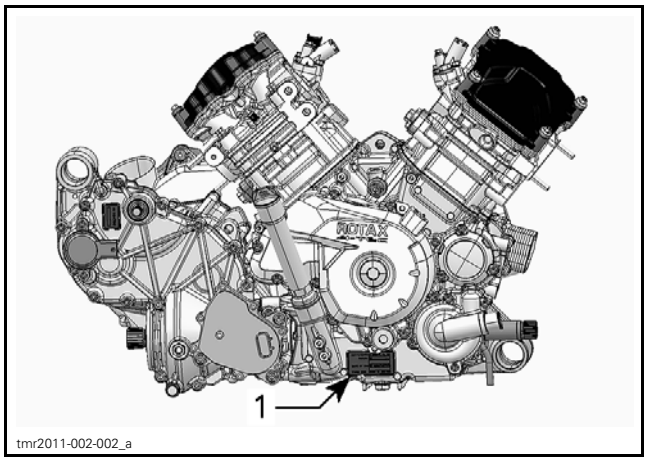
ENGINE IDENTIFICATION NUMBER (E.I.N.)



TYPICAL - RH SIDE OF ENGINE
1. Engine Identification Number (E.I.N.)

ENGINE EMISSIONS INFORMATION

MANUFACTURER'S RESPONSIBILITY

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

DEALER RESPONSIBILITY

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

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

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

Exceptions include manufacturer's prescribed changes.

OWNER RESPONSIBILITY

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

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

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 certification is contingent on certain adjustments being set to factory standards. For this reason, the factory procedure for servicing the product must be strictly followed and, whenever practicable, returned to the original intent of the design.

The responsibilities listed above are general and in no way a complete listing of the rules and regulations pertaining to the EPA requirements on exhaust emissions. For 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.

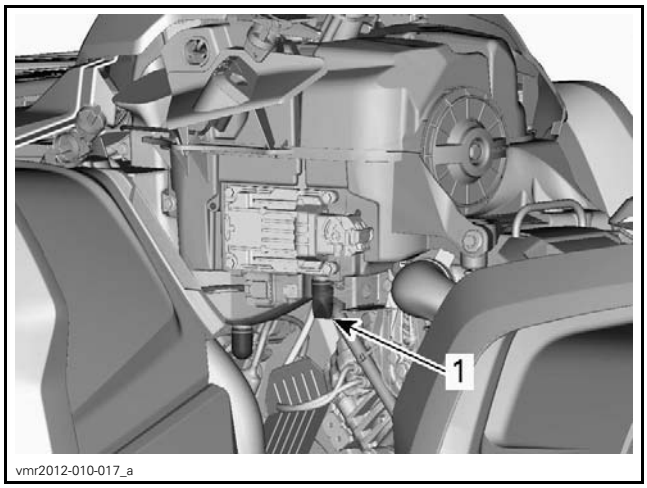
1. Air filter cover

4. Remove air filter.

AIR FILTER REMOVAL

Engine Air Filter Housing Inspection and Draining

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

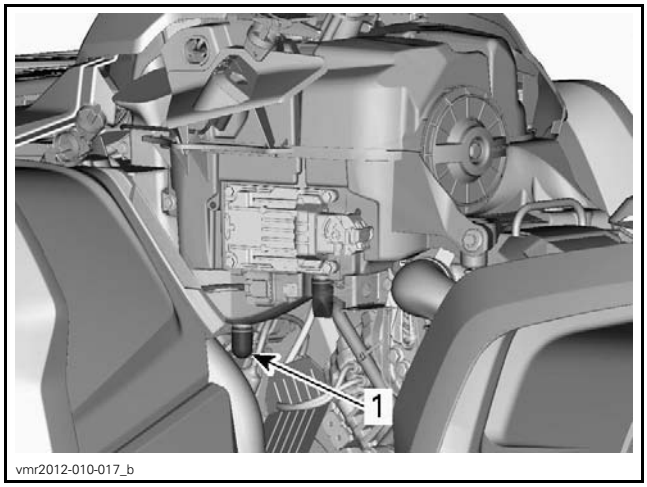


TYPICAL - SOME PARTS REMOVED FOR CLARITY
1. Air filter housing inlet drain tube

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

NOTICE Do not blow compressed air into air filter chamber.

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



TYPICAL - SOME PARTS REMOVED FOR CLARITY
1. Air filter drain tube

Paper Filter Cleaning

1. Ensure that the foam filter is removed from paper filter.
2. Tap out heavy dust from the paper filter.

This will allow dirt and dust to get out of the paper filter.

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

⚠ WARNING

Do not remove the coolant reservoir cap if engine is hot.

4. Use a funnel to avoid spillage. **Do not overfill.**
5. Properly reinstall and tighten reservoir cap.
6. Reinstall service cover.

NOTICE **Do not store any objects in the front service compartment.**

Engine Coolant Specific Gravity Check

1. Remove service cover. Refer to *BODY* subsection.
2. Remove pressure cap.

⚠ WARNING

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

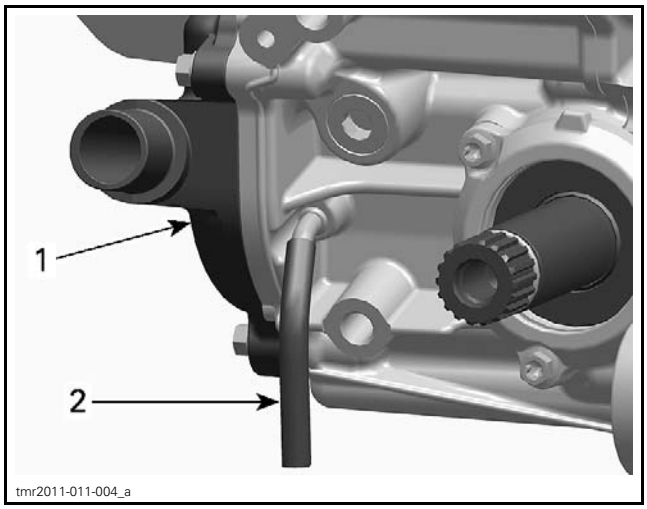
3. Using an antifreeze tester, test coolant strength.

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

Engine Cooling System Inspection

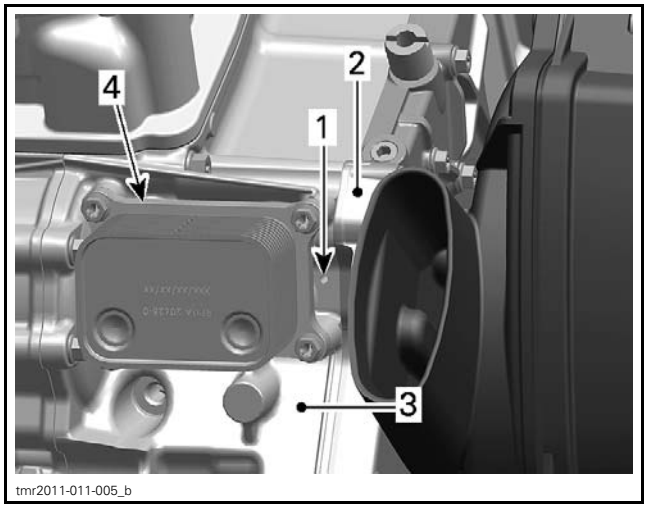
1. Check general condition of hoses and clamps for tightness.
2. Check the leak indicator hose for oil or coolant.

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 the *COOLING SYSTEM* 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.



TYPICAL
1. Leak indicator hole
2. PTO cover
3. Crankcase PTO, front side
4. Oil cooler (1000 only)

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

Engine Cooling System Pressure Cap Test

1. Remove service cover. Refer to *BODY* subsection.
2. Remove pressure cap.

⚠ WARNING

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

GENERAL

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

PROCEDURES

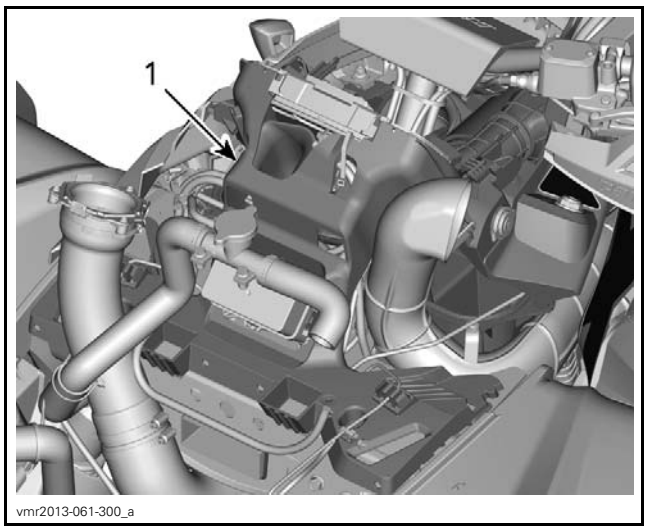
AIR FILTER

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

AIR FILTER HOUSING

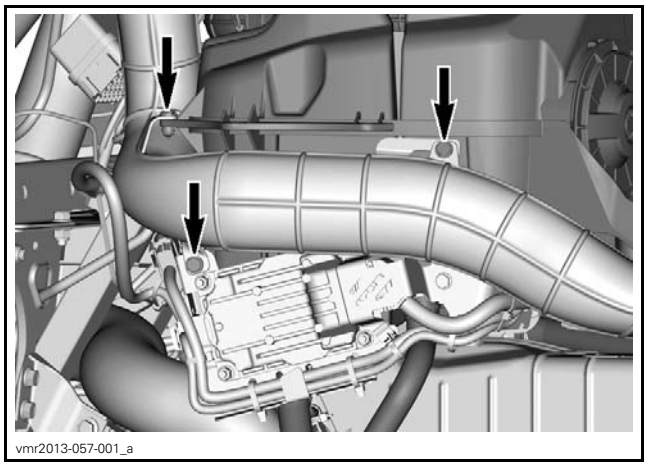
Air Filter Housing Removal

1. Remove front body module. Refer to *BODY* subsection.
2. On applicable models, move dashboard support toward front.



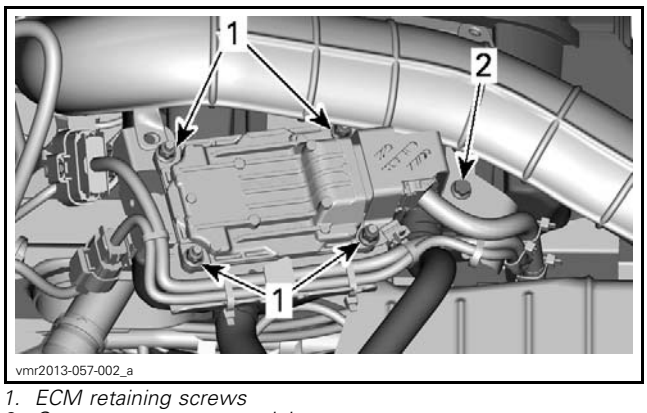
TYPICAL
1. Dashboard support

3. Remove plastic rivets securing CVT air inlet to CVT housing.



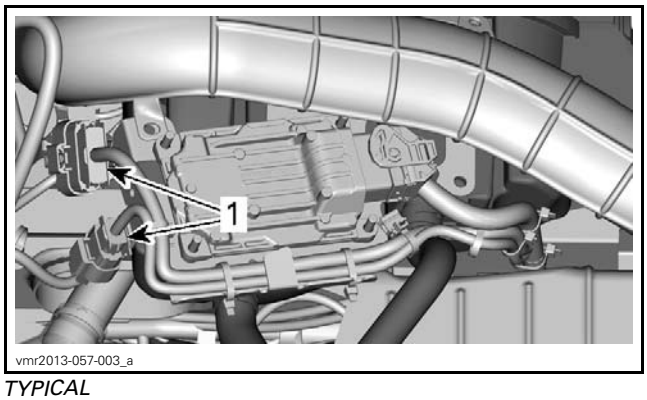
PLASTIC RIVETS TO REMOVE

4. Remove ECM retaining screws and ECM connector protector.



1. ECM retaining screws
2. Connector protector retaining screw

5. Disconnect both engine harness connectors (HIC).
6. Move ECM aside.

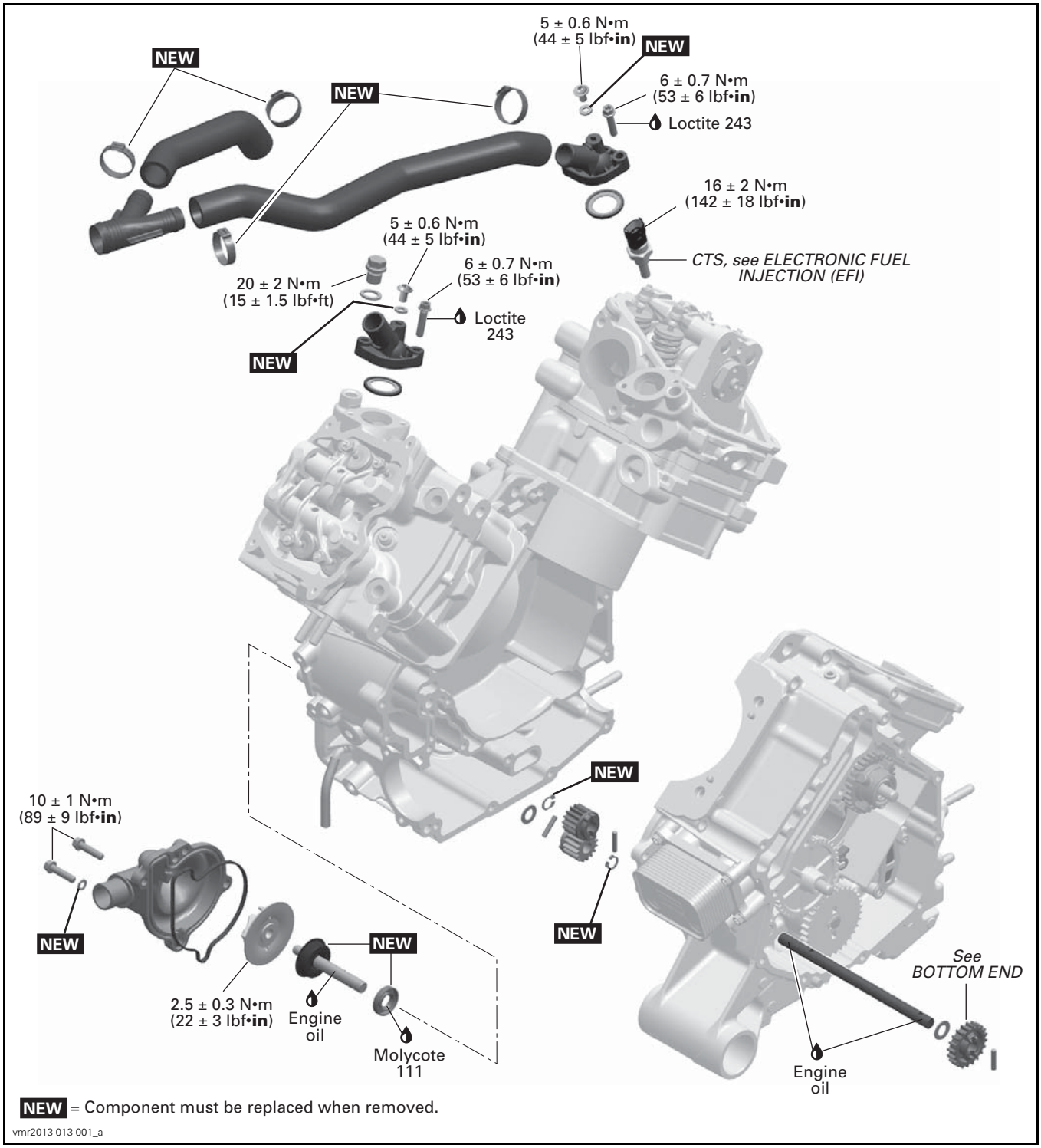


TYPICAL
1. Engine harness connectors (HIC)

7. Remove air intake tube retaining screw.

WATER PUMP

1000 Engine



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.*

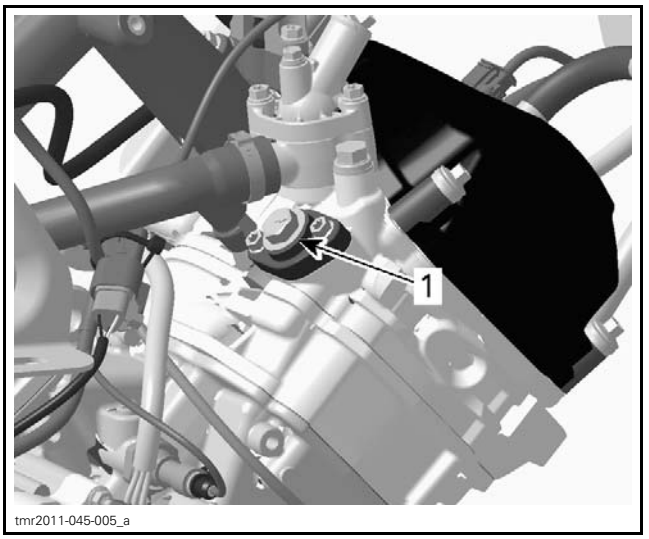
PROCEDURES

TIMING CHAIN TENSIONERS

Timing Chain Tensioner Location

500, 650 and 800R Engine

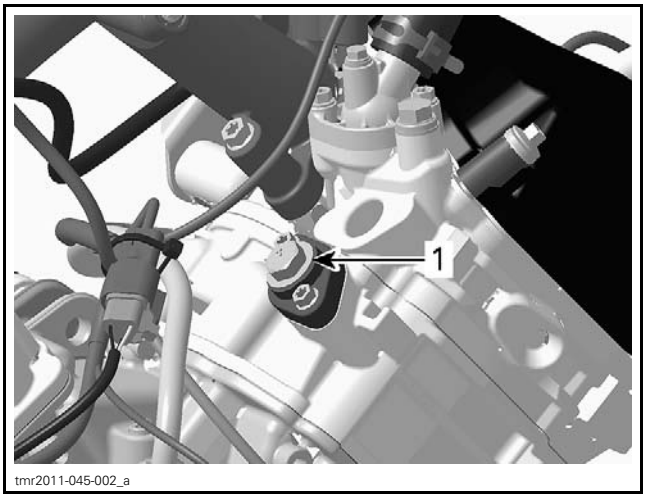
The timing chain tensioner is located in the cylinder head.



500, 650 AND 800R ENGINE (FRONT CYLINDER SHOWN)
1. Timing chain tensioner

1000 Engine

The timing chain tensioner is located in the cylinder.



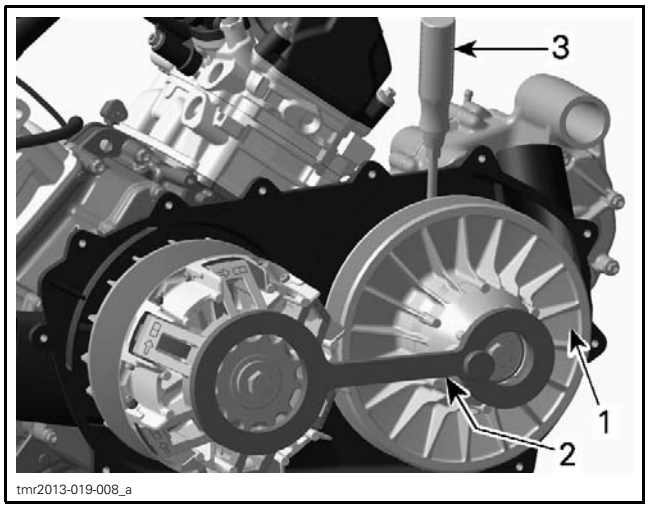
1000 ENGINE (FRONT CYLINDER SHOWN)
1. Timing chain tensioner

Timing Chain Tensioner Removal

1. Make sure the applicable cylinder is set to TDC ignition. Refer to *CAMSHAFT TIMING GEARS* in this subsection.
2. Carefully remove chain tensioner screw plug and release spring tension.

⚠ CAUTION Tensioner is spring loaded.

3. Remove:
   – O-ring,
   – Spring
   – Chain tensioner plunger.



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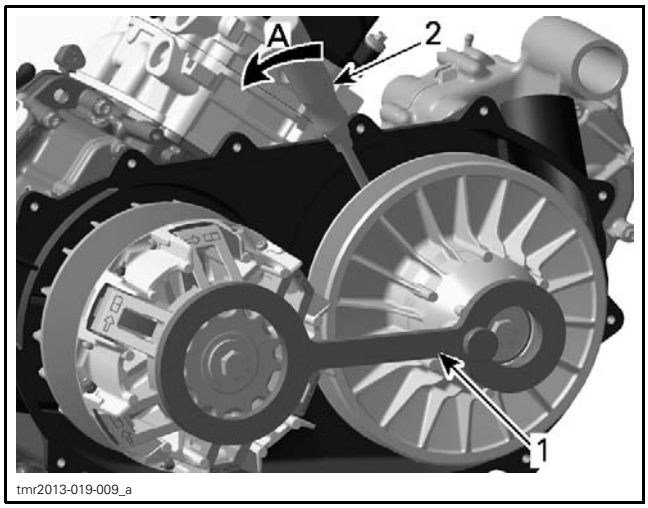
1000 ENGINE
1. *Fixed sheave*
2. *Clutch holder*
3. *Screwdriver*

Turn the screwdriver approximately 20° counterclockwise until cam engages in the driven pulley sliding sheave and hold it in this position (spring preload).



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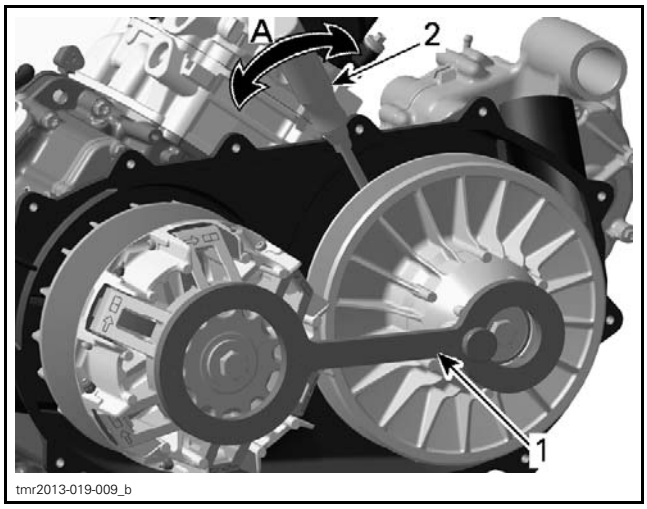
1000 ENGINE
1. *Clutch holder*
2. *Screwdriver*

Using a socket and extension, hand tighten the driven pulley screw.

NOTE: Do not apply specified torque at this time.

Move the screwdriver back and forth to check cam for free movement.

NOTICE **A cam not correctly engaged will cause damage to the driven pulley and cam.**



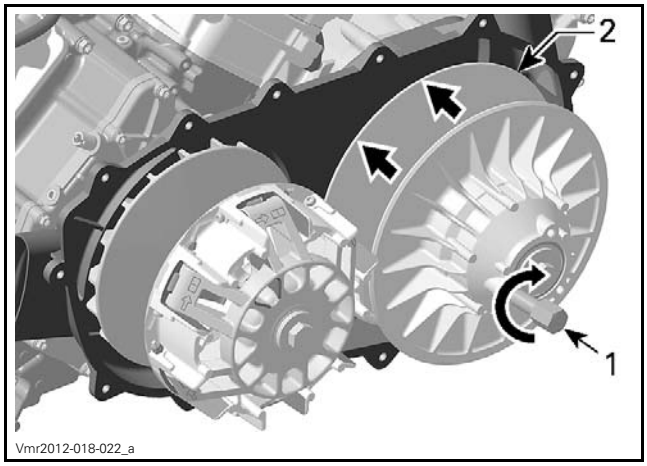
tmr2013-019-009_b

1000 ENGINE
1. *Clutch holder*
2. *Screwdriver*

A. Cam freedom of movement

Install drive belt. Refer to *DRIVE BELT* in this subsection.

REQUIRED TOOL	
PULLER/LOCKING TOOL (P/N 529 036 098)	



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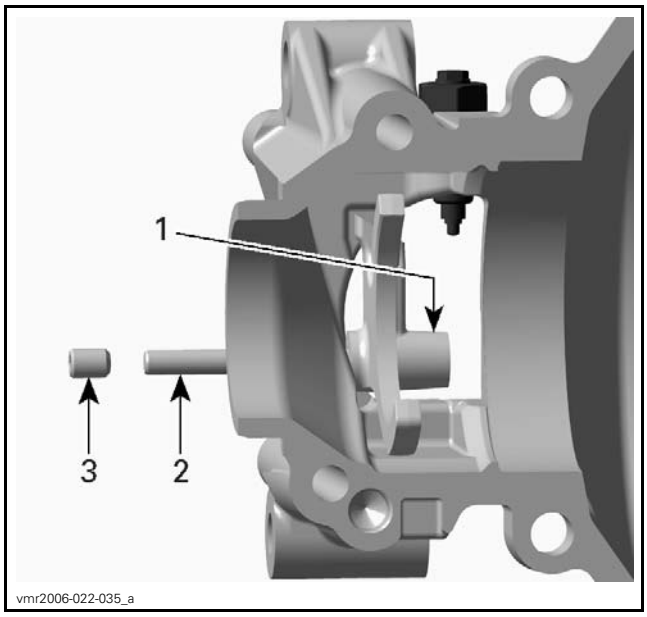
1. *Puller/locking tool*
2. *Sliding sheave*

NOTE: If driven pulley sheaves can to be opened when the service tool is screwed in, the cam is not correctly engaged in the sliding sheave.

Tighten driven pulley screw as specified.

REQUIRED TOOL	
CLUTCH HOLDER (P/N 529 036 238)	



1. Coupling fork
2. Pin
3. Set screw

Clean all metal components in a solvent.

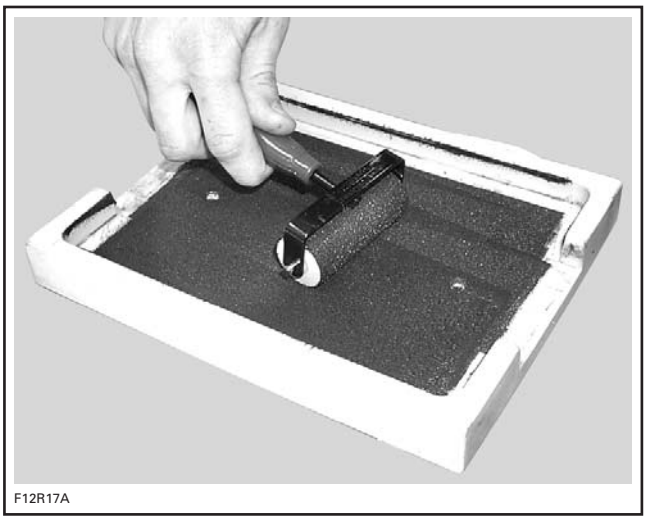
Housing mating surfaces are best cleaned using a combination of LOCTITE CHISEL (GASKET REMOVER) (P/N 413 708 500) and a brass brush. Brush a first pass in one direction then make the final brushing perpendicularly (90°) to the first pass cross (hatch).

NOTICE **Do not wipe with rags. Use a new clean hand towel only.**

IMPORTANT: When beginning the application of sealant, the assembly and the first torquing should be done within 10 minutes. It is suggested to have all you need on hand to save time.

Use LOCTITE 5910 (P/N 293 800 081) on mating surfaces.

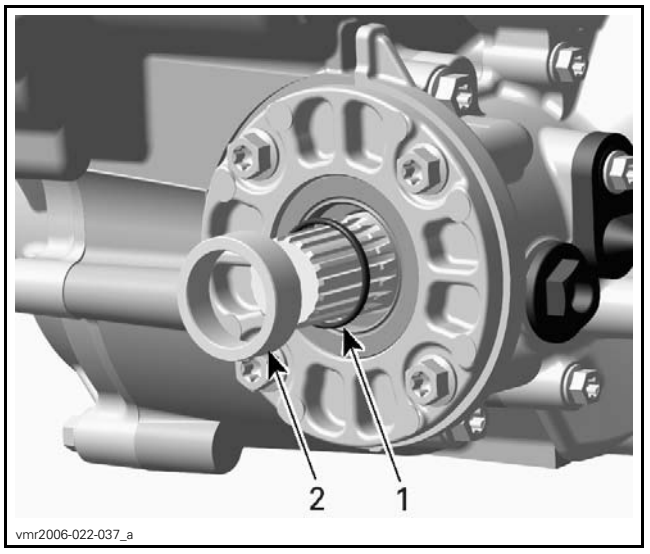
Use a plexiglass plate and apply some sealant on it. Use a soft rubber roller (50 - 75 mm (2 - 3 in)), available in arts products suppliers for printing, and roll the sealant to get a thin uniform coat on the plate (spread as necessary). When ready, apply the sealant on housing mating surfaces.



Do not apply in excess as it will spread out inside housings.

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

Install all other screws on right housing then the O-ring and the distance sleeve on end of output shaft. Chamfered bore of distance sleeve has to face the engine.



1. O-ring
2. Distance sleeve

NOTE: To install the right housing align the coupling fork with the groove in the coupling sleeve.

Torque the four (4) M8 Torx screws in a crisscross sequence to following specification.

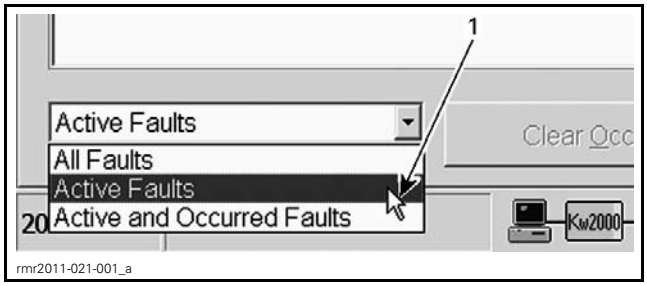
Fault Code States

Fault codes have 3 possible states:

– Active
– Occurred
– Inactive.

Click the **Fault** tab then click on the drop-down list on the LH lower corner.

Choose the fault code state you want to display.



TYPICAL
1. Drop down list

Active Fault Codes

An active fault code is an indication of a fault that is **currently triggered**.

The active fault may or may not compromise normal operation of the system(s). Service action should be taken to correct the problem that caused the fault code.

Once the fault condition(s) of the active fault is no longer present, its state will change to "occurred".

Occurred Fault Codes

An occurred fault code indicates a fault that was active, but **no longer** is.

The occurred fault does not presently affect system or component operation but is retained as a history of the faults that were detected.

The fault may have been generated due to a system or component that was momentarily operating outside normal parameters. Repeated occurred faults of this type should be considered when troubleshooting a problem, and may require that maintenance action be taken.

An occurred fault may also be generated when disconnecting and reconnecting a component, replacing a burnt fuse, when the software update of an electronic module has been carried out, or may be due to a momentary high or low voltage.

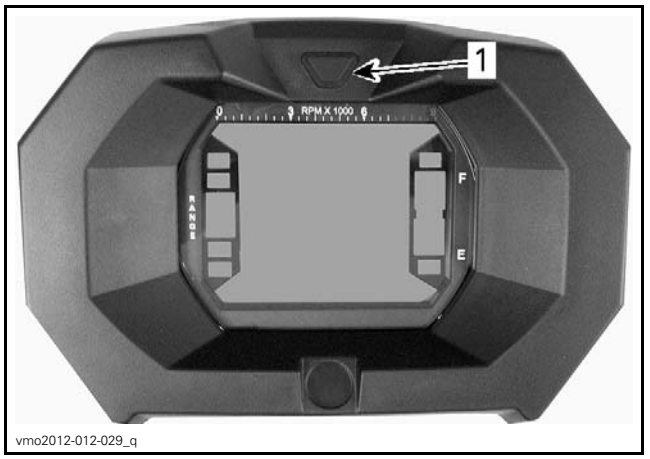
Inactive Fault Codes

An inactive fault code represents a fault code that is neither active, nor occurred. It is simply part of a list of all possible faults that can be monitored by the ECM and multifunction gauge, which may become active or occurred if the monitoring system detects an applicable fault. These codes can be viewed in B.U.D.S.

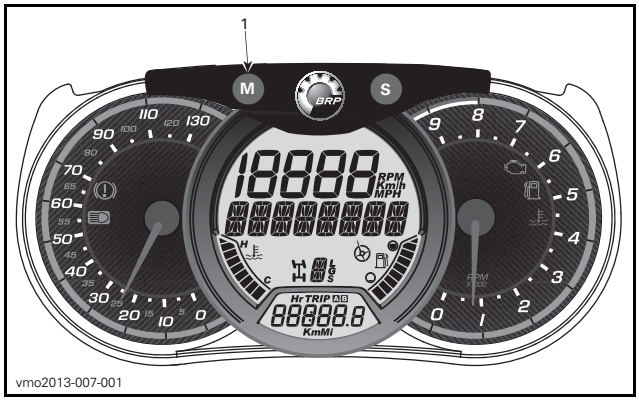
How to Display Fault Codes in the Multifunction Gauge

NOTE: A fault code must be in an "Active" state to be displayed in the multifunction gauge. B.U.D.S. must be used to read all fault codes states.

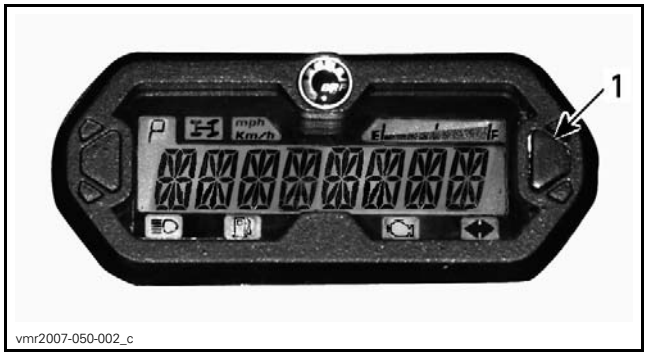
1. Use the selector button or mode button and scroll to Engine Hour (EH) on the gauge.



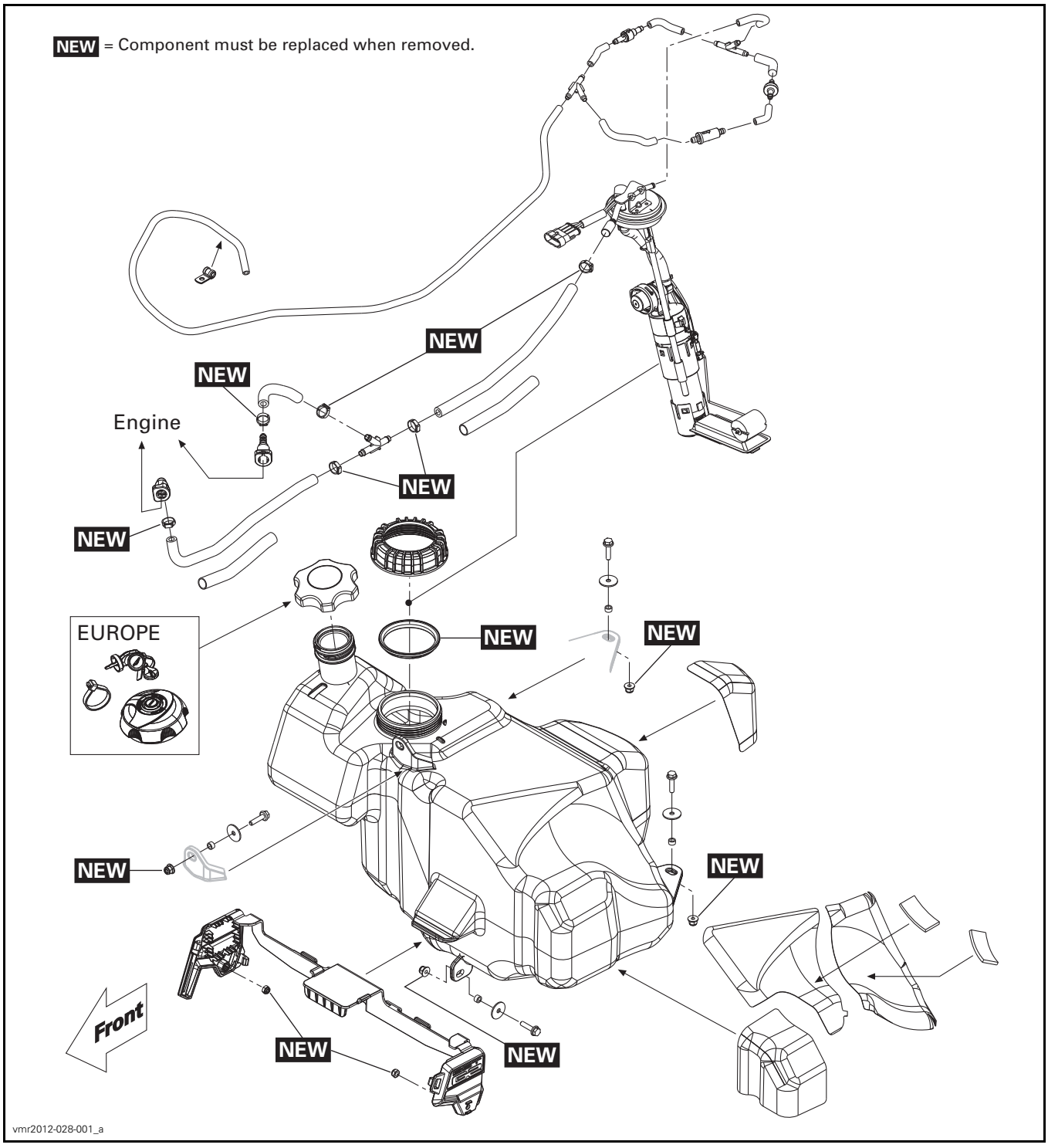
MULTIFUNCTION GAUGE LCD - OUTLANDER
1. Selector button



MULTIFUNCTION GAUGE (ANALOG/DIGITAL) - OUTLANDER
1. Mode button



RENEGADE
1. Selector button


NEW = Component must be replaced when removed.
NEW
NEW
Engine
NEW
NEW
EUROPE
NEW
NEW
NEW
NEW
Front
NEW
NEW
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WIRING HARNESS AND CONNECTORS

SERVICE TOOLS

SERVICE TOOLS – OTHER SUPPLIER

GENERAL

The illustrations in this subsection are typical. Several variants of the connector types, such as different number of pin cavities, are used on the vehicle.

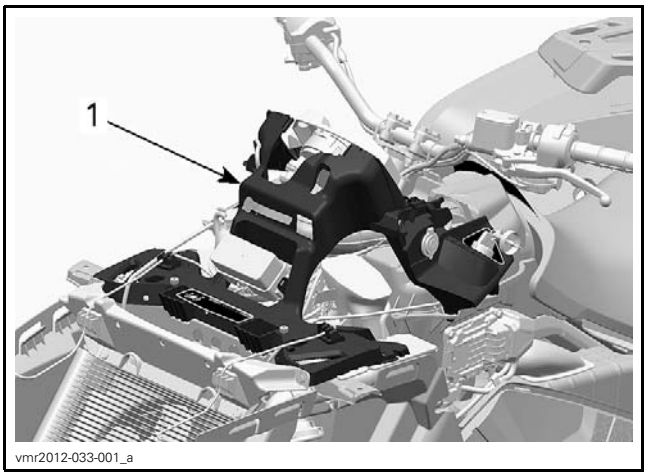
CONNECTOR ABBREVIATION DESCRIPTION

ABBREVIATION	DESCRIPTION
ACS	Air controlled suspension
BD	RH multifunction switch
BN1	Ground terminal
BN2	Ground terminal
BP1	Positive terminal
CAD	RH front turn light
CAD1	RH front turn light
CAD2	RH front turn light
CAG	LH front turn light
CAG1	LH front turn light
CAG2	LH front turn light
CC	Ignition switch
CL	Cluster
CRD	Rear RH turn light
CRG	Rear LH turn light
DB	Diagnostic connector
DC1	Accessory outlet
DC2	Accessory outlet
DC3	Accessory outlet
DC5	Accessory outlet
DC6	Accessory outlet
DC7	Accessory outlet
DPS1	Dynamic power steering
DPS2	Dynamic power steering
DPS3	Dynamic power steering
FP	Fuel pump
FRR	Rear brake light switch
FRRF	Rear brake light switch (female connector)
FRRF2	Rear brake light switch (female connector)
FRRM	Rear brake light switch (male connector)
FRV	Front brake light switch
FT	Cooling fan
HIC1	Harness interconnect
HIC2	Harness interconnect
HICa	Harness interconnect (CE models)
KX1	Horn
KX2	Horn
MC1	Turn light relay
MC2	Turn light relay
MG1	LH multifunction switch

TYPICAL - OUTLANDER MODELS ILLUSTRATED
1. Gauge support

Outlander Models

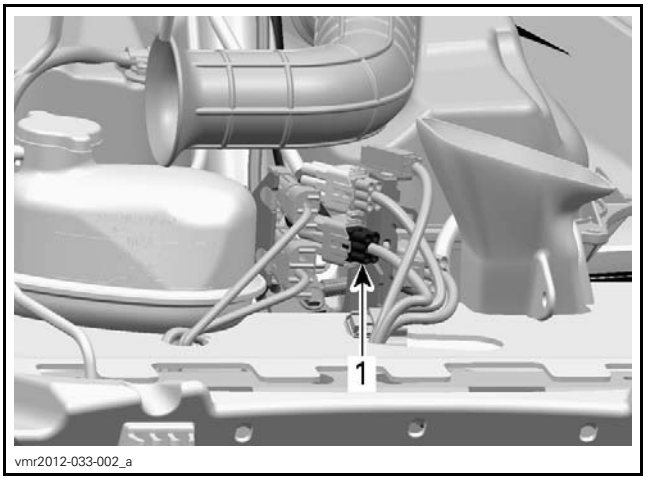
3. Remove dashboard support.



1. Dash board support

All Models

4. Disconnect the LH multifunction switch steering connector (MG2) and refer to *START BUTTON WIRE IDENTIFICATION* that follows.



1. LH multifunction switch connector (MG2)

Start Button Wire Identification

LH MULTIFUNCTION SWITCH CONNECTOR (MG2)		
FUNCTION	PIN	COLOR
12 volt input from emergency engine stop switch	1	VIOLET/BEIGE
12 volt output to starter solenoid pin SS1	6	YELLOW/RED

Start Button Resistance Test

1. Disconnect the MG2 connector, refer to *START BUTTON CONNECTOR ACCESS* in this subsection.
2. Using the FLUKE 115 MULTIMETER (P/N 529 035 868), measure resistance as per the following table.

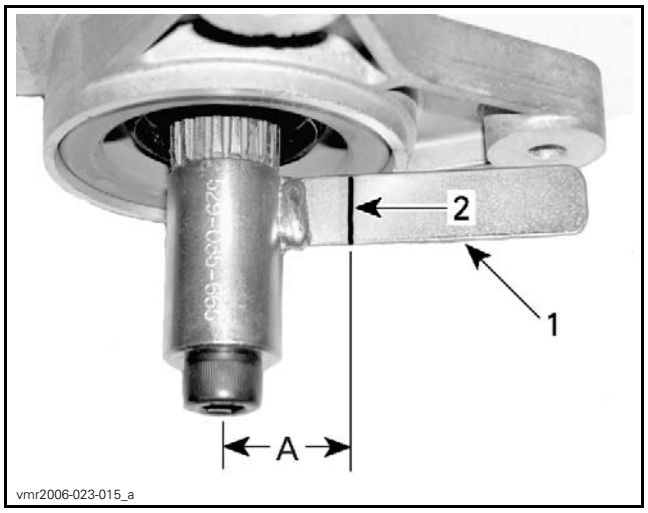
POSITION	START BUTTON CONNECTOR PIN		RESISTANCE
Switch released	1	6	Infinite (OL)
Switch depressed and held			0.6 Ω max.

3. If start button is defective, replace LH multifunction switch assembly.

STARTER SOLENOID

Starter Solenoid Access

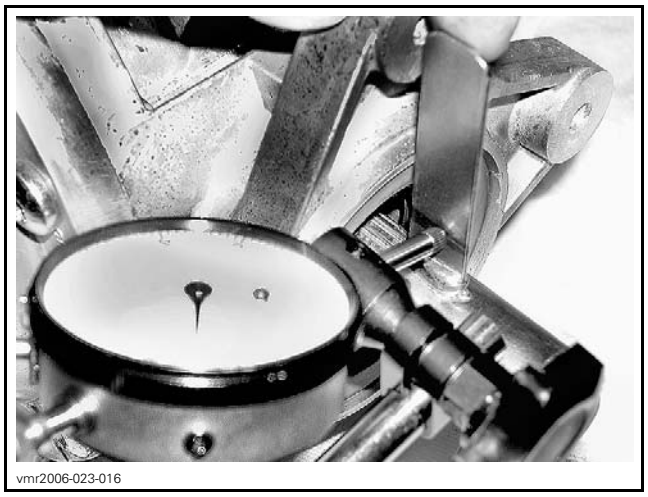
Remove seat.



1. Tab of backlash measurement tool
2. Mark on tab
A. 25.4 mm (1 in)

Position the dial indicator tip against the tab at a 90° angle and right on the previously scribed mark.

Gently, move the tool tab back and forth. Note the backlash result.



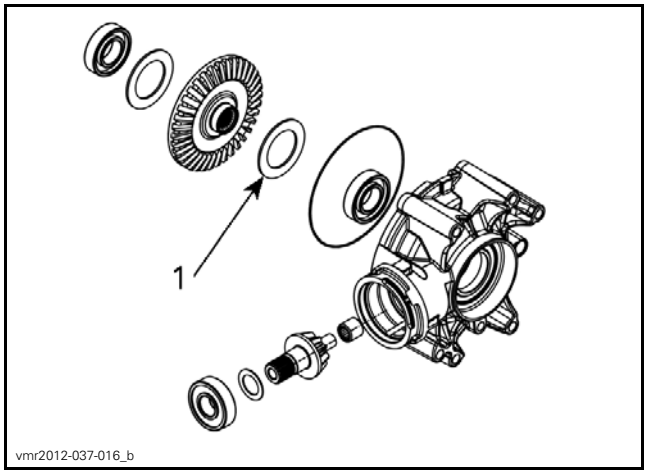
Rotate pinion gear 1/2 turn and recheck backlash. Note the result.

Rotate pinion gear 1 turn and recheck backlash.

BACKLASH SPECIFICATION
0.05 mm (.002 in) to 0.36 mm (.014 in)

If backlash is out of specification, split final drive housing and adjust shim thickness as per following guideline.

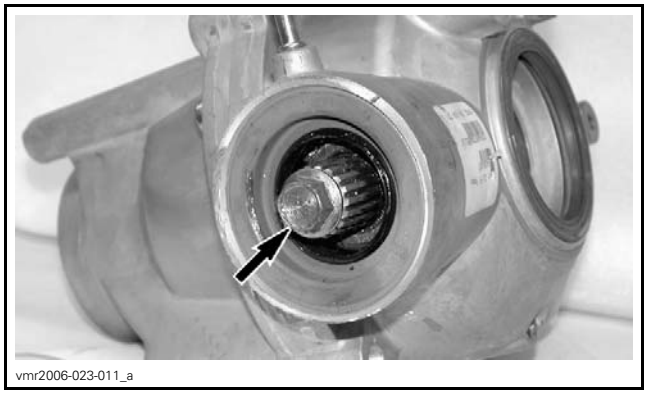
BACKLASH ADJUSTMENT GUIDELINE	
BACKLASH MEASUREMENT	WHAT TO DO
Below 0.05 mm (.002 in)	Add shim(s) and recheck backlash
Above 0.36 mm (.014 in)	Remove shim(s) and recheck backlash



1. Backlash shim

Preload Inspection

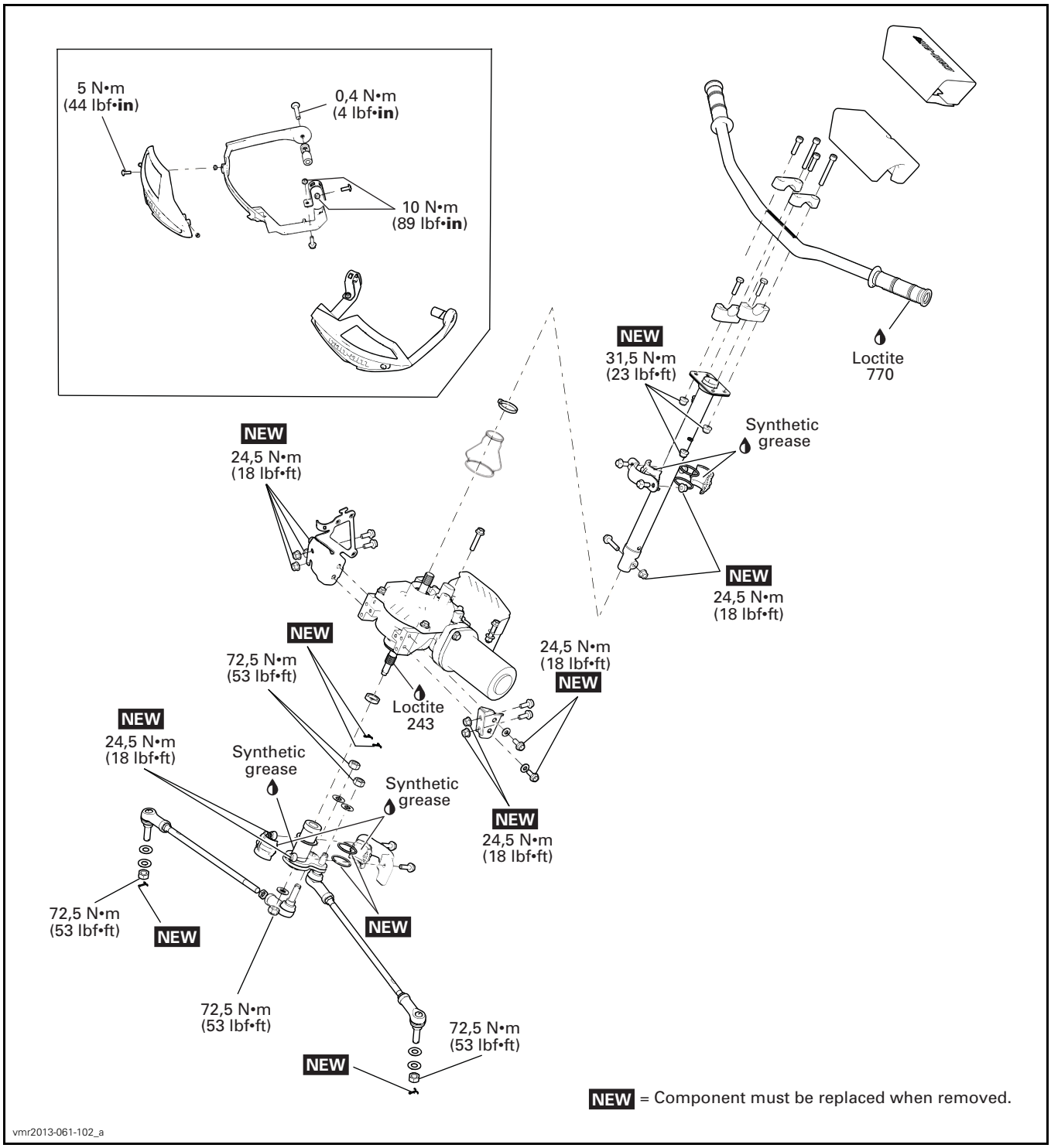
Screw the propeller shaft screw in pinion gear.

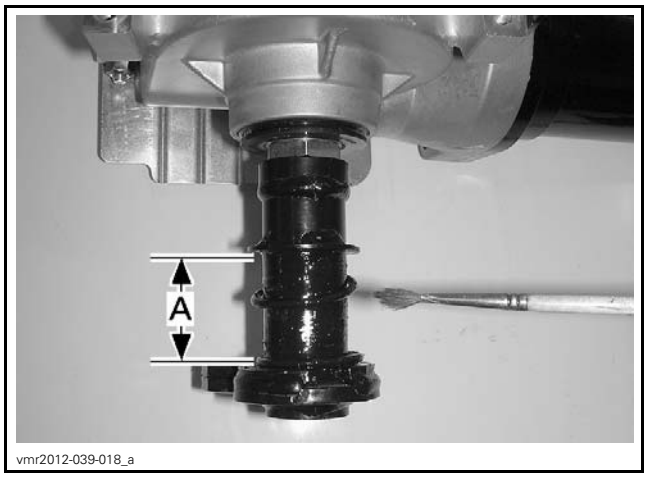


TYPICAL — FRONT DIFFERENTIAL SHOWN

Using a needle torque wrench, measure the preload.

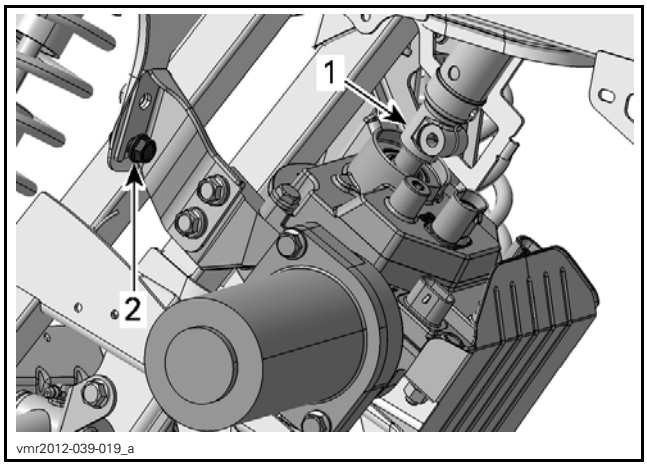
1000 Model


5 N•m
(44 lbf•in)
0,4 N•m
(4 lbf•in)
10 N•m
(89 lbf•in)
NEW
31,5 N•m
(23 lbf•ft)
Loctite
770
Synthetic
grease
NEW
24,5 N•m
(18 lbf•ft)
NEW
24,5 N•m
(18 lbf•ft)
NEW
72,5 N•m
(53 lbf•ft)
Loctite
243
24,5 N•m
(18 lbf•ft)
NEW
NEW
24,5 N•m
(18 lbf•ft)
Synthetic
grease
Synthetic
grease
NEW
24,5 N•m
(18 lbf•ft)
72,5 N•m
(53 lbf•ft)
NEW
NEW
72,5 N•m
(53 lbf•ft)
72,5 N•m
(53 lbf•ft)
NEW
NEW = Component must be replaced when removed.
vmr2013-061-102_a



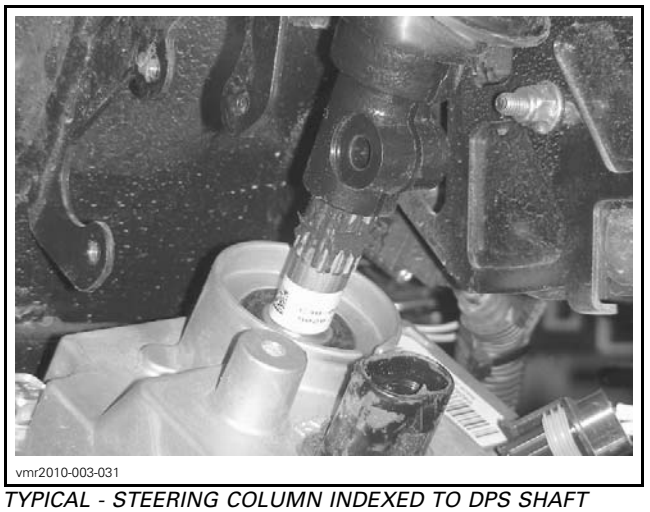
A. XPS synthetic grease (P/N 293 550 010) here

5. Insert the steering column onto the DPS input shaft
6. Position the LH DPS support bracket onto the hexagonal forming screw that was left on the frame DPS mount.



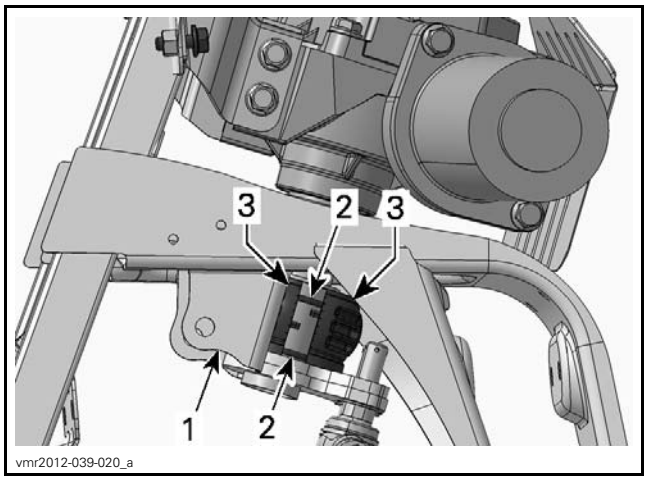
1. Steering column onto the DPS input shaft here
2. LH DPS support bracket onto the hexagonal forming screw here

NOTE: The DPS shaft splines have a key which **must be aligned** with the keyway in the steering column.



TYPICAL - STEERING COLUMN INDEXED TO DPS SHAFT SPLINES

7. Ensure the following are properly positioned on the lower steering shaft and lower steering shaft mount.
   – O-rings
   – Steering shaft half bushings.



1. Lower steering shaft mount
2. O-rings
3. Steering shaft half bushings

8. Install the 3 remaining hexagonal forming screws that secure the DPS unit **loosely** using **NEW** fasteners.

NOTE: **Ensure** the support bracket retaining screws have a **NEW** conical spring washer between the screw head and the DPS frame support.

Ensure both tie rod ends have a hardened steel washer on them, then insert the tie-rod ends onto the pitman arm.