

COOLING SYSTEM

SERVICE TOOLS

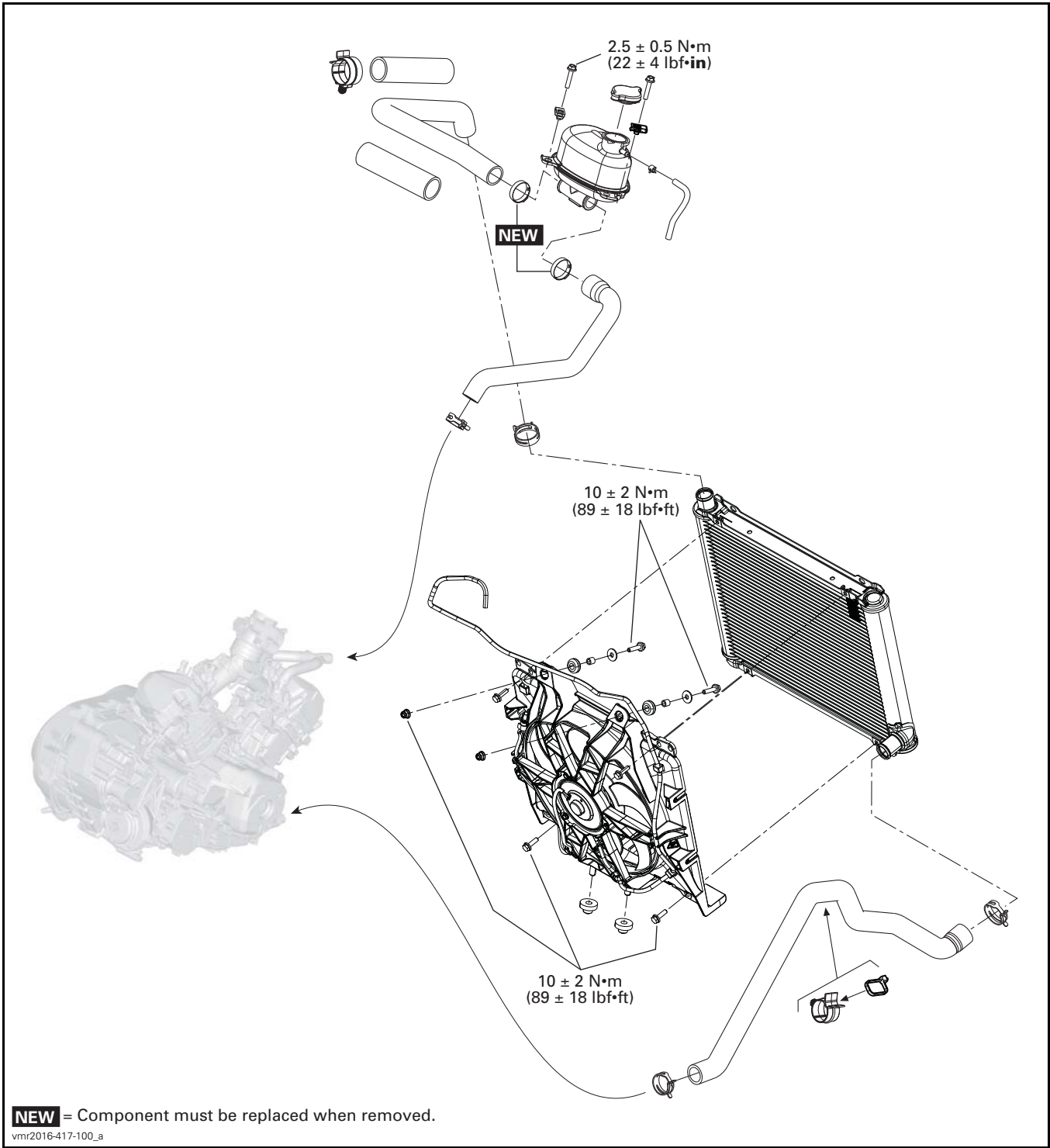
Description	Part Number	Page
HANDLE	420 877 650	17
OIL SEAL PUSHER.....	529 035 757	17
ROTARY SEAL PUSHER PLATE	529 036 130	14
SEAL PUSHER	529 035 766	14, 17

SERVICE PRODUCTS

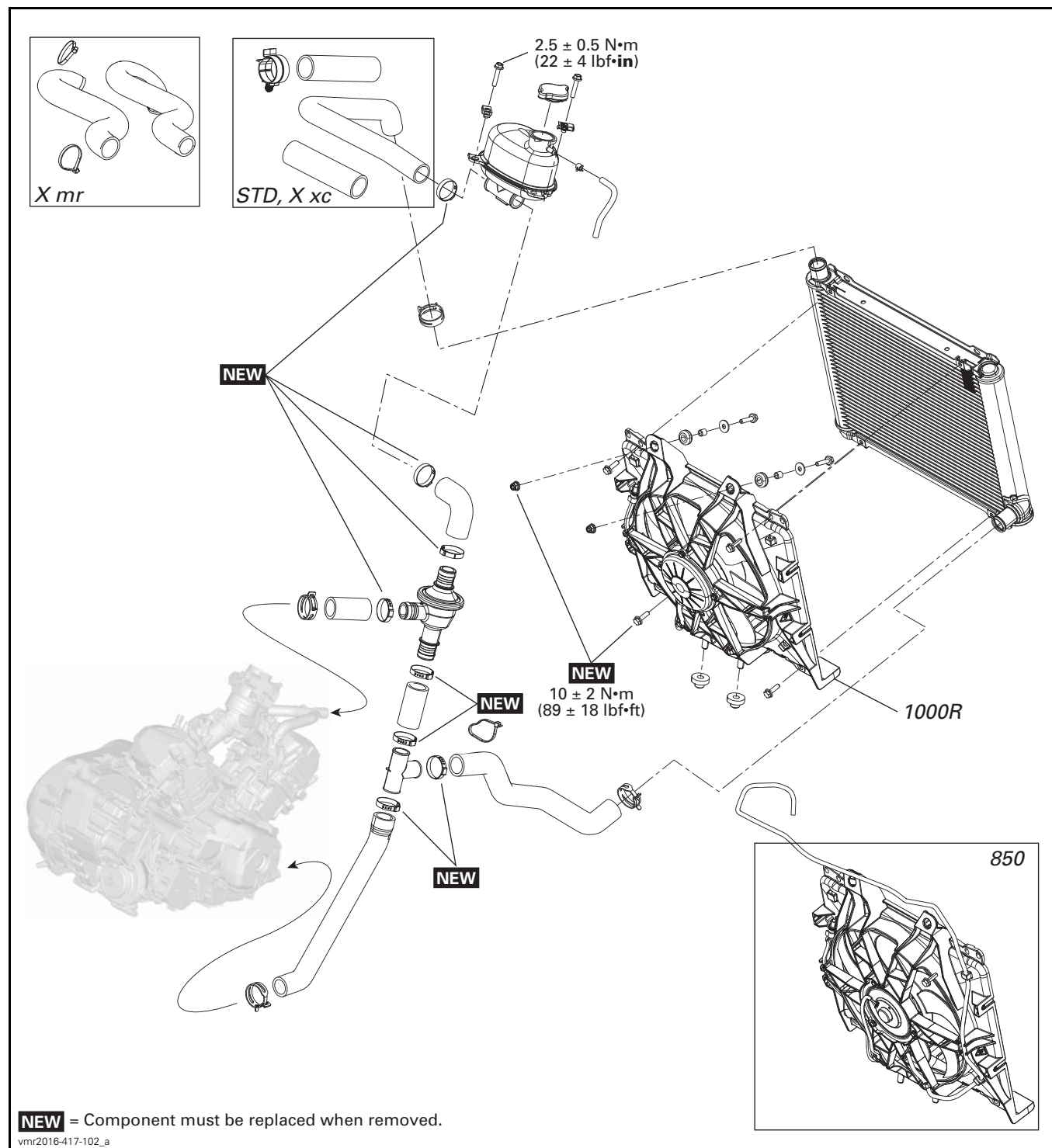
Description	Part Number	Page
DOW CORNING 111	413 707 000	17
LOCTITE 243 (BLUE).....	293 800 060	7

RADIATOR

570 Engine

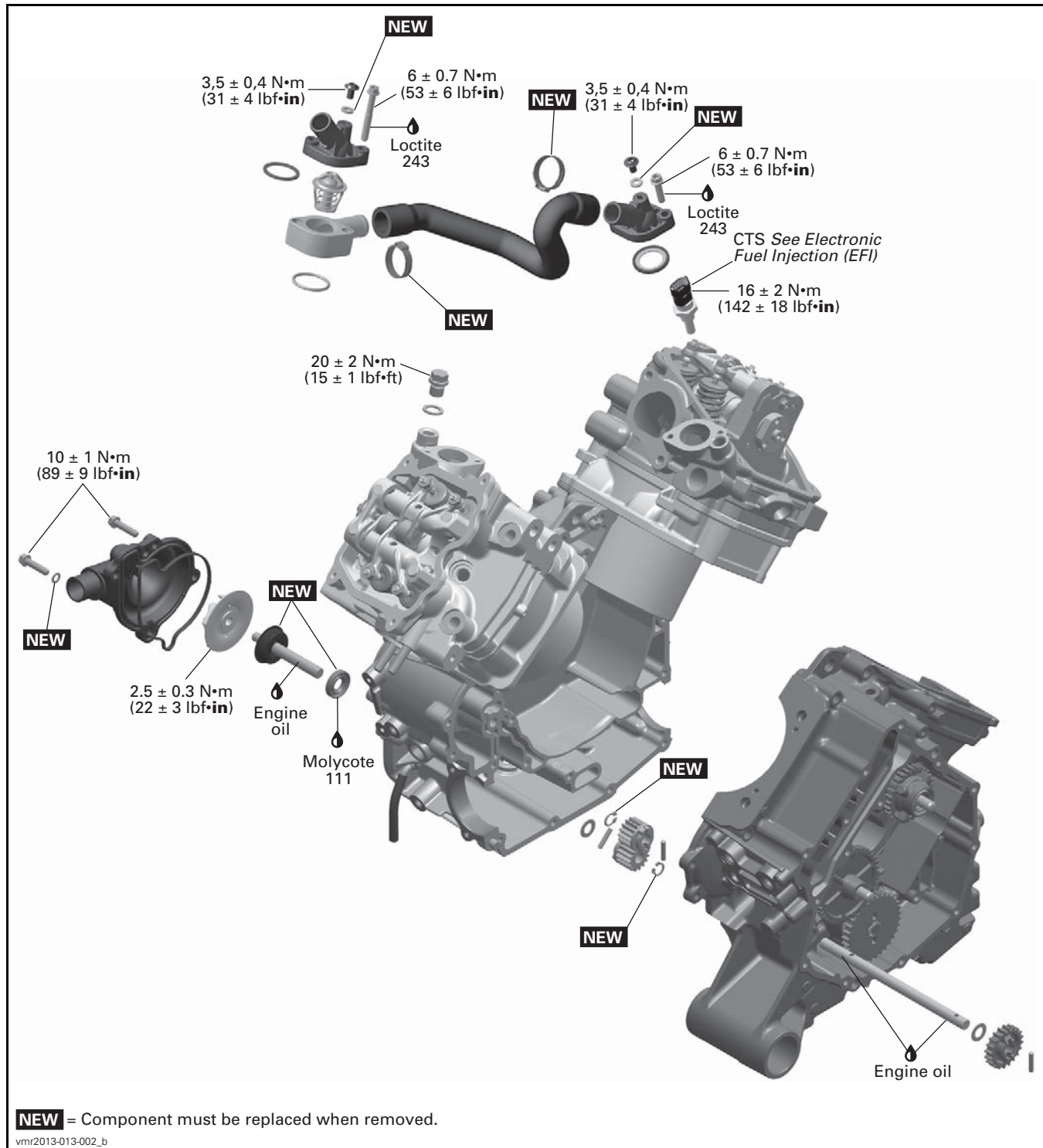


850 and 1000R Engine



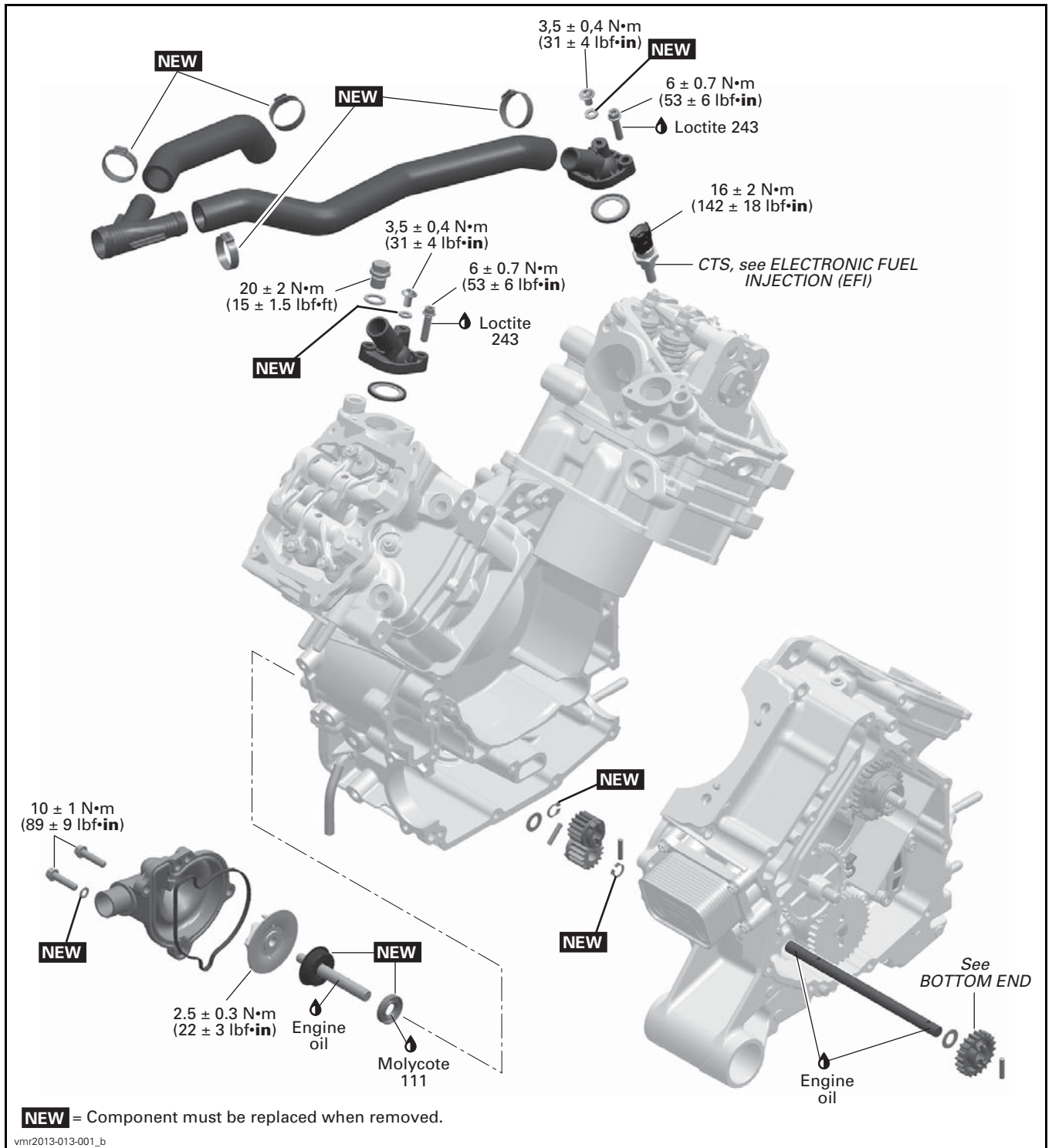
WATER PUMP AND THERMOSTAT

Renegade 570



WATER PUMP

Renegade 850 and 1000R



GENERAL

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

PROCEDURES

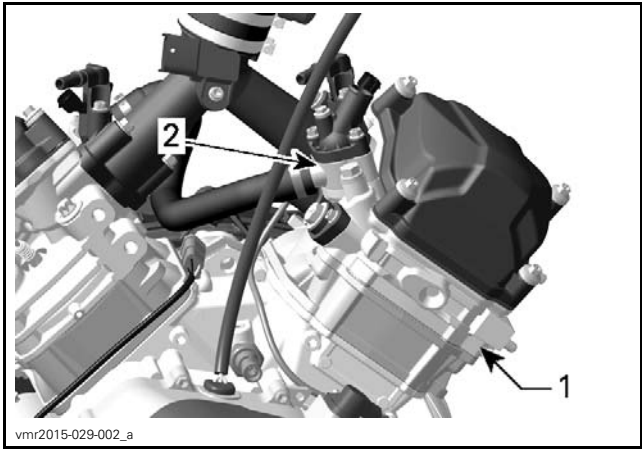
THERMOSTAT

Renegade 570

Thermostat Location

570 Engine

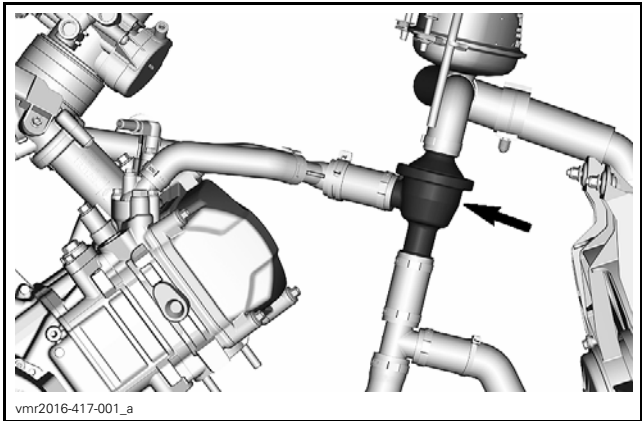
The thermostat is located in the thermostat housing at the top of the front cylinder (RH side).



- 1. Front cylinder
- 2. Thermostat housing

850 and 1000R Engines

The thermostat is located between the front cylinder and the radiator, behind the RH front inner fender.

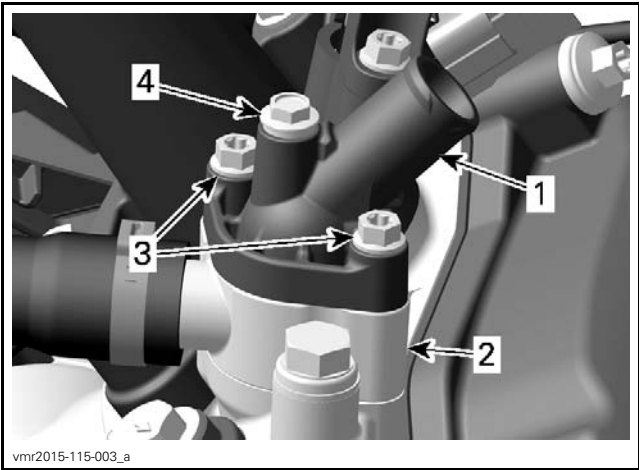


Removing the Thermostat

Drain engine coolant, refer to *PERIODIC MAINTENANCE PROCEDURES* subsection.

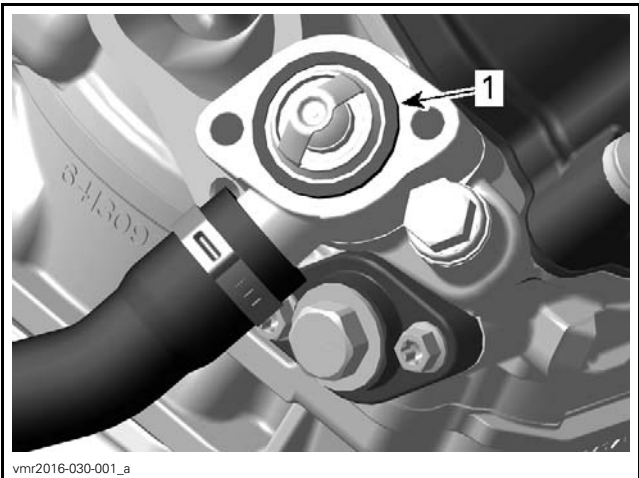
570 Engine

- 1. Remove thermostat housing screws and remove thermostat cover.



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

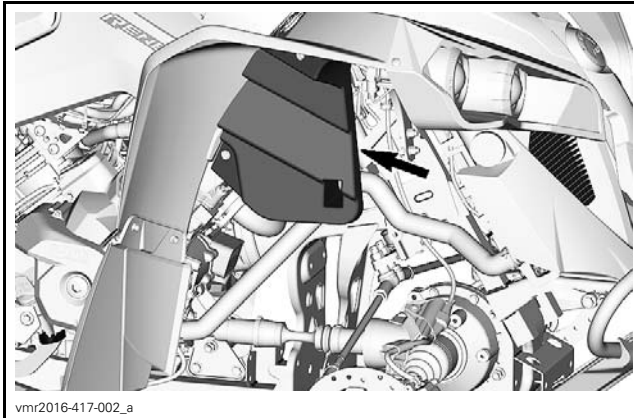
- 2. Pull thermostat and gasket.



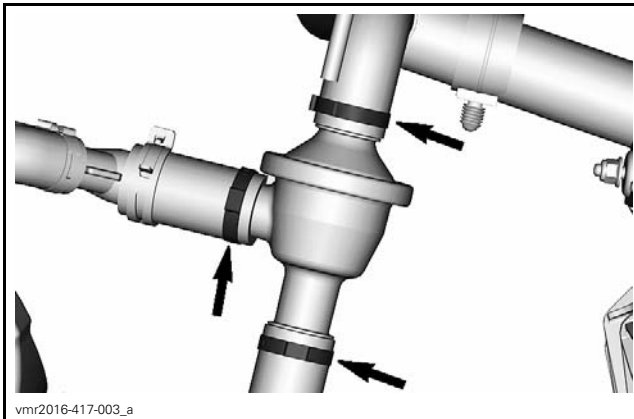
- 1. Thermostat with gasket

850 and 1000R Engines

- 1. Remove the RH front inner fender.



2. Remove Oetiker clamps.



3. Remove the thermostat and its housing as a unit.

Testing the Thermostat

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

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

Replace thermostat (with its housing for 850 and 1000R engines) if it does not begin to open at specified temperature.

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

Installing the Thermostat

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

570 Engine

TIGHTENING TORQUE	
Thermostat cover retaining screws	6 N•m ± 0.7 N•m (53 lbf•in ± 6 lbf•in)
	+ LOCTITE 243 (BLUE) (P/N 293 800 060)

850 and 1000R Engines

Install **NEW** Oetiker clamps.

All Engines

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

Check cooling system for leaks.

RADIATOR

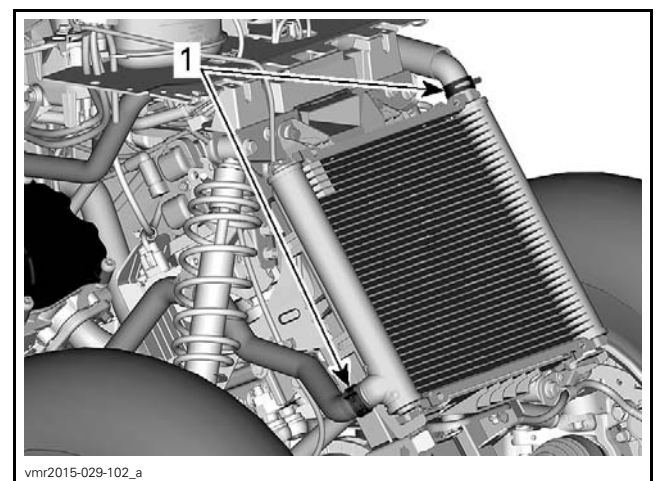
Inspecting the Radiator

Check radiator fins for clogging or damage.

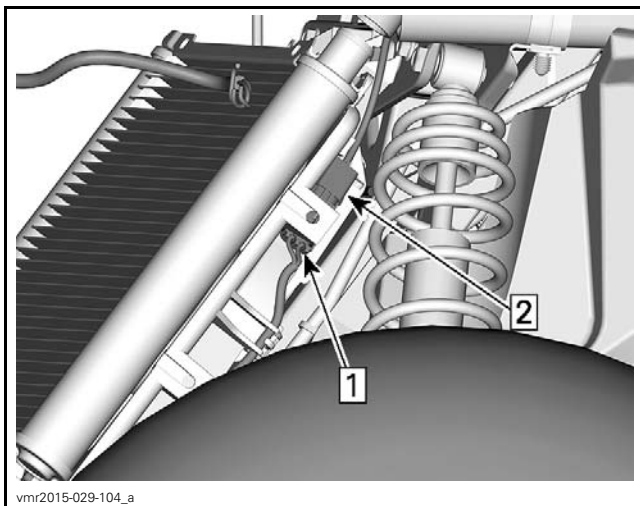
Remove insects, mud or other obstructions with compressed air or low pressure water.

Removing the Radiator

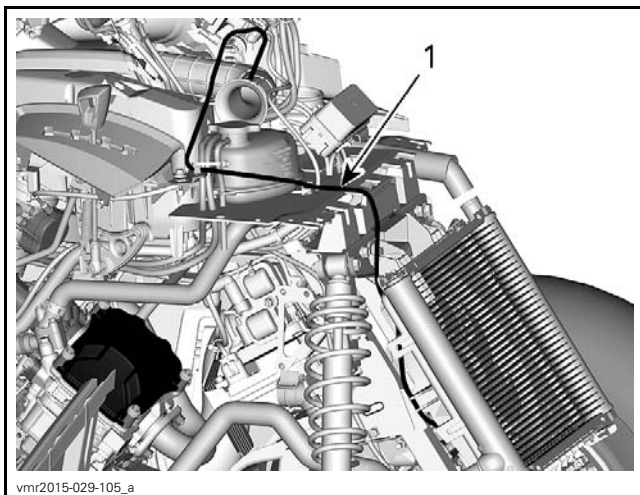
1. Drain engine coolant. Refer to *PERIODIC MAINTENANCE PROCEDURES* subsection.
2. Remove front body module. Refer to *BODY* subsection.
3. Disconnect radiator and fan assembly.



1. Radiator hoses

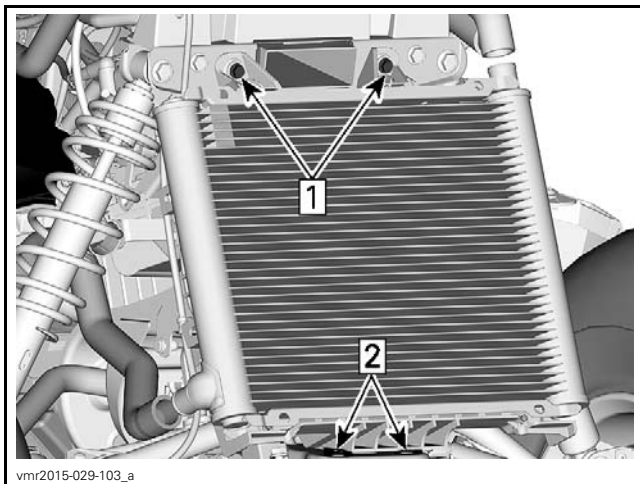


vmr2015-029-104_a
 Step 1: Disconnect cooling fan connector
 Step 2: Remove the harness connector from the fan shroud



vmr2015-029-105_a
 1. Remove fan motor vent hose (if so equipped)

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



vmr2015-029-103_a
 Step 1: Remove upper retaining bolts
 Step 2: Remove radiator from bushings

Installing the Radiator

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

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

Ensure that vent hose of the cooling fan motor is properly rooted as prior to removal (if so equipped).

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

Tighten radiator upper retaining bolts to specification.

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

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

Check cooling system for leaks.

COOLANT TEMPERATURE SENSOR (CTS)

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

RADIATOR COOLING FAN

Radiator Cooling Fan Operation

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

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

Radiator Cooling Fan Fuse Location

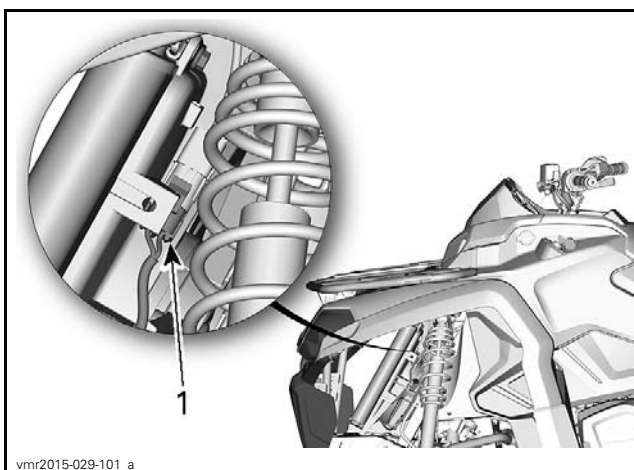
The radiator cooling fan fuse (F9) is located in the front fuse box, under the gauge support.

R1	F9	F8		F12	R3
				R8	
R2	F5	F4			R4

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Testing the Radiator Cooling Fan

1. Disconnect radiator cooling fan connector.



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

Troubleshooting the Radiator Cooling Fan

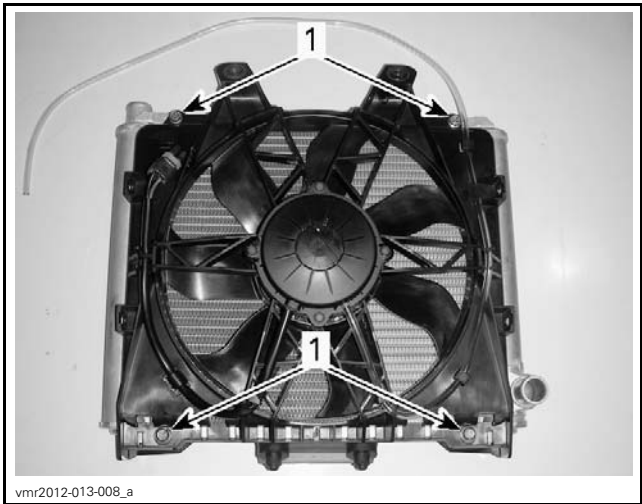
NOTE: The following troubleshooting chart assumes that the engine is operating in the fan activation temperature range. Refer to *RADIATOR COOLING FAN OPERATION*.

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

Removing the Radiator Cooling Fan

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

2. Remove radiator cooling fan retaining screws.



1. Cooling fan retaining screws

3. Remove radiator cooling fan.

Installing the Radiator Cooling Fan

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

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

RADIATOR COOLING FAN RELAY (R1)

Relay Location (Radiator Cooling Fan)

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

R1	F9	F8		F12	R3
				R8	
R2	F5	F4			R4

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Testing the Radiator Cooling Fan Relay

Relay Operation Test

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

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

Relay Continuity Test

Refer to *POWER DISTRIBUTION AND GROUNDS* subsection.

WATER PUMP HOUSING

Water Pump Housing Location

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

Water Pump Housing Access

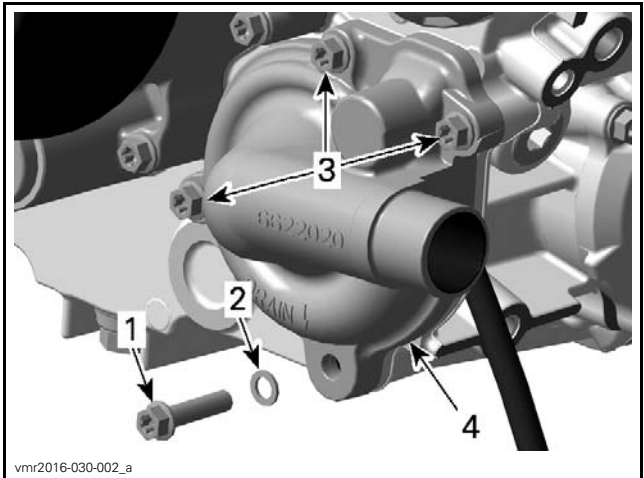
Remove RH footrest panel, refer to *BODY* subsection.

Removing the Water Pump Housing

**WARNING**

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

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

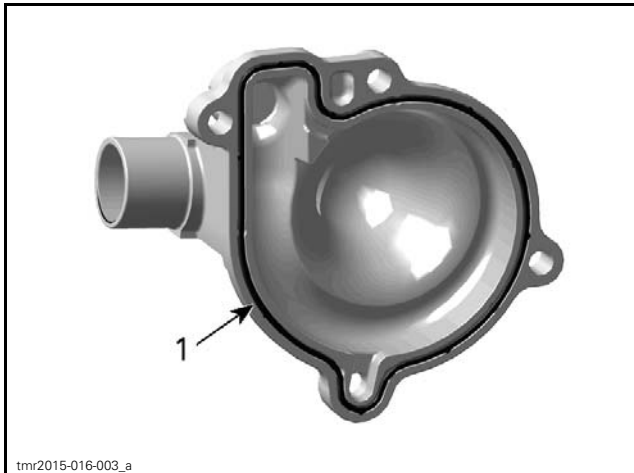


1. Coolant drain plug
2. Sealing ring
3. Screws
4. Water pump housing

4. Pull water pump housing to remove it.

Inspecting the Water Pump Housing

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



1. Gasket

Installing the Water Pump Housing

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

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

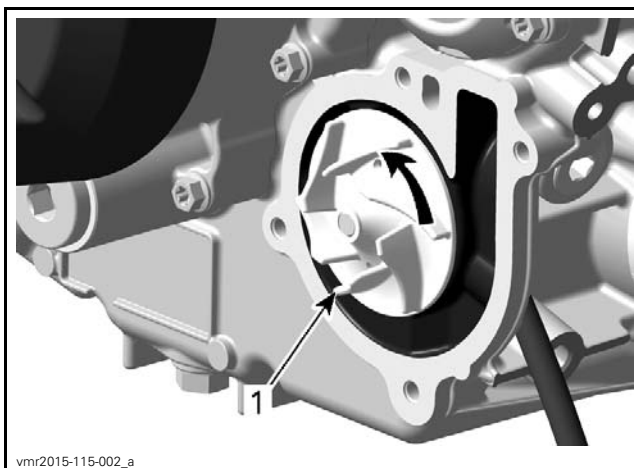
Tighten screws of water pump housing in a criss-cross sequence to specification.

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

WATER PUMP IMPELLER

Removing the Water Pump Impeller

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



1. Turn counterclockwise to unscrew

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

Inspecting the Water Pump Impeller

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

Installing the Water Pump Impeller

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

NOTICE Be careful not to damage impeller fins during installation.

WATER PUMP SHAFT AND SEALS

Use these guidelines to service these parts.

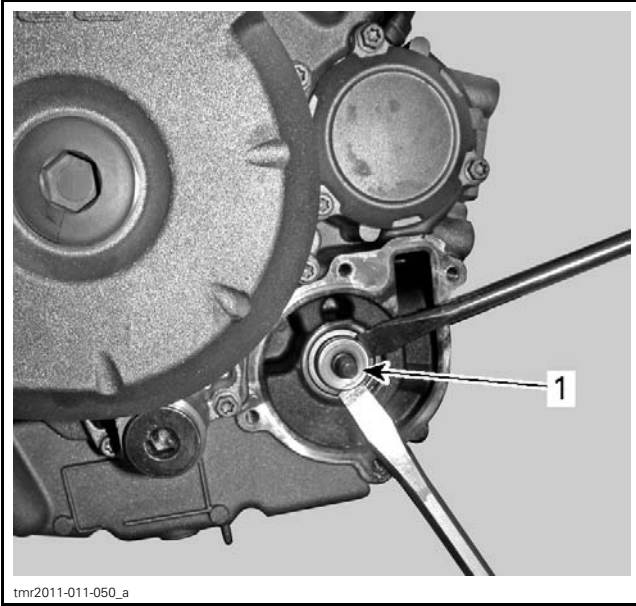
DEFECTIVE PART	ACTION
Rotary seal	Replace: - Rotary seal - Oil seal (assembled engine)
Oil seal	Replace: - Rotary seal - Oil seal (assembled engine)
Water pump shaft	Replace: - Water pump shaft assembly (including rotary seal) - Oil seal (engine disassembled)

Water Pump Seals Replacement (Assembled Engine)

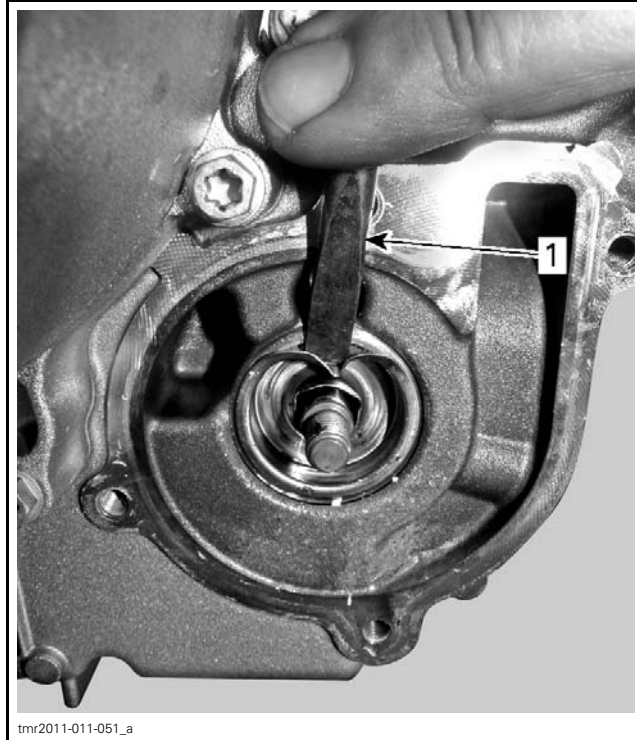
NOTE: Read and thoroughly understand the entire procedure before starting it.

Seals Removal

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

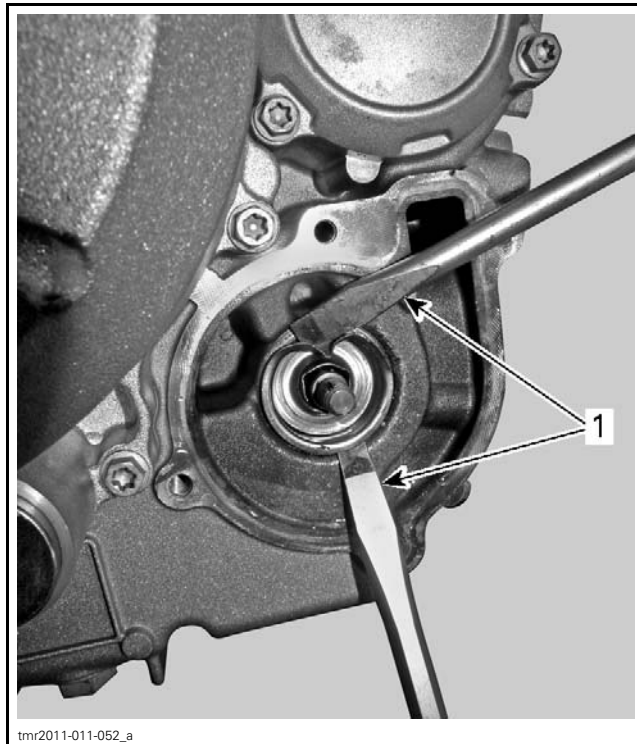


1. Inner part of rotary seal



1. Small chisel

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



1. Screwdrivers

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

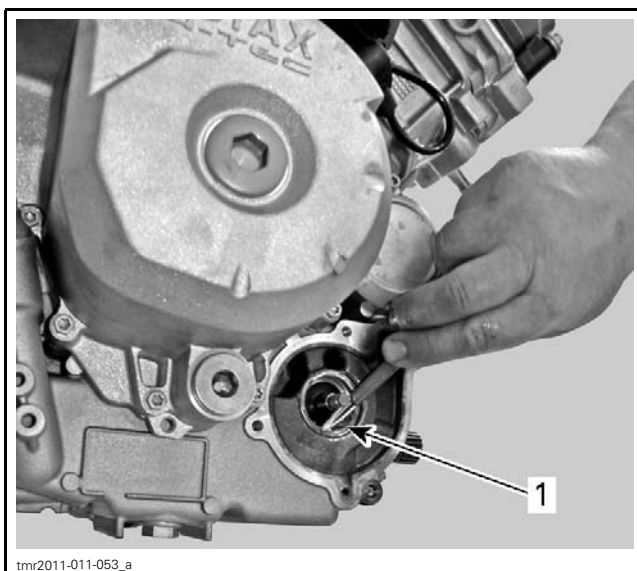


TYPICAL - INNER PART OF ROTARY SEAL REMOVED

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

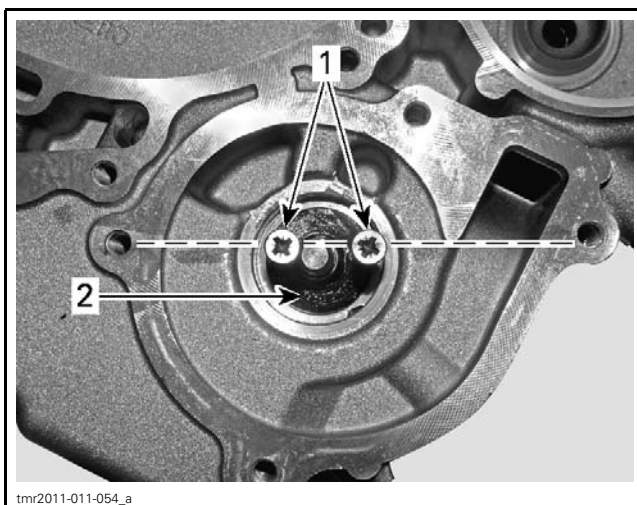
5. Thoroughly remove sealing residue and burr of rotary seal using a scraper.

NOTICE Be careful not to damage water pump shaft.



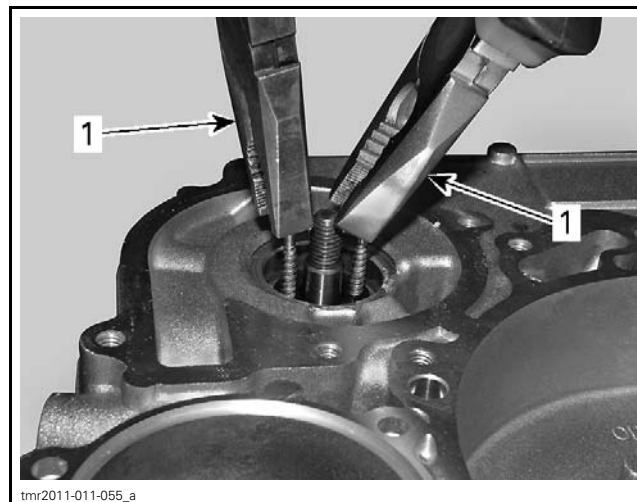
1. Scraper

6. Install 2 wooden screws in the seal.



1. Wooden screws
2. Oil seal

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

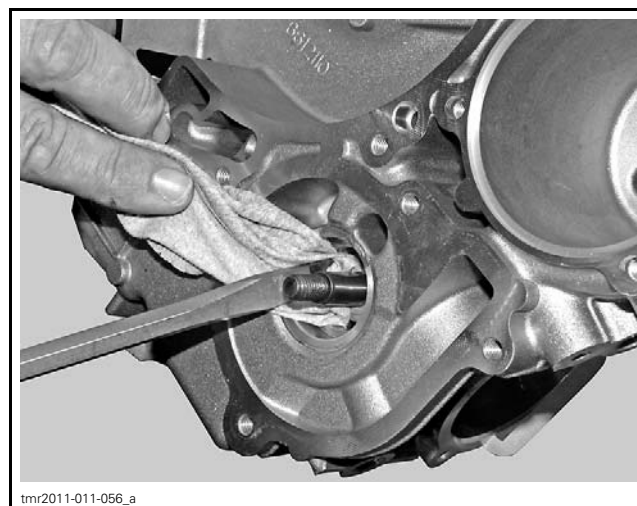


1. Pull on screws to remove seal

8. Check water pump shaft axial play.

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

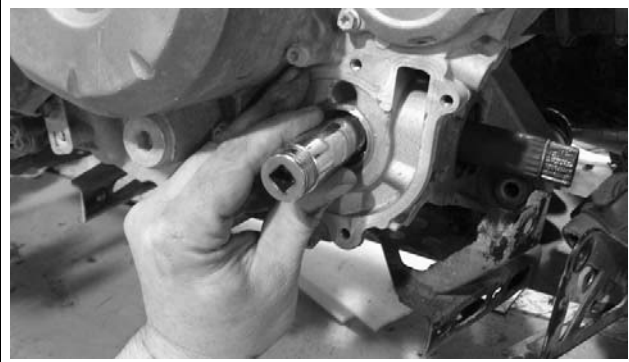
9. Clean oil seal seat.



Seals Installation

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

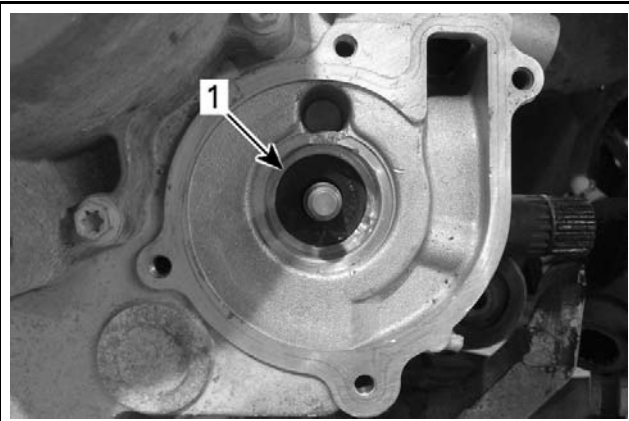
REQUIRED TOOL
17 mm (11/16 in) deep socket



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OIL SEAL INSTALLATION

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



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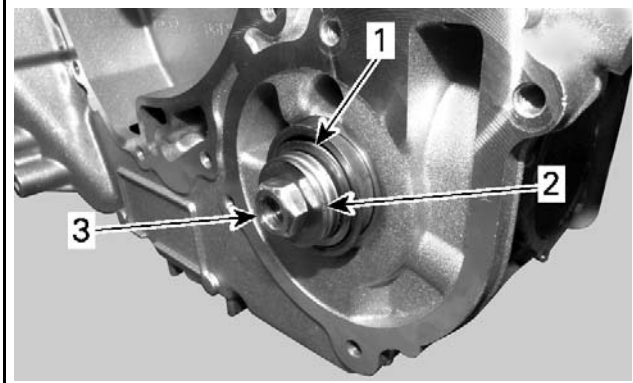
TYPICAL

1. Oil seal properly seated

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

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

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



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

11. Remove M8 nut.

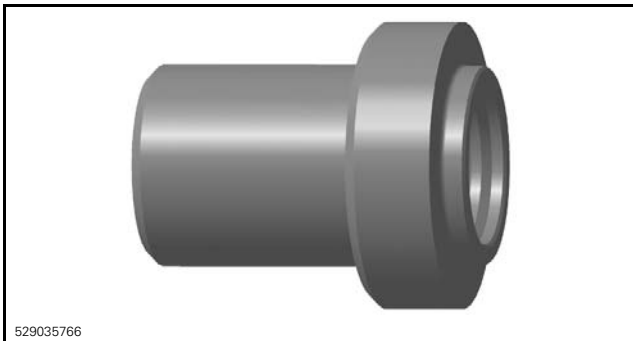
NOTE: The robust M8 flat washer must remain on water pump shaft.

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



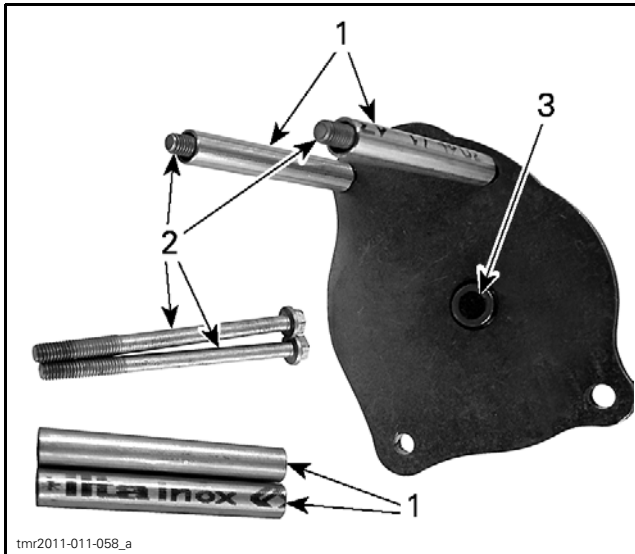
529036130

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



529035766

SEAL PUSHER (P/N 529 035 766)



ROTARY SEAL PUSHER PLATE ASSEMBLY

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

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

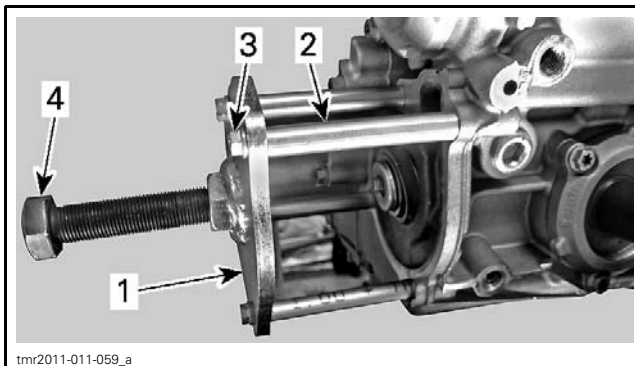
NOTE: Make sure pusher bolt has a plane surface.

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

- 12.2 Ensure that pusher bolt is completely unscrewed.

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

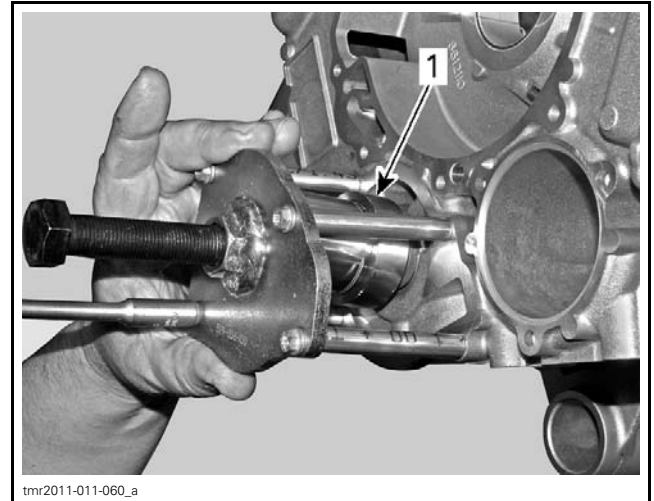
NOTICE Do not use pneumatic or electric tools for tightening screws.



ROTARY SEAL PUSHER PLATE INSTALLATION

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

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



SEAL PUSHER INSTALLATION

1. Seal pusher aligned with pusher bolt

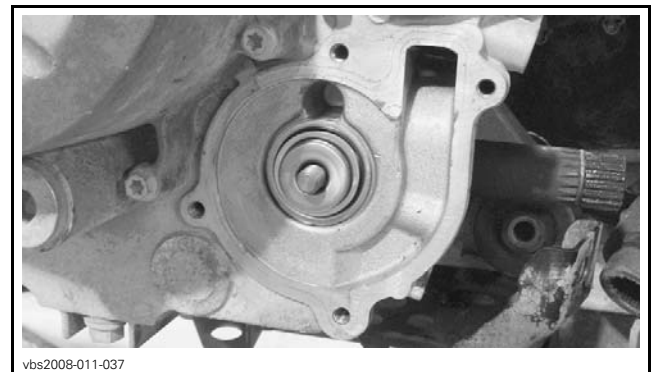
- 12.5 Tighten the pusher bolt by hand until it stops against the seal pusher.

13. Carefully thread the pusher bolt 1-1/2 turns.

14. Ensure that the rotary seal is going straight into crankcase.

15. Remove rotary seal installation tools from crankcase.

16. Repeat steps 9 TO 15 until rotary seal is completely seated in the crankcase.



ROTARY SEAL PROPERLY SEATED ON CRANKCASE

17. Carry out the final adjustment of the water pump shaft as follows.

- 17.1 Install M8 x 1.25 nut (P/N 233 281 414) onto water pump shaft.

- 17.2 Carefully thread M8 nut until the rotary seal is flush with the end of water pump shaft threads.



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WATER PUMP SHAFT PROPERLY ADJUSTED WITH ROTARY SEAL

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

18. Install the following parts, see procedure in this subsection.

- *WATER PUMP IMPELLER*
- *WATER PUMP HOUSING.*

19. Refill and bleed cooling system. Refer to *PERIODIC MAINTENANCE PROCEDURES* subsection.

20. Check cooling system for leaks.

Water Pump Shaft and Seals Replacement (Disassembled Engine)

Water Pump Shaft and Seals Removal

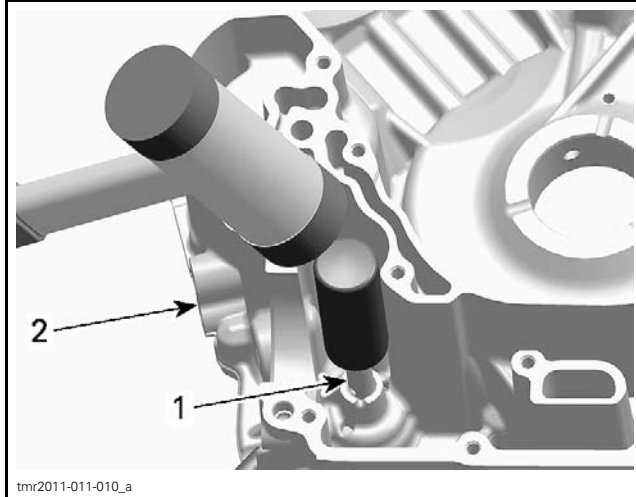
1. Remove the following parts, see procedure in this subsection:

- *WATER PUMP HOUSING*
- *WATER PUMP IMPELLER*
- *WATER PUMP GEARS.*

2. Push out water pump shaft with inner portion of rotary seal from inside of crankcase MAG side.

REQUIRED TOOL

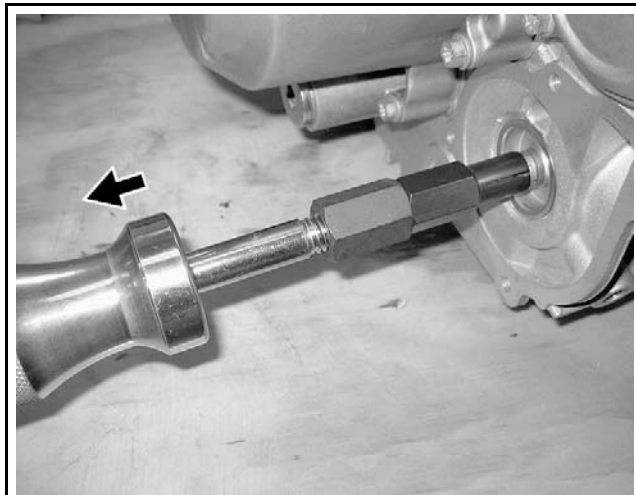
Soft hammer



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

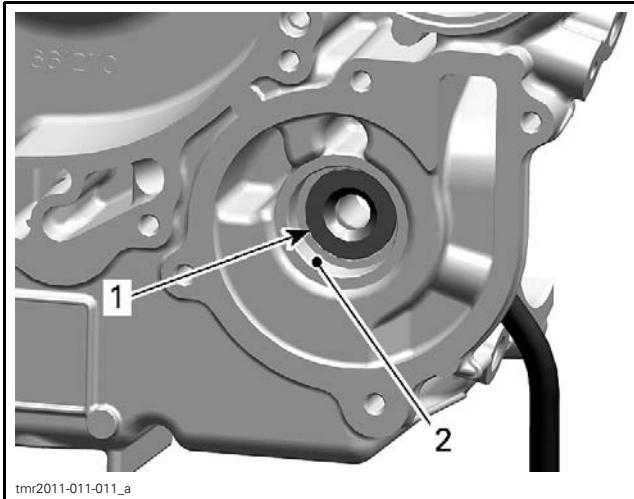
3. Install a blind hole puller expander snugly against outer part of rotary seal and pull seal out.



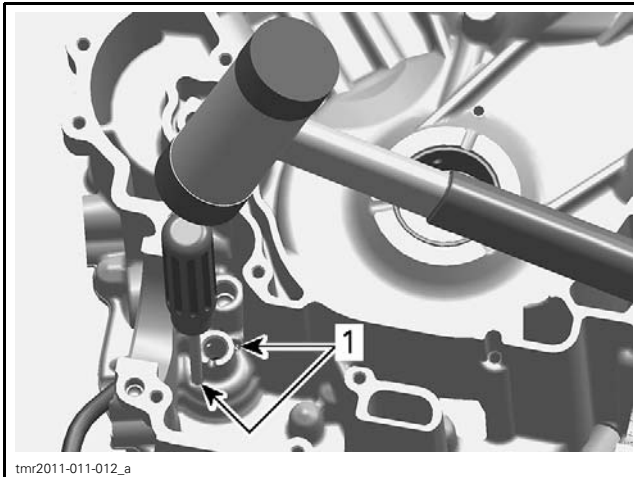
vmr2007-034-105_a

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

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



1. Oil seal
2. Machined surface for rotary seal



OIL SEAL REMOVAL - VIEW FROM INSIDE CRANKCASE MAG SIDE

1. Orifices for oil seal removal

Water Pump Shaft and Seals Installation

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

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

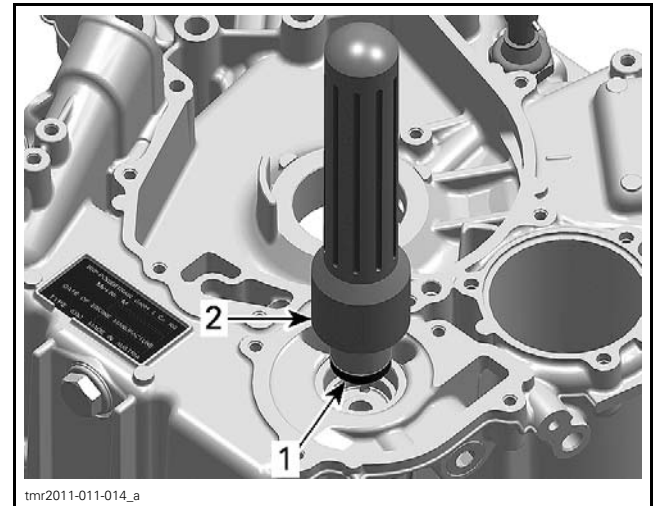
Clean rotary seal surface of any old sealant.

Install oil seal.

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

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

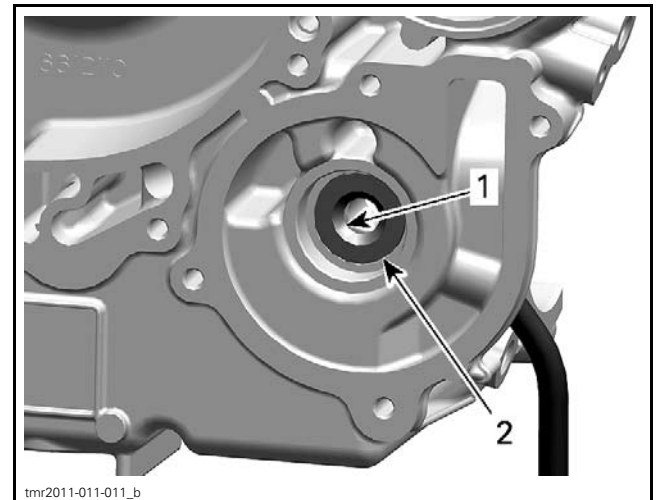
Push **NEW** oil seal in place.



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

Lubricate sealing lip of the oil seal.

SERVICE PRODUCT	
Sealing lip of the oil seal	DOW CORNING 111 (P/N 413 707 000)

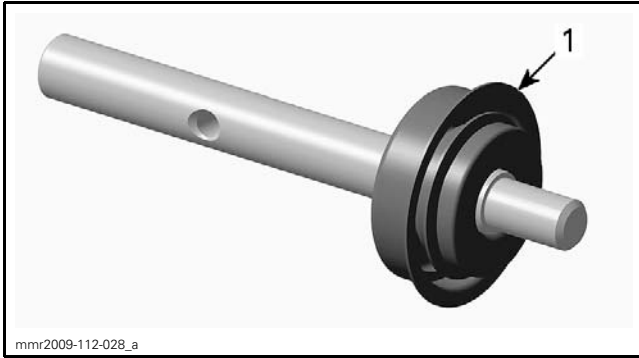


1. Sealing lip
2. Oil seal properly installed

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

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

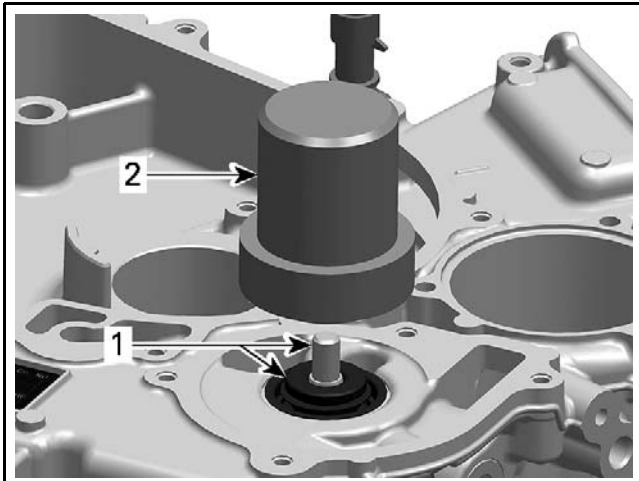
REQUIRED TOOL	
SEAL PUSHER (P/N 529 035 766)	



WATER PUMP SHAFT ASSEMBLY

1. Surface where rotary seal is pushed by tool

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

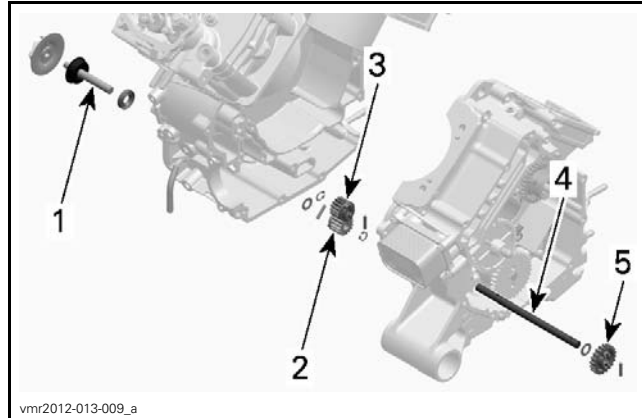


1. Water pump shaft with rotary seal
2. Water pump seal installer

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

WATER PUMP GEARS

Water Pump Gears Identification

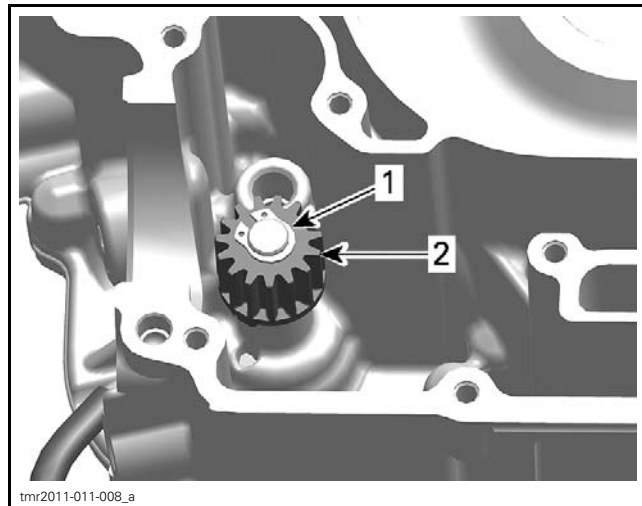


1. Water pump shaft
2. Water pump gear
3. Water pump intermediate drive gear
4. Water pump intermediate shaft
5. Water pump drive gear (See BOTTOM END subsection)

Inspecting the Water Pump Gears

Water Pump Gear

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

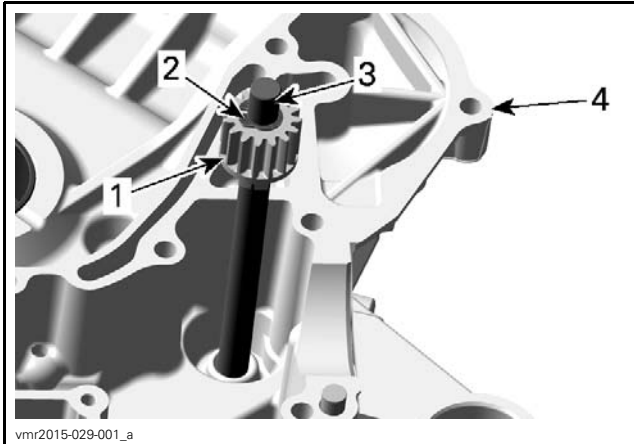


CRANKCASE MAG SIDE

1. Circlip
2. Water pump gear

Water Pump Intermediate Drive Gear

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



CRANKCASE PTO SIDE

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

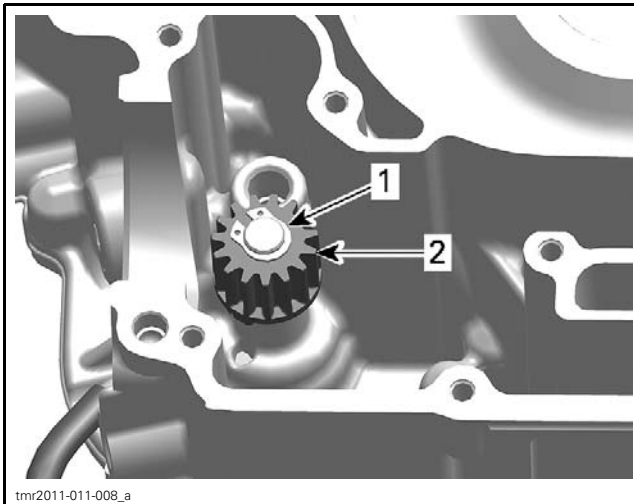
Water Pump Drive Gear

See *BOTTOM END* subsection.

Removing the Water Pump Gears

Water Pump Gear

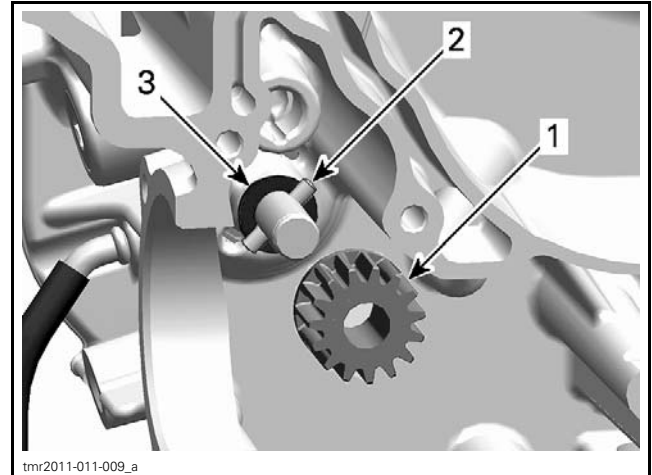
1. Remove circlip retaining water pump gear and discard it.



CRANKCASE MAG SIDE

1. Circlip
2. Water pump gear

2. Remove the following parts:
 - Water pump gear
 - Needle pin
 - Thrust washer.

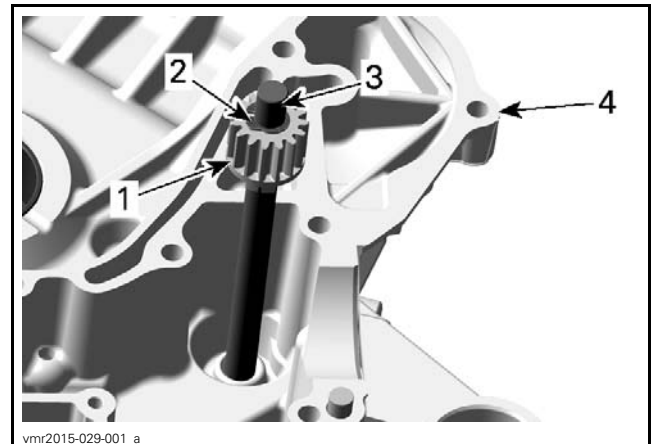


CRANKCASE MAG SIDE

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

Water Pump Intermediate Drive Gear

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



CRANKCASE PTO SIDE

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

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

Water Pump Drive Gear

See *BOTTOM END* subsection.

Installing the Water Pump Gears

Water Pump Gear

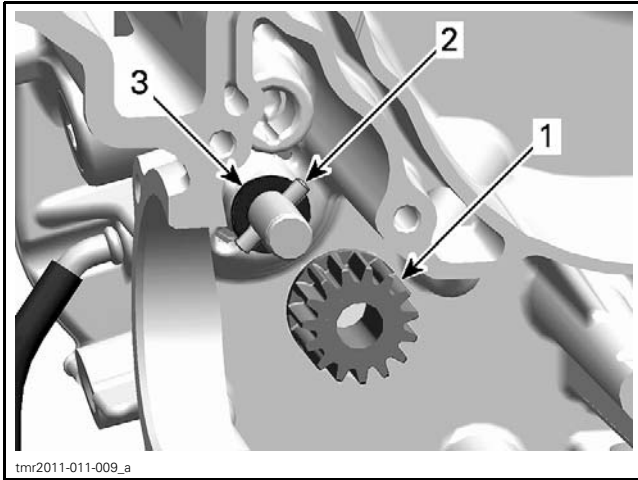
Install the following parts on water pump shaft.

- Thrust washer
- Needle pin
- Water pump gear.

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

Water Pump Drive Gear

See *BOTTOM END* subsection.

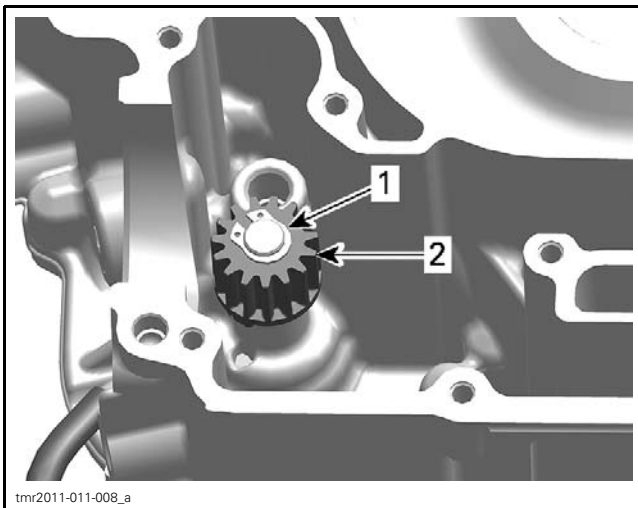


- 1. Water pump gear
- 2. Needle pin
- 3. Thrust washer

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

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

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



- 1. Circlip
- 2. Water pump gear

Water Pump Intermediate Drive Gear

Install the following parts on water pump intermediate shaft.

- Needle pin
- Water pump intermediate drive gear.

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

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