

ENGINE REMOVAL AND INSTALLATION

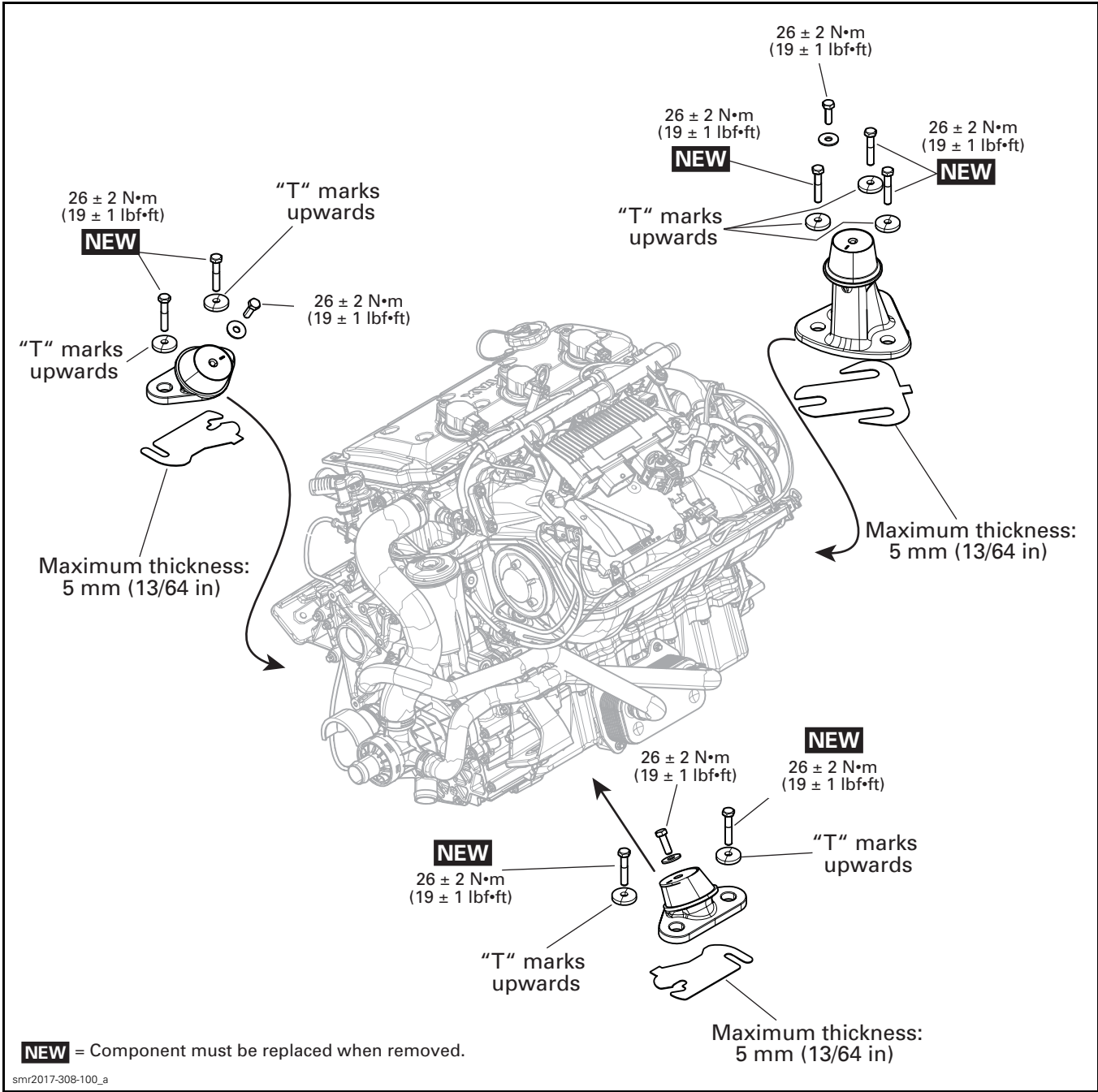
SERVICE TOOLS

Description	Part Number	Page
ALIGNMENT SHAFT ADAPTER	529 035 719	4-5
ALIGNMENT SHAFT SUPPORT	529 035 506	4
ALIGNMENT SHAFT	295 000 141	4-5
PUMP PLATE.....	529 036 224	4

SERVICE PRODUCTS

Description	Part Number	Page
LOCTITE 243 (BLUE).....	293 800 060	3, 6
PULLEY FLANGE CLEANER	413 711 809	3

ENGINE SUPPORTS



PROCEDURES

ENGINE

Removing the Engine

1. Remove the seat.
2. Disconnect the battery. Refer to *CHARGING SYSTEM* subsection.
3. Remove the intake manifold. Refer to *INTAKE MANIFOLD* subsection.
4. Unplug fuel hose from fuel rail. Refer to *ELECTRONIC FUEL INJECTION (EFI)* subsection.
5. Drain coolant. Refer to *COOLING SYSTEM* subsection.
6. Disconnect the "B" connector from the ECM.
7. Disconnect the HIC connector.
8. Disconnect the knock sensor and magneto connectors (remove connector housings from the ECM support).
9. If equipped, unplug both hoses from the supercharger.
10. Disconnect all fuel injector connectors and the following sensors (CTS, CPS, TOPS, CAPS and OPS).
11. Disconnect the EGTS sensor from the muffler.
12. Disconnect the three ground cables on the front end of engine.
13. Unplug the front exhaust hose from the muffler.
14. Unplug the blow-by valve hose.
15. Unplug the ride plate hoses from water pump housing.
16. Move muffler backward. Refer to *EXHAUST SYSTEM* subsection.
17. Remove the drive shaft. Refer to *DRIVE SHAFT* subsection.
18. Remove the engine mounting screws.
19. Cut any locking ties from hoses or wiring harness that prevent engine removal.
20. Slightly lift the engine using a suitable lifting device.



21. Unplug water hoses from exhaust manifold.
22. Disconnect the starter cable from the starter.
23. Disconnect the engine ground cable located under the exhaust manifold.
24. Carry on engine lifting to remove it from the body opening.

NOTICE Be careful not to scratch body or to hit any engine component during engine removal.

Installing the Engine

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

NOTICE Whenever engine is removed from watercraft, engine alignment must be performed at reinstallation.

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

Check tightness and condition of engine rubber mounts. Refer to *ENGINE MOUNTS* in this subsection.

Before completely lowering engine, install ground cable, starter cable and water hoses on exhaust manifold. Follow these guide lines.

- Ensure contact surface is perfectly clean then reconnect ground cable to engine.
- Apply LOCTITE 243 (BLUE) (P/N 293 800 060) on threads of ground cable screw or use a new screw with self-locking product.
- Install and secure the ground cable.
- Torque starter cable nut.
- Install protective cap over the starter cable end.
- Connect exhaust manifold water inlet and outlet hoses.

Subsection XX (ENGINE REMOVAL AND INSTALLATION)

TIGHTENING TORQUE	
Ground cable screw	23.5 N•m ± 1.5 N•m (17 lbf•ft ± 1 lbf•ft)
Starter cable nut	10 N•m ± 2 N•m (89 lbf•in ± 18 lbf•in)
Hose clamps	1.7 N•m ± 0.2 N•m (15 lbf•in ± 2 lbf•in)

Place engine into vehicle.

Install engine support screws. Do not apply threadlocker to engine support screws and do not torque yet.

Align engine. Refer to *ENGINE ALIGNMENT* in this subsection for complete procedure.

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

Install and properly align exhaust pipe. Refer to *EXHAUST SYSTEM* subsection.

Reinstall all other removed parts.

Check hose condition and pressure test 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).

Run engine and ensure there is no leakage.

NOTICE If watercraft is out of water, exhaust system must be cooled using the flush kit.

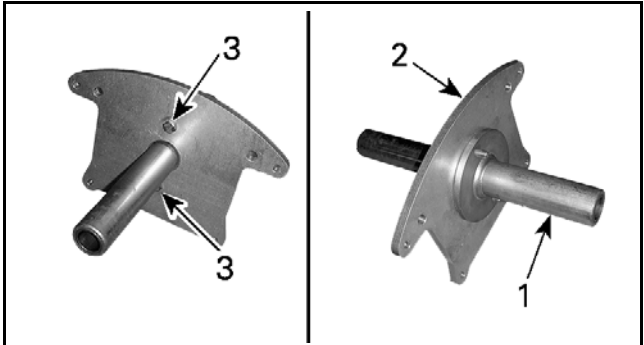
Engine Alignment

REQUIRED TOOLS	
PUMP PLATE (P/N 529 036 224)	
ALIGNMENT SHAFT SUPPORT (P/N 529 035 506)	
ALIGNMENT SHAFT ADAPTER (P/N 529 035 719)	
ALIGNMENT SHAFT (P/N 295 000 141)	

To verify alignment of engine proceed as follows:

1. Remove jet pump and drive shaft. Refer to *STEERING AND PROPULSION* section.

2. Remove drive shaft boot.
3. Assemble alignment tool.
- 3.1 Install the alignment shaft support on pump plate.
- 3.2 Secure using M8 x 25 x 1.25 hexagonal screws.

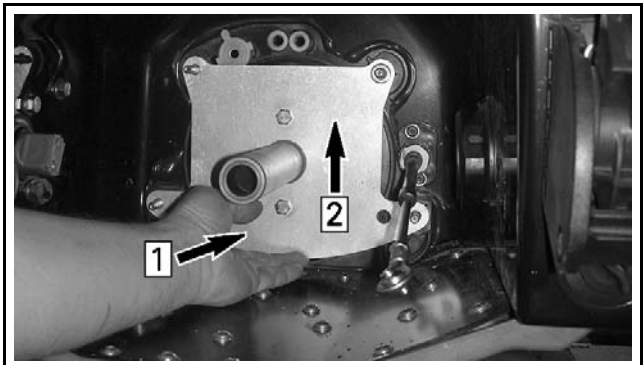


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1. Alignment shaft support (P/N 529 035 506)
2. Support plate (P/N 529 036 224)
3. M8 x 25 x 1.25 hexagonal screws

TIGHTENING TORQUE	
Alignment tool screws	24.5 N•m ± 3.5 N•m (18 lbf•ft ± 3 lbf•ft)

4. Install the alignment tool as follows.
- 4.1 Position the alignment tool against the pump support.
- 4.2 Push the alignment tool upward and hold it in this position.

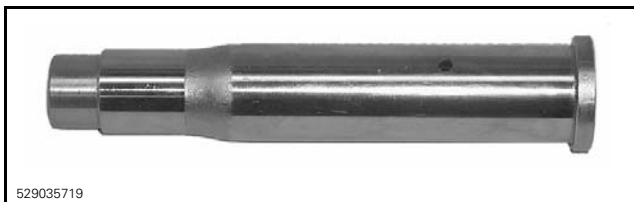


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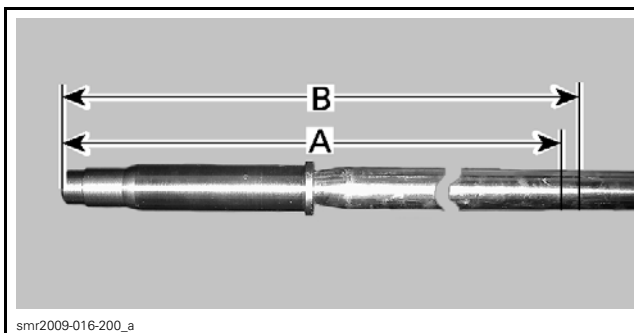
Step 1: Place alignment tool against pump support
Step 2: Push alignment tool upward

TIGHTENING TORQUE	
Alignment tool nuts	24.5 N•m ± 3.5 N•m (18 lbf•ft ± 3 lbf•ft)

Install the ALIGNMENT SHAFT ADAPTER (P/N 529 035 719) on the end of the ALIGNMENT SHAFT (P/N 295 000 141).



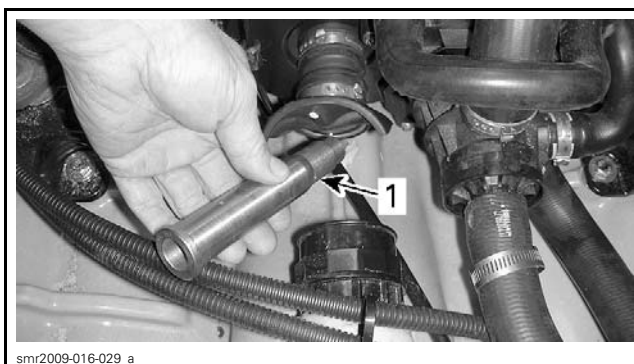
Trace two thin lines on alignment shaft.



LINES	DISTANCE
Line A	at 739.5 mm (29.114 in)
Line B	at 742.5 mm (29.232 in)

5. Remove the ALIGNMENT SHAFT ADAPTER (P/N 529 035 719) from the end of the alignment shaft and install it in engine PTO housing.

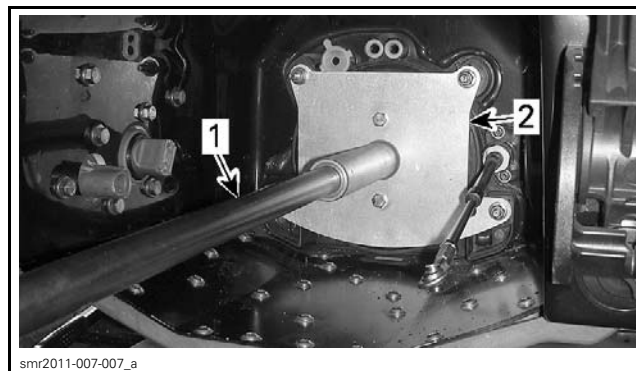
NOTICE Ensure alignment shaft adapter is fully inserted into the engine PTO housing.



TYPICAL

1. Alignment shaft adapter

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



1. Alignment shaft (P/N 295 000 141)

2. Alignment tool

7. Insert alignment shaft end into alignment shaft adapter. If the alignment is correct, the alignment shaft end should slide through the adapter.

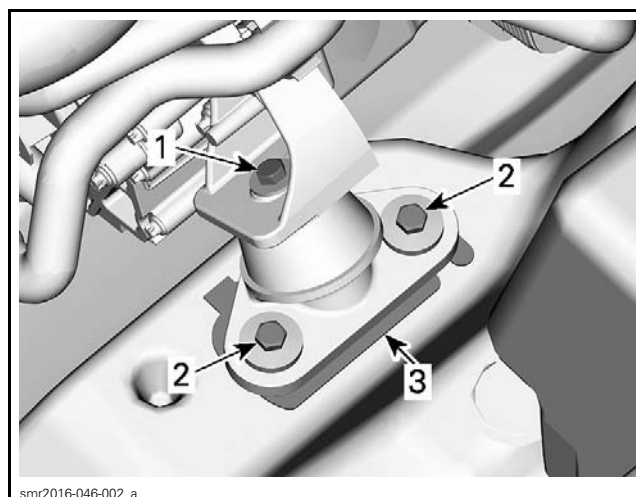
NOTE: A small resistance during shaft insertion is normal.

8. If the alignment is incorrect, loosen engine mount retaining screws (Allen socket screws).

9. Add or remove shims as required.

NOTE: Shims location is between engine mount and engine mount plate.

NOTICE Whenever shims are used to correct alignment, never install more than 5 mm (13/64 in) of shims.



REAR STARBOARD ENGINE MOUNT SHOWN

1. Engine mounting screw

2. Engine mount retaining screws

3. Shim(s)

10. When engine alignment is correct, check the longitudinal position of engine.

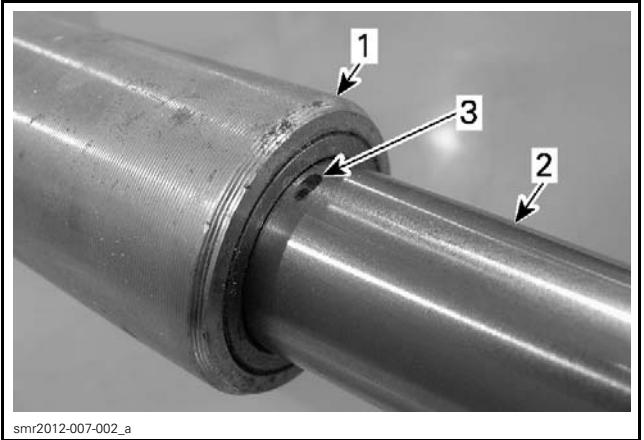
Verifying the Engine Longitudinal Position

With alignment shaft installed, check the location of the marks (previously drawn at the beginning of the engine alignment procedure).

Subsection XX (ENGINE REMOVAL AND INSTALLATION)

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 742.5 mm (29.232 in)

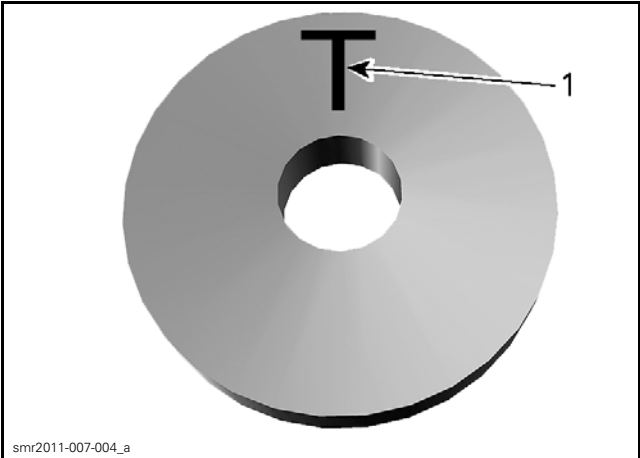
When alignment and longitudinal position of engine are correct, tighten engine mount screws. Refer to *ENGINE MOUNTS* in this subsection. Recheck engine alignment.

ENGINE MOUNTS

If engine mounts have been removed, apply LOC-TITE 243 (BLUE) (P/N 293 800 060) on screw threads or use new screws with self-locking product.

TIGHTENING TORQUE	
Engine mount screws	26 N•m ± 2 N•m (19 lbf•ft ± 1 lbf•ft)

NOTE: Position conical spring washer with the "T" mark upwards.



1. T mark