

COOLING SYSTEM

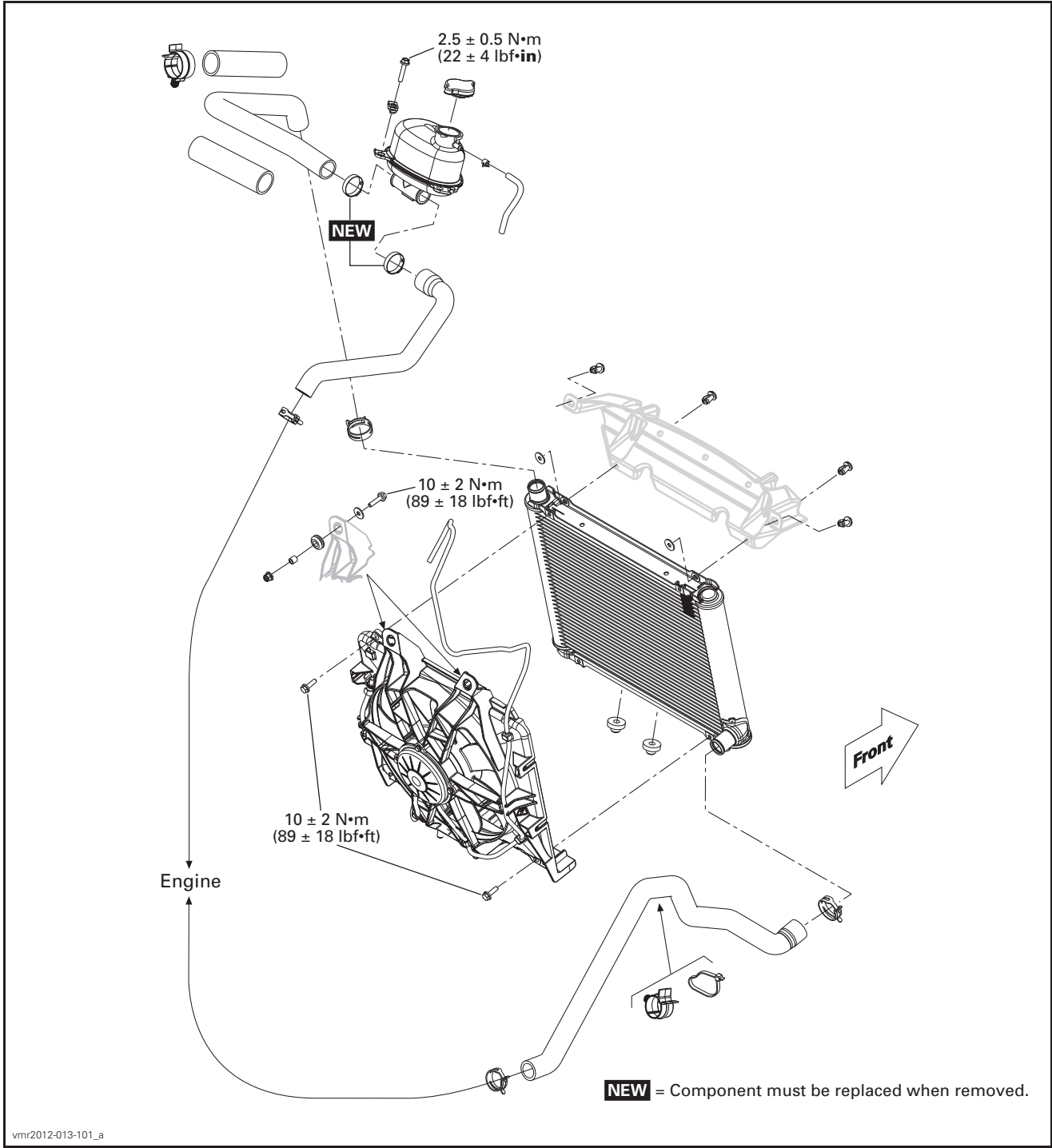
SERVICE TOOLS

Description	Part Number	Page
BLIND HOLE PULLER KIT	529 036 056	91
FLUKE 115 MULTIMETER	529 035 868	83
HANDLE	420 877 650	92
OIL SEAL PUSHER.....	529 035 757	92
ROTARY SEAL PUSHER PLATE	529 036 130	89
SEAL PUSHER	529 035 766	89, 93

SERVICE PRODUCTS

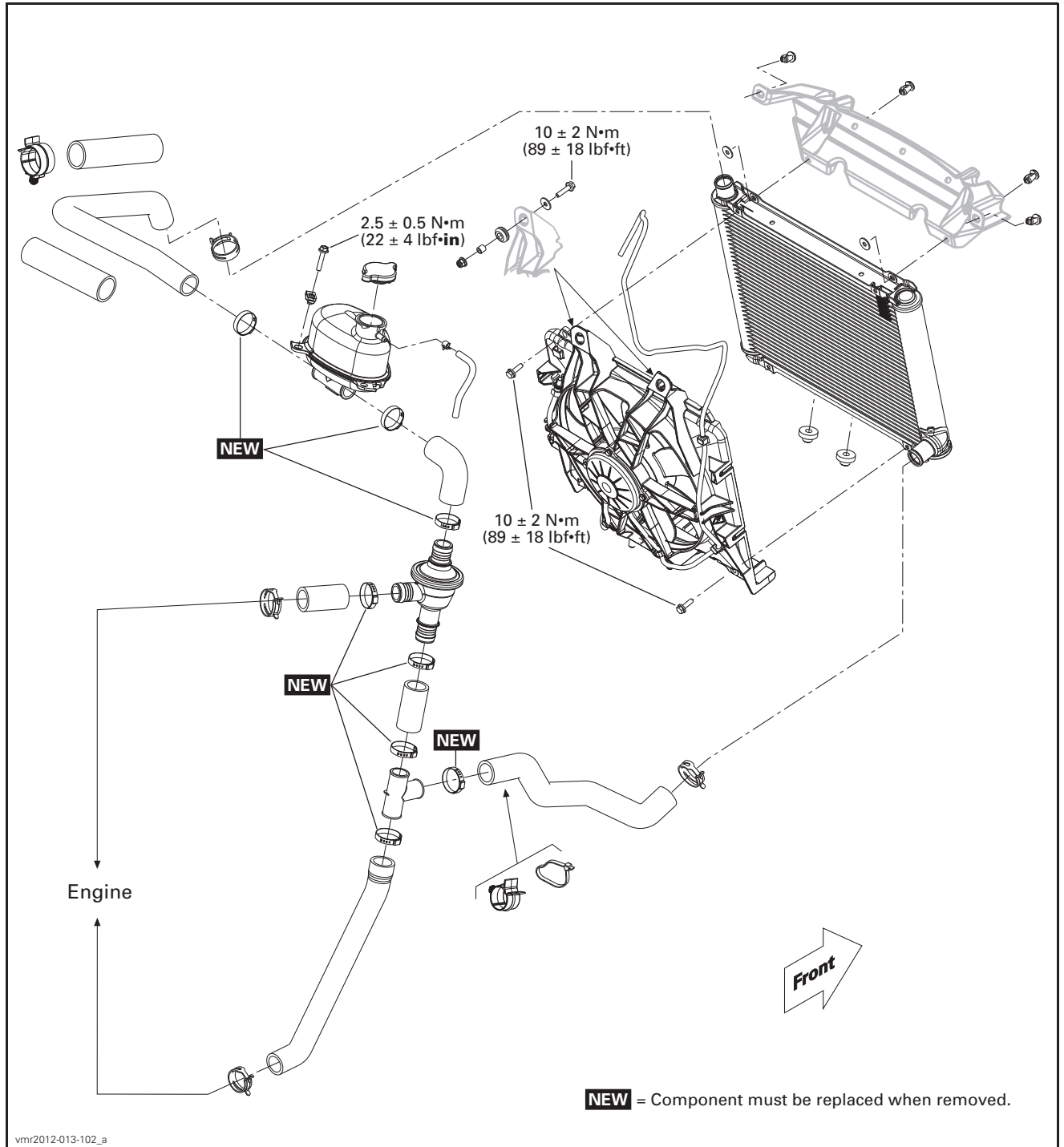
Description	Part Number	Page
DOW CORNING 111	413 707 000	92
LOCTITE 243 (BLUE).....	293 800 060	81

RADIATOR
800R Engine



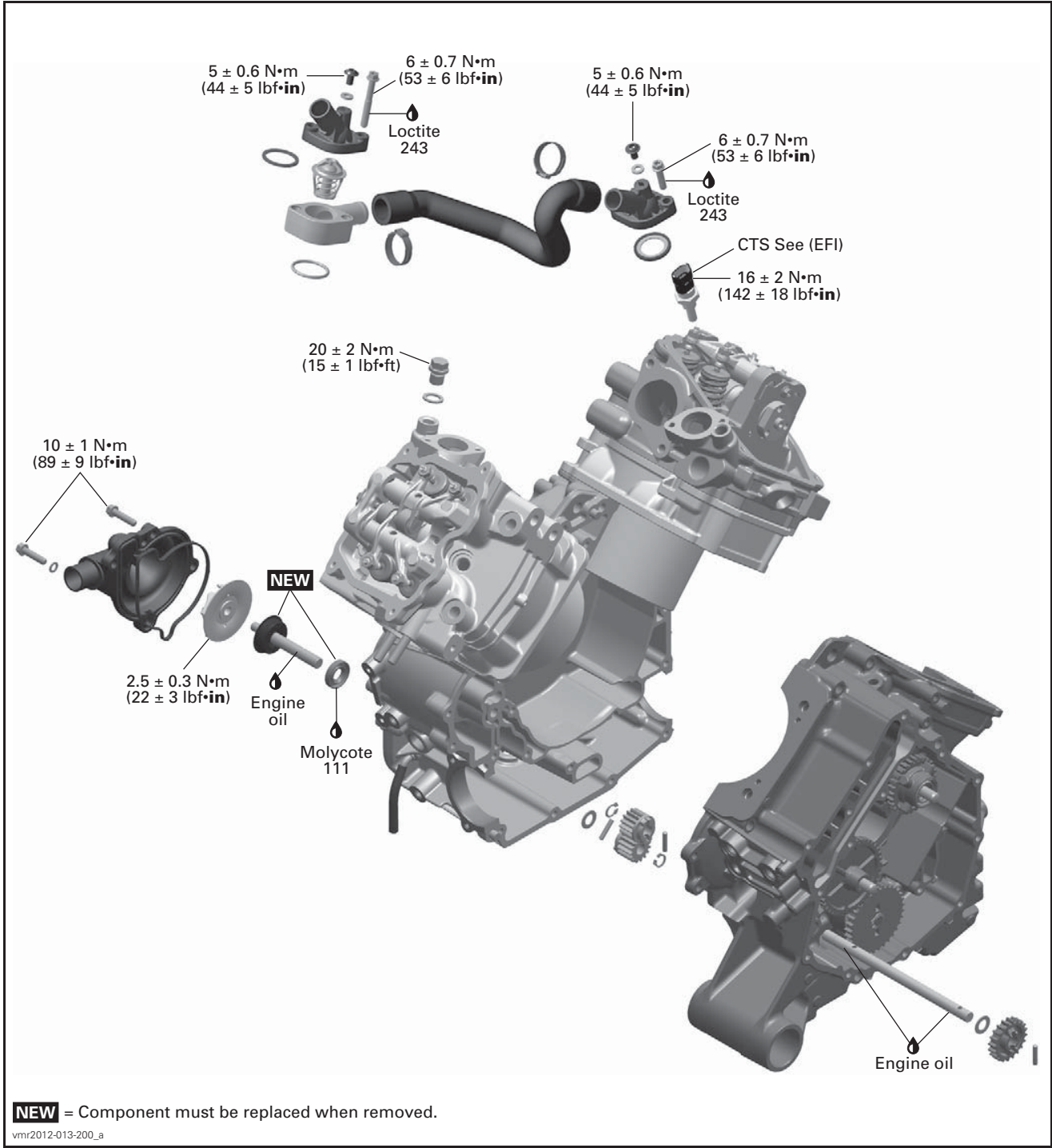
RADIATOR AND THERMOSTAT

1000 Engine



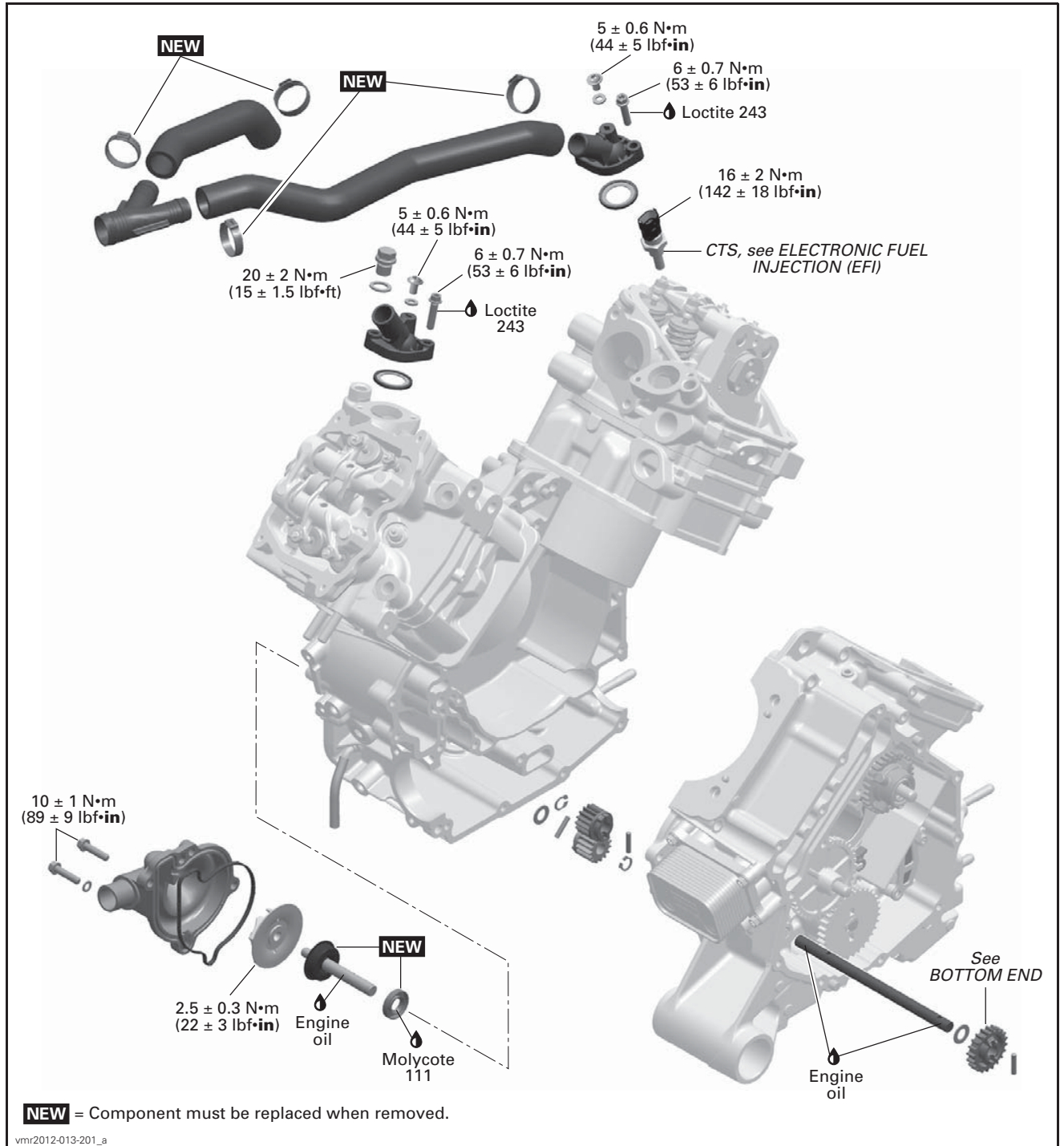
WATER PUMP AND THERMOSTAT

800R Engine



WATER PUMP

1000 Engine



Section 02 ENGINE, CVT AND GEARBOX

Subsection 05 (COOLING SYSTEM)

GENERAL

⚠ WARNING

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

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

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

⚠ WARNING

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

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

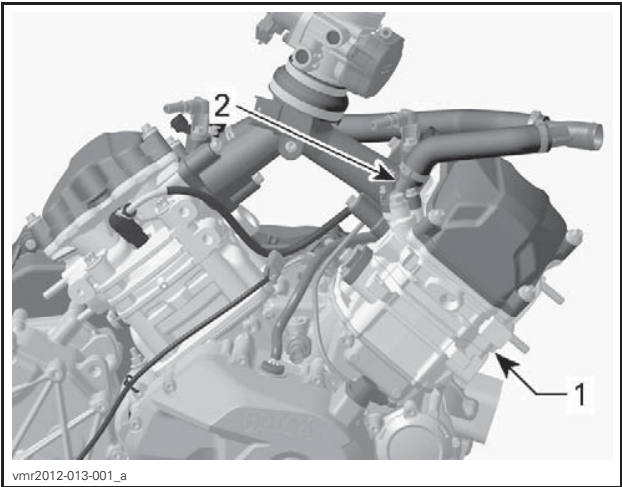
PROCEDURES

THERMOSTAT

Thermostat Location

800R Models

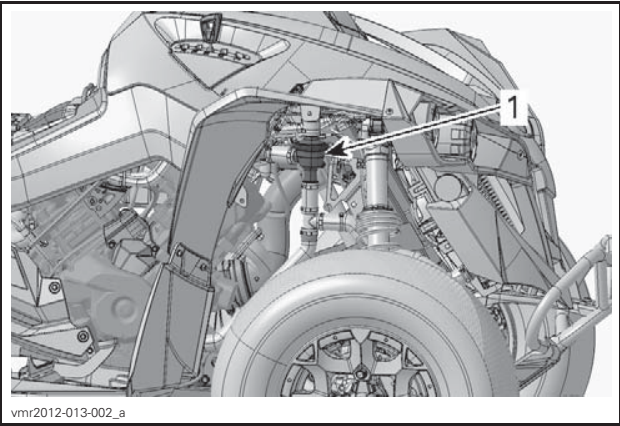
The thermostat is located in the thermostat housing at the top of the front cylinder (RH side).



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

1000 Models

The thermostat is located in-line in the cooling system circuit (RH side).

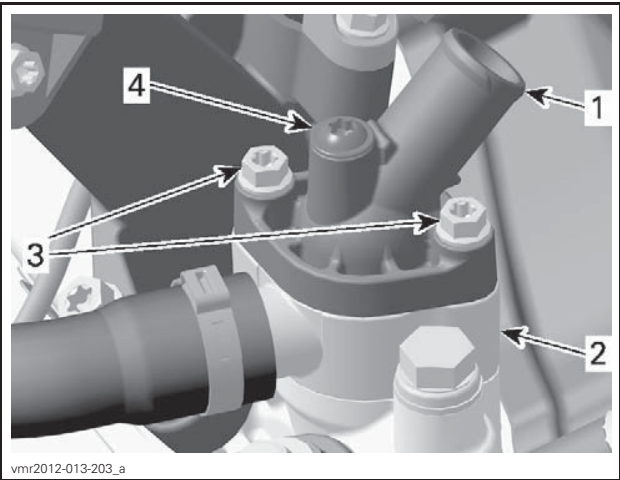


TYPICAL - THERMOSTAT LOCATION (1000 MODELS)
1. In-line thermostat

Thermostat Removal

800R Models

1. Drain engine coolant, refer to *PERIODIC MAINTENANCE PROCEDURES* subsection.
2. Remove thermostat housing screws and remove thermostat cover.

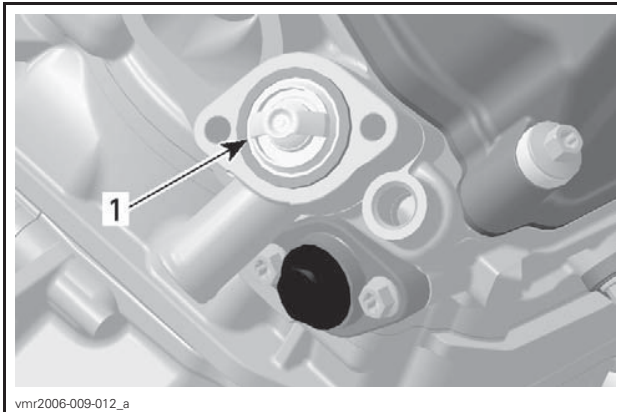


THERMOSTAT
1. Thermostat cover
2. Thermostat housing
3. Cover screws
4. Bleed screw

3. Pull thermostat and gasket from thermostat housing.

Section 02 ENGINE, CVT AND GEARBOX

Subsection 05 (COOLING SYSTEM)



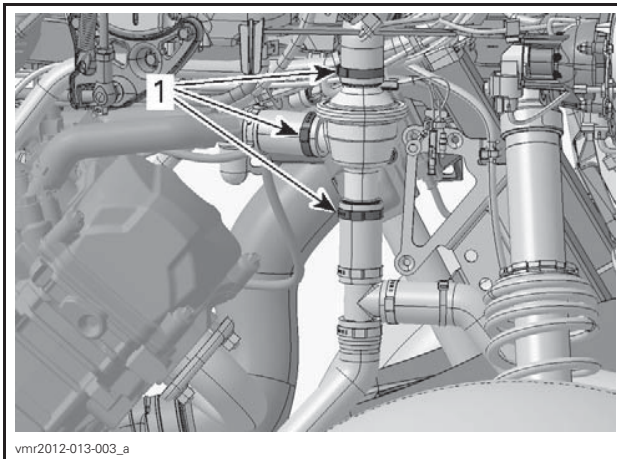
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TYPICAL

1. Thermostat with gasket

1000 Models

1. Drain engine coolant, refer to *PERIODIC MAINTENANCE PROCEDURES* subsection.
2. Remove Oetiker clamps that secure hoses to thermostat.



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TYPICAL - SOME PARTS REMOVED FOR CLARITY

1. Oetiker clamps

3. Pull hoses from thermostat housing to remove thermostat.

Thermostat Test

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

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

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

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

Thermostat Installation

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

800R Models

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

All Models

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

Check cooling system for leaks.

RADIATOR

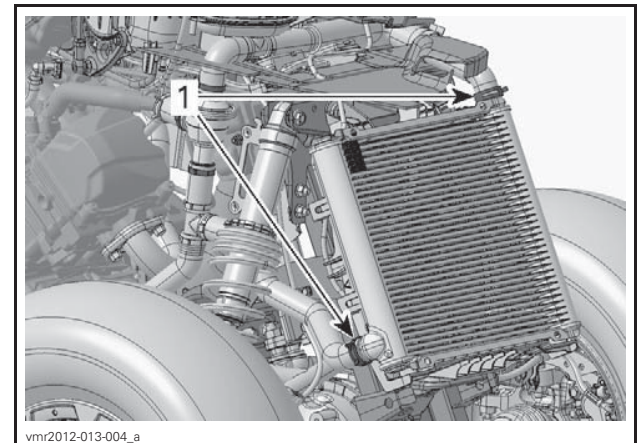
Radiator Inspection

Check radiator fins for clogging or damage.

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

Radiator Removal

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



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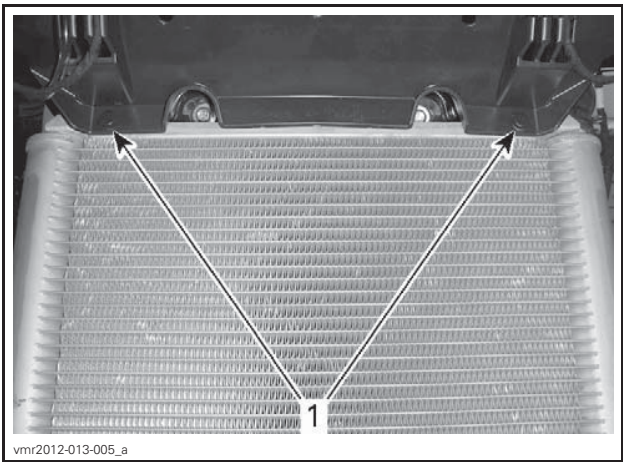
TYPICAL - RENEGADE 1000 SHOWN

1. Radiator hoses

4. On applicable models, remove the following plastic rivets.

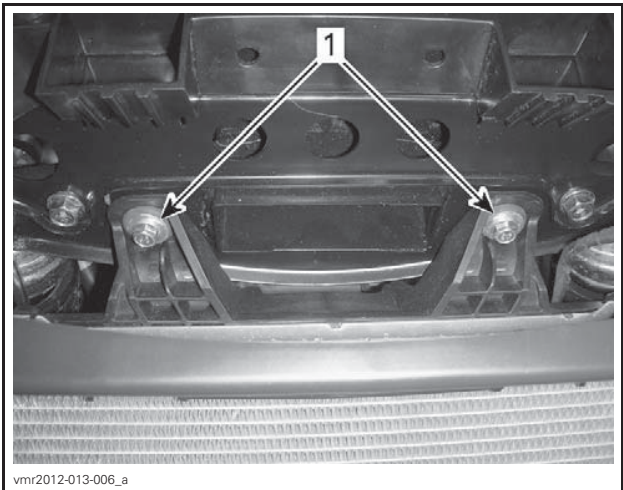
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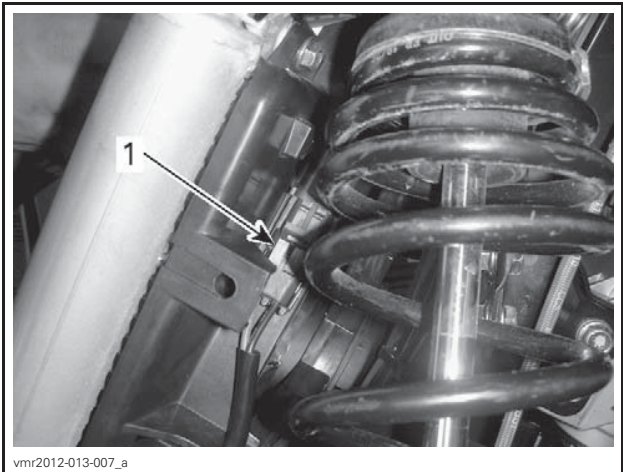
TYPICAL
1. Plastic rivets

5. Remove upper retaining bolts from radiator.



TYPICAL
1. Upper retaining bolts

6. Disconnect cooling fan connector.



FROM LH SIDE
1. Cooling fan connector

7. Remove cooling fan vent hose from vehicle.

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

8. Pull radiator upwards to release it from rubber bushings.

Radiator Installation

The installation is the reverse of the removal procedure. However, pay attention to the following. Ensure that rubber bushings are properly installed between frame and radiator.

Ensure that vent hose of the cooling fan motor is properly rooted as prior to removal.

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.

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.

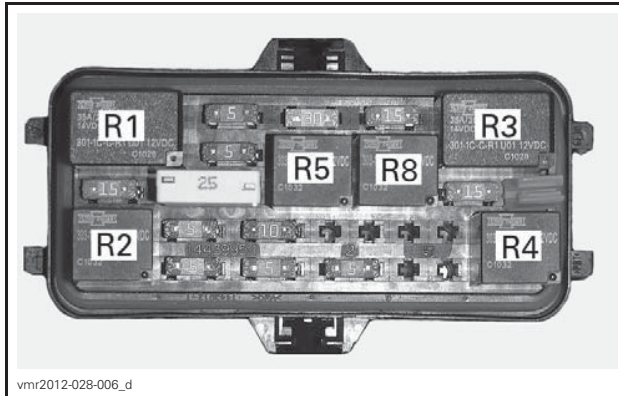
RADIATOR COOLING FAN RELAY (R1)

Relay Location (Radiator Cooling Fan)

The relay (R1) is located in front fuse box under gauge support.

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R1: RADIATOR COOLING FAN RELAY

Relay Operation Test (Radiator Cooling Fan)

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.

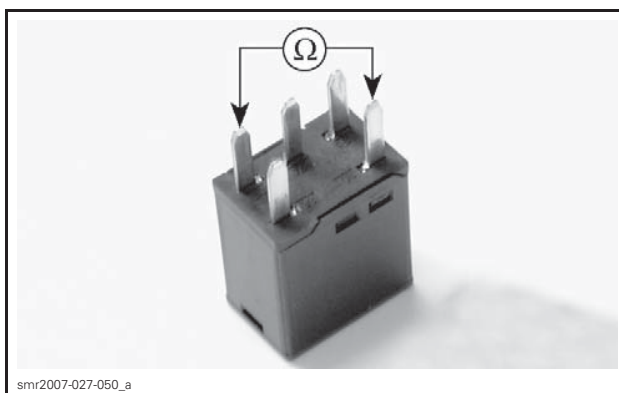
Relay Continuity Test (Radiator Cooling Fan)

1. Remove relay.
2. Set multimeter to Ω .

REQUIRED TOOL	
FLUKE 115 MULTIMETER (P/N 529 035 868)	

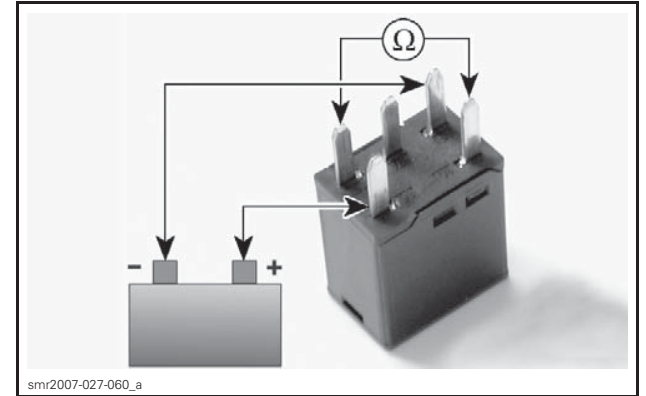
3. Probe relay as follows.

TERMINAL		RESISTANCE
30	87	Open circuit (OL)



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

TERMINAL		RESISTANCE
30	87	0.5 Ω max. (continuity)



If relay failed any test, replace it.

RADIATOR COOLING FAN

Radiator Cooling Fan Operation

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

AIR INTAKE TEMPERATURE	COOLING FAN
88°C (190°F)	Turns ON
85°C (185°F)	Turns OFF

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 fuse (F9) is located in front fuse box under gauge support.

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Radiator Cooling Fan Test

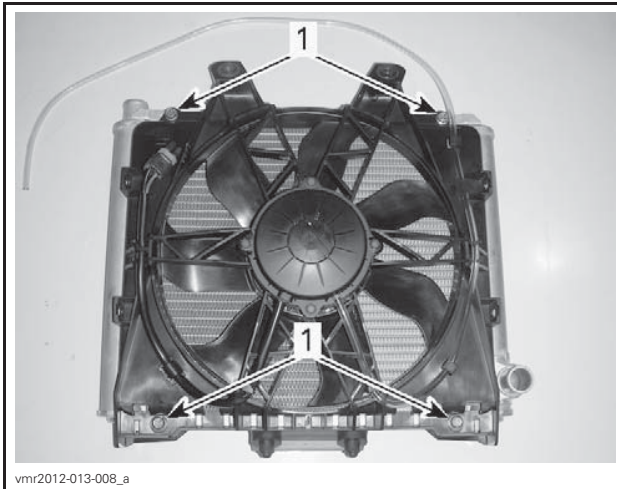
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2. Connect cooling fan connector pin B (BU wire) to a 20 A suitable fuse jumper and then directly to the positive battery post.
3. Connect cooling fan connector pin A (BK wire) directly to the negative battery post.
4. Check if cooling fan works properly.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

- | COOLING FAN TROUBLESHOOTING CHART | | |
|--|-------|-------------------------------------|
| Is fan working? | YES → | Everything is OK |
| NO ↓ | | |
| Check ECM fuse (F6)
Check FAN fuse (F9)
Is fuse burnt? | YES → | Replace fuse
Is fan working? |
| NO ↓ | | |
| Bypass fan relay R1 | | |
| ↓ | | |
| Fan turns? | YES → | Replace relay
Is fan working? |
| NO ↓ | | |
| Apply 12 Vdc to fan connector | | |
| ↓ | | |
| Fan turns? | NO → | Replace fan
Is fan working? |
| YES ↓ | | |
| Check CTS | | |
| ↓ | | |
| CTS works? | NO → | Replace CTS
Is fan working? |
| YES ↓ | | |
| Check wiring harness and connectors | | |
| ↓ | | |
| Harness and connectors good? | NO → | Repair or replace defective part(s) |
| YES ↓ | | |
| Try a new ECM | → | Is fan working? |

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1. Cooling fan retaining screws

3. Remove radiator cooling fan.

Radiator Cooling Fan Installation

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

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

WATER PUMP HOUSING

Water Pump Housing Location

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

Water Pump Housing Access

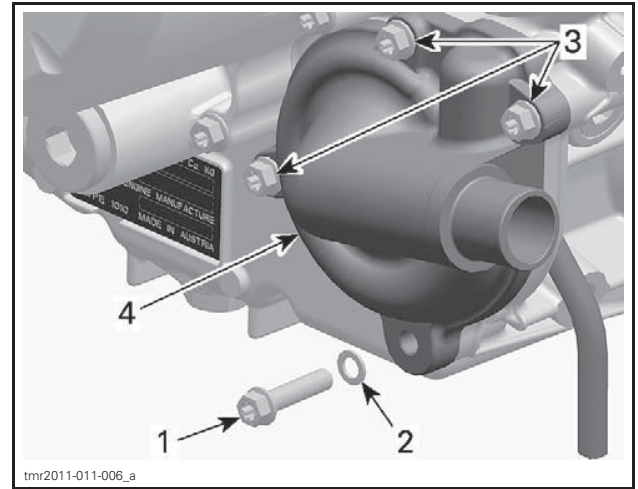
Remove RH footrest panel, refer to *BODY* subsection.

Water Pump Housing Removal

⚠ WARNING

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

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.

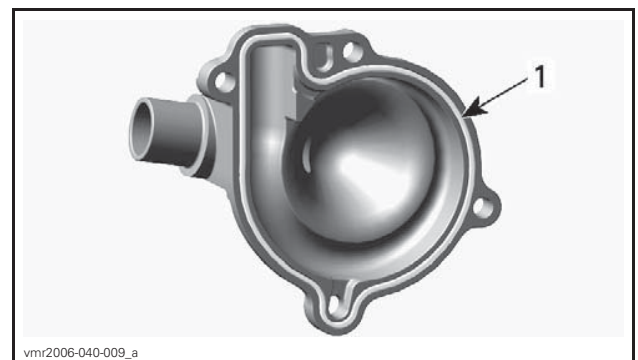


1. Coolant drain plug
2. Sealing ring
3. Screws
4. Water pump housing

4. Pull water pump housing to remove it.

Water Pump Housing Inspection

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



TYPICAL
1. Gasket

Water Pump Housing Installation

The installation is the 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.

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

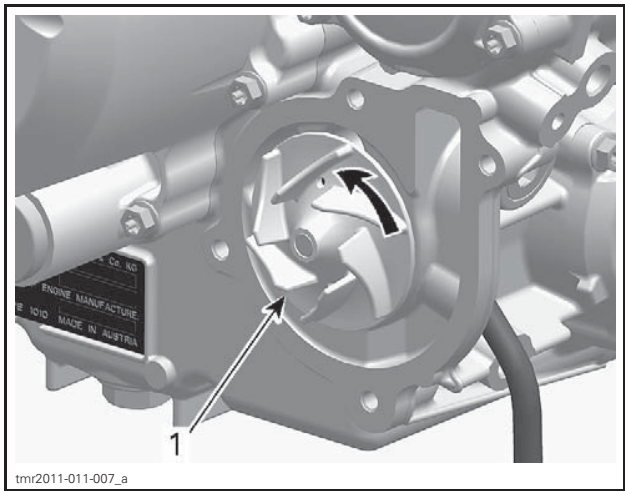
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WATER PUMP IMPELLER

Water Pump Impeller Removal

- 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.

Water Pump Impeller Inspection

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

Water Pump Impeller Installation

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, ROTARY SEAL AND OIL SEAL

Use these guidelines to service these parts.

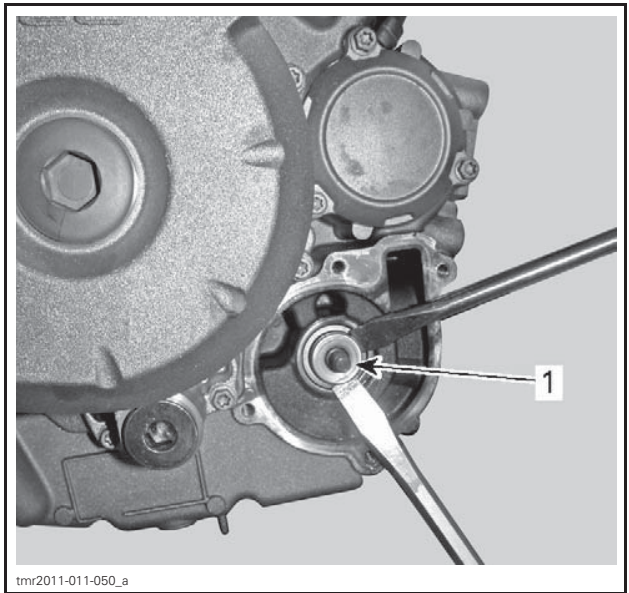
DEFECTIVE PART	ACTION
Rotary seal	Replace: <ul style="list-style-type: none">- Rotary seal- Oil seal (assembled engine)
Oil seal	Replace: <ul style="list-style-type: none">- Rotary seal- Oil seal (assembled engine)
Water pump shaft	Replace: <ul style="list-style-type: none">- Water pump shaft- Rotary seal- Oil seal (engine disassembled)

NOTICE Rotary seal and oil seal must be replaced if water pump shaft is to be replaced.

Rotary Seal and Oil Seal Replacement (Assembled Engine)

Rotary Seal and Oil Seal Removal

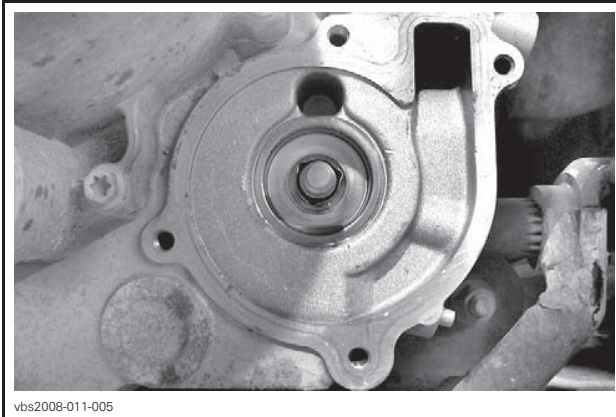
- 1. Remove the following parts, see procedure in this subsection.
 - *WATER PUMP HOUSING*
 - *WATER PUMP IMPELLER*.
- 2. Carefully pry out inner part of the rotary seal using 2 screwdrivers.



1. Inner part of rotary seal

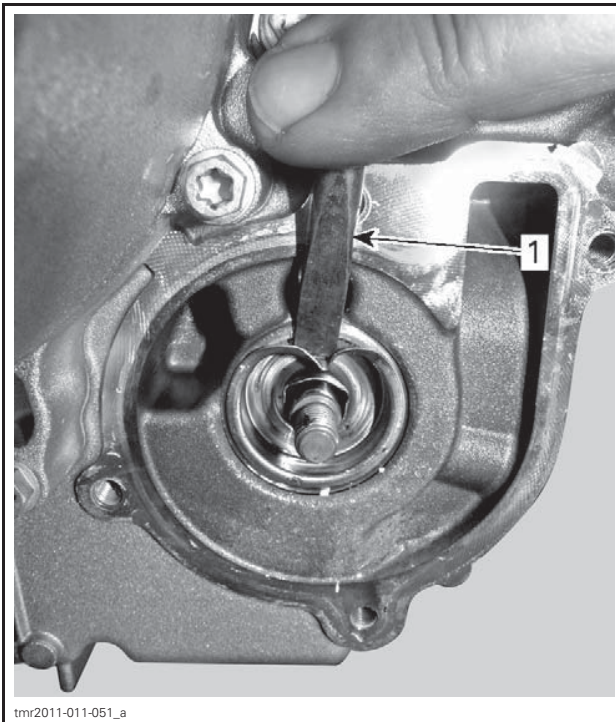
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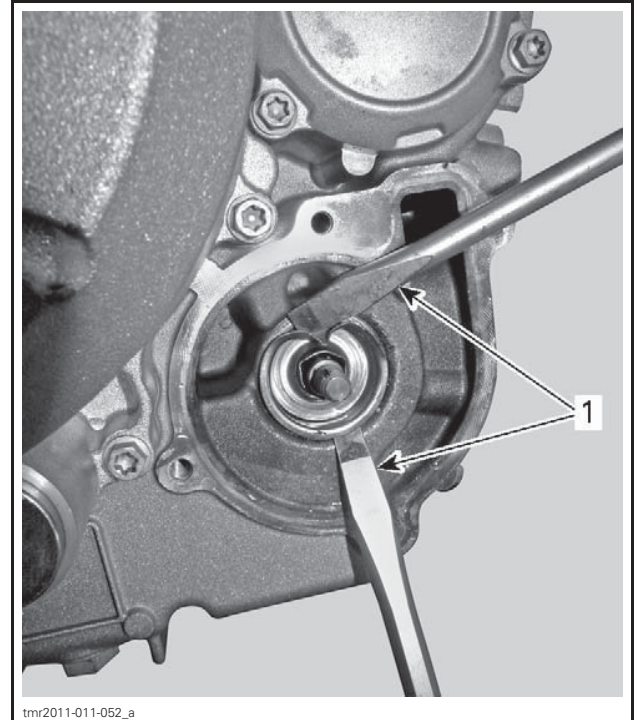
TYPICAL - INNER PART OF ROTARY SEAL REMOVED

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



1. Small chisel

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

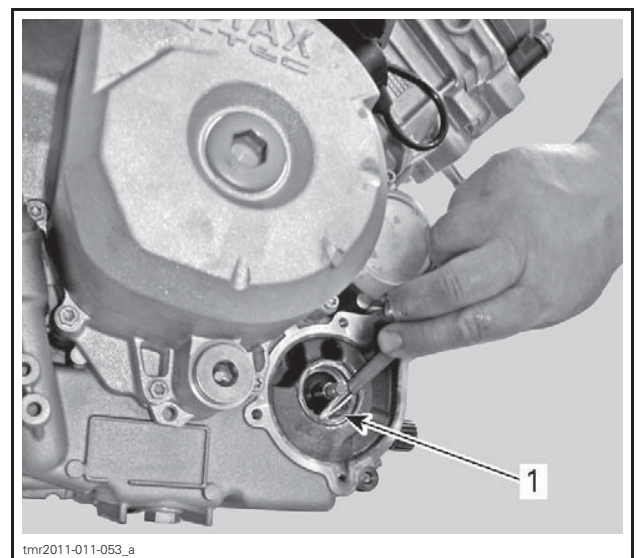


1. Screwdrivers

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

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

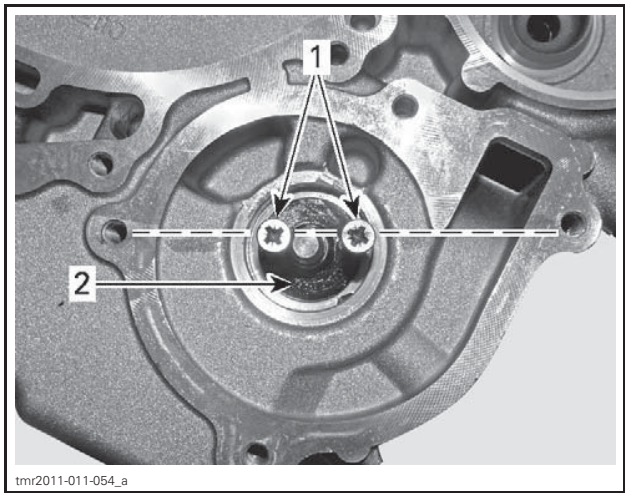
NOTICE Be careful not to damage water pump shaft.



1. Scraper

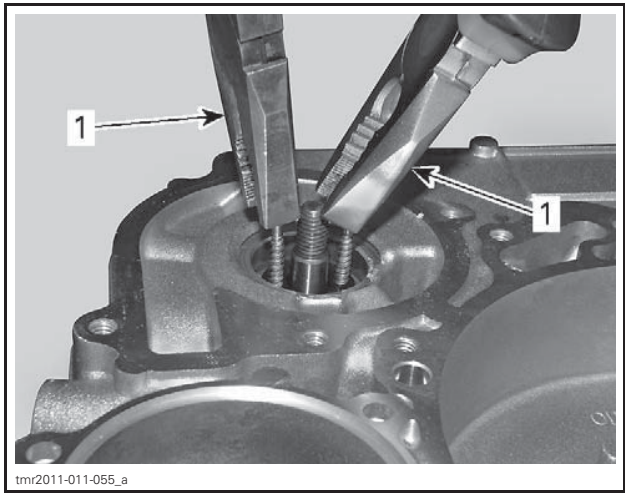
6. Install 2 wooden screws in the seal.

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- 1. Wooden screws
- 2. Oil seal

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

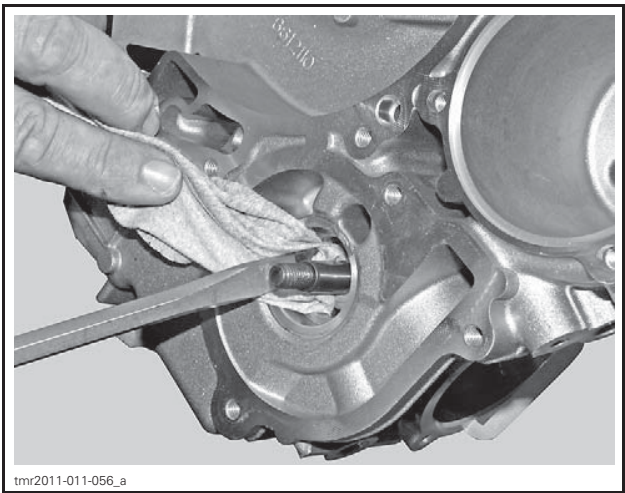


- 1. Pull on screws to remove seal

8. Check water pump shaft axial play.

NOTE: Engine must be disassembled to replace water pump shaft.

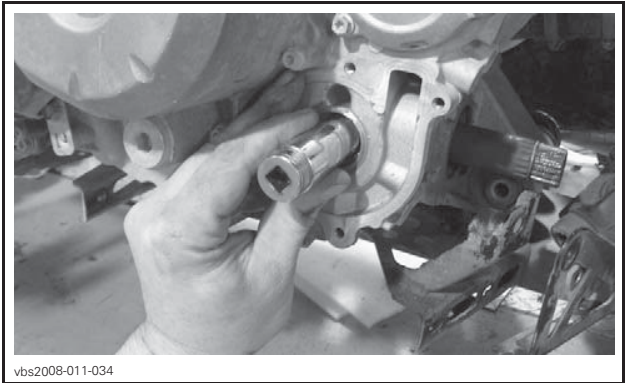
9. Clean oil seal seat.



Oil Seal 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

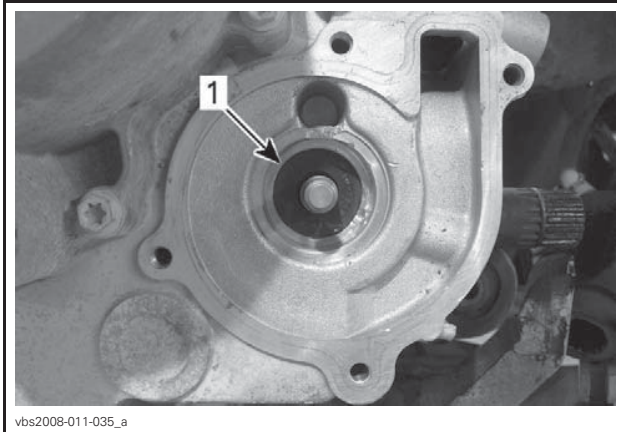


OIL SEAL INSTALLATION

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

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TYPICAL

1. Oil seal properly seated

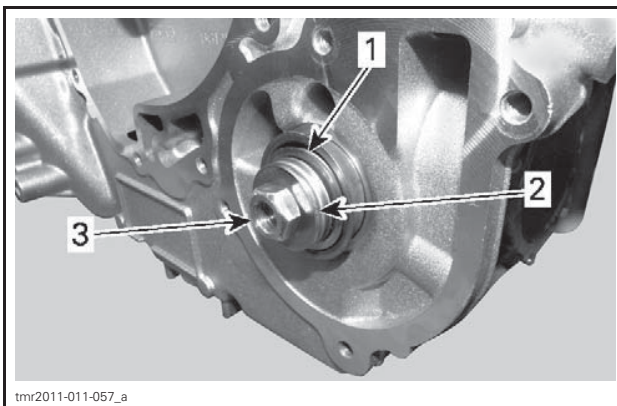
Rotary Seal Installation

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

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

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

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



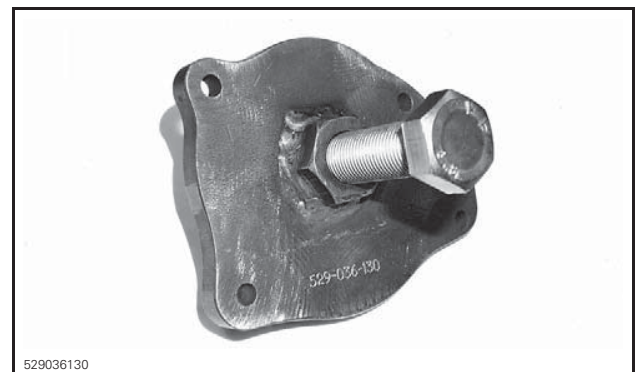
1. Rotary seal
2. M8 robust flat washer (P/N 420 227 935)
3. M8 x 1.25 nut (P/N 233 281 414)

6. Remove M8 nut.

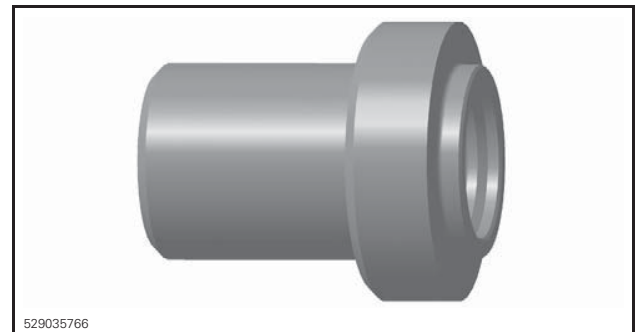
NOTE: The robust M8 flat washer must remain on water pump shaft.

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

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)



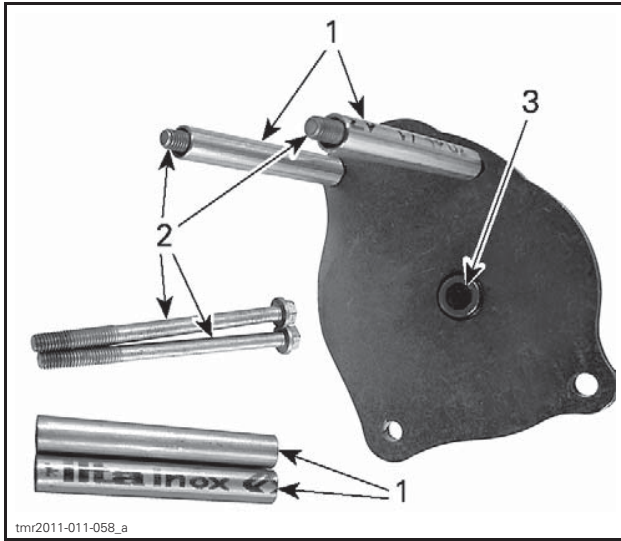
ROTARY SEAL PUSHER PLATE (P/N 529 036 130)



SEAL PUSHER (P/N 529 035 766)

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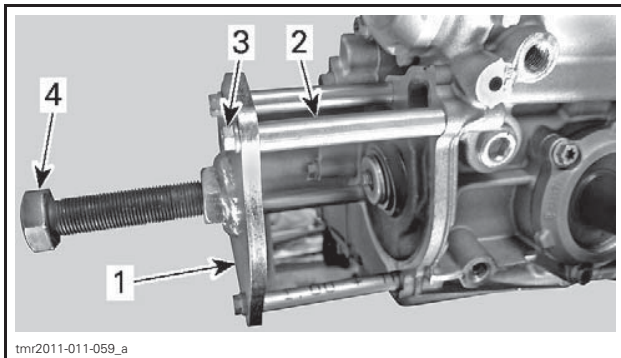
ROTARY SEAL PUSHER PLATE ASSEMBLY

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

NOTE: Make sure pusher bolt has a plane surface.

- 7.1 Apply a little grease at the end of tool pusher bolt.
- 7.2 Ensure that pusher bolt is completely unscrewed.
- 7.3 Install rotary seal pusher plate on crankcase by tightening M6 screws.

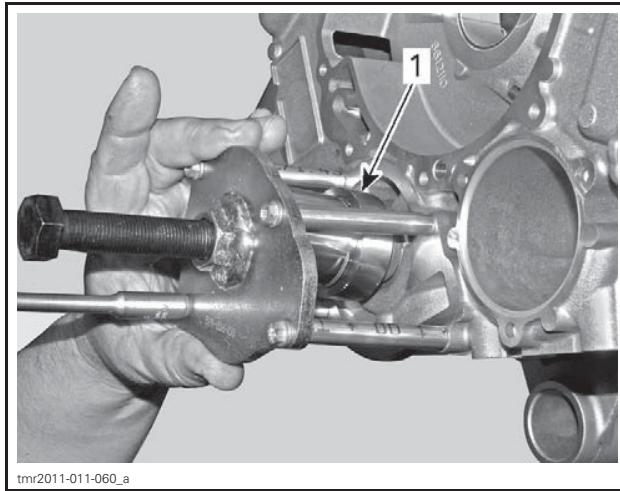
NOTICE Do not use pneumatic or electric tools for tightening screws.



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

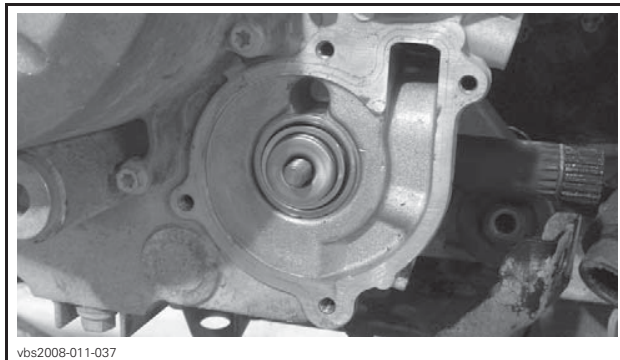
- 7.4 Install seal pusher between rotary seal pusher plate and water pump shaft.



SEAL PUSHER INSTALLATION

1. Seal pusher aligned with pusher bolt

- 7.5 Tighten the pusher bolt by hand until it stops against the seal pusher.
8. Carefully thread the pusher bolt 1-1/2 turns.
9. Ensure that the rotary seal is going straight into crankcase.
10. Remove rotary seal installation tools from crankcase.
11. Repeat steps 4 TO 10 until rotary seal is completely seated in the crankcase.

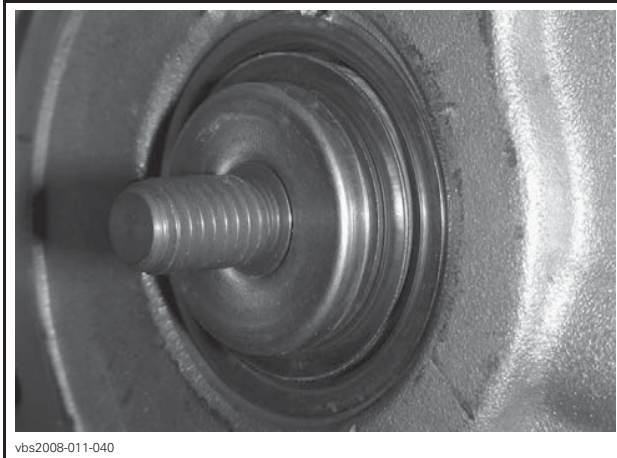


ROTARY SEAL PROPERLY SEATED ON CRANKCASE

12. Carry out the final adjustment of the water pump shaft as follows.
 - 12.1 Install M8 x 1.25 nut (P/N 233 281 414) onto water pump shaft.
 - 12.2 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 Ensure that the water pump shaft is properly adjusted with rotary seal.

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

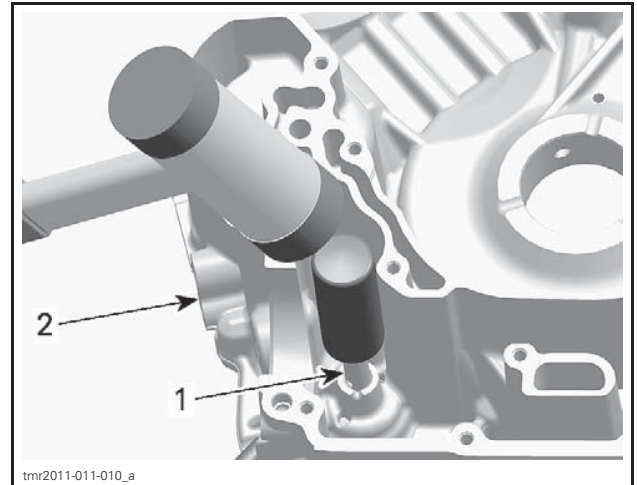
13. Install the following parts, see procedure in this subsection.
 - WATER PUMP IMPELLER
 - WATER PUMP HOUSING.
14. Refill and bleed cooling system. Refer to *PERIODIC MAINTENANCE PROCEDURES* subsection.
15. Check cooling system for leaks.

Water Pump Shaft, Rotary Seal and Oil Seal Replacement (Disassembled Engine)

Water Pump Shaft, Rotary Seal and Oil Seal 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

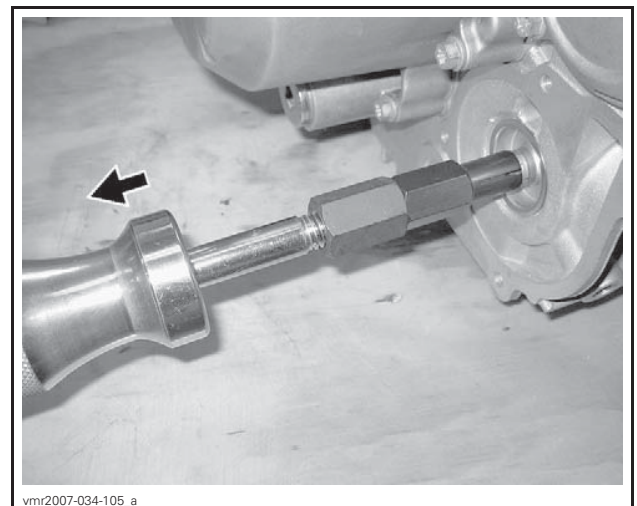


1. Water pump shaft
2. Crankcase MAG side

3. Remove outer part of rotary seal using an expander.

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

4. Install expander snugly against outer part of rotary seal and pull seal out.

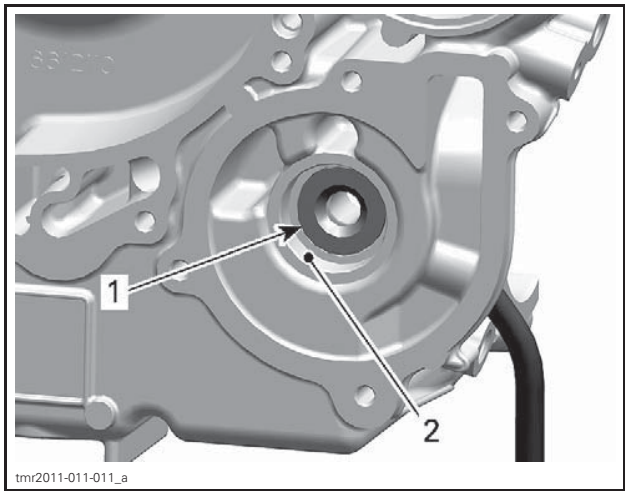


TYPICAL

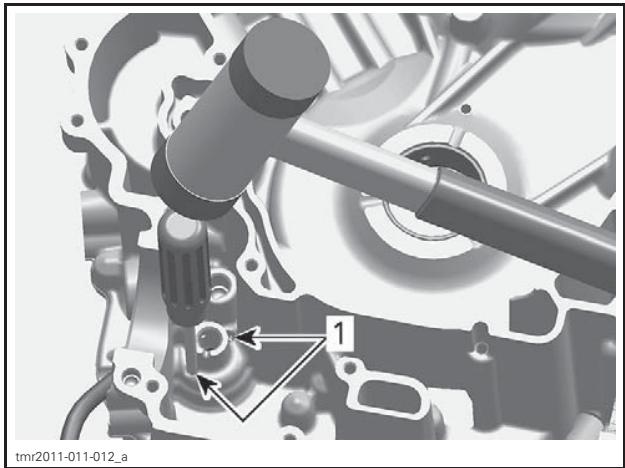
5. Remove oil seal from inside of crankcase MAG side using a pusher tool.

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

Section 02 ENGINE, CVT AND GEARBOX
Subsection 05 (COOLING SYSTEM)



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, Rotary Seal and Oil Seal Installation

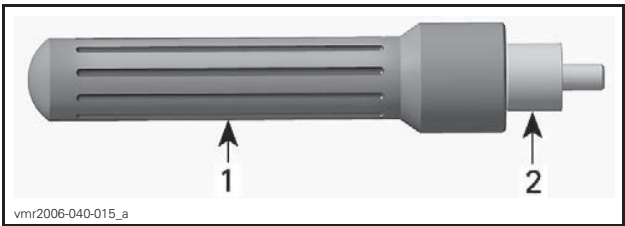
The installation is the reverse of the removal procedure. However, pay attention to the following. Use tightening torque values specified in the exploded view.

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

Clean rotary seal surface of any old sealant.

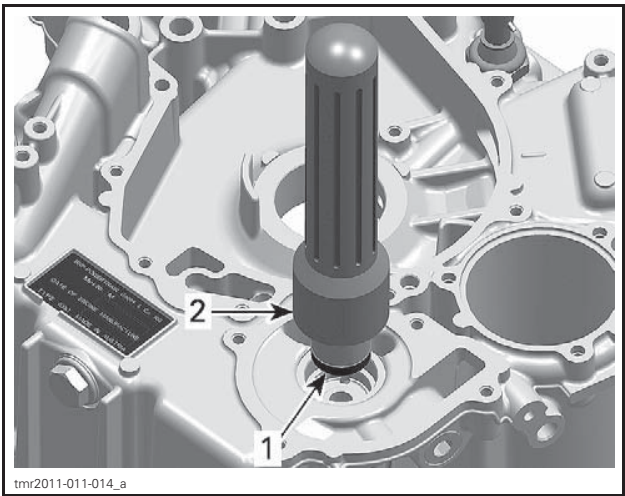
Install oil seal.

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



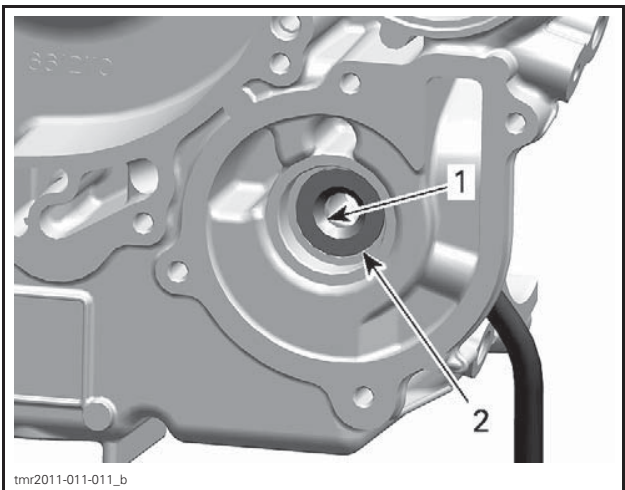
1. Handle
2. Pusher

When installing the oil seal on the pusher, make sure the sealing lip points outwards. Push NEW oil seal in place.



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

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



1. Sealing lip
2. Oil seal properly installed

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

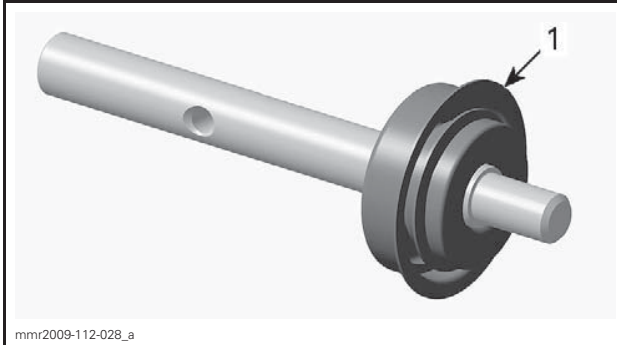
Slide new water pump shaft with the new rotary seal into crankcase.

Section 02 ENGINE, CVT AND GEARBOX

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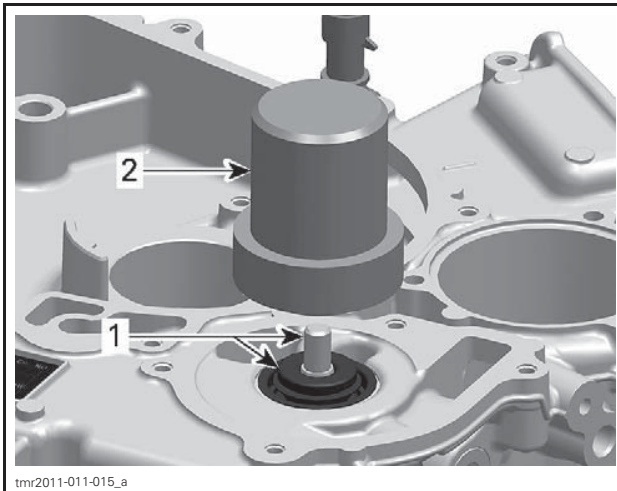
REQUIRED TOOL

SEAL PUSHER (P/N 529 035 766)



1. Surface where rotary seal is pushed by tool

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

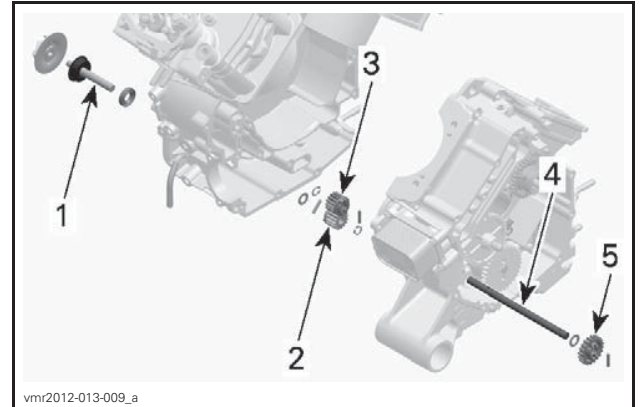


1. Water pump shaft with rotary seal
2. Water pump seal installer

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

WATER PUMP GEARS

Water Pump Gears Identification

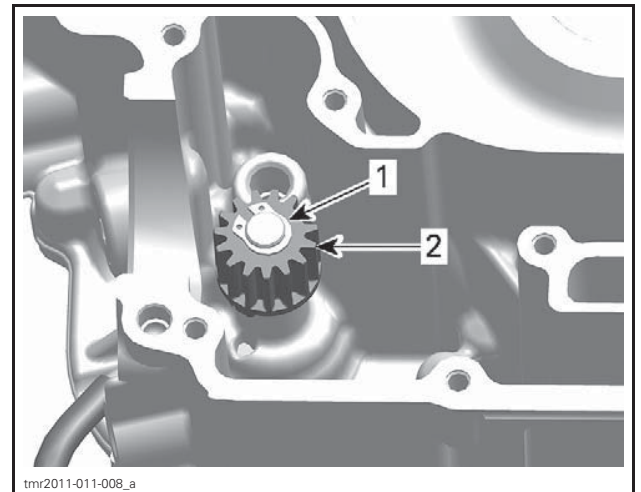


1. Water pump shaft
2. Water pump gear
3. Water pump intermediate drive gear
4. Water pump intermediate shaft
5. Water pump drive gear (See BOTTOM END subsection)

Water Pump Gears Inspection

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

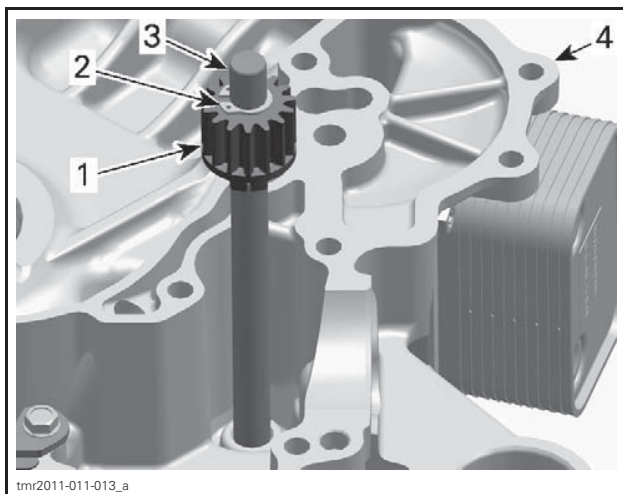
1. Circlip
2. Water pump gear

Water Pump Intermediate Drive Gear

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

Section 02 ENGINE, CVT AND GEARBOX

Subsection 05 (COOLING SYSTEM)



CRANKCASE PTO SIDE

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

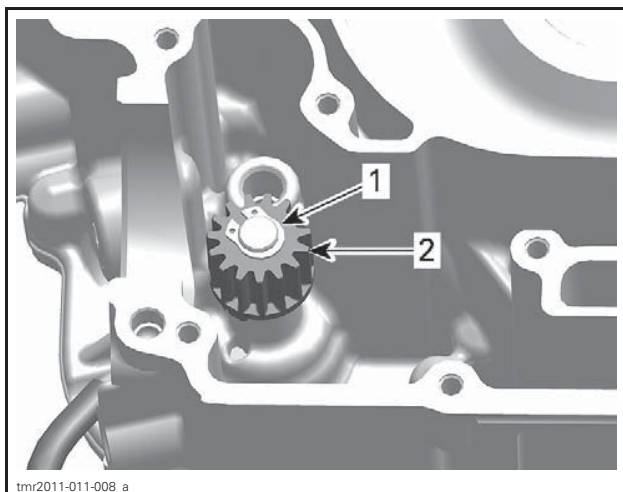
Water Pump Drive Gear

See *BOTTOM END* subsection.

Water Pump Gears Removal

Water Pump Gear

1. Remove circlip retaining water pump gear.

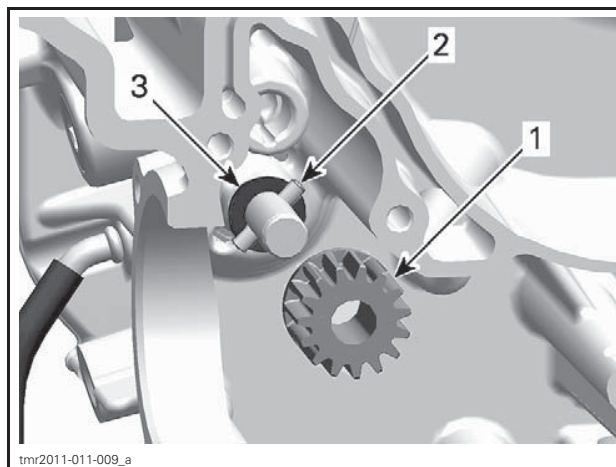


CRANKCASE MAG SIDE

1. Circlip
2. Water pump gear

2. Remove the following parts:

- Water pump gear
- Needle pin
- Thrust washer.

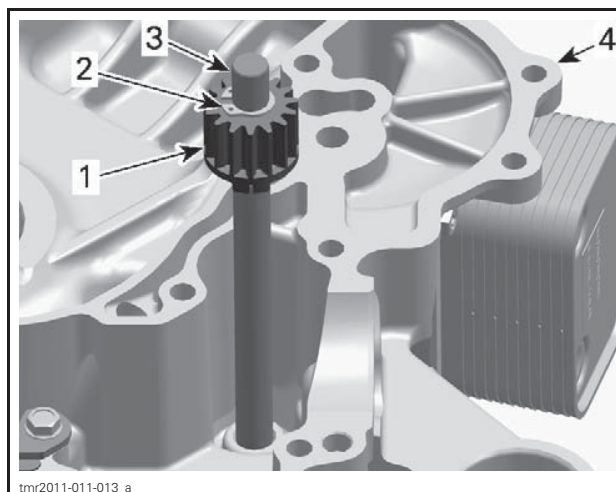


CRANKCASE MAG SIDE

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

Water Pump Intermediate Drive Gear

1. Remove circlip retaining water pump intermediate drive gear.



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.

Water Pump Gears Installation

Water Pump Gear

Install the following parts on water pump shaft.

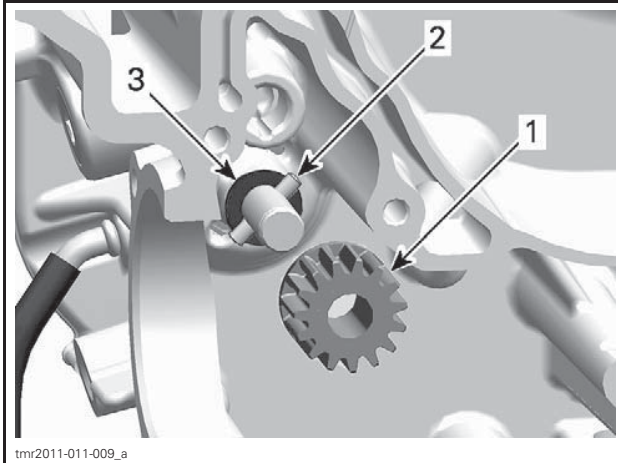
- Thrust washer

Section 02 ENGINE, CVT AND GEARBOX

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- Needle pin
- Water pump gear.

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

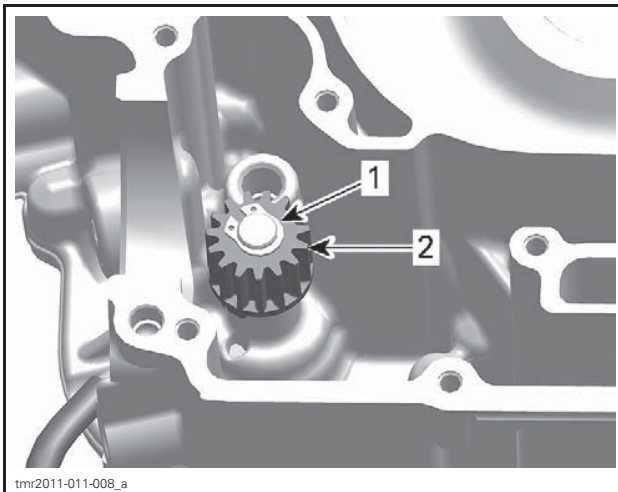


1. Water pump gear
2. Needle pin
3. Thrust washer

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

Install 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 circlip to retain water pump intermediate drive gear.

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

Water Pump Drive Gear

See *BOTTOM END* subsection.

MAGNETO SYSTEM

SERVICE TOOLS

Description	Part Number	Page
CRANKSHAFT LOCKING BOLT	529 035 617	103
CRANKSHAFT PROTECTOR	529 036 034	103
FLUKE 115 MULTIMETER	529 035 868	101–102
MAGNETO PULLER	529 035 748	103

SERVICE TOOLS – OTHER SUPPLIER

Description	Part Number	Page
FLUKE RIGID BACK-PROBE	TP88	102

SERVICE PRODUCTS

Description	Part Number	Page
DREI BOND SEALING COMPOUND	420 297 906	100
LOCTITE 648 (GREEN)	413 711 400	105
LOCTITE 767 (ANTISEIZE LUBRICANT)	293 800 070	106
LOCTITE CHISEL (GASKET REMOVER)	413 708 500	100
PULLEY FLANGE CLEANER	413 711 809	104