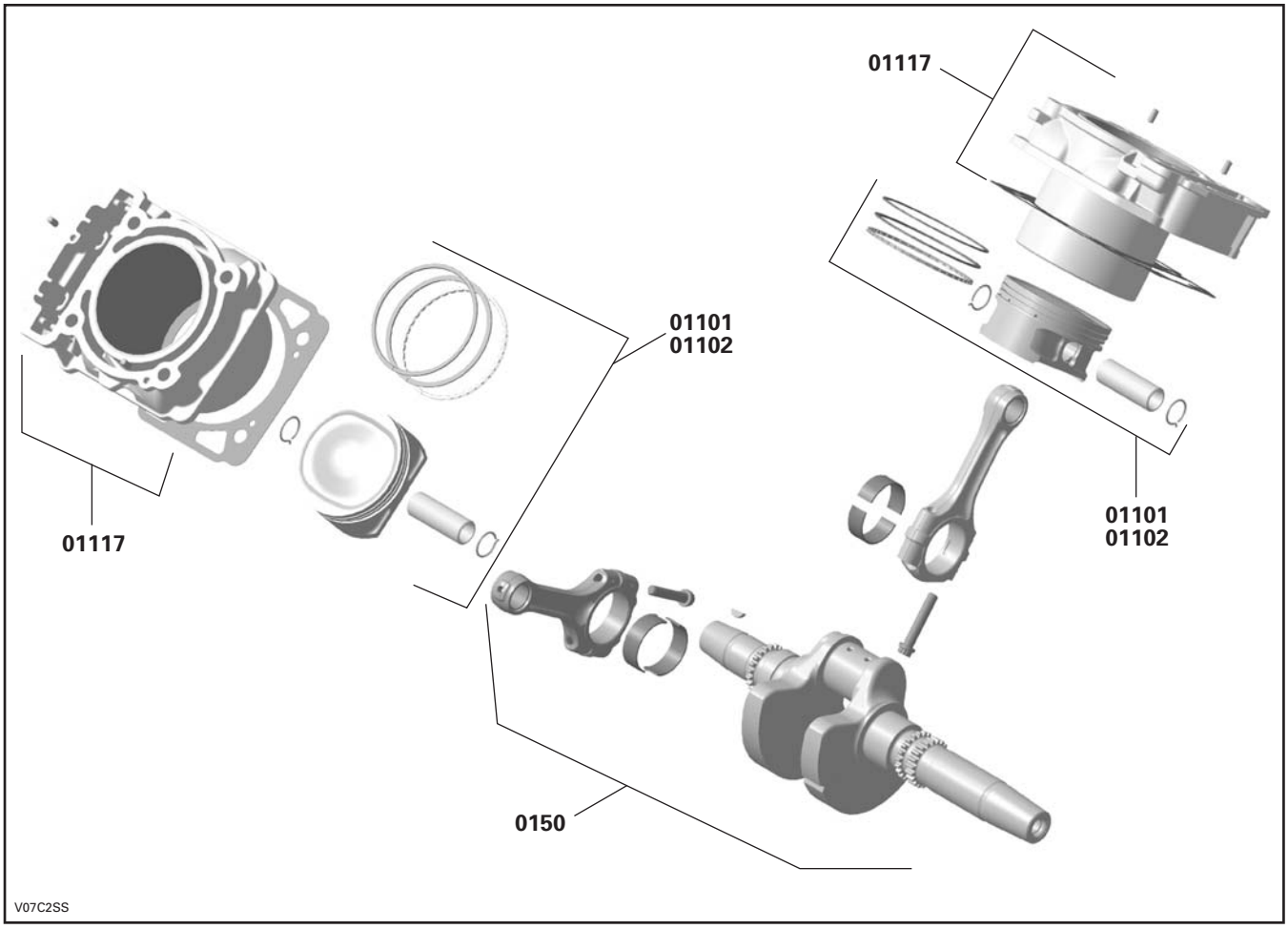
800/1000



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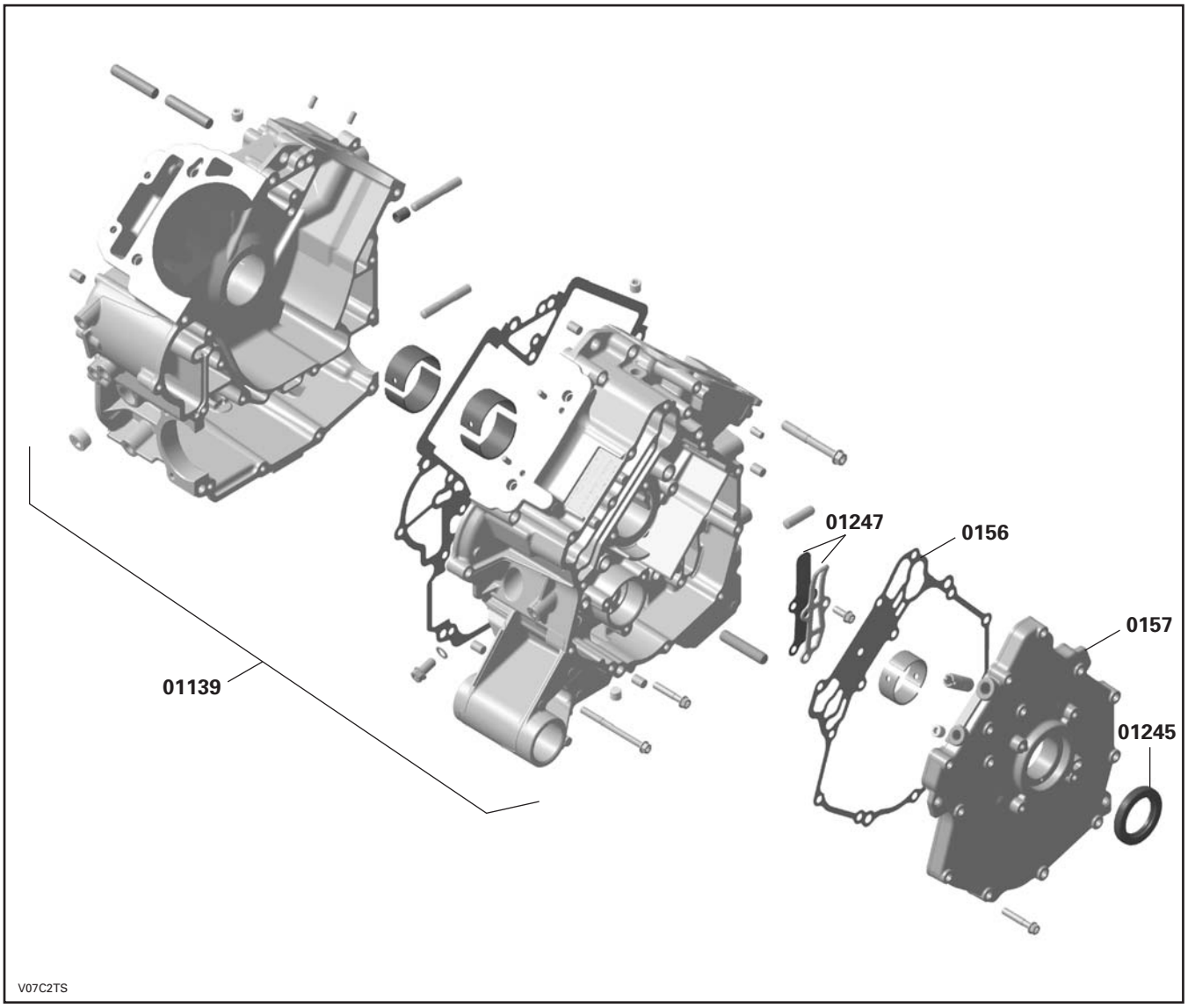

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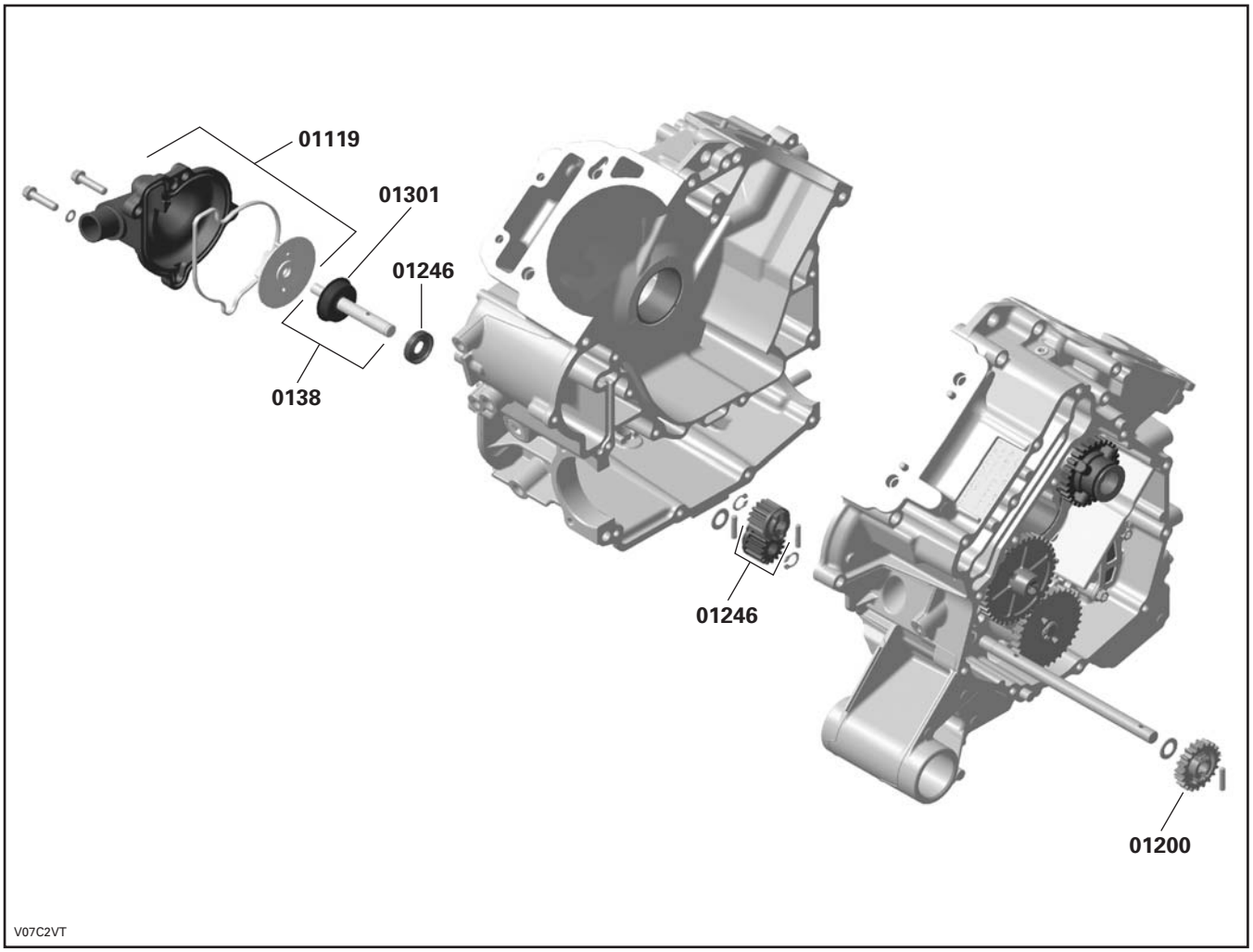

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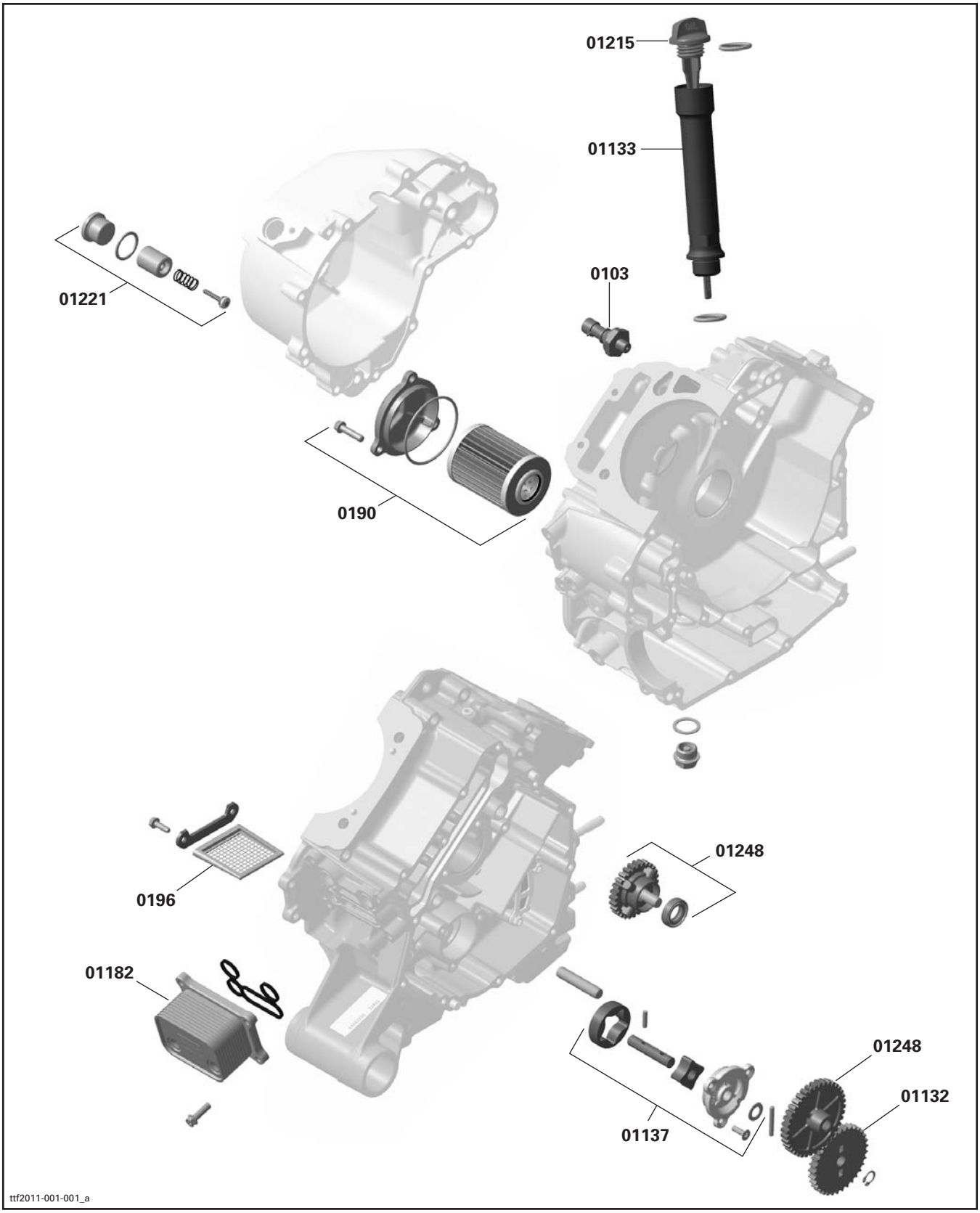
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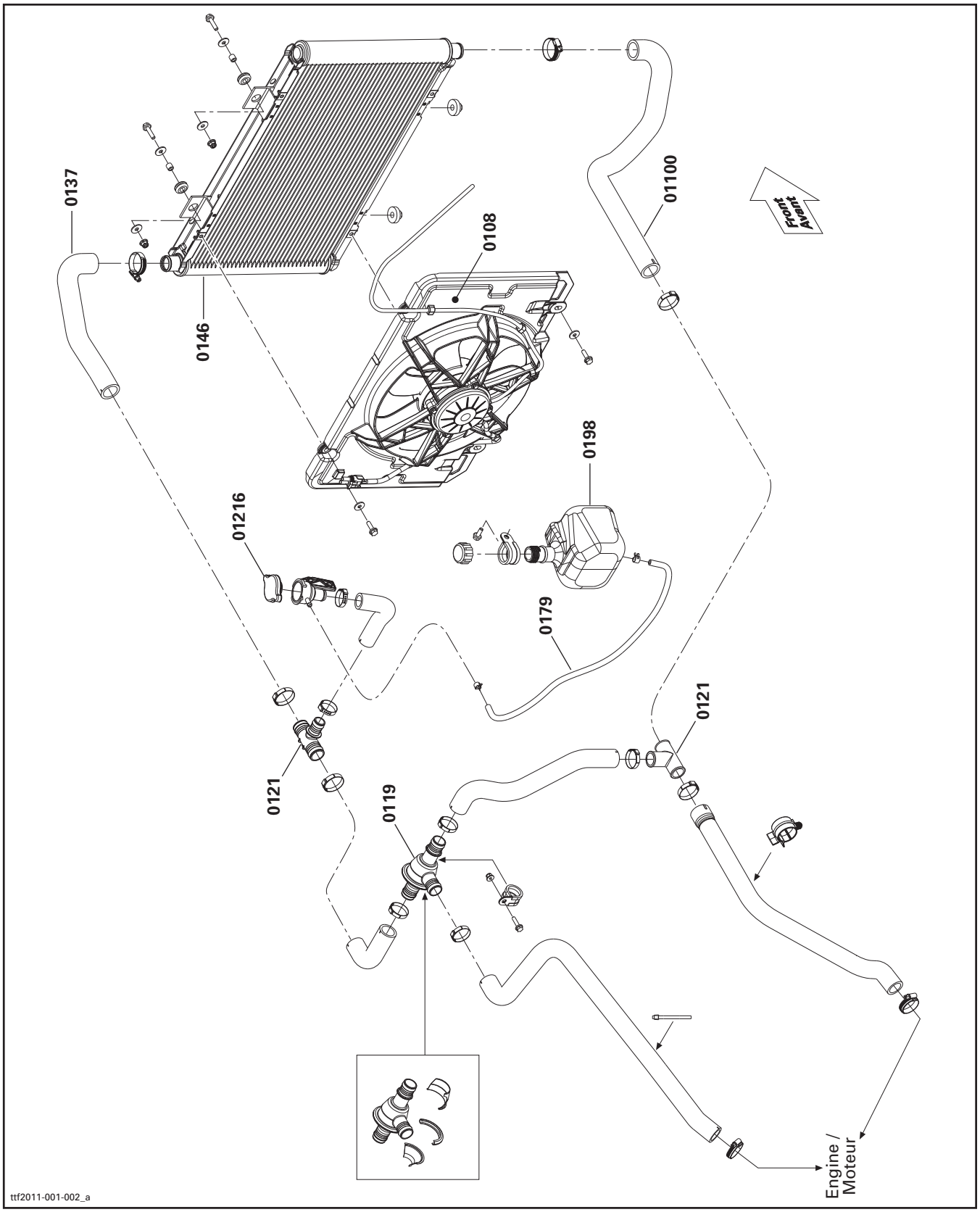
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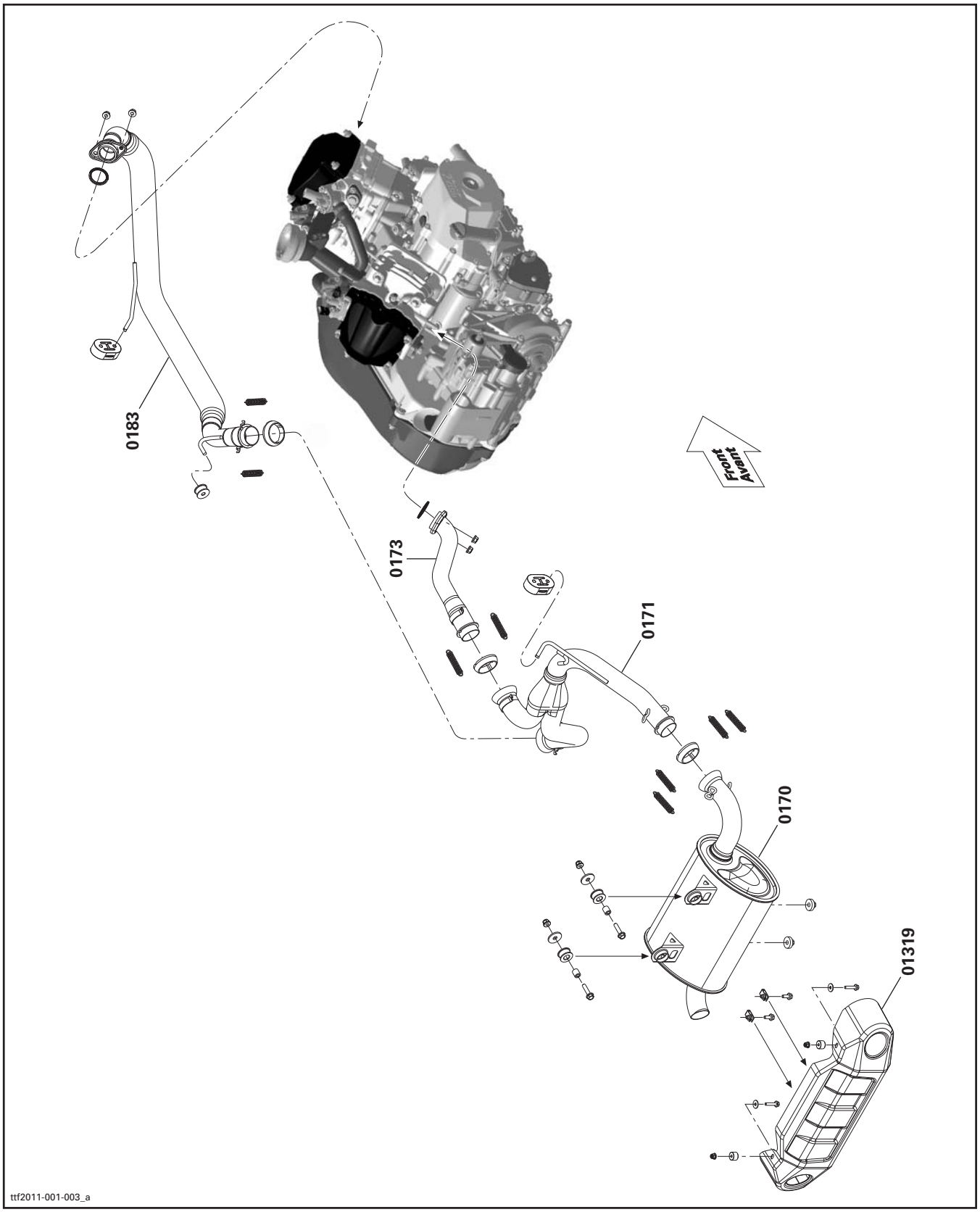
0119
Engine /
Moteur
ttf2011-001-002_a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Avant
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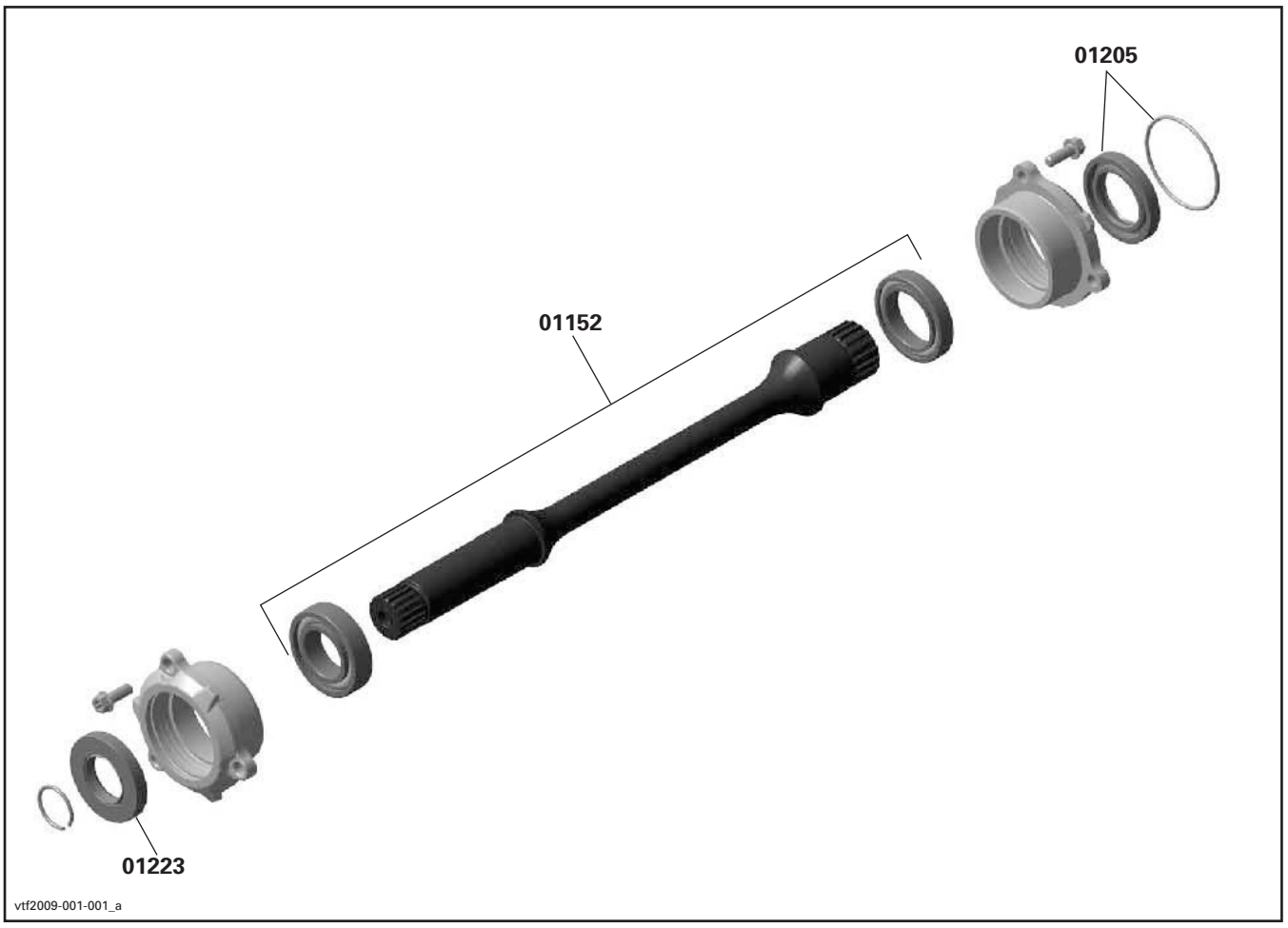
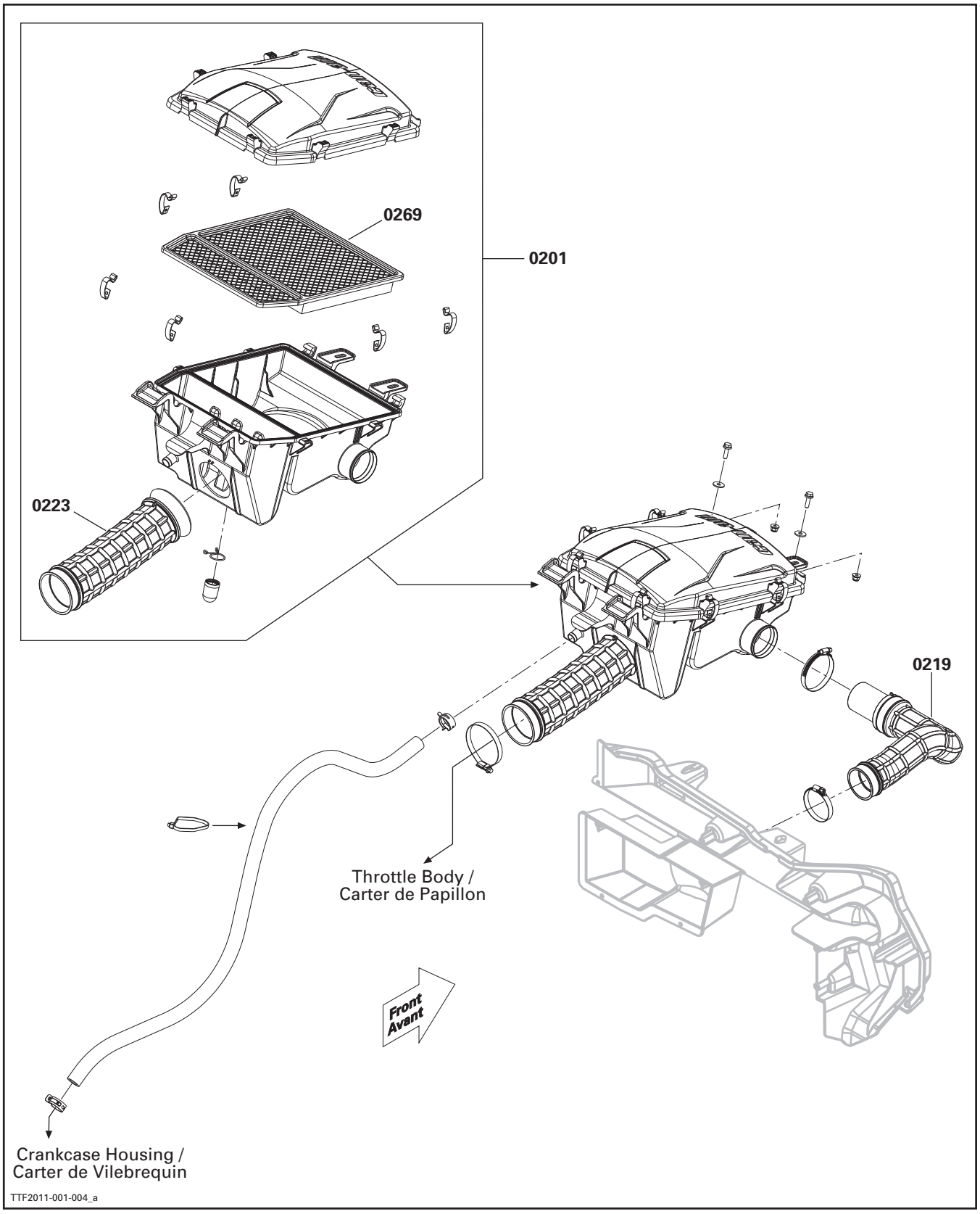
800/1000



INTAKE AND FUEL SYSTEM
ADMISSION ET SYSTÈME D'ALIMENTATION D'ESSENCE

SYSTEM SYSTÈME	CODE	DESCRIPTION	COMMANDER 800	COMMANDER 1000
			1	2
02	**00**	**NO LABOR INVOLVED AUCUNE MAIN D'OEUVRE**	**0**	**0**
02	01	AIR INTAKE SILENCER (ASS'Y) SILENCIEUX D'ADMISSION D'AIR (COMPLET)	1.1	1.1
02	16	INTAKE ADAPTOR ADAPTATEUR D'ADMISSION	0.7	0.7
02	19	AIR INTAKE TUBE TUYAU D'ADMISSION D'AIR	0.4	0.4
02	23	REAR AIR INTAKE TUBE AND/OR SLEEVE TUYAU D'ADMISSION D'AIR ARRIÈRE ET/OU DOUILLE	0.7	0.7
02	46	AIR TEMPERATURE SENSOR CAPTEUR DE TEMPÉRATURE D'AIR	0.6	0.6
02	57	FUEL FILTER FILTRE À ESSENCE	0.9	0.9
02	58	FUEL TANK RÉSERVOIR D'ESSENCE	1.1	1.1
02	59	INTAKE COVER AND/OR SEAL COUVERCLE D'ADMISSION ET/OU JOINT D'ÉTANCHÉITÉ	0.3	0.3
02	60	FUEL CAP BOUCHON DU RÉSERVOIR À ESSENCE	0.3	0.3
02	69	AIR FILTER FILTRE À AIR	0.3	0.3
02	72	INTAKE MANIFOLD CONNECTEUR D'ADMISSION	1.1	1.1
02	79	FUEL RAIL (1 OR 2) RAMPE D'ESSENCE (1 OU 2)	1.0	1.0
02	80	INJECTOR (ALL) INJECTEUR (TOUS)	1.0	1.0
02	81	THROTTLE BODY (ASS'Y) CARTER ACCÉLÉRATEUR (COMPLET)	1.1	1.1
02	89	FUEL PUMP MODULE MODULE POMPE À ESSENCE	0.9	0.9
02	94	FEMALE QUICK FITTING CONNECTEUR RAPIDE FEMELLE	0.4	0.4
02	99	FUEL INJECTION HOSE (ASS'Y) BOYAU À INJECTION D'ESSENCE (COMPLET)	0.8	0.8
02	112	AIR SILENCER SUPPORT SUPPORT DU SILENCIEUX D'ADMISSION	0.7	0.7
02	115	PLENUM CHAMBRE D'AIR	1.1	1.1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0201
0223
0219
Throttle Body /
Carter de Papillon
Front
Avant
Crankcase Housing /
Carter de Vilebrequin
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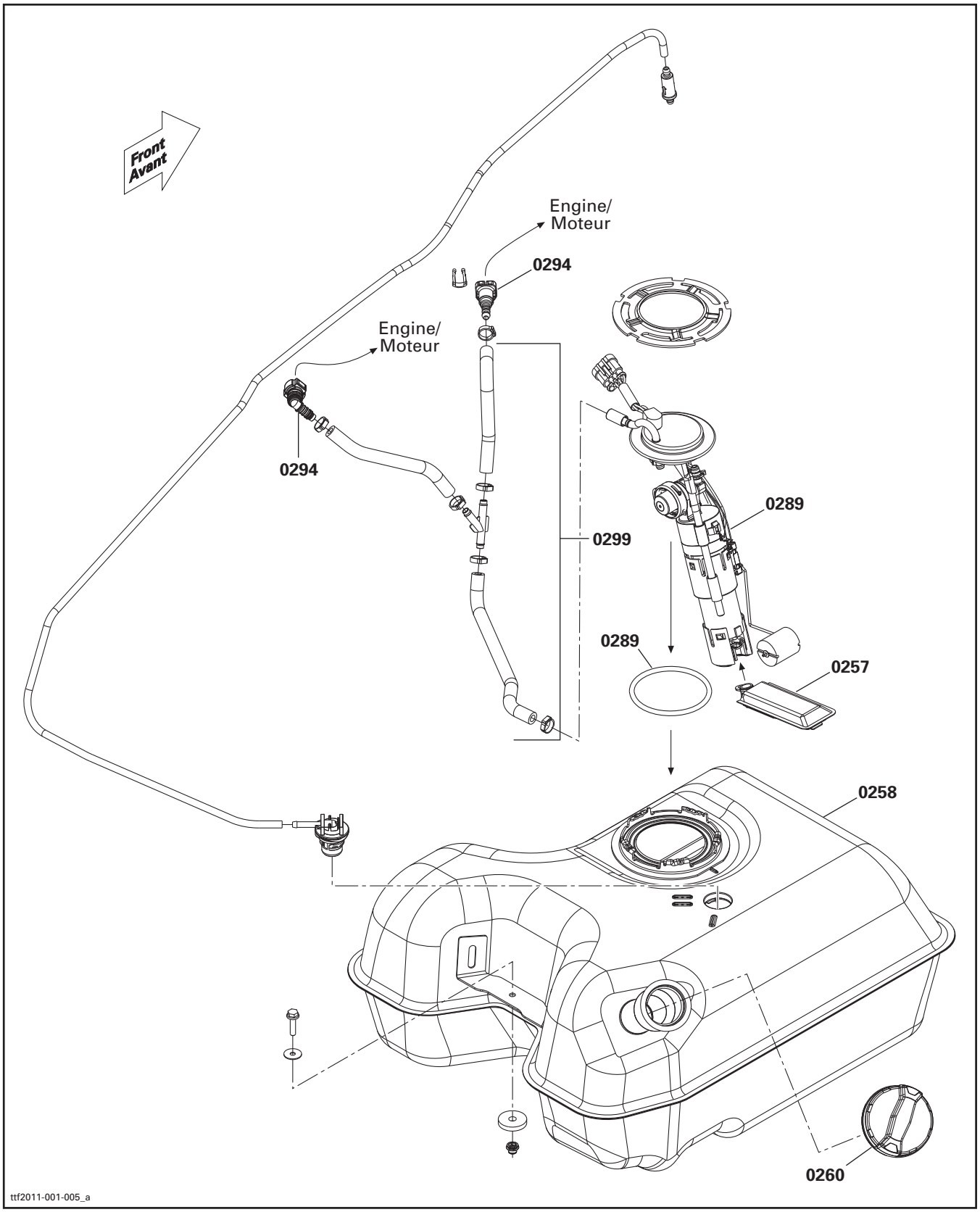
INTAKE AND FUEL SYSTEM
ADMISSION ET SYSTÈME D'ALIMENTATION D'ESSENCE



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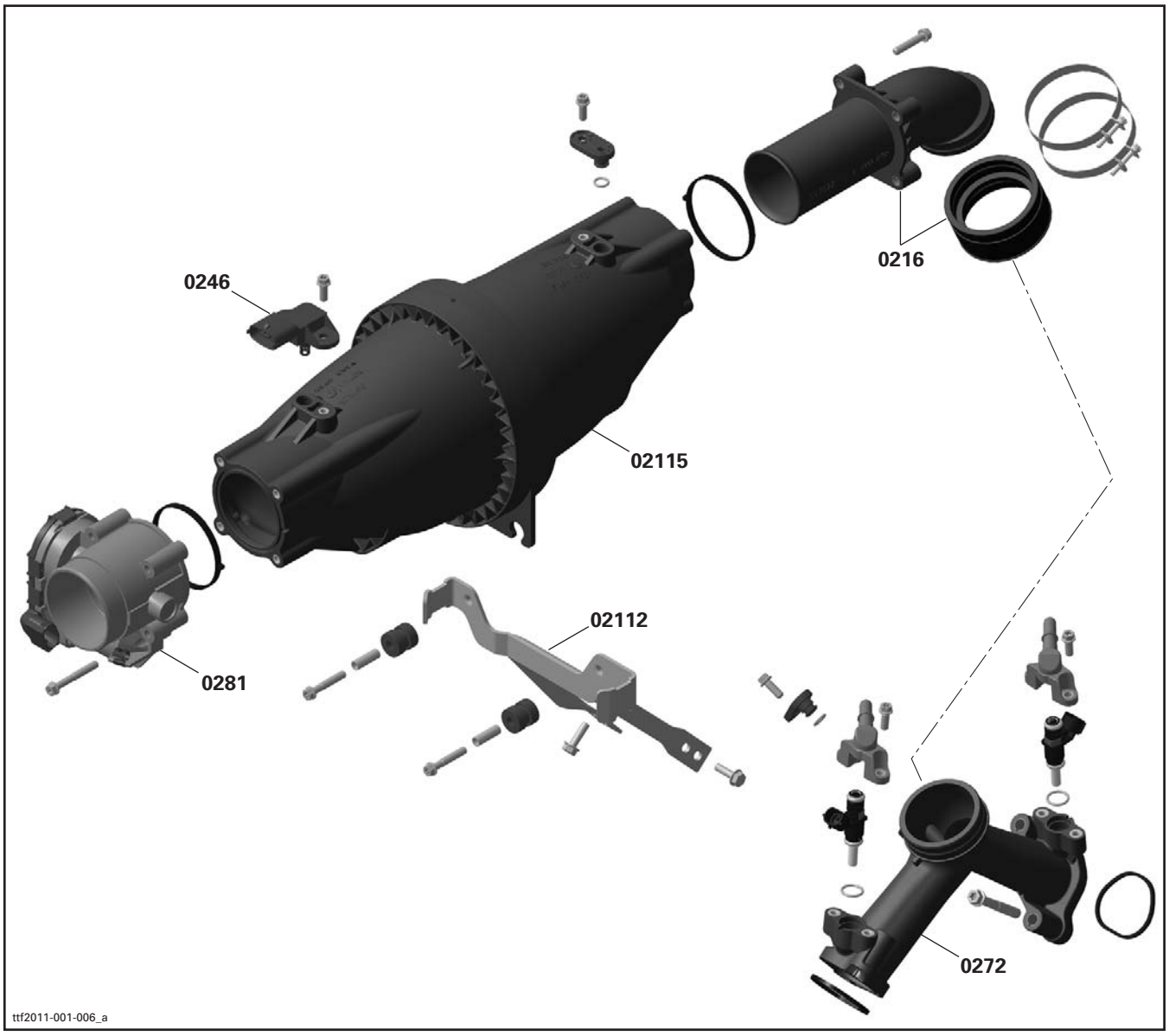
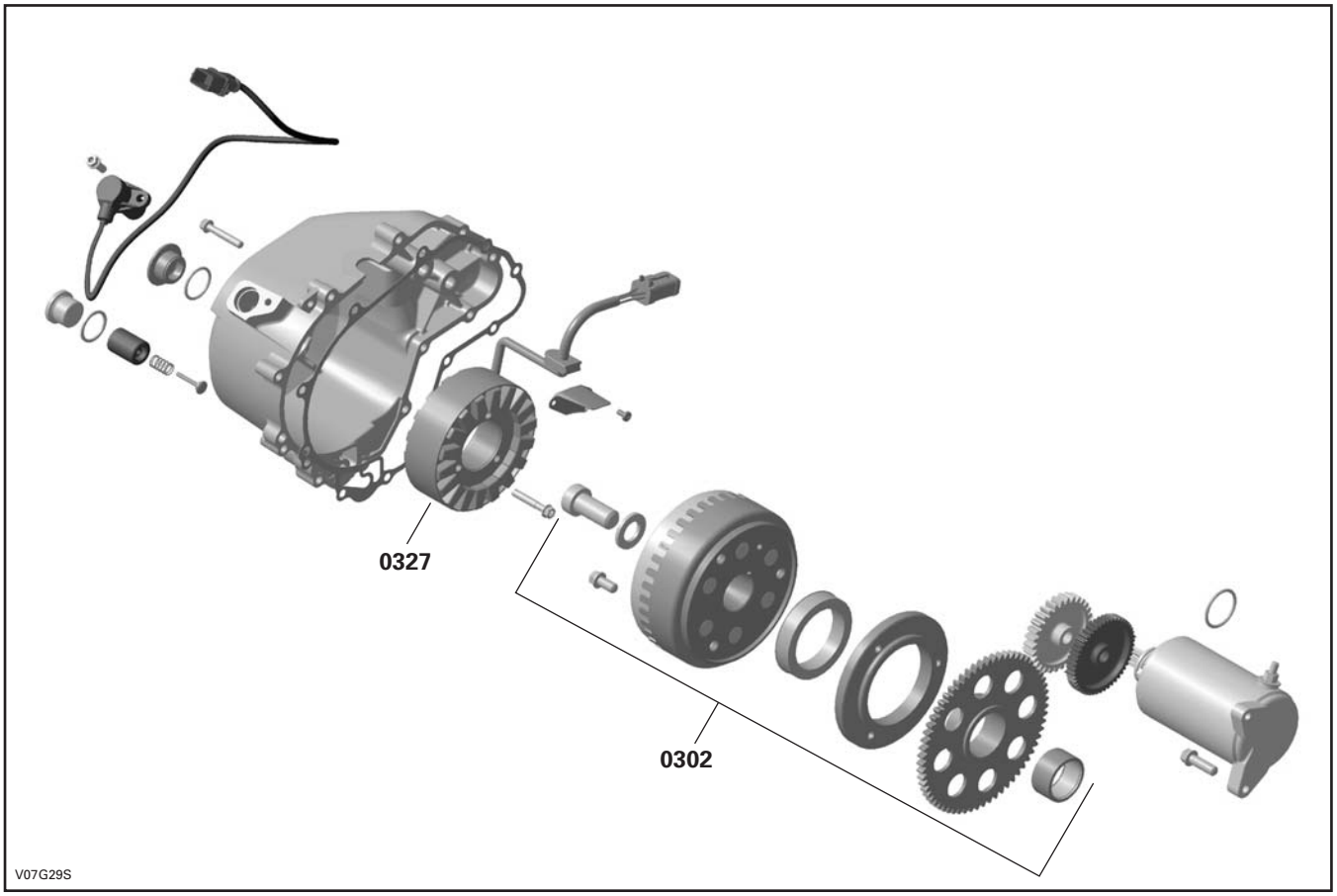


IGNITION SYSTEM
SYSTÈME D'ALLUMAGE

SYSTEM SYSTÈME	CODE	DESCRIPTION	COMMANDER 800	COMMANDER 1000
			1	2
03	**00**	**NO LABOR INVOLVED AUCUNE MAIN D'OEUVRE**	**0**	**0**
03	02	MAGNETO (ASS'Y) MAGNÉTO (COMPLET)	2.3	2.3
03	08	IGNITION COIL (EACH) BOBINE D'ALLUMAGE (CHAQUE)	0.5	0.5
03	10	IGNITION CABLE CÂBLE D'ALLUMAGE	0.4	0.4
03	27	STATOR (ASS'Y) STATOR (COMPLET)	2.1	2.1

800/1000



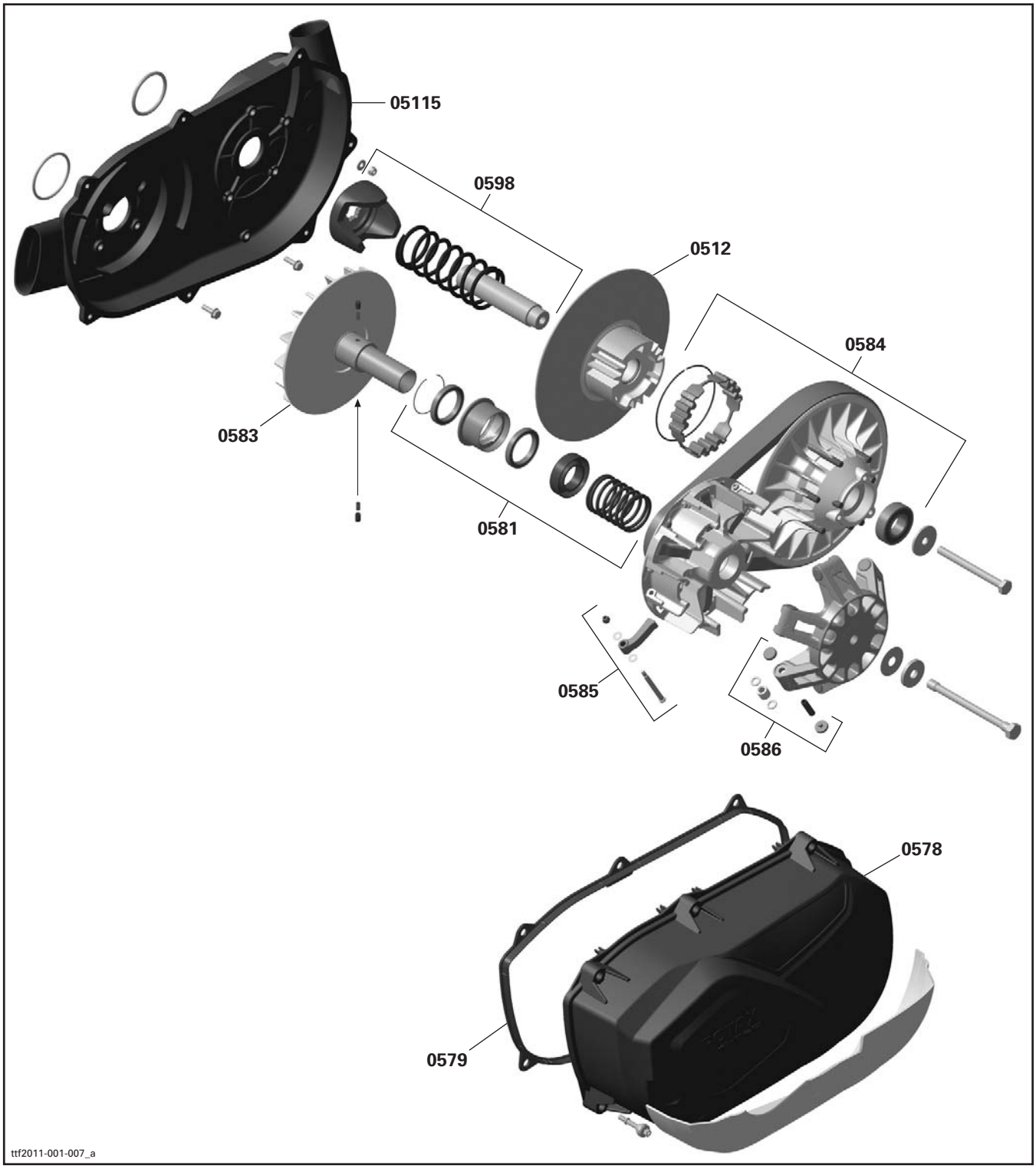
STARTER SYSTEM
SYSTÈME DE DÉMARREUR

SYSTEM SYSTÈME	CODE	DESCRIPTION	COMMANDER 800	COMMANDER 1000
			1	2
04	**00**	**NO LABOUR INVOLVED AUCUNE MAIN-D'OEUVRE**	**0**	**0**
04	02	ELECTRIC STARTER (ASS'Y) DÉMARREUR (COMPLET)	0.6	0.6
04	03	STARTER RELAY SOLÉNOÏDE DE DÉMARRAGE	0.3	0.3
04	19	STARTER DRIVE LANCEUR DÉMARREUR	2.3	2.3

SYSTEM SYSTÈME	CODE	DESCRIPTION	COMMANDER 800	COMMANDER 1000
			1	2
05	**00**	**NO LABOR INVOLVED AUCUNE MAIN-D'OEUVRE IMPLIQUÉE**	**0**	**0**
05	12	DRIVEN PULLEY SLIDING HALF DEMI-POULIE MENÉE COULISSANTE	1.3	1.3
05	19	BELT COURROIE	1.2	1.2
05	55	LEVER BUTTON BOUTON DE LEVIER	0.3	0.3
05	56	LEVER (ASS'Y) AND/OR LEVER SPRING LEVIER (COMPLET) ET/OU RESSORT DE LEVIER	0.6	0.6
05	59	SPEED SENSOR CAPTEUR DE VITESSE	0.4	0.4
05	66	GEARSHIFT LEVER LEVIER D'EMBRAYAGE	0.5	0.5
05	78	CVT COVER COUVERCLE CVC	1.1	1.1
05	79	GASKET JOINT D'ÉTANCHÉITÉ	1.1	1.1
05	80	GOVERNOR CUP COUPOLE RÉGULATEUR	1.4	1.4
05	81	ONE WAY CLUTCH, FLANGE, RING, SPRING EMBRAYAGE À ROUE LIBRE, FLASQUE, ANNEAU, RESSORT	1.4	1.4
05	82	DRIVE PULLEY (ASS'Y) POULIE MOTRICE (COMPLET)	1.5	1.5
05	83	DRIVE PULLEY FIXED HALF POULIE MOTRICE FIXE	1.5	1.5
05	84	DRIVEN PULLEY OUTER CAM AND/OR SPRING CAME DE POULIE MENÉE EXTERNE ET/OU RESSORT	1.3	1.3
05	85	CENTRIFUGAL LEVER LEVIER CENTRIFUGE	1.6	1.6
05	86	SLIDER SHOES GLISSIÈRES	1.4	1.4
05	89	REMOVE AND REPLACE TRANSMISSION ASS'Y REMPLACEMENT DE LA TRANSMISSION (COMPLET)	5.9	5.9
05	91	MAIN SHAFT (ASS'Y) ARBRE DE RENVOI (COMPLET)	6.5	6.5
05	95	AIR INTAKE (CVT) ENTRÉE D'AIR (CVC)	0.5	0.5
05	96	AIR OUTLET (CVT) SORTIE D'AIR (CVC)	0.5	0.5
05	97	FLEXIBLE ADAPTOR ADAPTATEUR FLEXIBLE	0.5	0.5

TRANSMISSION AND LINKAGE SYSTEM
SYSTÈME DE TRANSMISSION ET DE TRINGLERIE

SYSTEM SYSTÈME	CODE	DESCRIPTION	COMMANDER 800	COMMANDER 1000
			1	2
05	98	CAM, PLATE, DRIVEN SHAFT, SPRING CAME, PLAQUE, ARBRE POULIE MENÉE, RESSORT	1.3	1.3
05	99	OUTPUT SHAFT ARBRE DE SORTIE	6.4	6.4
05	100	REAR OUTPUT SHAFT SEALS ANNEAUX ÉTANCHÉITÉ DE L'ARBRE DE SORTIE ARRIÈRE	6.2	6.2
05	101	GEARS BOX (ASS'Y)/MAIN SHAFT BOÎTE D'ENGRENAGE (COMPLET)/ARBRE PRINCIPAL	6.7	6.7
05	102	SHIFT SHAFT (ASS'Y) ARBRE D'EMBRAYAGE (COMPLET)	6.7	6.7
05	104	INDEX LEVER (ASS'Y) LEVIER D'INDEXATION (COMPLET)	6.7	6.7
05	105	MAIN SHAFT SEAL JOINT D'ÉTANCHÉITÉ DE L'ARBRE PRINCIPAL	1.9	1.9
05	107	SPACER AND/OR O-RING ENTRETOISE ET/OU JOINT TORIQUE	0.8	0.8
05	108	ACTUATOR AND/OR FORK AND/OR SEAL ACTUATEUR ET/OU FOURCHETTE ET/OU JOINT D'ÉTANCHÉITÉ	0.8	0.8
05	109	FORK AND/OR PIN FOURCHETTE ET/OU GOUPILLE	1.2	1.2
05	110	CENTER HOUSING GEAR AND/OR BEARING LOGEMENT DE TRANSMISSION CENTRE ET/OU ROULEMENT	6.7	6.7
05	111	RH HOUSING GEAR AND/OR BEARING LOGEMENT DE TRANSMISSION DROIT ET/OU ROULEMENT	6.6	6.6
05	113	SHIFTING SWITCH INTERRUPTEUR D'EMBRAYAGE	0.6	0.6
05	115	CVT AIR GUIDE AND/OR O-RINGS GUIDE D'AÉRATION ET/OU JOINT D'ÉTANCHÉITÉ	1.6	1.6
05	120	GEARBOX POSITION SENSOR CAPTEUR DE POSITION D'ENGRENAGE	0.4	0.4
05	159	PRIMARY INLET AND/OR ADAPTER ENTRÉE PRIMAIRE ET/OU ADAPTATEUR	0.3	0.3
05	160	FILTER FILTRE	0.3	0.3
05	161	SHIFTING CABLE CÂBLE D'EMBRAYAGE	1.1	1.1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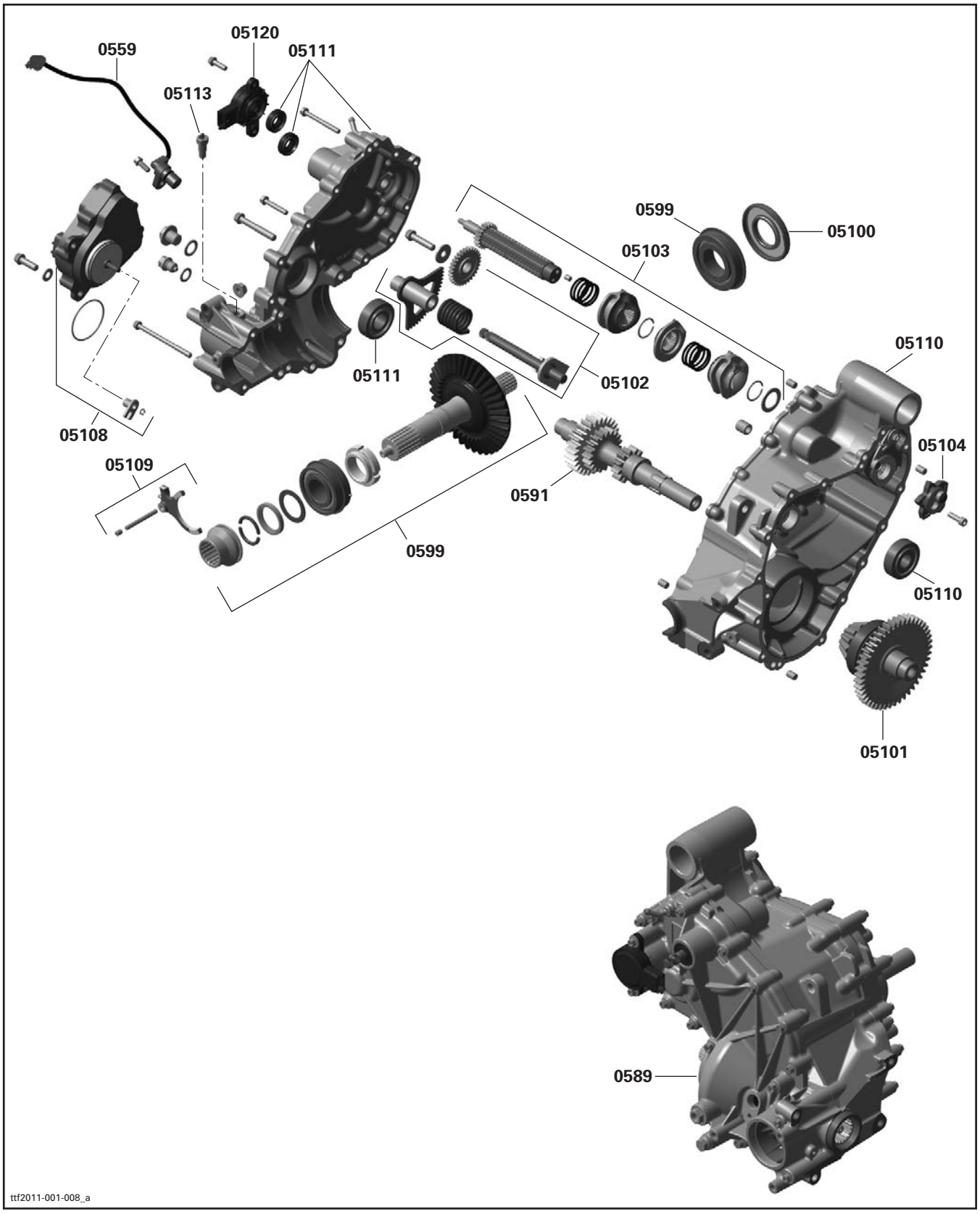
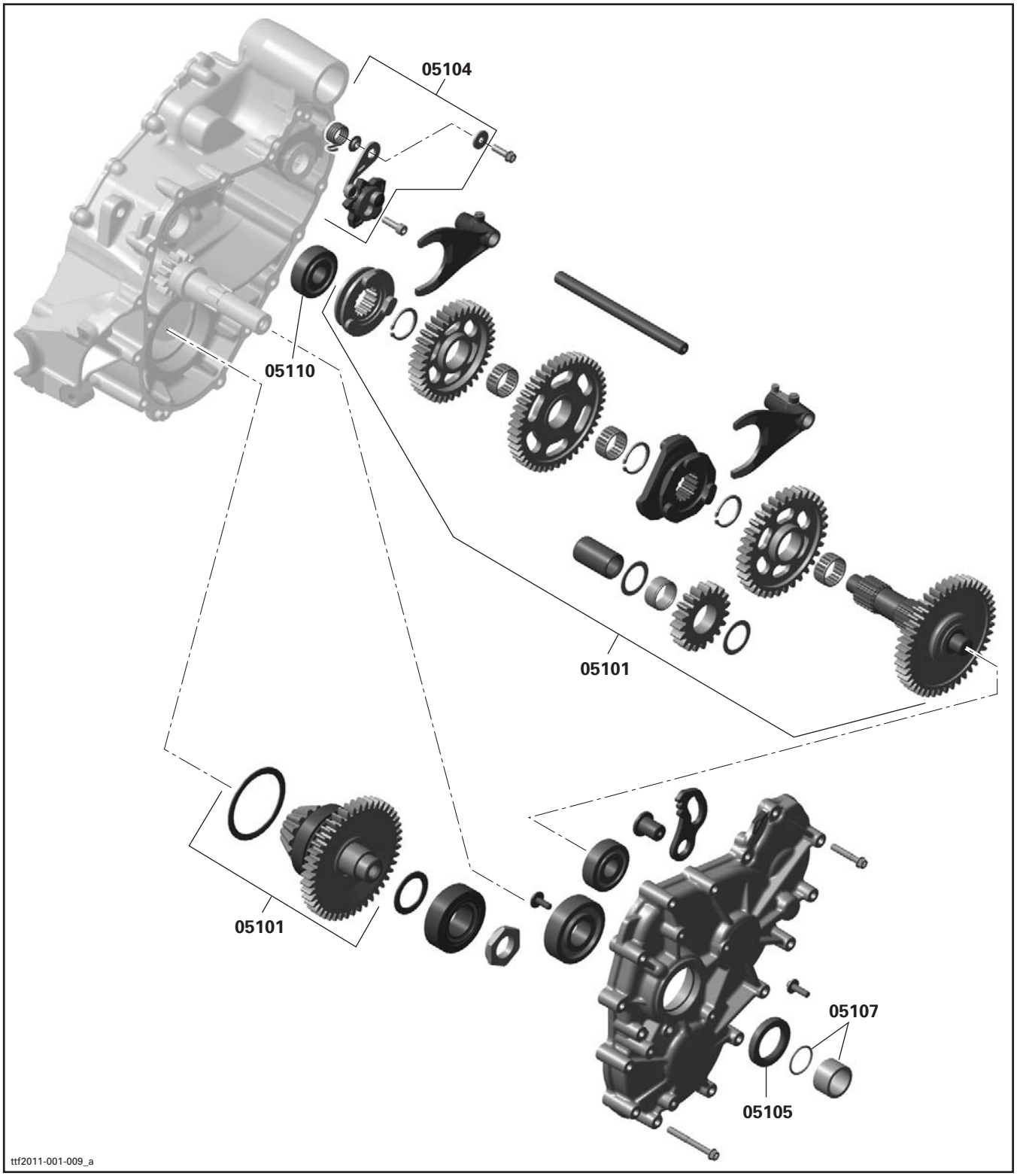
TRANSMISSION AND LINKAGE SYSTEM
SYSTÈME DE TRANSMISSION ET DE TRINGLERIE

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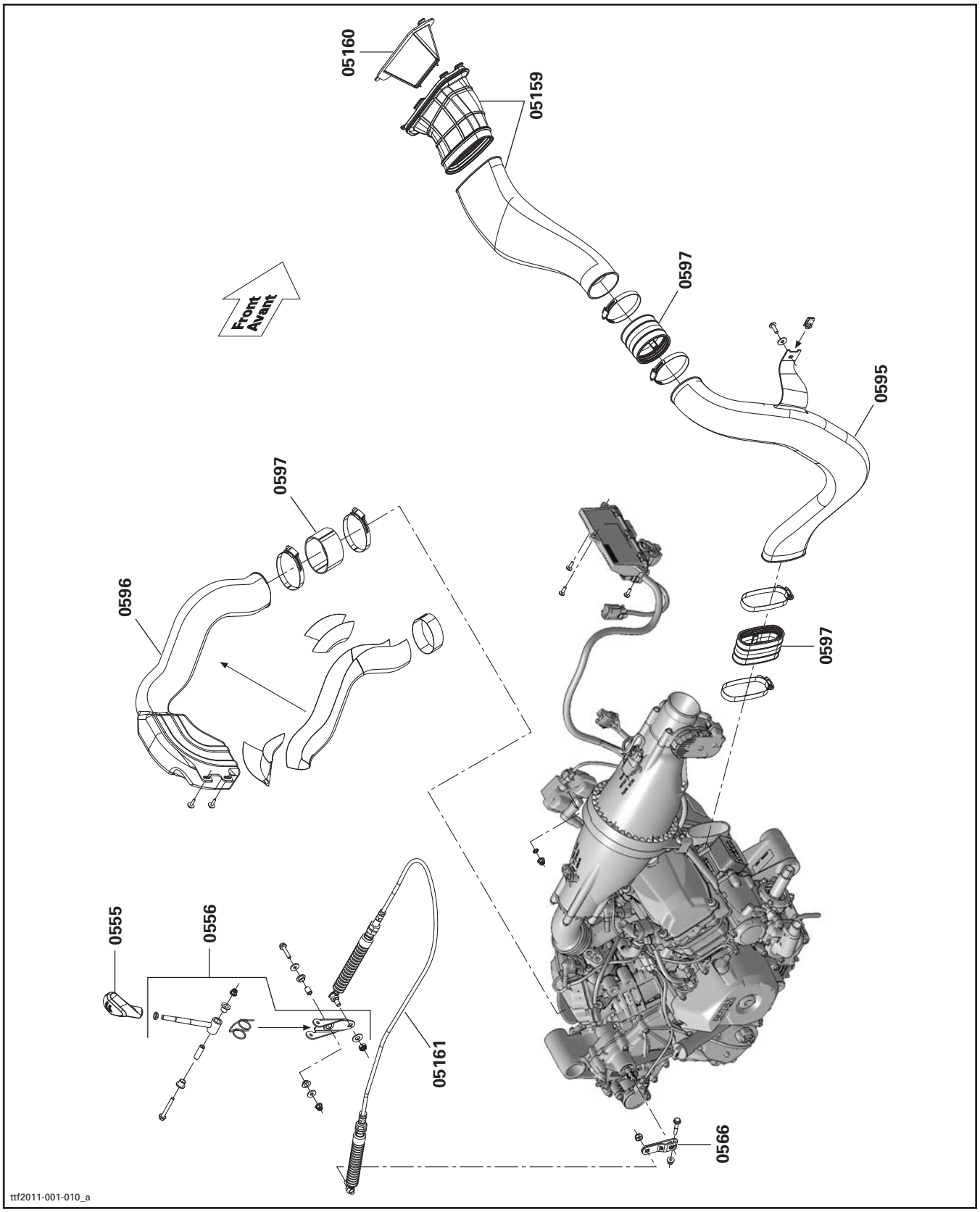
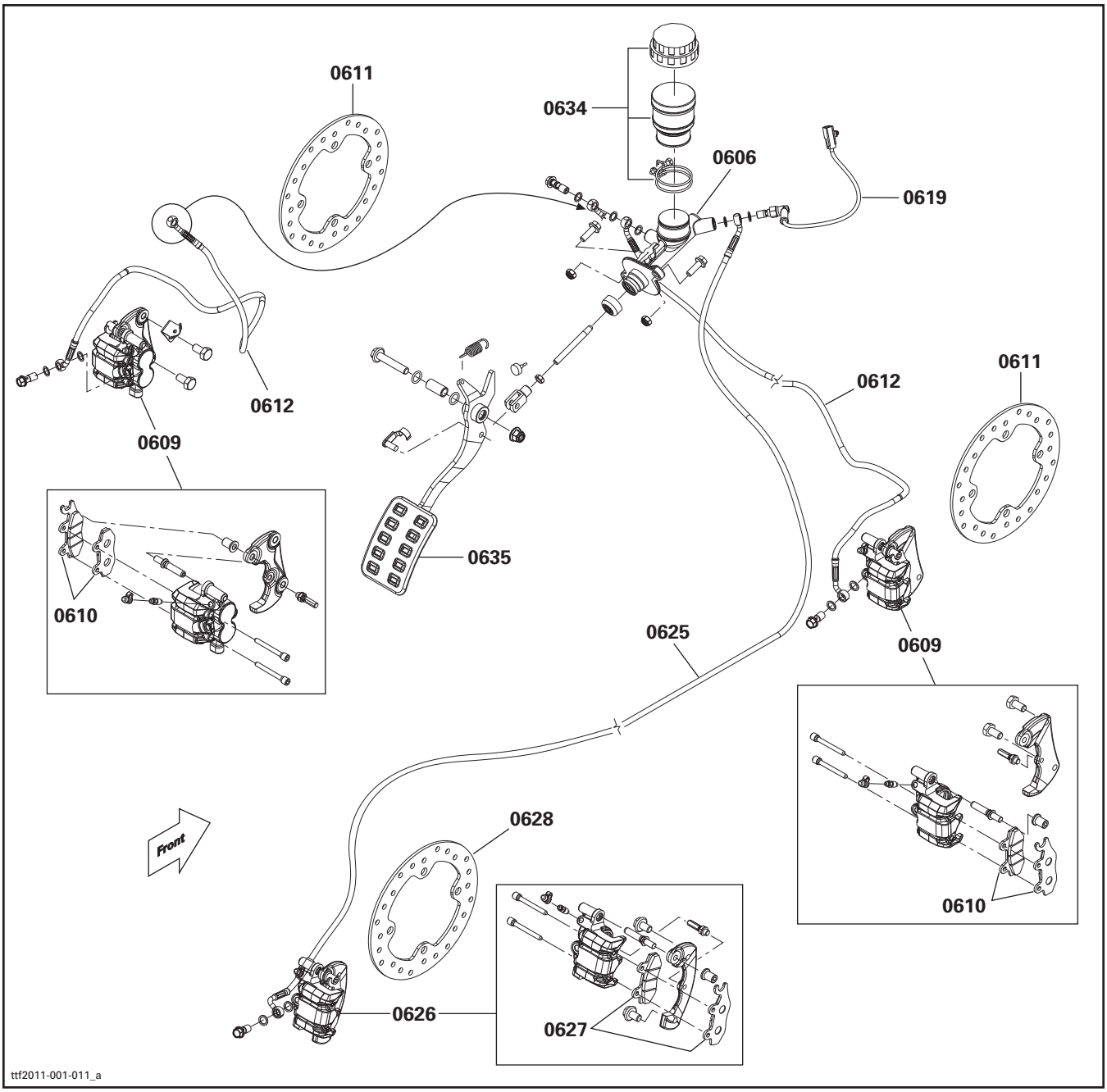
TRANSMISSION AND LINKAGE SYSTEM
SYSTÈME DE TRANSMISSION ET DE TRINGLERIE



SYSTEM SYSTÈME	CODE	DESCRIPTION	COMMANDER 800	COMMANDER 1000
			1	2
06	**00**	**NO LABOR INVOLVED AUCUNE MAIN-D'OEUVRE**	**0**	**0**
06	06	MASTER CYLINDER MAÎTRE-CYLINDRE	1.0	1.0
06	09	FRONT CALIPER (RH OR LH) ÉTRIER AVANT (DROIT OU GAUCHE)	0.5	0.5
06	10	FRONT BRAKE PAD (RH OR LH) PLAQUETTE DE FREIN AVANT (DROIT OU GAUCHE)	0.3	0.3
06	11	FRONT BRAKE DISC (RH OR LH) DISQUE DE FREIN AVANT (DROIT OU GAUCHE)	0.7	0.7
06	12	FRONT FLEXIBLE BRAKE HOSE BOYAU FLEXIBLE DE FREIN AVANT	0.8	0.8
06	19	BRAKE SWITCH INTERRUPTEUR DE FREIN	0.3	0.3
06	25	REAR BRAKE HOSE BOYAU DE FREIN ARRIÈRE	1.3	1.3
06	26	REAR CALIPER ÉTRIER ARRIÈRE	0.5	0.5
06	27	REAR BRAKE PAD PLAQUETTE DE FREIN ARRIÈRE	0.3	0.3
06	28	REAR BRAKE DISC DISQUE DE FREIN ARRIÈRE	0.7	0.7
06	34	MASTER CYLINDER RESERVOIR RÉSERVOIR DU MAÎTRE-CYLINDRE	0.5	0.5
06	35	BRAKE PEDAL PÉDALE DE FREIN	0.5	0.5
06	44	MASTER CYLINDER ROD TIGE DU MAÎTRE-CYLINDRE	0.4	0.4

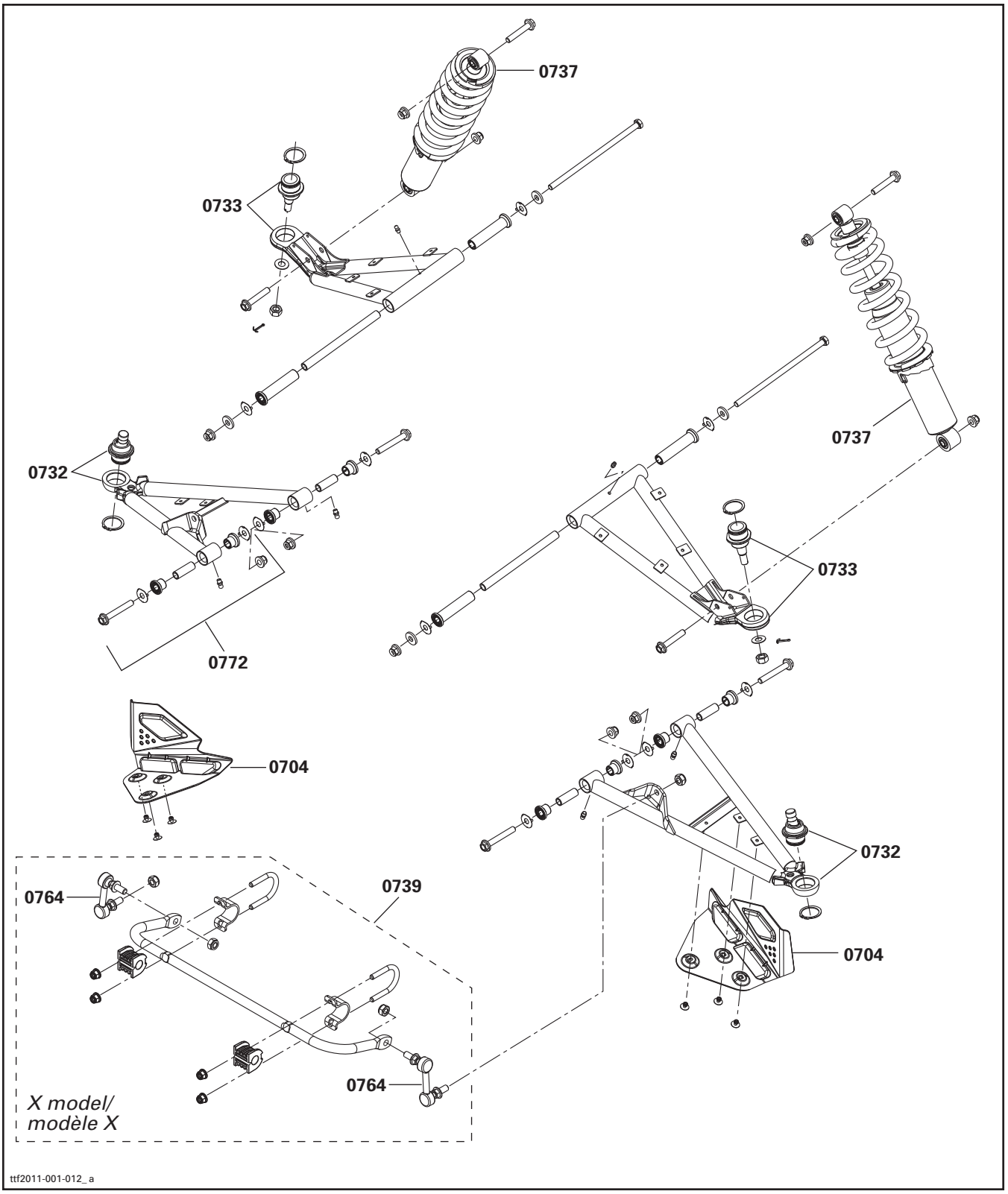
BRAKE SYSTEM
SYSTÈME DE FREIN



SYSTEM SYSTÈME	CODE	DESCRIPTION	COMMANDER 800	COMMANDER 1000
			1	2
07	**00**	**NO LABOR INVOLVED AUCUNE MAIN-D'OEUVRE**	**0**	**0**
07	04	ARM PROTECTOR (RH OR LH) PROTECTEUR DE BRAS (DROIT OU GAUCHE)	0.3	0.3
07	13	EXTERNAL BALL JOINT (RH OR LH) JOINT À ROTULE EXTERNE (DROIT OU GAUCHE)	0.8	0.8
07	24	MAIN TUBE TUBE PRINCIPAL	1.1	1.1
07	27	STEERING COVER COUVRE-GUIDON	0.3	0.3
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
07	33	UPPER ARM (RH OR LH) BRAS DE SUSPENSION SUPÉRIEUR (DROIT OU GAUCHE)	0.7	0.7
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)	0.4	0.4
07	40	FRONT DIFFERENTIEL (ASS'Y) DIFFÉRENTIEL AVANT (COMPLET)	2.8	2.8
07	42	FRONT PROPELLER SHAFT (ASS'Y) ARBRE DE PROPULSION AVANT (COMPLET)	2.0	2.0
07	45	CV JOINT (RH OR LH) JOINT HOMOCINÉTIQUE (DROIT OU GAUCHE)	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
07	47	KNUCKLE (RH OR LH) PORTE-FUSÉE (DROIT OU GAUCHE)	0.7	0.7
07	50	FRONT RIM AND/OR TIRE JANTE AVANT ET/OU PNEU	0.4	0.4
07	64	DOUBLE BALL JOINT JOINT À ROTULE DOUBLE		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
07	80	FRONT RIM JANTE AVANT	0.4	0.4
07	85	RING GEAR AND/OR CARRIER AND/OR SHIM COURONNE DE LANCEMENT ET/OU SUPPORT ET/OU CALE	3.3	3.3
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	3.3	3.3
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	3.6	3.6
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

STEERING - FRONT DRIVE SYSTEM AND SUSPENSION
DIRECTION - SYSTÈME D'ENTRAÎNEMENT AVANT ET SUSPENSION

SYSTEM SYSTÈME	CODE	DESCRIPTION	COMMANDER 800	COMMANDER 1000
			1	2
07	91	BOOT DIFFERENTIAL KIT AND/OR PLUNGING JOINT (RH OR LH) ENSEMBLE DE SOUFFLET DE DIFFÉRENTIEL ET/OU JOINT PLONGEANT (DROIT OU GAUCHE)	0.8	0.8
07	92	SLEEVE AND/OR WEARRING MANCHON ET/OU BAGUE D'USURE	3.1	3.1
07	103	DIFFERENTIAL SEAL (1) JOINT D'ÉTANCHÉITÉ DU DIFFÉRENTIEL (1)	0.7	0.7
07	104	DIFFERENTIAL SEALS (2) JOINTS D'ÉTANCHÉITÉ DU DIFFÉRENTIEL (2)	1.4	1.4
07	106	STEERING COLUMN SUPPORT AND/OR BUSHINGS SUPPORT DE COLONNE DE DIRECTION ET/OU COUSSINETS	0.8	0.8
07	115	RACK AND PINION STEERING DIRECTION À CRÉMAILLÈRE	2.0	2.0
07	116	STEERING SHAFT ARBRE DU VOLANT	0.9	0.9
07	117	ADJUSTMENT CYLINDER CYLINDRE D'AJUSTEMENT	0.3	0.3
07	118	STEERING WHEEL VOLANT	0.3	0.3
07	120	DIFFERENTIAL OIL SEAL ANNEAU D'ÉTANCHÉITÉ DU DIFFÉRENTIEL	3.0	3.0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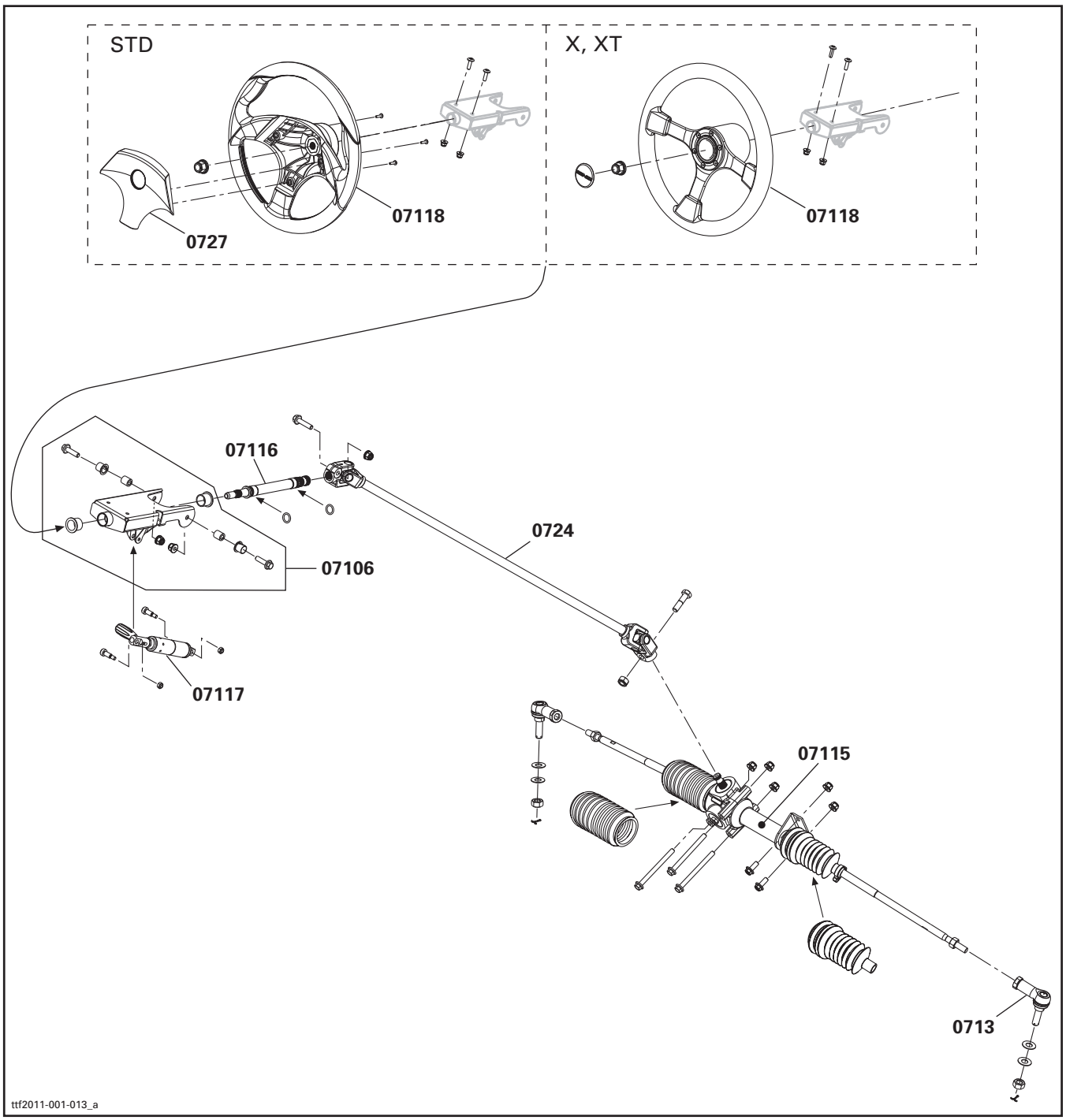
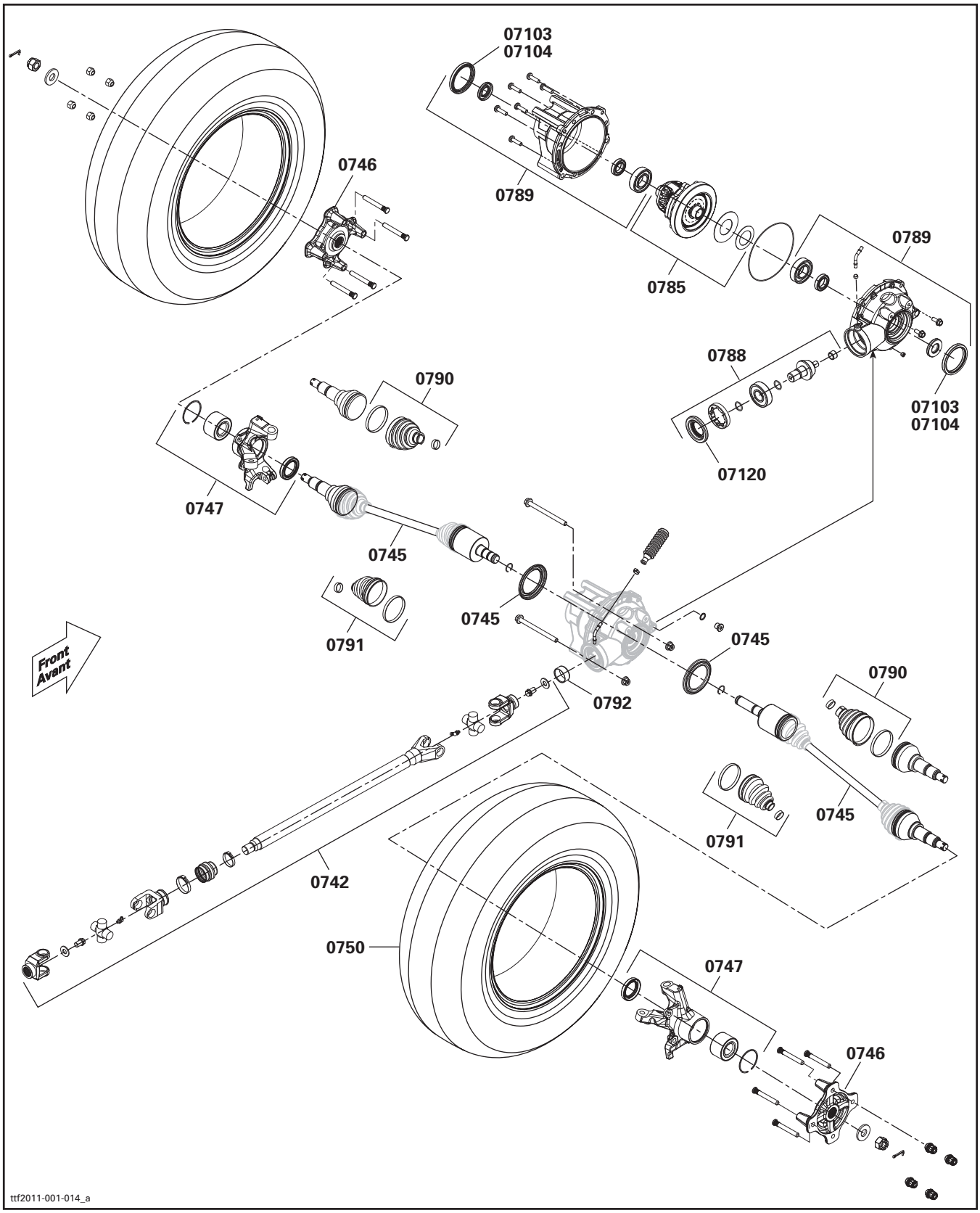
STEERING - FRONT DRIVE SYSTEM AND SUSPENSION
DIRECTION - SYSTÈME D'ENTRAÎNEMENT AVANT ET SUSPENSION

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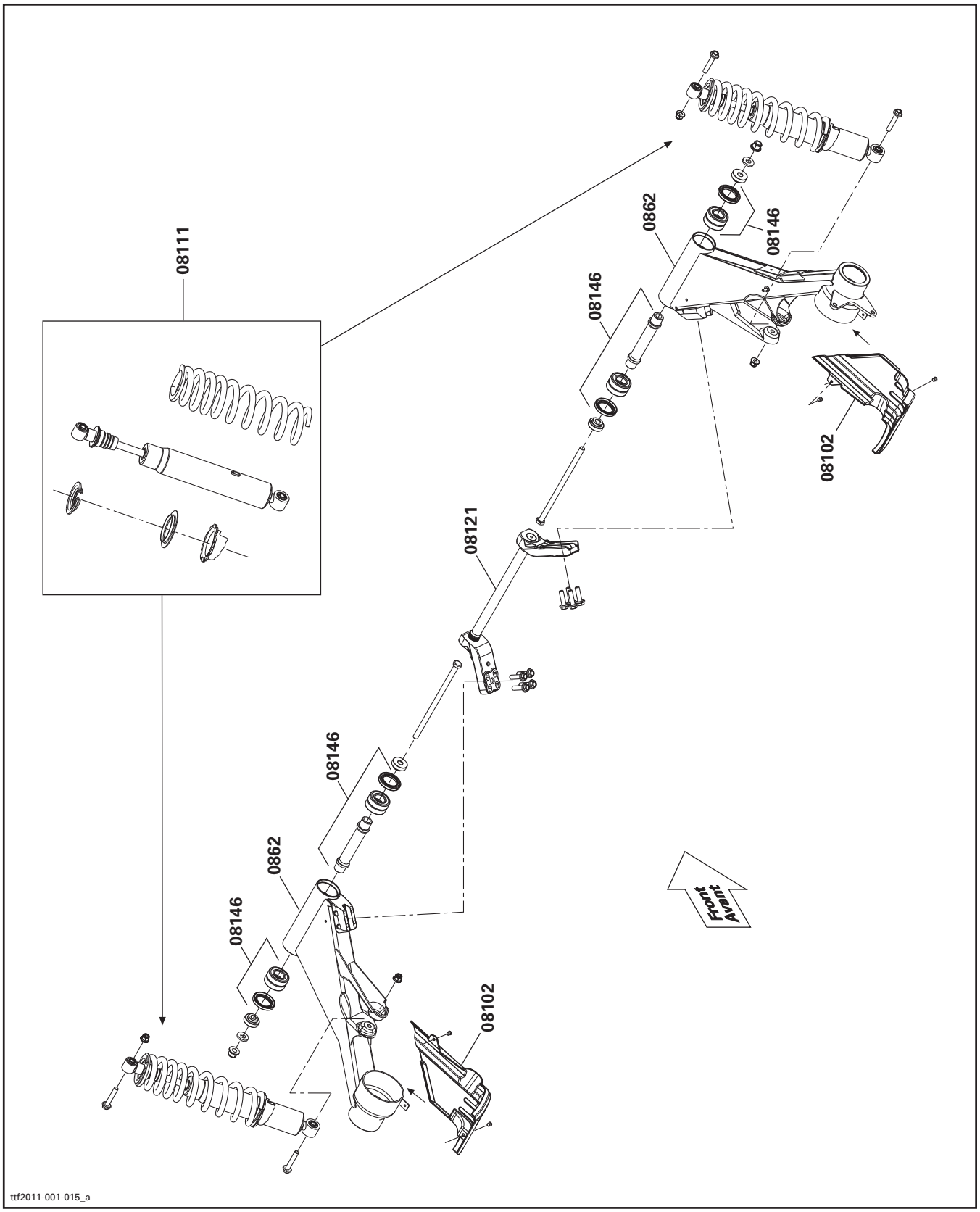
SYSTEM SYSTÈME	CODE	DESCRIPTION	COMMANDER 800	COMMANDER 1000
			1	2
08	**00**	**NO LABOR INVOLVED AUCUNE MAIN D'OEUVRE**	**0**	**0**
08	05	REAR WHEEL HUB (RH) MOYEU DE ROUE ARRIÈRE (DROIT)	0.3	0.3
08	07	REAR DIFFERENTIAL (ASS'Y) DIFFÉRENTIEL ARRIÈRE (COMPLET)	1.6	1.6
08	26	REAR PROPELLER SHAFT (ASS'Y) ARBRE DE PROPULSION ARRIÈRE (COMPLET)	1.8	1.8
08	62	SWING ARM BRAS OSCILLANT	1.2	1.2
08	101	LH PROTECTOR PROTECTEUR GAUCHE	0.3	0.3
08	102	RH PROTECTOR PROTECTEUR DROIT	0.3	0.3
08	109	REAR WHEEL HUB (LH) MOYEU DE ROUE ARRIÈRE (GAUCHE)	0.3	0.3
08	111	REAR SHOCK (RH OR LH) AMORTISSEUR ARRIÈRE (DROIT OU GAUCHE)	0.3	0.3
08	114	REAR RIM AND/OR TIRE JANTE ARRIÈRE ET/OU PNEU	0.4	0.4
08	120	CV JOINT (RH OR LH) JOINT HOMOCINÉTIQUE (DROIT OU GAUCHE)	0.7	0.7
08	121	STABILIZER BAR BARRE STABILISATRICE	0.4	0.4
08	122	RING GEAR AND/OR SHIM COURONNE DE LANCEMENT ET/OU CALE	2.8	2.8
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	2.8	2.8
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	2.9	2.9
08	125	BOOT WHEEL KIT AND/OR CV JOINT (RH OR LH) ENSEMBLE DE SOUFFLET DE ROUE ET/OU JOINT CV (DROIT OU GAUCHE)	0.8	0.8
08	126	BOOT DIFFERENTIAL KIT AND/OR PLUNGING JOINT (RH OR LH) ENSEMBLE DE SOUFFLET DE DIFFÉRENTIEL ET/OU JOINT PLONGENT (DROIT OU GAUCHE)	0.8	0.8
08	127	RADIAL BALL BEARINGS ROULEMENTS À BILLE RADIALES	0.9	0.9
08	134	DIFFERENTIAL SEAL (1) JOINT D'ÉTANCHÉITÉ DU DIFFÉRENTIEL (1)	0.5	0.5
08	135	DIFFERENTIAL SEALS (2) JOINTS D'ÉTANCHÉITÉ DU DIFFÉRENTIEL (2)	1.0	1.0
08	146	PIVOTS BUSHINGS, SEALS AND BEARINGS DOUILLES DE PIVOTS, JOINTS D'ÉTANCHÉITÉ ET ROULEMENTS À BILLE	0.9	0.9
08	148	DIFFERENTIAL OIL SEAL ANNEAU D'ÉTANCHÉITÉ DU DIFFÉRENTIEL	2.5	2.5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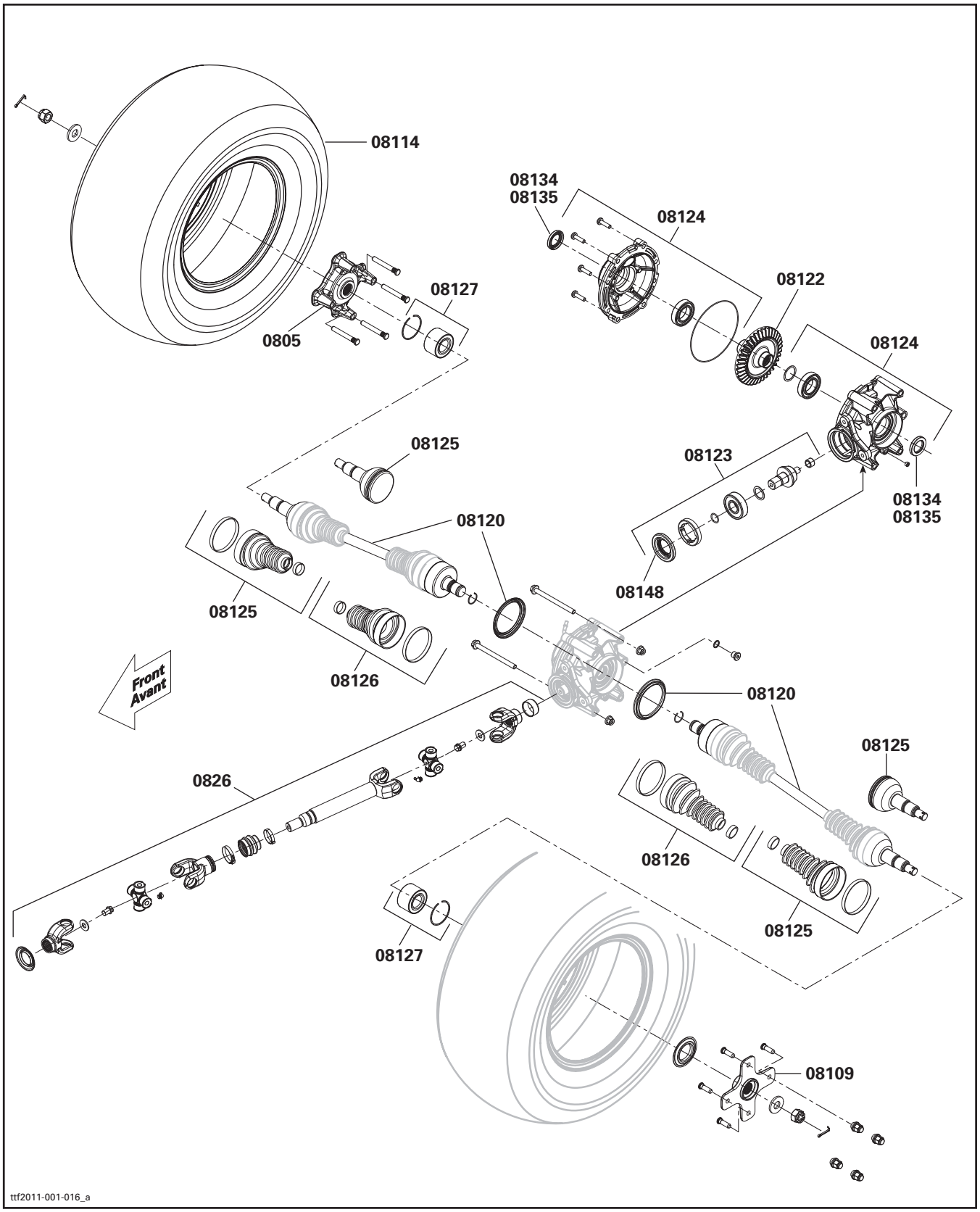
REAR DRIVE SYSTEM AND SUSPENSION
SYSTÈME D'ENTRAÎNEMENT ARRIÈRE ET SUSPENSION

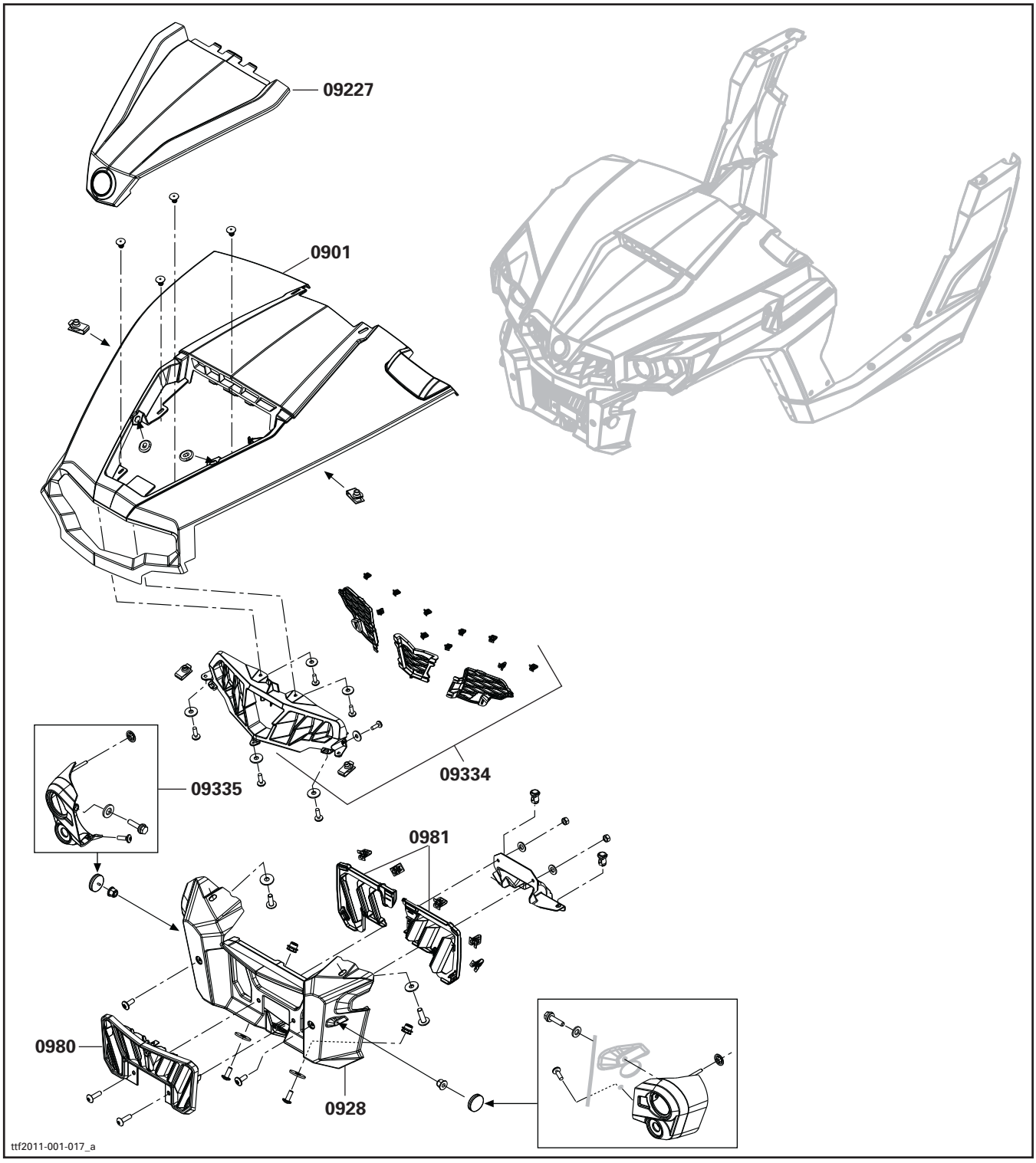


SYSTEM SYSTÈME	CODE	DESCRIPTION	COMMANDER 800	COMMANDER 1000
			1	2
09	**00**	**NO LABOR INVOLVED AUCUNE MAIN D'OEUVRE IMPLIQUÉE**	**0**	**0**
09	01	HOOD CAPOT	3.0	3.0
09	25	LATCH BASE AND/OR LEVER AND/OR SPRING BASE DE LOQUET ET/OU LEVIER ET/OU RESSORT	0.3	0.3
09	26	FRONT BUMPER PARE-CHOCS AVANT	0.6	0.6
09	27	WINCH LATCH ATTACHE DE TREUIL	0.3	0.3
09	28	FRONT FASCIA FASCIA AVANT	0.5	0.5
09	35	HITCH SUPPORT SUPPORT D'ATTELAGE	0.4	0.4
09	39	FRONT OR REAR MUDGUARD KIT (RH OR LH) ENSEMBLE DE GARDE-BOUE AVANT OU ARRIÈRE (DROIT OU GAUCHE)	0.7	0.7
09	57	FRONT FENDER AND/OR SUPPORT (RH OR LH) AILE AVANT ET/OU SUPPORT (DROIT OU GAUCHE)	1.5	1.5
09	71	FUEL TANK COVER COUVRE RÉSERVOIR D'ESSENCE	0.5	0.5
09	80	FRONT GRILLS GRILLES AVANT	0.3	0.3
09	81	SIDE GRILL (RIGHT AND/OR LEFT) GRILLE LATÉRALE (DROITE ET/OU GAUCHE)	0.3	0.3
09	82	CABLE RETAINER CÂBLE DE RETENUE	0.3	0.3
09	93	PROTECTION PLATE PLAQUE DE PROTECTION	0.4	0.4
09	95	EACH DECAL (1) CHAQUE AUTOCOLLANT (1)	0.3	0.3
09	97	SHOCK GAZ (REAR CARGO BOX) AMORTISSEUR (BOÎTE DE RANGEMENT)	0.3	0.3
09	102	PIVOT SUPPORT SUPPORT DE PIVOT	0.3	0.3
09	110	SEAT AND/OR BACKREST (DRIVER OR CO-PILOT) SIÈGE ET/OU DOSSIER (CONDUCTEUR OU COPILOTE)	0.3	0.3
09	111	SEAT BASE ASS'Y (DRIVER OR CO-PILOT) BASE DE SIÈGE COMPLET (CONDUCTEUR OU COPILOTE)	0.3	0.3
09	120	FRONT LIGHT FASCIA FASCIA DE LUMIÈRE AVANT	0.4	0.4
09	134	CARGO BOX LEVER AND/OR RINGS AND/OR CLAMP LEVIER BENNE ET/OU BAGUES ET/OU BRIDE	0.6	0.6

SYSTEM SYSTÈME	CODE	DESCRIPTION	COMMANDER 800	COMMANDER 1000
			1	2
09	157	UPPER CONSOLE CONSOLE SUPÉRIEURE	0.5	0.5
09	162	FRONT BUMPER (XT) PARE-CHOC AVANT (XT)	0.3	0.3
09	168	FRONT GRILL GRILLE FRONTALE	0.3	0.3
09	219	DOOR LATCH LOQUET DE PORTE	0.3	0.3
09	226	LOWER CONSOLE CONSOLE INFÉRIEURE	0.4	0.4
09	227	SERVICE COVER COUVERCLE DE SERVICE	0.3	0.3
09	231	REAR PANEL (LEFT OR RIGHT) PANNEAU ARRIÈRE (GAUCHE OU DROIT)	0.9	0.9
09	239	MIDDLE SIDE PANEL (LEFT OR RIGHT) PANNEAU LATÉRAL CENTRAL (GAUCHE OU DROIT)	0.6	0.6
09	282	LATCH AND/OR BASE (RIGHT OR LEFT) LOQUET ET/OU BASE (DROIT OU GAUCHE)	0.3	0.3
09	284	BOX DOOR PORTE DE COFFRE	0.3	0.3
09	289	GLOVES BOX BOÎTE À GANTS	0.3	0.3
09	290	DASHBOARD TABLEAU DE BORD	0.4	0.4
09	294	SIDE STORAGE COMPARTMENT (RIGHT OR LEFT) COMPARTIMENT DE RANGEMENT LATÉRAL (DROIT OU GAUCHE)	0.5	0.5
09	304	REAR SUPPORT SUPPORT ARRIÈRE	0.8	0.8
09	306	REAR SIDE PANEL (RIGHT OR LEFT) PANNEAU LATÉRAL ARRIÈRE (DROIT OU GAUCHE)	0.3	0.3
09	308	BOTTOM FRONT SIDE PANEL (RH OR LH) PANNEAU LATÉRAL AVANT BAS (DROIT OU GAUCHE)	0.6	0.6
09	334	UPPER FASCIA FASCIA SUPÉRIEUR	0.3	0.3
09	335	FLASHER COVER (RIGHT OR LEFT) COUVRE CLIGNOTANT (DROIT OU GAUCHE)	0.3	0.3
09	336	CENTRAL SKID PLATE PLAQUE DE PROTECTION CENTRALE	0.3	0.3
09	337	REAR SKID PLATE PLAQUE DE PROTECTION ARRIÈRE	0.3	0.3
09	338	AIR INLET COVER COUVERCLE D'ADMISSION D'AIR	0.3	0.3

SYSTEM SYSTÈME	CODE	DESCRIPTION	COMMANDER 800	COMMANDER 1000
			1	2
09	339	FLOOR PANEL (LEFT) PANNEAU DE PLANCHER (GAUCHE)	3.0	3.0
09	340	FLOOR PANEL (RIGHT) PANNEAU DE PLANCHER (DROIT)	2.1	2.1
09	341	FRONT BULKHEAD (LEFT) CLOISON AVANT (GAUCHE)	2.6	2.6
09	342	FRONT BULKHEAD (RIGHT) CLOISON AVANT (DROITE)	2.0	2.0
09	343	REAR BULKHEAD (LEFT) CLOISON ARRIÈRE (GAUCHE)	1.3	1.3
09	344	REAR BULKHEAD (RIGHT) CLOISON ARRIÈRE (DROITE)	1.3	1.3
09	345	LATERAL CONSOLE PANEL (LEFT) PANNEAU LATÉRAL DE CONSOLE (GAUCHE)	0.3	0.3
09	346	LATERAL CONSOLE PANEL (RIGHT) PANNEAU LATÉRAL DE CONSOLE (DROIT)	0.3	0.3
09	347	FIXE CONSOLE PANEL (LEFT) PANNEAU FIXE DE CONSOLE (GAUCHE)	0.8	0.8
09	348	FIXE CONSOLE PANEL (RIGHT) PANNEAU FIXE DE CONSOLE (DROIT)	0.8	0.8
09	349	LEVER INDICATOR INDICATEUR DE VITESSE	0.5	0.5
09	350	CARGO BOX (LEFT AND RIGHT) BENNE (GAUCHE ET DROITE)	4.6	4.6
09	351	CARGO BOX (LEFT) BENNE (GAUCHE)	3.7	3.7
09	352	CARGO BOX (RIGHT) BENNE (DROITE)	3.7	3.7
09	353	REMOVABLE FLOOR PLATEAU AMOVIBLE	0.3	0.3
09	354	FRONT REINFORCEMENT RENFORT AVANT	0.3	0.3
09	355	TAILLIGHT TRIM (LEFT OR RIGHT) ENJOLIVEUR DE FEU ARRIÈRE (GAUCHE OU DROIT)	0.3	0.3
09	356	CARGO BOX RAIL AND/OR COVER RAIL DE BENNE ET/OU COUVERCLE	0.3	0.3
09	357	CARGO BOX RETAINER AND/OR SPRING (LEFT OR RIGHT) ANCRAGE DE BENNE ET/OU RESSORT (GAUCHE OU DROIT)	0.5	0.5
09	358	CARGO BOX FRAME CHÂSSIS DE LA BENNE	1.6	1.6
09	359	CARGO BOX PIVOTS (ALL PARTS) PIVOTS DE LA BENNE (TOUTES LES PIÈCES)	0.7	0.7

SYSTEM SYSTÈME	CODE	DESCRIPTION	COMMANDER 800	COMMANDER 1000
			1	2
09	360	UPPER TAIL GATE PANEL PANNEAU DU HAYON SUPÉRIEUR	0.3	0.3
09	361	LOWER TAIL GATE PANEL PANNEAU DU HAYON INFÉRIEUR	0.3	0.3
09	362	UPPER TAIL GATE HAYON SUPÉRIEUR	0.4	0.4
09	363	LOWER TAIL GATE HAYON INFÉRIEUR	0.6	0.6
09	364	HEAD REST APPUI-TÊTE	0.3	0.3
09	365	SAFETY BELT CEINTURE DE SÉCURITÉ	0.3	0.3
09	366	BUCKLE BELT VERROU CEINTURE	0.3	0.3
09	367	LOCK VERROU	0.3	0.3
09	368	HANDHOLD (LEFT) POIGNÉE DE MAINTIEN (GAUCHE)	0.3	0.3
09	369	CAGE (FRONT) CAGE (AVANT)	0.5	0.5
09	370	CAGE (REAR) CAGE (ARRIÈRE)	0.9	0.9
09	371	ROCK SLIDER (LEFT OR RIGHT) GLISSIÈRE DE PROTECTION (GAUCHE OU DROITE)		0.5
09	372	SHOULDER GUARD (LEFT AND/OR RIGHT) PROTECTEUR D'ÉPAULE (GAUCHE ET/OU DROIT)	0.3	0.3
09	373	HANDHOLD (FRONT) POIGNÉE DE MAINTIEN (AVANT)	0.3	0.3
09	374	LATERAL NET (LEFT OR RIGHT) FILET LATÉRAL (GAUCHE OU DROIT)	0.5	0.5
09	375	HANDHOLD BAR (LEFT) BARRE DE POIGNÉE DE MAINTIEN (GAUCHE)	0.4	0.4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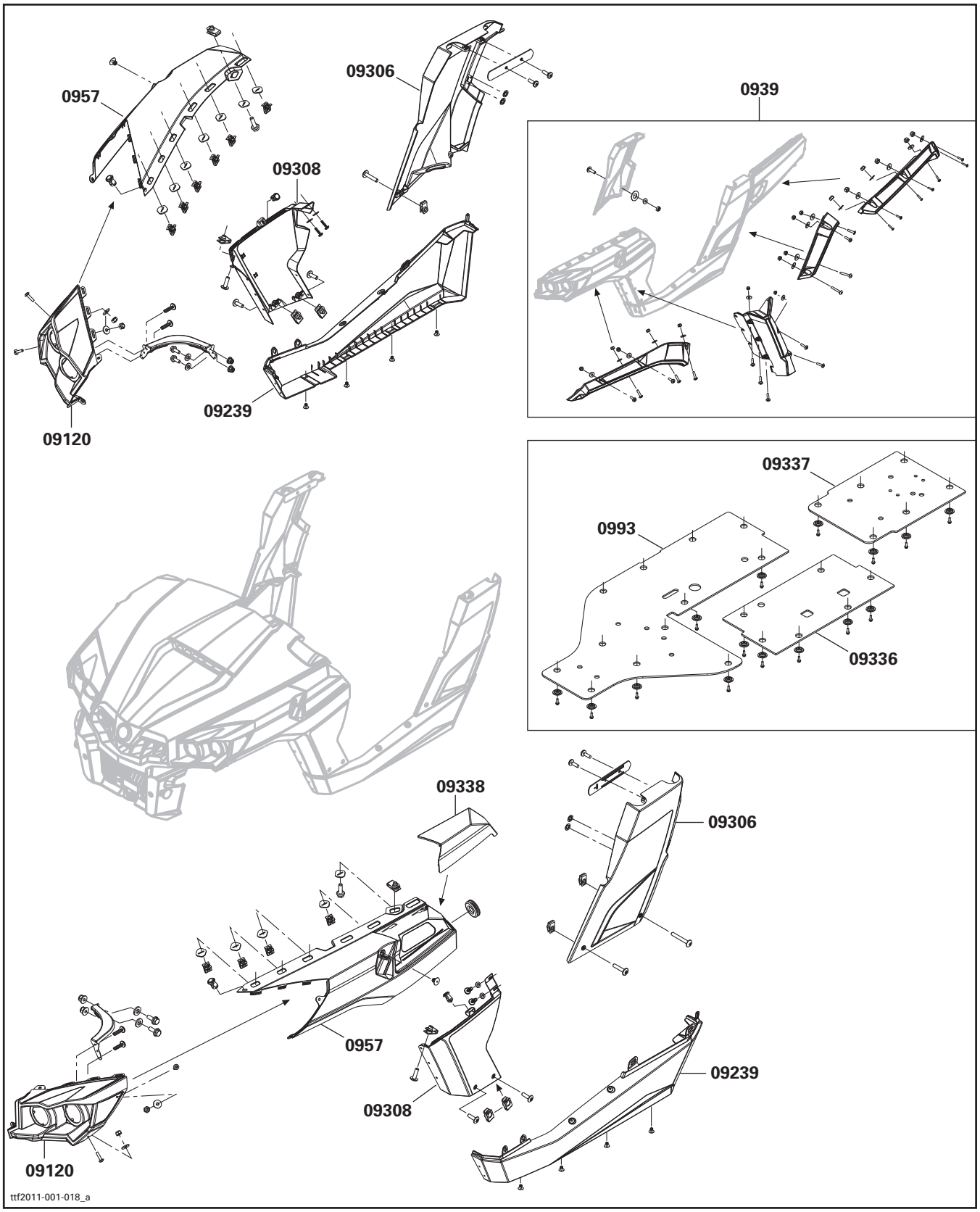
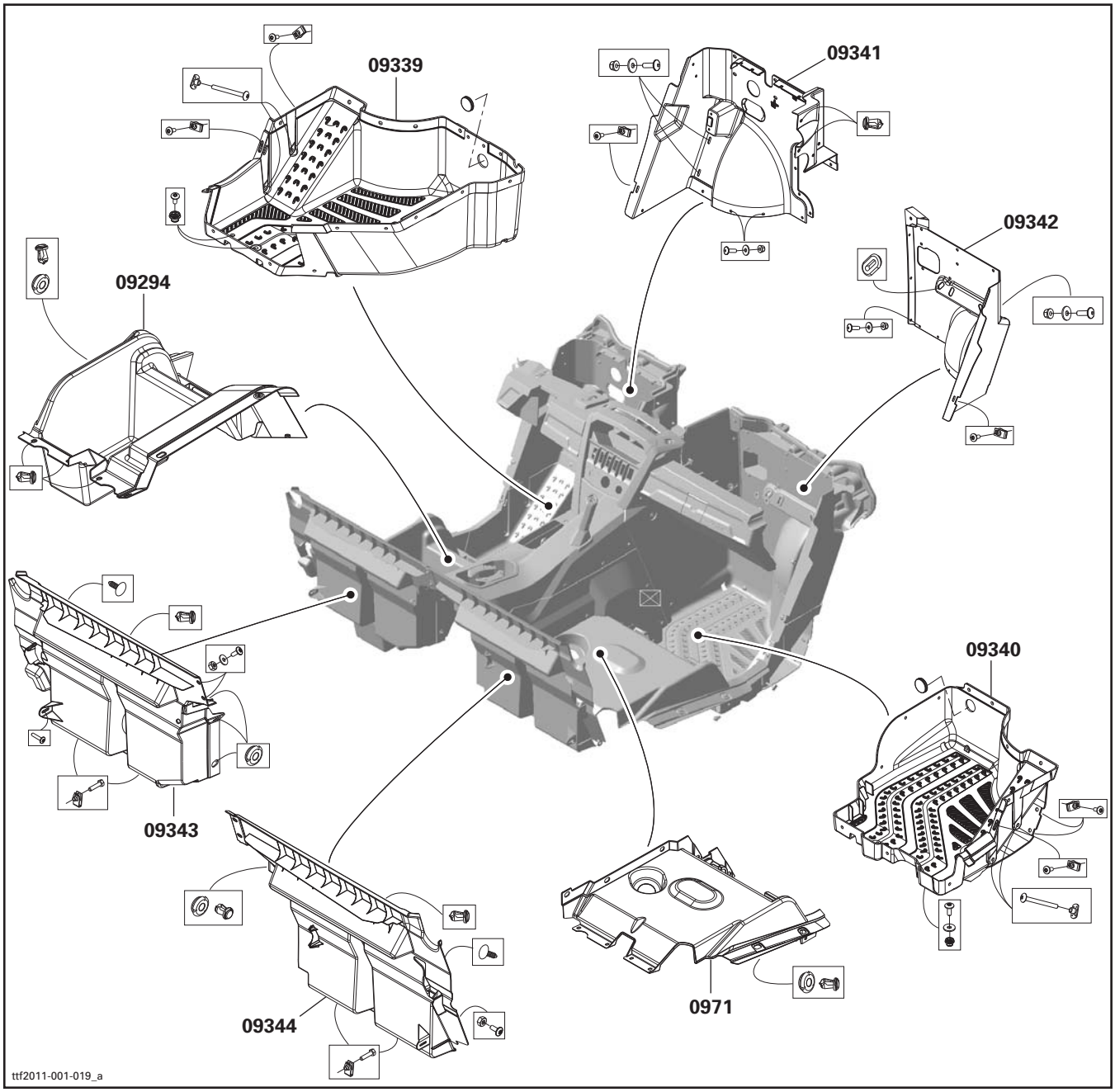
BODY AND ACCESSORIES
CARROSSERIE ET ACCESSOIRES

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BODY AND ACCESSORIES
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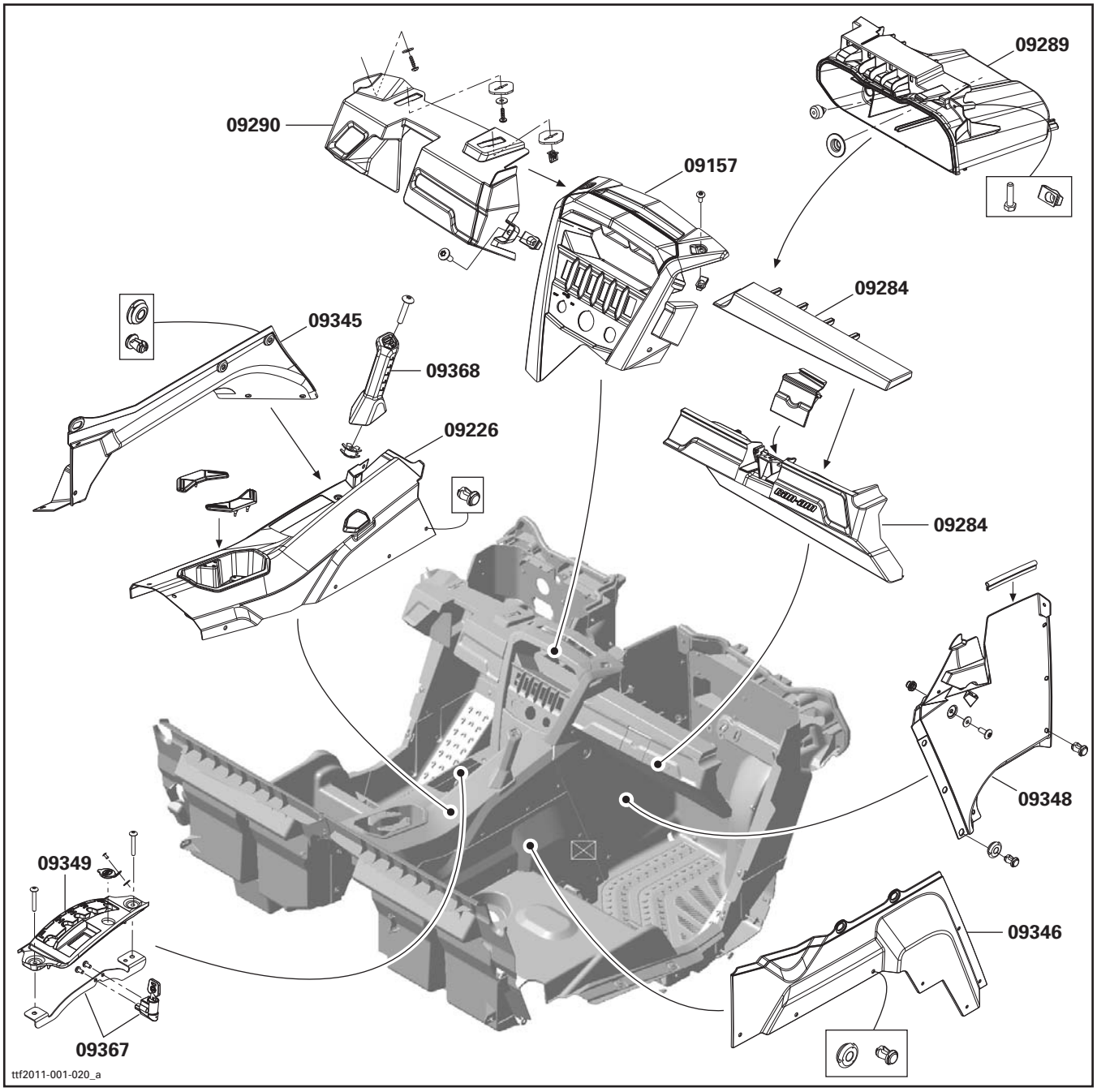

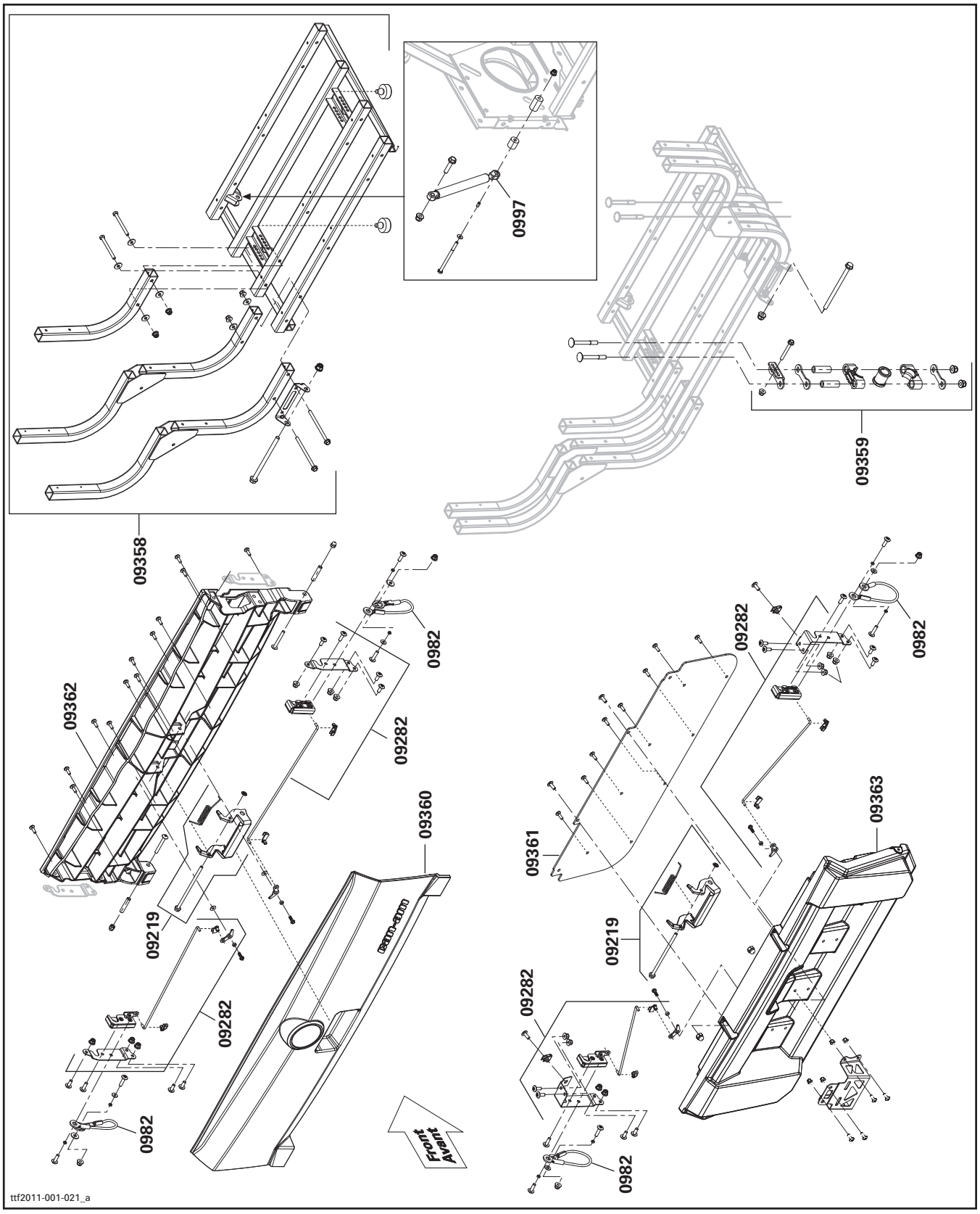
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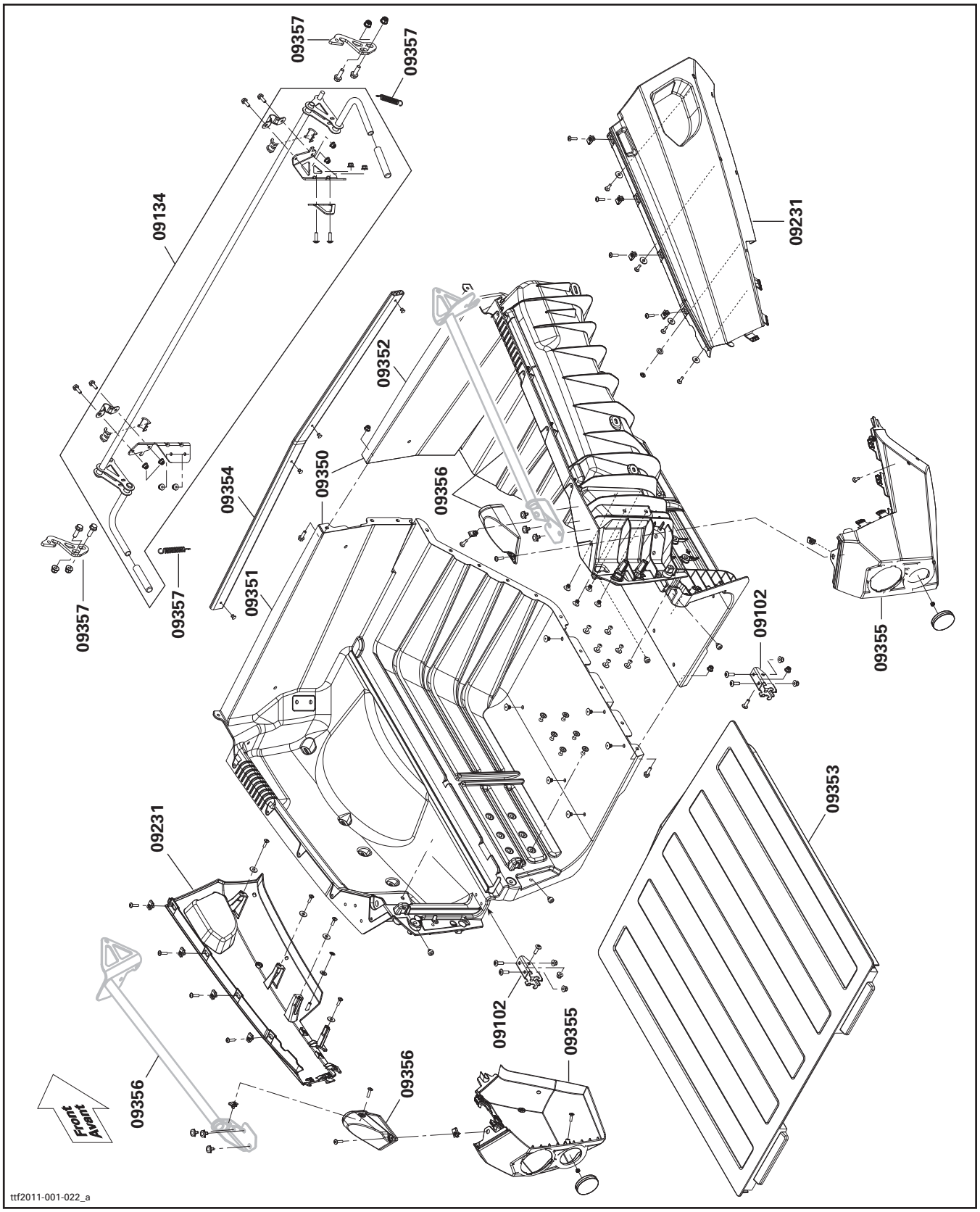
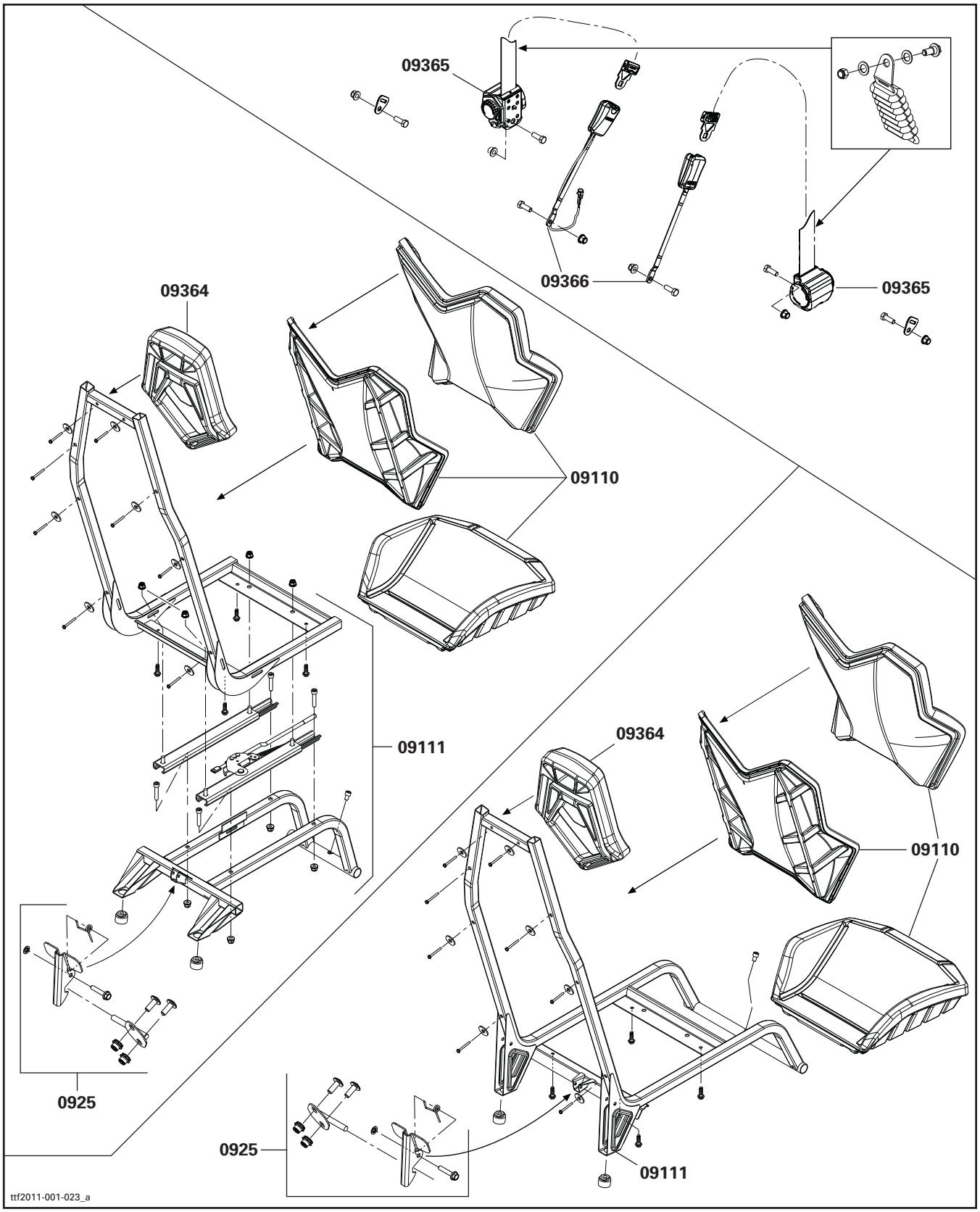
BODY AND ACCESSORIES
CARROSSERIE ET ACCESSOIRES

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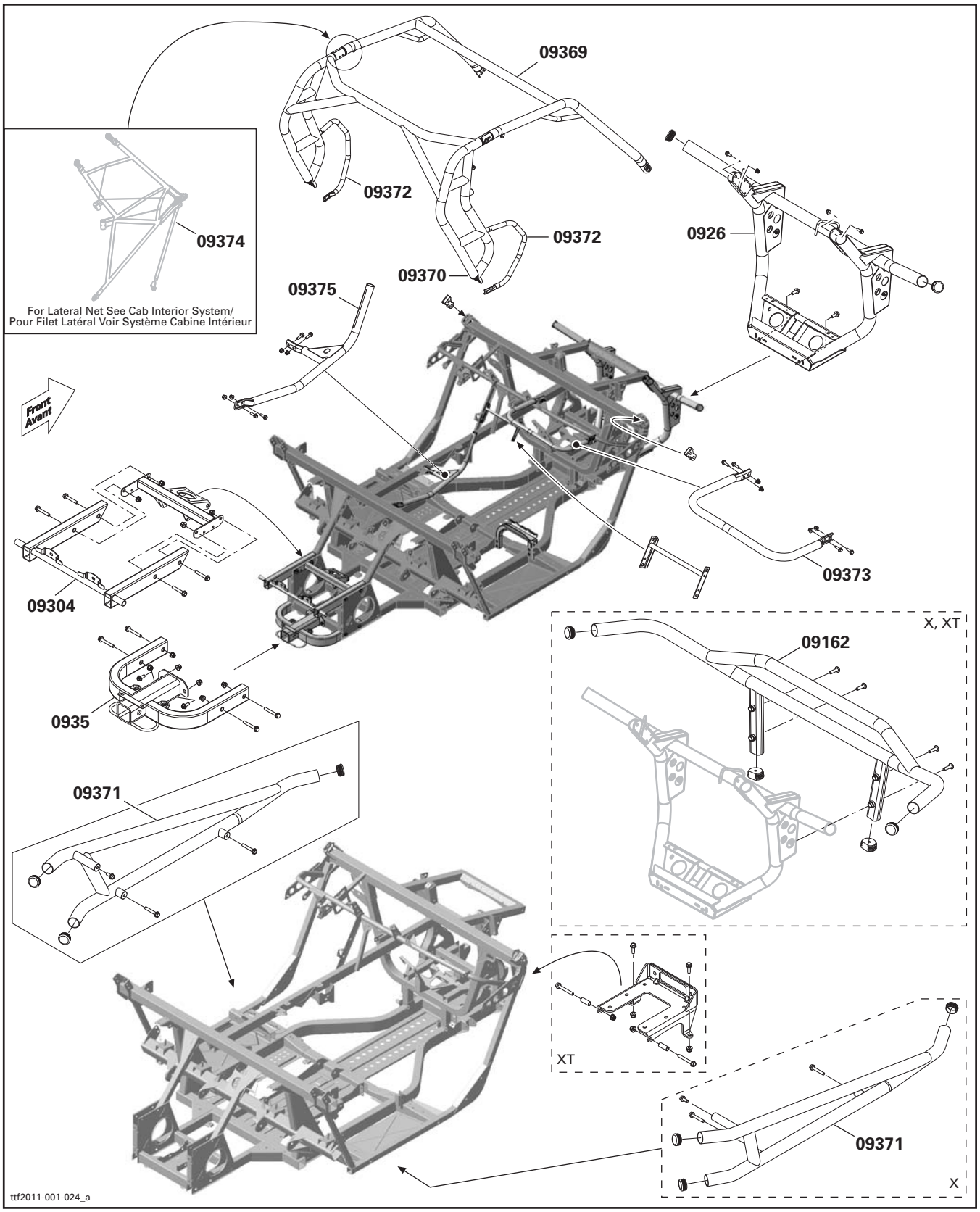
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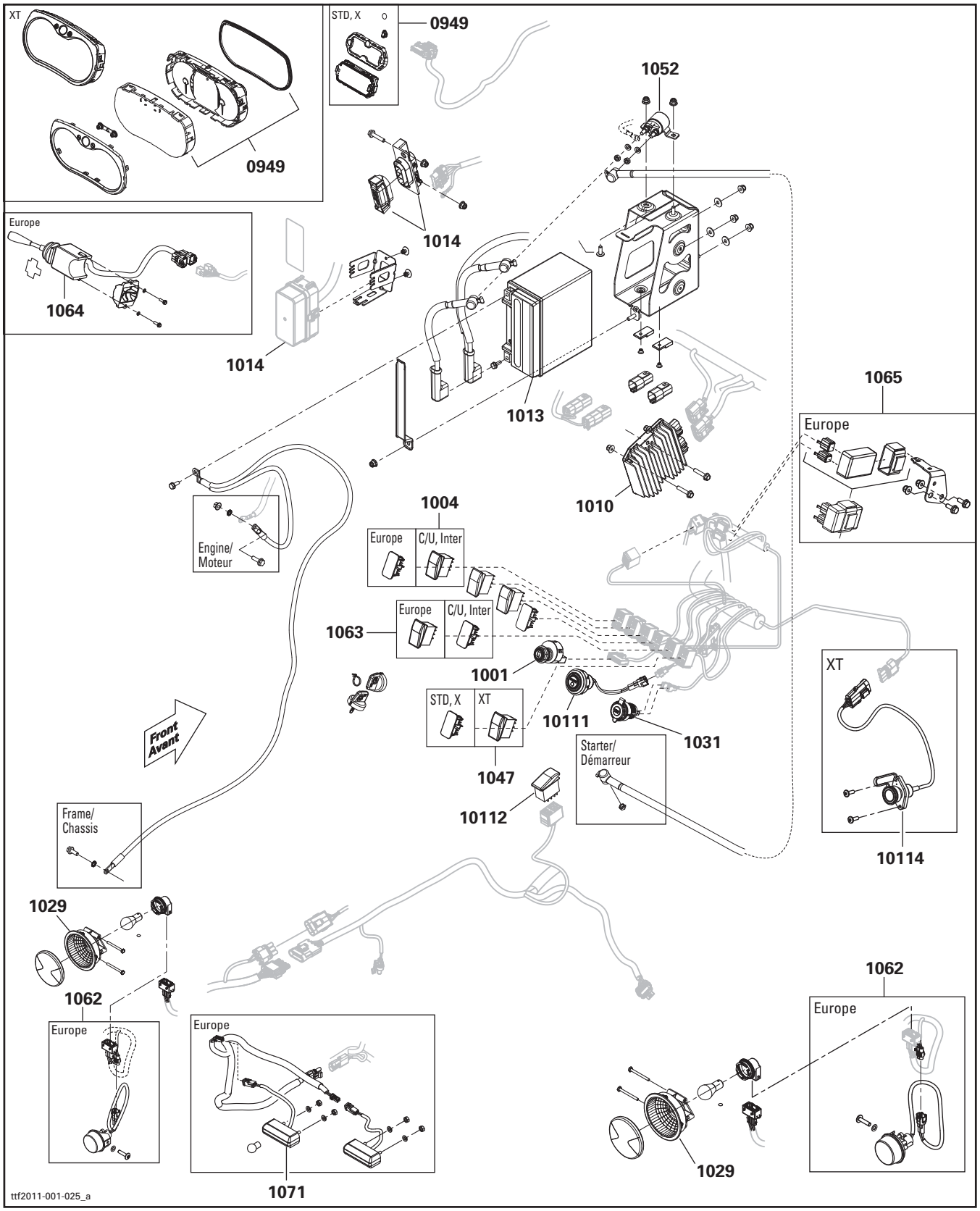
SYSTEM SYSTÈME	CODE	DESCRIPTION	COMMANDER 800	COMMANDER 1000
			1	2
10	**00**	**NO LABOR INVOLVED** **AUCUNE MAIN-D'OEUVRE**	**0**	**0**
10	01	IGNITION SWITCH INTERRUPTEUR D'ALLUMAGE	0.3	0.3
10	04	HEADLIGHT SWITCH INTERRUPTEUR DE PHARE	0.3	0.3
10	09	HEADLAMP AND/OR HEADLAMP SUPPORT (ASS'Y) (RH OR LH) PHARE AVANT ET/OU SUPPORT (COMPLET) (DROIT OU GAUCHE)	0.5	0.5
10	10	VOLTAGE REGULATOR RÉGULATEUR DE TENSION	0.3	0.3
10	13	BATTERY BATTERIE	0.3	0.3
10	14	FUSE BOX BOÎTE-FUSIBLE	0.4	0.4
10	29	TAIL LAMP HOUSING (ASS'Y) BOÎTIER DE FEU ARRIÈRE (COMPLET)	0.3	0.3
10	31	DC OUTLET PLUG PRISE D'ACCESSOIRE DC	0.3	0.3
10	34	ELECTRONIC MODULE MODULE ÉLECTRONIQUE	0.3	0.3
10	45	WINCH (ASS'Y) (XT) TREUIL (COMPLET) (XT)	0.6	0.6
10	46	WINCH SOLENOID (XT) SOLÉNOÏDE DE TREUIL (XT)	0.5	0.5
10	47	WINCH SWITCH (XT) INTERRUPTEUR DE TREUIL (XT)	0.3	0.3
10	49	MULTIFUNCTION GAUGE CADRAN MULTIFONCTION	0.3	0.3
10	51	MAIN WIRE HARNESS CÂBLAGE PRINCIPAL	3.0	3.0
10	52	STARTING RELAY RELAIS DE DÉMARRAGE	0.4	0.4
10	61	FRONT FLASHERS 1 OR 2 (**CE** ONLY) CLIGNOTANTS AVANT 1 OU 2 (**CE** SEULEMENT)	0.3	0.3
10	62	REAR FLASHERS 1 OR 2 (**CE** ONLY) CLIGNOTANTS ARRIÈRE 1 OU 2 (**CE** SEULEMENT)	0.3	0.3
10	63	HAZARD WARNING BUTTON (**CE** ONLY) COMMUTATEUR D'URGENCE (**CE** SEULEMENT)	0.3	0.3
10	64	DIRECTION INDICATOR SWITCH (**CE** ONLY) INTERRUPTEUR CLIGNOTANTS (**CE** SEULEMENT)	0.3	0.3
10	65	12 VOLT RELAY (CE ONLY) RELAIS 12 VOLT (CE SEULEMENT)	0.3	0.3

SYSTEM SYSTÈME	CODE	DESCRIPTION	COMMANDER 800	COMMANDER 1000
			1	2
10	66	HORN AVERTISSEUR	0.3	0.3
10	67	RELAY RELAIS	0.3	0.3
10	68	ANY BULBS TOUTES LES AMPOULES	0.4	0.4
10	71	LICENSE LIGHT (ASS'Y) LUMIÈRE D'IMMATRICULATION (COMPLET)	0.3	0.3
10	111	START BUTTON BOUTON DE DÉMARRAGE	0.3	0.3
10	112	OVERRIDE SWITCH INTERRUPTEUR DE NEUTRALISATION	0.3	0.3
10	113	REMOTE CONTROL COMMANDE À DISTANCE	0.3	0.3
10	114	WINCH CONNECTOR CONNECTEUR DE TREUIL	0.3	0.3


XT
0949
STD, X
0949
1052
1014
Europe
1064
1014
1013
1065
Europe
1010
1004
Europe
C/U, Inter
Engine/
Moteur
Europe
C/U, Inter
1063
1001
STD, X
XT
10111
1031
Starter/
Démarreur
1047
10112
Front
Avant
XT
10114
Frame/
Chassis
1029
1062
Europe
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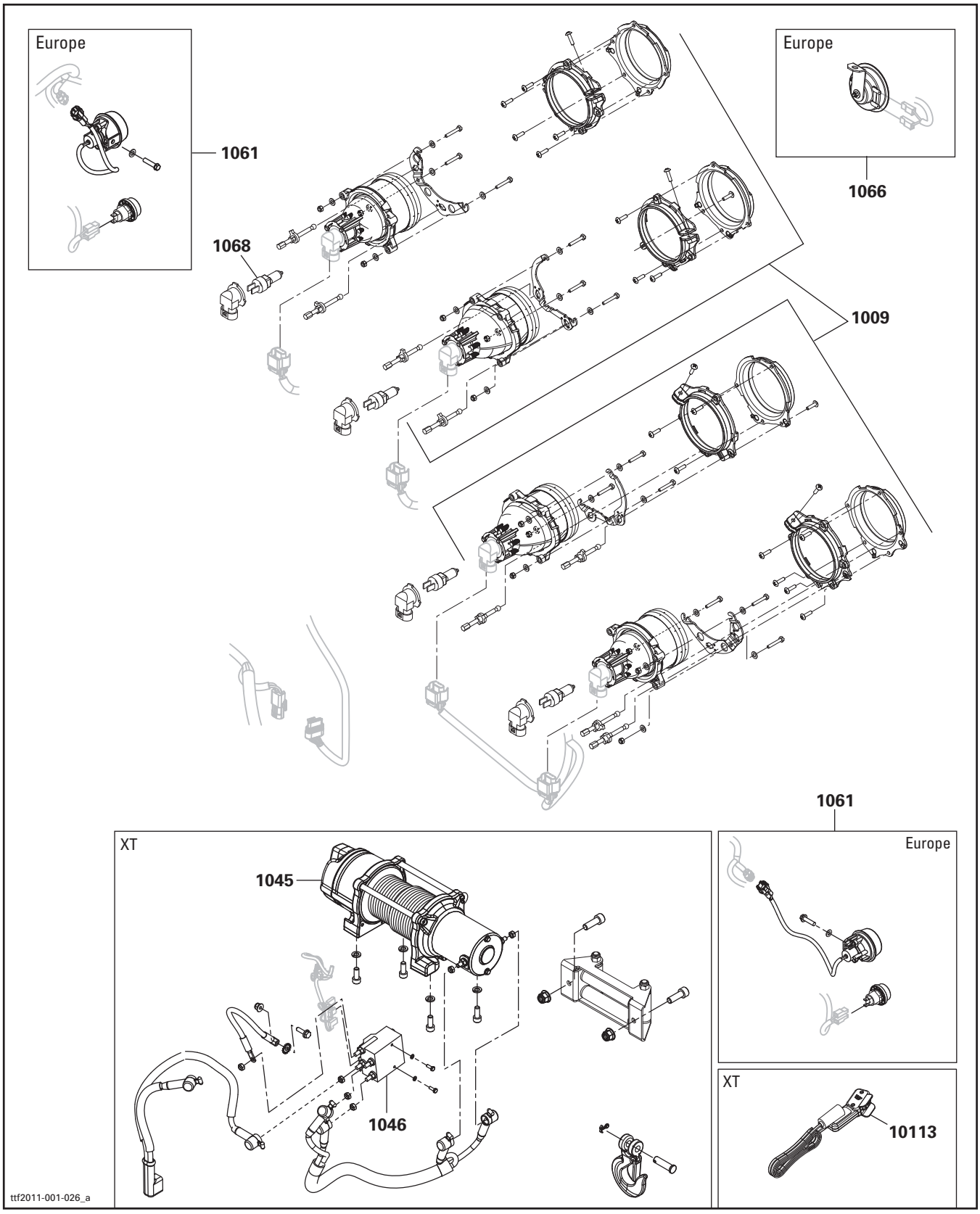

Europe
1061
Europe
1066
1068
1009
1061
XT
1045
1046
Europe
XT
10113
ttf2011-001-026_a

SYSTEM SYSTEME	CODE	DESCRIPTION	COMMANDER 800	COMMANDER 1000
			1	2
11	**00**	**NO LABOR INVOLVED AUCUNE MAIN-D'OEUVRE**	**0**	**0**
11	MT1	SCHEDULED MAINTENANCE TRACKING SUIVI DES ENTRETIENS PLANIFIÉS	0	0

June 10, 2010 Subject: **Spring Chart** No. **2011-3**

YEAR	MODEL	MODEL NUMBER	SERIAL NUMBER
2011	Commander Series	All	All

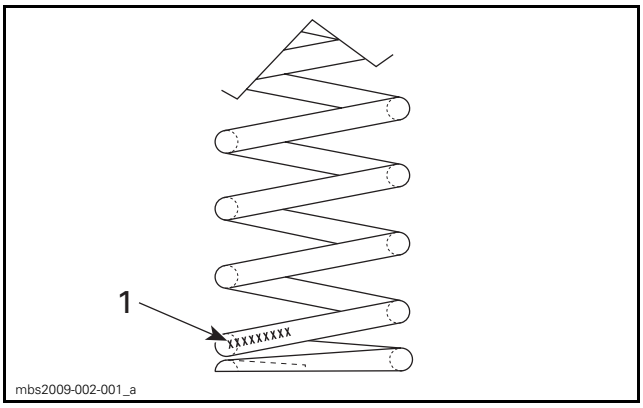
The information in this bulletin supersedes all information previously published.

SPRING INFORMATION

NOTE: Read color codes when spring is upright and stripes are down.

Identification

Spring identification is done by color code stripes **or** part number. Part number is printed on the spring within first 1-1/4 coils.



1. Part number ink marked within first 1-1/4 coils

Color Code Legend

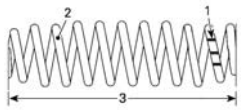
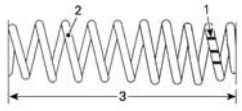
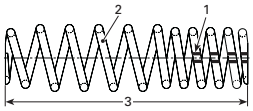
COLOR CODE					
BL	—	BLUE	PI	—	PINK
BK	—	BLACK	RD	—	RED
GD	—	GOLD	SI	—	SILVER
GN	—	GREEN	WH	—	WHITE
OR	—	ORANGE	YL	—	YELLOW

Spring Types

All call-outs below each following illustrations refer to:

1. Color code stripes or part number,
2. Wire diameter,
3. Free length.

NOTE: Read color codes when spring is upright and stripes are down.

Spring type		
Type T and V (barrel shape at both ends)	Single Rate Spring	
Type 2 and 6 (barrel shape at both ends)	Dual Rate Spring	
Type 8 (barrel shape at both ends)	Dual Rate Spring	

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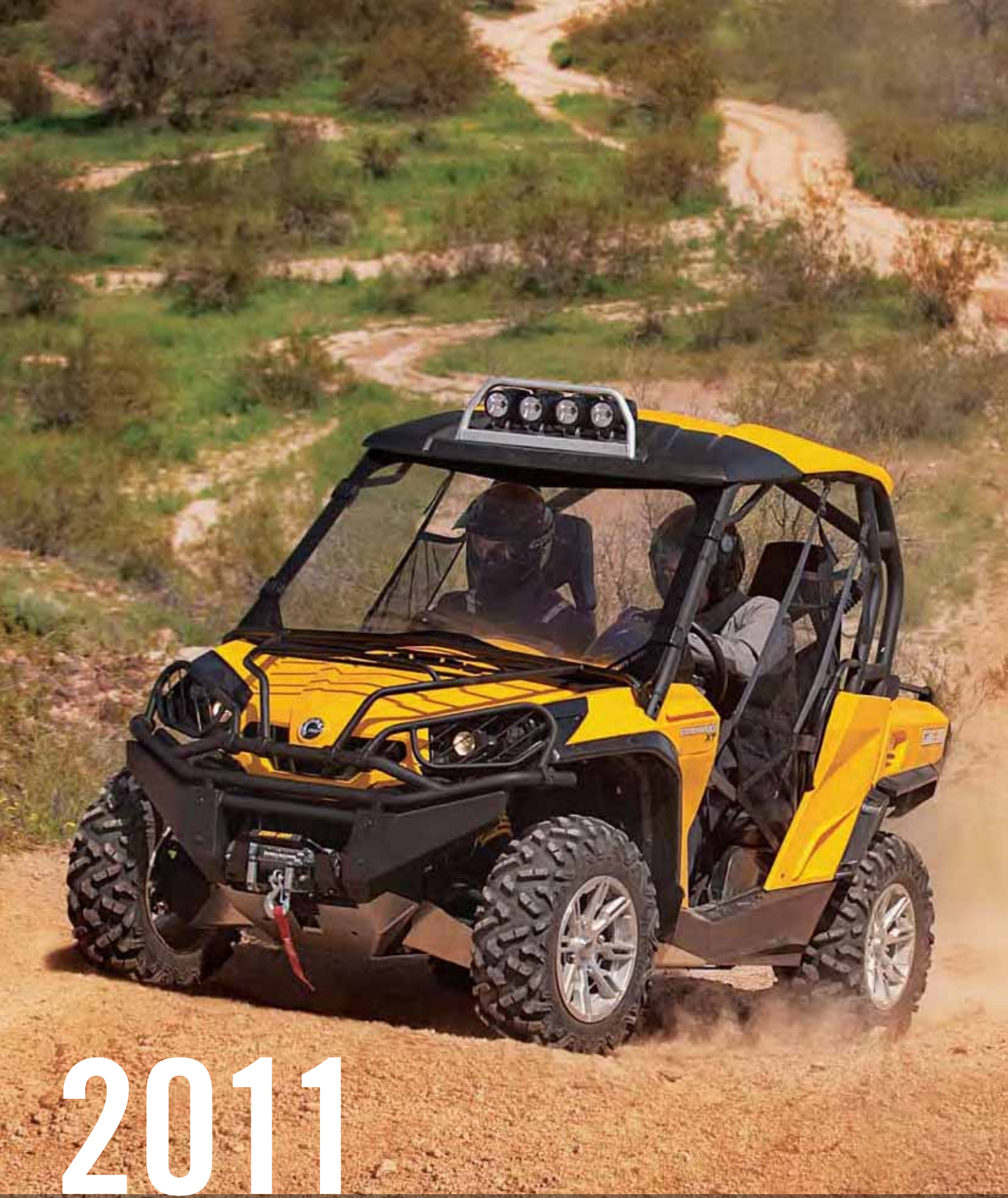
SPRING APPLICATIONS

SPRING APPLICATIONS					
MODEL		MODEL YEAR	MODEL NUMBER	SPRING P/N	
				FRONT	REAR
Commander 800R	STD	2011	6CBA, 6CBC	706 200 859	706 000 667
	XT	2011	6DBA	706 200 860	706 000 667
		2011	6DBD	706 201 369	706 001 045
Commander 1000	STD	2011	6ABA, 6ABC	706 200 859	706 000 667
	X	2011	6EBA, 6EBC	706 201 124	706 000 821
	XT	2011	6BBA, 6BBB, 6BBC	706 200 860	706 000 667
		2011	6BBD	706 201 367	706 001 043
		2011	6BBE, 6BBF	706 201 369	706 001 045

SPRING SPECIFICATIONS

COIL SPRINGS SPECIFICATIONS (REAR SHOCK ABSORBER)					
P/N	TYPE	SPRING RATE (LB/IN) ± 10 _____ (RATE 1 / RATE 2)	FREE LENGTH (MM) ± 3	WIRE DIAMETER (MM) ± .05	COLOR OF SPRING
706 000 667	6	200 / 251.3	358	11.5	Yellow
706 000 821	2	158.2 / 259.2	373	11.5	Yellow
706 001 043	6	200 / 251.3	358	11.5	Viper Red
706 001 045	6	200 / 251.3	358	11.5	Deep Black

COIL SPRINGS SPECIFICATIONS (FRONT SHOCK ABSORBER)					
P/N	TYPE	SPRING RATE (LB/IN) ± 10 _____ (RATE 1 / RATE 2)	FREE LENGTH (MM) ± 3	WIRE DIAMETER (MM) ± .05	COLOR OF SPRING
706 200 859	V	150 ± 5	355.6	10.31	Yellow
706 200 860	6	137 ± 5 / 162.7 ± 5	363	10.6	Yellow
706 201 124	T	150 ± 5	350	10.6	Yellow
706 201 367	6	137 ± 5 / 162.7 ± 5	363	10.6	Viper Red
706 201 369	6	137 ± 5 / 162.7 ± 5	363	10.6	Deep Black



2011

PARTS, ACCESSORIES & RIDING GEAR

can-am BRP

PARTS & ACCESSORIES

COMMANDER™ SIDE-BY-SIDE VEHICLE

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2011

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MAKE IT YOUR OWN

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UTILITY ACCESSORIES

WINTER ACCESSORIES

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A-ARM PROTECTORS ▸ P. 6 / TRAILING ARM PROTECTORS ▸ P. 6 / LATERAL SKID PLATES ▸ P. 6 / FRONT SKID PLATE ▸ P. 6 / CENTRAL SKID PLATE ▸ P. 6 / REAR SKID PLATE ▸ P. 6 / FRONT XT BUMPER ▸ P. 7 / OFF-ROAD XTREME FRONT-BUMPER ▸ P. 7 / FRONT LIGHT PROTECTION ▸ P. 7 / FRONT RACK ▸ P. 7 / REAR BUMPER ▸ P. 8 / LOWER TAILGATE PROTECTOR ▸ P. 8 / XT FENDER FLARES ▸ P. 8 / FULL WINDSHIELD ▸ P. 9 / SPORT VISOR ▸ P. 10 / ROOF MIDDLE SECTION ▸ P. 10 / LIGHT RACK FOR SPORT VISOR ▸ P. 11 / HALOGEN OR HID LIGHTS ▸ P. 11 / MULTIMOUNT WINCH KIT ▸ P. 13 / FRONT 2” RECEIVER HITCH ▸ P. 13 / RT40 WARN† WINCH KIT ▸ P. 14

A-ARM PROTECTORS ▸ P. 6 / TRAILING ARM PROTECTORS ▸ P. 6 / LATERAL SKID PLATES ▸ P. 6 / FRONT SKID PLATE ▸ P. 6 / CENTRAL SKID PLATE ▸ P. 6 / REAR SKID PLATE ▸ P. 6 / FRONT XT BUMPER ▸ P. 7 / OFF-ROAD XTREME FRONT-BUMPER ▸ P. 7 / FRONT RACK ▸ P. 7 / REAR BUMPER ▸ P. 8 / FULL WINDSHIELD ▸ P. 9 / SPORT VISOR ▸ P. 10 / ROOF MIDDLE SECTION ▸ P. 10 / LIGHT RACK FOR SPORT VISOR ▸ P. 11 / HALOGEN OR HID LIGHTS ▸ P. 11 / SUPER DUTY PLOW ▸ P. 12 / MULTIMOUNT WINCH KIT ▸ P. 13

UNDERBELLY PROTECTION

FRONT SKID PLATE

Draw-formed 5052-H32 aluminum front skid plate provides essential protection. 3/16" thick for durability and strength.
Commander, Commander X, Commander XT - 715000692
$159.99

A-ARM PROTECTORS

5052-H32 aluminum A-arm plates and plastic deflectors provide essential protection and aggressive look. Engraved Can-Am logo. 3/16" thick for durability and strength. Sold in pairs.
Commander, Commander X, Commander XT - 715000660
$164.99

LATERAL SKID PLATES

Draw-formed 5052-H32 aluminum lateral skid plates provide essential protection. 3/16" thick for durability and strength. Engraved Can-Am logo. Sold in pairs.
Commander, Commander X, Commander XT - 715000950
$229.99

CENTRAL SKID PLATE

5052-H32 aluminum, 3/16" thick. Pre-cut holes for fluid and mud drainage, and servicing access. Engraved Can-Am logo. Direct replacement of factory installed plastic skid.
Commander, Commander X, Commander XT - 715000693
$314.99

REAR SKID PLATE

5052-H32 aluminum, 3/16" thick. Provides additional protection to rear end of vehicle. Engraved Can-Am logo. Direct replacement of factory installed plastic skid.
Commander, Commander X, Commander XT - 715000694
$114.99

TRAILING ARM PROTECTORS

5052-H32 aluminum trailing arm plates and plastic deflectors provide essential protection. Engraved Can-Am logo. 3/16" thick for durability and strength. Sold in pairs.
Commander, Commander X, Commander XT - 715000661
$149.99

FOX PERFORMANCE FRONT SHOCKS

Fox Piggyback racing shocks. Includes rebound and high/low speed compression adjustments. Sold in pairs.
715001022
$999.99

FOX PERFORMANCE REAR SHOCKS

Fox 2.0 Position Sensitive racing shocks. Includes rebound and high/low speed compression adjustments. Sold in pairs.
715001023
$1,111.99

AIR INTAKE PRE-FILTER

Add extra protection to your engine in harsh riding conditions. Filter blocks particles larger than 0.005".
715000953
$39.99

BUMPERS

OFF-ROAD XTREME FRONT BUMPER

Delivers additional heavy duty protection that works with or without the front XT bumper. Textured black electrocoated for durability and rugged style. Can-Am logo tag.

Commander, Commander X, Commander XT

715000951

$299.99

FRONT XT BUMPER

Made of heavy gauge steel for additional protection. XT styled for matching appearance. Textured black electrocoated for durability and rugged style. Effortless mounting.

Commander

715000958

$219.99

FRONT RACK

Durable finish for scratch resistant performance. Equipped with genuine Can-Am casted clamps for easy mounting on required XT bumper (sold separately). Does not limit access to air filter or cooling. 75 lbs load capacity.

715000985

$299.99

FRONT LIGHT PROTECTION

Works in conjuction with XT bumper, offering protection to front headlights and sporting aggressive look. Textured black electrocoated for durability and rugged style. Integrated Can-Am fastening system provides efficient mounting vs traditional P-clamps.

Commander, Commander X, Commander XT

715000656

$159.99

RADIATOR PROTECTOR

Black epoxy electrocoated metal shield that mounts over radiator face to provide protection from stones and branches.

Commander, Commander X, Commander XT

715001126

$64.99

BUMPERS

LOWER TAILGATE PROTECTOR

Aluminum body plating covering lower tailgate provides additional protection and aggressive look.
Commander, Commander X, Commander XT except CE version
715001097
$89.99

REAR BUMPER

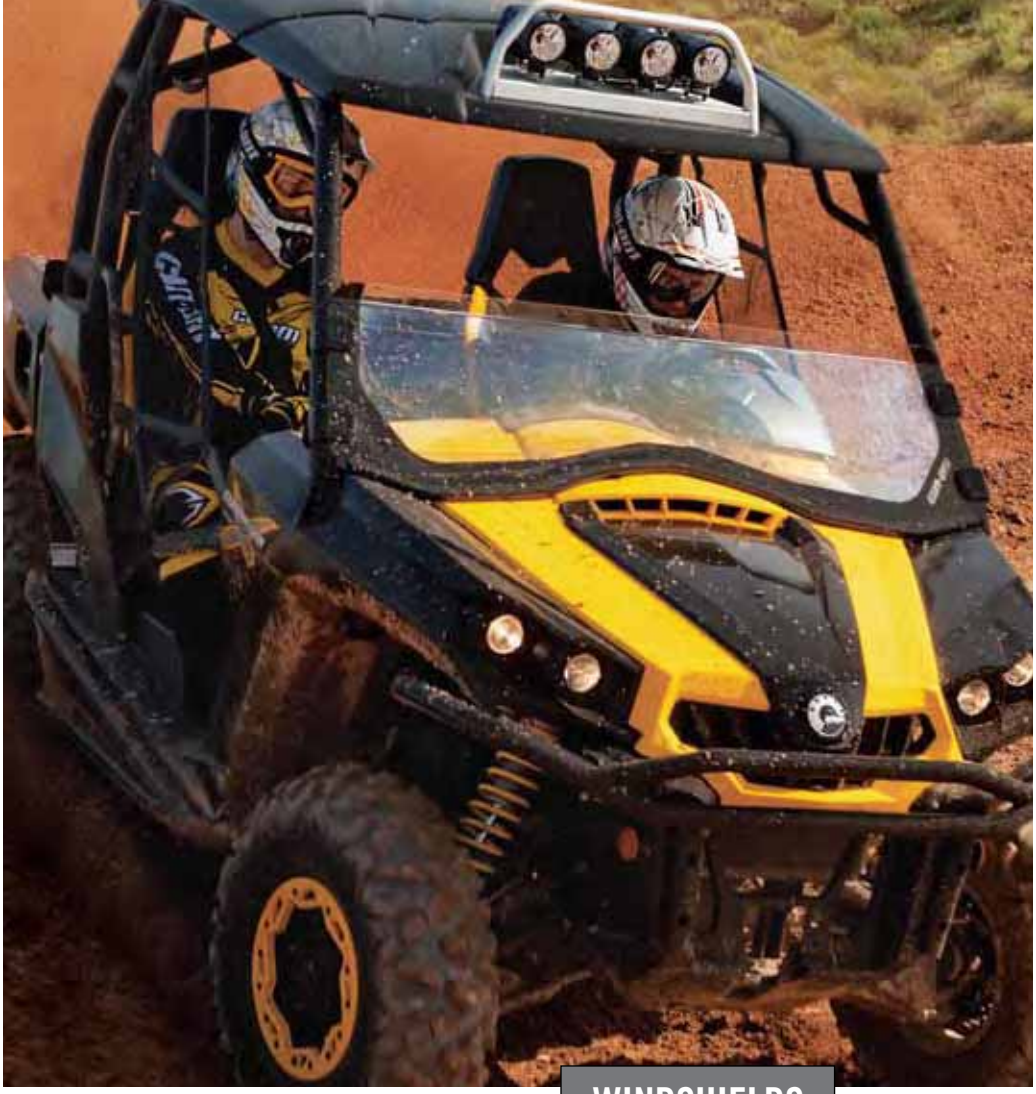
Integrated tubular system provides sporty look while protecting vehicle's bodywork. Flips with cargo box and lower tailgate.
Commander, Commander X, Commander XT
715000657
$249.99

XT FENDER FLARES

Deliver aggressive look while providing added protection from dirt and debris. Standard on XT models. Includes front and rear extensions and all mounting hardware.
715001013
$199.99

XT BOX RAILS

Add integrated tie down area to your cargo box while enhancing the look. Textured black finish.
715000957
$99.99



HALF WINDSHIELD

Designed for protection from wind and debris as well as optical clarity. This rugged, durable polycarbonate construction offers better impact resistance than acrylic windshields. Features reverse angle lip to deflect air flow. Non yellowing, non crazing, non cracking and UV resistant properties. Quick-attach brackets procure fast, easy and tool-less installation and removal.

Commander, Commander X, Commander XT

715000954

$229.99

WINDSHIELDS

FULL WINDSHIELD - HARDCOATED

Combines the utmost in protection from the elements with optical clarity while riding. Hardcoated (both sides) polycarbonate material offers excellent impact and abrasion resistance, as well as prolonged protection against wear-and-tear for longer “like new” look than acrylic windshields. Non yellowing, non crazing, non cracking and UV resistant properties. Quick-attach brackets procure fast, easy and tool-less installation.

Commander, Commander X, Commander XT

715001177

$529.99

FULL WINDSHIELD

Designed for optical clarity and better impact resistance than acrylic windshields thanks to durable polycarbonate construction. Non yellowing, non crazing, non cracking and UV resistant properties. Quick-attach brackets procure fast, easy and tool-less installation and removal.

Commander, Commander X, Commander XT

715000664

$369.99

ROOF ACCESSORIES

ROOF MIDDLE SECTION

Ultimate in protection, style and integration. Twinsheet HDPE manufacturing delivers premium look, and complete coverage when combined with Sport Visor. Quick-attach bracket procures fast, easy and tool-less installation and removal.

Commander, Commander X, Commander XT

715001176 **Yellow**

715000655 **Black**

$499.99

SPORT VISOR

Aggressive designed, twinsheet HDPE sport visor complete with integrated driver and passenger inner storage pockets. Required for installation of Can-Am light rack system. Complete with integrated light switch knock outs. Creates full roof for maximum element protection when combined with the roof middle section. Easy installation and removal. Can be used in conjunction with any windshield.

Commander, Commander X, Commander XT

715000762

$299.99

PANORAMIC CENTER MIRROR

Convex mirror for wide angle visibility. Can be used with or without roof and windshields. Light switches not included. Sport Visor sold seperately.

715000956

$74.99

LIGHTS ACCESSORIES

HID LIGHTS

Incomparable and powerful HID long range illumination plug-and-play system converts night usage into virtually daytime riding. Integrated ballast unit with 3.25" clear glass lens and swivel mounting heavy-duty bracket provides compact design. Water and dust proof IP67 and IP6K9K. Highest electromagnetic compatibility rating, i.e. EMC Class 5 according to CISPR 25, for total disturbance-free electronic operation. Peak light performance with just 35W. Luminous flux is 2.5 times higher than conventional halogen bulb with 35% less energy consumption. High vibration resistance with 5 times longer lifetime than halogen bulb. Constant light intensity even under unsteady power supply voltage. Includes basic wiring and switch. Works in conjunction with halogen and/or HID lights separately or in combination without overloading your charging system. Must be used with Light Rack for Sport Visor (715000910) and Sport Visor (715000762). Roof Accessories and Light Wiring Kit (715000987) is required to install the HID lights. Sold in packs of 2.

Commander, Commander X, Commander XT - 715000836

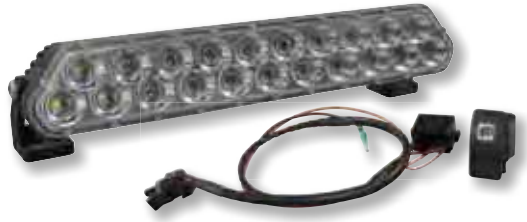
$899.99

HALOGEN LIGHTS

Delivers long range illumination. Integrated ballast unit with 3.25" clear glass lens and swivel mounting heavy duty bracket provides compact design. Includes basic wiring and switch. Works in conjunction with halogen and/or HID lights separately or in combination without overloading your charging system. Must be used with Light Rack for Sport Visor (715000910) and Sport Visor (715000762). Roof Accessories and Light Wiring Kit (715000987) is required to install the halogen lights. Sold in packs of 2.

Commander, Commander X, Commander XT - 715000909

$169.99



LED LIGHT BAR

Plug-and-play 21 LED x 5w 6300 lm system for premium long and close range illumination. Water and dust proof IP67. Heavy-duty, with 50,000 hrs durability. Includes basic wiring and switch. Must be used with Light Rack for Sport Visor (715000910) and Sport Visor (715000762). Roof Accessories and Light Wiring Kit (715000987) is required to install the LED Light Bar.

Commander, Commander X, Commander XT - 715000976

$849.99

LIGHT RACK FOR SPORT VISOR

Provides Commander side-by-side vehicle with a custom look. Made of rugged aluminum with a light anodized finish. Essential protection for your accessory lighting systems. Works in conjunction with LED Light Bar, or halogen and/or HID lights separately or in combination without overloading your charging system. Fully integrated. Sport Visor (715000762) is required for installation of the light rack. Lights sold seperately.

Commander, Commander X, Commander XT - 715000910

$149.99

ROOF ACCESSORIES AND LIGHT WIRING KIT

All the necessary hardware, wires, fuses and relay to power your roof lighting for a clean well routed look. Includes additional output for future roof accessories.

Commander, Commander X, Commander XT - 715000987

$79.99

WHEELS

XT 14" WHEELS (SILVER)

Premium cast aluminum rim.
Standard on XT models. Sold individually.
705400632 Front
$124.99
705500965 Rear
$139.99

XT 14" WHEELS (BLACK)

Premium cast aluminum rim with durable black finish. Standard on XT Camo models. Sold individually.
705400919 Front
$124.99
705501261 Rear
$139.99

PLOW

SUPER DUTY PLOW

Heavy-duty 12 gauge steel blade with integrated reinforcement for maximum durability. Complete plow system with manual lifting and angling. Heavy-duty push tubes withstand the roughest uses. Requires winch for raising and lowering. Easy install. Quick disconnect system for fast installation and removal. Front mount system provides a minimum of 11" of lift. Front mount included.
715001140
$999.99

NOTE: Picture shows plow extensions and drift cutters that are not included with the plow.

Front mount

Front mount does not reduce clearance and can be installed with or without front skid plate.

WINCH & HITCH SUPPORT PLATE

Mounting plate for RT40 Warn winch kit (715000658) and front 2" receiver hitch (715000663). Standard on XT models.

715000704

$89.99

FRONT 2" RECEIVER HITCH

Can be used with a standard 2" draw bar. Complete with integrated quick locking/release pin for easy installation and removal of draw bar. Allows for front-mount pulling/pushing or additional accessory attachments, such as a plow. Winch & hitch support plate (715000704) is required for installation.

715000663

$89.99

MULTIMOUNT TOW

1.5" bar system, no ball. Requires multimount winch kit (715000659).

715001142

$44.99

FRONT SWAY BAR

Enhances vehicle performance and control during hard cornering.

715001125

$479.99

MULTIMOUNT WINCH KIT

For use with RT40 Warn winch kit (715000658). Versatile system that can be easily mounted at the front or rear of the Can-Am Commander side-by-side vehicle. Complete with Can-Am plug-and-play front and rear wire harness. Ergonomic branded handle makes it easy to carry from front to rear. Front 2" receiver hitch (715000663) is required for installation. Integrated receiver allows for use with multimount tow (715001142), not included.

715000659

$299.99

HITCHES & WINCHES

SYNTHETIC WINCH CABLE

50 feet of 7/32" synthetic cable for RT40 Warn winch kit.
NOTE: Replacing a wire rope with synthetic cable also requires changing the fairlead to avoid damage and wear to the new synthetic cable from the rough surface of the old fairlead.
715001118
$119.99

SYNTHETIC CABLE EXTENSION

Lightweight 1/4" diameter, easy to handle and won't rattle in cargo box. Easily attaches to winch cable to provide additional 50' of distance. 4,000 lbs single line capacity.
715001120
$129.99

WIRE ROPE REPLACEMENT

55 feet of 7/32" wire rope for RT40 Warn winch kit.
715001117
$64.99

ROLLER FAIRLEAD

Heavy-duty replacement fairlead for RT40 Warn winch kit.
715001119
$119.99

RT40 WARN WINCH KIT

Fully-sealed, capable of 4,000 lbs pulling strength. Includes 1.5hp motor, 55 feet of 7/32" wire rope, ergonomically designed clutch knob, mechanical brake, hand-held remote and integrated dash switch, waterproof contactor and roller fairlead. CE certified.
715000658
$669.99

WIRELESS REMOTE CONTROL

The system is quick and easy to install, thanks to a wiring harness with an integrated antenna, and all necessary mounting hardware. The system allows you to operate your winch from anywhere within a 50' (15 m) radius, increasing your recovery options. All components are weatherproof.
715000544
$164.99

MULTI-FIT

TRAILERING AND STORAGE COVER

Can-Am branded 300-denier solution-dyed, water repellent polyester construction. Fits with or without roof, light rack, front rack, light protector, rear bumper, extreme bumper, side mirrors. Has trap for fuel, access to cargo box and passenger area. Heavy duty cord around bottom for secure fit. Features soft material in the windshield area to prevent scratches while trailering.

715001025

$279.99

LOCK FOR TAILGATE

Device locks lower tailgate. Includes key.

715001127

$29.99

WORK KEY

(Not illustrated)
Key limits vehicle speed to 25 mph for use on construction sites

715001201

$44.99

LOCKABLE GAS CAP

Protects your fuel. Meets latest EPA requirements.

715001124

$44.99

XT SPORT STEERING WHEEL

Polyurethane soft-touch black grip highlighted with silver spokes. Standard on XT and X models.

715001134

$149.99

REAR WIND SCREEN

Full rear mesh coverage reduces backdraft when windshield is installed. Mounts to roll bar. White Can-Am logo on black mesh.

715001193

$69.99

ROCK SLIDER

Protects vehicle's sides and undercarriage against large obstacles. Textured black electrocoated for durability. Standard equipment on Commander X model.

Commander, Commander XT - 715001014

$259.99

RACE

FOR RACE INSPIRED RIDERS WHO WANT TO RIDE LIKE PROS. HIGH PERFORMANCE, MULTIFUNCTIONAL GEAR FEATURING THE BOLD TEAM LOOK THAT HAS PODIUM-FINISH RIDE WRITTEN ALL OVER IT.

Yellow (10) Green (70) White (01)

Back

X RACE JERSEY

Very light, quick-dry, antibacterial, moisture-wicking fabric. Mesh panels at front, back and armholes for maximum breathability. Extended back for coverage while riding. Non-fading sublimated graphics.

100% Polyester — Sizes: M, L, XL, 2XL
286193 - White (01), Yellow (10), Green (70)
$59.99

Yellow (10) Green (70) Black (90)

X RACE PANTS

Lightweight and extremely breathable pants for riders seeking peak performance, toughness and a competitive edge. Strong nylon outer shell. Overall water-repelling Teflon® treatment, and light colors Teflon HT-treated for water and stain resistance. 3/4 length mesh lining. Can-Am sublimated stretch panel on sides. Double- and triple-stitched construction for enhanced durability. Inner knee debossed fullgrain leather for heat and abrasion resistance. Stretch panel at crotch, knee, back and lower back leg for ease of movement. Rubberized elastic waist to hold jersey in place. Ratchet-style waist closure for better adjustment. Straight hem at leg opening for better in-boot comfort.

Shell: 54% Nylon, 41% Polyester, 5% Genuine Leather — Sizes: 30, 32, 34, 36, 38, 40
286194 - Yellow (10), Green (70), Black (90)
$159.99

White (01) Charcoal Grey (07)

X RACE CAP

Fitted stretch twill cap with all-over pattern. X-Team rubber patch at front.

98% Cotton, 2% Spandex — Sizes: S/M, L/XL
286196 - White (01), Charcoal Grey (07)
$19.99

White (01) Yellow (10) Black (90)

X RACE GLOVES

Designed for coverage and flexibility. Hook-and-loop wrist closure system. Pre-curved design for improved fit. Air mesh panels for ventilation and mobility. Perforated palm for ventilation. Direct injection details on backhand. Silicone fingertip for added grip and control. Double Clarino layer at palm and thumb for extra durability and comfort. Knuckle gussets for better mobility.

Shell: Air Mesh, Spandex, Clarino†

Sizes: S, M, L, XL, 2XL

286195 - White (01), Yellow (10), Black (90)

$37.99

MATCHING PRODUCT

CAN-AM ATV XP-2 X RACE HELMET ▸ SEE P.34

Matte Black (93) Black (90)

TEAM JERSEY

Quick-dry, antibacterial, Microbox moisture-wicking fabric. Mesh at underarms. Non-fading sublimated graphics that match perfectly with Team Riding pants. Drop-tail.

100% Polyester
Sizes: S, M, L, XL, 2XL
286216 - Black (90), Matte Black (93)
$49.99

Charcoal Grey (07) Black (90)

TEAM RIDING PANTS

Ultimate-ride design. Lightweight and durable. Breathable, waterproof nylon shell. 500 denier nylon at seat for extra durability. Double- and triple-stitched construction for added toughness. Sealed critical seams. Zipper ventilation on thigh. 3/4 length mesh lining. Stretch panel at lower back for ease of movement. Water-resistant stretch panel at crotch. Binding hem for reinforcement. Two hip pockets. Quick-release front closure buckle adjustment. Connector attaching pants to Can-Am Riding jacket to prevent jacket from riding up.

Shell: 100% Nylon
Sizes: 30, 32, 34, 36, 38, 40
286138 - Charcoal Grey (07), Black (90)
$139.99

Charcoal Grey (07) Black (90)

TEAM RIDING GLOVES

Hook-and-loop wrist closure system. Spandex construction for good mobility. Pre-curved design for improved fit. Direct-injection patches on back hand. Chamude palm.

Shell: Spandex, Chamude
Sizes: S, M, L, XL, 2XL
286139 - Charcoal Grey (07), Black (90)
$26.99

MATCHING PRODUCT

CAN-AM ATV XC-1 HOLESHOT HELMET ▸ SEE P.34

RACE

Brown (04) Yellow (10) Black (90)

CAN-AM RIDING JACKET

Highly resistant, Teflon HP-treated nylon with RPM waterproof, breathable technology. Double stitch construction throughout. Mesh lining. Sealed critical seams. Shaped sleeves. Double front flap and adjustable wrist, hem and collar. Removable panel at underarm plus additional ventilation at back for maximum airflow. Interior zippered pocket. Two 3-D pockets at chest plus two hip pockets. Can-Am sonic-injection logo at chest; yellow version features X-Team logo. Reflective Can-Am logo at center back. Connector attaching jacket to Team Riding or Can-Am Cross pants to prevent jacket from riding up.

Shell: 100% Nylon — Sizes: XS, S, M, L, XL, 2XL
286143 - Brown (04), Yellow (10), Black (90)
$159.99

Charcoal Grey (07)

TEAM CAP

X-Team rubber patch with rubber details on peak. BRP metal adjuster at back.

100% Cotton — One size
286142 - Charcoal Grey (07), Black (90)
$19.99

Back

MUD JACKET

100% waterproof translucent PVC. Electronically-welded seams. Underarm and rear vent panels. Drawstring hood and hem. Elastic cuffs. Two hand pockets.

Sizes: S, M, L, XL, 2XL
286127 - Clear (00)
$28.99

MUD PANTS

Oversized pants made of 100% waterproof translucent PVC. Electronically-welded seams. Strategic ventilation. Side openings at bottom leg.

Sizes: S, M, L, XL, 2XL
286128 - Clear (00)
$12.99

White (01)

Turquoise (Aqua) (76)

Back

LADIES' TEAM JERSEY

Specific fit and design for ladies. Stretch, quick-dry, antibacterial, moisture-wicking fabric for maximum comfort. Fitted cut with non-fading sublimated graphics. Small cuff. V-neck.

94% Polyester, 6% Spandex — Sizes: S, M, L, XL, 2XL

286222 - White (01), Turquoise (Aqua) (76)

$49.99

White (01)

Charcoal Grey (07)

LADIES' TEAM PANTS

High-tech femine design fit for hard-riding. Lightweight and durable. Breathable, waterproof nylon shell. 500 denier nylon at seat for extra durability. Double- and triple-stitched construction for added toughness. Sealed critical seams. Side leg zipper ventilation. 3/4 length mesh lining. Water-resistant stretch panel at crotch. Reinforced binding hem with zipper to facilitate exit and entry. 2 hip pockets. Padded, shaped knees.

Shell: 100% Nylon — Sizes: 5-6, 7-8, 9-10, 11-12, 13-14

286148 - White (01), Charcoal Grey (07)

$139.99

White (01)

Turquoise (Aqua) (76)

LADIES' STRIPES CAP

Herringbone twill cap. Rubber Can-Am logo with contrasting appliqué stripes. Metal adjuster with BRP logo.

100% Cotton — One size

286150 - White (01), Turquoise (Aqua) (76)

$19.99

RACE

White (01) Turquoise (Aqua) (76)

LADIES' TEAM GLOVES

Pre-curved design for an improved fit. Air mesh panel for maximum ventilation and mobility. Hook-and-loop wrist closure system. Direct injection details on back hand. Silicone fingertips for added grip and control. Double Clarino layer at palm and thumb for extra durability and comfort.

Shell: Air Mesh, Spandex, Clarino
Sizes: S, M, L, XL
286149 - White (01),
Turquoise (Aqua) (76)

$32.99

MATCHING PRODUCT

PRO CROSS XP-R CARBON LIGHT HELMET ▸ SEE P.35

Brown (04) Yellow (10) Black (90)

Back

CAN-AM RIDING JACKET

Highly resistant, Teflon HP-treated nylon with RPM waterproof, breathable technology. 500 denier nylon at hem and double stitch construction throughout. Mesh lining. Sealed critical seams. Shaped sleeves. Double front flap and adjustable wrist, hem and collar. Removable panel at underarm plus additional ventilation at back for maximum airflow. Interior zippered pocket. Two 3-D pockets at chest plus two hip pockets. Can-Am sonic-injection logo at chest. Reflective Can-Am logo at center back. Connector attaching jacket to Team Riding or Can-Am Cross pants to prevent jacket from riding up.

Shell: 100% Nylon — Sizes: XS, S, M, L, XL, 2XL
286143 - Brown (04), Yellow (10), Black (90)
$159.99

CAN-AM CROSS PANTS

Lightweight durable pants Teflon HP-Treated with RPM waterproof and breathable technology. 500 denier waterproof nylon at crotch and seat plus triple seams at crotch. Sealed critical seams. Side leg zipper ventilation. Perfectly-positioned flaps to protect all openings from infiltration. Mesh lining. Binding hem at cuff for reinforcement with zipper to facilitate exit and entry. 2 practical cargo pockets with folded flaps. Cell phone pocket inside right cargo pocket. Belt loops. Connector attaching pants to Can-Am Riding Jacket to prevent jacket from riding up.

Shell: 100% Nylon — Sizes: 30, 32, 34, 36, 38, 40
286126 - Black (90)
$139.99

MATCHING PRODUCT

TRAIL GLOVES ▸ SEE P.26

TEAM RIDING GLOVES

Hook-and-loop wrist closure system. Spandex construction for good mobility. Pre-curved design for improved fit. Direct-injection patches on back hand. Chamude palm.

Shell: Spandex, Chamude† — Sizes: S, M, L, XL, 2XL
286139 - Charcoal Grey (07)
$26.99

ADVENTURE

DESTINATION RIDERS LOOK FOR ULTIMATE COMFORT FOR DRIVER AND PASSENGER. WEATHERPROOF AND RUGGED TO ENHANCE THE RIDE TO YOUR FAVOURITE SPOT OR SPORT.

Back

LADIES' CAN-AM RIDING JACKET

Highly resistant, Teflon HP-treated nylon with RPM waterproof, breathable technology. 500 denier nylon at hem and double stitch construction throughout. Mesh lining. Sealed critical seams. Shaped sleeves. Double front flap and adjustable wrist, hem and collar. Long ventilation at side and underarm, plus additional ventilation at back for maximum airflow. Interior zippered pocket. Can-Am sonic-injection logo at chest and reflective tribal print. Reflective Can-Am logo at center back. Connector attaching jacket to Team Riding or Can-Am Cross pants to prevent jacket from riding up. Gusset at back armhole for comfort. Brushed polyester at inner collar, pocket and wrist for extra comfort.

Shell: 100% Nylon — Sizes: XS, S, M, L, XL, 2XL
286201 - Black (90)
$159.99

LADIES' CAN-AM CROSS PANTS

Lightweight durable pants, Teflon HP-treated nylon with RPM waterproof and breathable technology. 500 denier waterproof nylon at crotch and seat. Sealed critical seams. Side leg zipper ventilation. 3/4 length mesh lining. Binding hem at cuff for reinforcement with zipper to facilitate exit and entry. Two zippered hip pockets with flaps. Connector attaching pants to Can-Am Riding Jacket to prevent jacket from riding up.

Shell: 100% Nylon
Sizes: 5-6, 7-8, 9-10, 11-12, 13-14
286267 - Black (90)
$139.99

Back

TEAM JERSEY

Quick-dry, antibacterial, Microbox moisture-wicking fabric. Mesh at underarms. Non-fading sublimated graphics that match perfectly with Team Riding pants. Droptail.

100% Polyester — Sizes: S, M, L, XL, 2XL

286216 - Matte Black (93)

$49.99

RAIN JACKET

Teflon HP-treated nylon. Sealed critical seams. Double front flap to protect against water and air infiltration. Underarm ventilation. Adjustable wrists and hem. Two exterior and one interior zippered pockets. Reflective logos.

Shell: 100% Waterproof Ripstop Nylon

Sizes: S, M, L, XL, 2XL

440416 - Black (90)

$84.99

RAIN PANTS

Teflon HP-treated nylon. Sealed critical seams. Two zippered hip pockets. Short zipper at calf to facilitate exit and entry. Belt loops. Reflective logos and details.

Shell: 100% Waterproof Ripstop Nylon

Sizes: S, M, L, XL, 2XL

441416 - Black (90)

$74.99

TEAM RIDING PANTS

Ultimate-ride design. Lightweight and durable. Breathable, waterproof nylon shell. 500 denier nylon at seat for extra durability. Double- and triple-stitched construction for added toughness. Sealed critical seams. Zipper ventilation on thigh. 3/4 length mesh lining. Stretch panel at lower back for ease of movement. Water-resistant stretch panel at crotch. Soft inner waist for increased comfort. Binding hem for reinforcement. 2 hip pockets. Quick-release front closure buckle adjustment. Connector attaching pants to Can-Am Riding jacket to prevent jacket from riding up.

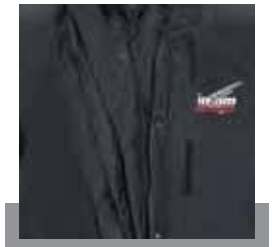
Shell: 100% Nylon

Sizes: 30, 32, 34, 36, 38, 40

286138 - Charcoal Grey (07)

$139.99

Back



QUADRUPLE FRONT FLAP

WINTER JACKET

Modern angular design. Robust textured fabric featuring RPM MAX waterproof, windproof and breathable technology. All seams and logos sealed for added protection from water. Quadruple front flap uniquely designed for windproofness while riding. Vents at underarm and back to enhance moisture evacuation during rigorous riding or mild temps. Adjustable fleece-lined chin-cushioned collar, wrists and sides. Soft micro-fleece inner cuffs. Shaped sleeves for unencumbered movement. Powder skirt to keep wind, cold and snow from riding up. MP3, cell phone, cap inner pockets. Easy-access Napoleon pocket. Reflective details.

Shell: Nylon — Insulation: PRIMALOFT CRESTA
Sizes: S, M, MT, L, LT, XL, XLT, 2XL
286253 - Black (90)
$299.99

WINTER HIGHPANTS

RPM MAX waterproof, windproof and breathable technology. All seams and logos sealed for added protection from water. Intelligent combination of materials specifically adapted to warmth, weatherproofing and comfort standards required for off-road winter riding. Lightweight and versatile. Composite insulation for extra warmth at seat and knees. 600 denier nylon seat, knees and inner legs. Pads at knees for durability. Accordion knees and pre-shaped legs for unencumbered movement. Bib style pants with high back and front to keep wind and snow out. Storm gaiter. Reinforced topstitch at back rise. Full-length side zip. Easy-access thigh pocket. Reflective ankle detail.

Shell: 100% Nylon — Insulation: Primaloft Cresta — Sizes: S, M, MT, L, LT, XL, XLT, 2XL
286254 - Black (90)
$249.99

CAN-AM WINTER RIDING GLOVES

Extra warm nylon, leather palm. Adjustable insulation with removable antibacterial, stay-dry moisture management lining. Visor-wiping cotton terry left thumb for clearing water, snow or fog (also effective on goggles and face). Large gauntlet with adjustable wrist. Reflective details.

Shell: Nylon, Leather
Insulation: Primaloft One
Sizes: S, M, L, XL, 2XL
286204 - Black (90)
$84.99

CAN-AM WINTER RIDING MITTS

Extra warm nylon mitts with leather palm. Adjustable insulation with removable lining. Antibacterial, stay-dry moisture management lining. Reinforced non-slip palm. Visor wiper. 5.5" (14 cm) gauntlet with adjustable wrist. Reflective details.

Shell: 100% Nylon
Insulation: Primaloft One
Sizes: S, M, L, XL, 2XL
286257 - Black (90)
$74.99

Back

JACKET-IN-POUCH

BAYOU JACKET

Waterproof DWR-treated nylon fabric. Wide reflective stripes on shoulder for better visibility. Back ventilation for moisture evacuation. Sealed critical seams. Pre-shaped sleeves. Bellows pocket at left chest. Two Velcro† waist pockets with flap to prevent water intrusion. Jacket-in-pouch folds into a back pocket for easy traveling. Cozy collar. Water deflecting double layer storm flaps. Adjustable wrists and hem. Inner pocket. Can-Am print at front and back.

Shell: 100% Nylon — Sizes: S, M, L, XL, 2XL
286264 - Charcoal Grey (07)
$119.99

PANTS-IN-POUCH

BAYOU PANTS

Waterproof DWR-treated nylon fabric. Double layer and triple topstitch at seat for durability. Sealed critical seams. Pre-shaped leg. Adjustable suspenders. Storm gaiters at bottom opening. Adjustable waist. Two cargo pockets with flap and gusset at front opening to prevent water intrusion. Gusset at crotch to facilitate movement. Can-Am print at left leg. Elastic at bottom leg to prevent pants from riding up. Pants-in-pouch folds into inner pocket for easy traveling.

Shell: 100% Nylon
Sizes: S, M, L, XL, 2XL
286265 - Charcoal Grey (07)
$99.99

CAN-AM CANVAS PANTS

Durable 12 oz polyester-cotton blend canvas. Fabric treated with water repellent, stone-washed for softness and comfort. Durable triple needle stitching and bar tacks at stress points. Double layer at knee. Gusset at crotch to facilitate movement. Higher back waist and shaped legs for better riding comfort. Velcro cargo and back pockets. Can-Am embroidery on back pocket. Belt loops.

65% Polyester, 35% Cotton — Sizes: 30, 32, 34, 36, 38, 40
286266 - Warm Grey (15)
$59.99

TRAIL GLOVES

Comfortable and flexible gloves. Leather reinforcements at fingers, palm and backhand for extra durability. Hipora insert at backhand to add water resistance without compromising grip at palm. Pre-curved design for improved fit. Clarino† at palm and thumb. Inverted seams at fingers for better comfort.

Shell: Air Mesh, Spandex, Clarino†
Sizes: S, M, L, XL, 2XL
286268 - Black (90)
$37.99

MATCHING PRODUCT

CAN-AM ST-3 HELMET ▸ SEE P.36

RECREATIONAL

APPAREL FOR WORK AND PLAY RIDING THAT DELIVERS GOOD VALUE FOR THE MONEY AND COVERS ALL THE BASICS. RUGGED AND RELIABLE FOR BIG PLAIN FUN!

Back

MUD JACKET

New matte black opaque version.
100% waterproof PVC. Electronically-welded seams. Underarm and rear vent panels. Drawstring hood and hem. Elastic cuffs. Two hand pockets. Can-Am logo at front left chest and upper back vent.
Sizes: S, M, L, XL, 2XL
286127 - Matte Black (93)
$28.99

MUD PANTS

New matte black opaque version.
Oversized pants made of 100% waterproof PVC. Electronically-welded seams. Strategic ventilation. Side openings and Can-Am logo at bottom legs.
Sizes: S, M, L, XL, 2XL
286128 - Matte Black (93)
$12.99

CAN-AM ZIPPED HOODY

Full-zip hooded sweatshirt. Ribbed waistband and cuffs. Embossed Can-Am logos on yellow stripe.

80% Cotton, 20% Polyester — Sizes: S, M, L, XL, 2XL

286209 - Black (90)

$59.99

Black (90)

Back

CAN-AM X RACE POLO

Quick-dry, antibacterial, moisture-wicking fabric. 3-button front placket. Sublimated non-faded Can-Am and sponsor logos. Side slits.

100% Polyester — Sizes: S, M, L, XL, 2XL

286206 - White (01), Black (90)

$54.99

CAN-AM AUTHENTIC CREWNECK

Crewneck sweatshirt. Ribbed collar, waistband and cuffs. Vintage crackled logo print.

80% Cotton, 20% Polyester

Sizes: S, M, L, XL, 2XL, 3XL

286208 - Charcoal Grey (07)

$49.99

Navy (89)

Black (90)

Back

CAN-AM TECHNICIAN SHIRT

Cotton twill shirt. Chest pockets. X-Team rubber patch at front. Large X-Team embroidery at back. Snap placket. Embroidered sponsor logos on sleeves.

100% Cotton — Sizes: S, M, L, XL, 2XL, 3XL

286205 - Navy (89), Black (90)

$59.99

RENEGADE TEE

Discharged print at front with Can-Am logo on right sleeve.
100% Cotton — Sizes: M, L, XL, 2XL
286189 - Black (90)
$24.99

CAN-AM BELT

Leather belt with vintage inspired metal Can-Am buckle.
100% Leather — Sizes: M, L, XL
286153 - Black (90)
$42.99

White (01) Charcoal Grey (07) Black (90)

DS TEE

Printed logo at front, X-Team logo on left sleeve and "critter" at back bottom.
100% Cotton — Sizes: M, L, XL, 2XL
286188 - White (01), Charcoal Grey (07), Black (90)
$24.99

Green (70) Black (90)

CAN-AM X-TEAM TEE

Can-Am X-Team graffiti print at center front.
100% Cotton — Sizes: M, L, XL, 2XL
286191 - Green (70), Blue (80), Black (90)
$24.99

Ice (38) Black (90)

CAN-AM AUTHENTIC TEE

Cool Can-Am vintage crackled logo on chest. Garment enzyme washed for soft and vintage handfeel.
100% Cotton — Sizes: M, L, XL, 2XL
286190 - Ice (38), Black (90)
$19.99

Charcoal Grey (07) Black (90)

CAN-AM CLASSIC CAP

Light ultra-comfortable stretch fabric. 3-D Can-Am embroidery at front. Metal adjuster with BRP logo.
72% Polyester, 23% Rayon, 5% Spandex
One size
286210 - Charcoal Grey (07), Black (90)
$19.99

Green (70) Black (90)

CAN-AM TRACK CAP

Stretch cotton brushed twill hat. Can-Am logo embossed on right front panel. Can-Am rubber logo. 2 contrast stripes on brim.
98% Cotton, 2% Spandex
Sizes: S/M, L/XL
286212 - White (01), Green (70), Black (90)
$19.99

Grey (09) Black (90)

CAN-AM AUTHENTIC CAP

Adjustable canvas hat. Vintage logo embroidered at front. Metal adjuster with BRP logo.
100% Cotton — One size
286211 - Fire Red (06), Grey (09), Black (90)
$19.99

CAN-AM COOLMAX TECHNICAL SOCKS

Below-knee length with varied thicknesses for comfort. Ribbed top. Moisture-wicking Coolmax† at foot to keep riders cool and dry. Spandex and nylon for comfort and durability. Elasticized ankle and foot arch for secure comfort and fit.
40% Coolmax, 27% Acrylic, 25% Cotton, 5% Nylon, 3% Lycra — Sizes: S/M, L/XL
286154 - Black (90)
$24.99

CAN-AM SUMMER BEANIE

Lightweight, texturized knitted beanie with "X" integrated logo and woven Can-Am label appliqué.
95% Cotton, 5% Spandex — One size
286156 - Black (90)
$14.99

TEEN & KIDS

TEEN RACE JERSEY

Made from quick-dry, antibacterial, moisture-wicking fabric. Extended back for riding position. Sublimated print.
100% Polyester — Sizes: 7-8, 10-12, 14-16
286202 - Yellow (10)
$44.99

TEEN TEAM RIDING GLOVES

Hook-and-loop wrist closure system. Spandex construction for good mobility. Pre-curved design for improved fit. Direct-injection patches on back hand. Chamude palm.
Shell: Spandex, Chamude — Sizes: 6-8, 10-12, 14-16
286203 - Black (90)
$26.99

KIDS' CAN-AM TEE

Can-Am ATV cartoon print at front.
100% Cotton — Sizes: 2, 3-4, 5-6
286260 - Blue (80)
$19.99

White (01)

LADIES' AUTHENTIC T-SHIRT

Fitted t-shirt. V-neck with vintage crackled print at front.
95% Cotton, 5% Spandex — Sizes: S, M, L, XL
286263 - White (01), Black (90)
$19.99

Charcoal Grey (07)

LADIES' X-TEAM T-SHIRT

Fitted feminine t-shirt. X-Team logo at chest.
95% Cotton, 5% Spandex — Sizes: S, M, L, XL
286262 - White (01), Charcoal Grey (07)
$24.99

Back

LADIES' X-TEAM POLO

Semi-fitted polo with contrasting placket. X-Team logo printed at chest. Can-Am outline embroidery at back.
95% Cotton, 5% Spandex — Sizes: S, M, L, XL
286261 - Charcoal Grey (07)
$34.99

LADIES' CAN-AM MICRO-FLEECE HOODIE

Asymmetrical neck opening on a hooded feminine-fit micro-fleece. Contrast cord, hood lining, pocket flaps and logo. Can-Am logo appliqué on left sleeve. Two pockets.
100% Polyester — Sizes: S, M, L, XL, 2XL
286200 - Charcoal Grey (07)
$59.99

FULL FACE HELMET CASE

Water-resistant shell biofoam construction. Self-healing nylon zippers. Quick-access spare faceshield storage. External legs for vertical storage. Interior scratch-proof inner surface. Ergonomic soft-touch rubber carrying handle.

One size
445856 - Black (90)
$46.99

CAN-AM PRO GEAR BAG

Designed and built for consummate riding. Protective helmet compartment, water-tight drained boot compartment, dry-mat and cavernous center compartment, tool compartment. Inline wheels and pull-handle for maximum portability.

One size
286214 - Black (90)
$189.99

CROSS HELMET CASE

Water-resistant EXO shell biofoam construction. Self-healing nylon zippers. Quick-access spare faceshield storage. External legs for vertical storage. Interior scratch-proof inner surface. Ergonomic soft-touch rubber carrying handle.

One size
445857 - Black (90)
$46.99

CAN-AM WEEKENDER DUFFLE BAG

Designed for day trips or extended outings.

One size
286213 - Black (90)
$44.99

CAN-AM X-TEAM GOGGLES BY SMITH†

Hinged strap for excellent fit. Comes with mirrored and clear lenses. Includes tear-off posts. Large flexible frame. Fast absorption technology 3-layer hypoallergenic face foam. Double wide silicone-backed strap. Mask positioning system.

One size
447310 - White (01), Orange (12)
$94.99

PRO CAN-AM GOGGLES WITH QUICK-STRAP BY SMITH

Same features as Pro Can-Am goggles plus quick-strap.

One size
445874 - Black (90)
$64.99

PRO CAN-AM GOGGLES BY SMITH

Flexible frame. 2-layer hypoallergenic face foam. Double wide silicone-backed strap. Clear Lexan† lens. Optional mask available.

One size
445873 - Yellow (10), Black (90)
$53.99

HELMETS

XP-2 / XC-1

Yellow (10)

Red (30) Green (70)

CAN-AM ATV XP-2 X RACE HELMET

Fiberglass/Kevlar matrix shell: high-tech, lightweight and tough. Fully-adjustable, aero-tuned visor that reduces lift at high speeds. Ventilation system. Moisture-wicking and breathable chin strap, liner and cheek pads. Easily removable and washable liner and cheek pads. Provides maximum visibility, fits all goggles. Strap grip keeps goggle strap in place. Clear coated bold waterslide graphics. Snell M2005 and D.O.T. certified.

Shell: Lightweight Fiberglass/Kevlar† — Sizes: XS, S, M, L, XL, 2XL
447407 - Grey (09), Yellow (10)
$199.99

CAN-AM ATV XC-1 HOLESHOT HELMET

Advanced Polycarbonate Composite shell: lightweight and tough. Fully-adjustable, aero-tuned visor that reduces lift at high speeds. Ventilation system. Moisture-wicking and breathable chin strap, liner and cheek pads. Easily removable and washable liner and cheek pads. Provides maximum visibility, fits all goggles. Strap grip keeps goggle strap in place. Clear coated bold waterslide graphics. Snell M2005 and D.O.T. certified. Two Can-Am stickers included.

Shell: Polycarbonate Composite — Sizes: XS, S, M, L, XL, 2XL
447406 - Yellow (10), Red (30), Green (70)
$139.99

CAN-AM ATV XC-1 HELMET

Advanced Polycarbonate Composite Shell: lightweight and tough. Fully-adjustable, aero-tuned visor that reduces lift at high speeds. Ventilation system. Moisture-wicking and breathable chin strap, liner and cheek pads. Easily removable and washable liner and cheek pads. Provides maximum visibility, fits all goggles. Strap grip keeps goggle strap in place. Snell M2005 and D.O.T. certified.

Shell: Polycarbonate Composite — Sizes: XS, S, M, L, XL, 2XL
445960 - Black (90)
$129.99

REPLACEMENT PEAKS

(Not illustrated)
One size

CROSS HELMET (2008)
445909 - Black with graphics (94)
$21.99

PRO CROSS HELMET (2008)
445914 - Black with graphics (94)
$21.99

CAN-AM ATV CROSS HELMET
445933 - Black (90)
$19.99

MECHANITUNE PRO CROSS HELMET
447295 - Silver (08)
$21.99

TEAM CROSS HELMET
447296 - Yellow (10), Pink (36)
$21.99

CROSS CRITTER HELMET
447297 - Black with graphics (94)
$21.99

X RACE PRO CROSS XP-2 HELMET
447408 - Grey (09), Yellow (10)
$21.99

HOLESHOT CROSS XC-1 HELMET
447409 - Yellow (10), Red (30), Green (70)
$21.99

PRO CROSS XP-R CARBON LIGHT HELMET
447434 - Black (90)
$29.99

25% LIGHTER THAN ALL OTHER HELMETS IN ITS CATEGORY

PRO CROSS XP-R CARBON LIGHT HELMET

Our best-of-the-best M.D.C.F. (Multi Directional Carbon Fiber) lightweight helmet with carbon and aramid fiber reinforced shell (weight: +/- 1275g for "L" size).

- EPS foam upper insert between inner fabric and outer shell for optimized user protection.
- Integrated rear fin for added stability and aerodynamic performance.
- Tool-less multi adjustable wide angle front peak with anti-reflecting sticker just below to deflect glare.
- Large flexible nose protector for better protection.
- Double D racing buckle, anti-slip goggle strap, pocket for sweat absorbent front pad.
- Removable and washable cheek and head pads.
- Morpho System Plus - Ergonomic 3D cheek pads available in your size.
- Surround comfort sanitized treated interior with Coolmax moisture wicking action.
- F.A.S. (Full Air System) with 10 ventilation points and double rear extractor.
- Aluminum screws, protective coated parts.
- Ergonomic helmet bag.
- D.O.T. and ECE 22.05 certified.

Shell: 100% Carbon Fiber Composite — Sizes: XS, S, M, L, XL
447412 - Black (90)
$449.99

CARBON FIBER TEXTURE

SWEAT ABSORBENT PADS

One size
447435 - White (01)
$7.99

PRO CROSS XP-R MORPHO KIT CHEEK PADS

Left and right cheek pads included.
Sizes: M, L, XL, 2XL, 3XL
447436 - Clear (00)
$14.99

ST-1 / ST-3

Silver (08) Blue (80)

CAN-AM ST-1 HYBRID HELMET

Multiple functionalities when fitted with optional one-of-a-kind jaws. Outer shell ventilation features include two ventilation tab kits with anti-fog spray kit. Anti-scratch and retractable sun visor. Moisture-wicking and breathable removable liner and cheek pads. D.O.T. and ECE 22.05 certified.

Shell: Polycarbonate Composite — Sizes: XS, S, S/M, M/L, L, XL

447427 - Silver (08), Blue (80), Black (90)

$299.99

CAN-AM ST-1 HYBRID FULL FACE JAW

Transforms the ST-1 Hybrid Helmet into a standard full face helmet for extra wind protection.

One size

447428 - Silver (08), Blue (80), Black (90)

$69.99

CAN-AM ST-1 HYBRID VENTED JAW

Transforms the ST-1 Hybrid Helmet into a jet ventilated full face helmet for enhanced protection with ventilation comfort.

One size

447429 - Silver (08), Blue (80), Black (90)

$69.99

Silver (08) Black (90)

CAN-AM ST-3 HELMET

Open face helmet. Vent system on top. Double density inner shell. Non-allergenic and breathable internal lining. Clear visor with anti-scratch treatment. D.O.T. approved.

Shell: Polycarbonate Composite — Sizes: XS, S, M, L, XL, 2XL

447464 - Silver (08), Black (90)

$89.99

CAN-AM ST-1 HYBRID PANE VISOR

Optically-correct shield with hardcoated anti-scratch technology.

One size

Short - 447431 - Clear (00)

$49.99

CAN-AM ST-1 HARDWARE KIT FOR TOP VENT

Hardware Kit for Top vent replacement.

One size

447432 - Clear (00)

$24.99

CAN-AM ST-1 HARDWARE KIT FOR VISOR AND JAW

Hardware Kit for Visor and Jaw.

One size

447433 - Clear (00)

$24.99

COMPLETELY REDESIGNED NEW GENERATION

OF FULL FACE HELMET INSPIRED BY ORIGINAL MODULAR 2 HELMET

SPACIOUS DESIGN ALLOWS ROOM FOR EYEGLASSES. D.O.T. APPROVED. THE BEST QUALITY / PRICE RATIO ON THE MARKET.

VISION 180° FULL FACE HELMET

Adjustable sunshield at the touch of a button

Integrated sunshield for reduced glare

Clear Vision Technology with optically-correct dual lens visor for increased 180° peripheral vision

Exhaust vent for control breathing airflow

Breath deflector system

Double D ring chin strap

Shell: Polycarbonate Composite
Sizes: XS, S, M, L, XL, 2XL, 3XL
447445 - Grey (09), Red (30), Black (90)
$169.99

Red (30) Black (90)

ELECTRIC VISOR

Sun visor not included.
One size
445968 - Clear (00)
$169.99

REPLACEMENT VISOR

Sun visor not included.
One size
445967 - Clear (00)
$99.99

ABSORBENT MASK

One size
447473 - White (01)
$7.99

SUN VISOR

One size
445971 - Yellow (10), Smoke (57)
$59.99

VISION 180° ELECTRIC FULL FACE HELMET

Shell: Polycarbonate Composite
Sizes: XS, S, M, L, XL, 2XL, 3XL
447446 - Grey (09), Red (30), Black (90)
$229.99

BV2S

BV2S fog-resistant mask system with unparalleled adjustment capabilities to adapt to all faces. Integrated backlight. Dual lens visor featuring enhanced 180° peripheral vision. Adjustable sunshield. Front push-button release. Detachable breathing mask. Quick-release chin strap. Washable interior. D.O.T. approved. Backlight batteries included.

LIMITED TIME OFFER*

FLASHLIGHT KIT INCLUDED

BV2S PROMO

Includes powerful led flashlight and quick attach kit. Improves visibility at night. Easily removable. Batteries not included

Retail value of $50.
At participating dealers only.
**While supplies last*

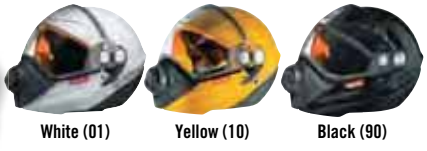
White (01) Red (30) Black (90)

BV2S HELMET PROMO

Shell: Polycarbonate Composite — Sizes: S, M, L, XL, 2XL, 3XL
447460 - White (01), Yellow (10), Red (30), Black (90)
SPECIAL PROMOTION PRICE $449.99

BV2S ELECTRIC SE HELMET PROMO

(Not illustrated)
447477 - Black (90)
SPECIAL PROMOTION PRICE $529.99



White (01) Yellow (10) Black (90)

BV2S HELMET

Polycarbonate Composite — Sizes: S, M, L, XL, 2XL, 3XL
447404 - White (01), Yellow (10), Red (30), Black (90)
$449.99

BV2S SE HELMET

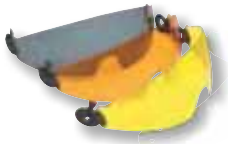
Polycarbonate Composite — Sizes: S, M, L, XL, 2XL, 3XL
447468 - Black (90)
$529.99

ELECTRIC VISOR

One size
447374 - Clear (00)
$179.99

REPLACEMENT VISOR

One size
445795 - Clear (00)
$109.99



SUNSHIELD VISOR

One size
445720 - Yellow (10), Orange (12), Smoke (57)
$59.99

HELMET LIGHTING SYSTEM KIT

Batteries are not included.
One size
447465 - Black (90)
$39.99

BREATHING MASK

One size
444695 - Yellow (10)
$49.99

ABSORBENT MASK

One size
447282 - White (01)
$7.99

MODULAR 2 HELMET

Built-in Clear Vision Technology with optically-correct dual lens visor for increased peripheral vision and integrated sunshield for reduced glare.

Adjustable sunshield lowers or raises at the touch of a button.

Front push-button release integrated into jaw section facilitates manipulation when wearing gloves.

BREATH EVAC fog-resistant mask system and increased vent diameter control breathing airflow.

Quick-release chin strap.

Spacious design allows room for eyeglasses.

Graphics applied with ink transfer process for high quality finish and increased scratch resistance.

D.O.T. approved.

Shell: Polycarbonate Composite — Sizes: S, M, L, XL, 2XL, 3XL
445935 - White (01), Grey (09), Yellow (10), Red (30), Black (90)
$324.99

Grey (09) Yellow (10) Red (30) Black (90)

REPLACEMENT VISOR

Sun visor not included.
One size
445967 - Clear (00)
$99.99

ELECTRIC VISOR

Sun visor not included.
One size
445968 - Clear (00)
$169.99

SUN VISOR

One size
445971 - Yellow (10), Smoke (57)
$59.99

ABSORBENT MASK

One size
445953 - White (01)
$7.99

MODULAR 2 SE HELMET

Shell: Polycarbonate Composite
Sizes: S, M, L, XL, 2XL, 3XL
447469 - Black (90)
$399.99

BASIC BALACLAVA

No-nonsense balaclava designed for warmth, dryness and comfort. Flatlocked seams prevent skin chafing.

80% Nylon, 20% Spandex
One size
447449 - Black (90)
$9.99

MICRO-FLEECE BALACLAVA

Stretchable, antibacterial warming fleece fabric with brushed inner surface. Flatlocked seams prevent skin chafing.

92% Polyester, 8% Spandex
One size
445952 - Black (90)
$21.99

MASK SYSTEM BALACLAVA

Mask system helmet-matching balaclava. Seals around mouth and nose, while keeping head and face warm and dry.

60% Polyester, 30% Nylon, 10% Spandex
Sizes: S/M, L/XL
447450 - Black (90)
$25.99

MOUNTAIN BALACLAVA

Stretchable, quick-dry fabric with brushed inner surface. Neoprene face guard for effective moisture exchange to promote breathing in extreme cold. Flatlocked seams prevent skin chafing.

80% Nylon, 15% Spandex, 5% Synthetic Rubber
One size
445951 - Black (90)
$26.99

TECHNICAL BALACLAVA

Strategically placed mesh for breathability, micro-fleece for warmth. Windproof neck bib. Higher at back of neck for increased motion range. Flatlocked seams prevent skin chafing.

92% Polyester, 8% Spandex — One size
445950 - Black (90)
$26.99

USA – 716000724

2011

PARTS, ACCESSORIES & RIDING GEAR

can-am

STORE.CAN-AM.BRP.COM

IT'S FAST, IT'S CONVENIENT AND IT'S ONLINE NOW!

The exciting new 2011 Can-Am line-up will be available for purchase in September 2010, both **online** and at your **authorized Can-Am dealer**!

STAY CONNECTED WITH THE LATEST, NEWEST, HOTTEST CAN-AM GEAR:
SIGN UP TODAY FOR OUR PROMO E-NEWS.

2011

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Read the Side-by-Side vehicle (SSV) and All Terrain Vehicle (ATV) Operator's Guide and watch the Safety DVD before driving. For your safety: wear a helmet, eye protection and other protective gear. In your SSV, fasten lateral net and seat belt at all times. Operator must be at least 16 years old. Users should, however, respect any applicable law establishing a higher minimum age for riding an ATV or SSV. BRP urges you to "TREAD LIGHTLY" on public and private lands. Preserve your future riding opportunities by showing respect for the environment, local laws and the rights of others when you ride. Always ride responsibly and safely. BRP highly recommends that all ATV and SSV drivers take a training course. For safety and training information, see your authorized Can-Am dealer or, in the U.S.A., call the ATV Safety Institute at 1-800-887-2887. In Canada, call the Canadian Safety Council at 1-613-739-1535 ext. 227. ATVs and SSVs can be hazardous to operate. Always remember that riding and alcohol/drugs don't mix. SSVs and ATVs are for off-road use only. Never ride on paved surfaces or public roads. Never engage in stunt driving. Avoid excessive speeds and be particularly careful on difficult terrain. Racing scenes in this brochure were photographed during an organized race involving highly skilled operators under controlled conditions. Do not attempt. Can-Am Outlander MAX ATVs: these ATVs are recommended for drivers aged 16 and older, and passengers aged 12 and older only. Make sure that all laws, regulations, and BRP's warnings/recommendations for ATV and SSV passengers are respected. Never carry passengers on any ATV not specifically designed for such use. Never carry a passenger under the age of 12. A passenger must be able to hold handgrips and to comfortably place both feet flat on the floorboard while seated upright. BRP reserves the right, at any time, to discontinue or change specifications, prices, designs, features, models or equipment without incurring obligation. Some models depicted herein may include optional equipment. Prices are based on Manufacturer Suggested Retail Prices. Dealers may sell for a different price. Taxes are not included. In the U.S.A., products are distributed by BRP US Inc. In Canada, products are distributed by BRP US Inc. In Canada, products are distributed by Bombardier Recreational Products Inc. ™ ® and the BRP logo are trademarks of Bombardier Recreational Products Inc. or its affiliates. UNI is a trademark of UNIFILTER Inc. TWIN AIR is a trademark of Twin Air USA. KYB is a registered trademark of Kayaba. WARN is a trademark of Warn Industries Inc. YUASA is a registered trademark of YUASA Batteries Inc. NGK is a registered trademark of NGK Spark Plugs, Ltd. Smith is a registered trademark of Smith Sport Optics, Inc. Chamude is a registered trademark of Kolon Industries, Inc. Clarino is a trademark of Kuraray Co. Ltd. Teflon HT, Teflon HP and Kevlar are trademarks of E.I. DuPont de Nemours & Co. Lexan is a trademark of General Electric (GE). Primaloft One and Primaloft Cresta are registered trademarks of Albany International Corp. Windows is a trademark of Microsoft group of companies and is used under license from Microsoft. CARLISLE is a trademark of Carlisle Companies. FOX is a trademark of FOX Racing Canada. All other trademarks are the property of their respective owners.
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OUTLANDER

XT FRONT BUMPER KIT ▸ P.6
REAR TRUNK BOX ▸ P.7
PASSENGER WIND DEFLECTORS ▸ P.7
FRONT RACK EXTENSIONS ▸ P.8
MUDGUARD KIT ▸ P.8
FRONT SHOCK PROTECTORS ▸ P.15
FRONT BAG ▸ P.33
MIRROR ▸ P.34

A-ARM PROTECTORS

Made with high strength aluminum for more protection to the CV joint and rubber boots. Drain hole to release water, mud and debris. Unique design with embossed Outlander name. Easy to install. Sold in pairs.

703500524

$139.99

FRONT ALUMINUM SKID PLATE

Stamped aluminum. Protection for the front portion of the frame. Use in conjunction with the central chassis skid plate (715000636) for full frame protection.

715000548

$109.99

CENTRAL CHASSIS SKID PLATE

Protect your frame from the unexpected – a must-have for rugged terrain. Stamped 1/8" (3 mm) aluminum construction. Recessed bolt holes. Cannot be installed with Plow Mounting Kit.

Renegade & Outlander 500, 650, 800 & Outlander MAX

715000636

$99.99

FOOTWELL PROTECTOR PLATES

Bump up the impact protection to the footwells. 1/8" (3 mm) aluminum construction. Use in conjunction with the central skid plate (703500570 or 715000636). Sold in pairs.

715000547

$169.99

TRAILING ARM PROTECTORS

1/8" (3 mm) aluminum construction. Replace stock plastic protectors. Sold in pairs.

Renegade & Outlander - 715000311

$139.99

REAR DIFFERENTIAL PROTECTOR

1/8" (3 mm) aluminum construction. Replaces stock plastic protector.

Renegade & Outlander - 715000285

$129.99

REAR SKID PLATE

1/8" (3 mm) aluminum plate provides additional protection for your frame. A must when riding on extremely rugged terrain.

Renegade & Outlander 500, 650, 800 - 715000609

$59.99

Outlander MAX 500, 650, 800 - 715000610

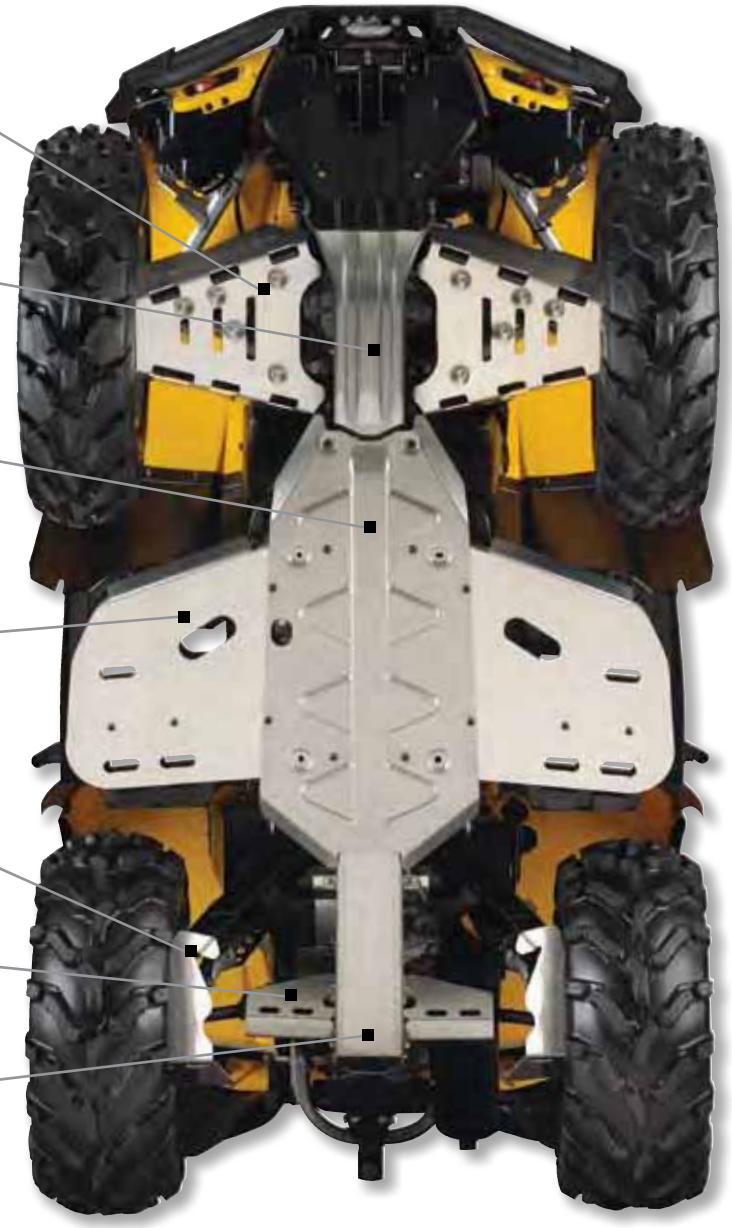
$74.99

Must be installed with the Central and Front Skid Plate (703500570**). Outlander MAX 400 only -** 703500381

$79.99

Outlander 400 only - 703500382

$64.99



CENTRAL AND FRONT SKID PLATE

Two-piece 3/16" (5 mm) aluminum full-body skid plate designed to protect frame and engine case from rough terrain conditions.

Outlander 400 only - 703500570

$104.99

LOWER BUMPER EXTENSION

Adds protection to lower front plastic fascia. Easy to install. No drilling required. Removable for Apache Track Kit installation. Must be installed with XT Front Bumper Kit (715000670).

715000635 **Black**

$79.99

XT REAR BUMPER KIT

Adds on to stock bumper to convert your Outlander into an XT model. Large tube construction with textured black finish.

2009 800R only & 2010-2011 - 715000671 **Black**

$144.99

2006-2009, except 800R - 703500550 **Black**

$149.99

2004-2005 - 703500349 **Black**

$159.99

XT FRONT BUMPER KIT

Adds on to stock bumper to convert your Outlander into an XT model. Large tube construction with textured black finish.

2009 800R only & 2010-2011 - 715000670 **Black**

2006-2009, except 800R - 703500551 **Black**

$159.99

2004-2005 - 703500348 **Black**

$169.99

REAR CARGO BOX

Convert your Outlander MAX into a very versatile vehicle in only 30 seconds. Designed exclusively for the Outlander MAX, this latest-generation rear cargo box is built tough and made of high-resistance polyethylene plastic. Featuring a removable rear tailgate that also conveniently installs in the center of the box. Since it can handle a maximum payload of 260 lbs (118 kg), you'll really hit paydirt with this cargo box. Dimensions: 35" (88 cm) W X 21" (54 cm) D X 7" (17 cm) H.

Outlander MAX 2006-2011 - 715000734 **Black**

$439.99

FOOTPEG KIT

Made of aluminum, the Footpeg Kit provides maximum integrated grip. Larger than stock model, it gives more stability during vigorous riding. Kick-up end generates added grip during hard cornering. Sold in pairs.

715000916

$34.99

FOOTPEG EXTENSIONS

Made of aluminum, the Footpeg Extensions provide grip in all weather and riding conditions. Use in conjunction with footpeg kit (715000916). Sold in pairs.

715000996

$69.99

HIGH WINDSHIELD KIT

These top of the line Windshield Kits provide excellent wind protection. Can be used on standard, XT and LTD models. Easy to install and remove. Can-Am branded.

Outlander 500, 650 & 800

715001015 **Yellow**

715001016 **Red**

715001017 **Tinted Black**

$189.99

ULTRA HIGH WINDSHIELD KIT

Provides superior wind protection. 4" (10 cm) higher windshield. Added substructure to control vibration. Can-Am branded and color matched. Can be used on standard, XT and LTD models. Easy to install and remove.

Outlander 500, 650 & 800

715001018 **Yellow**

715001019 **Red**

715001020 **Tinted Black**

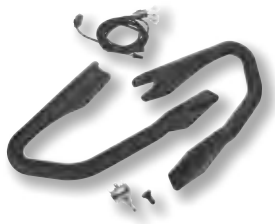
$219.99

WINDSHIELD KIT

Can be used with or without handlebar protectors. Includes steering cover. Easy to install and remove.

Outlander 400 - 703500444

$154.99



PASSENGER HEATED GRIPS

Heat control can be set to High or Low. Ideal for replacing stock passenger handles. Added passenger comfort. Easily removable when summer comes. Easy to install.

Outlander MAX 2006-2011 - 715000634

$159.99

REAR TRUNK BOX

Perfect fit with vehicle. Made of impact resistant polyethylene. Fully sealed lid. Tray quick-hooks to box. Equipped with lid key lock. The molded handle makes lifting and moving the box easy. Robust double wall lid. Improved trunk latch and attachment system on rack. Easy-install quick attach system (715000273) available as an option. Fits any ATV on the market. Cannot be used with Rear Rack Extensions (703500537 & 703500538).

2006-2011 - 715000626 **Black**

$279.99

QUICK ATTACH/DETACH SYSTEM FOR REAR TRUNK BOX

(Not illustrated)

2006-2011 - 715000273

$79.99

PASSENGER WIND DEFLECTORS

These wind deflectors fit snugly around the passenger handles and provide total comfort while riding. Easy to install and remove.

Outlander MAX 2006-2011 - 715000233

Outlander MAX 2004-2005 - 715000231

$59.99

MUDGUARD KIT

Offers more protection from dirt and debris. Extra flair for that ruggedly cool look. Kit includes front and rear extensions and all mounting hardware.

Outlander 500, 650, 800 - 715000533 **Black**
Outlander 400 2006-2011 - 715000297 **Black**
Outlander 400 2004-2005 - 715000296 **Black**
$129.99

FRONT RACK EXTENSIONS

Offers 4" (100 mm) or 7" (178 mm) of clearance with the existing racks. Secure bulky loads with its sturdy tube construction. Textured black finish.

Medium Profile 4" (100 mm)
(Not illustrated)
2006-2011 - 703500536 **Black**
$89.99

High Profile 7" (178 mm)
2006-2011 - 703500535 **Black**
$89.99

FENDER PROTECTORS

Provide extra fender protection when you're in tight situations.
1" (25 mm) diameter steel construction with textured black finish.

Outlander 2006-2011 - 703500544 **Black**
Outlander MAX 2006-2011 - 703500546 **Black**
$109.99

REAR RACK EXTENSIONS

Offers 4" (100 mm) or 7" (178 mm) of clearance with the existing racks. Secure bulky loads with its sturdy tube construction. Textured black finish.

Medium Profile 4" (100 mm)
(Not illustrated)
2006-2011 - 703500538 **Black**
$89.99

High Profile 7" (178 mm)
2006-2011 - 703500537 **Black**
$109.99

FRONT HITCH

Front hitch for Outlander with or without a winch. This hitch offers 750 lbs (340 kg) of towing capacity. Needs to be installed with the winch fairlead bracket (715000696) for all Outlander models equipped with a winch.

2006-2011 - 703500421 **Black**
$79.99

XT HANDLEBAR PROTECTOR KIT

Add handlebar protection with our XT-style kit.

Outlander 500, 650, 800 - 703500553 **Black**
$59.99

Outlander 400 2005-2011 - 715000271 **Black**
Outlander 400 2004 - 715000272 **Grey**
$99.99

NEW GPS PROTECTOR

Provides extra protection from mud and dust. Covers GPS support when GPS is removed.
Outlander LTD 2010-2011
715001210 **- Black**
$19.99

715000961

GPS ADAPTOR FOR OUTLANDER LTD WINDSHIELD

Kit needed to install your GPS from LTD model when using a Can-Am windshield.
Outlander 2009 and prior - 715000309
Outlander LTD 2010-2011 - 715000961
$24.99

FRONT HPG SHOCK KIT

High pressure gas (HPG) shocks. Provides enhanced Outlander ride, handling and control. Razor sharp calibration for even the most demanding riders. Fade-free performance. Sold in pairs.
Outlander 650, 800 Standard models - 715000303
$221.99

FRONT HPG SHOCK KIT WITH SPRINGS

Outlander 650, 800 XT models - 715000304
$259.99

REAR HPG SHOCK KIT WITH SPRINGS

(Not illustrated)
Outlander 650, 800 Standard and XT models - 715000305
$259.99

FRONT SPRING KIT

Front heavy-duty springs. Stiffer than factory installed front springs for more precise front suspension behavior. Ideal for snow plowing or heavy load transportation applications. Sold in pairs.
Outlander 650, 800 Standard and XT models - 715000306
$74.99

NEW SNORKEL KIT

The only way to tackle extreme muddy conditions. Snorkel kit comes complete with redesigned air-box with extended air intake and a new extended CVT exhaust outlet conveniently integrated into the upper gauge pod, maximizing muddy condition performance. Standard equipment on X mr model.

Outlander 650 & 800R 2010-2011

715001136

$259.99

NEW OUTLANDER X XC FRONT PRE-RUNNER BUMPER

Lightweight yet sturdy aluminum bumper provides maximum frontal protection. Incorporated front skid plate, reinforced tubing and still works with a winch.

Outlander 800R 2009 & Outlander 2010-2011

715001123 **Aluminum**

$269.49

NEW RADIATOR RELOCATOR KIT

Relocates radiator to top mount position to prevent mud packing. For use in extreme muddy conditions, providing maximum performance. Includes all brackets, hardware and hoses (radiator not included).

Outlander 650 & 800R 2010-2011

715001178 **Black**

$249.99

NEW X MR TRACTION PLATES

Provide extra foot grip for driver when riding in extreme muddy conditions. Help driver maintain ideal riding position to maximize vehicle traction. Not meant for a passenger.

Outlander Max

715001137 **Aluminum**

$149.99

NEW OUTLANDER X XC WINCH MOUNTING KIT

Required for winch installation on models equipped with the X xc bumper. Must be used in conjonction with winch mounting kit (703500547) and roller fairlead (715000011) (Winch not included)

Outlander X xc 2011

(or Outlander with X xc bumper)

715001121 **Black**

$39.99

RECEIVER HITCH

Powder-coated finish. Does not affect ground clearance. Trailer ball not included. Rear hitch plate (715000286) is required for Renegade and Outlander X xc 2011.

Renegade & Outlander with hitch plate kit -

715000325

$97.99

GUN-BOOT

The best way to transport your rifle or shotgun. This high-impact case securely holds your rifle while providing a padded dust-proof and water-resistant protection.
Outlander & Rally - 715000028 **Black**
$69.99

GUN-BOOT SUPPORT

(Not illustrated)
Used in conjunction with the gun-boot. Attaches to the rear rack.
Outlander & Rally - 715000029 **Black**
$89.99

NONSKID LUGGAGE RACK STRIPS

Rubber strips you can apply to your front and rear luggage racks to maintain your cargo in position. Helps keep your luggage rack scratch free. Easy to install. Sold in packs of 4.
Outlander 2006-2011 - 703500569 **Black**
$15.99

RADIATOR PROTECTOR

Metal shield which mounts over radiator face providing protection from stones and branches.
Outlander 2006-2011 - 703500543 **Black**
Outlander & Rally 2004-2005 - 703500427 **Black**
$59.99

FLASHER AND HORN KIT

Complete flasher and horn kit. Integrates to vehicle. Easy to install. Not for road use.
Outlander 800R 2009-2011 - 715000695
$249.99

REWIND STARTER KIT

Complete manual rewind assembly.
Outlander 400 EFI 2010-2011 - 715001034
$154.99

RENEGADE

CENTER CONSOLE DAY LIGHT ▸ P.14
REAR ALUMINUM RACK ▸ P.14
FRONT SHOCK PROTECTORS ▸ P.15
HANDLEBAR WIND DEFLECTORS ▸ P.17
FULL WRAP ALUMINUM MOUNTING KIT ▸ P.17
MIRRORS ▸ P.34

A-ARM PROTECTORS

Add protection to your Renegade lower A-arm with this high-strength aluminum protector with drain hole to release water, mud and debris. 1/8" (3 mm) aluminum construction. Easy to install. Replaces stock plastic protectors. Engraved Can-Am logo. Sold in pairs.

715000287

$139.99

CENTRAL CHASSIS SKID PLATE

Protect your frame from the unexpected – a must-have for rugged terrain. Stamped 1/8" (3 mm) aluminum construction. Recessed bolt holes. Cannot be installed with Plow Mounting Kit.

Renegade & Outlander 500, 650, 800 & Outlander MAX

715000636

$99.99

FOOTWELL PROTECTOR PLATES

Bump up the impact protection to the footwells and structure. 1/8" (3 mm) aluminum construction. Use in conjuction with a central chassis skid plate (715000636). Sold in pairs.

715000686

$169.99

REAR DIFFERENTIAL PROTECTOR

1/8" (3 mm) aluminum construction. Replaces stock plastic protector.

Renegade & Outlander - 715000285

$129.99

TRAILING ARM PROTECTORS

1/8" (3 mm) aluminum construction. Replace stock plastic protectors. Sold in pairs.

Renegade & Outlander - 715000311

$139.99

REAR SKID PLATE

1/8" (3 mm) aluminum plate provides additional protection for your frame. A must when riding on extremely rugged terrain.

Renegade & Outlander 500, 650, 800 - 715000609

$59.99

NEW MUD GUARD KIT FOR RENEGADE

Integrated extended fender flairs for sporty look and full body protection from dirt and water. Kit of 4 includes front and rear extensions and all mounting hardware.
Renegade 2007 to 2011
715001115 **Black**
$189.99

X PACKAGE REAR SHOCK & SPRING KIT

Rebound and dual speed compression adjustable gas shocks. Kit includes matching springs and hardware. Sold in pairs.
2008-2011 - 715000538
$979.99

X PACKAGE FRONT SHOCK & SPRING KIT

Rebound and dual speed compression adjustable gas shocks. Kit includes matching springs and hardware. Sold in pairs.
715000536
$614.99

FRONT SWAY BAR KIT

Enhances vehicle stability and control during hard cornering.
Renegade 2010-2011 - 715000967
$149.99

REAR ALUMINUM RACK

30 lbs (14 kg) capacity. Compact, lightweight aluminum construction. Engraved Can-Am logo. Stamped 5052 aluminum center plate. Easy to install.
715000242
$164.99

CENTER CONSOLE DAY LIGHT

Mountable on top end of center console. Enhance look of vehicle.
715000691
$69.99

REAR HITCH PLATE

Includes bolt-on hitch plate and hardware.
Renegade & Outlander X xc 2011 - 715000286
$39.99

UNI† FOAM FILTER

Ease of maintenance. Can be easily washed, re-oiled and re-used when subject to severe dusty/muddy environments. Contains a rigid adaptor with an added flair providing retention of the air filter.
Outlander 500, 650, 800 & Renegade 2010-2011 and prior, except 800R and 650 2010-2011 - 715000310
$30.99

CVT AIR INTAKE

Designed to relocate and maximize height of the CVT air intake to prevent belt slippage in deep snow or muddy conditions. Equipped with integrated CVT pre-filter to also reduce dust and extend CVT and belt life.
Renegade 500, 800 2007-2009 - 715000984
Outlander 500, 650, 800 2008-2009 - 715000970
$64.49

AIR PRE-FILTER

Adds extra protection to your engine in harsh riding conditions. Filter blocks particles larger than 0.005". Note: A pre-filter is necessary to maintain the vehicle warranty when an Apache Track kit is installed.
Renegade & Outlander 500, 650 & 800 2008 and prior, 500, 650 2009 and 500 2010 - 715000291
$24.99

HEATED HAND GRIP KIT

Keep your hands warm while riding with this easy-to-install hand grip kit. Includes a 3-position switch, switch cover, wiring harness, hand grip and handlebar end cap. Grips are 4 7/8" (12 cm) long with an interior diameter of 7/8" (22 mm). Grip heat control can be set to High (20 watts) or Low (10 watts).
Renegade & Outlander - 715000322
$79.99

SHIFTER LOCK

Locking device locks transmission shifter in "Park" position. Minimum 5000 key combination. Fully integrated.
Renegade & Outlander 500, 650, 800 2009-2011 - 715000689
Outlander 400 - 715000690
$49.99

NEW CAN-AM FOAM AIR FILTER BY TWINAIR†

Maximizes performance by increasing air flow throughout RPM range. Maintenance-friendly, i.e. just wash, re-oil and re-use after riding in severely dusty/muddy environments.
Renegade & Outlander 800R 2009-2011 and 650 2010 & 2011 - 715001130
$69.99

AIR PRE-FILTER

Filters out even the tiniest of contaminants in dusty conditions. Extends service period. Use in conjunction with stock filter. Air filter not included.
DS 450 & Outlander 400 - 707800293
$20.99

AIR BOX PRE-FILTER

(Not illustrated)
Add extra protection to your engine in harsh riding conditions. Filter blocks particles larger than 0.005". Note: A pre-filter is necessary to maintain the vehicle warranty when an Apache Track kit is installed.
Renegade & Outlander 650 2010-2011, 800R 2009-2011 715000908
$36.49

HEATED THROTTLE LEVER ASSEMBLY

Improved heating element provides faster warm-up time and increased maximum temperature. For a perfect fit and finish, designed especially for your Can-Am ATV. Kit includes a 3-position switch, switch cover, wiring harness and throttle lever assembly.
Renegade & Outlander - 715000584
$61.99

NEW SHOCK PROTECTOR

Provides X-package shock rods with additional protection against pitting.
Fit X-package KYB shocks except DS 450 X xc 715001209 **Black**
$29.99

FRONT SHOCK PROTECTORS

Feature ventilation holes. Sold in pairs.
Renegade & Outlander - 715500301
$29.99

NEW LOCKABLE GAS TANK CAP

Protects your fuel. Meets latest EPA requirements.
Renegade & Outlander - 860200387 **Black**
$39.99

XT RIM

Made of aluminum. Upgrade for non XT models.
Renegade & Outlander, except Outlander 800 2006
Front - 705400648 **Rear** - 705500986
$119.99 **$129.99**

XT-P RIM

Made of aluminum. Upgrade for non XT models.
Renegade & Outlander, except Outlander 800 2006
Front - 705400687 **Rear** - 705501019
$124.99 **$139.99**

LTD RIM

Made of aluminum. Upgrade for non XT models.
Renegade & Outlander, except Outlander 800 2006
Front - 705400683 **Rear** - 705501015
$124.99 **$139.99**

NOTE: MATCHING NUTS - 250100100 Black and 250100082 Chrome — MATCHING CAP - 705400680 Black

XTR CUSTOM WHEEL KIT

Custom Can-Am XTR branded 12" (30.5 cm) painted aluminum rims. Includes matching chrome nuts and center covers. Set of 4.
Renegade & Outlander, except Outlander 800 2006 - 715000611 **Black** - 715000612 **Yellow**
$499.99

RENEGADE RIM

Center cast aluminum rims.
Renegade & Outlander, except Outlander 800 2006
Front 705400506 **Rear** 705500837
$119.99 **$129.99**

COLORED FINS FOR RIMS

Plastic fins that enhance appearance of your vehicle. Pack of 8.
Fits on following wheels: XT, XT-P and LTD 2010-2011 (705500986, 705501015, 705501019, 705400687, 705400648, 705400683)
705400681 **Yellow**
705400950 **Steel Grey (Not illustrated)**
$13.04

BEAD LOCK

Cast aluminum. Must be installed on rims 705400794 and 705501137.
Renegade & Outlander 650 and 800, except 800 2006 - 705400841
$79.99

RENEGADE X RIM

Center cast aluminum rims. Welded exterior and interior reinforcement rings. Needs to be installed with Bead Lock (705400841).
Renegade & Outlander 650 and 800, except 800 2006
Front - 705400794 **Rear** - 705501137
$124.99 **$139.99**

FULL WRAP ALUMINUM MOUNTING KIT

Lightweight black die cast aluminum construction. Includes complete hardware. Handlebar wind deflectors sold separately.

Renegade, Outlander 500, 650, 800 & DS 450 - 715000545

$79.99

SHORT ALUMINUM MOUNTING KIT

Lightweight black die cast aluminum construction. Includes complete hardware. Handlebar wind deflectors sold separately.

Renegade, Outlander 500, 650, 800 & DS 450 - 715000513

$49.99

HANDLEBAR WIND DEFLECTORS

Rugged injected plastic construction with Can-Am logo. Includes removable cap for air flow adjustment. Mounting kit sold separately.

Renegade, Outlander 500, 650, 800 & DS 450

715000733 **Yellow / Black (Not illustrated)**

$44.99

715000537 **White / Black**

715000525 **Black / Yellow**

$49.99

MIRROR KIT FOR HANDLEBAR WIND DEFLECTORS

Handlebar wind deflector mount design. To be used with handlebar wind deflectors. Sold in pairs.

Renegade, Outlander 500, 650, 800 & DS 450 - 860200080

$24.99

ALUMINUM TAPERED HANDLEBAR

7/8"- 1 1/8" (22 mm - 28 mm) tapered handlebar made of 6061-T6 aluminum. Includes all hardware, center steering foam and cover.

Renegade & Outlander 500, 650, 800 - 715000550

$99.99

DS 450

X PACKAGE CHASSIS SKID PLATE ▸ P.19
X PACKAGE NERF BARS ▸ P.19
REAR ALUMINUM BASKETS ▸ P.19
FRONT SHOCK PROTECTORS ▸ P.21
NUMBER PLATE ▸ P.21
X PACKAGE FRONT ALUMINUM BUMPER ▸ P.21
X PACKAGE ADJUSTABLE FRONT SHOCKS ▸ P.21
SPEEDOMETER ▸ P.22

A-ARM PROTECTORS

Lightweight injected plastic A-arm protectors provide strong protection for lower aluminum A-arm. Can-Am branding visible from top and underneath vehicle. Easy installation, no holes to drill. Sold in pairs. Does not fit DS 450 X mx.

715000517 **Black**

715000589 **Yellow**

$69.99

X PACKAGE CHASSIS SKID PLATE

Lightweight and strong full chassis skid plate. 5052 1/8" (3 mm) stamped aluminum construction. Recessed bolt holes. Includes all necessary hardware.

715000506

$124.99

FRONT FENDER EXTENSIONS

Lightweight aluminum extension connects the front fender to the nerf bar. Sold in pairs.

715000514

$74.99

X PACKAGE NERF BARS

Strong lightweight rectangular aluminum tubing provides extra protection for assertive riding. Complete with mounting hardware and black webbing. Must be installed with Rear Aluminum Baskets (715000673). Sold in pairs.

2009 - 715000672

$199.99

2008 and prior - 715000505

$209.99

REAR ALUMINUM BASKETS

For direct replacement of stock plastic version. 1/8" (3 mm) 5052 aircraft aluminum construction and 7/8" (22 mm) tubing. Stronger construction than stock model. Must be installed with X Package Nerf Bars (715000672).

X Package 2009 - 715000673

$259.99

Can be installed with or without X Package Nerf Bars (715000505).

715000526

$264.99

X PACKAGE SWING ARM SKID PLATE

Lightweight protection for your swing arm, rear disc, sprocket and chain. 5052 3/16" (5 mm) aluminum construction. Replaces stock plastic protector.

715000507

$124.99

X XC FRONT RIM KIT

Dimensions: 10" x 5" (25 cm x 13 cm) diameter. ITP† T-9 Trac-Lock† rims. Sold in pairs.
715000902
$459.99

X XC REAR RIM KIT

Dimensions: 9" x 8" (23 cm x 20 cm) diameter. ITP T-9 Trac-Lock rims. Sold in pairs.
715000905
$474.99

X MX FRONT RIM KIT

Dimensions: 10" x 5" (25 cm x 13 cm) diameter. ITP T-9 GP rims. Sold in pairs.
715000903
$219.99

X MX REAR RIM KIT

Dimensions: 8" x 8" (20 cm x 20 cm) diameter. ITP T-9 Trac-Lock rims with bead lock and inside reinforcement. Sold in pairs.
715000906
$399.99

X PACKAGE REINFORCED RIM KIT

Black painted aluminum rims with exterior reinforcement ring. Sold in sets of 4. Tires not included. Always respect tire size appropriate for your vehicle. Bead lock with inside reinforcement.
715000510
$374.99

X PACKAGE ADJUSTABLE FRONT SHOCKS

Ultra-high performance KYB† fully adjustable shock. Includes rebound and high/low speed compression adjustments. More performance oriented valving than stock vehicle. Uses original stock spring. Sold in pairs.

715000511

$569.49

FRONT SHOCK PROTECTORS

Offer added protection against tough terrain and weather conditions. Sold in pairs.

715500302

$34.99

X PACKAGE FRONT ALUMINUM BUMPER

Extra-large and lightweight front bumper offers the best protection for all forms of racing. 6063 aluminum construction. Provides superior coverage to the front of your DS 450. Required to install number plate.

715000508

$109.99

NUMBER PLATE

Injection molded high gloss finish. To be used with X Package front aluminum bumper (715000508).

715000521 **Black**

715000522 **Yellow**

$21.99

FRONT SPROCKETS

Hardened steel construction. Changing sprocket ratio will vary vehicle top speed and behaviour. Includes snap ring. For racing applications only.

13-tooth (-1) - 715000519
14-tooth (stock) - 715000591
15-tooth (+1) - 715000518
$24.99

REAR SPROCKETS

Lightweight 7075 T-6 aluminum construction. Changing sprocket ratio will vary vehicle top speed and behaviour. For racing applications only.

39-tooth (-3) - 715000527
42-tooth (stock) - 715000592
$74.99
44-tooth (+2) - 715000515
$79.99

SPEEDOMETER

Digital speedometer. Complete kit with mounting pod. Includes reliable speed sensor built into transmission and extra race functions, e.g. maximum speed, average speed, lap counter, comparative average vs. actual speed and RPM. Easy to install.

2009-2011 - 715000512
$249.99

REGINA Z-RING CHAIN

This chain is the best choice for the most severe and demanding applications. Among other characteristics, the ZR chains feature high alloy steel plates and pins, solid bushings and rollers, shot-peening of plates, pins and rollers, performance-enhancing pre-stretched and “Can-Am yellow” outer plates. Stronger than stock chain (32000N). 102 link to match with different sprocket sizes. Includes connecting link.

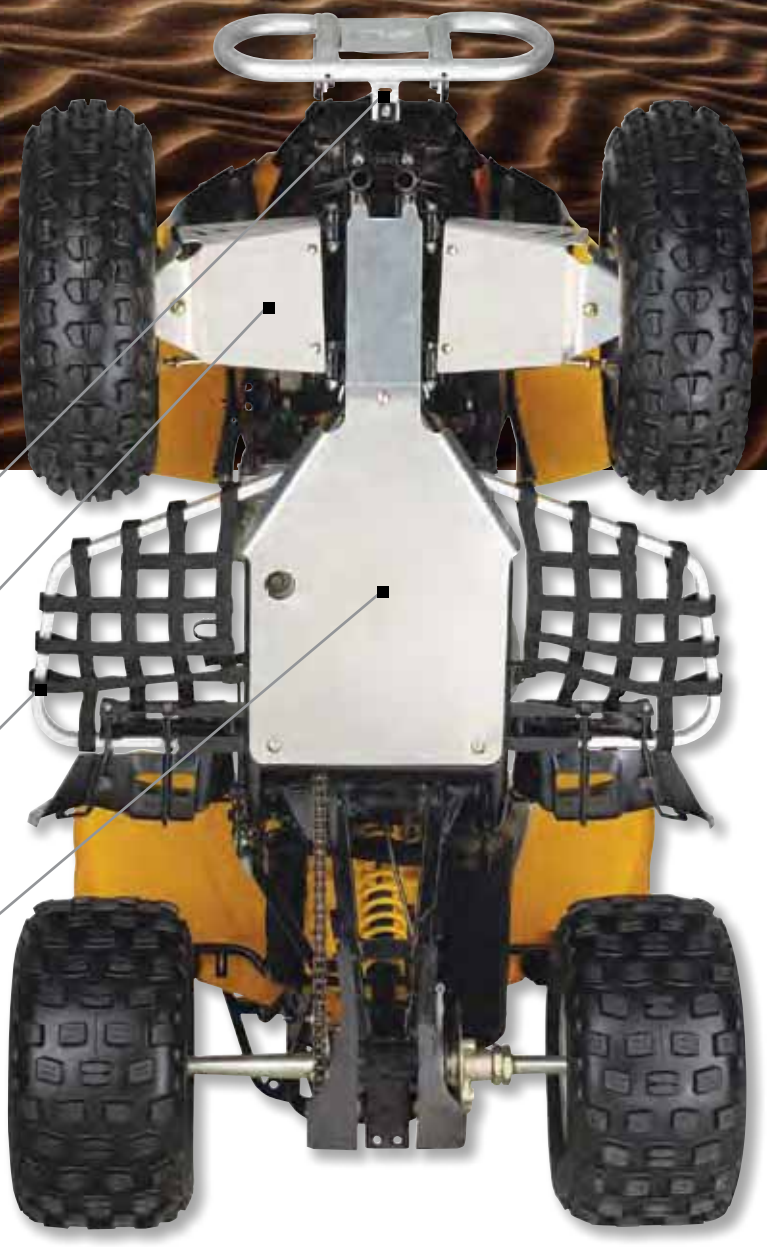
715000523
$109.99

FRONT PLASTIC GRILLE

Add color to your vehicle.

2009 and prior - 715000516
$16.99

DS 250



FRONT BUMPER BRACKET

Adds extra protection to the front of your vehicle.
715000241
$69.99

A-ARM PROTECTORS

These aluminum parts provide maximum A-arm protection.
703500618
$124.99

NERF BARS

Strong lightweight rectangular aluminum tubing provides extra protection for hard riding. Complete with mounting hardware and black webbing. Sold in pairs.
703500617
$249.99

FULL-BODY SKID PLATE

Aluminum full chassis skid plate designed to protect your frame and engine case from rocks and undercarriage damage. Maximum underbody protection when driving your DS on the most rugged terrain.
703500616
$159.99

MIRROR

Stem includes 5/16" (8 mm) thread.
Right - S88110RA1000
Left - S88120RA1000
$20.99

REAR RACK

Sturdy steel construction, powder paint finish. Can be used with rear rack bag (715000264).
715000243 **Black**
$224.99

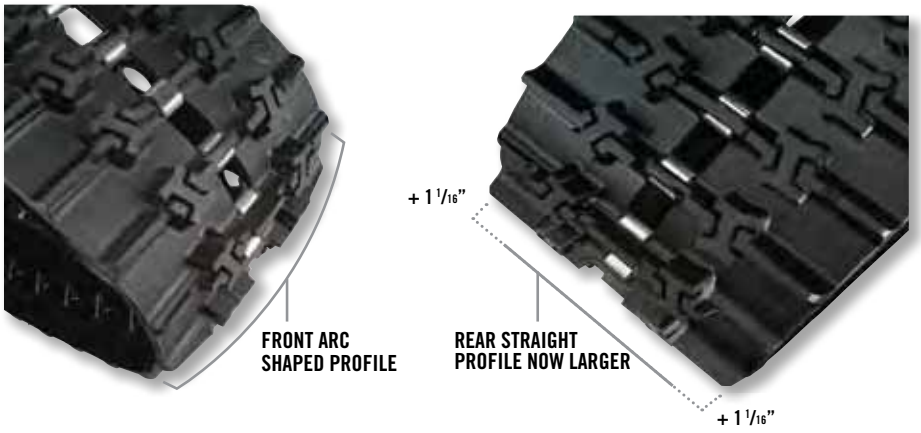
REAR RACK BAG

100% water-repellent polyester bag. Specially designed to fit on the rear rack (715000243).
715000264 **Black**
$89.99

APACHE WT SYSTEMS

THE WIDEST TRACK IN THE INDUSTRY

The 13 5/8" x 1" (34.6 cm x 2.5 cm) rear track profile provides a larger footprint and industry-leading flotation and a 11 1/2" (29 cm) arc-shaped front track reduces vibration and steering effort.



NOW INCLUDED WITH THE NEW APACHE WT SYSTEMS

REAR AND FRONT MOUNTING KITS

A simplified system that reduces installation time. New and improved front mounting kit allows for smoother steering with less effort and reduced stress on the front suspension.

APACHE WIDE TRACK SYSTEM

(Not illustrated)
Same great features that have made this a must-have and more. Specially designed for your Can-Am ATV.
Outlander & Outlander MAX - 715001086
$3,399.99

STUDDED APACHE WIDE TRACK SYSTEM

Additional traction providing more control in icy conditions. Factory pre-studded tracks. 114 studs per rear track. 76 studs per front track. 380 studs total.
Outlander & Outlander MAX - 715001087
$3,659.99

Note: The Apache WT System is the only track kit available that maintains the Can-Am ATV vehicle warranty.

CVT PRE-FILTER

Designed to prevent snow intrusion in the CVT and belt slippage when Apache Track System is used in deep snow. Easy to install and remove. Comes standard on Renegade and Outlander 800 2009.
Renegade & Outlander 500, 650, 800, 2009 and prior - 715000552
$6.49

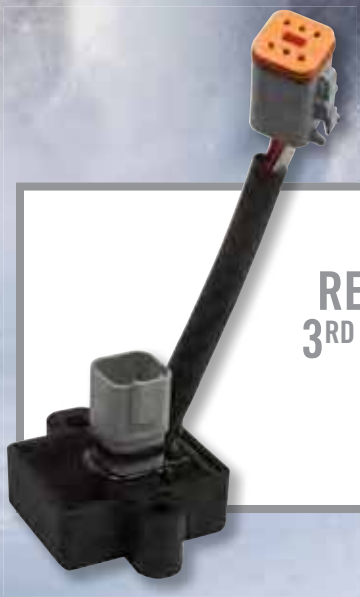
CVT AIR INTAKE

Designed to relocate and maximize height of the CVT air intake to prevent belt slippage in deep snow or muddy conditions. Equipped with integrated CVT pre-filter to also reduce dust and extend CVT and belt life.
Outlander 500, 650, 800 2008-2009 - 715000970
$64.49

PRE-FILTERS

See P.15
Add extra protection to your engine in harsh riding conditions. Filter blocks particles larger than 0.005".
715000908 - Air Box Pre-Filter
715000291 - Air Pre-Filter

Note: A pre-filter is necessary to maintain the vehicle warranty when an Apache System is installed.



INDUSTRY REVOLUTION: 3RD DPS MODE

ONLY AVAILABLE WITH THE APACHE WT SYSTEMS

The 3rd DPS mode, when installed with the Apache WT system, optimizes power steering performance. It is a module for the Dynamic Power Steering maximizing steering agility at lower speeds while providing firmer steering at cruising speeds. In addition, it provides a speed correction factor for the speedometer.

BUILD YOUR PLOW SYSTEM IN 3 EASY STEPS BY SELECTING:

1 THE PUSH FRAME & OPTIONAL FEATURES

Super-duty push tubes withstand the roughest use. Mid-mount carriage provides up to 11½" (29 cm) of lift. Push frame fits all blade styles.

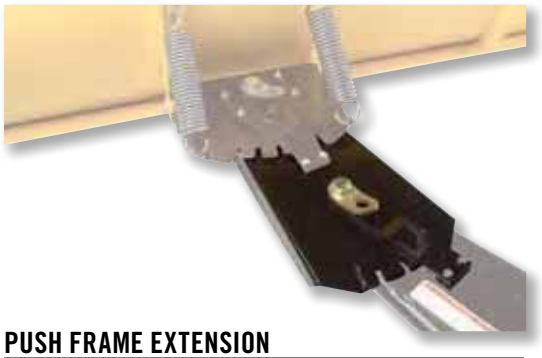
PUSH FRAME

Quick-attach not included.
715001064 **Black**
$239.99

PUSH FRAME WITH QUICK-ATTACH SYSTEM

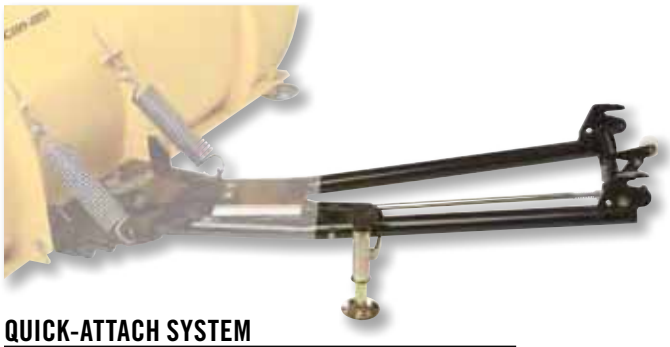
Fully assembled quick-attach system. Pin-ready for reduced installation time.
715001063 **Black**
$374.99

PUSH FRAME FEATURES



PUSH FRAME EXTENSION

12 ¼" (31 cm) chassis extension for use with Apache Track systems. Increases angle and enables extra blade rotation. Cannot be used with Manual EZ Lift System (703500522) and Remote Angling System (715000260).
703500603
$119.99



QUICK-ATTACH SYSTEM

Available as an option to upgrade base Push Frame. The plow will be easy to install with this quick-attach system. Durable with a powder-coated rust-resistant finish.
715000731
$129.99

REMOTE ANGLING SYSTEM

Increases operator convenience. Swivel system allows the driver to manually pivot the plow blade from the driver's seat. Cannot be used with the Push Frame Extension (703500603).
715000260
$169.99

2 THE PLOW

Straight or One Way State

STRAIGHT PLOW

Super-duty plow blades made from 12-gauge steel. Replaceable wear blades. When angled, 60" (1.5 m) blade clears 53½" (1.36 m) path, 54" (1.37 m) blade clears 48" (1.23 m) path. Blades swivel left or right, 5 positions. Large pin designed for easy blade rotation to eliminate dirt and snow buildup at pivot point. Blade design provides best snow/dirt roll-off at any angle. Yellow-colored version Can-Am branded.

54" (1.37 m)
- 715000647 **Yellow**
- 715000208 **Black**

$184.99

60" (1.5 m)
- 715000648 **Yellow**
- 715000209 **Black**

$189.99

ONE WAY STATE PLOW

One-way "winged" state plow designed to throw snow higher. Wing end measures 25" (63 cm) high and plow tapers down to 16" (41 cm). Rubber flap designed to keep snow away from driver. Yellow-colored version Can-Am branded.

60" (1.5 m)
- 715000649 **Yellow**
- 715000207 **Black**

$299.99

66" (1.68 m)
- 715000650 **Yellow**
- 715000253 **Black**

$339.99

3 THE MOUNTING SYSTEM FOR YOUR VEHICLE

Quick release pins attach and detach plow blade and base assembly in minutes. Can be used with or without Quick Attach System (715000731). Simplified installation. No frame drilling required.

(Not illustrated)
Renegade 2010-2011 & Outlander X xc 2011 - 715001206

$134.99

Outlander 2006-2011 & Renegade 2007-2009 - 715001205

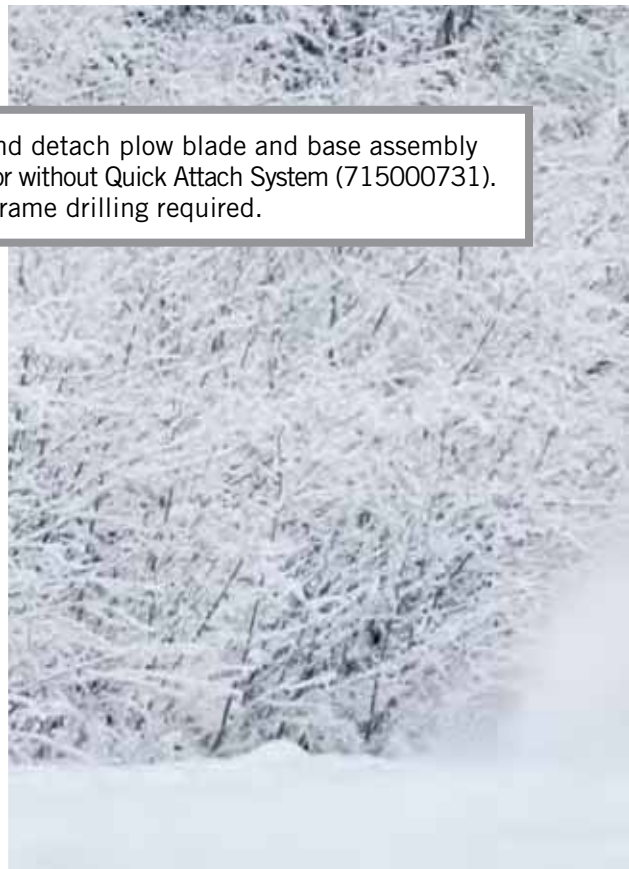
$104.99

(Not illustrated)
Outlander 400 2004-2005 - 715000586

$79.99

Traxter & Quest - 715000258

$79.99



REAR TIRE CHAIN

Improve your traction in mud and snow. Sold in pairs.
25 X 10 X 12 - 715000225
26 X 10 X 12 - 715500218
$79.99

PLOW LIGHTS

Featuring 35W H3 halogen bulbs and a lens design that achieves 110-degree beam spread to provide excellent lighting for plowing.
Outlander - 715000063
$69.49

PULLEY KIT

Pulley kit to be used in conjunction with the winch when using a snow plow. Recommended to increase winch efficiency. To be used with the XT Front Bumper.
715000279
$44.99

DRIFT CUTTER

Helps keep snow in the plow. Designed with a rear pivot point. Works with both Straight and One Way State blades.
Left: - 715000217
Right: - 715000218
$79.99

SYNTHETIC WINCH CABLE FOR PLOW

Specially designed for plowing applications. 8' (2.4 m) section of durable, extra-strong synthetic rope. Stands up to repeated, sharp angle pulls used to lift heavy plow blades. Temporarily replace your winch rope for plow season to save wear and tear on wire rope.
715000540
$39.99

RT25 WARN† WINCH KIT

Fully-sealed Warn winch with 2,500 lbs (1,134 kg) of pulling strength. Includes a 0.9hp motor, 50' (15 m) of 3/16" (5 mm) wire rope, an ergonomically designed clutch knob, mechanical brake, sealed mini-rocker handlebar switch, a waterproof contactor and a roller fairlead. CE certified.

715000553

$424.99

XT15 WARN WINCH KIT

Lightweight Warn 1,500 lbs (680 kg) winch kit complete with synthetic rope, roller fairlead, mounting plates and hardware. Specifically designed for the Renegade.

715000254

$584.99

RT30 WARN WINCH KIT

Fully-sealed winch capable with 3,000 lbs (1,361 kg) of pulling strength. Includes a 0.9hp motor, 50' (15 m) of 3/16" (5 mm) wire rope, an ergonomically designed clutch knob, mechanical brake, hand-held remote and a potted-and-sealed mini-rocker handlebar switch, a waterproof contactor and a roller fairlead. CE certified.

715000528

$524.99

XL2500 WINCH KIT FOR TRAXTER/QUEST

(Not illustrated)
Complete 2,500 lbs (1,134 kg) winch and mounting kit including a roller fairlead.

Traxter & Quest - 715000546

$529.99

WINCH MOUNTING KIT

(Not illustrated)

All Traxter models - 715500108

All Outlander models - 703500547

$34.99

NEW WINCH BRAKE KIT

(Not illustrated)
Upgrades standard winch with brake kit. Convenient for use with plow.

Fits all production Outlander with XL3000 winch

715001135

$79.99

SYNTHETIC WINCH CABLE

Easier to manipulate than steel cable. Replaces the original cable on any factory installed Warn winch or sold as an accessory by BRP. Kit includes synthetic rope and rock guard sleeve. Always use with roller fairlead (715000011) to prevent premature wear.

50' (15 m) long. 3,000 lbs (1,361 kg) of strength. - 715000539

$109.99

For XT15 winch only. 40' (12 m) long. 1,500 lbs (680 kg) of strength. - 715000593

$99.99

WINCH ACCESSORIES KIT

Get the most out of your winch. Double your pulling power, change your pulling direction and keep your winch in proper working order. Includes tree straps, snatch block and shackle.

715000005

$134.99

WIRE ROPE REPLACEMENT

Play it safe. Always carry a replacement wire rope. 50' (15 m) aircraft grade steel wire. 3/16" (5 mm) diameter. 3,000 lbs (1,361 kg) of strength.

All Warn winches - 715000047

$44.99

WIRED REMOTE CONTROL

(Not illustrated)
This kit allows the winch owners to add the hand-held remote to their winch. Works in conjunction with the mini-rocker switch.

715000197

$74.99

WIRELESS REMOTE CONTROL

The system is quick and easy to install, thanks to a wiring harness with an integrated antenna, and all necessary mounting hardware. The system allows you to operate your winch from anywhere within a 50' (15 m) radius, increasing your recovery options. All components are weatherproof. Works with all Outlander XT, Traxter/Quest XT MY 2004 and up and BRP accessory winches with a handlebar mounted mini-rocker switch.

715000544

$164.99

WINCH FAIRLEAD BRACKET

Allows for more winch cable clearance when using XT-style bumpers.

Outlander XT, MAX XT - 715000696

$39.99

HOOK WITH SAFETY LATCH & STRAP KIT

Heavy-duty winch-rope hook with stainless steel snap. Includes a nylon safety strap.

715000069

$16.99

ROLLER FAIRLEAD

Features top, bottom and side rollers for less cable wear and smoother operation from any direction for easier winching.

715000011 **Black**

$44.99

RENEGADE TRAILERING COVER

300-denier solution-dyed, water-repellent polyester construction. Fits with or without mirrors and windshield attachment brackets (windshield must be removed). Key wear areas are reinforced.

280000316

$149.99

DS 450 TRAILERING COVER

X-attachment system. 300-denier solution-dyed, water-repellent nylon. Key areas are reinforced. Includes sponsor graphics.

280000346

$149.99

OUTLANDER TRAILERING COVER

(Not illustrated)
X-attachment system. 300-denier solution-dyed, water-repellent polyester construction. Fits with or without mirrors and windshield. Key areas are reinforced.

Outlander with Trunk Box - 715000675
$179.99

Outlander - 715000682
$149.99

Outlander MAX - 715000681
$159.99

STORAGE COVER

For storage use only. Fits with or without windshield and mirrors.
Heavy-duty elastic cord around bottom for secure fit.

100-denier polyester construction

Outlander MAX - 715000676 **Black**
$109.99

Outlander - 715000677 **Black**
$99.99

Vinyl construction

Renegade - 715000678 **Black**
$99.99

DS 450 - 280000347 **Black**
$99.99

DS 250 - 715000261 **Black**
$84.99

PREMIUM MODULAR BAG

Multi-configuration four section bag. Constructed of 600-denier, solution-dyed, water-repellent polyester. Semi-rigid thermoformed structure. Heavy-duty water-resistant zipper. Easily converts into a duffle bag.

Outlander 2006-2011 - 280000296 **Black**

$179.99

FRONT BAG

100% water-repellent polyester construction. Designed to fit with or without a rack extension. Integrated map holder. Waterproof zippers.

Outlander 2006-2011 - 715000235 **Black**

$119.99

Outlander 2004-2005 - 295100276 **Black**

$114.99

REAR BAG

100% water-repellent polyester construction. Designed to fit with or without a rack extension. Waterproof zippers.

Outlander 2006-2011 - 715000234 **Black**

$119.99

Outlander 2004-2005 - 295100277 **Black**

$114.99

DS 250 - 715000264 **Black**

$89.99

REAR BAG

Constructed of 600-denier, solution-dyed, water-repellent polyester. Semi-rigid thermoformed structure. Quickly and easily converts into a practical backpack. Heavy-duty water-resistant zipper. Easy to install and remove.

Renegade - 280000295 **Black**

$89.99

GPS MOUNT

Find your way home. Great for the ATV riding environment. This mount holds steady any GPS under high vibration conditions.

715000120 **Black**

$89.99

CELL PHONE MOUNT

Keep your phone close by when working or riding. The unique design of this mounting system offers easy installation, mobility, strength and versatility.

715000122 **Black**

$89.99

HOOK HOLDER

An easy way to carry your tools, firearm or bow over any terrain with confidence. Swivels to allow various mounting positions for multiple applications. Allen wrench is included for easy installation to your tubular rack.

Single - 715000042 **Black** **$49.99**

Double - 715000043 **Black** **$69.99**

HAND HELD LIGHT

High-intensity rubber spotlight comes standard with a one-inch diameter double ball and socket system. Designed to withstand more than 50 g of shock. Can be easily moved from your handlebar, rack or any other location you choose. Plugs into 12V DC outlet.

715000007 **Black**

$79.99

CUP HOLDER

Mounts easily to handlebars or racks.

715000121

$73.49

BRP CAN-AM VANITY PLATE

484800455

$12.99

TIE-DOWN

Our 100% polyester ratchet-style tie-down measures 10' (3 m) in length and ensures a safe load with its unique soft loop strap design.

715000276 **Black**

$14.99

MIRROR

True vision surface. Matte finish. Stem includes 3/8" (10 mm) thread. Bracket (715000190) is required for installation on an Outlander without windshield.

Right 5/16" (8 mm) - 709400407

Right 3/8" (10 mm) - 709400523

Left 3/8" (10 mm) - 709400406

$18.49

FLAG

Make sure everyone knows what you're riding. Perfect for the dunes and new riders. 8-foot (2.4 m) length. Includes flag mount (715000127).

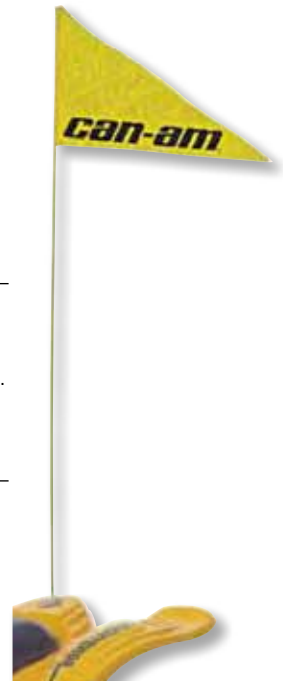
715000277 **Yellow**

$19.99

FLAG MOUNT

715000127

$19.99



PRIME TLC FOR YOUR ATV

Original Equipment Manufacturer and Manufacturer Recommended Products & Kits

You own a Can-Am ATV because you demand the very best from your machine. Take care of your ATV by maintaining it using strictly BRP and Rotax OEM or 100% Can-Am approved parts and products, and enjoy levels of performance that make every Can-Am ATV ride or functional application a uniquely original experience.

XPS 4-STROKE OIL CHANGE KIT

Complete maintenance right out of the box: O-Ring, XPS oil, Rotax oil filter and instruction sheet.

Summer use - 703500736
All climate use - 703500735

CARLISLE† TIRES

The complete collection of Carlisle tires for Can-Am ATVs under one roof.

Front - 705400431 **$96.99**
Rear - 705500606 **$93.49**

BRAKE PAD KIT

One-stop replacement brake pad kit designed to replace the parts while keeping your ATV's performance intact.

705600349
705600350
$39.99

UNI FOAM OIL FILTER

Allows maximum airflow while keeping the dirt and dust particles out.

5½ oz. 219700340
$73.99

UNI FOAM FILTER CLEANER

Uni Filter Cleaner's powerful agents quickly strip away grease and dirt, yet won't damage air filters.

14½ oz. 219700341
$101.99

YUASA† BATTERIES

Top of the line models from the leading preferred original equipment battery supplier in the U.S.

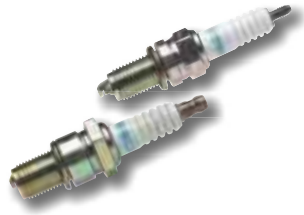
18 Amps. Wet (YTX20L-BS)
410301203
$114.49

19 Amps. Dry (YB16CL-B)
278001756
$76.99

13 Amps. Wet (YTX15L-BS)
710000283
$121.99

Dry (YB30CLB)
278001882
$133.49

3 Amps. Wet (YT4L-BS)
410301204
$53.99



NGK† SPARK PLUGS

BRP dealers carry the full line of premium NGK spark plugs for Can-Am ATVs.

707000246
$3.50

BECAUSE ONCE YOU RIDE WITH THE BEST, ANYTHING LESS IS MIDDLE OF THE ROAD.

See your Can-Am ATV Authorized Dealer for the full line of OEM and manufacturer recommended parts and products.

MAINTENANCE

XPS DOT 4 BRAKE FLUID

Exceeds DOT 3 and 4 requirements. Unique low-moisture formulation providing maximum protection against vapor lock. Recommended in Ski-Doo snowmobiles and Can-Am off-road vehicles.

293600131

$4.99

XPS 4-STROKE OIL CHANGE KIT

Kit includes: 3 quarts of XPS synthetic blend oil, oil filter, o-ring and instruction sheet.

For Renegade, Outlander & Commander

Summer use - 703500736 **All climate** - 703500735

XP-S SYNTHETIC SUSPENSION GREASE

Specially designed for Can-Am off-road vehicle suspensions. Offers optimal lubrification at low and high temperature extremes while protecting critical suspension components from dirt and other contaminants.

400 g - 293550033

$94.99

FUEL STABILIZER

Fuel additive to protect against fuel contamination and residue build-up in carburetors and gas lines. Should always be used before storing your Can-Am off-road vehicle. Suitable for all gasoline engines.

413408601

$8.49

XPS 4-STROKE SYNTHETIC OIL - ALL CLIMATE GRADE

Unlike other ordinary 4-stroke motor oils, XPS all climate grade synthetic 4-stroke oil is specifically engineered to meet the particular lubrication requirements of the Can-Am off-road vehicles equipped with Rotax 4-TEC™ 4-stroke engines. Provides easier starting in very cold temperatutes.

1 quart / 946 ml - 293600112 **1 US gallon / 3.785 L** - 293600115

XPS 4-STROKE BLEND OIL - SUMMER GRADE

Synthetic blend 4-stroke engine oil for the Rotax 4-TEC engine. XPS summer grade synthetic blend off-road vehicle engine oil is a high performance oil developped for riders that demand maximum engine performance and protection during all operating conditions.

1 quart / 946 ml - 293600121

1 US gallon / 3.785 L - 293600122

PRE-MIXED ANTIFREEZE/COOLANT

Pre-mixed ready to top up your coolant level. Blended to perform best in our Rotax engines with anti-corrosive additive.

219700362

$7.49

XP-S LUBE

A multipurpose lubricant that prevents rust, corrosion and moisture intrusion. Contains active extreme-pressure additives which provide excellent lubricity and antiwear properties. Comes in a spray can that works upside down.

14 oz. - 293600016

$9.99

XP-S STORAGE OIL

This specialty oil is a must when putting your Can-Am off-road vehicle away for extended periods. Specially formulated to protect the engine's internal parts from the hazards of rust and corrosion due to condensation during storage or prolonged periods of non-use.

350 g - 413711900

$8.99

XPS OFF-ROAD VEHICLE HPG-T/A GAS SHOCK OIL

Recommended for all top quality gas shocks for off-road vehicle including our own Can-Am HPG-T/A nitrogen gas charged shocks. High viscosity index for extreme temperatures encountered in off-road vehicle conditions.

293600136

$65.99

FLEXIBLE SPOUT

To use your 1 quart / 946 ml, 1 US gallon / 3.785 L oil bottles for spill-free pouring. Easy installation.

414837300

$6.49

Note: Please contact your nearest dealer for suggested retail prices of oil based products.

XPS CLEANING PRODUCTS

XPS MICROFIBER TOWELS

The latest in high-quality detailing towels. Made up of extremely fine fibres, their soft surfaces have been perfected for drying and polishing motorcycles, boats, cars or any shiny finish. They are so absorbent they hold up to seven times their weight in water. Machine washable means they can be used over and over again.

Packs of 2 219701759

$8.49

XPS OFF-ROAD VEHICLE WASH

A biodegradable and non-toxic cleaner that removes mud and dried-on dirt from your off-road vehicle. Whether grimy from the track, the woods or the fields, this cleaner will leave your off-road vehicle sparkling. When used as directed, XPS ATV Wash is safe for all off-road vehicle finishes.

32 oz. / 946 ml 219701702

$9.99

XPS FINISHING SPRAY

The final touch to your detailing job. Uses an advanced silicone product. Melon-scented spray quickly treats faded plastics, vinyl, rubber and more to restore their original look. Long lasting, it helps keep mud and dirt from sticking to your vehicle's finish and does not leave streaks or spots. Contain no ozone depleters and no chlorinated solvents.

12 oz. / 340 g 219701704

$8.49

XPS BRAKES & PARTS CLEANER

A concentrated blend of solvents with a powerful blasting spray that effectively removes grease, grime, brake fluid and other contaminants from brake components and metal parts without the need for disassembly. Evaporates instantly and completely leaving no residue to hinder performance. Contains no ozone depleters.

14 oz. / 397 g 219701705

$7.99

XPS OFF-ROAD VEHICLE CLEANING KIT

Kit includes: XPS off-road vehicle Wash, XPS Finishing Spray and XPS Microfiber Towels.

219701713

$24.99

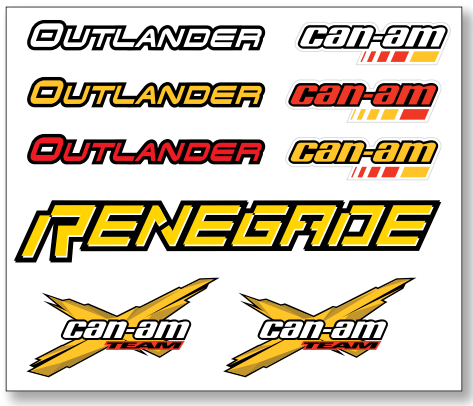
DECALS

6" x 12 3/4" (15 cm x 32 cm)
704901484
$11.99

6" x 12 3/4" (15 cm x 32 cm)
704901483
$11.99

12" x 4" (30 cm x 10 cm)
704901482
$11.99

Set of 2. 2" x 6" (5 cm x 15 cm)
704901480
$9.99



9 per sheet. 24" x 8" (60 cm x 20 cm)
704901481
$10.99

OFFICIAL LICENSED PRODUCTS

CAN-AM X-TEAM UMBRELLA

58" (147 cm) arc umbrella with fiberglass shaft and black tire grip handle.
CA08A70090

CAN-AM MULTI-TOOL

High-Sierra† 15-function multi-tool. Includes can and bottle opener, phillips head screw driver, 3 driver bits (2 – 4 mm), 3 blades (3 – 5 mm), serrated blade, pliers, needle nose pliers, wire cutter and dual-function file.
CA08A60090

CAN-AM FLEECE BLANKET

Anti-pill blanket. 100% polyester. 50" × 60" (130 cm × 150 cm) fleece blanket with carry handles.
CA08A80090

CAN-AM WIRELESS AQUA MOUSE

Wireless mouse with floating vehicle replica. PS/2, USB Port. Compatible with Windows†.
CA09A20030

Produit Autorisé Licensed Product

For additional information or to purchase these items, please contact your nearest BRP dealer.

TRUCK ACCESSORIES

CAN-AM MUD FLAPS

Keep dirt and mud off trucks, SUVs. Reduce damage from rock chips and other road debris. Fit most trucks and SUVs. Quick and easy installation. Sold in pairs.
4849410086

CAN-AM X-TEAM HITCH PLUG

Gives trucks, SUVs custom finished look. Keeps dirt, snow and other debris out of receiver. Fits 2" (5 cm) receivers.
4849510086

CAN-AM X-TEAM REAR WINDOW SKIN

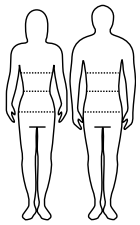
Great looking rear window skin. Provides shade from the sun to help keep interior temps low. Clear view from the inside looking out. Trim to fit almost any vehicle. Non-permanent adhesive for easy removal.
4849110086

CAN-AM LICENSE PLATE

Made of stainless steel with mirror finish. Raised letters to give 3D look. Thicker and more durable. Universal to fit all vehicles.
4849610008

SIZING CHART

HOW TO MEASURE
For best results, have someone else take measurements.
Measure body in underwear.
Tape must be snug but not tight.
If measurements fall between two sizes, order the larger size.



CHEST/BUST: Measure under your arms, around the fullest part of your chest.

WAIST: Measure around your natural waistline, keeping one finger between the tape and body.

GLOVES: Measure palm width.

HELMET: Measure around your head at the temple above the eye brow.

MEN/JACKET

	XS	S	M	MT	L	LT	XL	XLT	2XL	3XL
CHEST	33 - 35	36 - 38	39 - 41	39 - 41	42 - 44	42 - 44	46 - 48	46 - 48	50 - 52	54 - 56
WAIST	28 - 30	30 - 32	33 - 35	33 - 35	36 - 39	36 - 39	41 - 43	41 - 43	45 - 48	50 - 52
ARM LENGTH	31	33	33	34 1/2	34	35 1/2	34	35 1/2	35	35
HIPS (SEAT)	32 - 34	35 - 37	38 - 40	38 - 40	41 - 43	41 - 43	45 - 47	45 - 47	49 - 51	53 - 55
INSEAM	31	32	32	34	32	34	33	35	33	33

MEN/PANTS

	30	32	34	36	38	40
WAIST	30 - 32	32 - 34	34 - 36	36 - 38	38 - 40	40 - 42
HIPS (SEAT)	35 - 37	37 - 39	39 - 41	41 - 42	42 - 44	44 - 46
INSEAM	32	32	32	32	32	33

LADIES'/JACKET

	XS	S	M	L	XL	2XL
CHEST	32 1/2 - 33 1/2	34 1/2 - 35 1/2	36 1/2 - 38	39 1/2 - 41	43 - 45 1/2	47 - 49 1/2
WAIST	24 1/2 - 25 1/2	26 1/2 - 27 1/2	28 1/2 - 30	31 1/2 - 33	35 - 37	39 - 41
ARM LENGTH	29	30	31	32	32	32

LADIES'/PANTS

	5-6	7-8	9-10	11-12	13-14
WAIST	26 - 28	28 - 30	30 - 32	32 - 34	34 - 36
HIPS (SEAT)	36 - 38	38 - 40	40 - 42	42 - 44	44 - 46
INSEAM	29	30	30	30	30

MEN GLOVES (MEASURE PALM WIDTH)

	S	M	L	XL	2XL
INCHES	3	3 3/8	3 3/4	4 1/8	4 1/2
CM	7.5	8.5	9.5	10.5	11.5

SOCKS

S/M	L/XL
6 - 9	10 - 13

LADIES' GLOVES (MEASURE PALM WIDTH)

	S	M	L	XL
INCHES	2 5/8	3	3 1/4	3 1/2
CM	6.8	7.5	8.3	9

HELMETS

	XS	S	M	L	XL	2XL	3XL
HELMET SIZE	6 1/2 - 6 3/4	6 7/8 - 7	7 1/8 - 7 1/4	7 3/8 - 7 1/2	7 5/8 - 7 3/4	7 7/8 - 8	8 1/8 - 8 1/4
HEAD (INCHES)	20 7/8 - 21 1/4	21 5/8 - 22	22 3/8 - 22 3/4	23 1/8 - 23 5/8	24 - 24 3/8	24 3/4 - 25 1/8	25 3/8 - 25 7/8
HEAD (CM)	53 - 54	55 - 56	57 - 58	59 - 60	61 - 62	63 - 64	65 - 66

KIDS/TEEN

	2	3-4	5-6	7-8	10-12	14-16
CHEST	21	22 - 23	24 - 25	26 - 27	28 1/2 - 30	31 1/2 - 33
WAIST	20	20 1/2 - 21	21 1/2 - 22	22 1/2 - 23	24 - 25	26 - 27
HIP (SEAT)	21	22 - 23	24 - 25	26 - 27	28 1/2 - 30	31 1/2 - 33
ARM LENGTH	15 1/2	17 - 18 1/2	20 - 21 1/2	23 - 24 1/2	28 1/2 - 30	31 1/2 - 33
INSEAM	13 1/2	15 1/2 - 17 1/2	19 1/2 - 21	22 3/4 - 24 1/2	26 1/4 - 28	29 1/2 - 31

WHAT CODE REPRESENTS YOUR SIZE?

1. Find your size
2. The corresponding code is **THE CODE** you use to complete the part number on your order.

Example: 440 227_90
Size: M = code 06
Therefore 440 227 **06**90

SIZE	CODE
One Size	00
XS	02
S	04
M	06
MT	07
L	09
LT	10
XL	12
XLT	13
2XL	14
3XL	16
S/M	72
L/XL	73
2	21
3-4	79
6-8	48
10-12	49
14-16	50
30	37
32	38
34	39
36	40
38	41
40	42
5-6	52
7-8	54
9-10	55
11-12	56
13-14	80

TECHNICAL TERMINOLOGY

WE KEEP YOU DRY

RPM Respiractive Performance Matrix or RPM coating exclusive to BRP Riding Gear. Delivers extremely high performance and durability for perfect climate control under even the most extreme conditions. Trademark waterproofness, windproofness and breathability required of BRP Riding Gear shell fabric developed for intensive use and demanding riders.

RPM MAX Same great RPM coating PLUS total seam and logo sealing. Also, added direct venting in strategic jacket areas for more efficient moisture management during intense activity.

TEFLON† Teflon provides an invisible barrier around fabric fibers to repel water and stains. In addition to retaining its water shedding properties longer than standard Teflon, Teflon HT and HP are also even more resistant to soiling and staining without altering the fabric's color, appearance, structure, texture and breathability. Teflon HT, good up to 20 washes and Teflon HP up to 30 washes compared to manufactured coatings washable only 1 to 5 times.

HIPORA† Windproof, breathable and waterproof membrane that features unique polyurethane coating technology and delivers excellent moisture management.

DWR† DWR stands for Durable Water Repellency. This treatment helps prevent the outer fabric surface from absorbing water, keeping the outerwear both light and comfortable.

SEAM SEALING Seams and embroidery can act as tiny entry points through which wind and water can infiltrate. That's why jackets and pants with RPM are critical seam and logo sealed. And Riding Gear with RPM Max are 100% seam and logo sealed for an even more comprehensive barrier from all the elements. The proprietary tape is also waterproof and breathable to fully seal the deal for complete performance.

WE KEEP YOU WARM

CRESTA BY PRIMALOFT
Primaloft Cresta offers warmth without weight and extra bulk. It is designed to keep you warm and comfortable throughout the day.

PRIMALOFT ONE
Warmer wet or dry than any other synthetic insulation. The ultimate down-like microfiber insulation. Quick drying, soft, and breathable. Primaloft One is lightweight, compressible and thermally efficient.