

ENGINE REMOVAL AND INSTALLATION

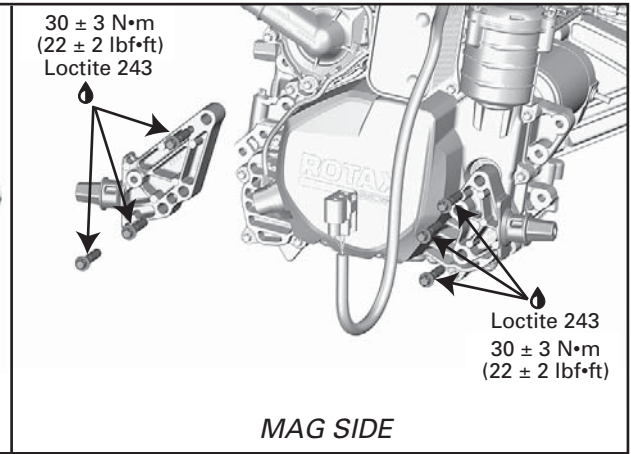
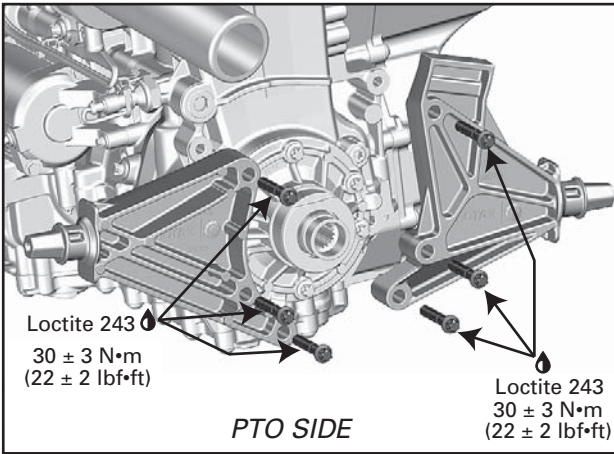
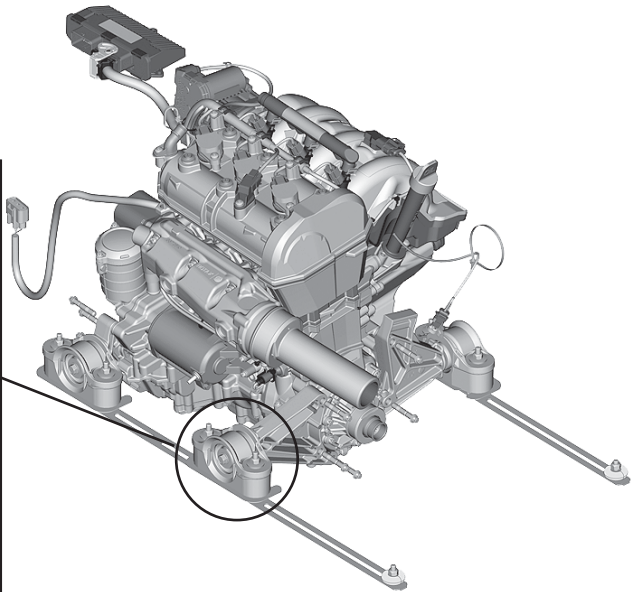
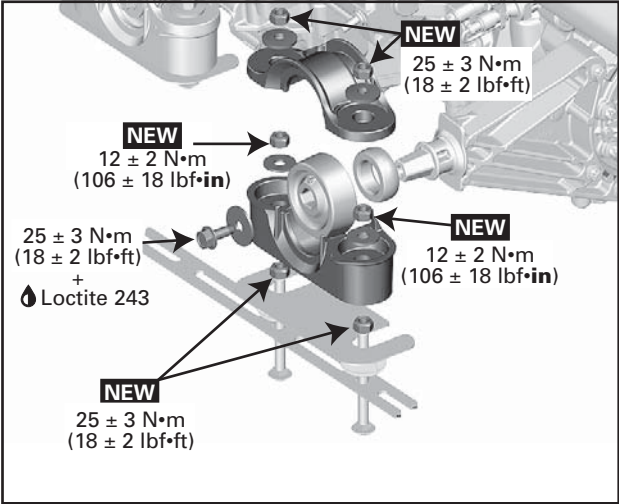
SERVICE TOOLS

Description	Part Number	Page
ALIGNMENT SHAFT SUPPORT	529 035 506	7
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LARGE HOSE PINCHER.....	529 032 500	3-4
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SUCTION PUMP	529 035 880	3

SERVICE PRODUCTS

Description	Part Number	Page
PULLEY FLANGE CLEANER	413 711 809	7
TRIPLE-GUARD GREASE	296 000 329	7

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NEW = Component must be replaced when removed.

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GENERAL

⚠ WARNING

When electrically disconnecting or removing the throttle body from the intake manifold, always remove the tether cord from the engine cut-off switch and disconnect the battery.

⚠ WARNING

Always disconnect battery prior to working on the fuel system. Always disconnect battery exactly in the specified order, **BLACK (-)** cable first. Electrical connections should be disconnected prior to disconnecting fuel lines.

⚠ WARNING

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

⚠ WARNING

Fuel lines remain under pressure at all times. Always proceed with care and use appropriate safety equipment when working on a pressurized fuel system. Wear safety glasses. Do not allow fuel to spill on hot engine parts and/or on electrical connectors. Proceed with care when removing or installing high pressure test equipment, or disconnecting fuel line connections. Wipe off any fuel spillage in the bilge. Never use a hose pincher on high pressure hoses.

Cover the fuel line connection with an absorbent shop rag before disconnecting them. Slowly disconnect the fuel hose to minimize spilling.

When the repair is completed, ensure the hose from the fuel rail to the fuel pump is properly connected and secured in its support.

⚠ WARNING

After working on the fuel system, always pressurize the fuel system and check for fuel leaks. Refer to **FUEL SYSTEM PRESSURIZATION** in **FUEL TANK AND FUEL PUMP** subsection.

⚠ WARNING

If a gasoline leak and/or odor is present, do not start the engine. Repair the leak.

PROCEDURES

ENGINE

Engine Removal

REQUIRED TOOLS		
DESCRIPTION		QTY
SUCTION PUMP (P/N 529 035 880)		1
FUEL HOSE DISCONNECT TOOL (P/N 529 036 037)		1
LARGE HOSE PINCHER (P/N 529 032 500)		2

- Place vehicle on a workstation equipped with an engine-lifting hoist.
- Remove the following components:
 - Central body (refer to *BODY* subsection)
 - Jet pump housing (refer to *JET PUMP* subsection)
 - Drive shaft (refer to *DRIVE SHAFT* subsection)
 - Muffler (refer to *EXHAUST SYSTEM* subsection).
- Disconnect **BLACK (-)** lead from battery.
- Drain engine coolant using the **SUCTION PUMP** (P/N 529 035 880).

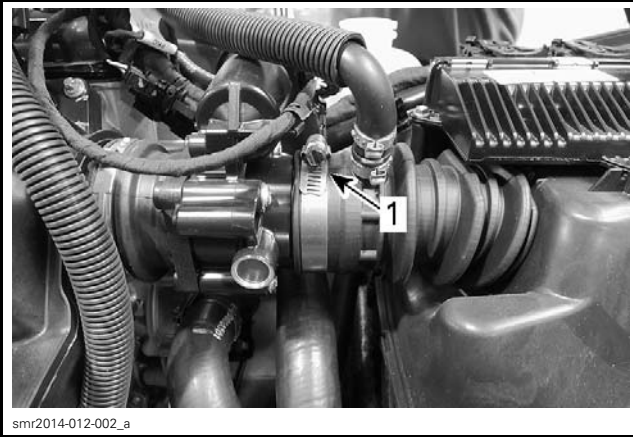


- Coolant reservoir
- Suction pump hose

- Detach air intake silencer hose from throttle body.

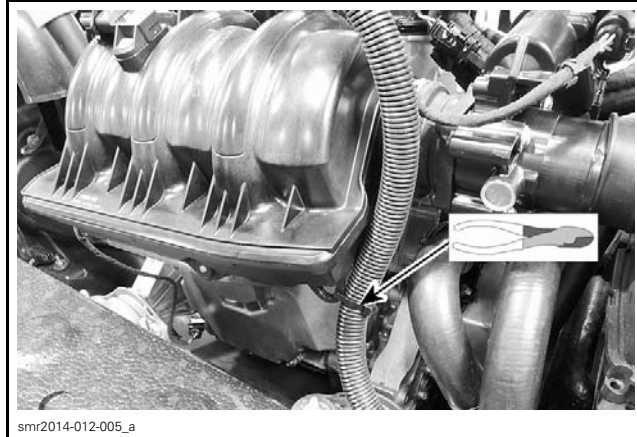
- Loosen air intake silencer hose clamp.

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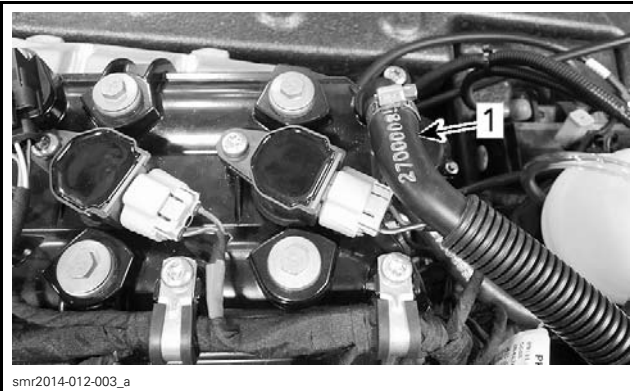
1. Loosen this clamp

5.2 Detach blow-by hose from cylinder valve cover.



8. Disconnect coolant return hose.

8.1 Cut locking tie securing the hose to wiring harness.



1. Blow-by hose

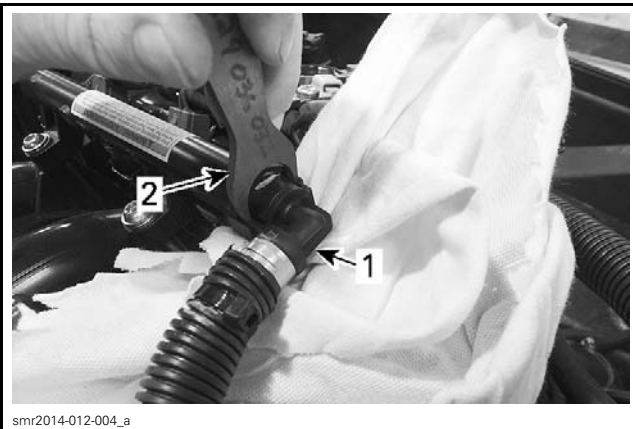
6. Disconnect fuel inlet hose from fuel rail.

6.1 Place a rag around fuel hose fitting.

6.2 Disconnect fuel hose from fuel rail using the FUEL HOSE DISCONNECT TOOL (P/N 529 036 037)

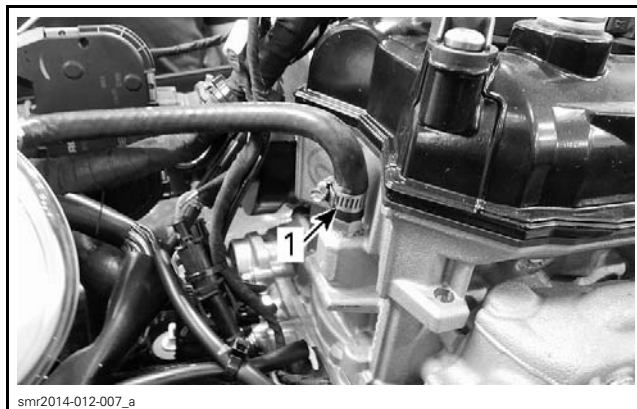


8.2 Loosen clamp on cylinder head.



1. Fuel hose fitting
2. Fuel hose disconnect tool

7. Cut locking tie securing fuel hose to intake manifold.

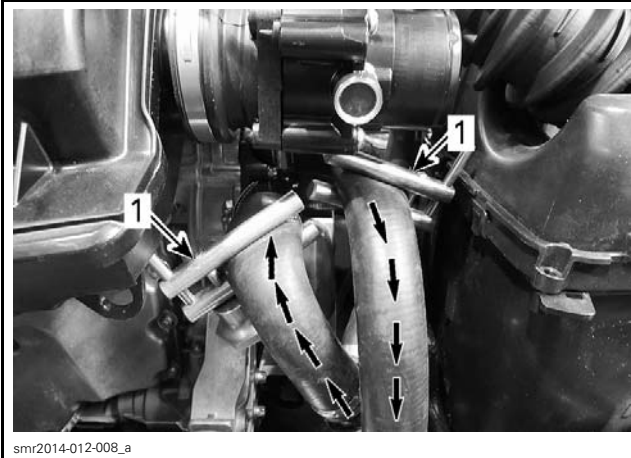


1. Coolant return hose clamp

9. Disconnect inlet and outlet radiator hoses.

9.1 Install a LARGE HOSE PINCHER (P/N 529 032 500) on each hose.

9.2 Loosen hoses clamps and disconnect hoses from thermostat housing.



1. Large hose pinchers

10. Unplug knock sensor connector.



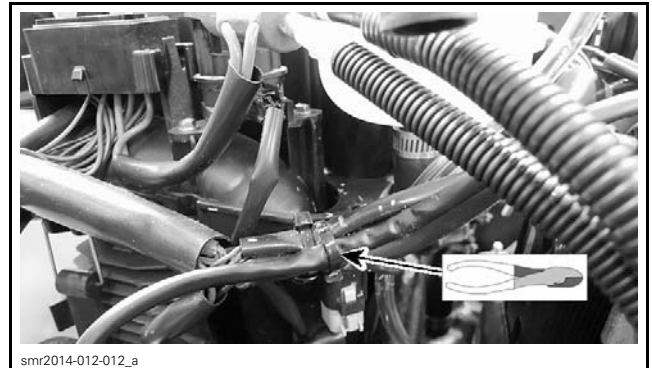
1. Knock sensor connector

11. Unplug the "A" connector from the ECM.

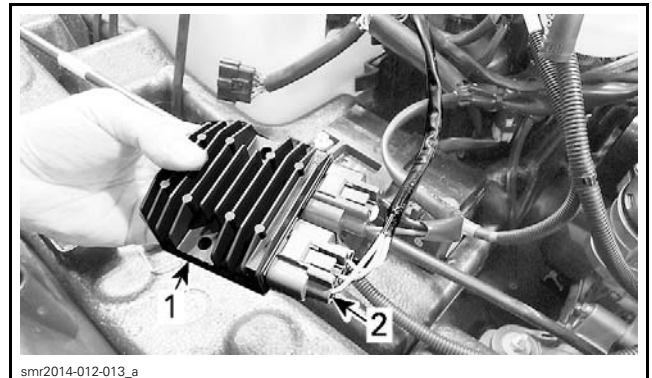


1. ECM "A" connector

12. Cut locking ties securing engine harness to vehicle harness.



13. Unplug magneto connector from voltage regulator/rectifier.



1. Voltage regulator/rectifier
2. Magneto connector

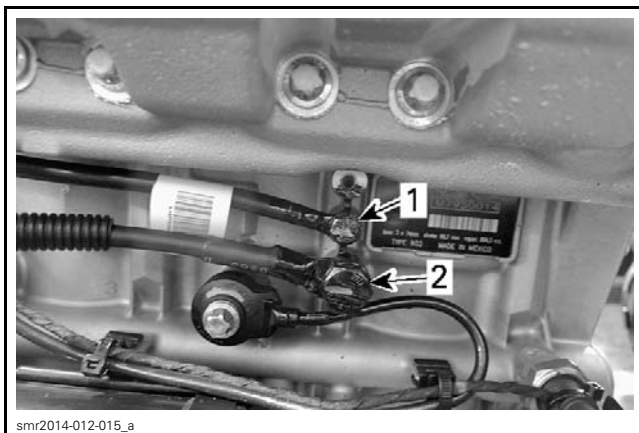
14. Disconnect inlet and outlet hoses from exhaust manifold.

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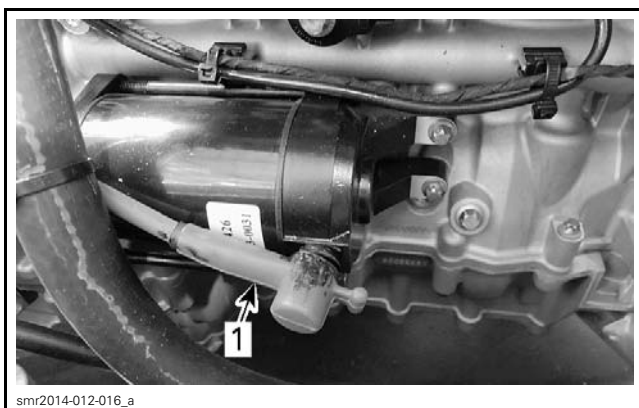
1. Exhaust manifold inlet hose
2. Exhaust manifold outlet hose

15. Unscrew both ground wires from engine.



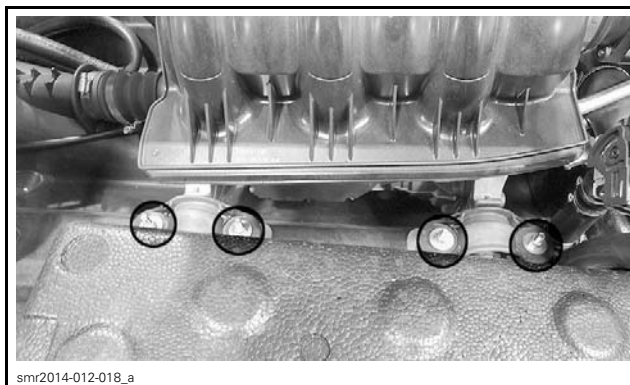
1. Engine/vehicle grounds
2. Battery ground

16. Detach starter cable from starter.

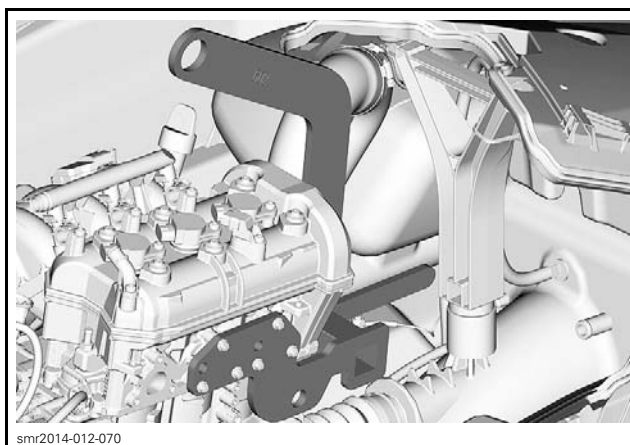


1. Starter cable

17. Remove and discard elastic nuts retaining engine mount clamps.



18. Remove exhaust manifold and install the ENGINE LIFTING TOOL (P/N 529 036 217).



19. Slowly lift the engine out of hull.

Engine Installation

Installation of engine in watercraft is essentially the reverse of removal procedures. However pay particular attention to the following.

Wipe off any spillage in bilge. Clean with the PULLEY FLANGE CLEANER (P/N 413 711 809).

Place engine into vehicle.

Install all engine mount clamps using previously removed M8 elastic stop nuts.

TIGHTENING TORQUE	
Engine mount clamp nuts	25 N•m ± 3 N•m (18 lbf•ft ± 2 lbf•ft)

Perform the engine alignment.

NOTICE The engine alignment must be completed before finalizing the engine installation.

Install and properly align muffler. Refer to *EX-HAUST SYSTEM* subsection.

Reinstall all other removed parts. Pay particular attention to the following items:

- PTO boot condition
- Apply TRIPLE-GUARD GREASE (P/N 296 000 329) on drive shaft splines
- PTO position on drive shaft and PTO sleeve
- Use recommended Oetiker clamps and proper clamping force
- Brown bellows properly located and clamped on PTO cover.

Check fuel hose condition and pressure test the fuel system, refer to *FUEL SYSTEM* section.

⚠ WARNING

Whenever doing any type of repair on watercraft or if any components of the fuel system are disconnected, a pressure test must be done before starting engine.

Verify all electrical connections (ground wires and battery).

Fill and bleed the engine cooling system. Refer to *COOLING SYSTEM* subsection

Run engine and ensure there is no leakage.

NOTICE If watercraft is out of water, exhaust system must be cooled using the flush kit. Never run engine more than 2 minutes.

Engine Alignment

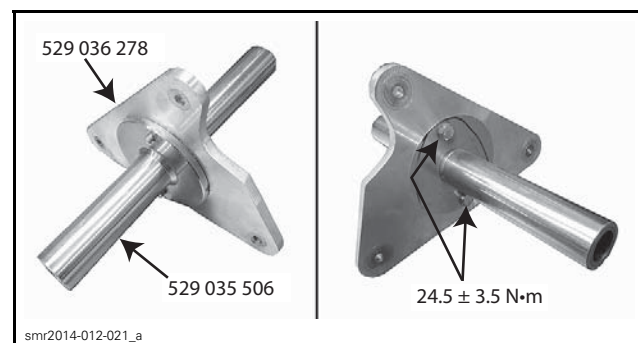
Engine alignment is required only when one of the following parts is removed and/or replaced with new one.

- Engine supports (from cylinder block)
- Engine mount base (more than one)
- Jet pump support
- Hull.

REQUIRED TOOLS		
DESCRIPTION		QTY
ENGINE ALIGNMENT PLATE (P/N 529 036 278)		1
ALIGNMENT SHAFT SUPPORT (P/N 529 035 506)		1
ALIGNMENT SHAFT (P/N 295 000 141)		1
PTO ADAPTER (P/N 529 036 273)		1

To verify alignment of engine proceed as follows:

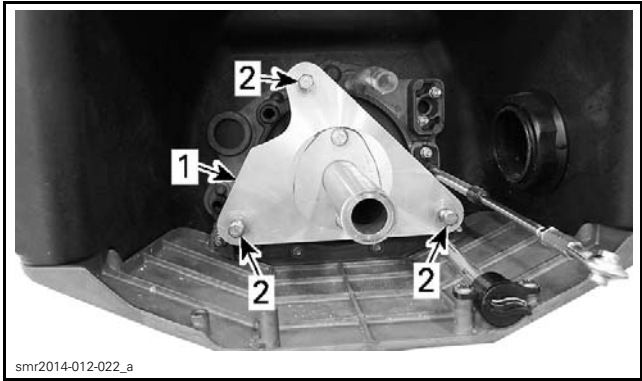
1. Remove jet pump, drive shaft and drive shaft boot. Refer to *STEERING AND PROPULSION* section.
2. Assemble alignment tool.
 - 2.1 Install the alignment shaft support on engine alignment plate.
 - 2.2 Secure using M8 x 25 x 1.25 hexagonal screws.



3. Install the alignment tool.

- 3.1 Put the alignment tool assembly against the pump support.
- 3.2 Secure it using previously removed jet pump retaining screws.

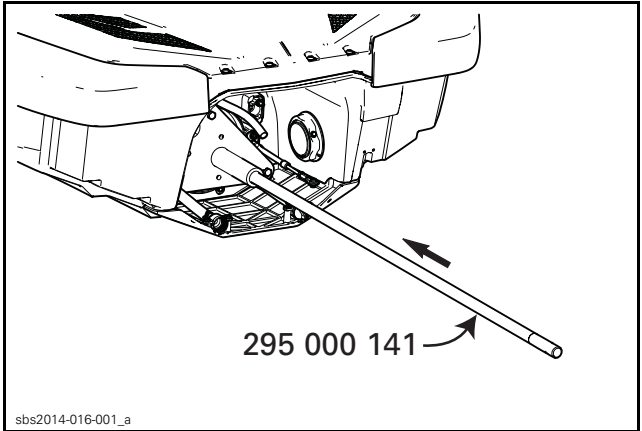
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1. Alignment tool
2. Jet pump retaining screws

TIGHTENING TORQUE	
Jet pump retaining screws	22 N•m ± 2 N•m (16 lbf•ft ± 1 lbf•ft)

4. Carefully slide the ALIGNMENT SHAFT (P/N 295 000 141) through the engine alignment tool.



5. Insert alignment shaft end into crankshaft PTO coupler.

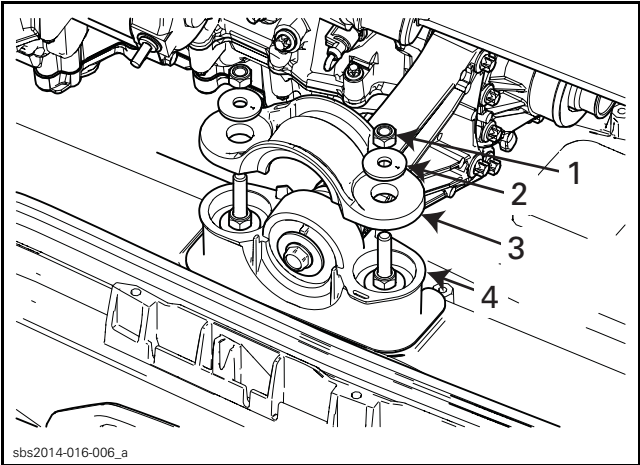
NOTE: A small resistance during shaft insertion is normal.

Correct Alignment

1. Check the longitudinal position of engine.

Incorrect Alignment

1. Remove all engine mount clamps.
2. Loosen nuts securing engine mount base.

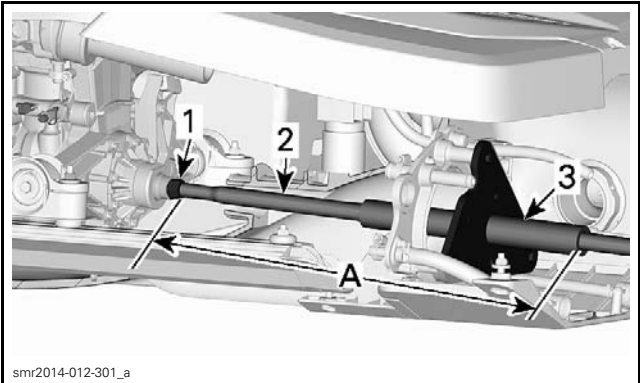


1. Engine mount clamp nut
2. Flat washer
3. Engine mount clamp
4. Engine mount base

3. Add or remove shims as required.
4. Try to insert the alignment shaft into crankshaft PTO coupler again.
5. Repeat all steps until alignment is done.
6. When engine alignment is correct, check the longitudinal position of engine.

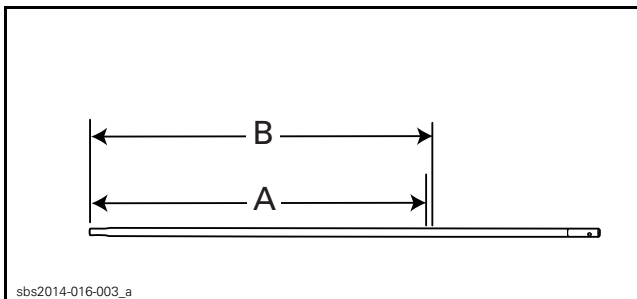
Engine Longitudinal Position Verification

The longitudinal verification is taken between the PTO adapter and the end of the alignment tool.



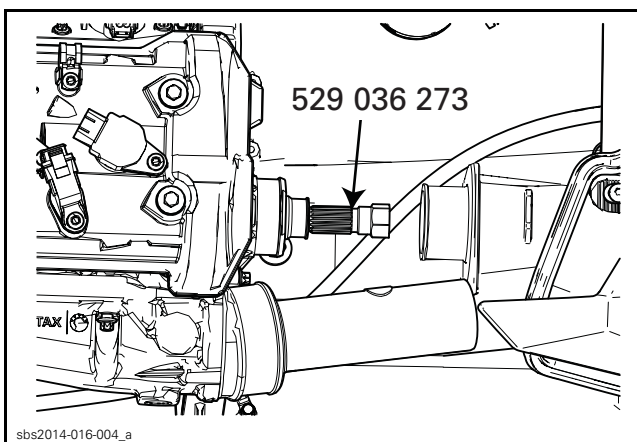
1. PTO adapter
2. Alignment shaft
3. Alignment tool
A. Required longitudinal distance of engine

Trace two thin lines on alignment shaft as per the following table.

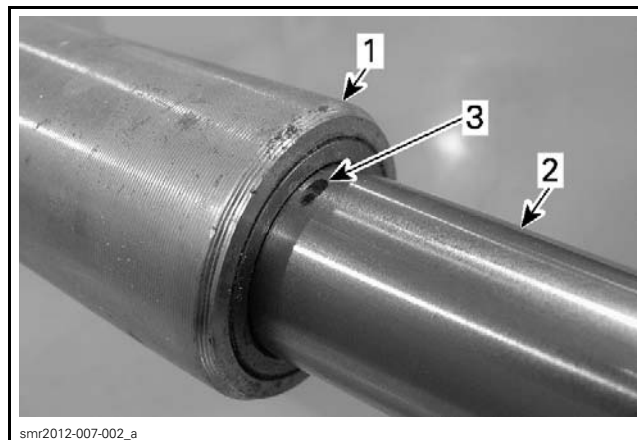


LINES	DISTANCE
Line A	at 589 mm (23-3/16 in)
Line B	at 592 mm (23-5/16 in)

1. Insert the PTO ADAPTER (P/N 529 036 273) into the crankshaft PTO coupler.



2. Carefully slide the alignment shaft through the engine alignment tool and lean it against the PTO adapter.
3. While holding the alignment shaft in this position, check the location of the marks (previously drawn at the beginning of this procedure).
4. Engine is properly positioned longitudinally when the engine alignment tool is between both shaft marks.
 - If **one** mark is visible, the engine is properly positioned.
 - If **both** marks are visible, the engine must be moved forward.
 - If **no** mark is visible, the engine must be moved rearward.

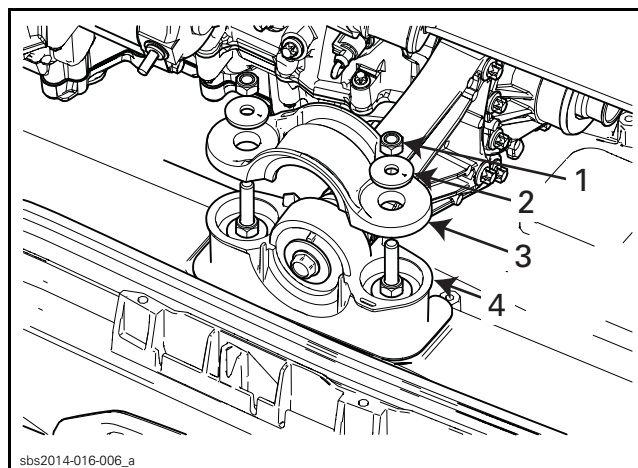


PROPER POSITION

1. Engine alignment tool
2. Alignment shaft
3. Mark at 592 mm (23-5/16 in)

If an adjustment is required:

- Remove all engine mount clamps.
- Loosen nuts securing engine mount base.
- Move the engine forwards or rearwards to reach the required position.



1. Engine mount clamp nut
2. Flat washer
3. Engine mount clamp
4. Engine mount base

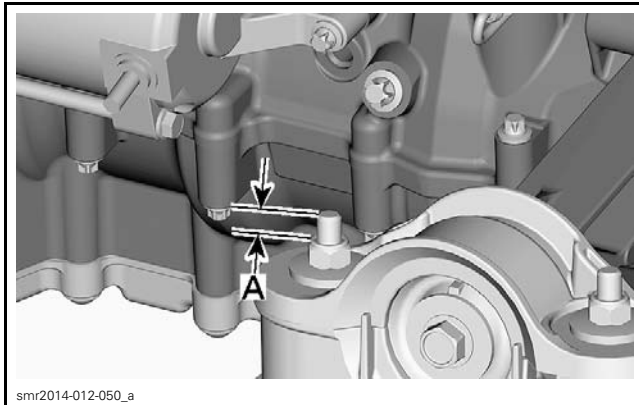
5. Retighten engine mount base nuts.
6. Install and secure engine mount clamps.

TIGHTENING TORQUE	
Engine mount base nuts	12 N•m ± 2 N•m (106 lbf•in ± 18 lbf•in)
Engine mount clamp nuts	25 N•m ± 3 N•m (18 lbf•ft ± 2 lbf•ft)

7. Repeat all steps until alignment is done.
8. When the engine alignment is completed, replace nuts retaining the engine mount clamps with **NEW** ones.

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NOTICE When the tightening is completed, make sure to leave a minimum of 3 mm (1/8 in) of free threads over the engine mount clamp nuts.



A. 3 mm (1/8 in) minimum

Recheck engine alignment.