

CLUTCH

SERVICE TOOLS

Description	Part Number	Page
wrench 11 mm	529 036 076	4
clutch hub locking tool.....	529 036 080	8

NDLR: insert illustration vmr2008-018-001

DRAFT

Subsection XX (CLUTCH)

NDLR: insert illustration vmr2008-018-002

GENERAL

NOTE: For a better understanding, the following illustrations are taken with engine out of vehicle. To perform the following instructions, it is not necessary to remove engine from vehicle.

Always disconnect the negative wire from the battery before working the engine.

WARNING

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

When the repair is done. Test drive to confirm all is working well. If the test drive is good, perform a change of engine oil.

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

MAINTENANCE

NOTE: When removing an access cover or the clutch cover, lift and block LH side of vehicle enough to prevent oil leakage.

NOTE: As soon as any part is replaced by a new one, the clutch adjustment procedure must be performed. Refer to *CLUTCH ADJUSTMENT*.

CLUTCH ADJUSTMENT

The clutch adjustment is necessary after any work in the clutch system.

Fully unscrew cable adjustment lock nut.

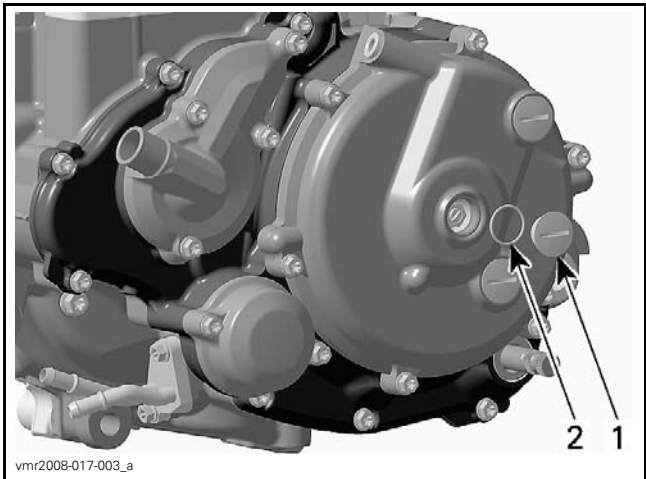


Fully screw and tighten clutch cable adjuster to provide maximum slack.



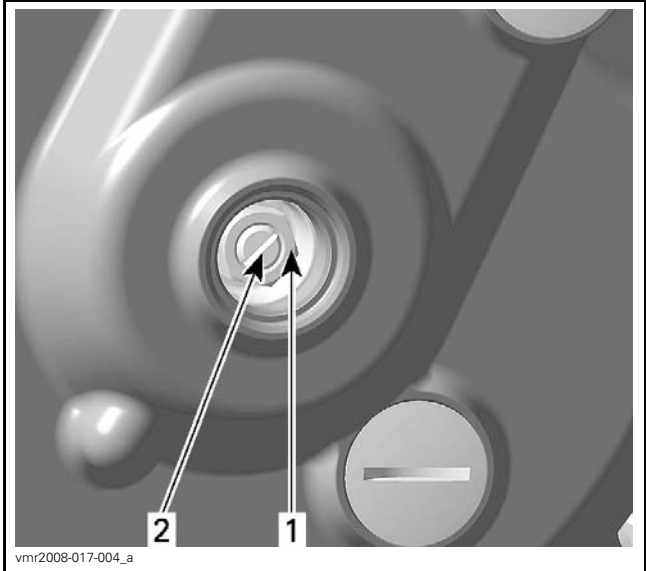
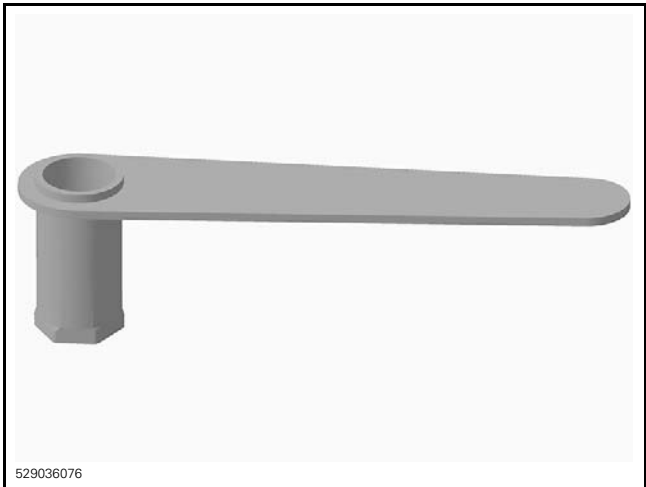
Remove clutch adjustment access plug and O-ring from engine.

Subsection XX (CLUTCH)



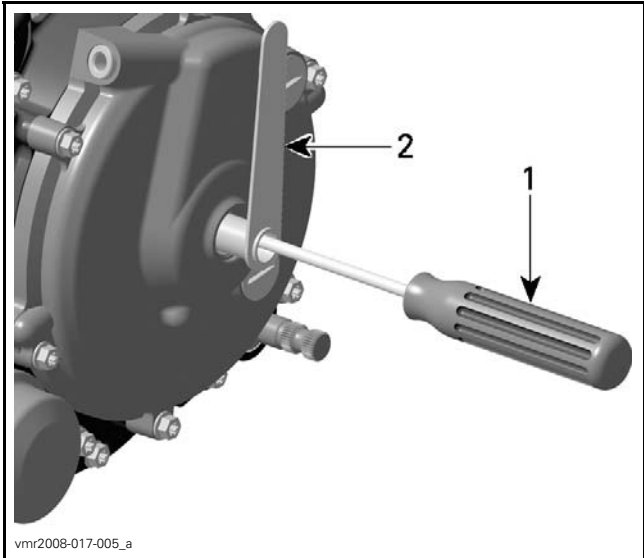
- 1. Plug screw for clutch adjustment
- 2. O-ring

Loosen adjustment screw lock nut using wrench 11 mm (P/N 529 036 076)



- 1. Lock nut
- 2. Adjustment screw

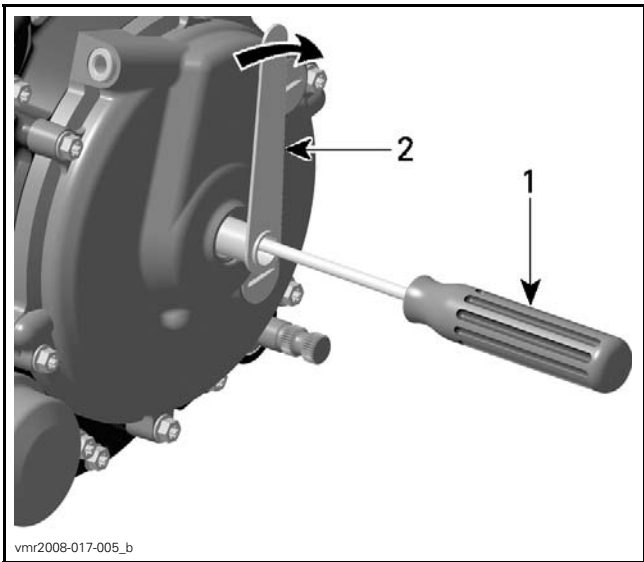
Using a flat screwdriver, gently turn clutch adjustment screw clockwise to locate the point of contact with release bearing, then turn screw out (counterclockwise) 3/8 to 1/2 turn from contact point.



- 1. Screwdriver
- 2. Wrench 11 mm

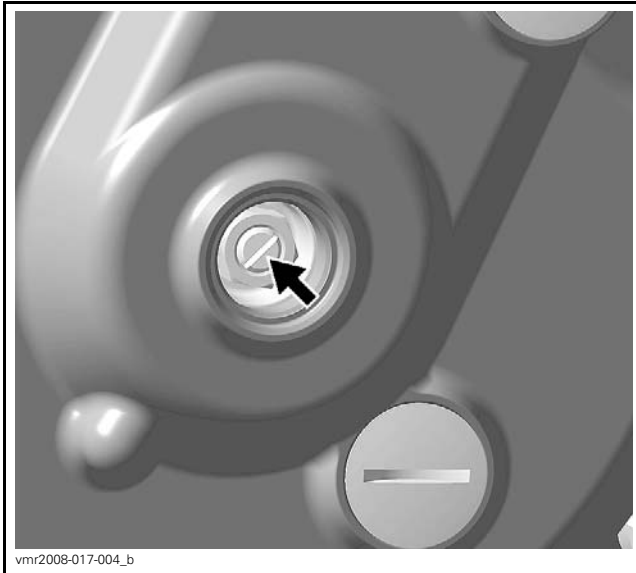
Holding the adjustment screw in its position with the screwdriver, carefully retighten the lock nut to lock the adjustment.

NOTE: Be careful not to change the adjustment.



- 1. Screwdriver
- 2. Wrench 11 mm

To confirm proper adjustment, gently push on adjustment screw with a finger.



A small play should be felt; otherwise, perform adjustment again.

CAUTION: A premature clutch disk wear may occur if adjustment is too tight.

Reinstall access plug with its O-ring.

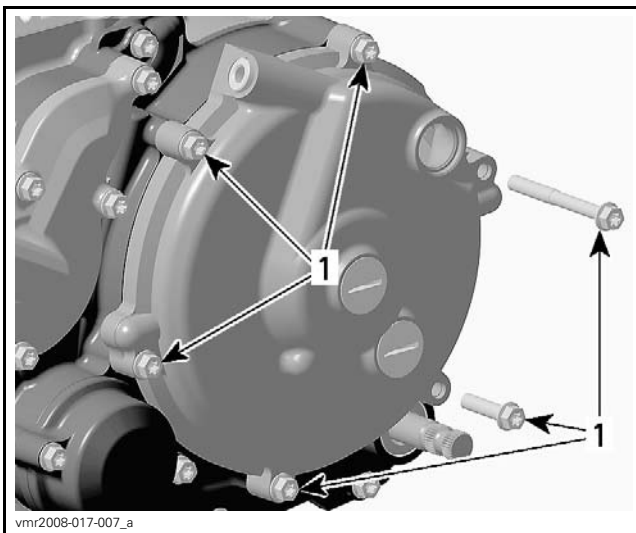
PROCEDURES

CLUTCH RELEASE COVER

Clutch Release Cover Removal

Remove foot shift lever.

Unscrew and remove clutch release cover screws and withdraw cover.

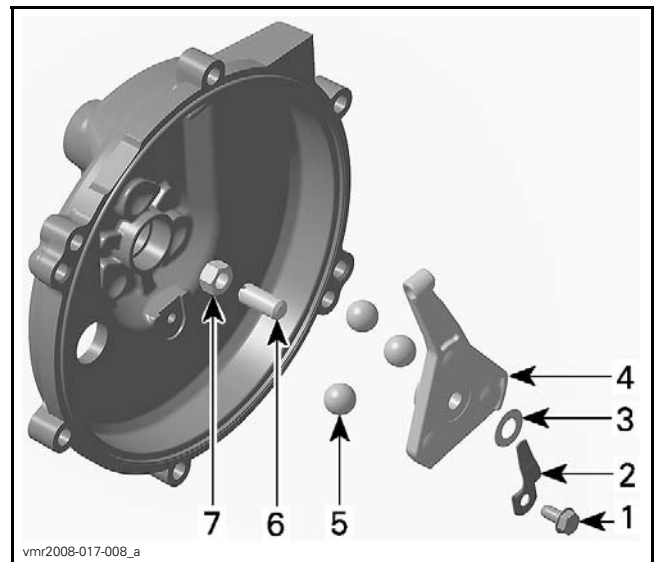


1. Clutch release cover screws

Disengage clutch cable.



Remove leave spring, thrust washer, clutch release cam with adjustment screw and locking nut and balls.

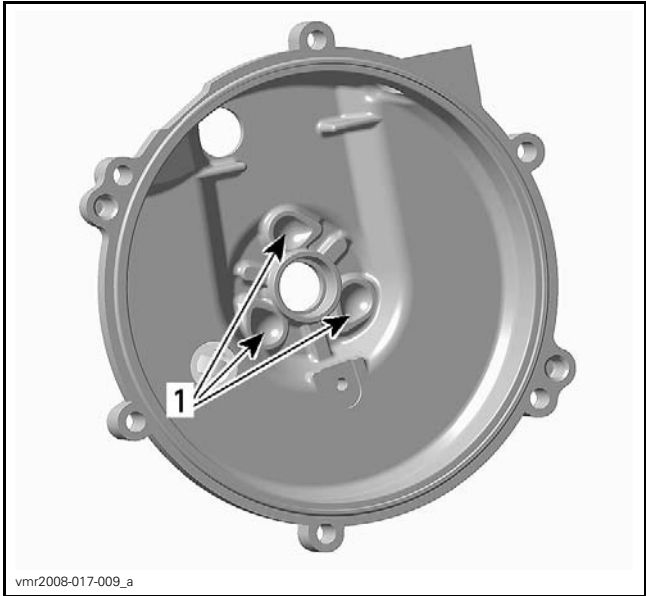


1. Screw
2. Leave spring
3. Thrust washer
4. Clutch release cam
5. Balls
6. Adjustment screw
7. Locking nut

Clutch Release Cover Inspection

Clutch Release Cover

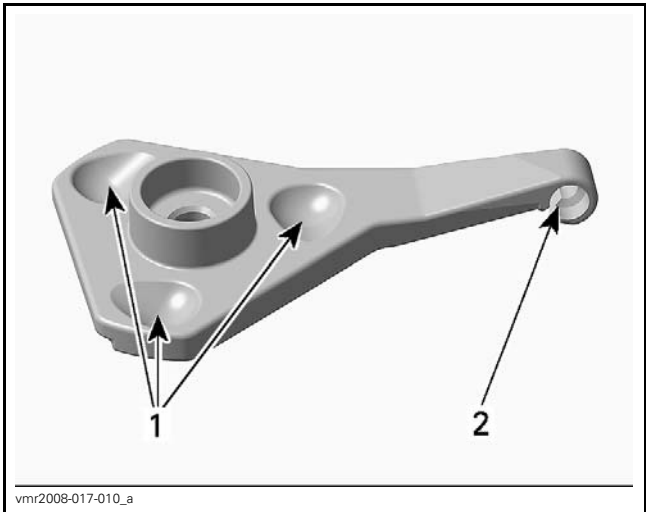
Check ramps for wear.



1. Ramps

Clutch Release Cam

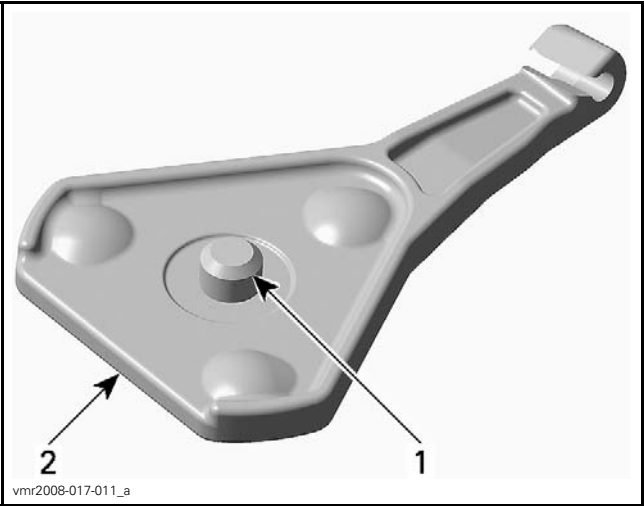
Check ramps and cable engagement areas for wear.



1. Ramps
2. Cable engagement

Adjustment Screw

Check adjustment screw for wear or any other damage.

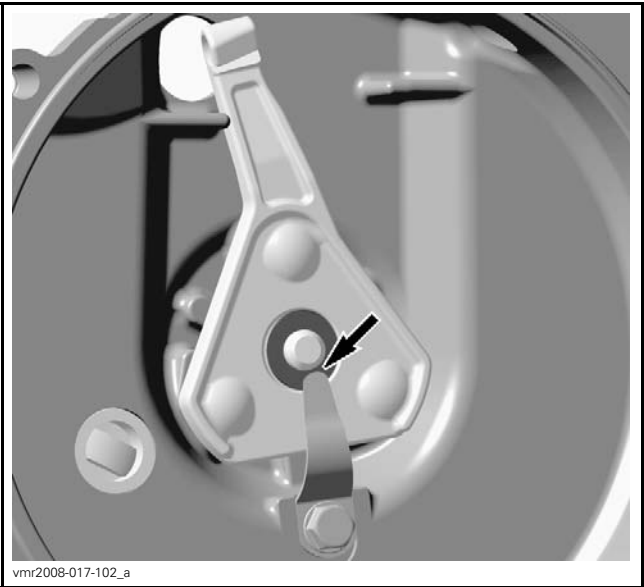


1. Adjustment screw
2. Clutch release cam

Clutch Release Cover Installation

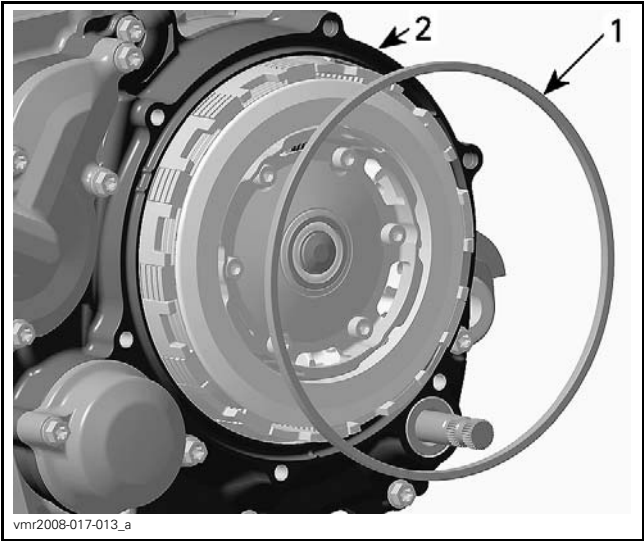
The installation is the reverse of the removal procedure. However, pay attention to following details.

NOTE: When fitting the release cam, make sure that the end of the leaf spring rests neatly on the thrust washer and does not touch the adjustment screw.



LEAF SPRING NOT TOUCHING ADJUSTMENT SCREW

Check clutch release cam for easy movement.
Before installation of clutch release cover always replace gasket by a new one.



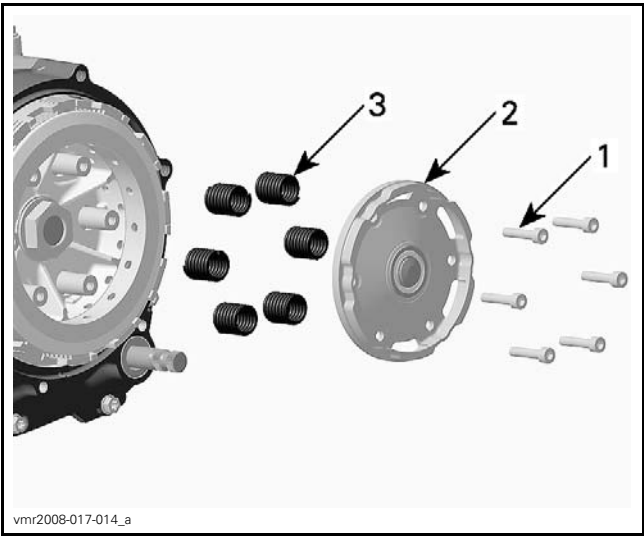
1. Clutch release cover gasket
2. Clutch cover

Tighten clutch release cover screws in a criss-cross sequence.

RETAINING PLATE AND CLUTCH SPRING

Retaining Plate and Clutch Spring Removal

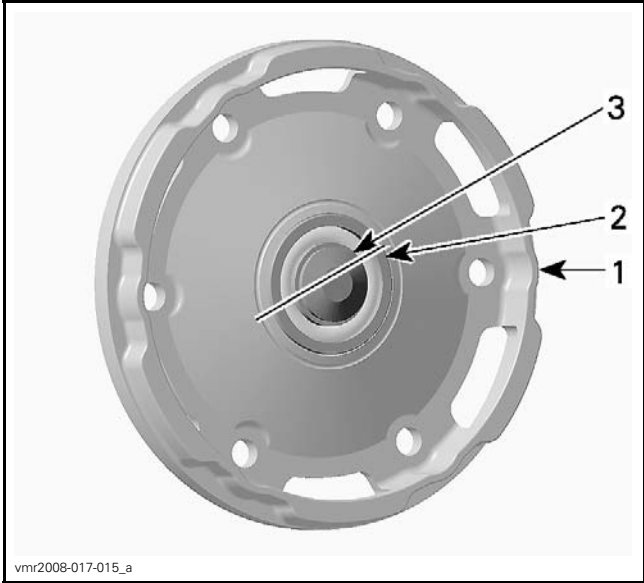
Remove clutch release cover.
Unfasten screws crosswise and remove retaining plate and clutch spring.



1. Screws
2. Retaining plate
3. Clutch springs

Retaining Plate and Clutch Spring Inspection

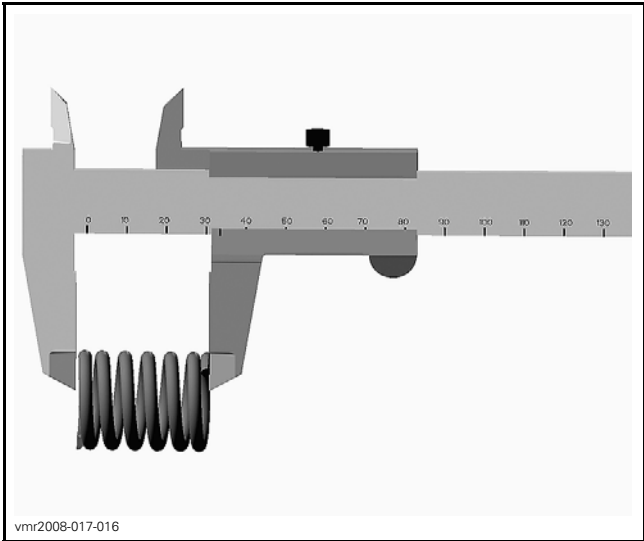
Retaining Plate
Check retaining plate for crack or other damage. Change if necessary.
Check if the retaining plate bearing turns smoothly and freely. Replace if necessary.
Check thrust hub for wear or other damage.



1. Retaining plate
2. Bearing
3. Thrust hub

Clutch Spring
Measure each clutch spring free length.

CLUTCH SPRING FREE LENGTH	
New	33.70 to 34.50 mm (1.327 to 1.358 in)
Service limit	31.60 mm (1.244 in)



Retaining Plate and Clutch Spring Installation

For installation, reverse the removal procedure.

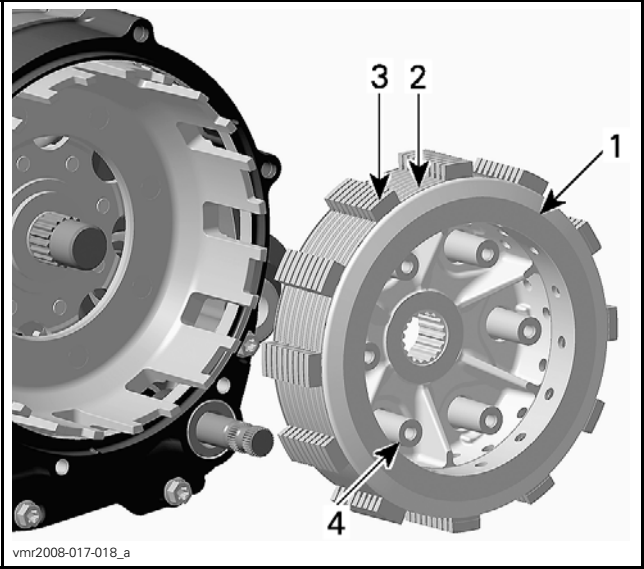
CLUTCH

Clutch Removal

Remove:

- clutch release cover, refer to *CLUTCH RELEASE COVER* above
- pressure plate
- clutch springs, refer to *PRESSURE PLATE AND CLUTCH SPRING* above

Hold clutch hub by using clutch hub locking tool (P/N 529 036 080) and remove hex nut and spring washer.

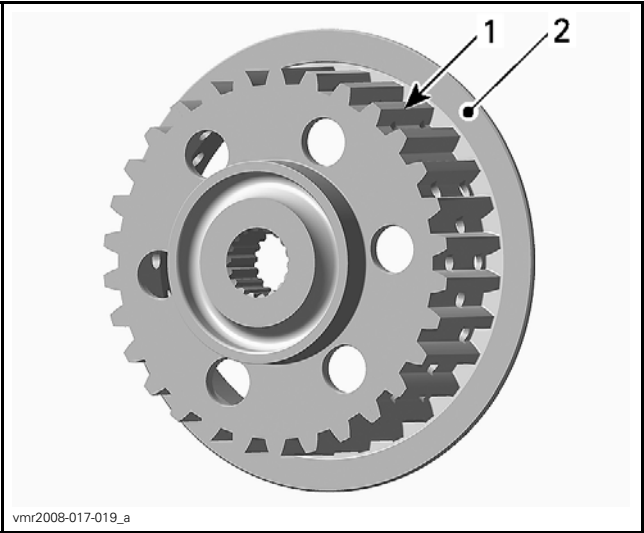


- 1. Clutch hub
- 2. Clutch plates
- 3. Friction plates
- 4. Inner plate

Clutch Inspection

Clutch Hub

Check the splines and the flat surface for grooves, wear or other damage.

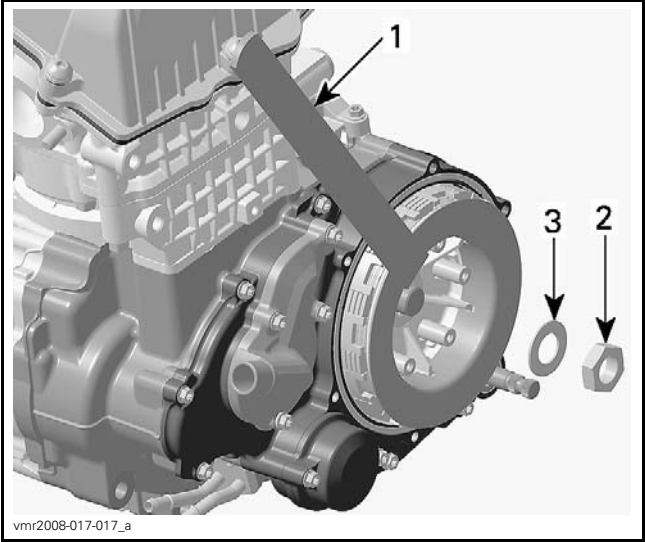
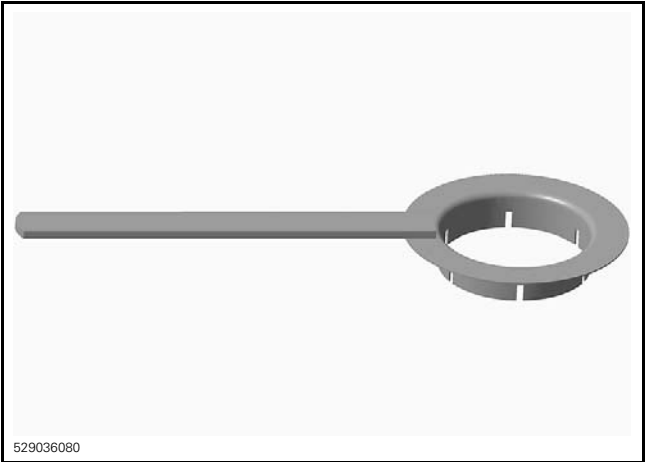


- 1. Splines
- 2. Flat surface

Friction Plate

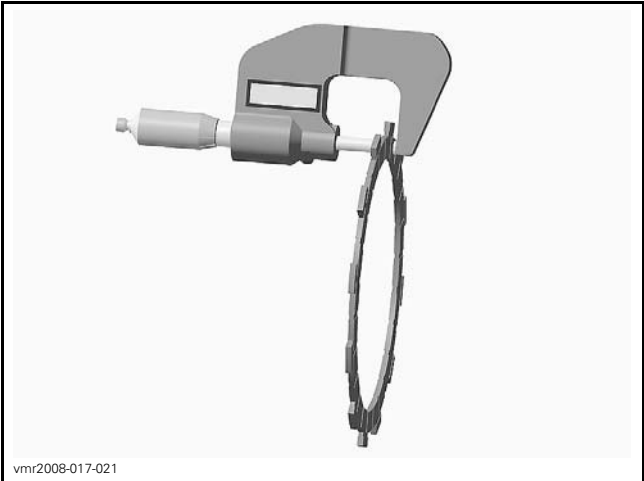
Measure friction plate thickness.

FRICTION PLATE THICKNESS	
New	2.52 to 2.68 mm (.100 to .106 in)
Service limit	2.45 mm (.096 in)



- 1. Clutch hub locking tool
- 2. Hex nut
- 3. Spring washer

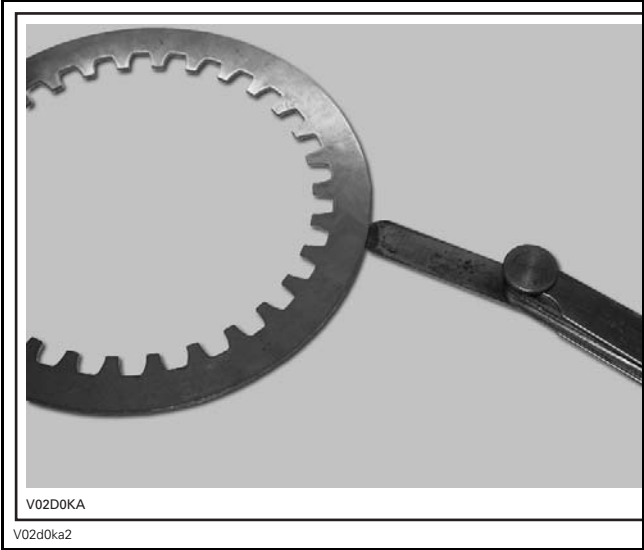
Withdraw clutch hub together with friction plates, clutch plates and inner plate.



Clutch Plate

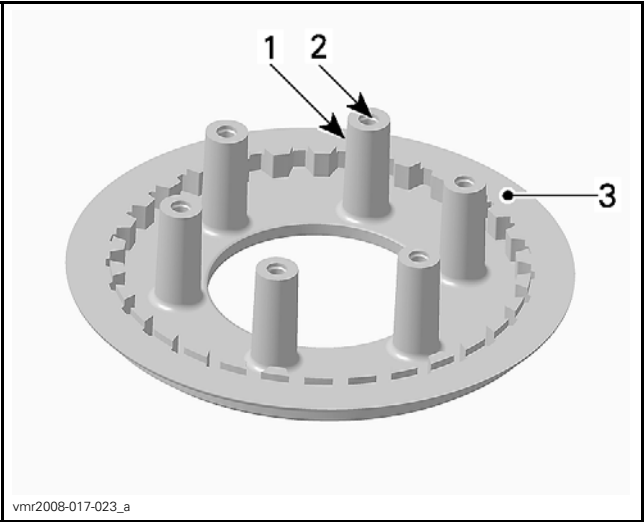
Check clutch plate warpage.
Place clutch plate on a flat surface and tip with a finger on plate to find maximum warpage. Use a feeler gauge to measure warpage.

CLUTCH PLATE WARPAGE	
Service limit	0.15 mm (.006 in)



Inner Plate

Check inner plate for damaged spring towers and dirty or stripped threads.
Check the flat surface on the inner plate for wear or damage.



- 1. Spring tower
- 2. Threads
- 3. Flat surface

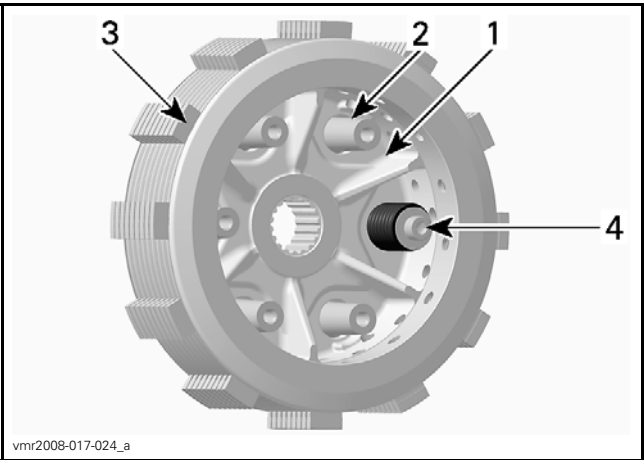
Clutch Installation

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

NOTE: Thoroughly lubricate new clutch plates with engine oil before assembly to prevent clutch plates burning during break in period.

Preassemble the friction and clutch plates together with the inner plate onto the clutch hub. Align the tabs of the friction plates and secure the clutch assembly in place with a clutch spring , Allen screw and a large flat washer.

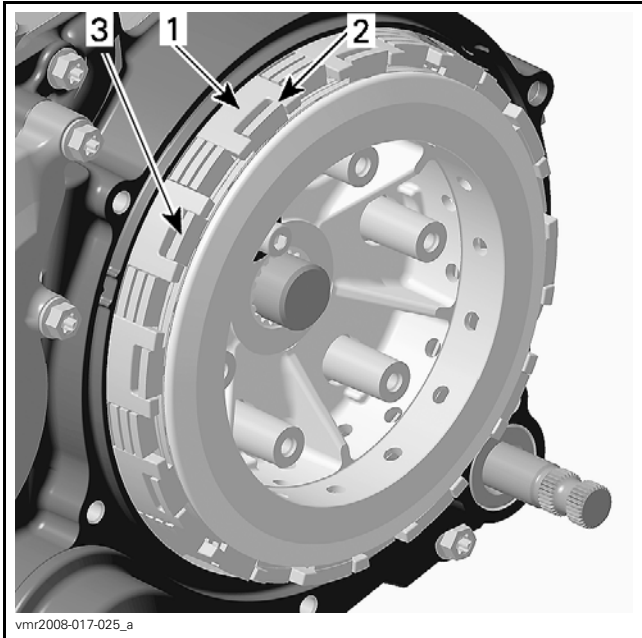
NOTE: Take care that the inner splines of the inner plate slip into the outer splines of the clutch hub.



- 1. Clutch hub
- 2. Inner plate
- 3. Tabs of the friction plates
- 4. Clutch spring, flat washer and Allen screw

Install clutch assembly into clutch drum. Position the tabs of the outer friction plate so that it fits into the shorter slots of the clutch drum.

Subsection XX (CLUTCH)



- 1. Clutch drum
- 2. Shorter slot
- 3. Outer friction plate

Remove clutch spring, washer and Allen screw and proceed with the installation procedure.

COOLING SYSTEM

SERVICE TOOLS

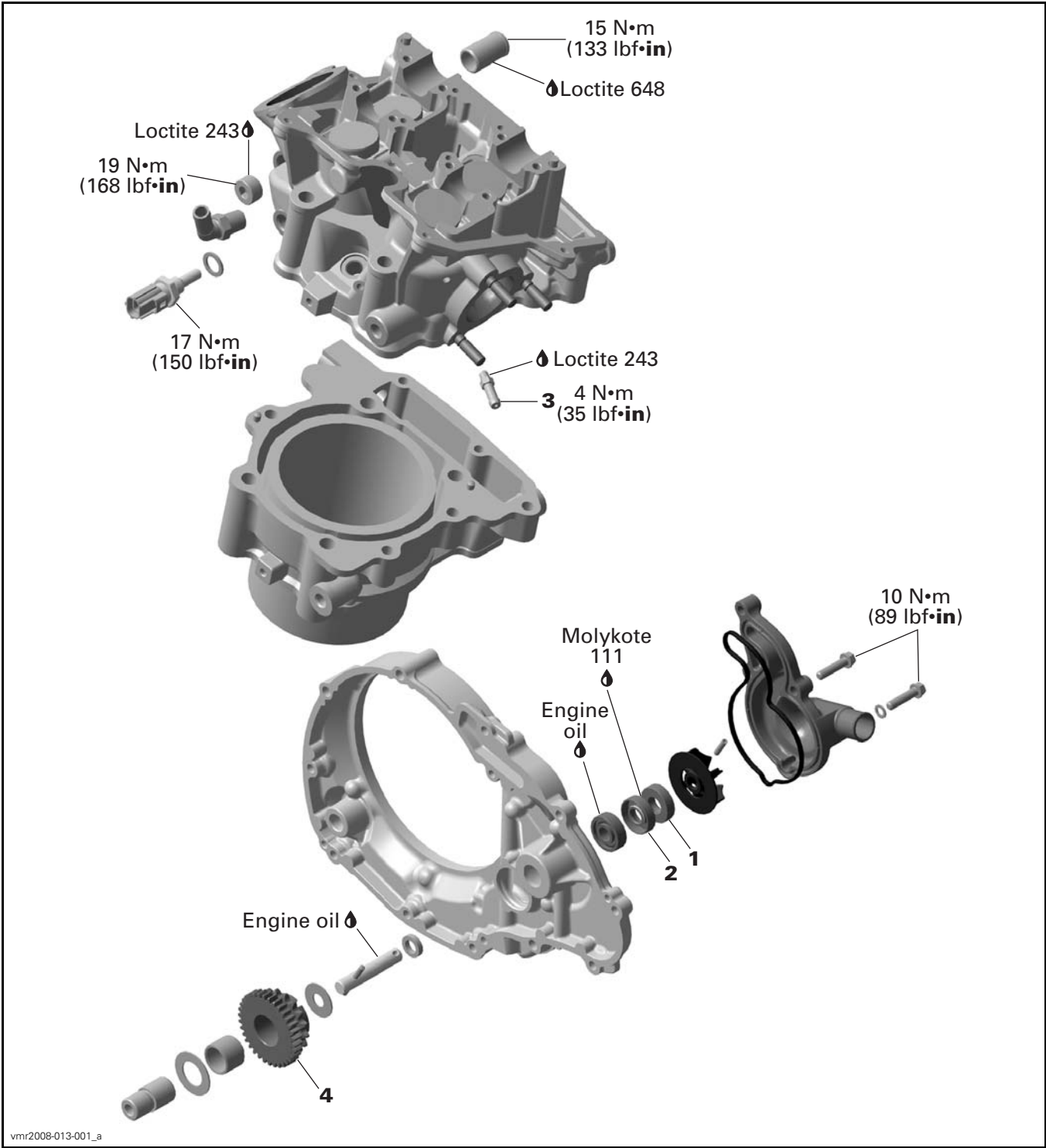
Description	Part Number	Page
pliers	295 000 070	3
installer handle.....	420 877 650	9
vacuum/pressure pump kit.....	529 021 800	3
oil seal pusher.....	529 035 757	9
special radiator cap.....	529 035 991	3
oil seal installer.....	529 036 077	9
ball bearing pusher	529 036 078	9

SERVICE PRODUCTS

Description	Part Number	Page
BRP premixed coolant.....	219 700 362	4
Dow Corning 111.....	413 707 000	9



Subsection XX (COOLING SYSTEM)



GENERAL

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

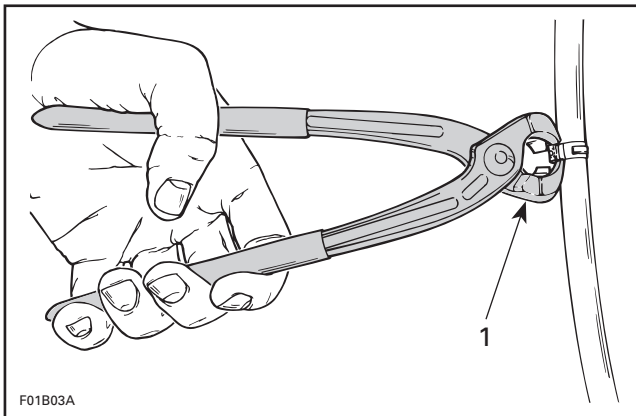
Clean threads before applying a threadlocker. Refer to *SELF-LOCKING FASTENERS* and *LOCTITE APPLICATION* at the beginning of this manual for complete procedure.

WARNING

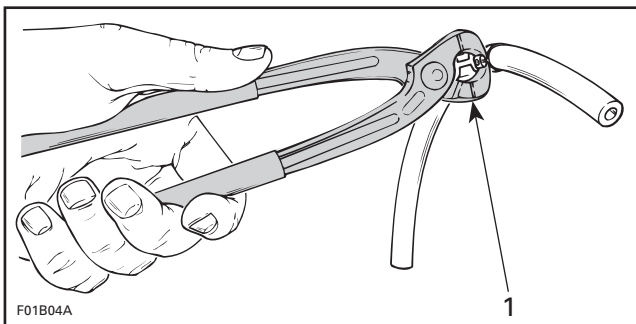
Torque wrench tightening specifications must strictly be adhered to. Locking devices (e.g.: locking tabs, elastic stop nuts, cotter pin, etc.) must be replaced with new ones.

Oetiker Clamp Replacement

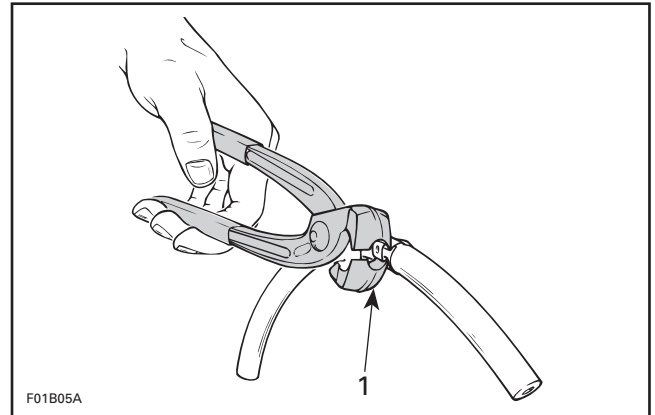
To secure or cut Oetiker clamps, use pliers (P/N 295 000 070).



1. Cutting clamp



1. Securing clamp



1. Securing clamp in limited access

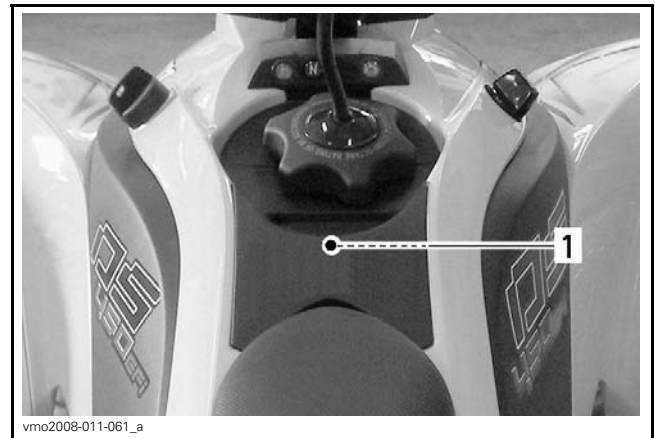
INSPECTION

COOLING SYSTEM LEAK TEST

WARNING

In order to avoid getting burned, do not remove the coolant tank cap or loosen the engine drain plug if the engine is hot.

Remove access cover to reach coolant tank cap. Refer to *BODY*.



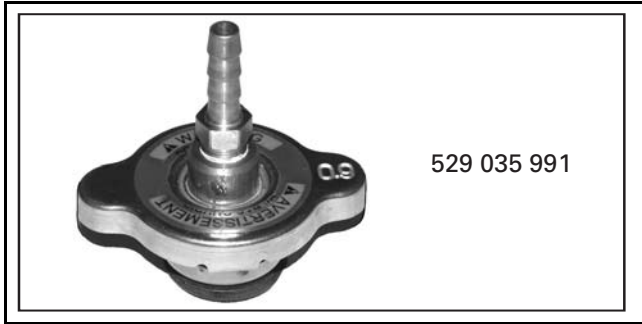
1. Access cover

Remove coolant tank cap.

Install the special radiator cap (P/N 529 035 991) on filler neck of coolant tank.

Pressurize all system through coolant tank to 110 kPa (16 PSI) by using the pump included in the vacuum/pressure pump kit (P/N 529 021 800).

Subsection XX (COOLING SYSTEM)



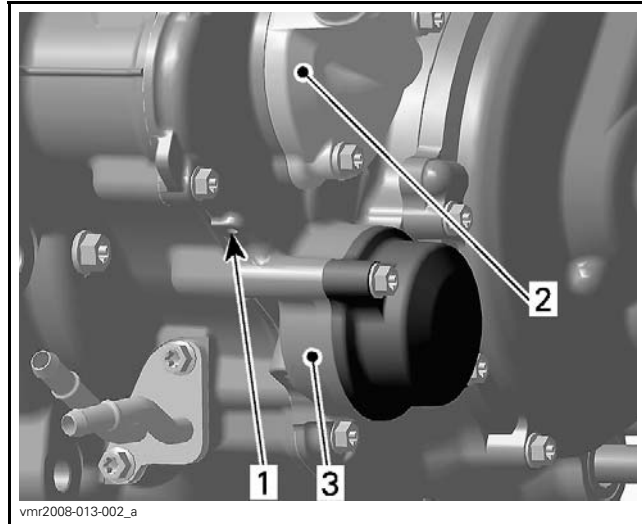
Check all hoses, radiator and cylinder/base for coolant leaks. Spray a soap/water solution and look for air bubbles.

Inspection

Check general condition of hoses and clamp tightness.

Check the leak indicator hole if there is oil or coolant.

NOTE: Leaking coolant indicates a damaged seal on water pump side. Leaking oil indicates a damaged seal on oil pump side. If either seal is leaking, both seals must be replaced at the same time. Refer to *WATER PUMP SHAFT, SEALS AND BEARING* in this section.



1. Leak indicator hole
2. Water pump housing
3. Clutch cover

MAINTENANCE

COOLANT REPLACEMENT

WARNING

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

Recommended Coolant

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

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

CAUTION: To prevent rust formation or freezing condition, always replenish the system with the BRP premixed coolant or with 50% antifreeze and 50% water. Do not use tap water, straight antifreeze or straight water in the system. Tap water contains minerals and impurities which build up in the system. During cold weather, straight water causes the system to freeze while straight antifreeze thickens and does not have the same efficiency. Always use ethylene glycol antifreeze containing corrosion inhibitors specifically recommended for aluminum engines.

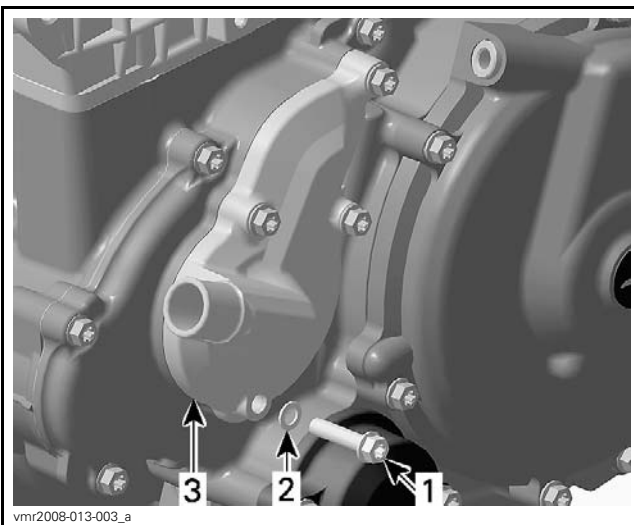
Draining the System

Partially unscrew drain plug on water pump cover.



Remove coolant tank pressure cap.

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

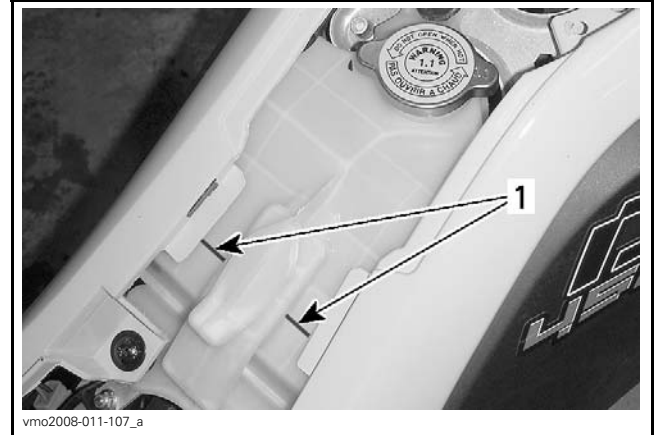


1. Drain plug
2. Gasket ring
3. Water pump cover

Refilling the System

Ensure vehicle is on a flat surface and engine is cold.

Fill tank until coolant reaches level marks (small ribs).



1. Level marks

Install coolant tank pressure cap.

Run engine until thermostat opens, then stop engine.

Let engine cool down.

Recheck coolant level and top up if necessary.

NOTE: Check coolant concentration (freezing point) with proper tester each year or every 50 hours or when vehicle reaches 2500 km (1600 mi).

PROCEDURES

COOLANT TANK CAP

Check if coolant tank cap pressurizes the system to 110 kPa (16 PSI). If not, install a new cap.

THERMOSTAT

The thermostat is a single action type.

Removal

The thermostat is located on the LH side of engine inside a plastic housing.



Partially drain coolant until approximately 1 L (1 quart) flowed out. Refer to *COOLANT REPLACEMENT*.
Cut clamps using Oetiker pliers.



Pull out thermostat housing. Catch spilled coolant.

Test

To check thermostat, put housing in water and heat water. Thermostat should begin to open when water temperature reaches 75°C (167°F).

Installation

For installation, reverse the removal procedure.
Install new clamps using Oetiker pliers.
Refill coolant tank.

WATER PUMP HOUSING

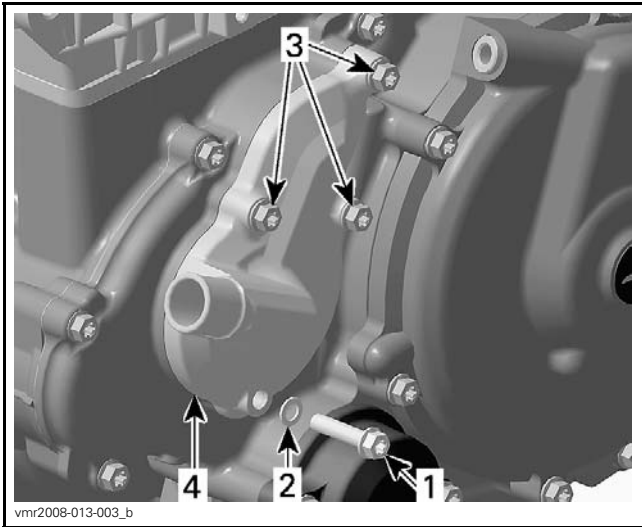
The water pump housing is located on the engine, clutch side.

Water Pump Housing Removal

 **WARNING**

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

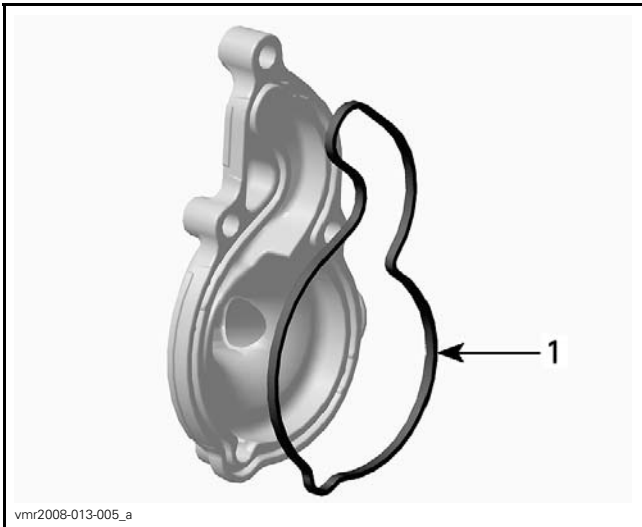
Drain cooling system. Refer to *COOLANT REPLACEMENT* above.
Remove radiator outlet hose from water pump housing.
Remove screws retaining water pump housing.



- 1. Cooling drain plug
- 2. Sealing ring
- 3. Screws
- 4. Water pump cover

Water Pump Housing Inspection

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



- 1. Gasket

Water Pump Housing Installation

The installation is the opposite of the removal procedure.

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

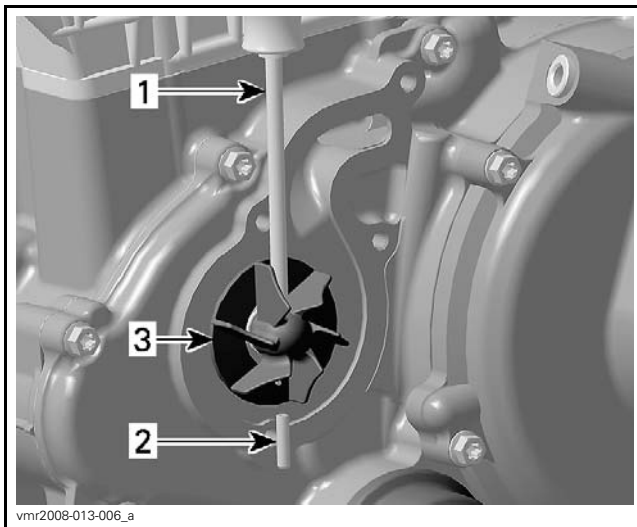
Tighten screws of water pump housing in a criss cross sequence.

WATER PUMP IMPELLER

Water Pump Impeller Removal

Remove water pump housing.

Use a proper punch to remove spring pin.



1. Punch
2. Spring pin
3. Impeller

Remove impeller from water pump shaft.

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. Pay attention to the following detail.

NOTE: Do not drive spring pin into impeller until clutch cover has been installed.

CAUTION: Be careful not to damage impeller wings during installation.

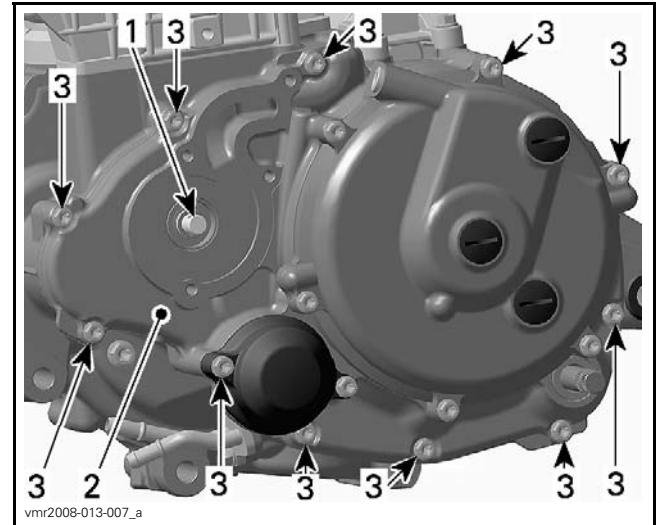
WATER PUMP SHAFT, SEALS AND BEARING

Water Pump Shaft Removal

Drain cooling system and engine oil (refer to *LU-BRICATION SYSTEM*).

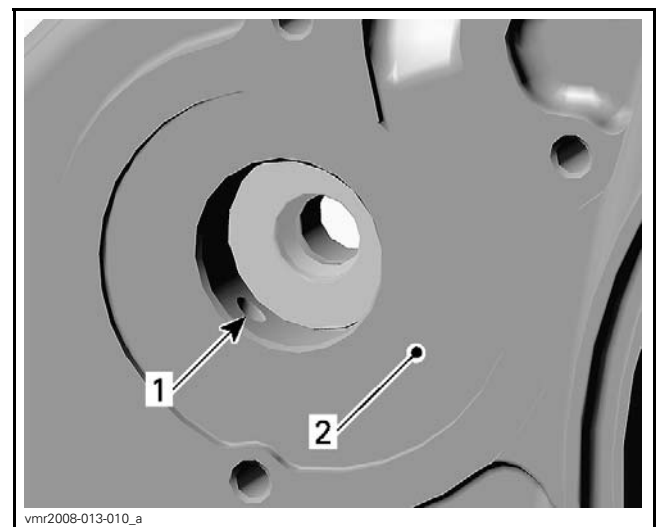
Remove water pump cover and impeller.

Remove clutch cover retaining screws and pull clutch cover.

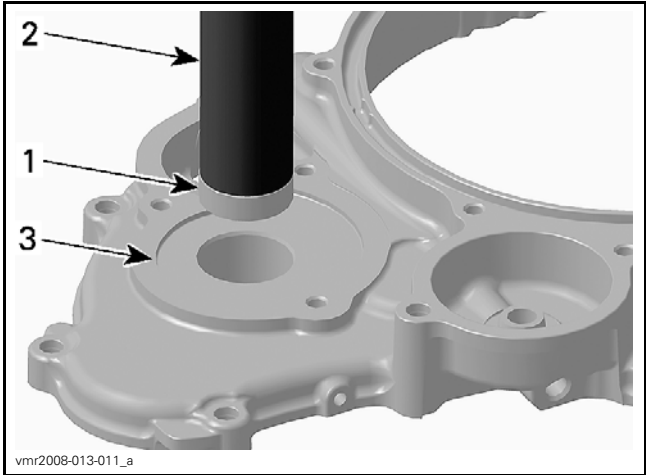


1. Water pump shaft
2. Clutch cover
3. Clutch cover retaining screws

CAUTION: When removing the clutch cover take care not to loose the thrust washers on the water pump shaft and shift shaft.

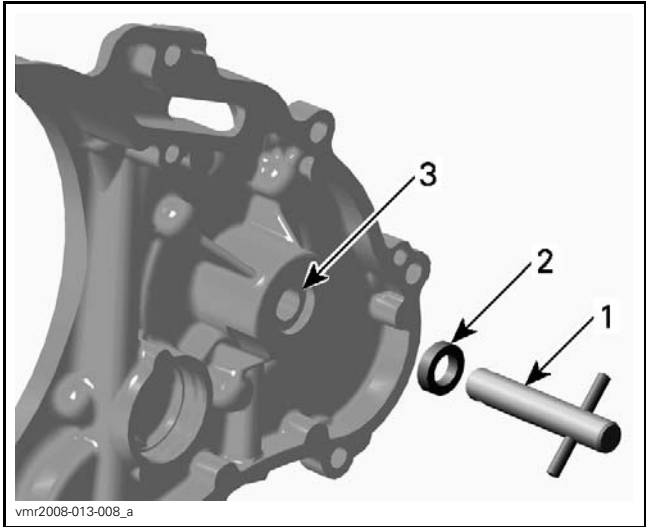


1. Thrust washer
2. Water pump shaft



1. Thrust washer
2. Shift shaft

Pull water pump shaft and distance sleeve from inside out.



1. Water pump shaft assembly
2. Distance sleeve
3. Ball bearing

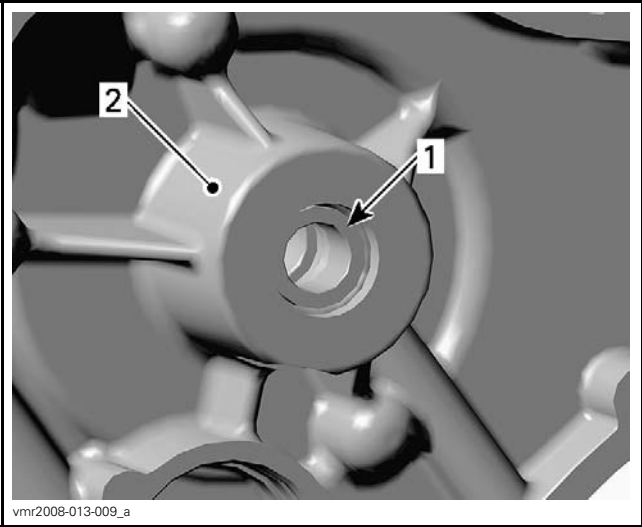
Water Pump Shaft, Seals and Bearing Inspection

Water Pump Shaft

Inspect water pump shaft and pin for wear and damage. Replace if damaged.

NOTE: When replacing water pump shaft, always replace together with oil seals.

Bearing



1. Bell bearing
2. Clutch cover

Check if bearing turns freely and smoothly.

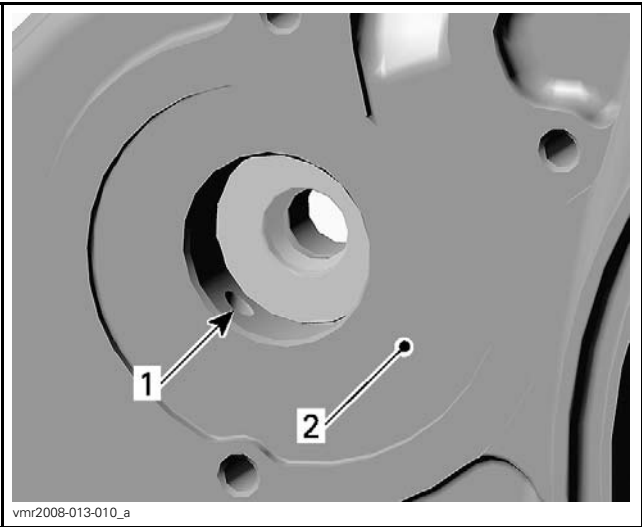
If not, remove oil seals and with a flat screw driver and use a proper punch to press bearing from inside out.

CAUTION: Be careful not to damage the surface of the oil seal bore in the clutch cover during removal.

Check if leak indicator bore in clutch cover is free. If necessary use a parts cleaner, then use an air gun to dry it.

 **WARNING**

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



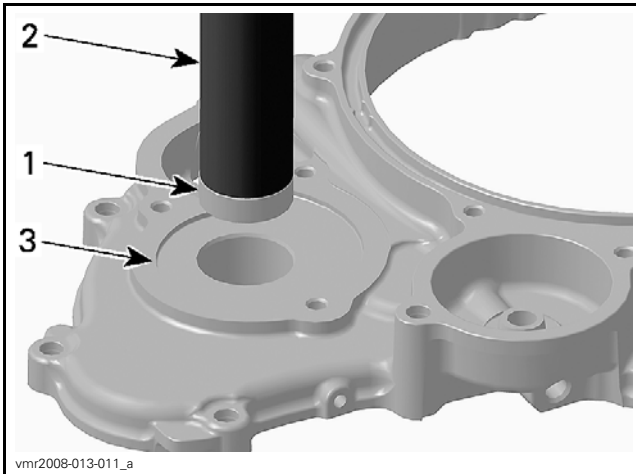
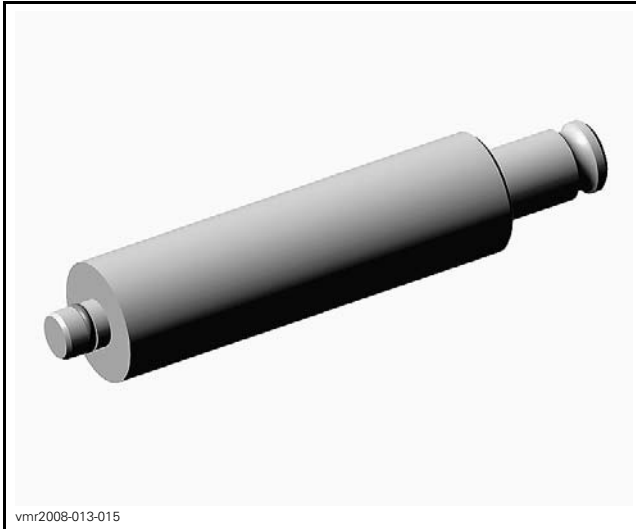
1. Leak indicator bore
2. Clutch cover

Water Pump Shaft, Seals and Bearing Installation

For installation, reverse the removal procedure.

NOTE: Never use a hammer to install ball bearing, use press machine only in order, not to damage press fit area of the oil seals.

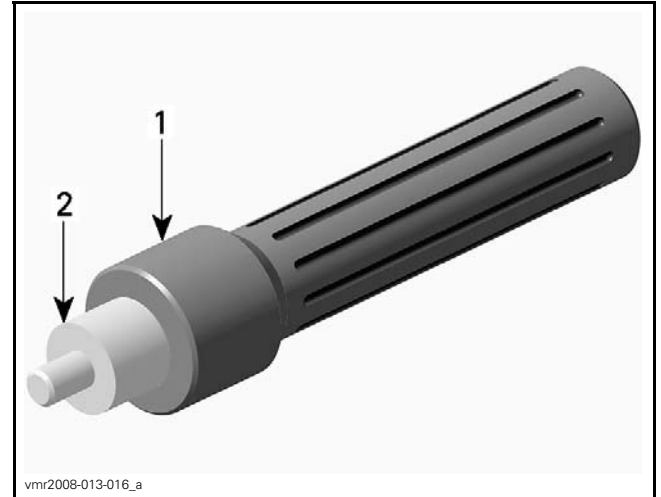
Use the ball bearing pusher (P/N 529 036 078) for installing ball bearing.



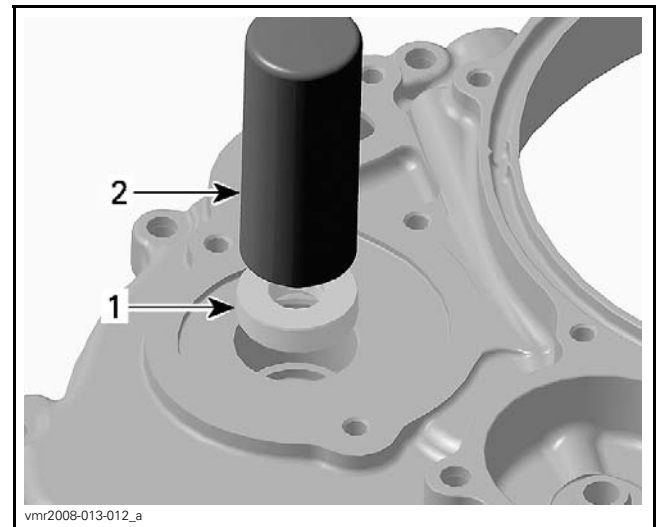
1. Ball bearing
2. Ball bearing pusher
3. Clutch cover

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

Install inner oil seal, sealing lip facing towards the bearing, with the oil seal pusher (P/N 529 035 757) and the installer handle (P/N 420 877 650) firmly into place.



1. Handle
2. Oil seal pusher

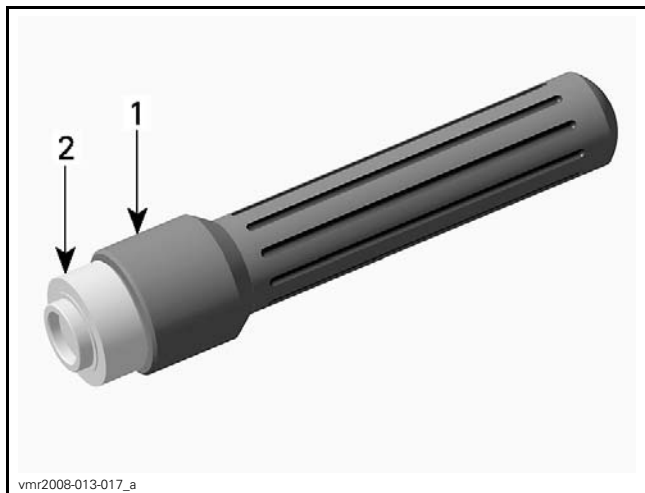


1. Inner oil seal
2. Oil seal pusher

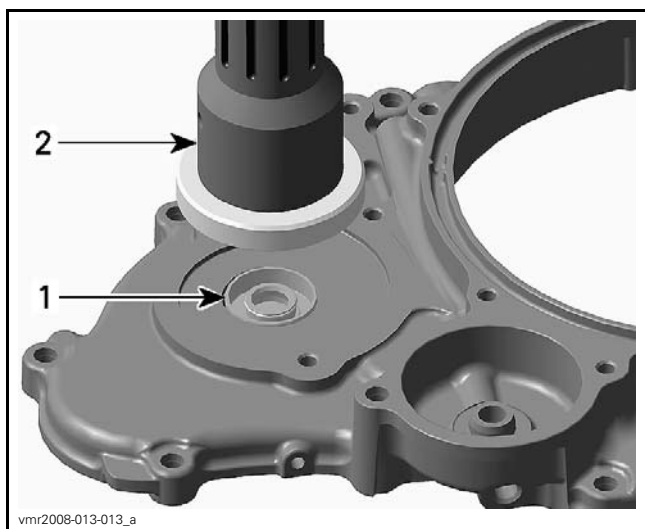
Fill cavity between sealing rings with Dow Corning 111 (P/N 413 707 000).

Install outer sealing ring with the oil seal installer (P/N 529 036 077) and the installer handle (P/N 420 877 650) into place until flush with the race. Sealing lip must point towards impeller.

Subsection XX (COOLING SYSTEM)



1. Handle
2. Oil seal installer

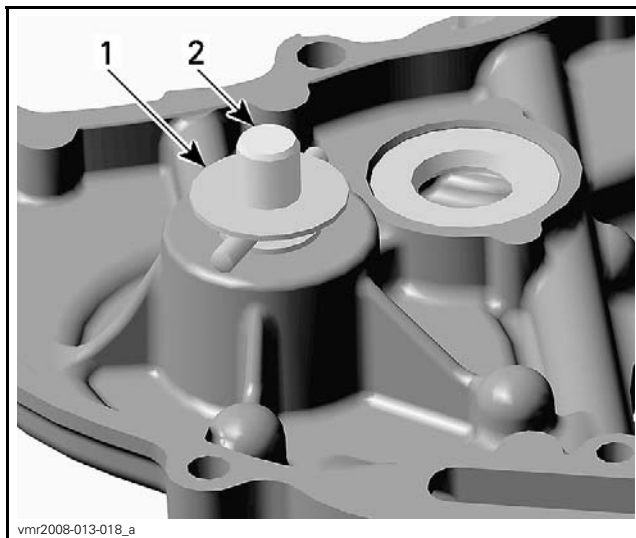


1. Outer oil seal
2. Oil seal pusher

Apply engine oil on the water pump shaft and install water pump shaft together with distance sleeve into clutch cover.

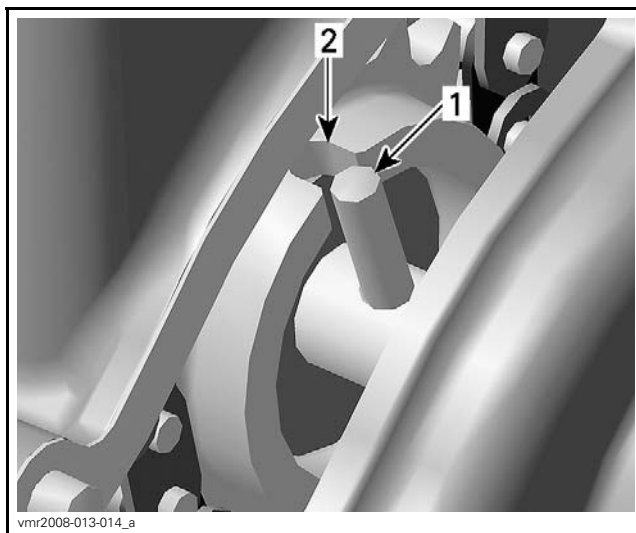
NOTE: Do not drive spring pin into impeller until clutch cover has been installed.

Place thrust washer on water pump shaft and fit clutch cover on crankcase.



1. Thrust washer
2. Water pump shaft

Take care, that the pin in the water pump shaft engages in the slot of the intermediate gear .



1. Pin in water pump shaft
2. Slot in intermediate gear

CRANKCASE/CRANKSHAFT/BALANCE SHAFT

SERVICE TOOLS

Description	Part Number	Page
crankshaft locking tool.....	529 036 107	1

GENERAL

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

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

WARNING

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

CRANKSHAFT LOCKING PROCEDURE

Remove both spark plugs. Refer to *MAGNETO SYSTEM*.

Turning Crankshaft from Magneto Cover

Remove magneto cover. Refer to *MAGNETO SYSTEM*.

Use a 13 mm nut and turn crankshaft.

CAUTION: Turn only clockwise to avoid loosening of magneto flywheel screw.

Turning Crankshaft using Rear Wheels

Alternately, crankshaft can be turned from rear wheels.

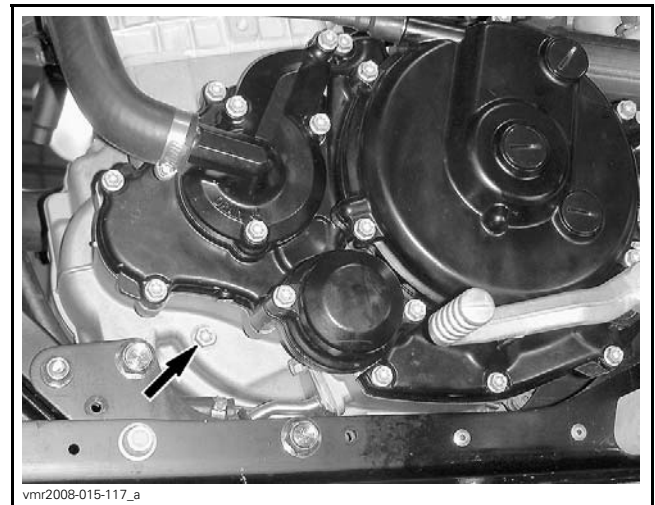
Lift and secure rear of vehicle.

Set transmission to 5th gear.

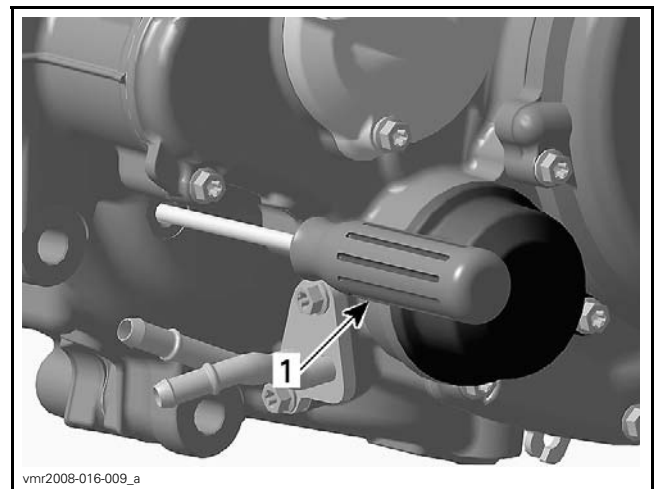
Bring crankshaft to TDC by turning rear wheels forward.

Installation of Locking Tool

Remove access screw.



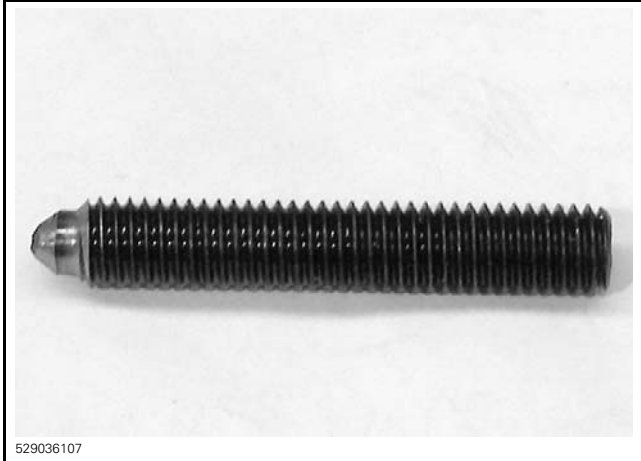
Use a screwdriver to check if the groove in the crankshaft is aligned with the hole.



1. Screwdriver

When crankshaft is at the right position, lock crankshaft at TDC using crankshaft locking tool (P/N 529 036 107).

Subsection XX (CRANKCASE/CRANKSHAFT/BALANCE SHAFT)



CAUTION: Do not use the locking tool of Outlander models. It will not fit properly on crankshaft.



Reinstall removed parts.

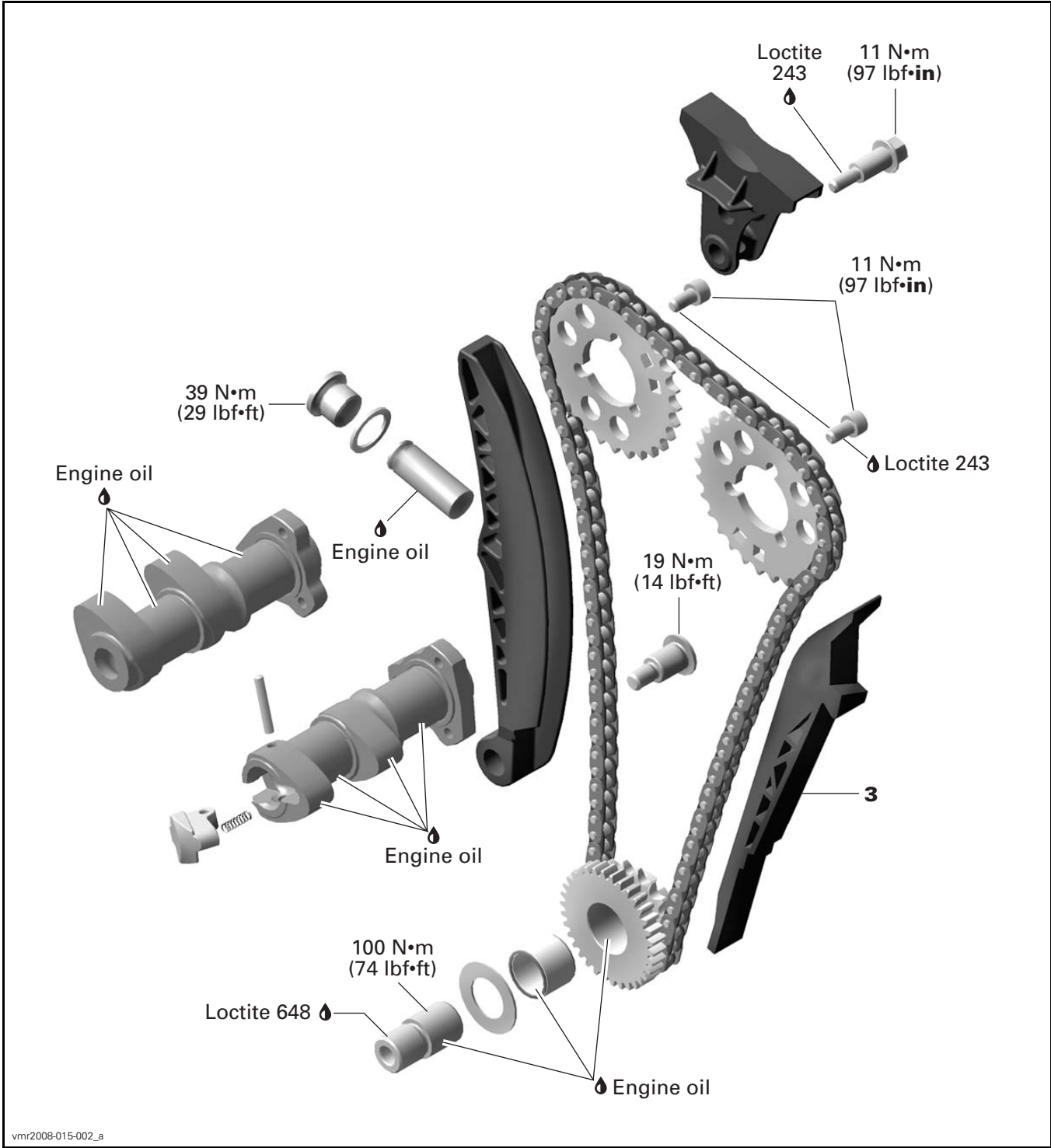
NOTE: When job is done, check oil level and refill if necessary since some oil came out of access hole.

CYLINDER HEAD/CYLINDER

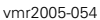
SERVICE TOOLS

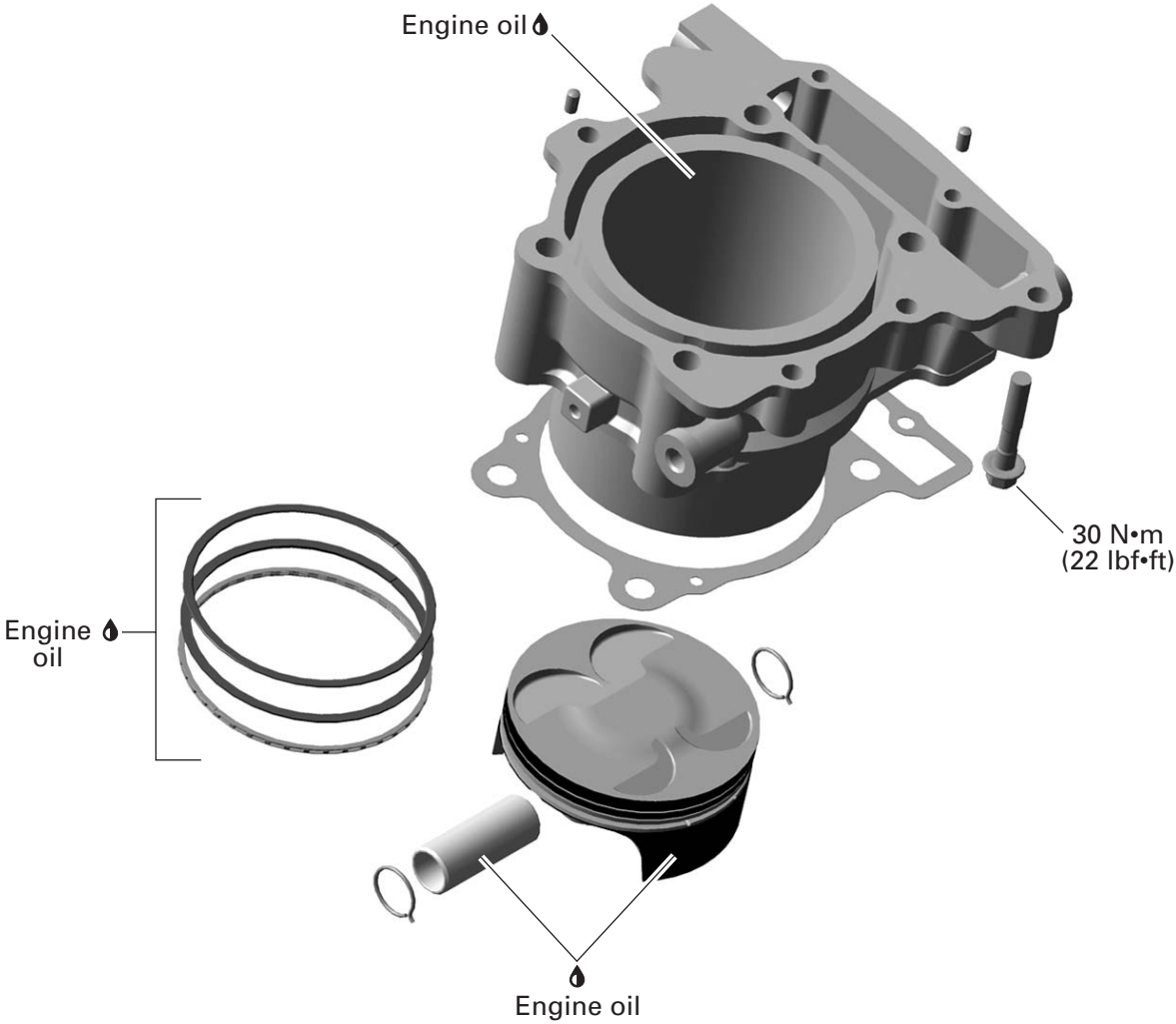
Description	Part Number	Page
crankshaft locking tool.....	529 036 107	7
feeler gauge.....	Not sold by BRP	5-6

DRAFT



vmr2008-015-002_a





GENERAL

NOTE: When diagnosing an engine problem, always perform the cylinder leak test. This will help pinpoint a problem. Refer to the instructions included with your leak tester and *LEAK TEST* in this section for procedures.

Always place the vehicle on a level surface.

NOTE: For a better understanding, the following illustrations are taken with engine out of vehicle. To perform the following instructions, it is not necessary to remove engine from vehicle.

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

WARNING

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

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

When disassembling parts that are duplicated in the engine, (eg: valves, springs, etc.), it is strongly recommended to note their position (PTO, MAG side) and to keep the parts of the same assembly as a "group". If you find a defective component, it will be much easier to find the cause of the failure among its group of parts (eg: you found a worn valve guide. A bent spring could be the cause; it will be easy to know which one of the springs is the cause and to replace it if you grouped the parts of the same assembly at disassembly). Besides, since used parts have matched together during the engine operation, they will keep their matched fit when you reassemble them together within their "group".

MAINTENANCE

VALVE CLEARANCE ADJUSTMENT

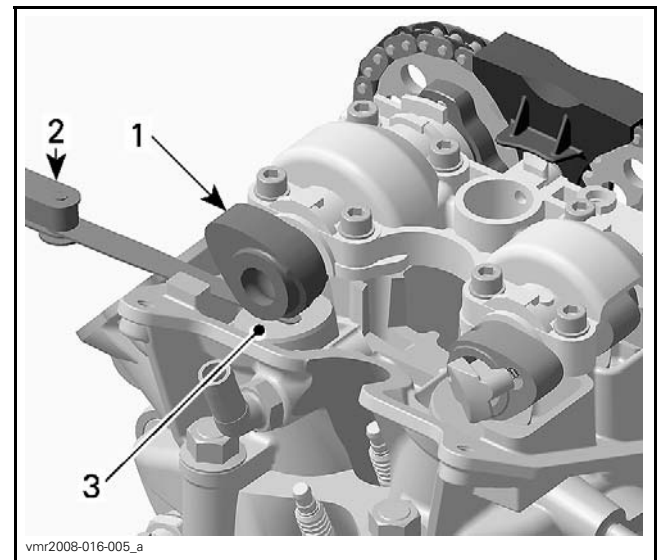
NOTE: Check and adjust valve clearance only on a cold engine.

Remove valve cover. Refer to *VALVE COVER*.

Bring crankshaft to TDC of compression stroke. Refer to *VALVE TIMING*.

Inspection

Use a feeler gauge to check valve clearance.



1. Camshaft
2. Feeler gauge
3. Valve lift bucket

VALVE CLEARANCE

	VALVE CLEARANCE
Exhaust	0.22 to 0.30 mm (.0087 to .0118 in)
Intake	0.11 to 0.19 mm (.0043 to .0075 in)

If valve clearance is out of specification, adjust valve clearance.

Adjustment

Adjust valve clearance by replacing the adjustment shim no. 1 of the required valve.

CAUTION: When replacing the adjustment shims, crankshaft must be locked at TDC of compression stroke, refer to *VALVE TIMING*.

To adjust valve clearance, remove:

- timing chain tensioner
- camshaft timing gear
- camshaft bearing cap

Subsection XX (CYLINDER HEAD/CYLINDER)

- camshaft
- valve lifter bucket.

Refer to the procedures below in this section.

Remove adjustment shim and check its thickness with a micrometer.

Choose the proper adjustment shim thickness to reach the specified valve clearance.

Installation

For installation reverse the removal procedure.

After parts installation, check again valve clearance.

INSPECTION

ENGINE LEAK TEST

General

Before performing the cylinder leak test, verify the following:

- clamp(s) tightness
- radiator and hoses condition.

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

 **WARNING**

Prevent burning yourself due to handling on the hot engine.

Repair Tips

- blue exhaust gas means damaged/worn piston rings or valve stem seals
- white exhaust gas means damaged cylinder head gasket.

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

Preparation

Disconnect battery.

 **WARNING**

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

Remove spark plugs. Refer to *IGNITION SYSTEM*.

Remove valve cover and gasket. Refer to *VALVE COVER*.

Bring crankshaft to TDC of compression stroke. Refer to *VALVE TIMING*.

Leak Test

Connect to adequate air supply.

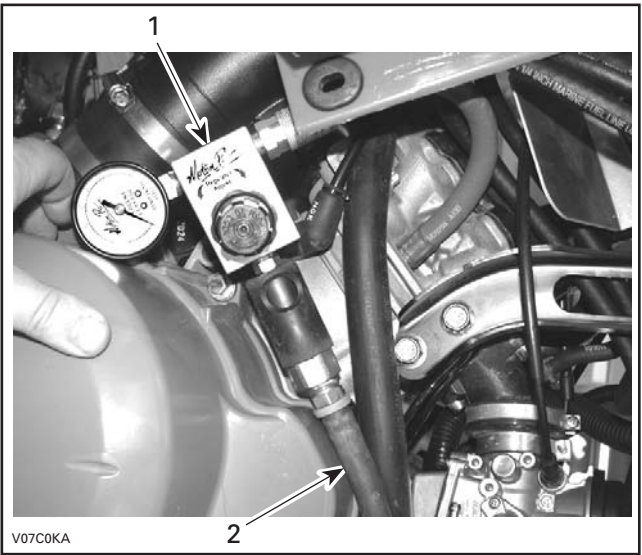
Set needle of measuring gauge to zero.

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

Install gauge adapter into bottom spark plug hole.

NOTE: It may be necessary to remove RH side member to make room.

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.

Diagnosis

- Listen to for air leaks.
- air escaping on intake port/throttle body means leaking intake valve(s)
 - air escaping on exhaust port means leaking exhaust valve(s)

- air bubbles out of radiator means leaking cylinder head gasket
- air/oil escaping from crankcase means damaged gasket and/or loosened screws (refer to *BOTTOM END*)
- air/coolant escaping from cylinder/head means damaged gasket(s) and/or loosened screws (refer to *CYLINDER AND HEAD*)
- air escaping into crankcase area means excessively worn cylinder and/or broken piston rings (refer to *CYLINDER AND HEAD*).

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

Assembly

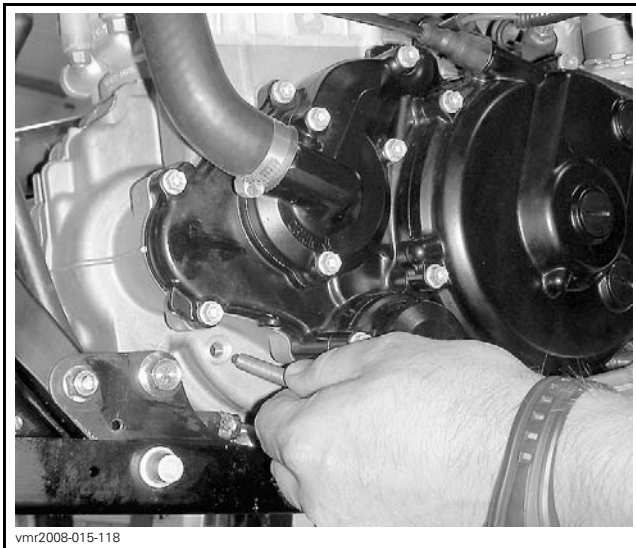
Reverse the preparation procedure. Ensure to respect torque values and use of appropriate products/lubricants. Refer to exploded views of this and other sections of this manual as required.

PROCEDURES

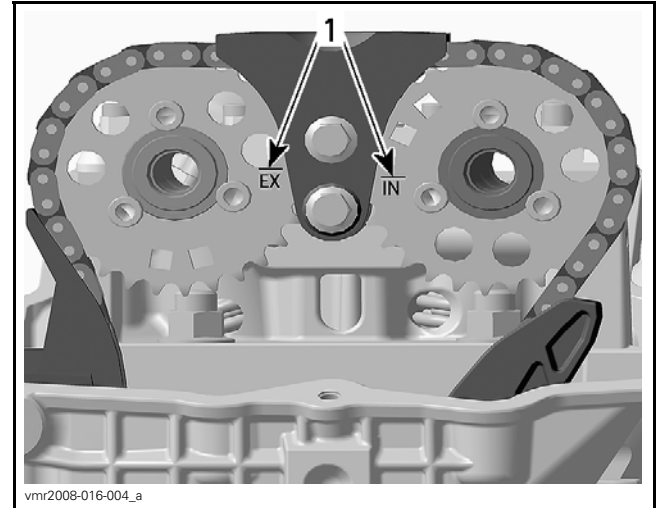
VALVE TIMING

Bring crankshaft to TDC at compression stroke. Refer to *CRANKSHAFT LOCKING PROCEDURE*.

Valves are properly synchronized with crankshaft when crankshaft is locked at TDC with the crankshaft locking tool (P/N 529 036 107) **AND** marks on intake and exhaust camshaft timing gears are aligned.



USE TOOL TO POSITION AND LOCK CRANKSHAFT AT TDC



1. Marks aligned on timing gears

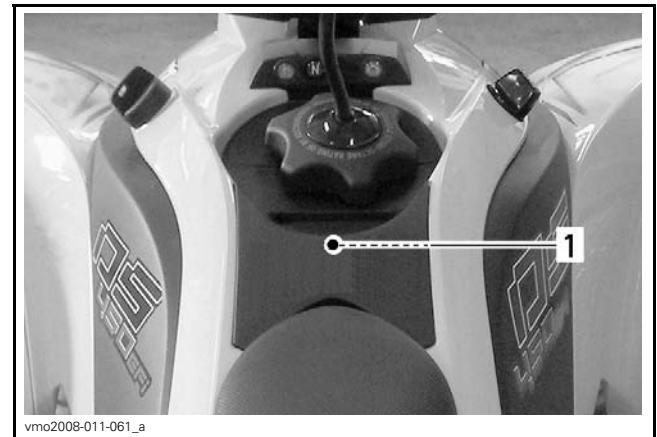
VALVE COVER

Valve Cover Removal with Engine in Vehicle

Remove seat.

Use B.U.D.S. and depressurize fuel system. Refer to *FUEL TANK AND FUEL PUMP*.

Remove access cover. Refer to *BODY*.



1. Access cover

LH Side of Vehicle

Remove front fender assembly. Refer to *BODY*.

Remove coolant tank retaining screw.

Subsection XX (CYLINDER HEAD/CYLINDER)



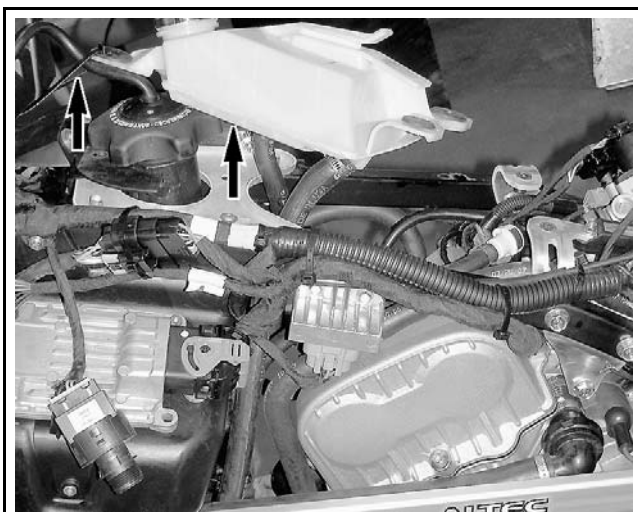
vmr2008-015-100_a

Move tank away to make room. You may use a locking tie to hold tank.



vmr2008-015-102

Disconnect engine harness connectors and ECM connector. Refer to *ELECTRICAL CONNECTORS*.



vmr2008-015-101_a

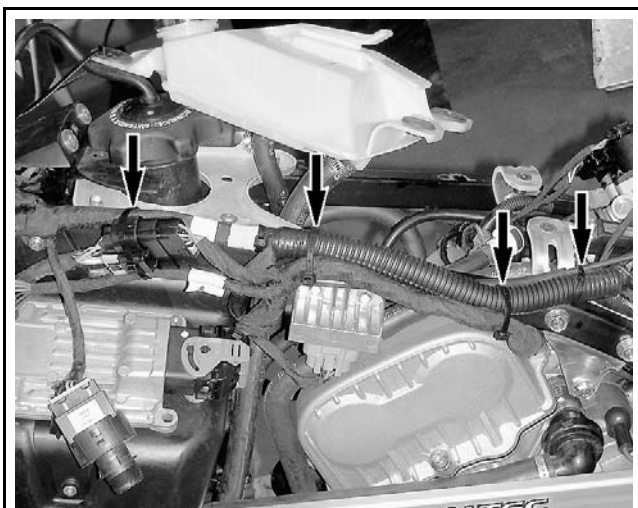
Cut locking ties holding engine harness to frame.



vmr2008-015-103_a

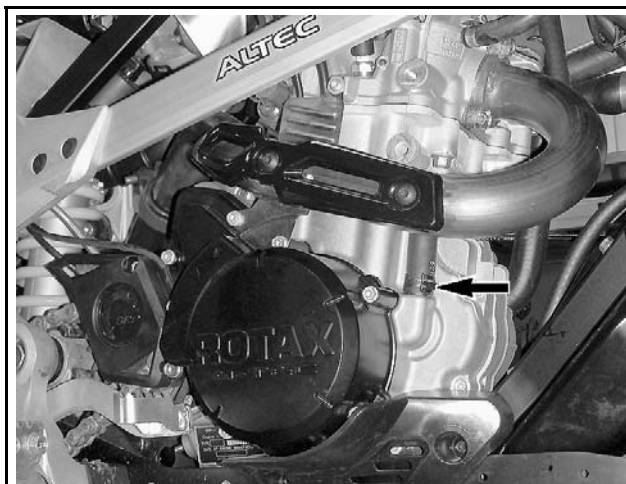
RH Side of Vehicle

Disconnect crankcase vent hose.



vmr2008-015-101_b

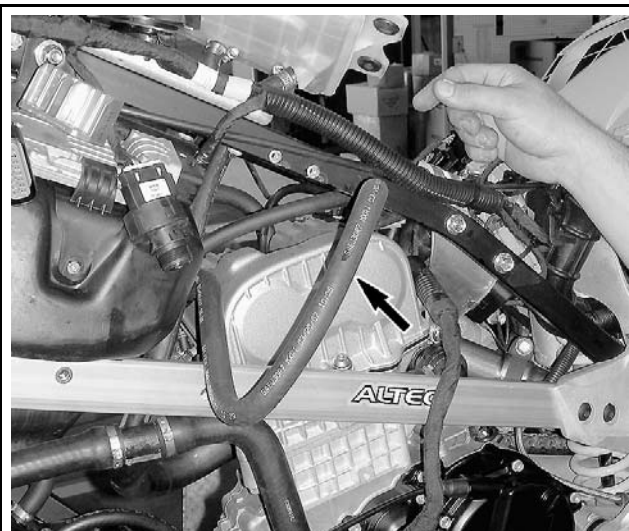
Remove retaining screws of headlight power regulator.



vmr2008-015-104_a

LH Side of Vehicle

Move crankcase vent hose away to free valve cover area.



Move headlight power regulator away, toward ECM.

Move engine harness away, toward seat area.



Disconnect fuel rail quick connector.



Lift and secure LH front of vehicle.

Remove top shock absorber screw.

CAUTION: Pay attention that suspension will suddenly release when removing retaining screw.



Detach top of shock absorber from its bracket.

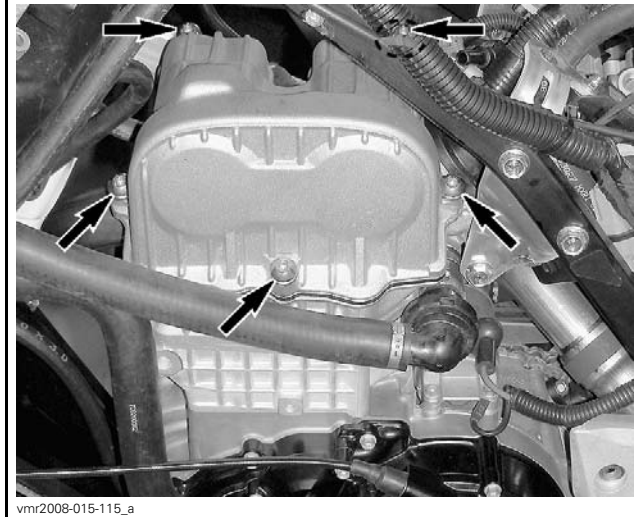
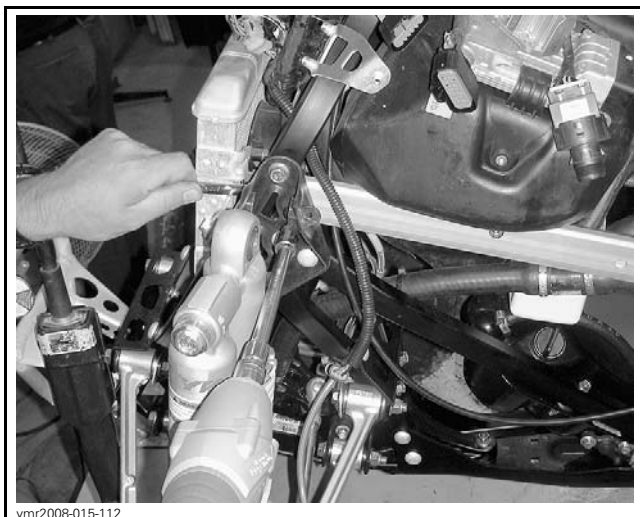
Subsection XX (CYLINDER HEAD/CYLINDER)



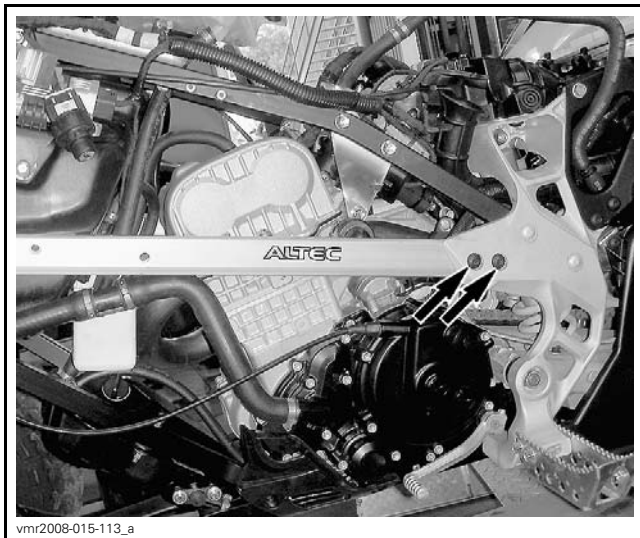
Remove LH side member retaining screws.



Completely remove valve cover screws.



Gently pull out valve cover. Be careful not to damage gasket.



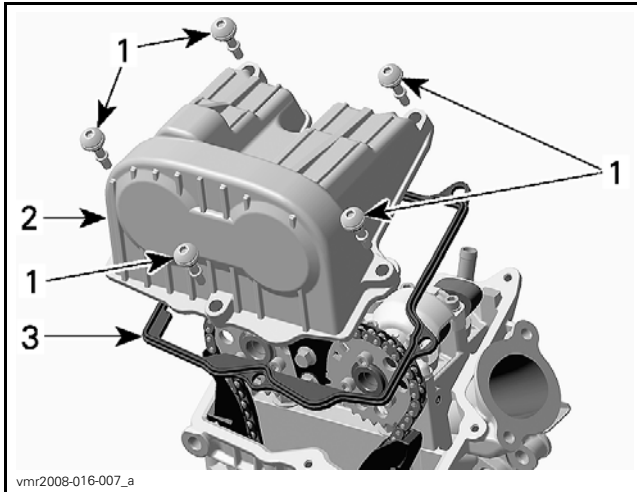
Pull out LH side member.



Valve Cover Removal from Engine

Unscrew cover retaining screws.

Remove the cover with the gasket.



1. Retaining screws
2. Valve cover
3. Valve cover gasket

Valve Cover Inspection

Check the valve cover for cracks or other damages.

Check if the gasket is brittle, hard or otherwise damaged.

Replace all defective parts.

Valve Cover Installation

For installation reverse the removal procedure.

Take care that the gasket is located properly into the groove in the cover.

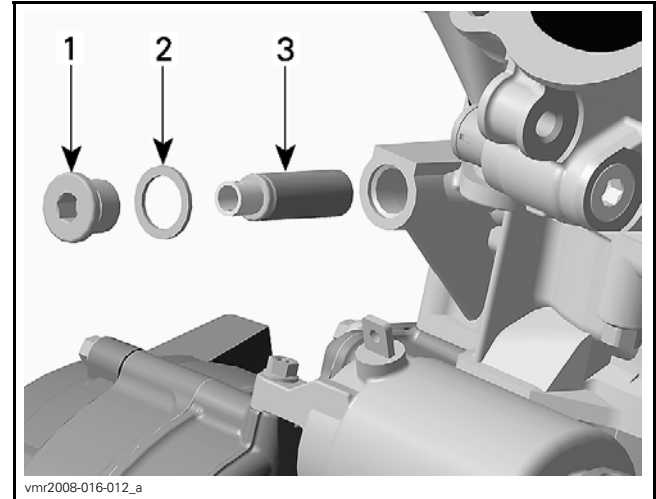
TIMING CHAIN TENSIONER

NOTE: Before removal and installation make sure that the crankshaft is set to TDC at compression stroke. Refer to *VALVE TIMING*.

Timing Chain Tensioner Removal

Remove plug screw and sealing.

Pull out chain tensioner.



1. Plug screw
2. Gasket ring
3. Chain tensioner

Timing Chain Tensioner Inspection

Check chain tensioner for free movement in bore and/or scoring.

Compress chain tensioner and check if works properly.

Timing Chain Tensioner Installation

For installation reverse the removal procedure.

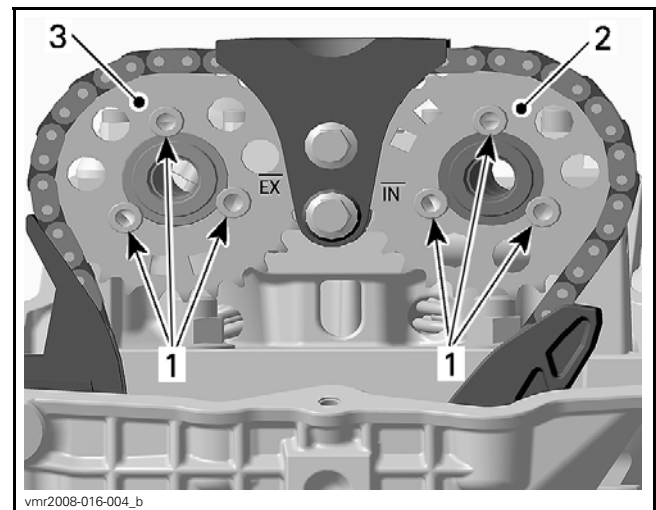
CAMSHAFT TIMING GEAR

Camshaft Timing Gear Removal

Remove valve cover.

Bring crankshaft to TDC of compression stroke. Refer to *VALVE TIMING*.

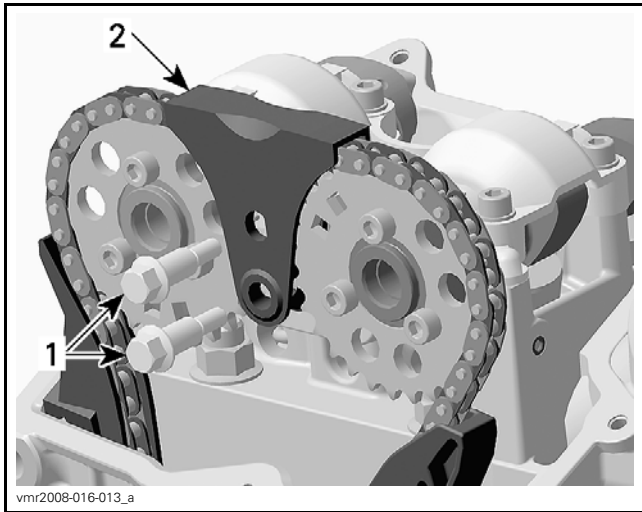
Loosen camshaft timing gear screws



1. Timing gear screws
2. Timing gear, intake
3. Timing gear, exhaust

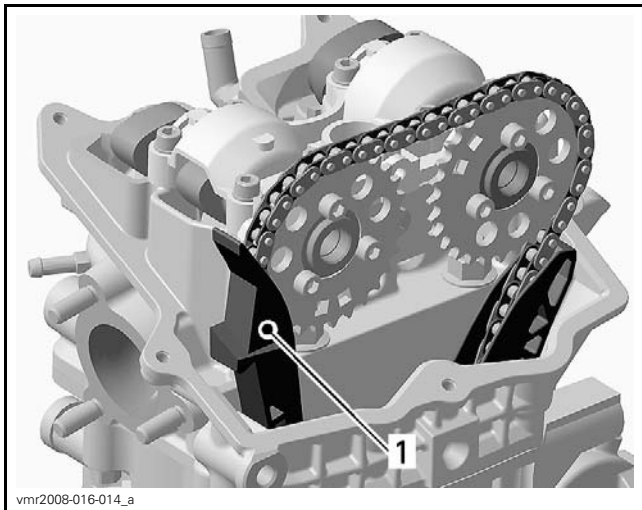
Subsection XX (CYLINDER HEAD/CYLINDER)

Remove chain tensioner.
Remove upper chain guide.



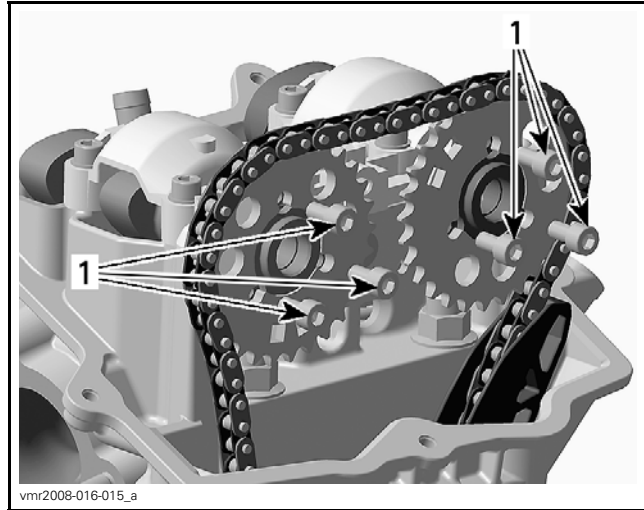
1. Distance screws
2. Upper chain guide

Remove timing chain guide.



1. Timing chain guide

Remove camshaft timing gear screws



1. Timing gear screws

Remove camshaft timing gears.

NOTE: Secure timing chain with a securing wire.

Camshaft Timing Gear Inspection

Check camshaft timing gears for wear or deterioration.

If a gear is worn or damaged, replace it as a set (both camshaft timing gears, intermediate gear and timing chain).

For intermediate gear replacement refer to *BOTTOM END*.

Upper Chain Guide

Inspect upper chain guide for wear, replace if necessary.

Camshaft Timing Gear Installation

The installation is the reverse of the removal procedure.

CAUTION: Make sure that crankshaft is locked at TDC AND camshaft timing gear marks are aligned.

Align camshaft timing gear. Refer to *VALVE TIMING*.

CAMSHAFT

Camshaft Removal

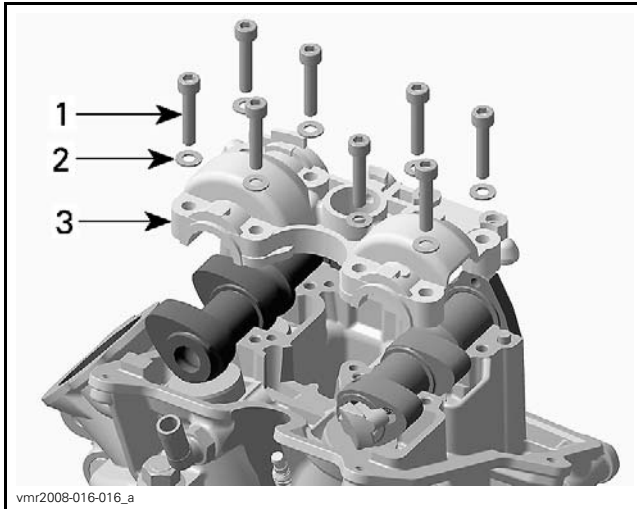
Remove valve cover.

Lock crankshaft at TDC of compression stroke, refer to *VALVE TIMING*.

Remove:

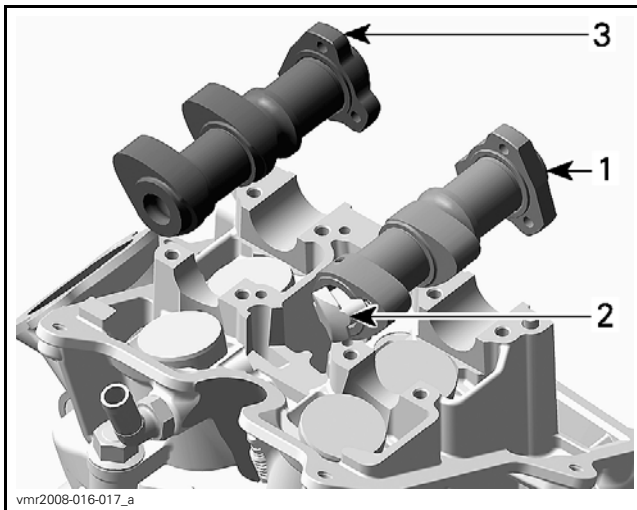
- chain tensioner
- upper chain guide
- timing chain guide

- camshaft timing gears.
- Secure timing chain with a retaining wire.
Remove camshaft bearing cover.

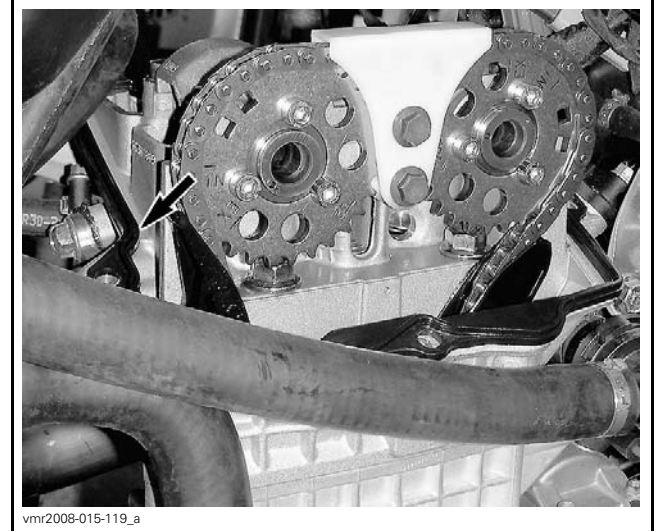


1. Retaining screws
2. Washers
3. Bearing cover

Remove exhaust camshaft with decompressor and intake camshaft.



1. Exhaust camshaft
2. Decompressor
3. Intake camshaft

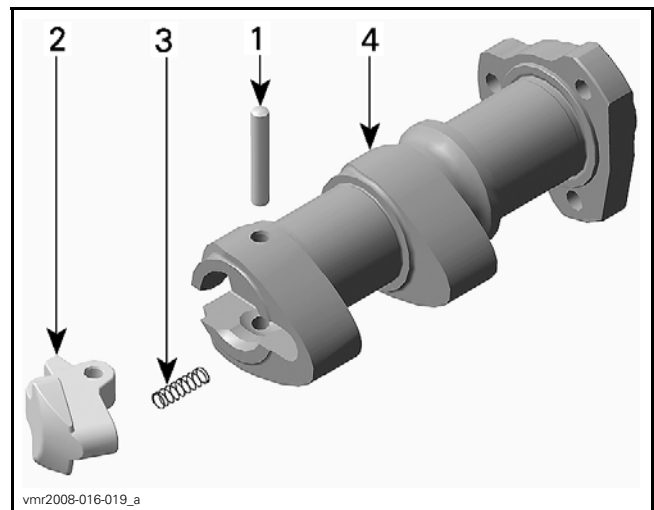


Camshaft Installation

Reassembly is the reverse order of disassembly.
Pay attention to the following details.

Decompressor Installation

If the centrifugal decompressor was dismantled, ALWAYS replace the spring.



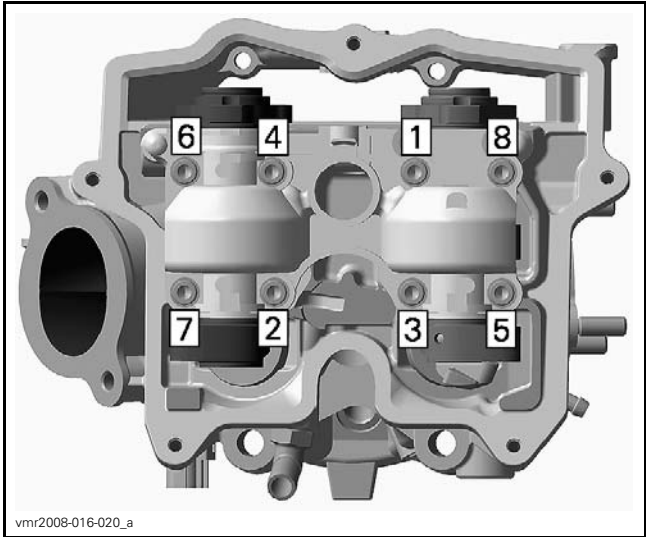
1. Decompressor shaft
2. Centrifugal weight
3. Spring
4. Exhaust camshaft

After assembly, check if the centrifugal weight moves smoothly.

Camshaft Installation

Lubricate camshaft bearings with engine oil before placing them into cylinder head.

Fit camshaft bearing cover and tighten down as per following described sequence.



TIGHTENING SEQUENCE

NOTE: After bearing cover installation check if camshafts turn easily.

Check valve clearance. Refer to the *VALVE CLEARANCE ADJUSTMENT*.

VALVE LIFTER BUCKET

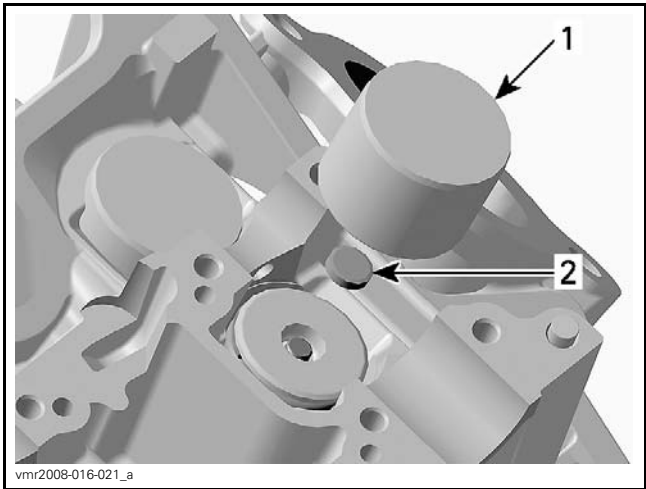
Valve Lifter Bucket Removal

Remove:

- valve cover
- chain tensioner
- camshaft timing gears
- camshafts.

Use a magnet and lift valve lifter bucket.

CAUTION: Adjustment shim can stick in valve lifter bucket. Take care not to loose adjustment shim.



1. Valve lifter bucket
2. Adjustment shim

Valve Lifter Bucket Inspection

Check surface of valve lifter bucket for scoring or other damages.

Measure diameter of valve lifter bucket. If diameter is out of specification replace it.

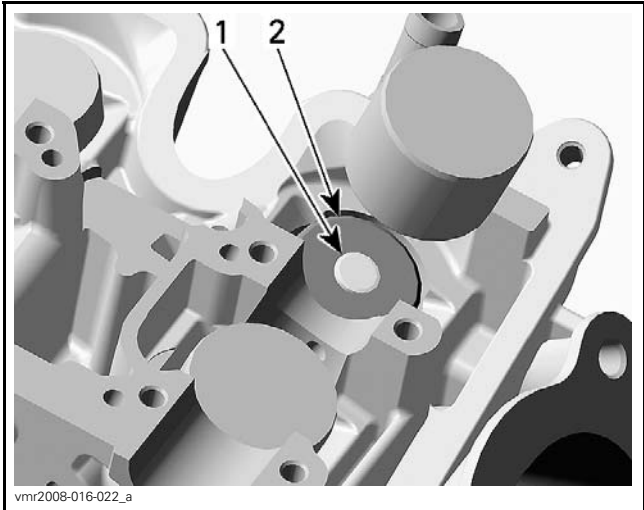
VALVE LIFTER BUCKET DIAMETER	
New	33.459 to 33.475 mm (1.3173 to 1.3179 in)
Service limit	33.440 mm (1.3165 in)

VALVE LIFTER BUCKET RADIAL CLEARANCE	
Service limit	0.08 mm (.0032 in)

For measurement of valve lifter bucket bore refer to *CYLINDER HEAD* below.

Valve Lifter Bucket Installation

CAUTION: Place adjustment shim properly in place before installing valve lifter bucket.



1. Adjustment shim
2. Valve spring retainer

VALVE LIFTER BUCKET

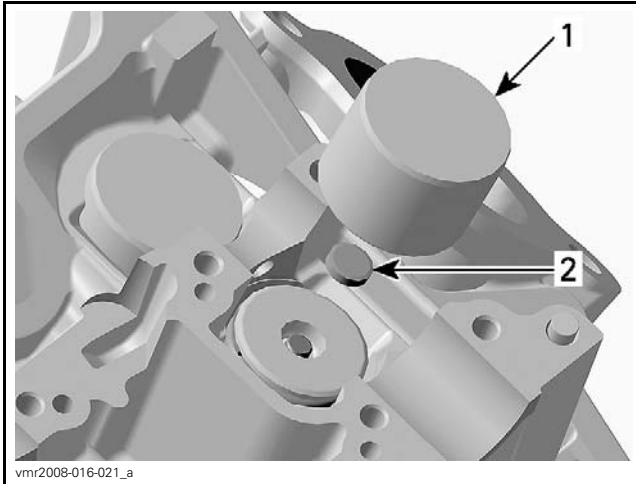
Valve Lifter Bucket Removal

Remove:

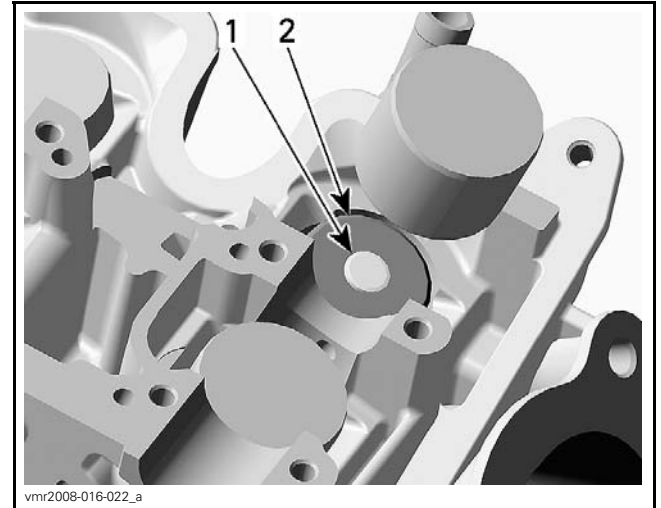
- valve cover
- chain tensioner
- camshaft timing gears
- camshafts.

Use a magnet and lift valve lifter bucket.

CAUTION: Adjustment shim can be stuck in valve lifter bucket. Take care not to loose adjustment shim.



1. Valve lifter bucket
2. Adjustment shim



1. Adjustment shim
2. Valve spring retainer

Valve Lifter Bucket Inspection

Check surface of valve lifter bucket for scoring or other damages.

Measure diameter of valve lifter bucket. If diameter is out of specification replace it.

VALVE LIFTER BUCKET DIAMETER	
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VALVE LIFTER BUCKET RADIAL CLEARANCE	
Service limit	0.08 mm (.0032 in)

For measurement of valve lifter bucket bore refer to *CYLINDER HEAD* below.

Valve Lifter Bucket Installation

CAUTION: Place adjustment shim properly in place before installing valve lifter bucket.

DRIVETRAIN

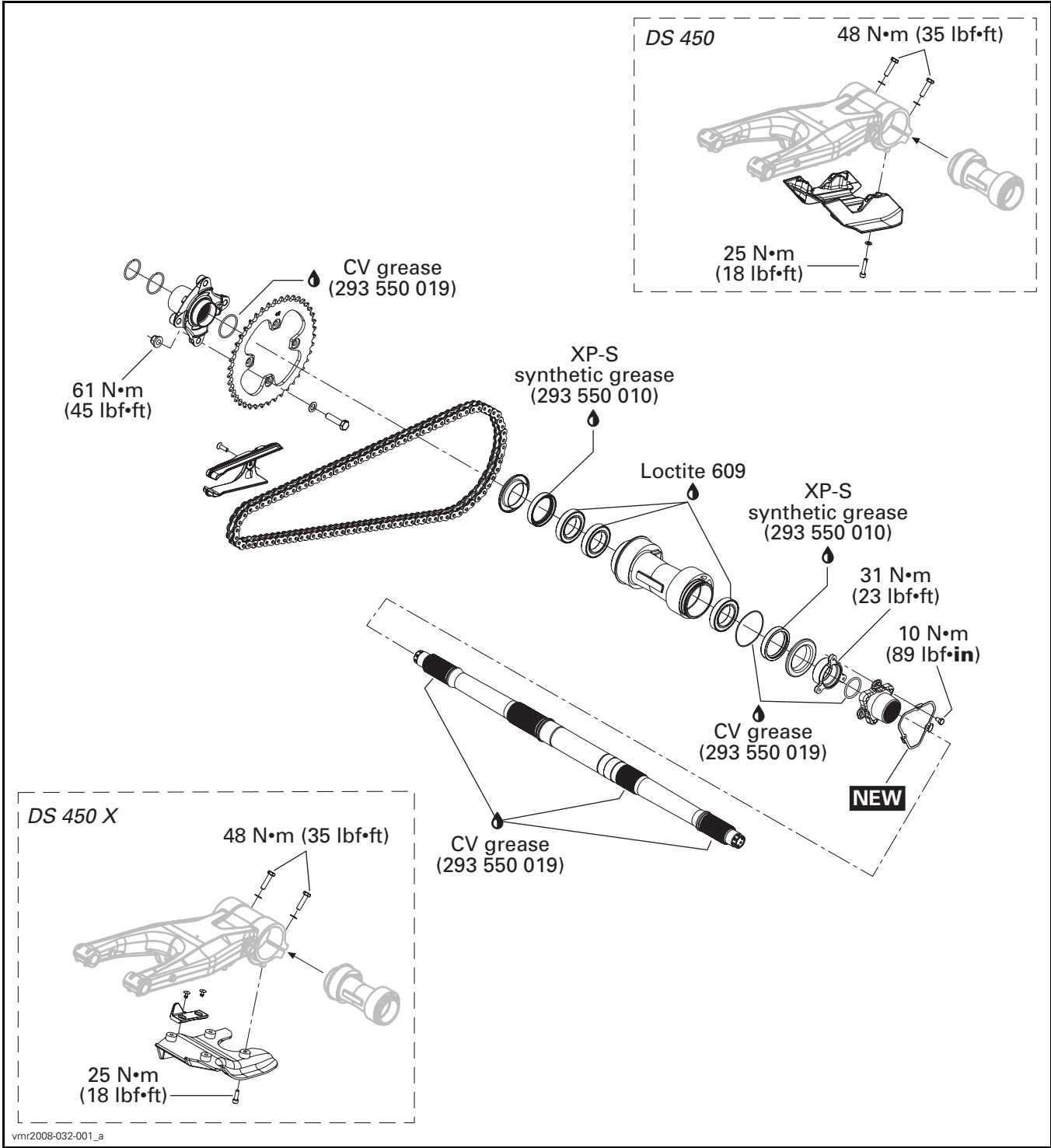
SERVICE TOOLS

Description	Part Number	Page
trailing arm bearing remover/installer	529 035 918	10
rear axle key	529 036 082	8-9

SERVICE PRODUCTS

Description	Part Number	Page
CV grease	293 550 019	9
Loctite 767 (antiseize lubricant)	293 800 070	10
Loctite 609.....	413 703 100	10





GENERAL

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

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

WARNING

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

CAUTION: During installation, make sure every part is free from old grease and dirt. This allows for a clean reassembly and will avoid premature wear caused by dirt contamination.

After each repair, ride the vehicle for a few minutes and make sure the job is successful; i.e. axle is not loose, chain is not rubbing on any part or making noise, rear brake operates correctly, etc.

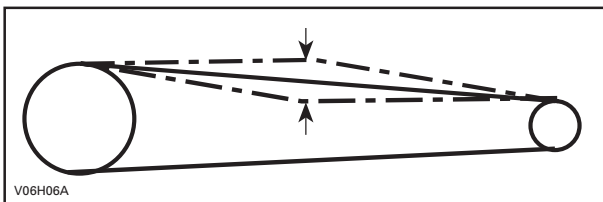
PROCEDURES

DRIVE CHAIN

Drive Chain Adjustment

NOTE: Always adjust drive chain with the driver, or equivalent weight, seated on the vehicle.

Check drive chain free play midway between sprockets, on upper run of drive chain.



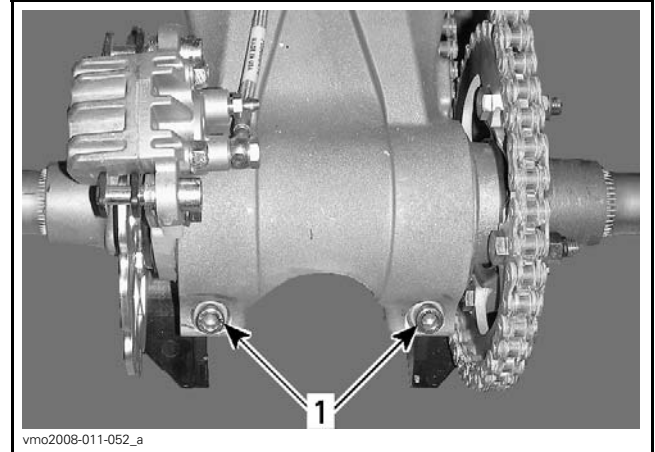
Drive chain free play should allow the following vertical movement by hand.

DRIVE CHAIN FREE PLAY	22 mm (7/8 in)
-----------------------	----------------

Check drive chain free play at several points along the chain. The free play should remain constant. Otherwise, inspect drive chain.

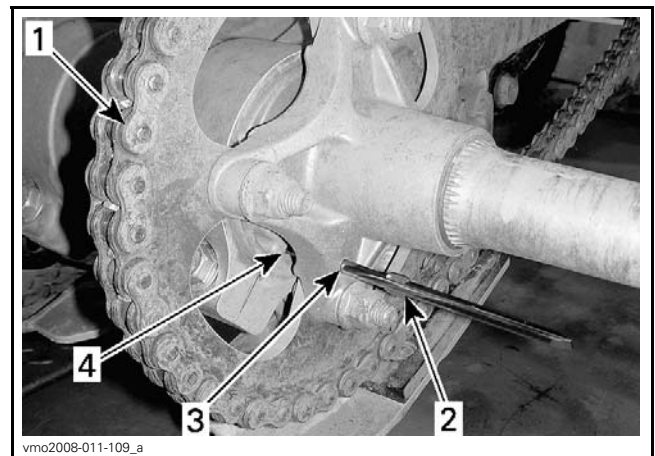
If drive chain free play is constant but out of specification, adjust as follow:

Loosen rear axle lock bolts.



1. Rear axle lock bolts

Insert screwdriver pin (from the vehicle's tool kit) or an equivalent tool through rear sprocket hub and into chain tensioner.



1. Drive chain
2. Screwdriver pin
3. Rear sprocket hub
4. Chain tensioner

With the screwdriver pin properly in place, move the vehicle forward to increase free play or backward to decrease free play. Adjust as per specification.

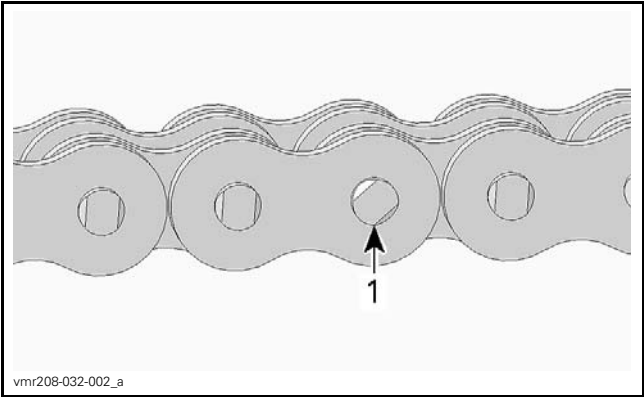
NOTE: A drive chain with uneven free play will jump and be noisy.

Tighten the rear axle lock bolts to 48 N•m (35 lbf•ft).

Drive Chain Inspection

Inspect drive chain for:

- Damaged rollers
- Damaged or missing O-rings
- Kinked or binding links (try to lubricate).
- Rotated pins



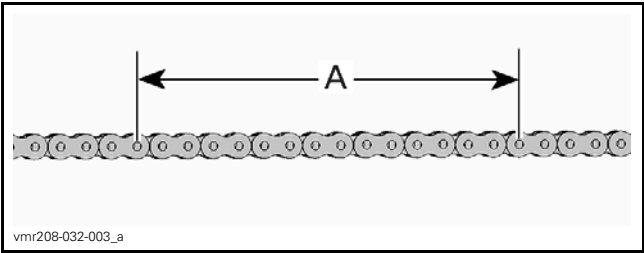
1. Rotated pin

Measure elongation or stretching of drive chain as per following procedures:

If the chain is installed on the vehicle, tension the top of chain by placing transmission on 1st gear and move vehicle backward.

If the chain is on the bench, securing one end and apply a tension load of approximately 20 kg (45 lb).

Measure the distance between a span of 16 pins (center to center), using a caliper or a ruler.



A. Maximum stretching

DRIVE CHAIN MAXIMUM STRETCHING	
Service limit	256.5 mm (10.098 in)

Replace drive chain if out of specification or if any defect were detected.

CAUTION: Replace drive chain and sprockets together to prevent premature wear.

Check slider shoe on swing arm. Replace as required.

Drive Chain Cleaning

CAUTION: Never wash the chain with a high pressure washer or gasoline. Damage to the O-rings will result, causing premature wear and drive chain failure.

Clean the side surfaces of the chain with a dry cloth.

NOTE: Do not brush chain.

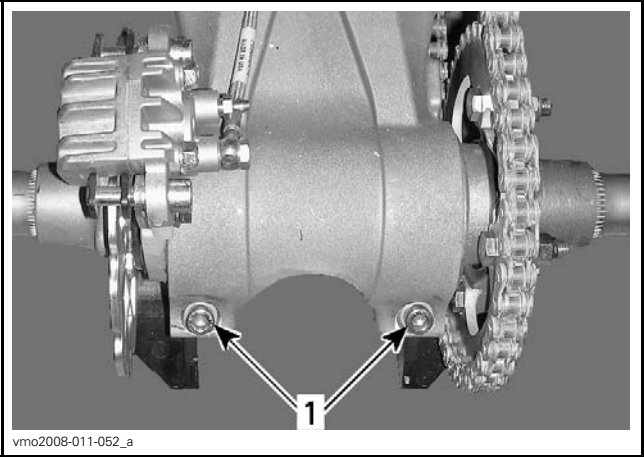
Drive Chain Lubrication

Lubricate only with an approved O-ring chain lubricant. Other commercial chain lubricant may contain solvent which could damage the O-rings.

Drive Chain Removal

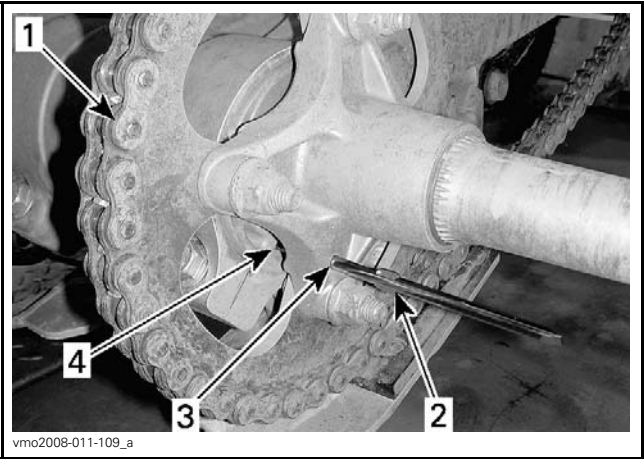
Select a level surface and set transmission to NEUTRAL.

Loosen rear axle lock bolts.



1. Rear axle lock bolts

Insert screwdriver pin (from the vehicle's tool kit) or an equivalent tool through rear sprocket hub and into chain tensioner.

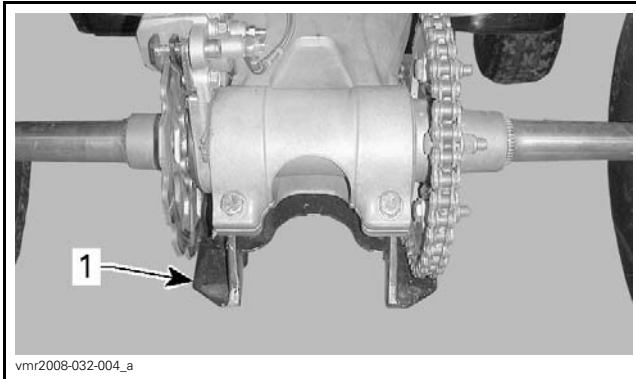


1. Drive chain
2. Screwdriver pin
3. Rear sprocket hub
4. Chain tensioner

Move the vehicle backward to release chain tension.

Lift the rear of vehicle and install jack stands under the frame to support vehicle off the ground.

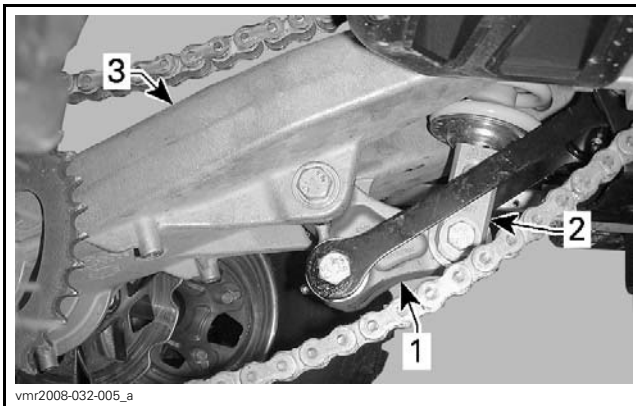
Remove swing arm protector.



1. Swing arm protector

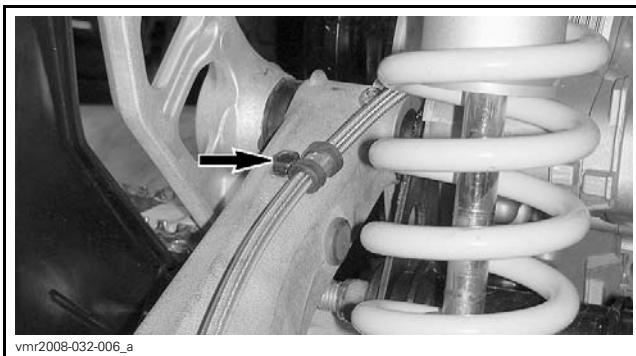
Remove drive chain from rear sprocket.

Remove bolt securing bell crank lever to swing arm.

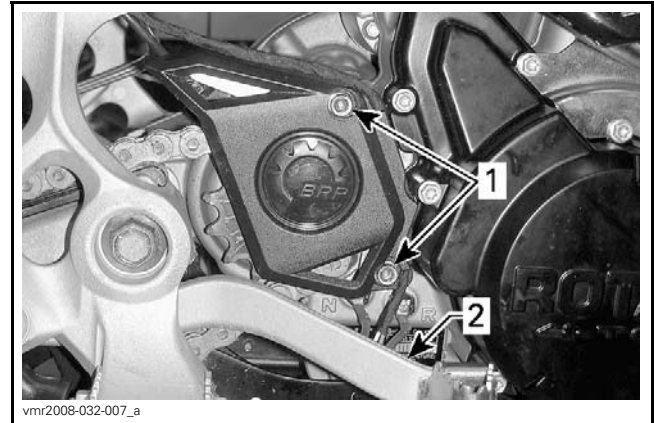


1. Bell crank lever
2. Rear shock absorber
3. Swing arm

Remove front screw holding brake hose to swing arm.

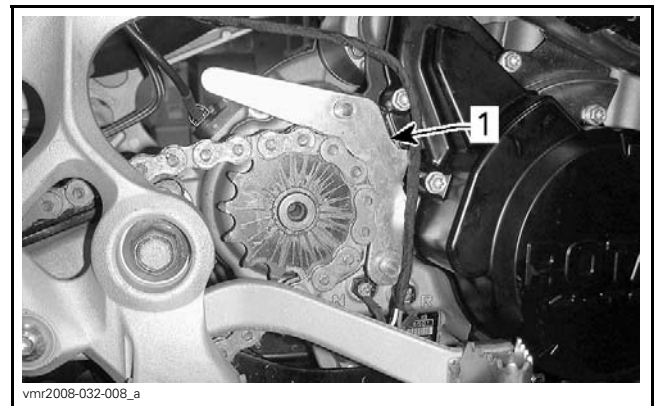


Remove front sprocket protector.



1. Protector screws
2. Brake pedal

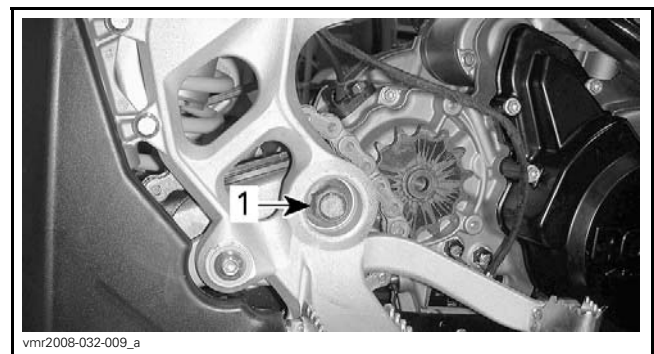
Remove chain guard.



1. Chain guard

Remove drive chain from front sprocket.

Remove swing arm bolt.



1. Swing arm bolt

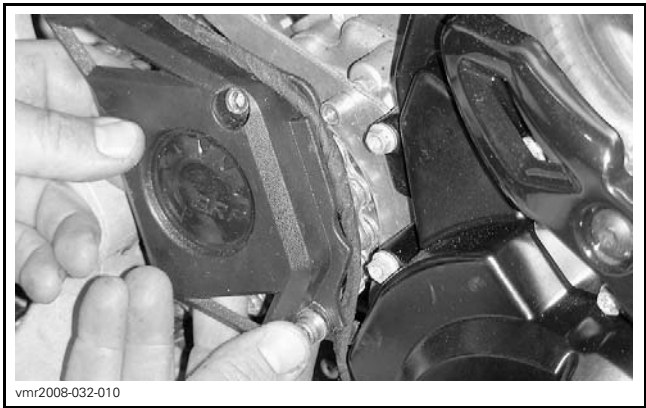
Move swing arm backward. Retain swing arm to avoid damaging brake hose.

Install a support under swing arm during the replacement of drive chain.

Remove drive chain from vehicle.

Drive Chain Installation

Installation is the reverse of the removal. However pay attention to the following.
Position wires from indicator switches on front sprocket protector before installing it.

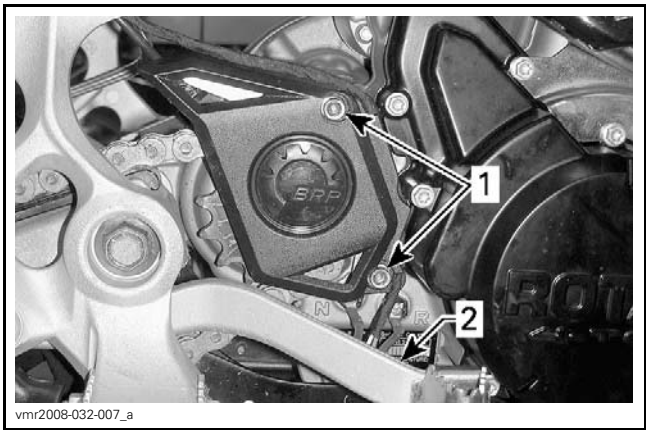


Adjust drive chain. Refer to *ADJUSTMENT* for the proper procedure.

FRONT SPROCKET

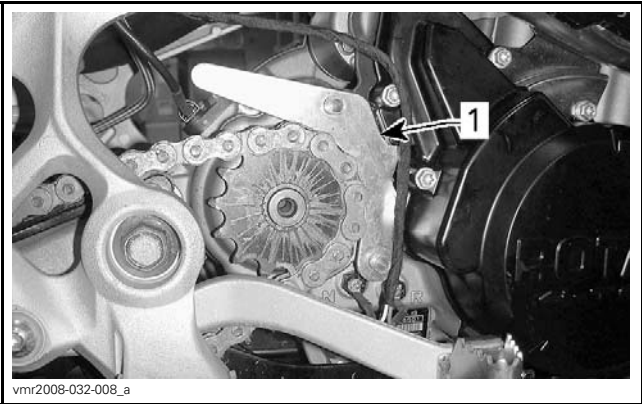
Front Sprocket Removal

Loosen drive chain. Refer to *DRIVE CHAIN ADJUSTMENT* for the procedure.
Remove front sprocket protector.



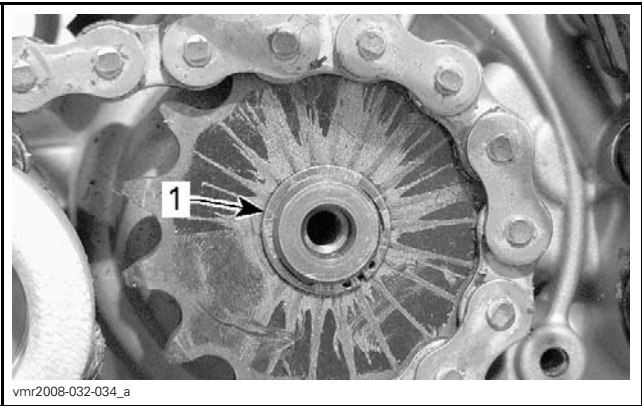
- 1. Protector screws
- 2. Brake pedal

Remove chain guard.



1. Chain guard

Remove circlip at the center of front sprocket.



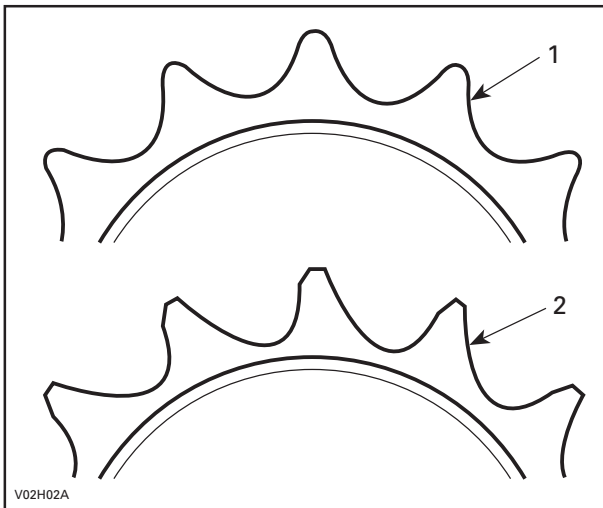
1. Circlip

Remove front sprocket and chain from engine output shaft.
Remove front sprocket from chain.

Front Sprocket Inspection

Check front sprocket for:

- distortion
- excessive wear
- other damages.



1. Good
2. Worn

CAUTION: Replace drive chain and sprockets together to prevent premature wear.

Front Sprocket Installation

The installation is the reverse of the removal procedure.

REAR SPROCKET

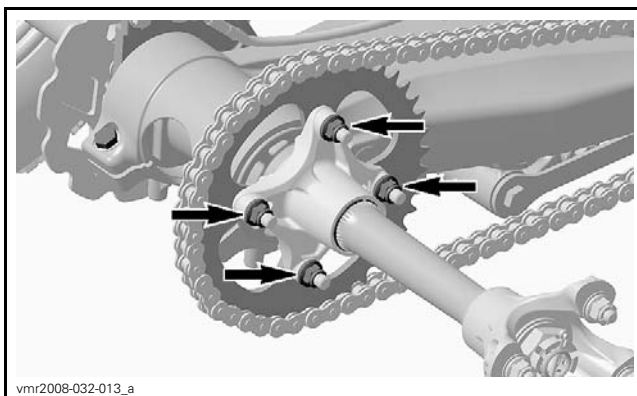
Rear Sprocket Removal

Lift the rear of vehicle and install jack stands under the frame to support vehicle off the ground.

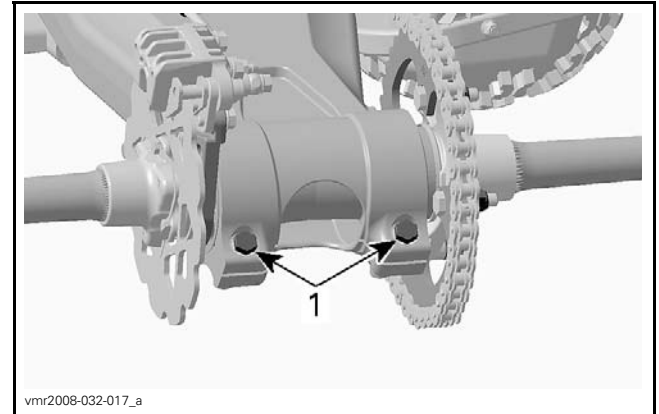
Remove the RH rear wheel.

Remove swing arm protector.

Loosen rear sprocket nuts.

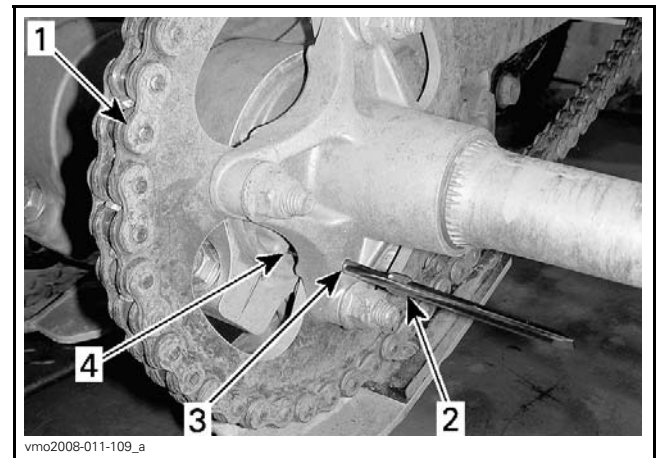


Loosen rear axle lock bolts.



1. Rear axle lock bolts

Insert screwdriver pin (from the vehicle's tool kit) through rear sprocket hub and into chain tensioner.

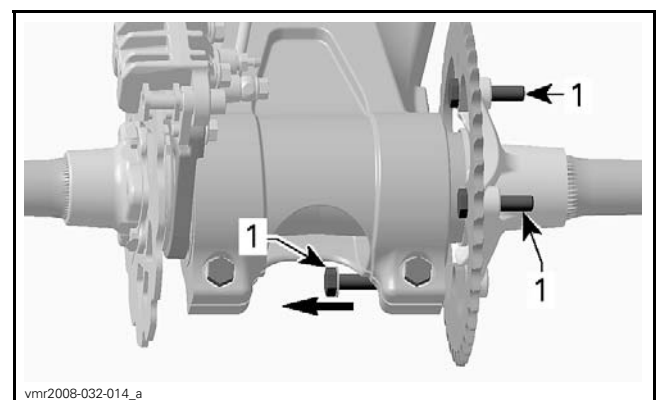


1. Drive chain
2. Screwdriver pin
3. Rear sprocket hub
4. Chain tensioner

Turn the axle forward to release chain tension.

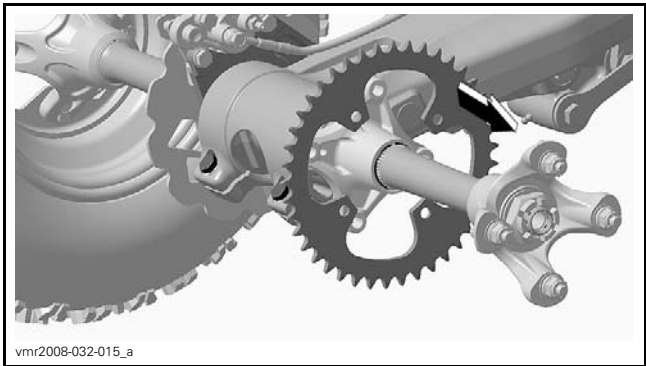
Remove drive chain from rear sprocket and place it on swing arm.

Remove axle sprocket bolts.

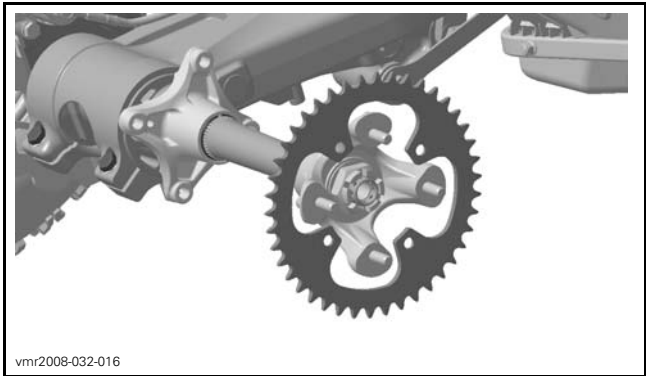


1. Rear sprocket bolts

Remove the rear sprocket from its hub.



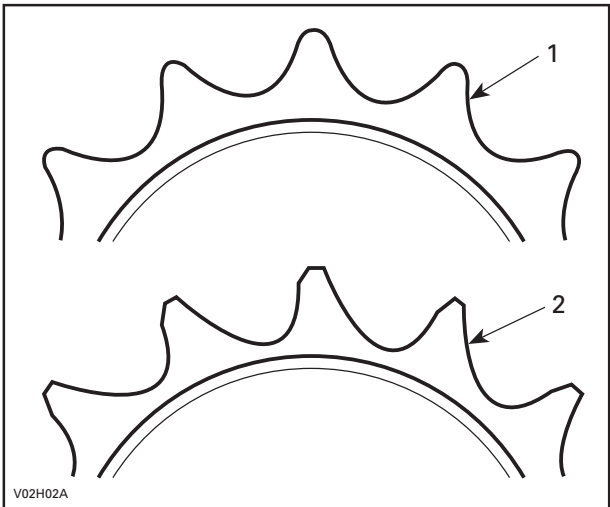
Slide it over wheel hub.



Rear Sprocket Inspection

Check rear sprocket for:

- distortion
- excessive wear
- other damages.



1. Good
2. Worn

CAUTION: Replace drive chain and sprockets together to prevent premature wear.

Rear Sprocket Installation

The installation is the reverse of the removal procedure.

REAR AXLE

Rear Axle Removal

Select a level surface and set transmission to NEUTRAL.

Loosen wheel nuts.

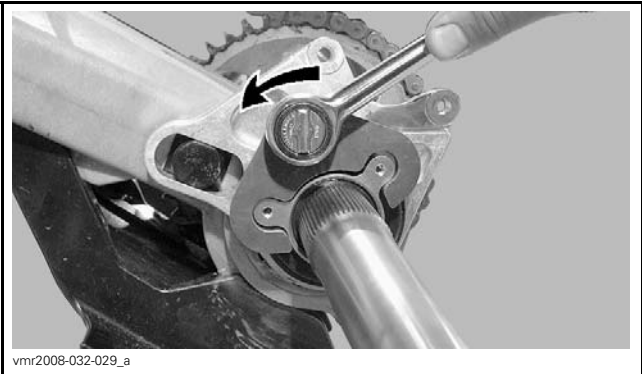
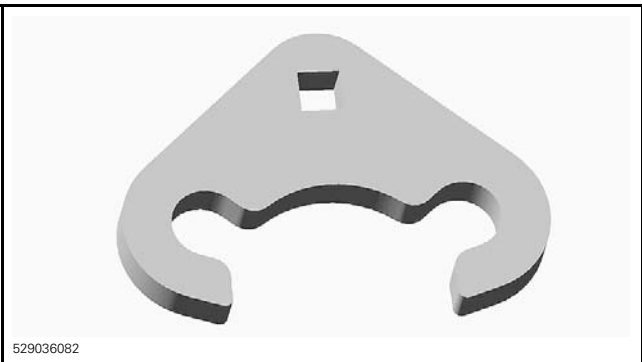
Lift the rear of vehicle and install jack stands under the frame to support vehicle off the ground.

Remove both wheels.

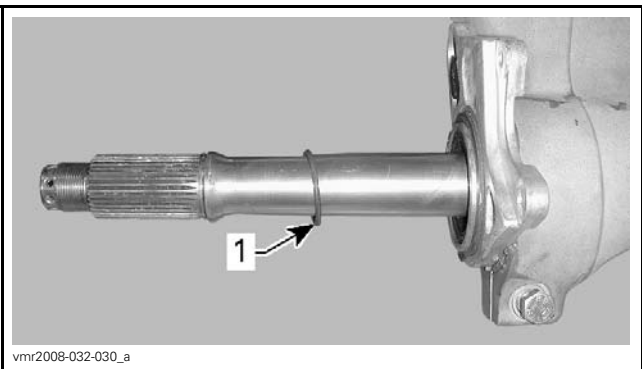
Remove both wheel hubs. Refer to *WHEELS AND TIRES* above.

Remove brake disc hub. Refer to *BRAKE SYSTEM* section.

Using the rear axle key (P/N 529 036 082), unscrew the axle nut.



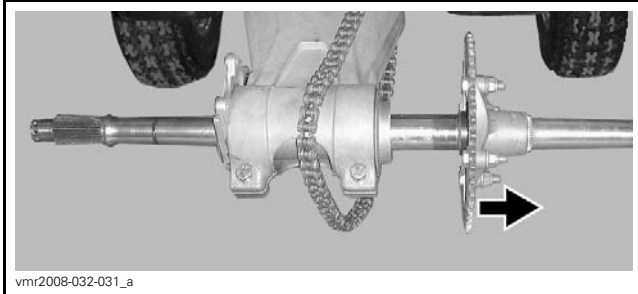
Remove the O-ring behind the axle nut.



Release drive chain tension.

Remove drive chain from rear sprocket. Lay the drive chain on swing arm.

Remove the rear axle by pulling it on the RH side.



Rear Axle Inspection

Check axle for:

- bending
- torsion
- rust (indicates a possible damage to axle)
- bearing surfaces condition.

Replace rear axle as required.

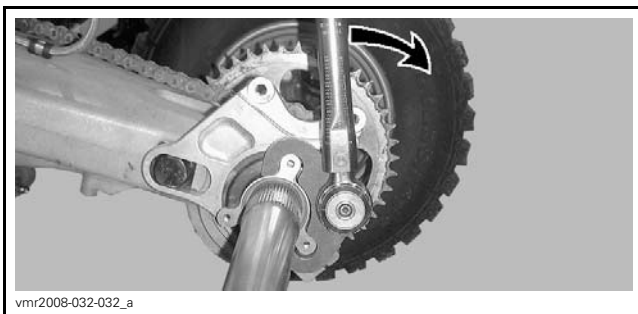
Rear Axle Installation

Insert rear axle into chain tensioner.

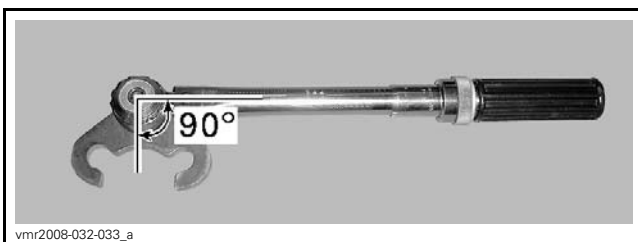
On LH side, install the O-ring. Push it inside chain tensioner.

Install axle nut.

Using the rear axle key (P/N 529 036 082), tighten axle nut to 31 N•m (23 lbf•ft).



CAUTION: It is very important to place the torque wrench perpendicularly with the special tool.



Apply CV grease (P/N 293 550 019) on all rear axle splines.

Install all other removed parts.

CHAIN TENSIONER

Chain Tensioner Inspection

Check seals for damages. Replace if necessary.

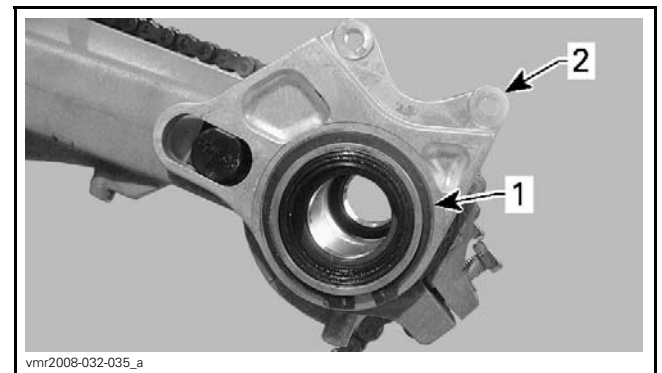
Check if the bearings turn smoothly and freely. Replace them if necessary.

NOTE: If bearings were seized on rear axle, carefully inspect it. New bearings must have a slide fit on the axle.

Chain Tensioner Removal

Remove rear axle. Refer to *REAR AXLE* above for complete procedure.

Remove the circlip on the LH side of chain tensioner.



1. Circlip
2. Caliper bracket

Remove caliper bracket.



1. Pull off bracket

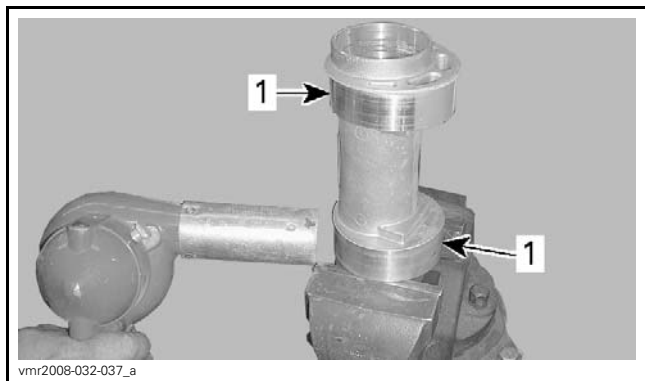
Remove chain tensioner from the RH side.

Chain Tensioner Disassembly

Remove and discard both seals.

Using a heat gun, heat chain tensioner lobes.

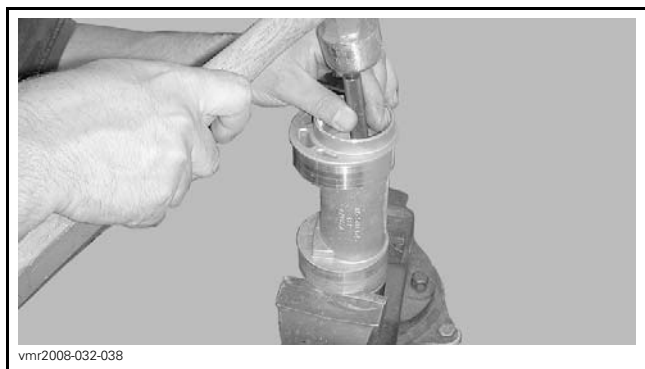
Subsection XX (DRIVETRAIN)



1. Heat here

Drive bearings out by using a punch.

NOTE: Support chain tensioner properly to avoid damaging it.



Chain Tensioner Assembly

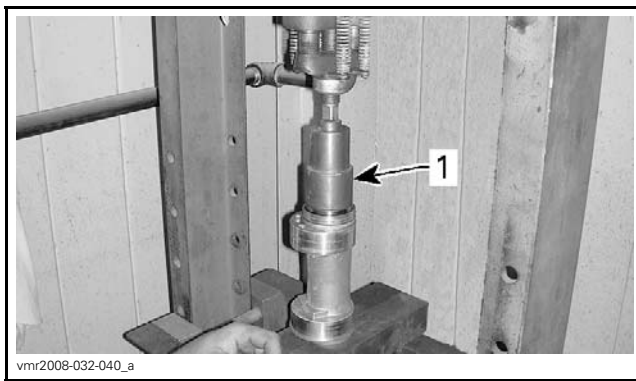
Clean inside and outside of chain tensioner to remove antiseize and adhesive products.

Apply a thin layer of Loctite 609 (P/N 413 703 100) on outer race of each bearing.



CAUTION: On rear sprocket side, bearings could stick together if a large amount of Loctite 609 is used.

Using a press and the trailing arm bearing remover/installer (P/N 529 035 918), install **NEW** bearings.



1. Special tool (P/N 529 035 918)

NOTE: Sometimes, bearings can be installed without tools.

Clean Loctite surplus.

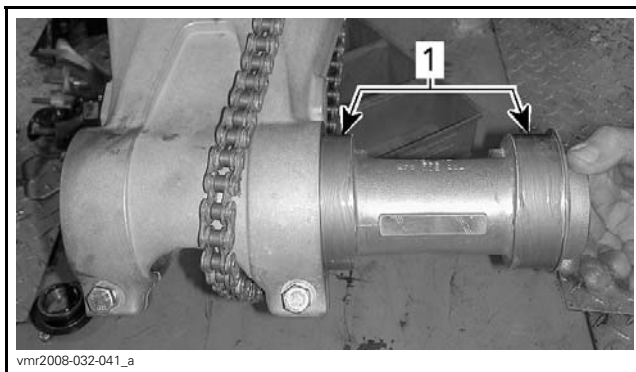
Check if bearings turn smoothly and freely.

Install **NEW** seals.

Chain Tensioner Installation

Apply Loctite 767 (antiseize lubricant) (P/N 293 800 070) on chain tensioner lobes.

Insert chain tensioner inside swing arm by the RH side.



1. Apply antiseize lubricant here

Install caliper bracket.

Install the circlip.

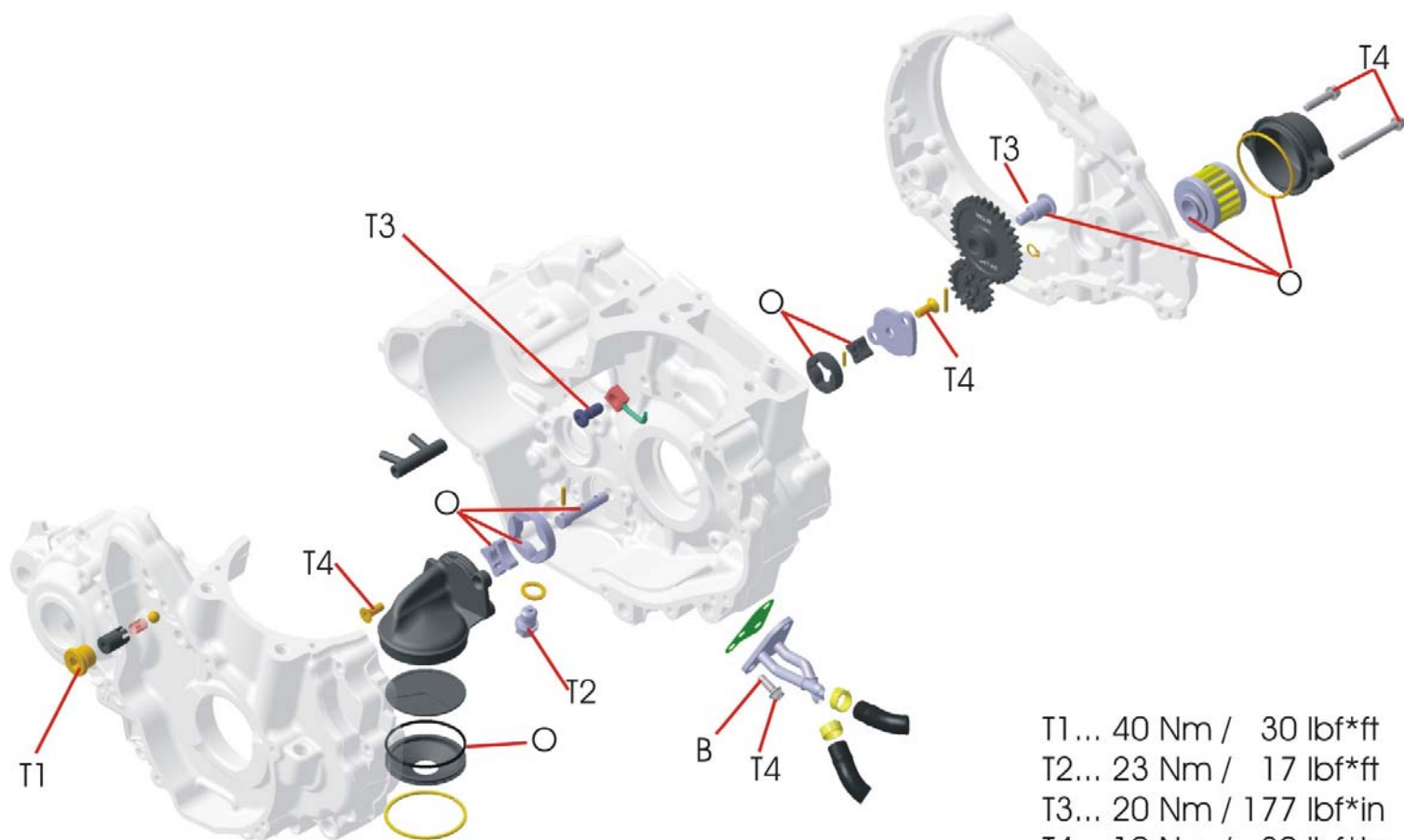
Install all other removed parts.

DRAFT

Pcode	Description	Possible fault	Action	Engine mode	Check engine lamp display	Code name	ECM description
1107	Manifold Air pressure sensor Shorted to GND or Open circuit	Faulty sensor - Dirty sensor - Connector loose - short wire	Make sure sensor's connector is fully inserted. Clean the sensor. Check circuit AAPT A1-3 and D2-4.	Limp Home	Flashing	AMP	Shorted to GND or Open circuit
1108	Manifold Air pressure sensor shorted to Battery 12V	Faulty sensor - Dirty sensor - water or dirt in the connector- shorted wire	Make sure sensor's connector is fully inserted. Clean the sensor. Check circuit AAPT C3-1 and D2-4.	Limp Home	Flashing	AMP	Shorted to VBK
480	Engine cooling Fan relay disconnected	Faulty relay - faulty terminal under the relay or at HIC connector - Dirt stuck on relay blades and/or terminals - wires from the ECM to the relay cut	Check 20A fuse. Look for damaged or disconnected cooling fan relay, damaged connectors or damaged ECM output pins. Check circuit from relay pin 1 to ECM pin B3. Check circuit from relay Pin 2 to 20A fuse.	Check Engine no limitation	Steady	CFA	Open circuit
484	Engine cooling Fan relay signal pin shorted to Battery 12V	Faulty relay - faulty terminal under the relay or at HIC connector - Dirt stuck on relay blades and/or terminals - wires from the ECM to the relay shorted to a power source	Check for damaged or disconnected cooling fan relay, damaged circuit wires, damaged connectors or damaged ECM output pins. Check circuit from relay pin 1 to ECM pin B3	Check Engine no limitation	Steady	CFA	Shorted to VBK
485	Engine cooling Fan relay signal pin shorted to GND	Faulty relay - faulty terminal under the relay or at HIC connector - Dirt or water stuck on relay blades and/or terminals - wires from the ECM to the relay shorted to a GND	Check for damaged or disconnected cooling fan relay, damaged circuit wires, damaged connectors or damaged ECM output pins. Check circuit from relay pin 1 to ECM pin B3	Check Engine no limitation	Steady	CFA	Shorted to GND
339	RPM signal fault	Damaged encoder wheel - damaged CPS - metal dirt stuck on CPS - CPS wires damaged and/or shorted to the engine or frame - squeezed CPS wires between the Magneto cover and engine	Check circuit between CPS and ECM pin E1 and D1. Check CPS resistor value approx 260 ohm. Check CPS AC voltage value approx 0,95 V. Check CPS wires. Check if CPS is dirty with metal particle. Check Encoder wheel.	Limp Home	Flashing	CRK_SPIKE_DET	Crank spike detection
336	RPM signal fault	Damaged encoder wheel - damaged CPS - metal dirt stuck on CPS - CPS wires damaged and/or shorted to the engine or frame - squeezed CPS wires between the Magneto cover and engine	Check circuit between CPS and ECM pin E1 and D1. Check CPS coil resistor value approx 260 ohm. Check CPS AC voltage value approx 0,95 V. Check CPS wires. Check if CPS is dirty with metal particle. Check Encoder wheel.	Limp Home	Flashing	CRK_TOOTH_NR	Crank tooth NR
230	Fuel Pump relay disconnected	Faulty relay - faulty terminal under the relay or at HIC connector - Dirt stuck on relay blades and/or terminals - wires from the ECM to the relay cut	Check 15A fuse. Look for damaged or disconnected fuel pump relay, damaged circuit wires, damaged connectors or damaged ECM output pins. Check circuit from relay pin 1 to ECM pin J1. Check circuit from relay Pin 2 to ECM 15A fuse.	Check Engine no limitation	Steady	EFP	Open circuit
232	Fuel pump relay signal pin shorted to Battery 12V	Faulty relay - faulty terminal under the relay or at HIC connector - Dirt stuck on relay blades and/or terminals - wires from the ECM to the relay shorted to a power source	Check for damaged or disconnected fuel pump relay, damaged circuit wires, damaged connectors or damaged ECM output pins. Check circuit from relay pin 1 to ECM pin J1	Check Engine no limitation	Steady	EFP	Shorted to VBK
231	Fuel pump relay signal pin shorted to GND	Faulty relay - faulty terminal under the relay or at HIC connector - Dirt or water stuck on relay blades and/or terminals - wires from the ECM to the relay shorted to a GND	Check for damaged or disconnected fuel pump relay, damaged circuit wires, damaged connectors or damaged ECM output pins. Check circuit from relay pin 1 to ECM pin J1	Check Engine no limitation	Steady	EFP	Shorted to GND
351	Ignition coil signal shorted to Battery 12V	Faulty primary ignition coil - wire shorted to battery 12V	Check for 1 +/-0.5 ohm between ignition coil pins. Check circuit between Ignition coil (-) and ECM pin M1 and M2 if shorted to 12V. Check fuse 15A.	Limp Home	Flashing	IGA_CYL	Shorted to VBK
1351	Ignition coil disconnected	Faulty primary ignition coil - disconnected coils - cut wires - faulty terminals	Check for 1 +/-0.5 ohm between ignition coil pins. Check circuit between Ignition coil (-) and ECM pin M1 and M2. Check circuit between Ignition coil (+) and fuse.	Limp Home	Flashing	IGA_CYL	Shorted to GND or Open circuit
261	Injector signal shorted to GND	Faulty injector - water and/or dirt in injector connector - shorted wires	Check for approximately 12,2 ohms on injector. Check circuit between Injector pin 1 and ECM L4 if shorted to GND.	Limp Home	Flashing	IV_INJ_0	Shorted to GND
262	Injector signal shorted to Battery 12V	Faulty injector - water and/or dirt in injector connector - shorted wires	Check for approximately 12,2 ohms on injector. Check circuit between Injector Pin 1 and ECM L4 if shorted to 12V.	Limp Home	Flashing	IV_INJ_0	Shorted to VBK
1263	Injector disconnected	Faulty injector - severed wires - faulty terminals	Check 15A fuse. Check for approximately 12,2 ohms on injector. Check circuit between Injector pin 1 and ECM L4 if open.	Limp Home	Flashing	IV_INJ_0	Open circuit
107	Manifold air pressure sensor signal shorted to GND or Open	Faulty Manifold pressure sensor - disconnected connector - faulty terminals - severed wires - Dirty sensor - shorted wire - disconnected VCC (sensor power)	Make sure sensor's connector is fully inserted. Check for approximately 5 volts between sensor connector pins 1 and 2. Check circuits between MAP pins and ECM pins A1-1,G2-2 and F2-3 if open or shorted to GND.	Limp Home	Flashing	MAP	Shorted to GND or Open circuit
108	Manifold air pressure sensor signal shorted to VBK	Faulty Manifold pressure sensor - disconnected connector - faulty terminals - severed wires - Dirty sensor - shorted wire - disconnected VCC (sensor power)	Make sure sensor's connector is fully inserted. Check for approximately 5 volts between sensor connector pins 1 and 2. Check circuits between MAP pins and ECM pins A1-1,G2-2 and F2-3 if shorted to 12V.	Limp Home	Flashing	MAP	Shorted to VBK
1335	RPM signal too high (12000)	Damaged encoder wheel - damaged CPS - metal dirt stuck on CPS - CPS wires damaged and/or shorted to the engine or frame - squeezed CPS wires between the Magneto cover and engine - tampered engine	Check circuit between CPS and ECM pin E1 and D1. Check CPS coil resistor value approx 260 ohm. Check CPS AC voltage value approx 0,95 V. Check CPS wires. Check if CPS is dirty with metal particle. Check Encoder wheel.	Limp Home	Flashing	N_MAX	Engine over speed detected

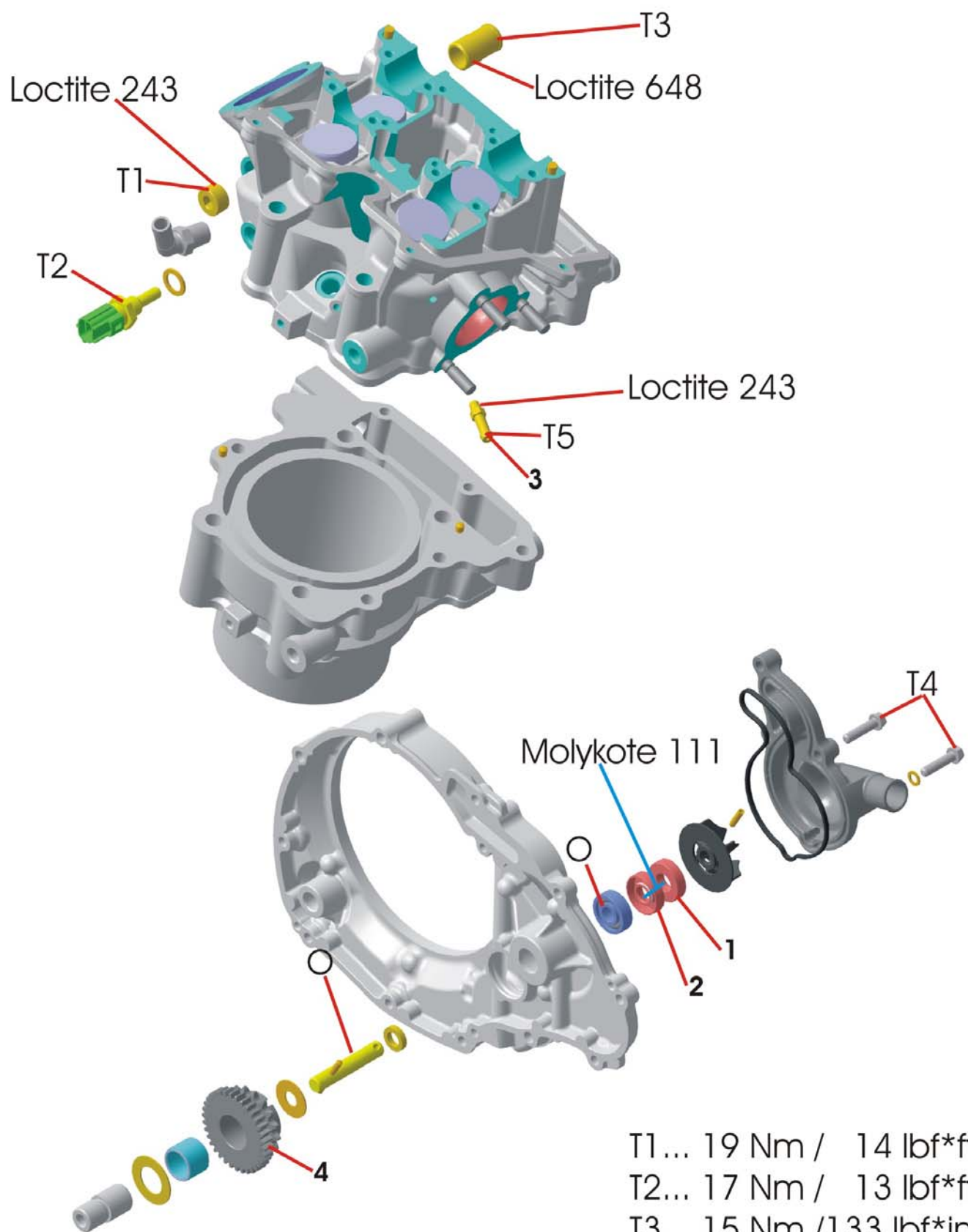
Pcode	Description	Possible fault	Action	Engine mode	Check engine lamp display	Code name	ECM description
508	Idle valve controller pin(s) shorted to Battery 12V	Faulty Idle valve controller - disconnected connector - faulty terminals - severed wires - shorted wire	Make sure sensor's connector is fully inserted. Check circuits between Idle valve Motor pins and ECM pins D3-A, E4-B, C4-C and D4-D.	Limp Home	Flashing	STP	Shorted to VBK
509	Idle valve controller pin(s) disconnected or shorted to GND	Faulty Idle valve controller - disconnected connector - faulty terminals - severed wires - shorted wire	Make sure sensor's connector is fully inserted. Check circuits between Idle valve Motor pins and ECM pins D3-A, E4-B, C4-C and D4-D.	Limp Home	Flashing	STP	Shorted to GND or Open circuit
117	Engine coolant sensor signal shorted to Battery 12V	Faulty Water coolant sensor - disconnected connector - faulty terminals - severed wires - shorted wire	Check sensor resistor value between 1800 and 2200 ohm at 22°C. Check circuits between sensor pins and ECM pin F4-1 and C3-2.	Limp Home	Flashing	TCO	Shorted to VBK
118	Water coolant sensor signal shorted to GND or disconnected	Faulty Water coolant sensor - disconnected connector - faulty terminals - severed wires - shorted wire	Check for disconnected engine temperature sensor. Check sensor resistor value between 1800 and 2200 ohm at 22°C. Check circuits between sensor pins and ECM pin F4-1 and C3-2.	Limp Home	Flashing	TCO	Shorted to GND or Open circuit
119	Water coolant sensor intermittent fault	Faulty Water coolant sensor - partially disconnected connector - faulty terminals - severed wires - shorted wire - change in temperature too high from the sensed temperature	Check for disconnected engine temperature sensor. Check sensor resistor value between 1800 ohm and 2200 at 22°C. Check circuits between sensor pins and ECM pin F4-1 and C3-2.	Limp Home	Flashing	TCO_INTM	TCO intermittent failure
115	Water coolant liquid too high	Refer to Engine and/or cooling system service manual section	Refer to Engine and/or cooling system service manual section	Limp Home	Flashing	TCO_OVER_TEMP	TCO too high
112	Air box temperature sensor signal shorted to GND	Faulty Intake temperature sensor - disconnected connector - faulty terminals - severed wires - shorted wire to GND	Check for disconnected air temperature sensor on the intake. Check the air temperature sensor for approximately 2510,6 ohms at 20°C. Replace the sensor if necessary. Check circuits between Sensor pin 2 and ECM pin F3, between C3-1 and between A1-3.	Limp Home	Flashing	TIA	Shorted to GND
113	Air box temperature sensor signal shorted to Battery 12V and Open	Faulty Intake temperature sensor - disconnected connector - faulty terminals - severed wires - shorted wire to Battery	Check for disconnected air temperature sensor on the intake. Check the air temperature sensor for approximately 2510,6 ohms at 20°C. Replace the sensor if necessary. Check circuits between Sensor pin 2 and ECM pin F3, between C3-1 and between A1-3.	Limp Home	Flashing	TIA	Shorted to VBK or Open circuit
114	Air box temperature sensor signal switched intermittent fault	Faulty Intake temperature sensor - partially disconnected connector - faulty terminals - severed wires - incoherent change in temperature reading	Check for disconnected air temperature sensor on the intake. Check the air temperature sensor for approximately 2510,6 ohms at 20°C. Replace the sensor if necessary. Check circuits between Sensor pin 2 and ECM pin F3, between C3-1 and between A1-3.	Limp Home	Flashing	TIA_INTM	TIA intermittent failure
122	TPS shorted to GND and Open	Faulty Throttle position sensor - disconnected connector - faulty terminals - severed wires - shorted wire to GND - Sensor voltage missing	Check circuits between TPS pins and ECM pins A1-1, G3-3 and G2-2. Refer to the service manual for complete throttle position sensor testing procedure.	Limp Home	Flashing	TPS_1	Shorted to GND or Open circuit
123	TPS shorted to Battery 12V	Faulty Throttle position sensor - disconnected connector - faulty terminals - severed wires - shorted wire to Battery	Check circuits between TPS pins and ECM pins A1-1, G3-3 and G2-2. Refer to the service manual for complete throttle position sensor testing procedure.	Limp Home	Flashing	TPS_1	Shorted to VBK
1562	Battery voltage under 8V at Key switch voltage input	Battery voltage too low - disconnected connector faulty terminals - severed wires	Check battery voltage for 12to 13 volts with engine stopped. Check battery voltage for 13.8 to 15.0 volts with engine idling. Check connections on magneto and regulator.	Check Engine no limitation	Steady	VBK	V too Low
1563	Battery voltage over 16V at Key switch voltage input	Battery voltage too high - faulty regulator -faulty magneto	Check battery voltage for 13.8 to 15.0 volts with engine idling. Replace Regulator if necessary.	Check Engine no limitation	Steady	VBK	V too High
562	Battery voltage under 8V at Main relay voltage input	Battery voltage too low - disconnected connector faulty terminals - severed wires	Check battery voltage for 12to 13 volts with engine stopped. Check battery voltage for 13.8 to 15.0 volts with engine idling. Check connections on magneto and regulator.	Check Engine no limitation	Steady	VBR	V too Low
563	Battery voltage over 16V at Main relay voltage input	Battery voltage too high - faulty regulator -faulty magneto	Check battery voltage for 13.8 to 15.0 volts with engine idling. Replace Regulator if necessary.	Check Engine no limitation	Steady	VBR	V too High
116	Engine coolant sensor signal implausible low temperature	Faulty Water coolant sensor - disconnected connector - faulty terminals - severed wires - shorted wire - reading of cold temperature while engine is running and as gone over 72C (162F)	Check sensor resistor value between 1800 and 2200 at 22°C. Check circuits between sensor pins and ECM pin F4-1 and C3-2. Replace sensor if necessary. Refer to service manual for complete cooling system testing procedure.	Limp Home	Flashing	TCO_HYS	TCO drops too low
560	Sensor 5V power supply pin shorted to Battery 12V	Shorted wire - faulty sensor	Check circuits between TPS pin 1, MAP pin 1, AAPT pin 3 and ECM pin A1 Check TPS, MAP and Air pressure sensor.	Check Engine no limitation	Steady	VCC	Shorted to VBK
561	Sensor 5V power supply pin shorted to GND or Open	Shorted wire - faulty sensor	Check circuits between TPS pin 1, MAP pin 1, AAPT pin 3 and ECM pin A1 Check TPS, MAP and Air pressure sensor.	Check Engine no limitation	Steady	VCC	Shorted to GND or Open circuit
600	CAN communication port off	CAN communication port shorted - Incompatible CAN communicating component connected on CAN port	Check for damage circuit between Diagnostic connector 1 and 2 and ECM B1 and C1. Replace cluster if necessary. Test with disconnected cluster.	Check engine	Steady	BOFF	Bus OFF

Pcode	Description	Possible fault	Action	Engine mode	Check engine lamp display	Code name	ECM description
1600	CAN communication information 208 missing	Gauge missing, faulty or not connected properly	Check for damage circuit between Diagnostic connector 1 and 2 and ECM B1 and C1 . Replace cluster if necessary.	Nothing	Nothing	CLUSTER_208	Frame 208 missing
1601	CAN communication information 514 missing	Gauge missing, faulty or not connected properly	Check for damage circuit between Diagnostic connector 1 and 2 and ECM B1 and C1 . Replace cluster if necessary.	Nothing	Nothing	CAN_CLUSTER_514	Frame 514 missing
335	RPM signal lost	Damaged encoder wheel - damaged CPS - metal dirt stuck on CPS - CPS wires damaged and/or shorted to the engine or frame - squeezed CPS wires between the Magneto cover and engine	Check circuit between CPS and ECM pin E1 and D1. Check CPS coil resistor value approx 260 ohm. Check CPS AC voltage value approx 0,95 V. Check CPS wires. Check if CPS is dirty with metal particle. Check Encoder wheel.	Limp Home	Flashing	CRK_LOST_SYNC	Lost of synchronisation
1104	TPS sensor out of range at first initialisation	Faulty Throttle position sensor - disconnected connector - faulty terminals - severed wires - shorted wire	Check cable adjustment. Check circuit between ECM and TPS: A1-1, G2-2 and G3-3. Make sure throttle plate is against throttle stop. Reset the vehicle 3 times (ON-OFF-ON X3).	Limp Home	Flashing	V_TPS_AD_BOL	TPS position sensor out of range
821	Neutral switch fault	Faulty switch - disconnected connector - faulty terminals - severed wires - shorted wire -	Check circuit between neutral switch and ECM H4. Check switch. Check pilot lamp circuit.	Limp Home	Flashing	TRANS	Gear switch information is not plausible



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DRAFT



T1... 19 Nm / 14 lbf*ft

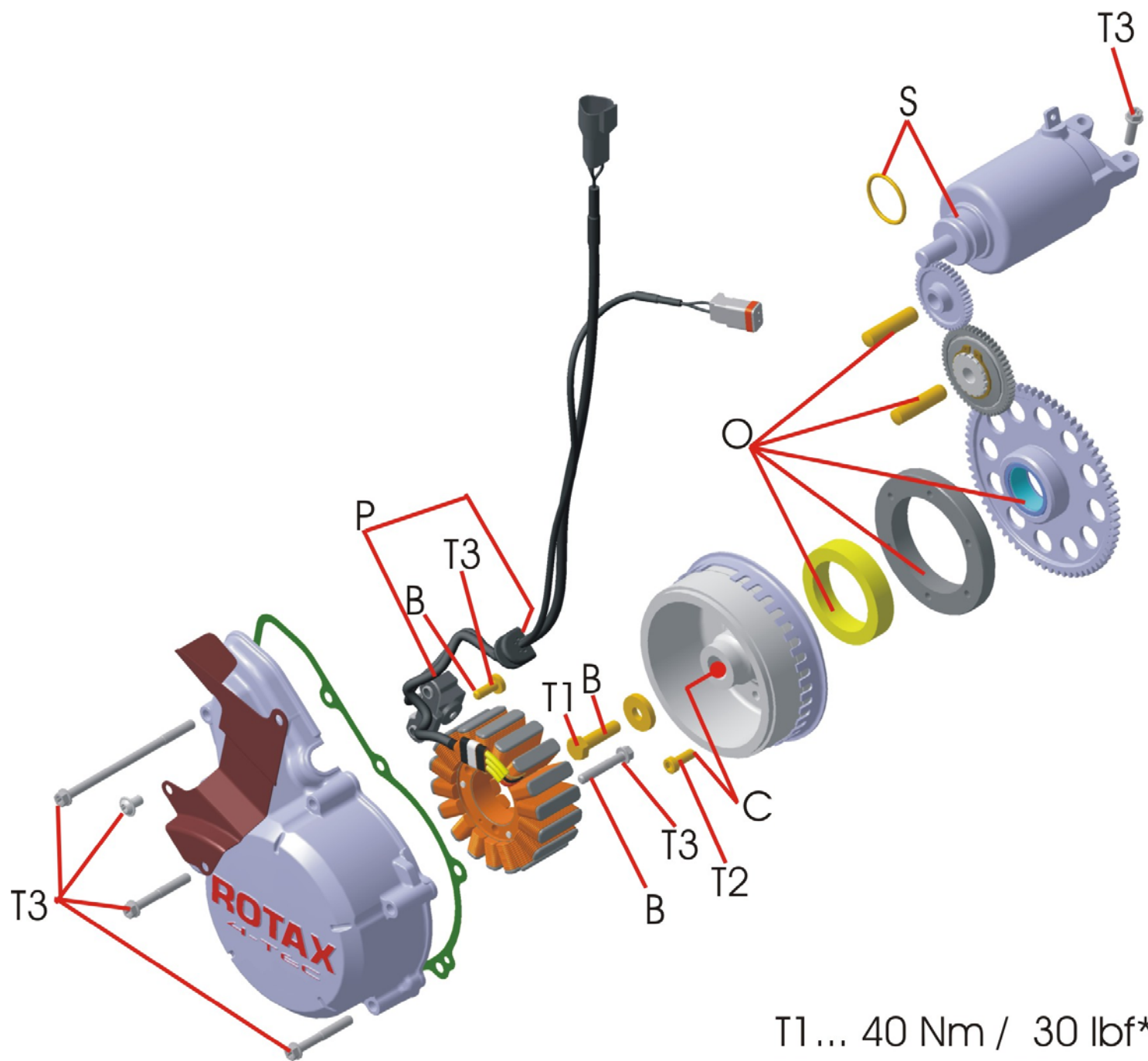
T2... 17 Nm / 13 lbf*ft

T3... 15 Nm / 133 lbf*in

T4... 10 Nm / 89 lbf*in

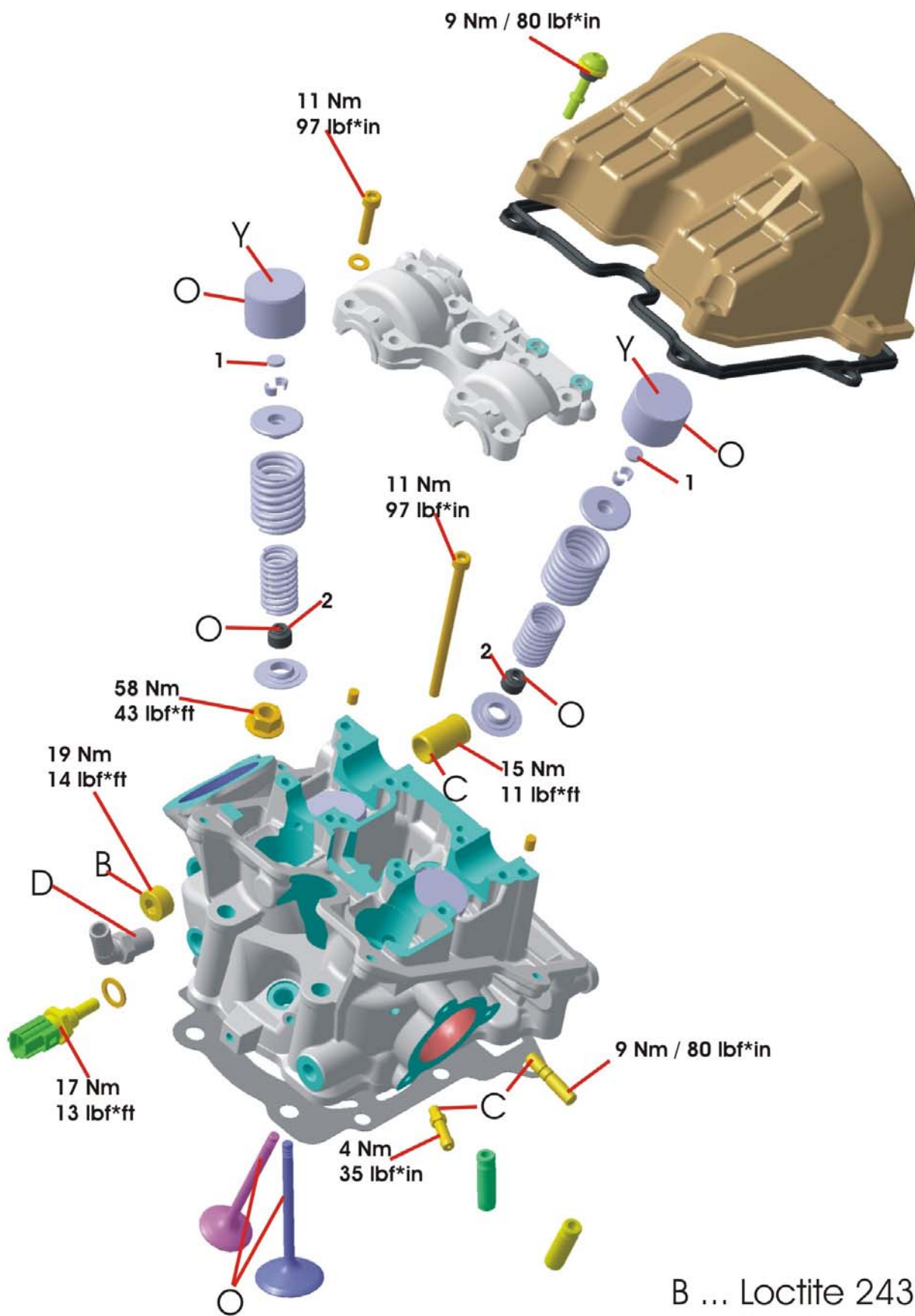
T5... 4 Nm / 35 lbf*in

O... Engine oil

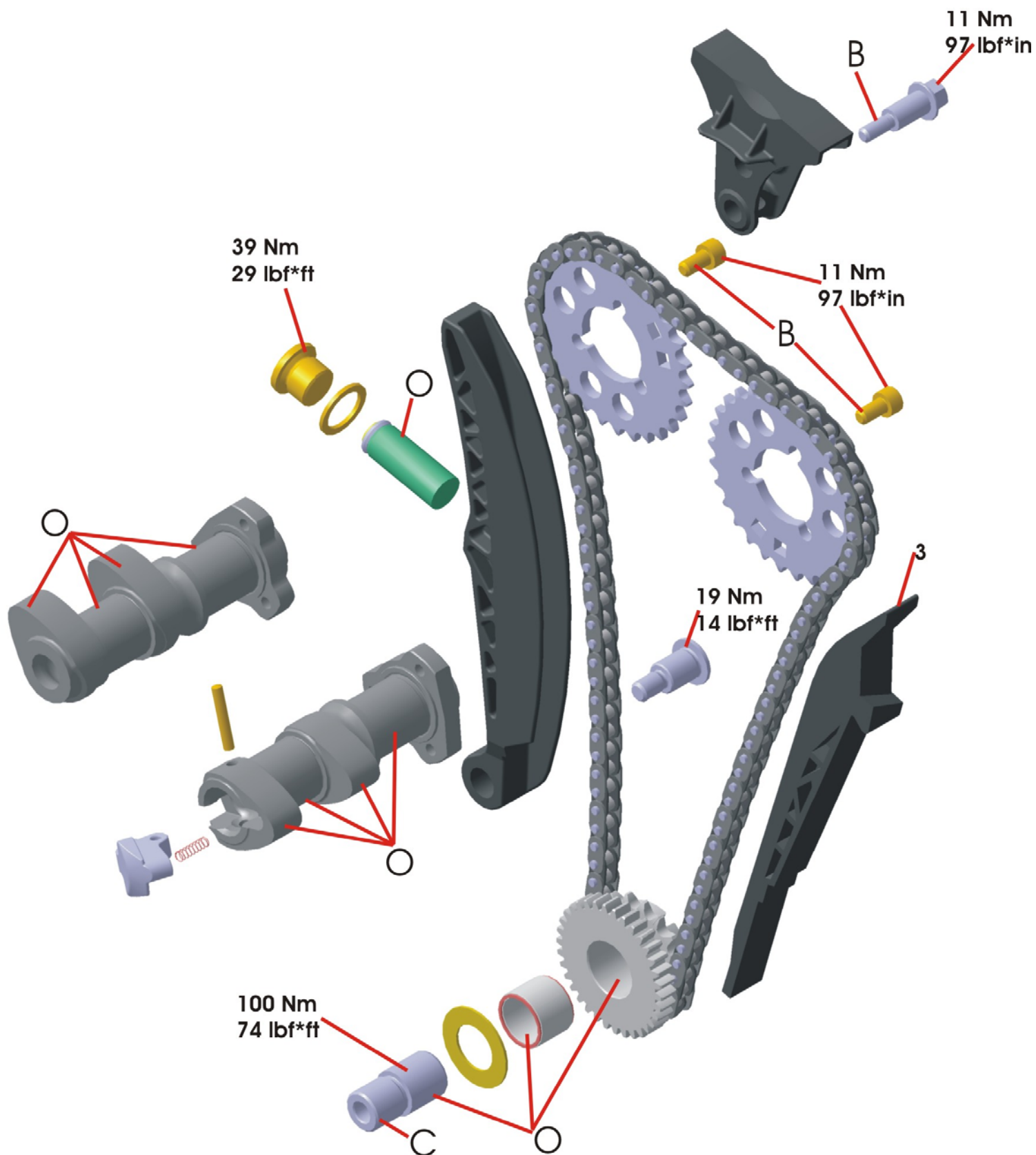


T1... 40 Nm / 30 lbf*ft
 T2... 14 Nm / 124 lbf*in
 T3... 10 Nm / 89 lbf*in

B ... Loctite 243
 C ... Loctite 648
 O... Engine oil
 P ... Loctite 5910
 S ... Copaslip

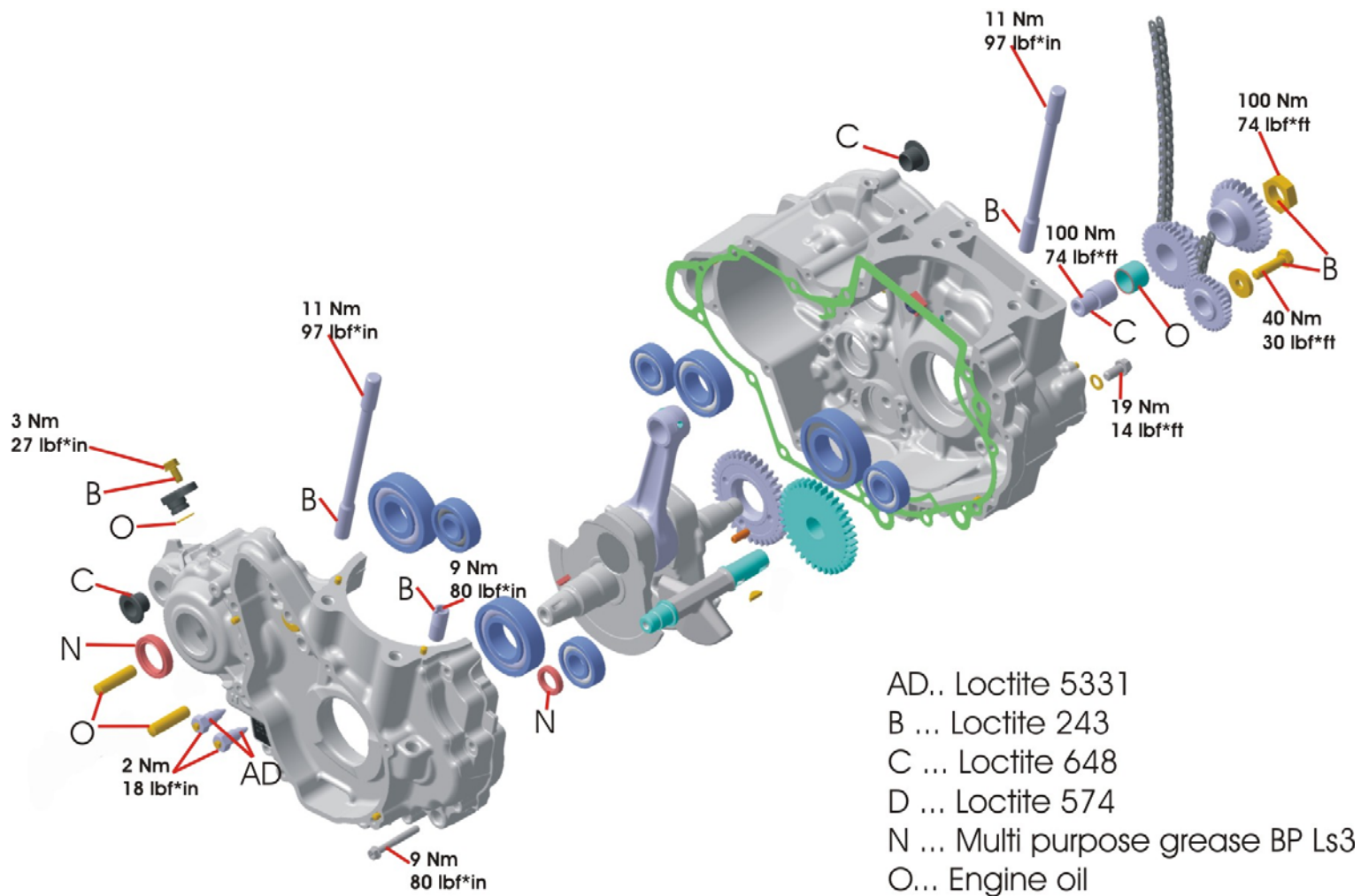


B ... Loctite 243
 C ... Loctite 648
 D ... Loctite 574
 O... Engine oil
 Y ... Klueber 46 MR 401

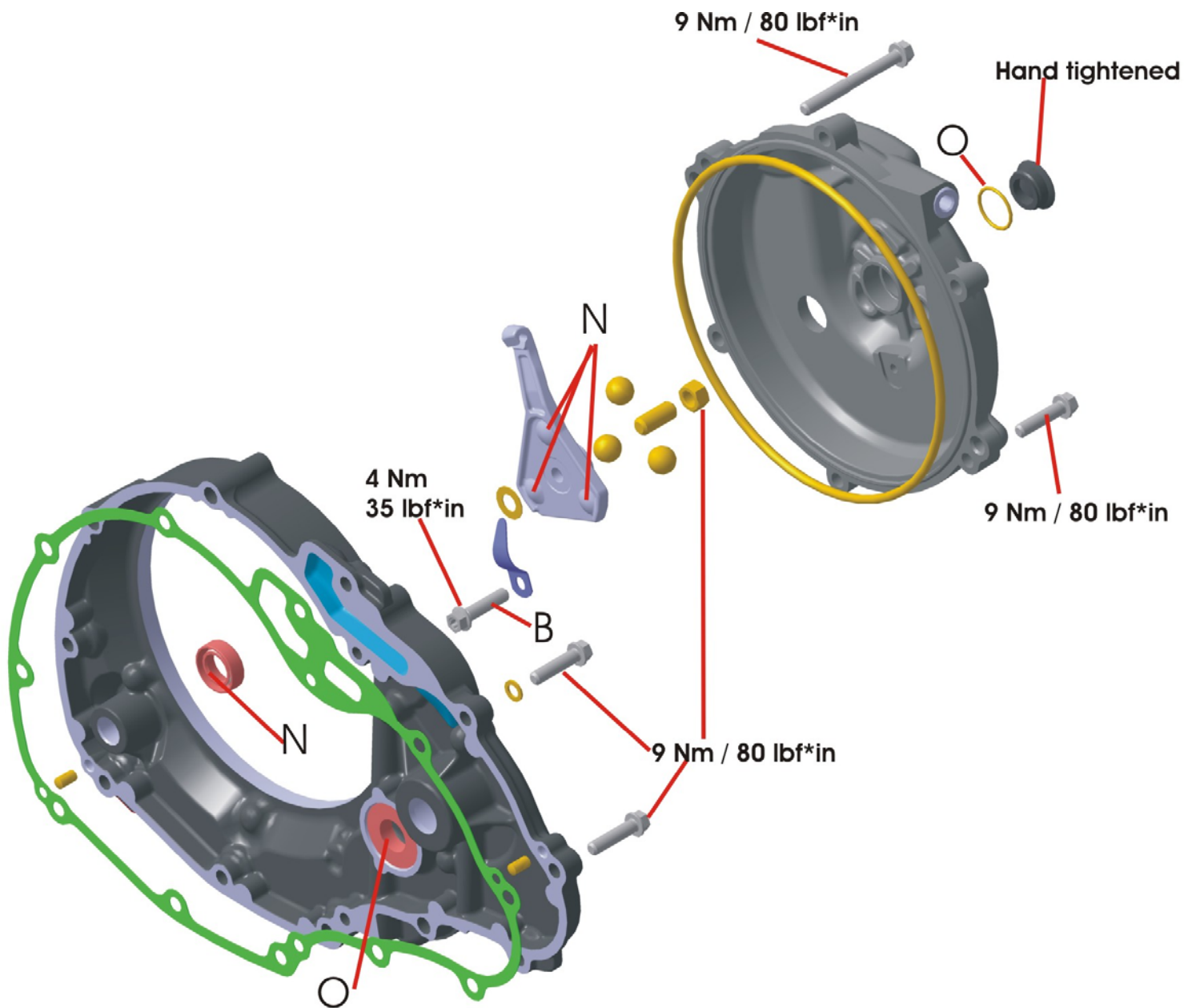


B ... Loctite 243
 C ... Loctite 648
 O... Engine oil



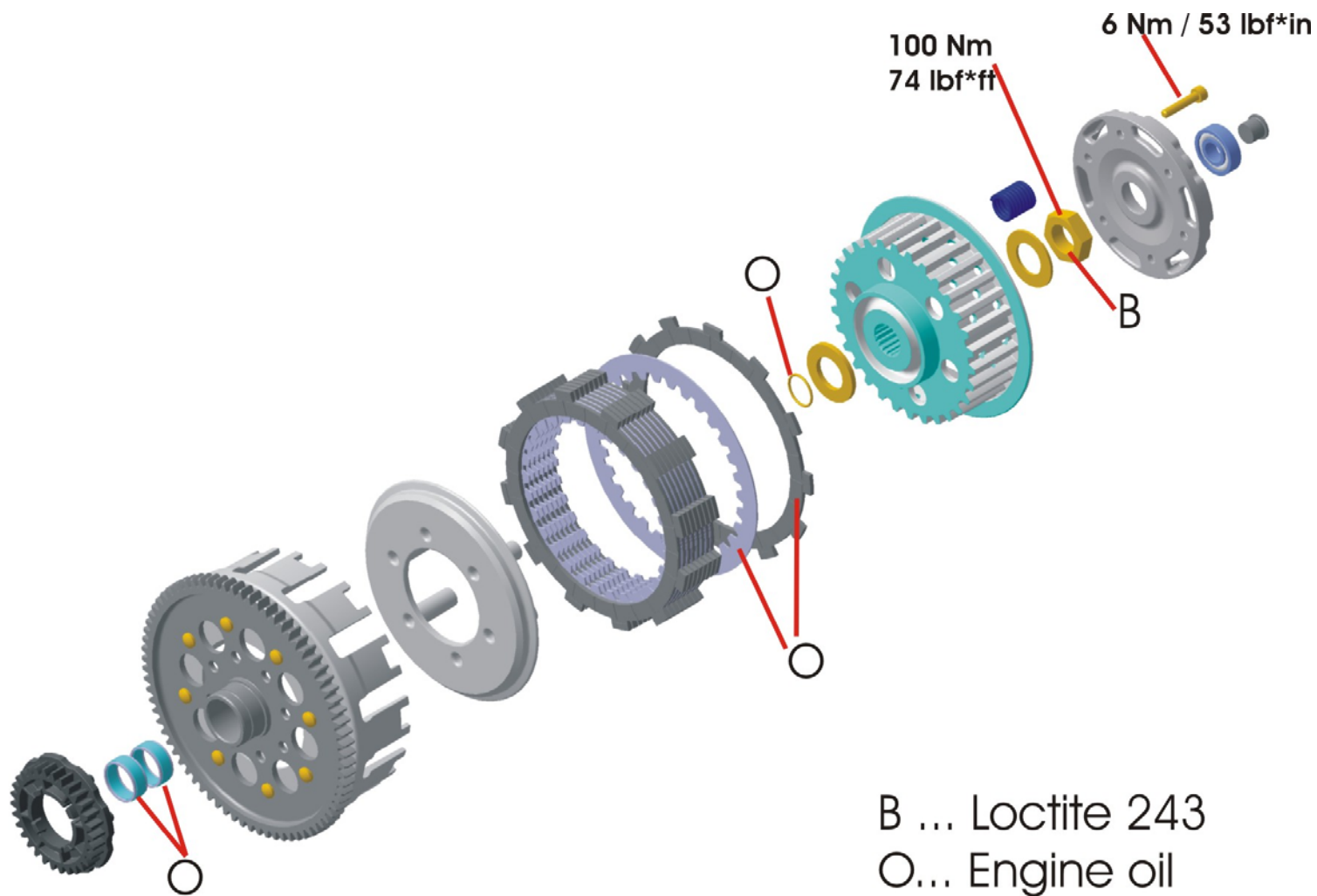


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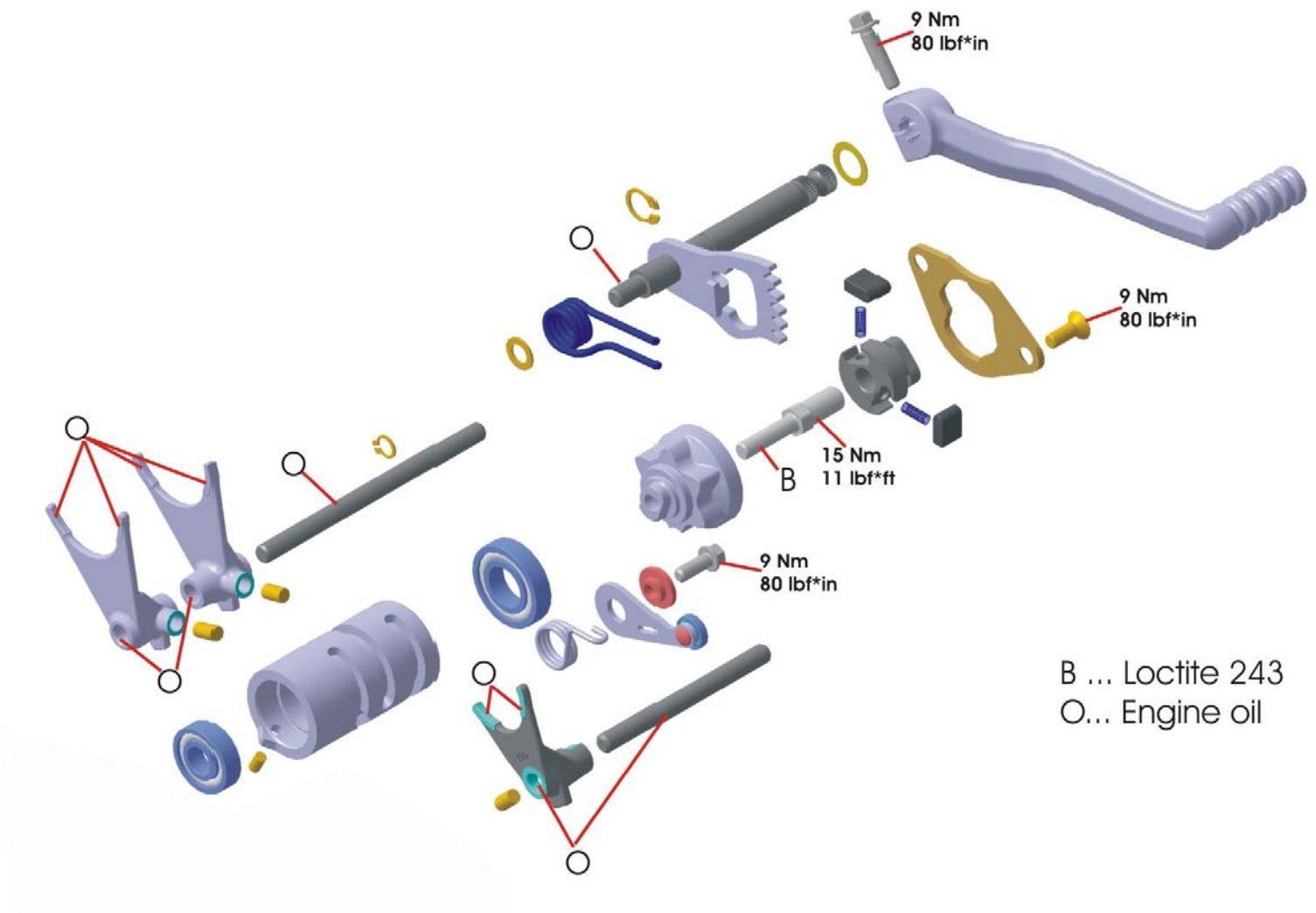


B ... Loctite 243
 N ... Multi purpose grease
 O... Engine oil

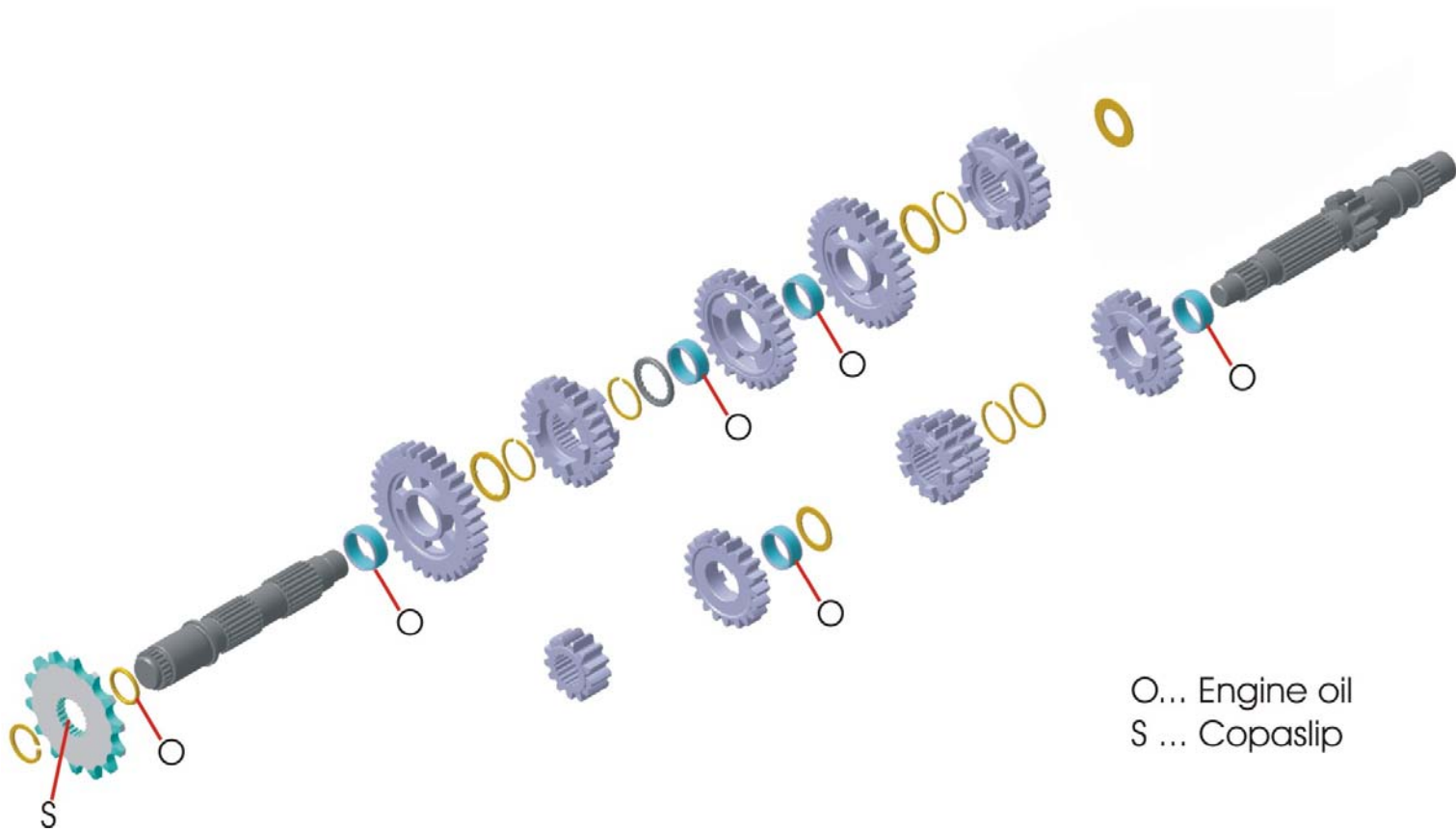
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vmr2008-018-002.jpg

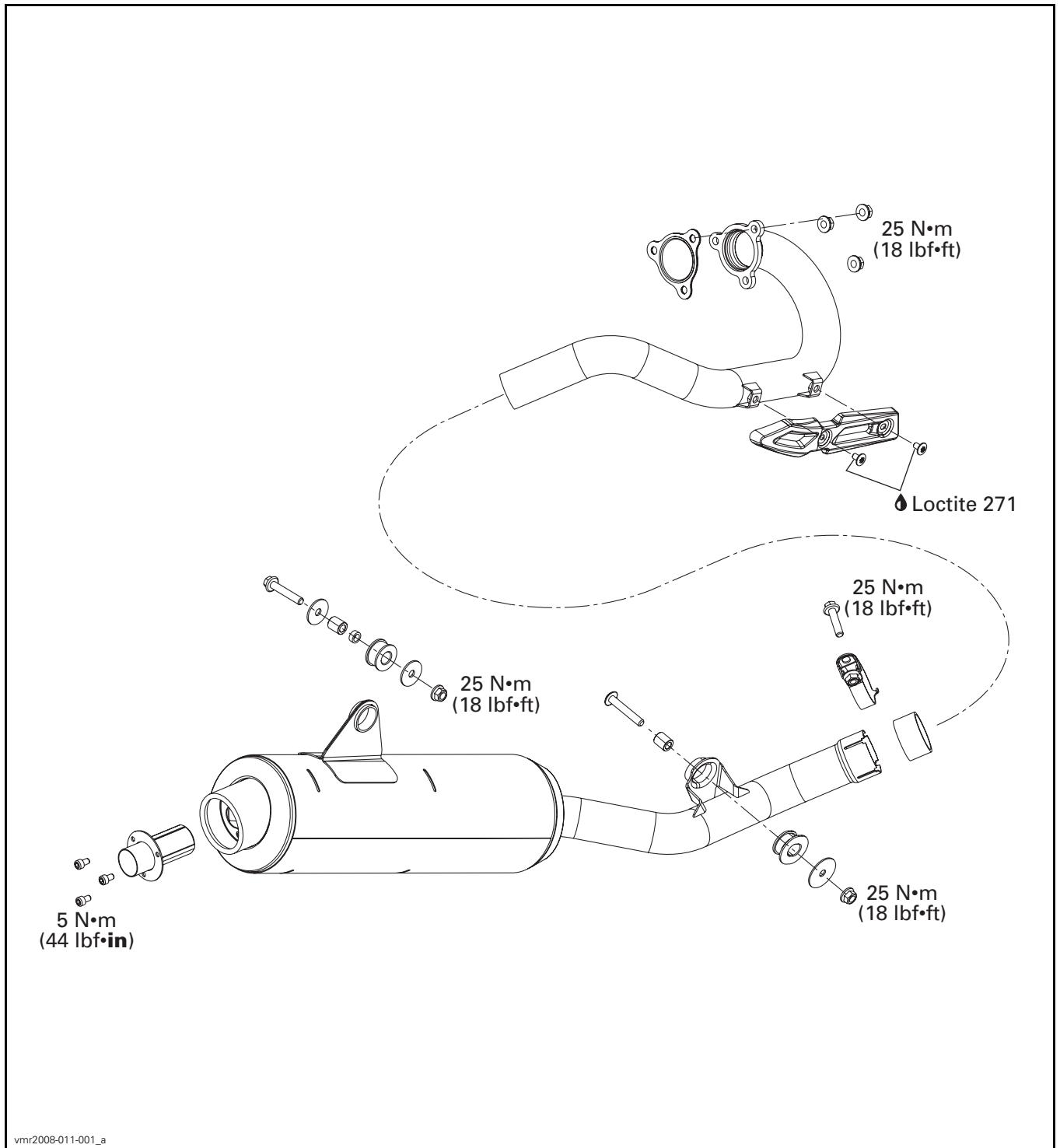


vmr2008-019-001.jpg



vmr2008-019-002.jpg

EXHAUST SYSTEM



DRAFT

GENERAL

⚠ WARNING

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

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

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

⚠ WARNING

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

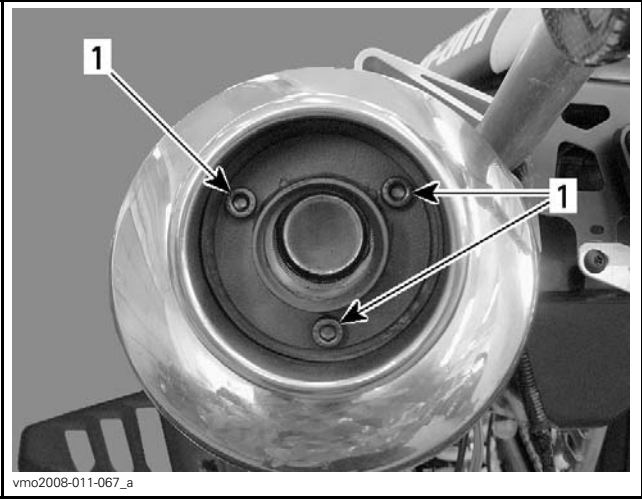
PROCEDURES

SPARK ARRESTER

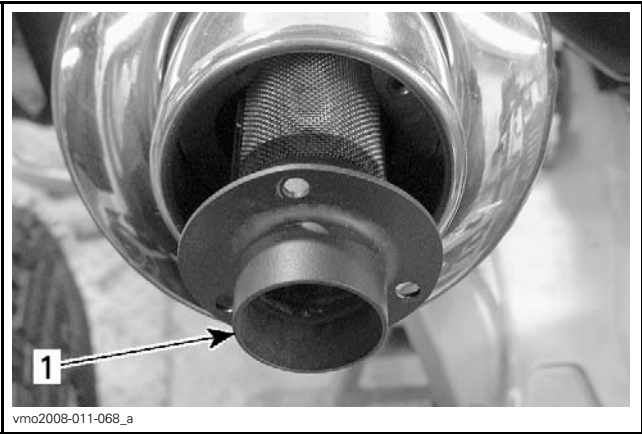
⚠ WARNING

Never perform this operation immediately after the engine has been run because exhaust system is very hot.

Remove the spark arrester from the muffler.



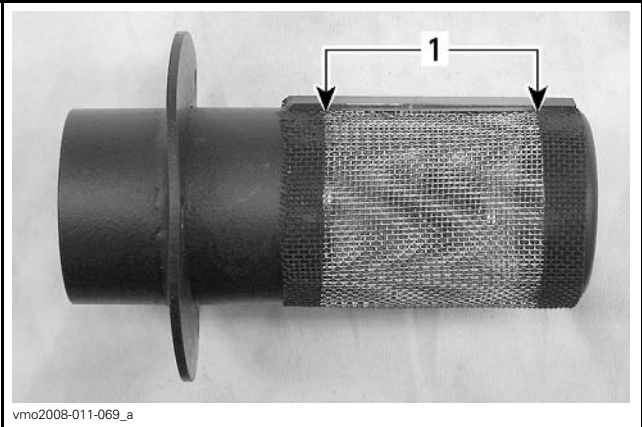
REMOVE
1. Screws



REMOVE
1. Spark arrester

Remove carbon deposits from the spark arrester using a brush.

NOTE: Use a soft brush and be careful to avoid damaging spark arrester.



CLEAN
1. Clean this portion

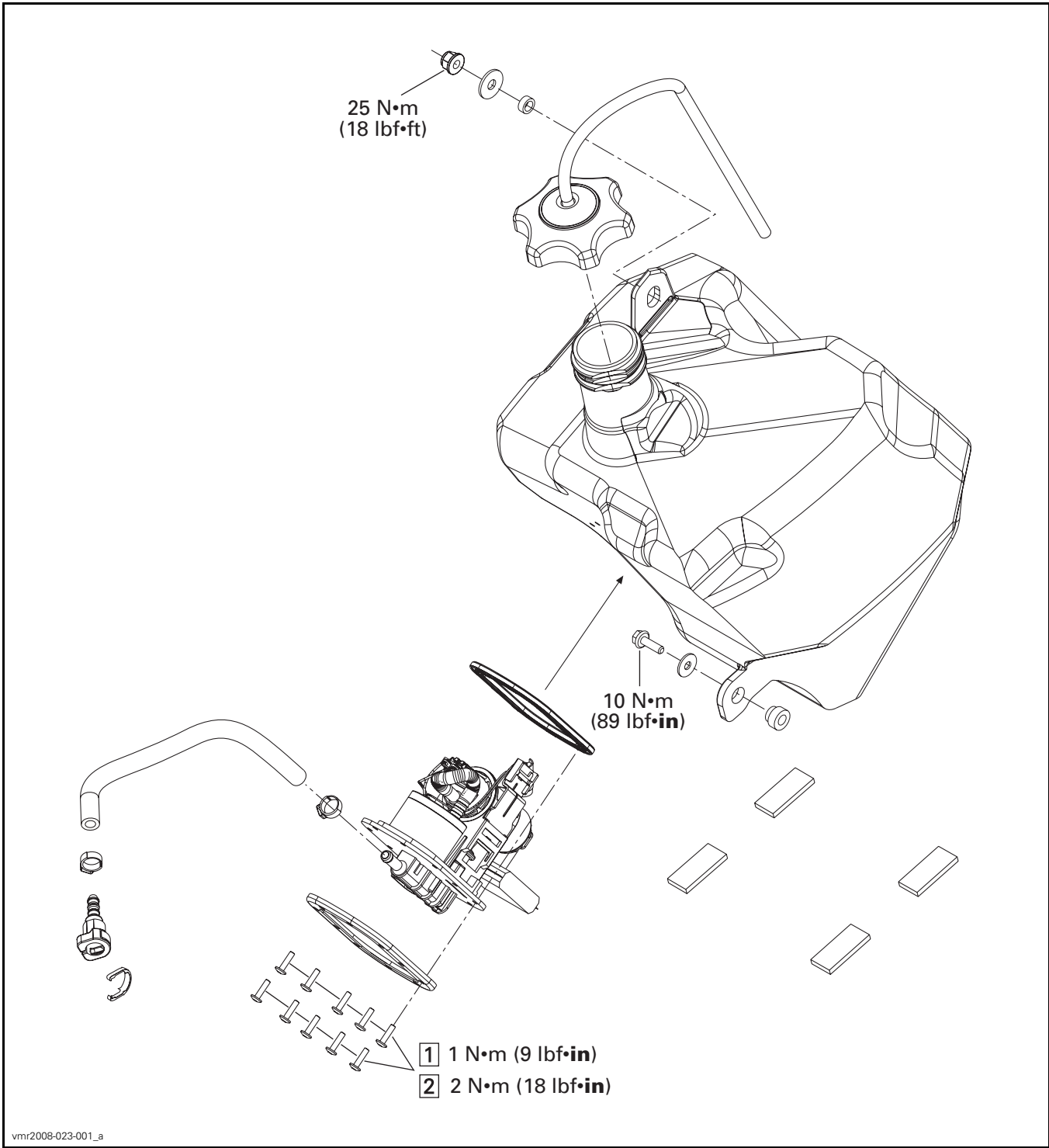
For installation, reverse the removal procedure.

FUEL TANK/FUEL PUMP

SERVICE TOOLS

Description	Part Number	Page
pliers	295 000 070	7
vacuum/pressure pump.....	529 021 800	3
pressure gauge.....	529 035 709	6
T-fitting	529 036 023	6





GENERAL

WARNING

Fuel is flammable and explosive under certain conditions. Ensure work area is well ventilated. Do not smoke or allow open flames or sparks in the vicinity.

WARNING

Always disconnect battery prior to working on the fuel system. Always disconnect battery exactly in the specified order, BLACK (-) cable first. It is recommended to disconnect electrical connections prior to disconnecting fuel lines.

Whenever working on fuel system, always verify for water or dust infiltration in reservoir.

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

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

WARNING

Torque wrench tightening specifications must 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.

WARNING

The fuel system of a fuel injection system holds much more pressure than on a carbureted ATV. Prior to disconnecting a hose or to removing a component from the fuel system, follow the recommendation described here.

- Use the B.U.D.S. software to release the fuel pressure in the system. Look in the **Activation** section.

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. Proceed with care when removing/installing pressure test equipment or disconnecting fuel line connections. Use the B.U.D.S. software to release fuel pressure prior to removing a hose. Cover the fuel line connection with an absorbent shop rag. Slowly disconnect the fuel hose to minimize spilling. Wipe off any fuel spillage in the engine compartment. Do not allow fuel to spill on hot engine parts and/or on electrical connectors. Never use a hose pincher on injection system high pressure hoses. Replace any damaged or deteriorated fuel lines.

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 section.

WARNING

Always perform the fuel pressure test if any component has been removed. A pressure test must be done before turning the ignition key to ON and setting the engine run/stop switch to RUN. The fuel pump is activated each time in these conditions. After performing a fuel pressure test, use the valve on the fuel pressure gauge to release the pressure (if so equipped).

To locate a leak, pressurize the system. Check for leaking fuel or fuel odor. Spray soapy water on all hose connections and injectors. Air bubbles will show the leaking area.

INSPECTION

FUEL TANK LEAK TEST

WARNING

Ensure to also perform the fuel pressure test.

Fill up fuel tank.

Using the vacuum/pressure pump (P/N 529 021 800), pressurize fuel tank through vent line on tank cap.

Subsection XX (FUEL TANK/FUEL PUMP)



Pressurize fuel tank as follows.

PRESSURE	TIME WITHOUT PRESSURE DROP
21 kPa (3 PSI)	3 minutes

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

To ease locating leak(s), spray soapy water on components; bubbles will indicate leak location(s).

FUEL PRESSURE TEST

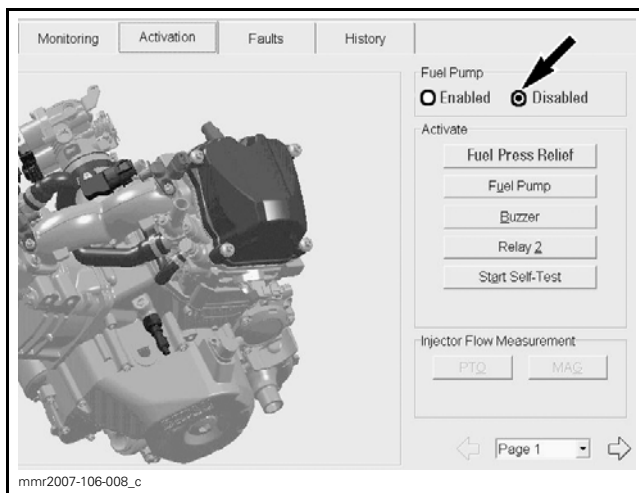
The pressure test will show the available pressure at the fuel pump outlet. It validates the pressure regulator, the fuel pump and leaks in the system.

NOTE: Refer also to the *FUEL SYSTEM DIAGNOSTIC FLOW CHART* at the end of this section to help diagnose a fuel system related problem.

Ensure there is no leak from hoses and fittings. Repair any leak.

Before proceeding to the pressure test ensure the battery is fully charged. Battery voltage must be over 12 volts.

Disable fuel pump using B.U.D.S. Look in the **Activation** tab and select **Disabled**.



Release fuel pressure by running engine until it runs out of gas.

WARNING

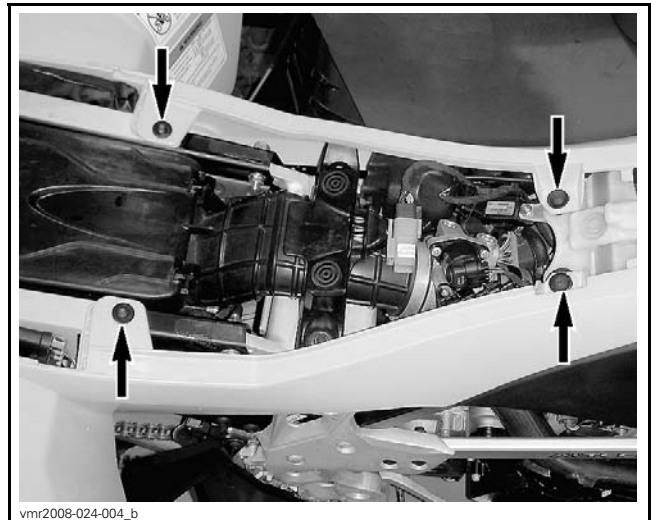
The fuel hose may be under pressure. Cover the fuel line connection with an absorbent shop rag. Slowly disconnect the fuel hose to release the pressure. Wipe off any fuel spillage inside engine compartment.

Ensure there is enough gas in fuel tank.

Remove screws of front fender ass'y as shown.



RH SIDE



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LH SIDE

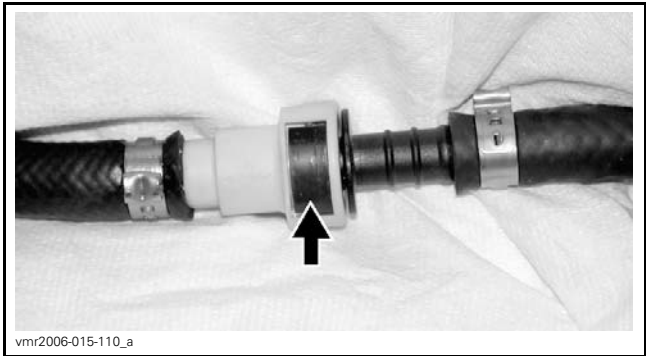
Remove coolant tank retaining screw.

Subsection XX (FUEL TANK/FUEL PUMP)

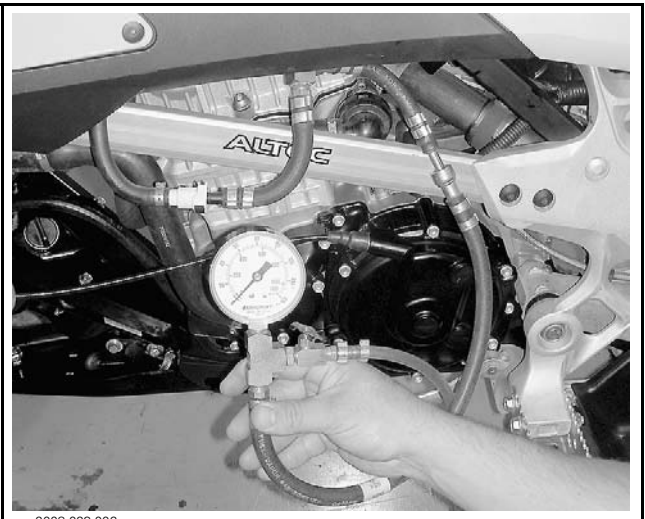


Carefully pull side panels apart just enough to allow withdrawal of coolant tank. Move tank away to make room.

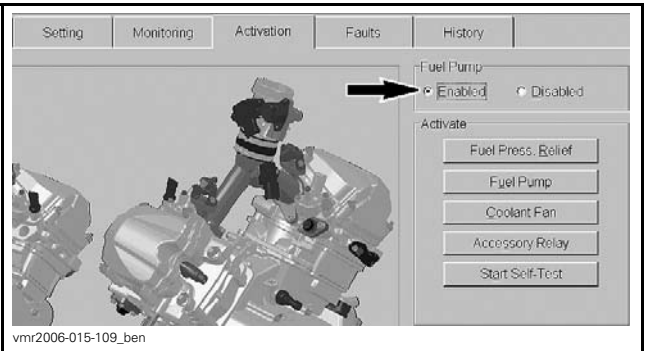
Disconnect fuel outlet hose.



Install fuel pressure gauge (P/N 529 035 709) and T-fitting (P/N 529 036 023) between disconnected hoses (in-line installation).



Using B.U.D.S., reactivate fuel pump by selecting **Enabled**.



Turn ignition key ON and set engine run/stop switch to RUN and observe fuel pressure. Turn ignition key off then back on. Repeat the test.

FUEL PRESSURE	350 kPa (51 PSI)
---------------	------------------

A rapid pressure drop indicates leakage either from the fuel rail or from the fuel pump check valve. Check fuel rail for leaks. If it is not leaking then replace fuel pump.

A slow pressure drop indicates leakage either from the fuel injector or from the fuel pressure regulator. Check fuel injector for leaks. If it is not leaking then replace fuel pump.

If there is no leakage, **start engine** and observe fuel pressure. The fuel pressure should be the same as above.

If pressure is within limits, fuel pump and pressure regulator are working adequately.

Release fuel pressure in the system using B.U.D.S. Look in the **Activation** tab.

Remove pressure gauge from inlet hose. Reconnect inlet hose.

⚠ WARNING

Wipe off any fuel spillage. Fuel is flammable and explosive under certain conditions. Always work in a well ventilated area.

Reinstall removed parts.

PROCEDURES

FUEL HOSE AND OETIKER CLAMPS

Fuel Hose Replacement

When replacing fuel hoses, be sure to use hoses and clamps as available from BRP parts department. This will ensure continued proper and safe operation.

⚠ WARNING

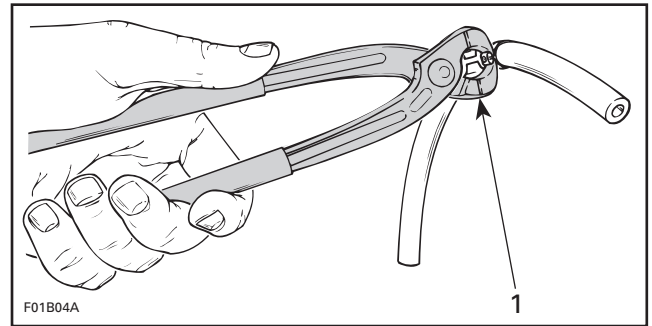
Use of improper fuel lines could compromise fuel system integrity.

⚠ WARNING

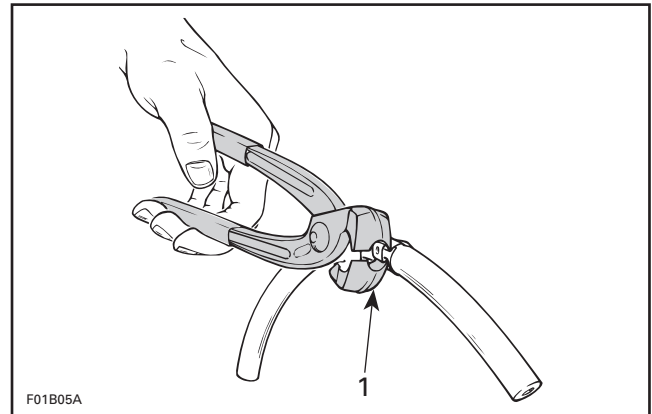
Whenever removing a hose in the fuel system, always use new Oetiker clamps at assembly. Then, validate fuel tightness by performing a fuel pressure test.

Oetiker Clamp Replacement

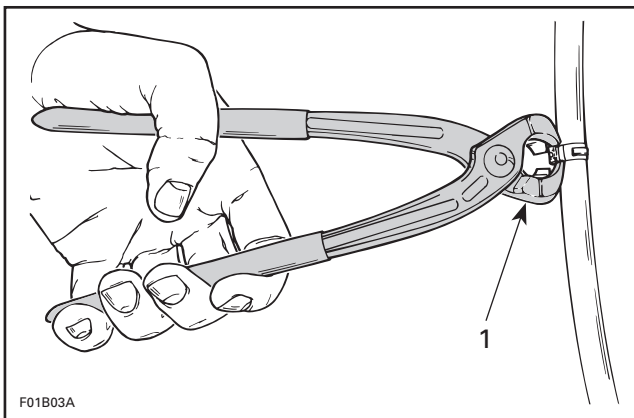
To secure or cut Oetiker clamps no. 3 on fuel lines, use pliers (P/N 295 000 070).



1. Securing clamp

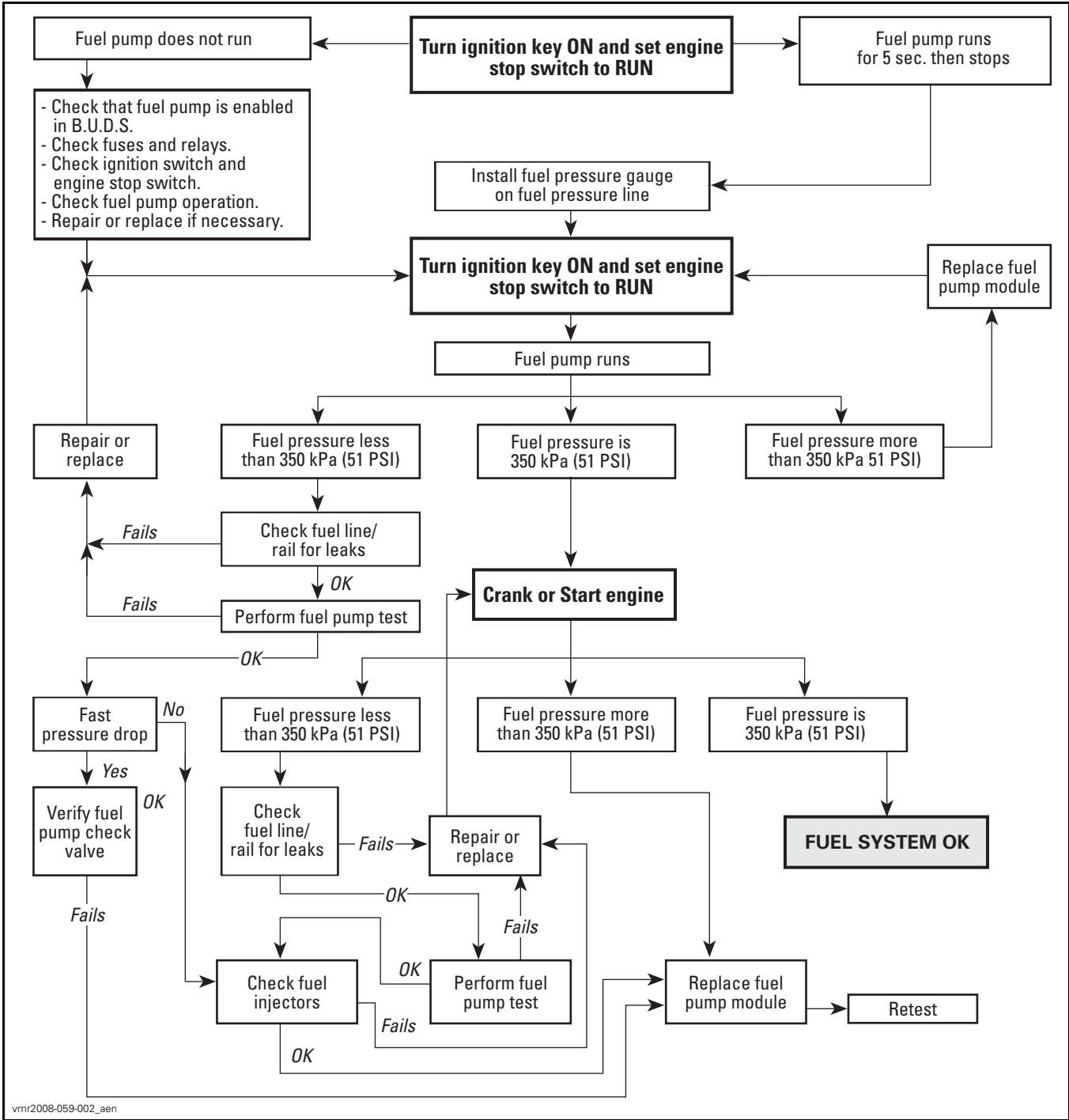


1. Securing clamp in limited access



1. Cutting clamp

FUEL SYSTEM DIAGNOSTIC FLOW CHART



IGNITION SYSTEM

SERVICE TOOLS

Description	Part Number	Page
feeler gauge.....	Not sold by BRP	2

SERVICE PRODUCTS

Description	Part Number	Page
heat-sink paste P12	420 897 186	2

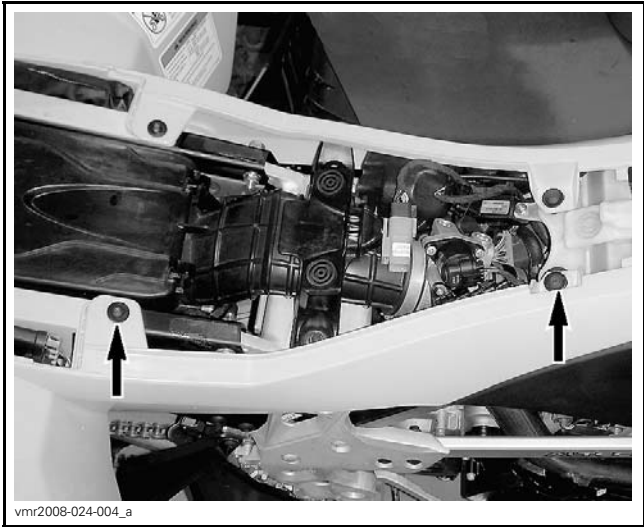
IGNITION TIMING

There is no timing adjustment to perform.

SPARK PLUG

DISASSEMBLY

Remove screws of front fender ass'y as shown.



Raise side panel and unplug the spark plug cables.



FENDER ASS'Y REMOVED FOR CLARITY PURPOSE ONLY

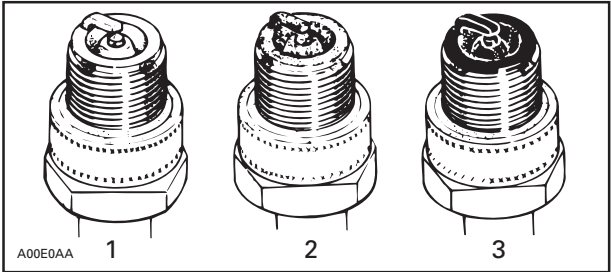
Unscrew the spark plugs one turn.
Clean the spark plugs and cylinder head with pressurized air then completely unscrew.

DRAFT

FOULING

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, or running on a too rich mixture due to abuse of choke, a clogged air filter, a faulty carburetor adjustment, incorrect fuel, defective ignition system, incorrect ignition timing, 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)

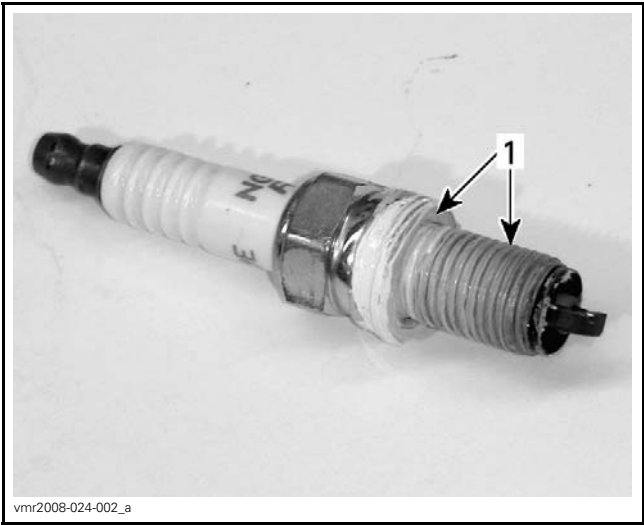
The plug face reveals the condition of the engine, operating condition, method of driving and fuel mixture. For this reason it is advisable to inspect the spark plug at regular intervals, examining the plug face (i.e. the part of the plug projecting into the combustion chamber).

SPARK PLUG INSTALLATION

CAUTION: Always use the recommended spark plug.

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

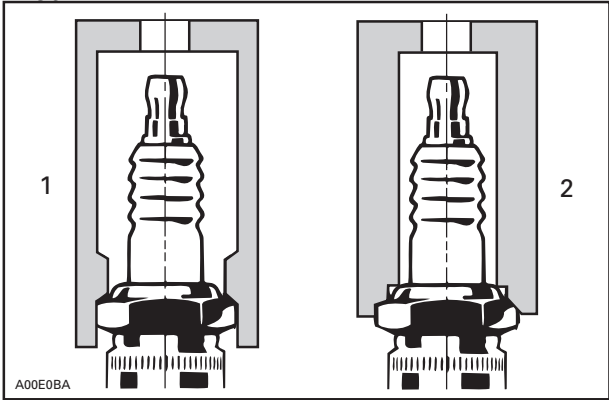
- Using a feeler gauge, set electrode gap properly. Refer to *TECHNICAL SPECIFICATIONS*.
- Apply heat-sink paste P12 (P/N 420 897 186) on the spark plug threads and gasket to allow proper cooling of spark plug.



1. Heat-sink paste here

CAUTION: Not applying the heat-sink paste would cause premature spark plug failing.

- Hand screw spark plug into cylinder head and tighten with a torque wrench and a proper socket.



1. Proper socket
2. Improper socket

- Torque spark plug to 19 N•m (168 lbf•in). Secure front fender ass'y.

LUBRICATION SYSTEM

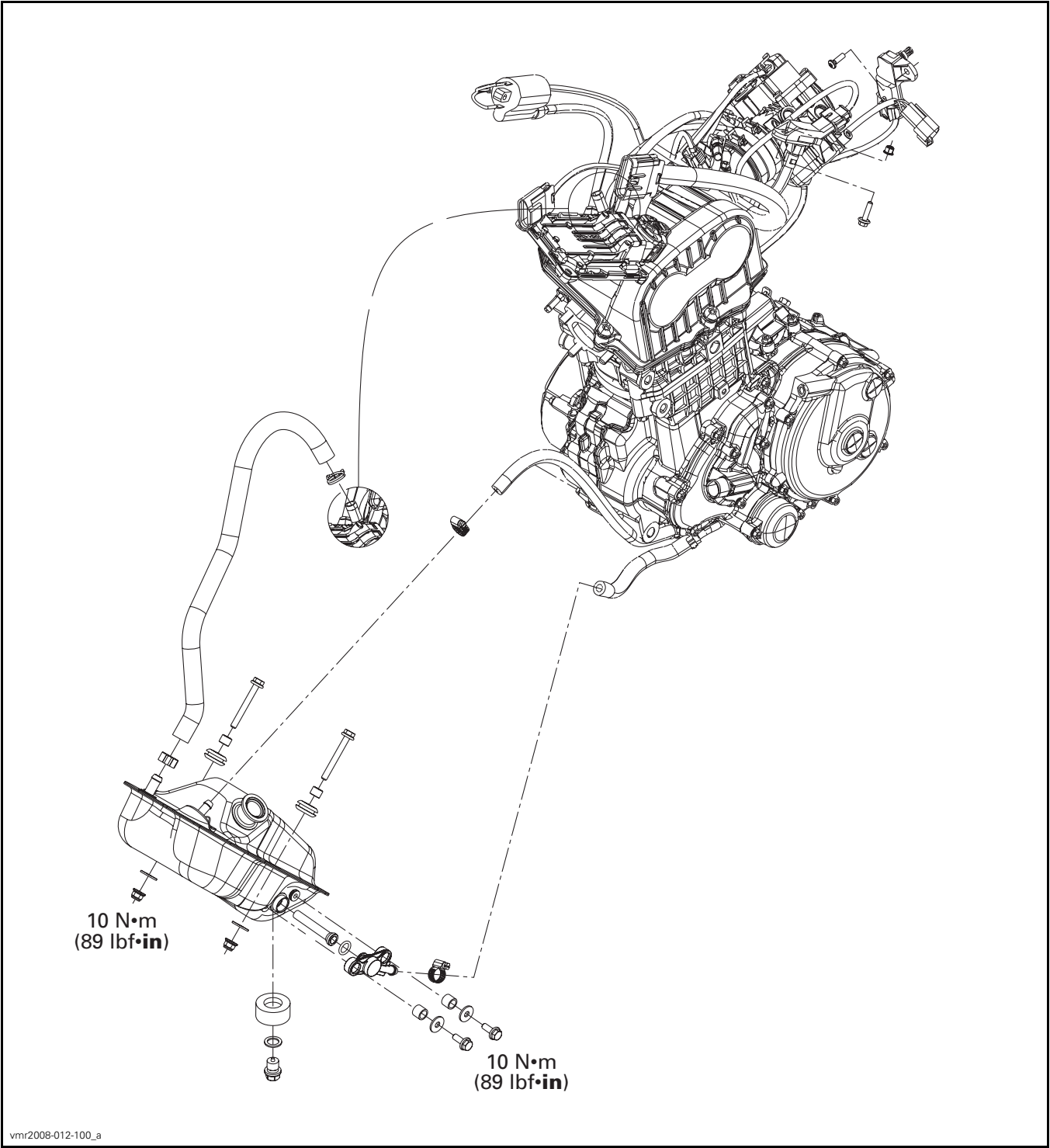
SERVICE TOOLS

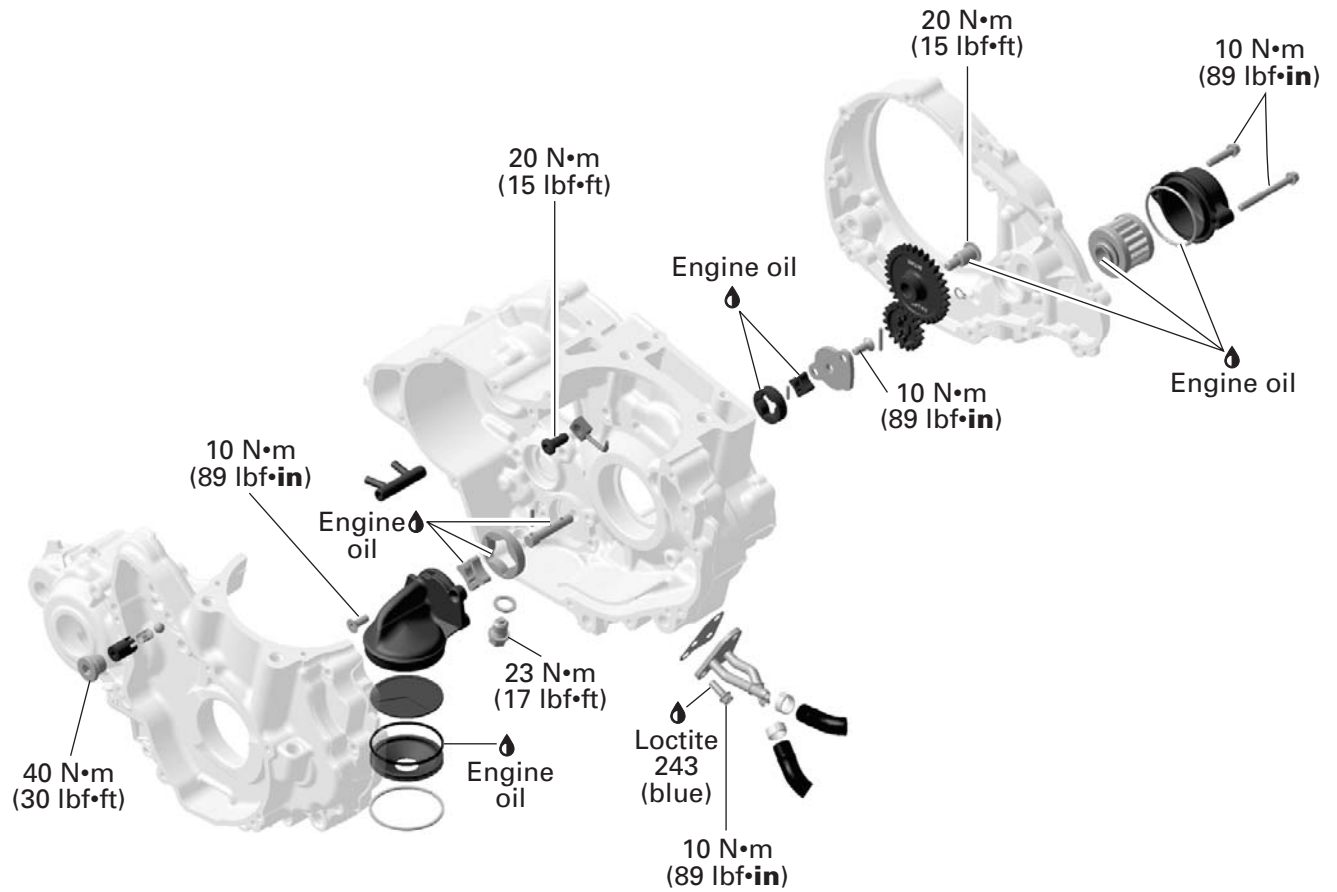
Description	Part Number	Page
hose adapter.....	529 035 652	7
oil pressure gauge	529 035 709	7
engine oil pressure adapter	529 036 079	7
feeler gauge.....	Not sold by BRP	12

SERVICE PRODUCTS

Description	Part Number	Page
Loctite 243.....	293 800 060	9

DRAFT





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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 (ex: locking tabs, elastic stop nuts, self-locking fasteners, cotter pin, etc.) must be replaced with new ones.

MAINTENANCE

ENGINE/TRANSMISSION OIL

Recommended Oil

Use a **10W40** 4-stroke mineral-based engine oil that meets the requirements for API service classification SL or SJ. Always check the API service label on the oil container, it must contain at least one of the above standards.

CAUTION: Never use an engine oil with the API SM or ILSAC GF-4 classification, using these oils in Can-Am ATV wet clutch equipped vehicles will create clutch slippage.

NOTE: The XP-S 10W40 4-stroke oil (P/N 219 700 346) sold by BRP meets those requirements.

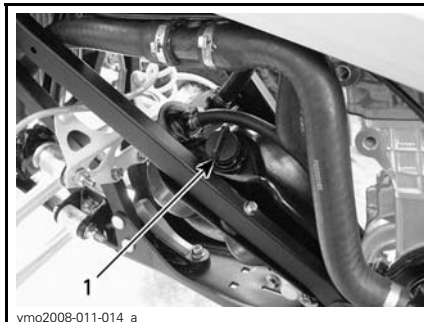
Synthetic Oil

For improved overall performance and all season application, use XP-S 5W40 synthetic oil (P/N 293 600 039). This is a special synthetic oil formulated for wet clutch type gear box.

CAUTION: Do not use other synthetic oil, synthetic blend oil or oil additives in Can-Am ATV wet clutch equipped vehicles.

Engine/Transmission Oil Level

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

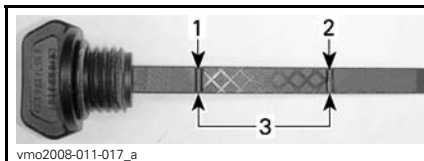


LH SIDE OF VEHICLE

1. Oil tank dipstick

With vehicle on a level surface, start engine and let it running at idle, around 1 minute, then stop engine. Check oil level as follows:

1. Unscrew dipstick out and wipe clean.
2. Screw dipstick until it bottoms.
3. Remove dipstick and check oil level. It should be near or equal to the upper mark.



1. Full
2. Add
3. Operating range

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

Add a small amount of oil and recheck oil level.

Repeat the operation until oil level reaches the dipstick's upper mark. **Do not overfill.**

Properly tighten dipstick.

Oil Change

Prior to changing the engine oil, ensure vehicle is on a level surface and engine is warm.

WARNING

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

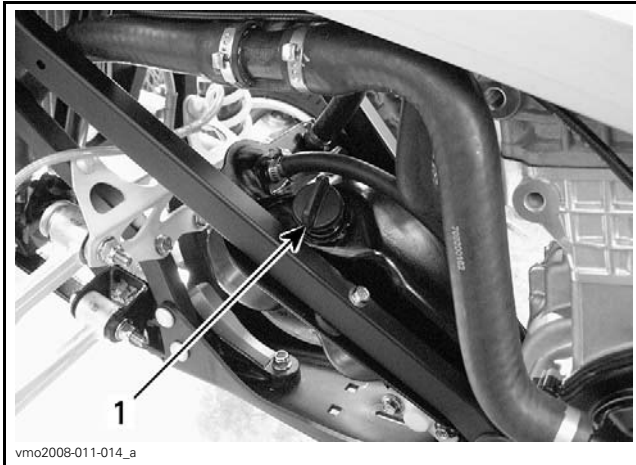
Oil and oil filter must be replaced at the same time.

NOTE: Clean oil tank strainer if necessary. Refer to *MAINTENANCE CHART*.

Dispose oil and filter as per your local environmental regulations.

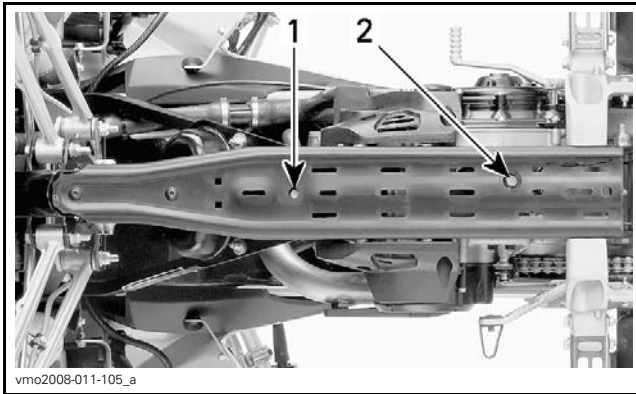
Oil Drain

Remove oil tank cap.



1. Engine/transmission oil tank cap

Clean drain plugs area.



UNDERNEATH VIEW OF VEHICLE

1. Oil tank drain plug
2. Engine drain plug

Place a drain pan under oil tank.

Remove oil tank drain plug.

Move drain pan under engine drain plug.

Remove engine drain plug.

NOTE: Allow enough time for oil to flow out.

Remove oil filter. Refer to *OIL FILTER*.

Oil Inspection

Oil condition gives information about the engine condition. See *TROUBLE SHOOTING* section.

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

Oil fill

Wipe out any oil spillage on frame.

Clean gasket areas on engine and drain plugs.

Always install new gasket rings on engine drain plugs.

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

Install drain plugs.

Torque drain plugs to 23 N•m (17 lbf•ft).

Refill oil tank at the proper level with the recommended oil.

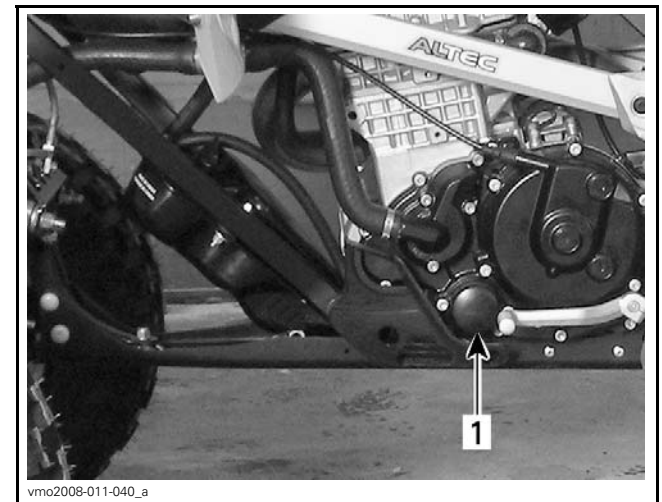
Reinstall oil dipstick in oil tank.

Start engine and let idle for a few minutes.

Ensure there are no leaks.

Stop engine and check oil level. Refill as necessary.

OIL FILTER



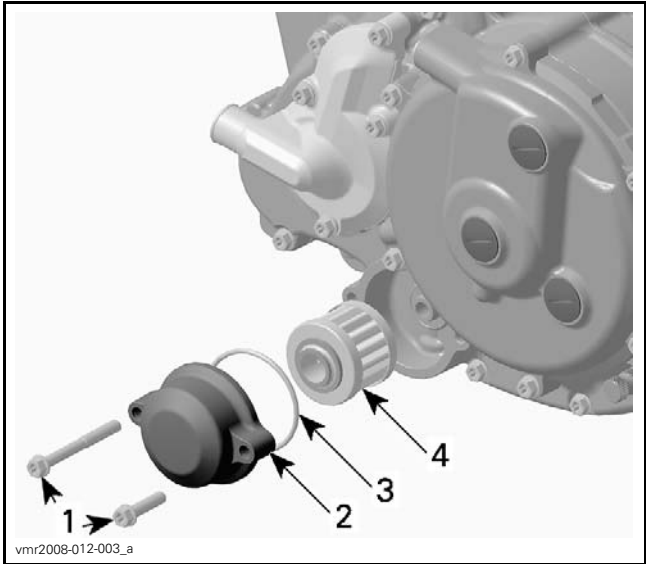
LH SIDE OF VEHICLE

1. Oil filter

Oil Filter Removal

Remove:

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

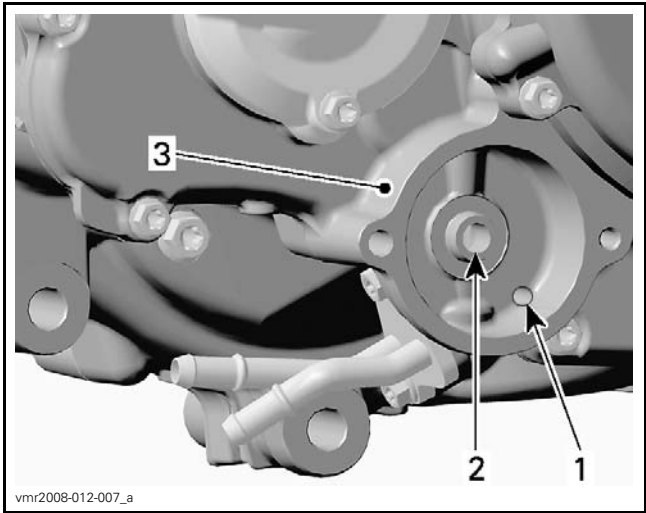


- 1. Oil filter screws
- 2. Oil filter cover
- 3. O-ring
- 4. Oil filter

NOTE: Allow enough time for oil to flow out of oil filter.

Oil filter Inspection

Check the oil filter inlet and outlet area in the clutch cover for dirt and contaminations.



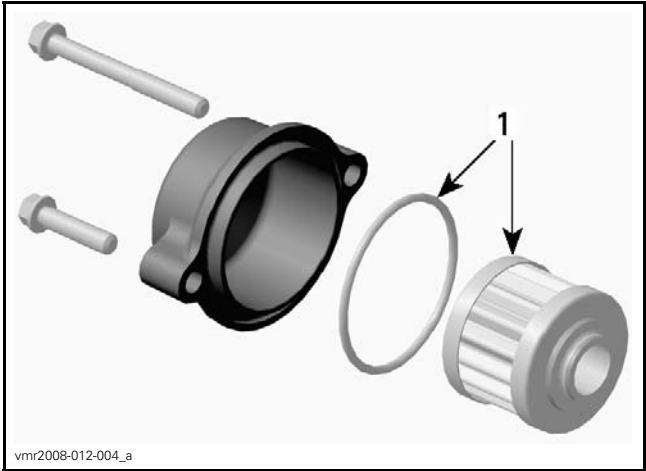
- 1. Oil inlet bore from the oil pressure pump
- 2. Oil outlet bore to the engine lubrication system
- 3. Clutch cover

Oil filter Installation

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

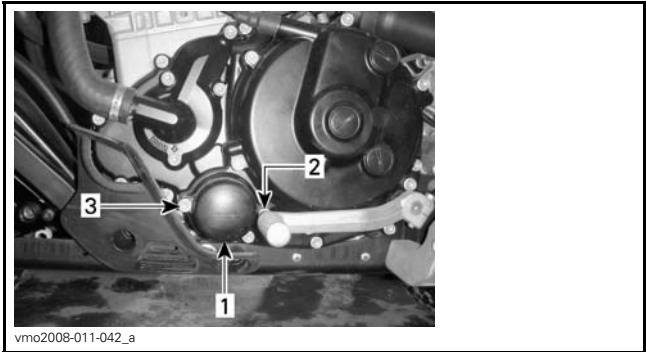
Install a new O-ring on oil filter cover.

To ease assembly and prevent displacement of the O-ring during installation, slightly oil filter and O-ring, refer to following illustration.



- 1. Slightly oil

Install proper screw length as shown.



- 1. Oil filter cover
- 2. Screw 25 mm
- 3. Screw 55 mm

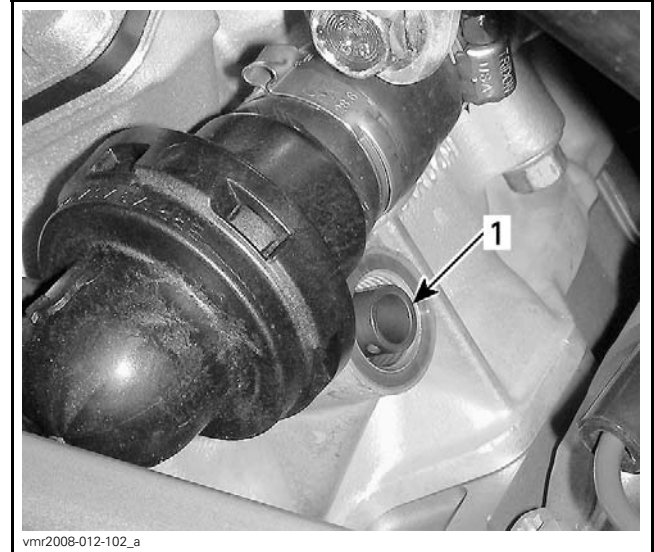
Refill engine with oil. Refer to *OIL CHANGE*.

INSPECTION

ENGINE OIL PRESSURE

The engine oil pressure test should be done with a warm engine (80 °C (176 °F) engine oil temperature) and with the recommended oil at the proper level.

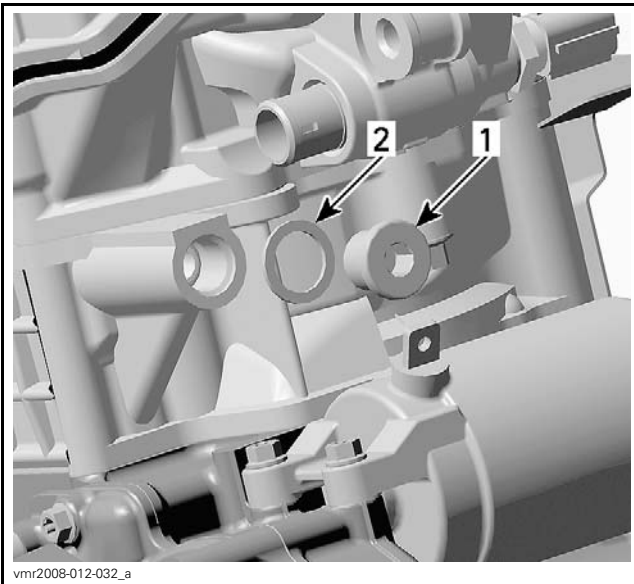
From LH side of vehicle, remove the plug screw and gasket ring of the timing chain tensioner.



1. Timing chain tensioner in position

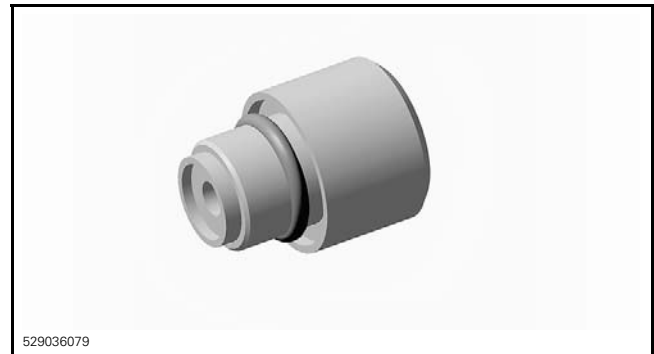
CAUTION: Do not remove timing chain tensioner.

Install the engine oil pressure adapter (P/N 529 036 079) on hose adapter (P/N 529 035 652)

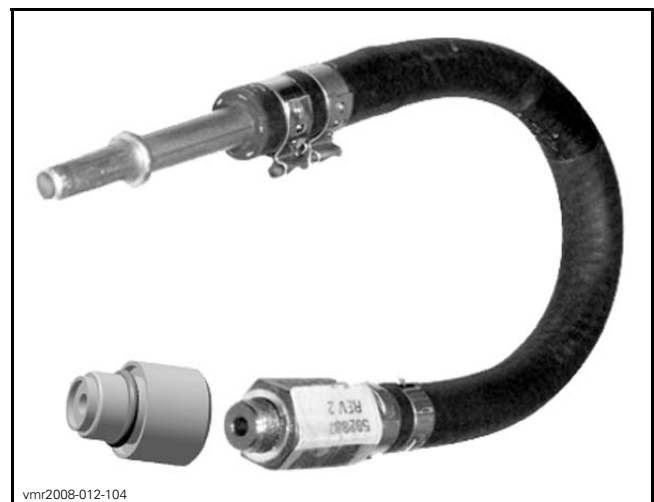


1. Plug screw of timing chain tensioner
2. Gasket ring

Keep timing chain tensioner in position.



ENGINE OIL PRESSURE ADAPTER



ENGINE OIL PRESSURE ADAPTER WITH HOSE ADAPTER

Install hose adapter on oil pressure gauge (P/N 529 035 709).



The engine pressure should be 80 kPa (12 PSI) minimum at idle and 200 kPa (29 PSI) at 5000 RPM.

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

After engine oil pressure test, reinstall chain tensioner plug screw and gasket ring and torque to 40 N•m (30 lbf•ft).

PROCEDURES

OIL TANK STRAINER

The oil tank strainer is located on LH side of oil tank .

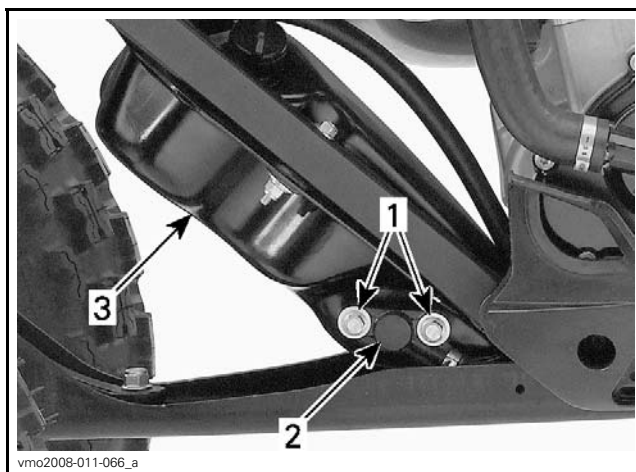
Oil Tank Strainer Removal

Ensure vehicle is on a level surface.

Drain oil tank.

Remove hose from oil tank outlet fitting.

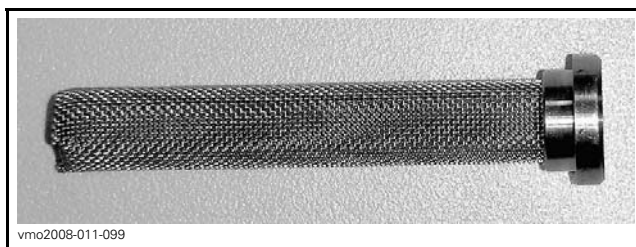
Remove bolts retaining oil tank outlet fitting.



LH SIDE OF VEHICLE

1. Retaining bolts
2. Tank outlet fitting
3. Oil tank

Remove oil tank strainer behind outlet fitting.



STRAINER

Oil Tank Strainer Cleaning

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

Oil Tank Strainer Inspection

Check condition of strainer mesh. Replace as required.

Oil Tank Strainer Installation

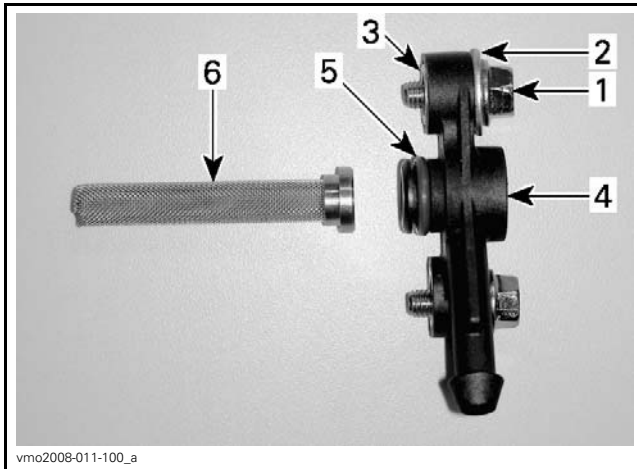
For installation, reverse the removal procedure.

Wipe out any oil spillage on oil tank.

Carefully reinstall all previously removed parts.

NOTE: Check and change the O-ring, if necessary.

CAUTION: Take care not to damage O-ring while inserting outlet fitting into oil tank. Apply oil on O-ring to ease installation.



TYPICAL OIL OUTLET ASSEMBLY

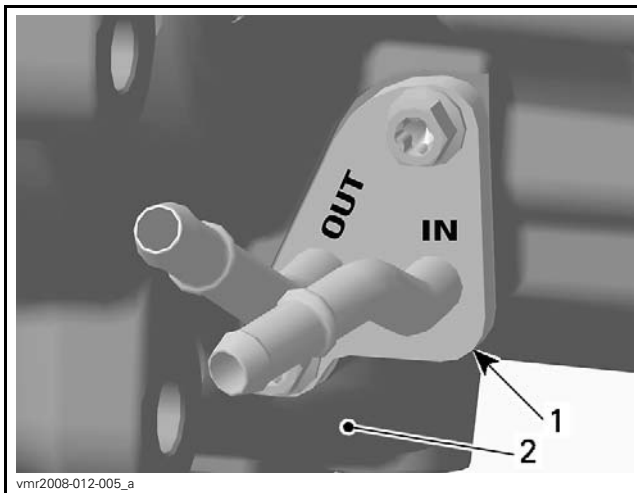
1. Hexagonal bolt
2. Washer
3. Insert
4. Outlet fitting
5. O-ring
6. Strainer

NOTE: Apply Loctite 243 (P/N 293 800 060) on oil tank strainer threads.

Torque screws.

OIL HOSE CONNECTOR

The oil hose connector is located on the crankcase, clutch side.



1. Oil hose connector cover
2. Crankcase, clutch side

Oil Hose Connector Removal

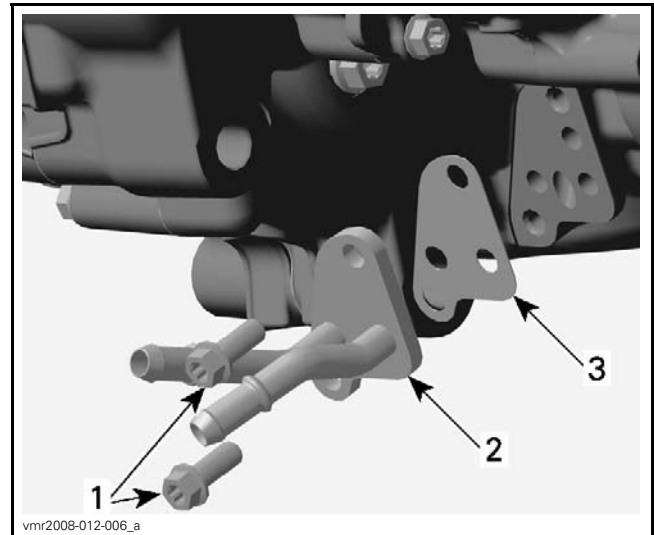
Drain engine oil, refer to *OIL DRAIN* above.

Remove plastic protector.



Remove oil hoses from connector.

Loosen connector retaining screws . Remove connector and gasket.



1. Screws
2. Oil hose connector
3. Gasket

Oil Hose Connector Inspection

Check gasket if brittle, hard or damaged. Replace if necessary.

Clean oil hose connector with a part cleaner, then use an air gun and dry the parts.

WARNING

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

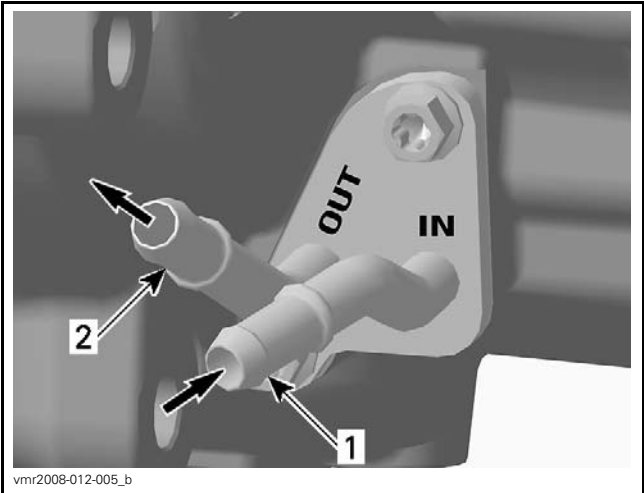
Check if tubes of the oil hose connector are bent or damaged. Replace if necessary.

Oil Hose Connector Installation

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

Always replace connector gasket by new one.

Install hoses as shown.

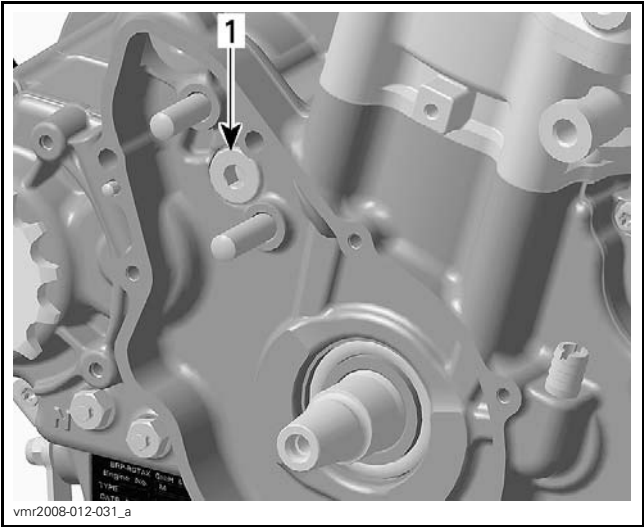


1. From oil tank LOWER fitting
2. To oil tank UPPER fitting

Reinstall protector.

ENGINE OIL PRESSURE REGULATOR

The engine oil pressure regulator is located in crankcase on magneto side.



1. Engine oil pressure regulator location

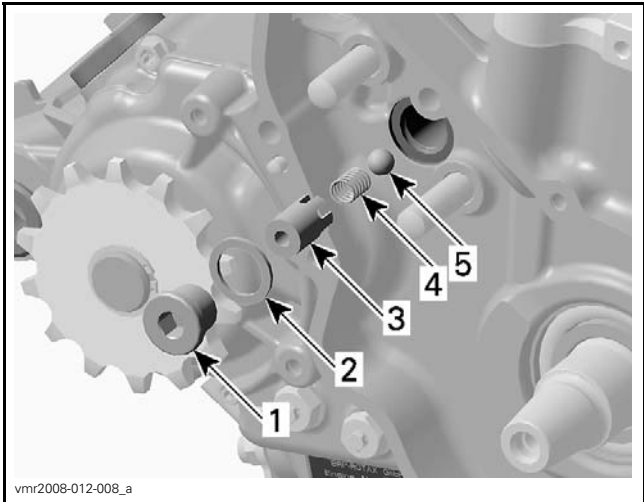
Oil Pressure Regulator Removal

Drain engine oil, refer to *OIL DRAIN* above.

Refer to MAGNETO SYSTEM to remove the following parts:

- protection shield

- magneto cover and gasket
 - rotor with sprag clutch gear and friction clutch
 - starter drive intermediate gear.
- Remove plug screw and gasket ring.
- Pull out oil pressure regulator.



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

Oil Pressure Regulator Inspection

Inspect pressure regulator housing for scoring or other damages and check if housing moves easily in crankcase bore.

Check compression spring for squareness and for free length.

SPRING FREE LENGTH	
NEW NOMINAL	15 mm (.591in)
SERVICE LIMIT	14 mm (.551in)

NOTE: Replace worn or damaged components.

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

Oil Pressure Regulator Installation

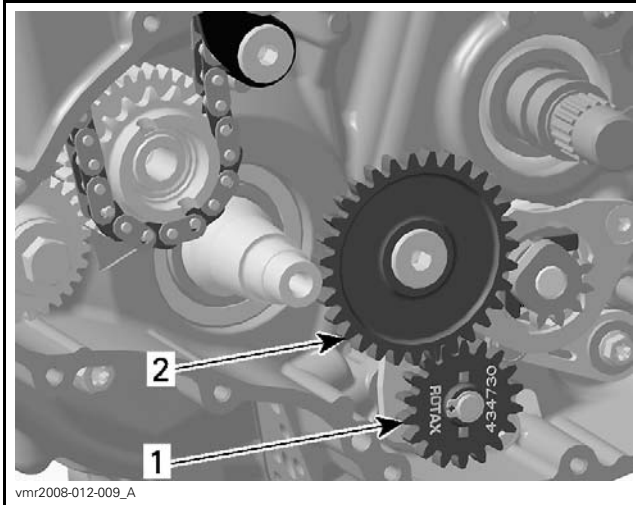
For installation, reverse the removal procedure. Pay attention to the following details.

Before installing the plug screw, press on pressure regulator housing a few times to check if the oil pressure regulator works properly.

NOTE: The gasket ring has to be installed in order that the pressure regulation valve opens at the proper oil pressure.

OIL PRESSURE PUMP

The oil pressure pump is located on the clutch side of the crankcase housing.



1. Oil pressure pump gear
2. Oil pump intermediate gear

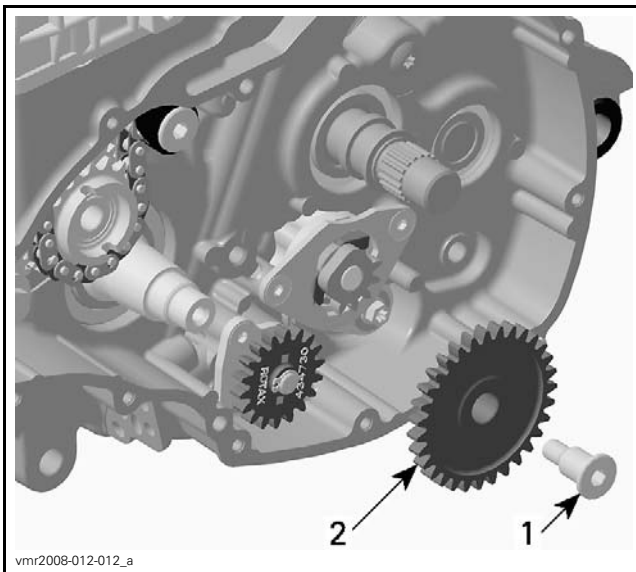
Oil Pressure Pump Removal

Remove water pump housing, refer to *COOLING SYSTEM*.

Drain engine oil, refer to *OIL CHANGE* above.

Remove clutch. Refer to *CLUTCH*.

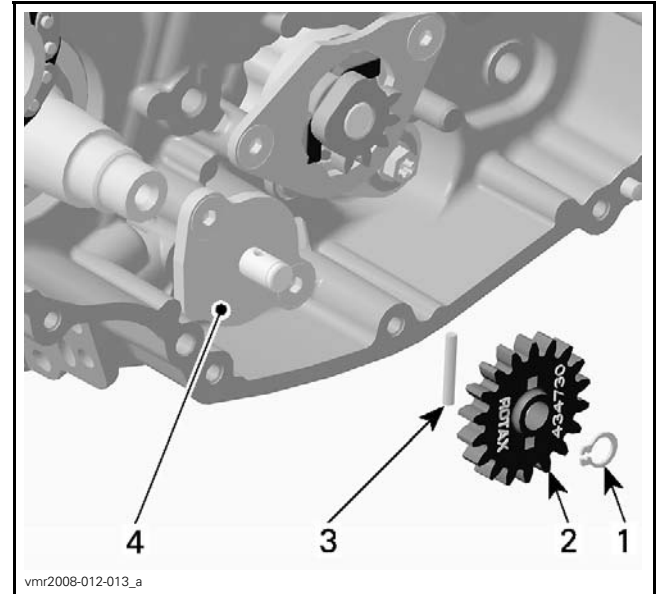
Remove oil pump intermediate gear.



1. Bearing screw
2. Intermediate gear

Remove:

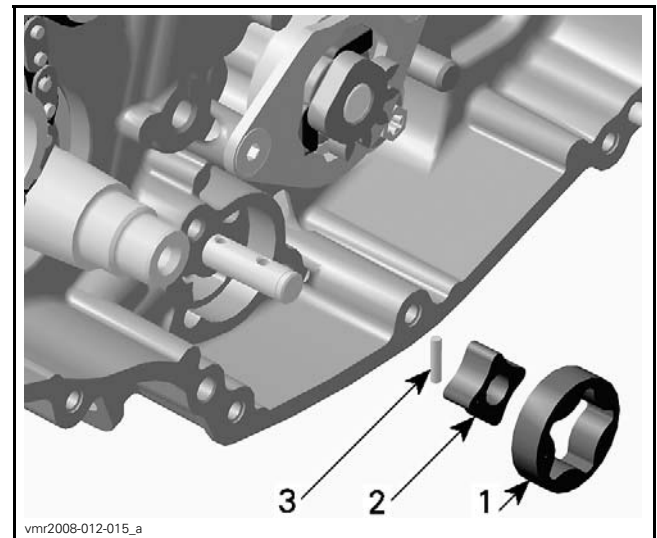
- snap ring
- oil pump gear
- needle pin
- oil pump cover.



1. Snap ring
2. Oil pump gear
3. Needle pin
4. Oil pump cover

Remove:

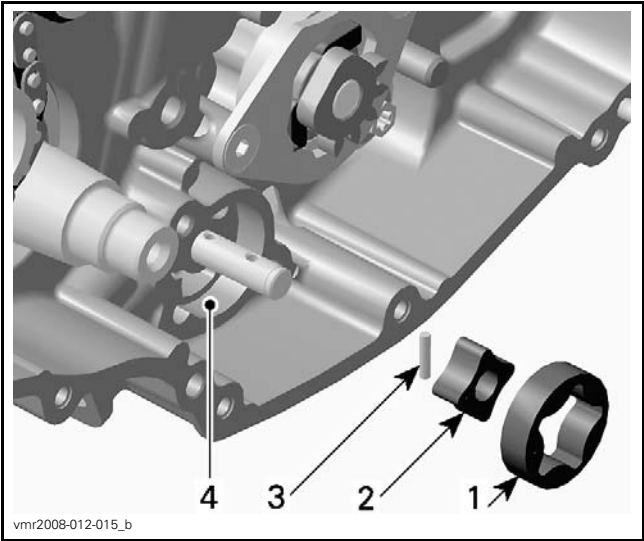
- outer rotor
- inner rotor
- needle pin.



1. Outer rotor
2. Inner rotor
3. Needle pin

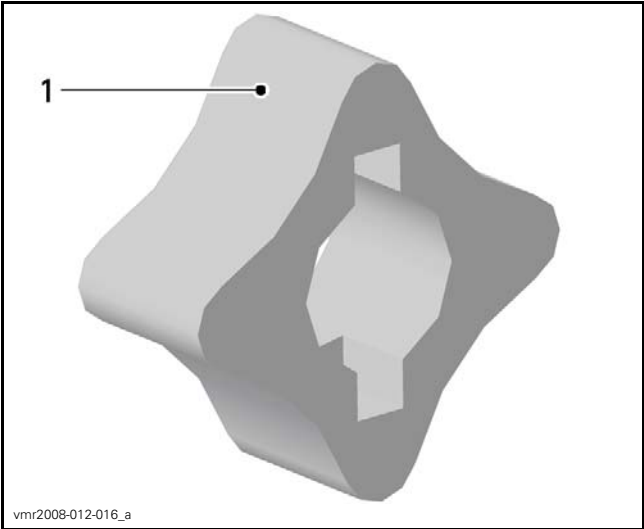
Oil Pressure Pump Inspection

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



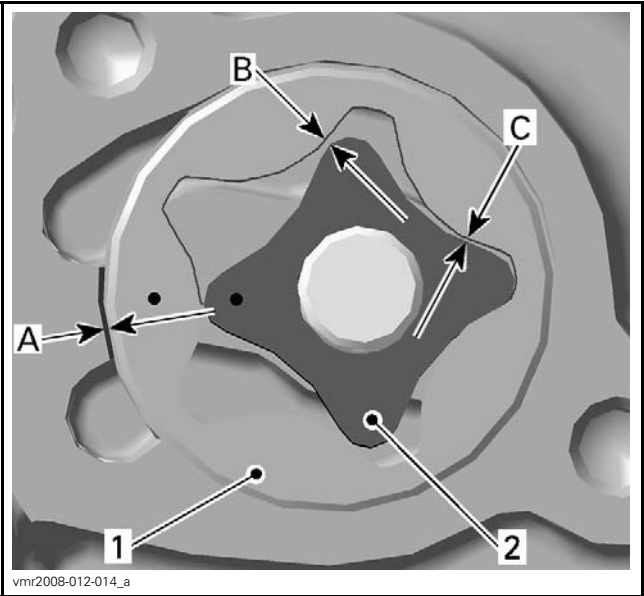
- 1. Outer rotor
- 2. Inner rotor
- 3. Needle pin
- 4. Oil pump bore

Check inner rotor for corrosion pin holes or other damages. If so, replace oil pressure pump inner and outer rotor.



- 1. Pitting on the teeth

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



- 1. Outer rotor
- 2. Inner rotor

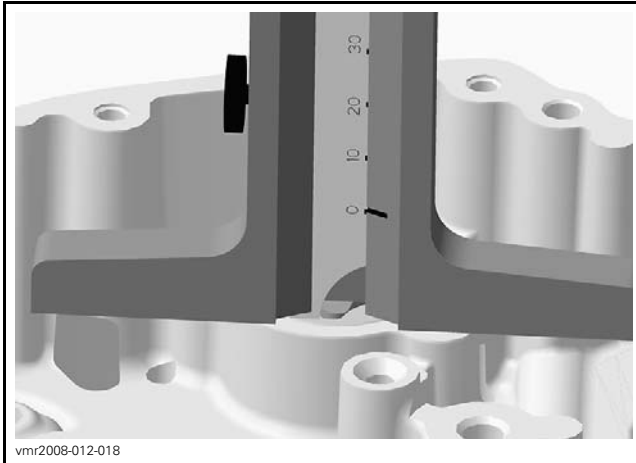
OUTER AND INNER ROTOR CLEARANCE	
SERVICE LIMIT	
A	0.25 mm (0.009 in)
B	
C	

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

Measure outer rotor thickness and oil pump bore depth.

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 — AXIAL CLEARANCE MEASUREMENT

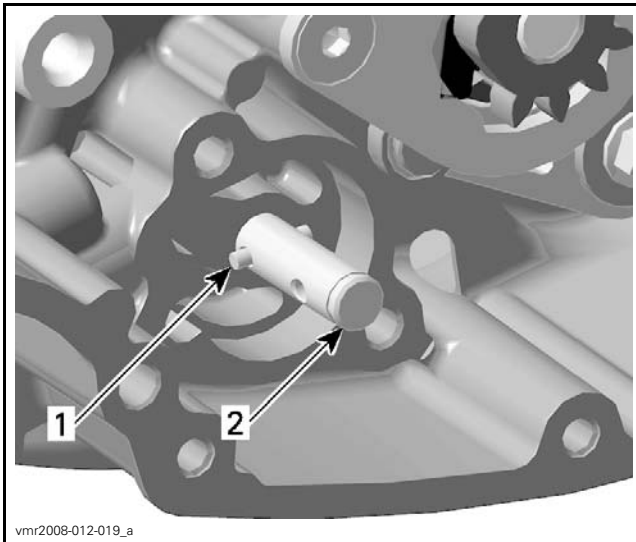
Check oil pump cover surface with a straight edge. Difference between measurements should not exceed 0.2 mm (.008 in). If so, replace the complete oil pump assembly.

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

Oil Pressure Pump Installation

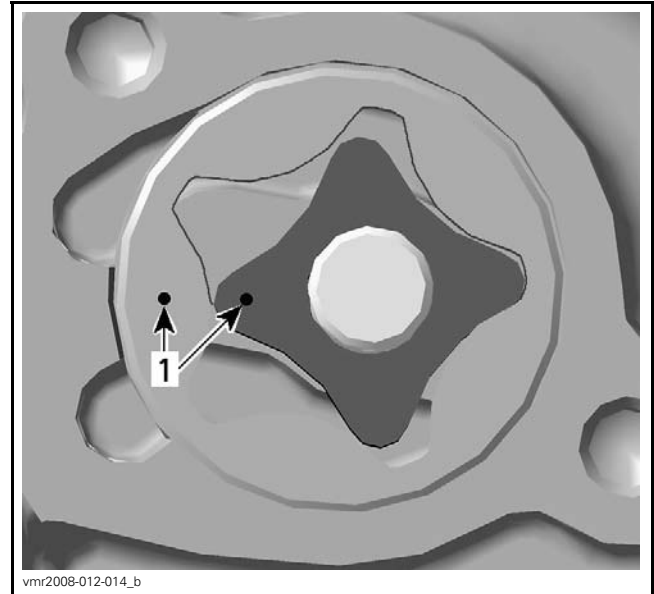
For installation, reverse the removal procedure. Pay attention to the following details.

CAUTION: At installation of needle pin and inner rotor take care not to loose needle pin and drop it into crankcase.



1. Needle pin
2. Oil pump shaft

Markings on inner rotor and outer rotor must be visible.



1. Markings on inner and outer rotor

Coat inner rotor and oil pump rotor with oil.

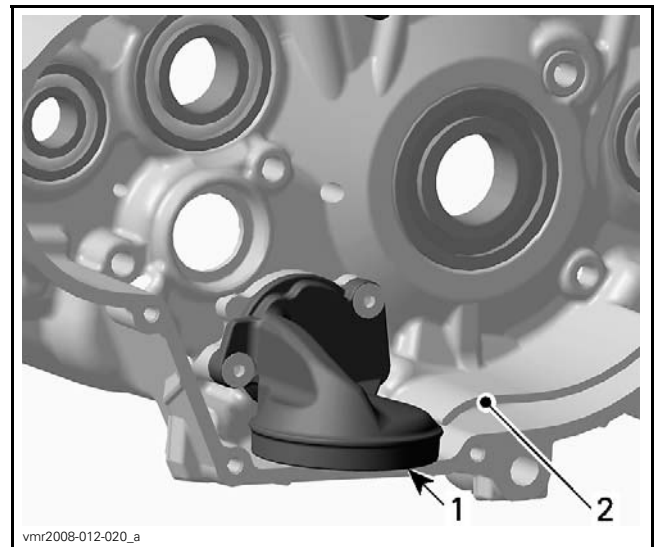
After reinstallation of the remaining parts, check for smooth operation of the oil pump assembly.

Final Test

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

ENGINE OIL STRAINER

The engine oil strainer is located inside crankcase, clutch side.

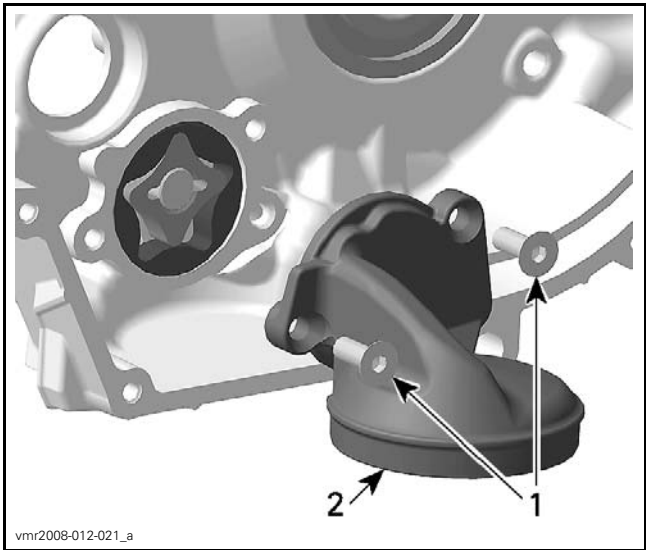


1. Oil strainer cover
2. Crankcase, clutch side

Engine Oil Strainer Removal

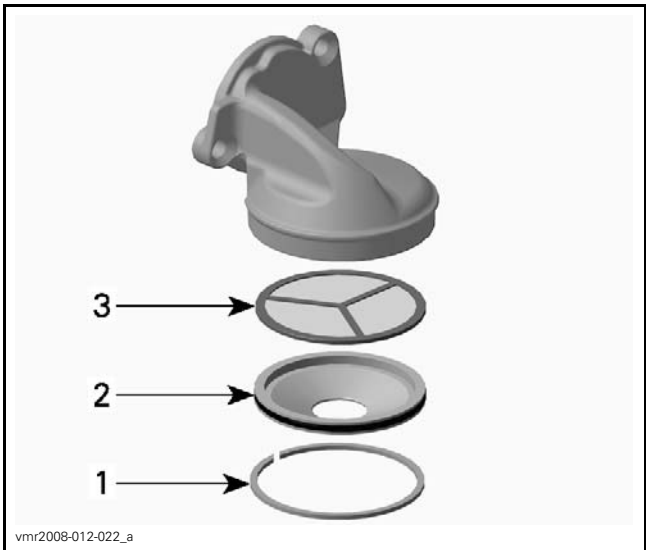
Separate both crankcase housings. Refer to *CRANKCASE/CRANKSHAFT/BALANCE SHAFT* section.

Unscrew the bolts retaining the oil strainer cover.



- 1. Screws
- 2. Oil strainer cover

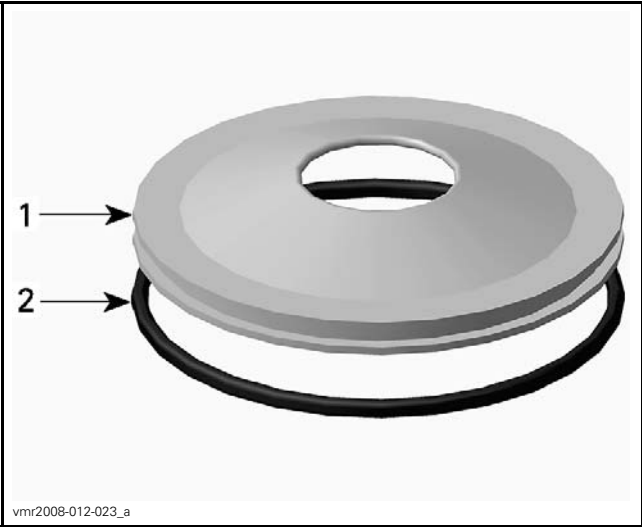
Remove snap ring, oil collector with O-ring and oil strainer.



- 1. Snap ring
- 2. Oil collector with O-ring
- 3. Oil strainer

Engine Oil Strainer Inspection

Inspect O-ring of the oil collector if damaged. Replace if necessary.



- 1. Oil collector
- 2. O-ring

 **WARNING**

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

Check engine oil strainer for damage and change if necessary.

Engine Oil Strainer Cleaning

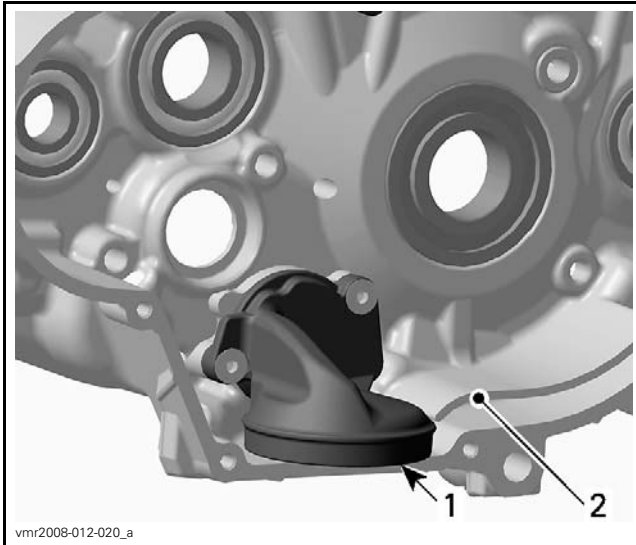
Clean engine oil strainer and cover with a parts cleaner then use an air gun to dry it.

Engine Oil Strainer Installation

For installation, reverse the removal procedure.

OIL SUCTION PUMP

The oil suction pump is located inside crankcase clutch, under the oil strainer cover.



1. Oil strainer cover
2. Crankcase, clutch side

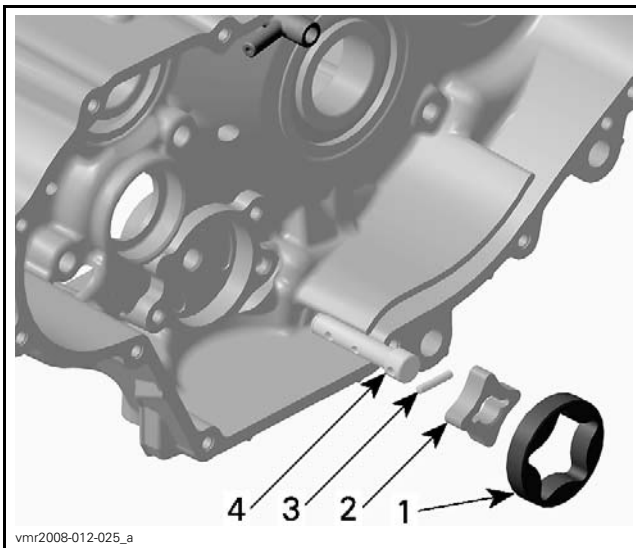
Oil Suction Pump Removal

Remove oil pressure pump, refer to *OIL PRESSURE PUMP* above.

Separate both crankcase housings. Refer to *CRANKCASE AND CRANKSHAFT/BALANCE SHAFT* section.

Remove engine oil strainer cover, refer to *ENGINE OIL STRAINER* above.

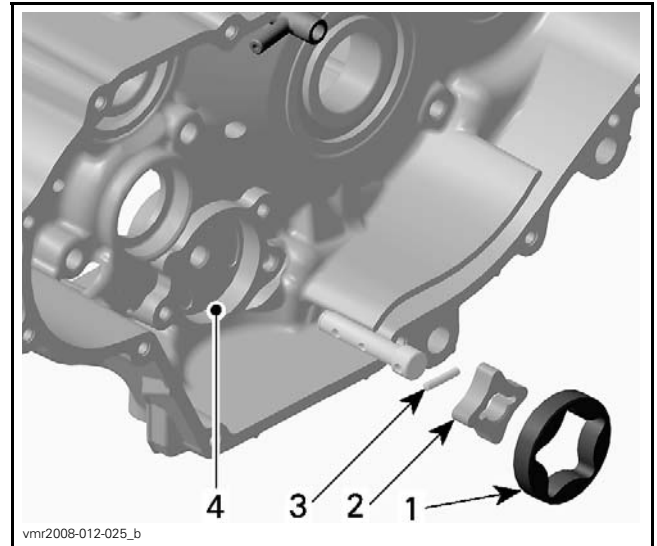
Remove outer and inner rotor, needle pin and oil pump shaft.



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

Oil Suction Pump Inspection

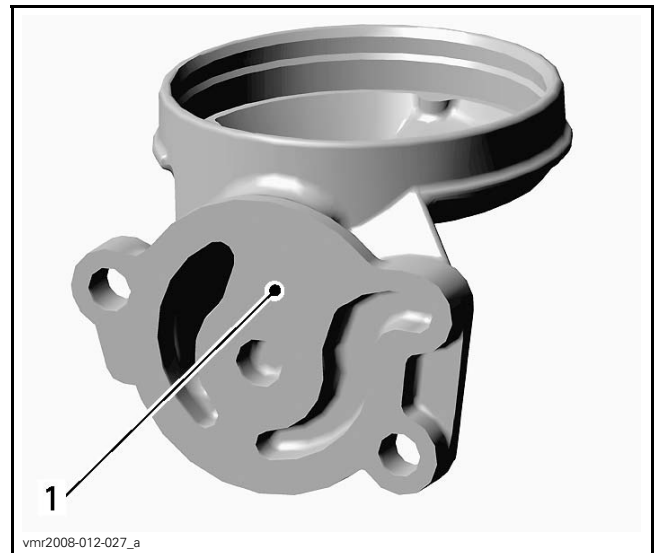
Inspect oil pump for marks or other damages. Check for scratches in crankcase between outer rotor and oil pump bore. If so, replace damaged parts.



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

For inner and outer rotor inspection refer to *OIL PRESSURE PUMP* above.

Check oil pump shaft and surface of oil strainer cover for scratches or other damages.



1. Surface of oil strainer cover

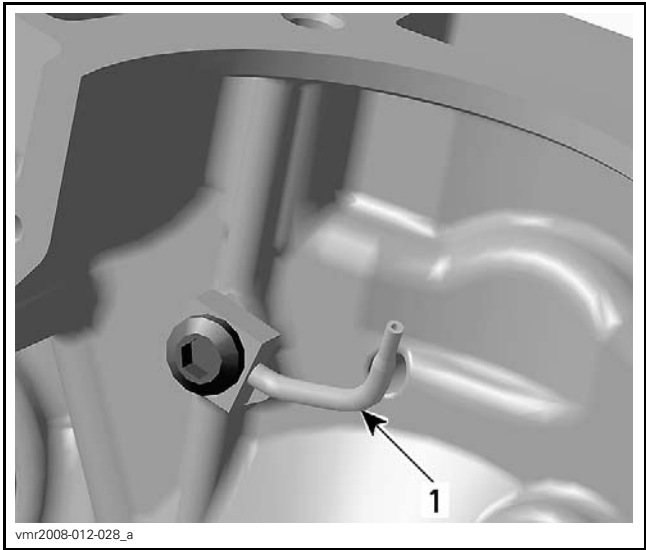
Replace parts if necessary.

Oil Suction Pump Installation

For installation, reverse the removal procedure.

OIL NOZZLE

The oil nozzle is located inside crankcase, clutch side.



1. Oil nozzle

NOTE: If the engine has to be dismantled within the scope of repair work, take this opportunity to clean the oil nozzle.

Oil Nozzle Removal

Separate both crankcase housings. Refer to *CRANKCASE AND CRANKSHAFT/BALANCE SHAFT* section.

Oil Nozzle Cleaning

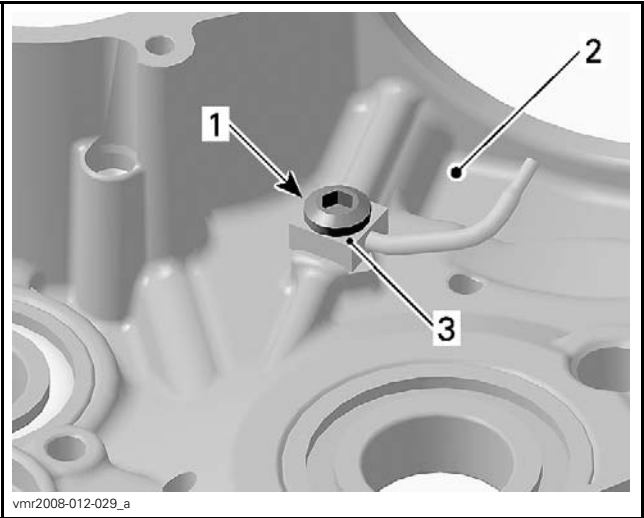
Clean oil nozzle with a part cleaner, then use an air gun and dry the parts.

**WARNING**

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

Oil Nozzle Installation

CAUTION: At assembly make sure the contact surface of the oil nozzle is well fitted onto the crankcase. If this is not ensured, the oil spray direction will change, causing potential engine damage.

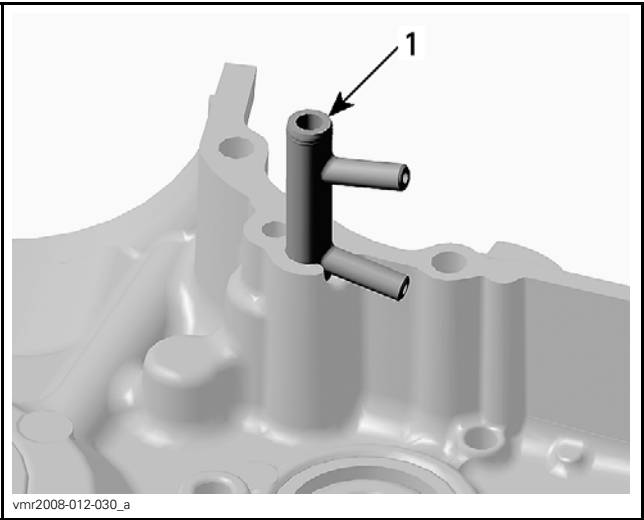


- 1. Oil nozzle
- 2. Crankcase
- 3. Contact surface

NOTE: If the oil nozzle is damaged or bent during work in the crankcase, it must be replaced immediately.

OIL TUBE

The oil tube is located inside crankcase, magneto side.



1. Oil tube

NOTE: If the engine has to be dismantled within the scope of repair work, take this opportunity to clean the oil tube.

Oil Tube Removal

Separate both crankcase housings. Refer to *CRANKCASE AND CRANKSHAFT/BALANCE SHAFT* section.

Oil Tube Inspection

Clean oil tube with a part cleaner, then use an air gun and dry the parts.

WARNING

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

Oil Tube Installation

NOTE: If the oil tube is damaged or bent during work in the crankcase, it must be replaced immediately.

CAUTION: At assembly make sure the contact surface of the oil tube is well fitted onto the crankcase. If this is not ensured, the oil spray direction will change, causing potential engine damage.

OIL TANK



Oil Tank Removal

Drain oil tank. Refer to *OIL DRAIN*.

Unplug all hoses from tank.

Remove tank retaining bolts.

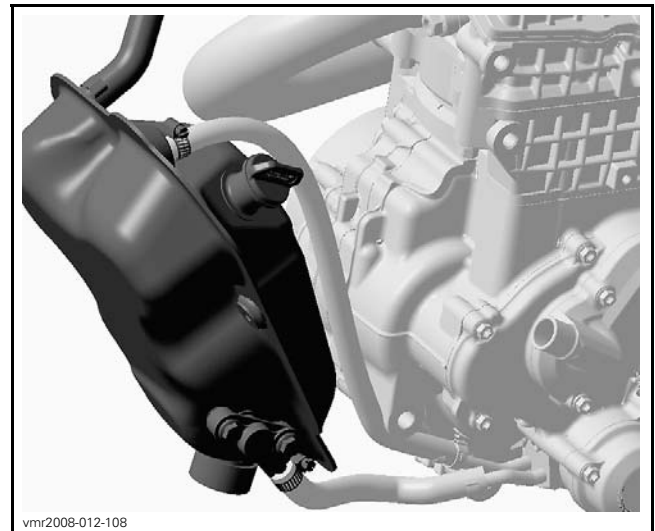


Withdraw oil tank.

Oil Tank Installation

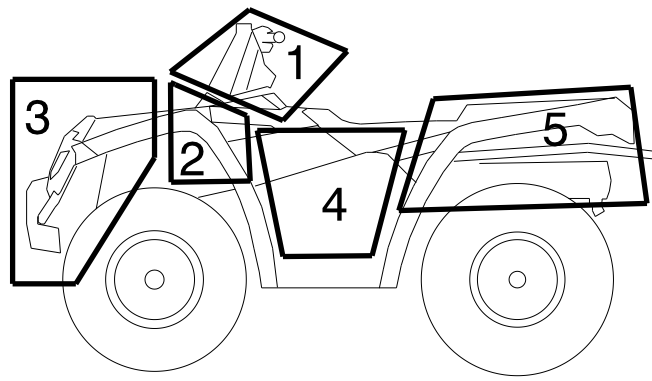
The installation is the reverse of the removal procedure.

Connect hoses as shown.



Refill oil tank with recommended oil. Refer to *ENGINE OIL* above.

DS 450 2008
GENERAL SYSTEM



TERMINAL IDENTIFICATION			
	NAME	ZONE-CONNECTOR	NAME-TERMINAL #/A
EX:	CI	1 -	CI - 15
EX:	CV	4 -	CV - A
EX:	ME	2 -	ME

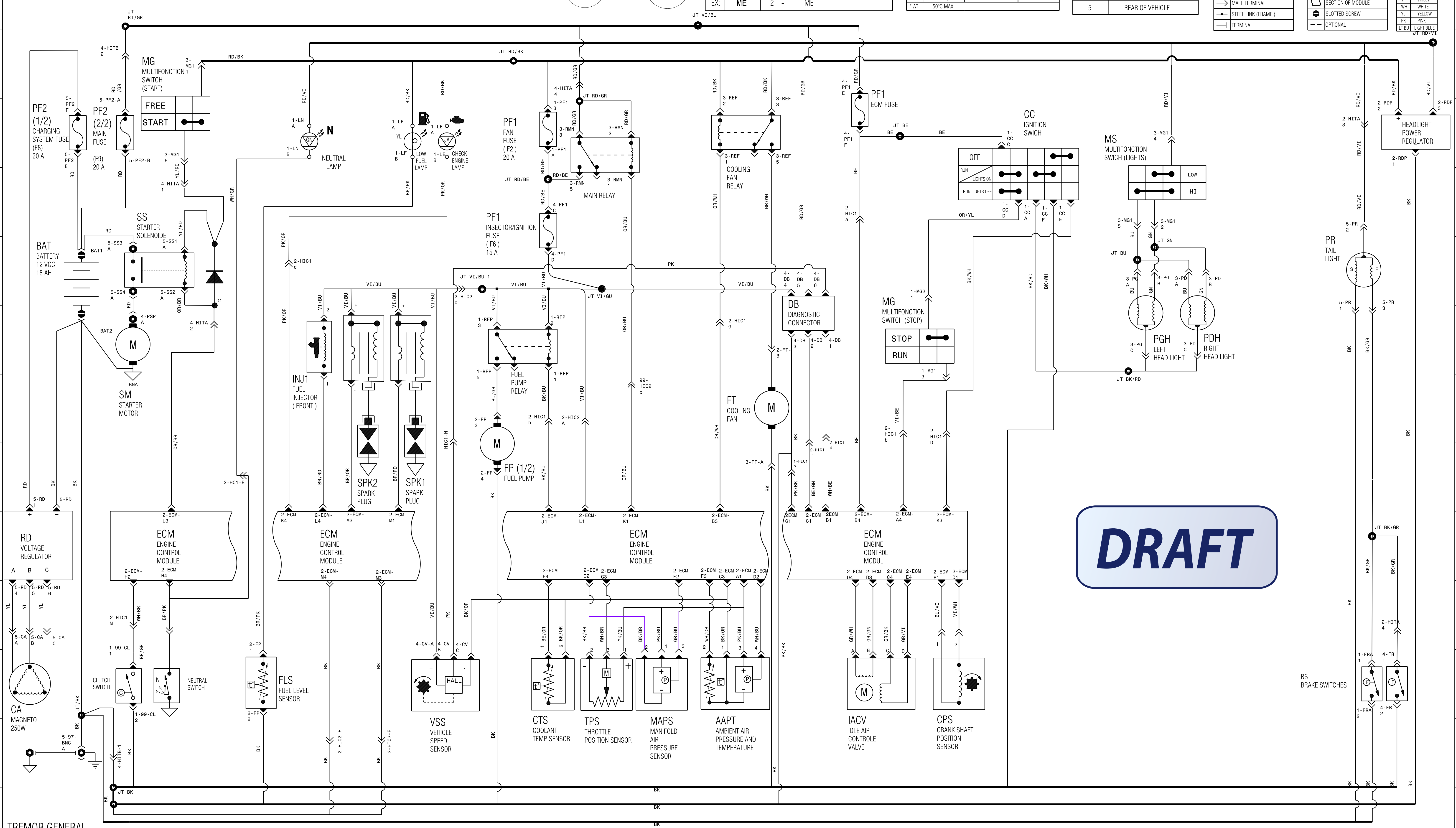
AWG	MAX. CURRENT	MAX. FUSE CURRENT	MAX. WATT
# 6	100 amps	125 amps	1450 watts
# 8	65 amps	80 amps	930 watts
# 10	40 amps	50 amps	580 watts
# 12	25 amps	30 amps	365 watts
# 14	16 amps	20 amps	230 watts
# 16	10 amps	15 amps	145 watts
# 18	6 amps	7.5 amps	85 watts
* AT 50°C MAX			

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
⏏	ENGINE GROUND
⏏	PHILLIPS SCREW
⏏	NUT CONNECTION
⏏	SPLICE CONNECTION
⏏	COMPONENT CONNECTION
⏏	SECTION OF MODULE
⏏	SLOTTED SCREW
—	OPTIONAL

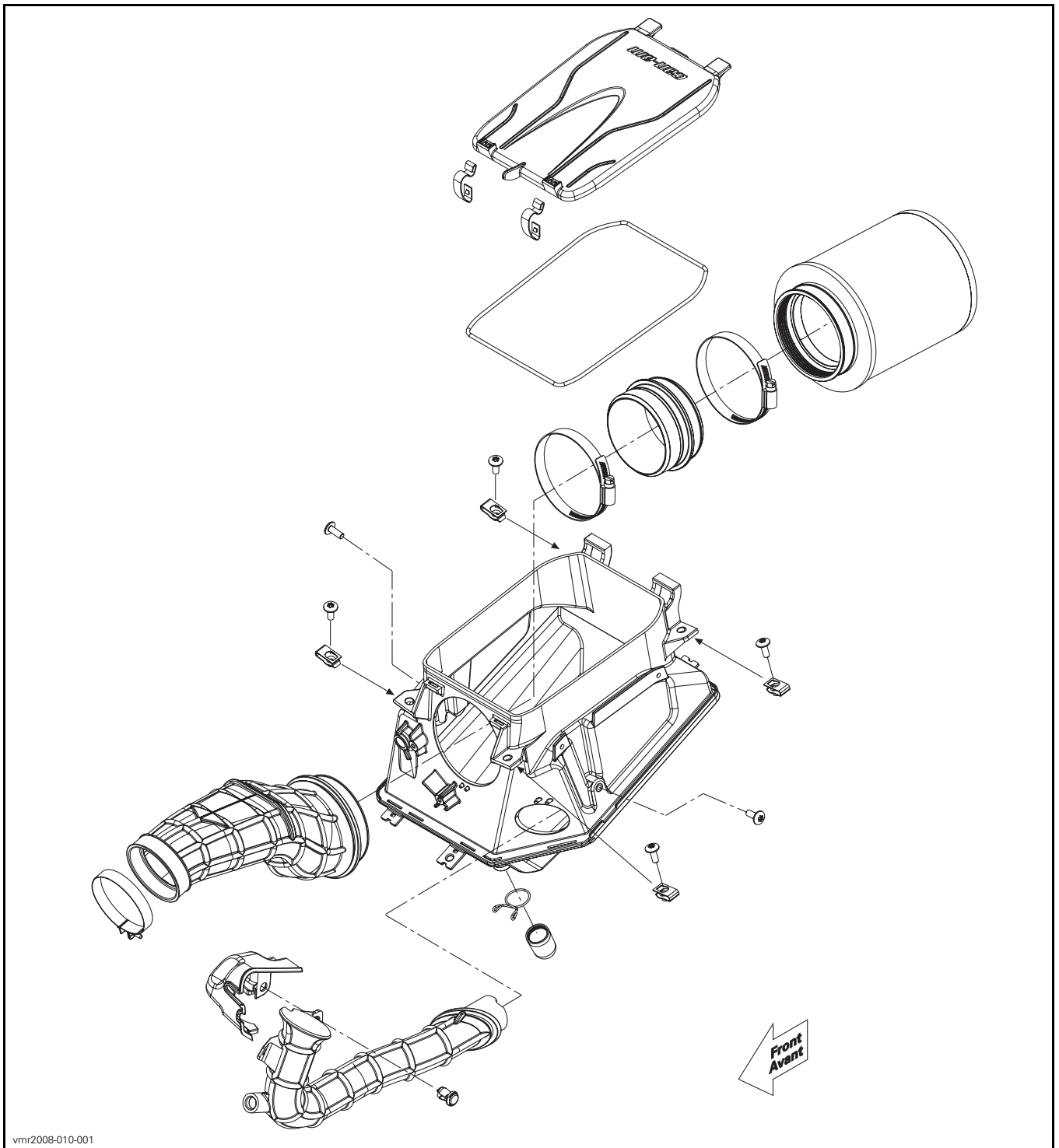
COLOR CODE	
BE	BEIGE
BK	BLACK
BU	BLUE
BR	BROWN
GR	GREEN
GY	GREY
OR	ORANGE
RD	RED
VI	VIOLET
WH	WHITE
YL	YELLOW
PK	PINK
LT BU	LIGHT BLUE
JT	RED/YT



DRAFT

TREMOR GENERAL SYSTEM

AIR INTAKE SYSTEM



DRAFT

GENERAL

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

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

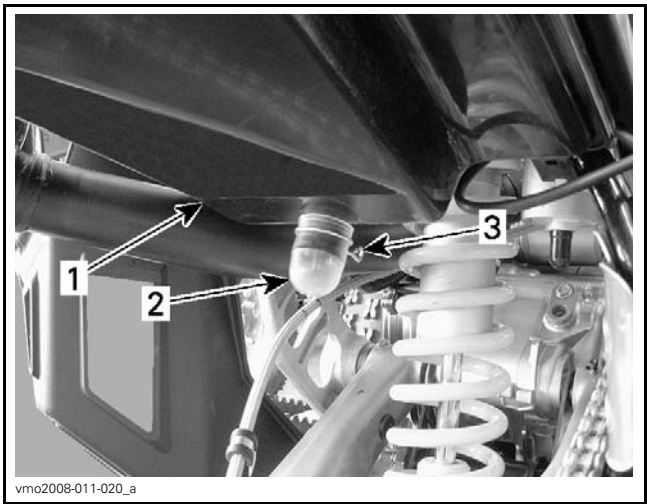


WARNING
Torque wrench tightening specifications must strictly be adhered to. Locking devices (e.g.: locking tabs, elastic stop nuts, cotter pin, etc.) must be replaced with new ones.

PROCEDURES

AIR FILTER HOUSING

Inspect air filter housing drain tube for liquid or deposits.



- 1. Air filter housing
- 2. Drain tube
- 3. Clamp

If liquid/deposits are found, squeeze and remove the clamp. Pull drain tubes out then empty it.

CAUTION: Do not start engine when liquid or deposits are found in the drain tubes.

When liquid/deposits are found, the air filter must be inspected/dried/ replaced depending on its condition.

Remove air filter as explained below.

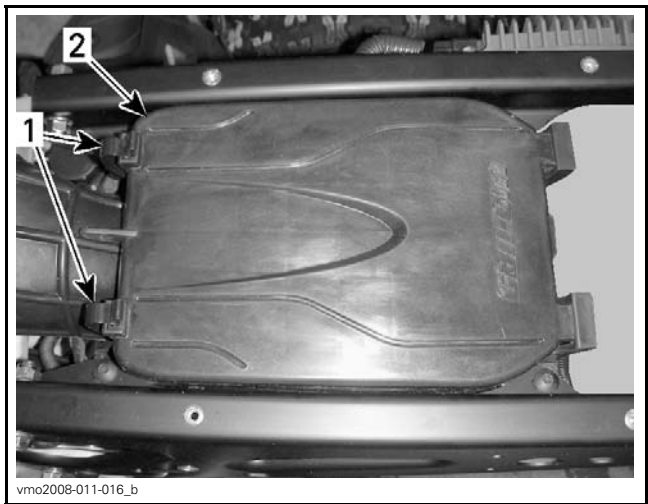
AIR FILTER

Removal

CAUTION: Never remove or modify any component in the air filter housing. Always use genuine parts or suitable equivalent when replacing air filter. The engine is calibrated to operate specifically with these components. Otherwise, engine performance degradation or damage can occur.

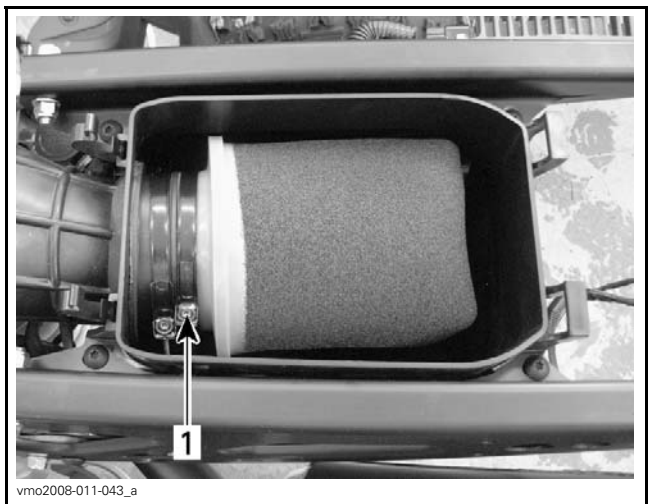
Remove seat.

Release clamps and remove air filter housing cover.



- 1. Clamps
- 2. Air filter housing cover

Loosen clamp and remove filter.



- 1. Clamp

Pour air filter cleaner (P/N 219 700 341) or an equivalent into a bucket. Put the filter in to soak. While filter soaks, clean inside of air filter housing. Rinse air filter with warm water.

Squeeze foam to remove excess water. Let dry air filter thoroughly.

NOTE: Slight dust may be cleaned using a low-pressure airgun. Blow compressed air backward of operating air flow.

If air filter element is damaged, replace with a new one.

When the filter is dried, re-oil with air filter oil (P/N 219 700 340) or an equivalent.

Installation

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