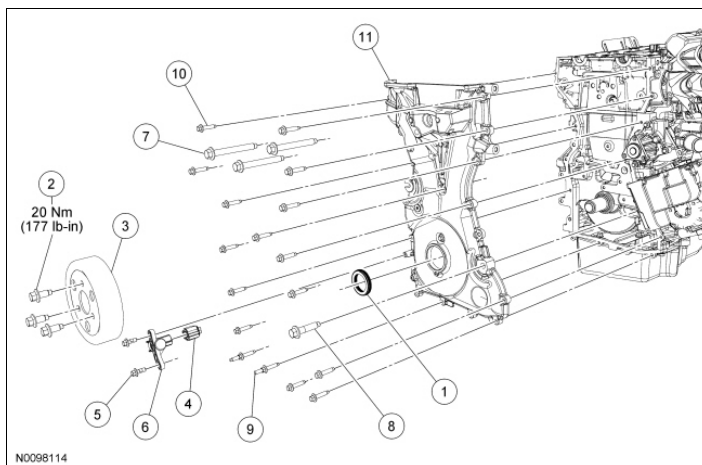


Item	Part Number	Description
1	W707399	A/C tube bracket bolt
2	-	Vehicle high voltage electrical connector (part of 14300)
3	14B227	DC/DC converter
4	-	Vehicle high voltage electrical wiring retainer (part of 14300)

Engine Front Cover (View 2 of 2)



Item	Part Number	Description
1	6700	Crankshaft front seal
2	W500221	Coolant pump pulley bolt (3 required)
3	8509	Coolant pump pulley
4	14A464	Crankshaft Position (CKP) sensor electrical connector (part of 12B637)
5	W701219	CKP sensor bolt (2 required)
6	6C315	CKP sensor
7	W500328	Engine front cover bolt (3 required)
8	W705310	Engine front cover stud bolt (2 required)

9	W500300	Engine from cover bolt
10	W500215	Engine front cover bolt (15 required)
11	6019	Engine front cover

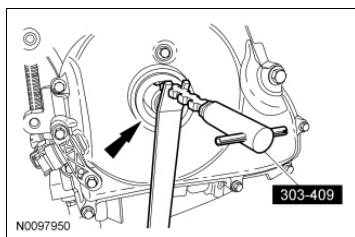
Removal

NOTICE: Do not loosen or remove the crankshaft pulley bolt without first installing the special tools as instructed in this procedure. The crankshaft pulley and the crankshaft timing sprocket are not keyed to the crankshaft. The crankshaft, the crankshaft sprocket and the pulley are fitted together by friction, using diamond washers between the flange faces on each part. For that reason, the crankshaft sprocket is also unfastened if the pulley bolt is loosened. Before any repair requiring loosening or removal of the crankshaft pulley bolt, the crankshaft and camshafts must be locked in place by the special service tools or severe engine damage can occur.

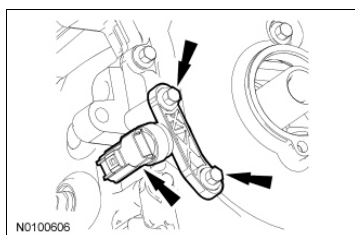
NOTICE: During engine repair procedures, cleanliness is extremely important. Any foreign material (including any material created while cleaning gasket surfaces) that enters the oil passages, coolant passages or the oil pan can cause engine failure.

1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to [Section 100-02](#).
2. Depower the vehicle high voltage electrical system. For additional information, refer to [Section 414-03](#).
3. Remove the accessory drive belt and tensioner. For additional information, refer to [Section 303-05D](#).
4. Remove the crankshaft pulley. For additional information, refer to [Crankshaft Pulley](#) in this section.
5. Remove the engine mount. For additional information, refer to [Engine Mount](#) in this section.
6. **NOTICE:** Use care not to damage the engine front cover or the crankshaft when removing the seal.

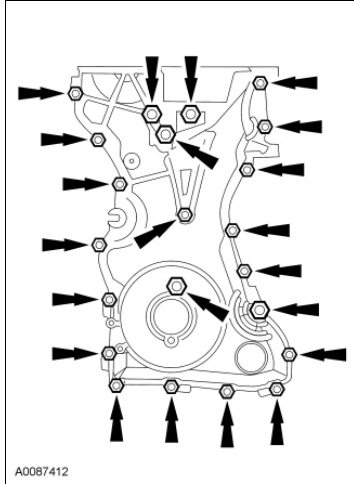
Using the Oil Seal Remover, remove the crankshaft front seal.



7. Remove the 3 bolts and the coolant pump pulley.
8. Disconnect the Crankshaft Position (CKP) sensor electrical connector.
9. Remove the 2 bolts and the CKP sensor.



10. Remove the A/C tube bracket bolt from the strut tower.
11. Disconnect the vehicle high voltage electrical connector from the DC/DC converter and detach the wiring retainer.
12. Remove the bolts and the engine front cover.



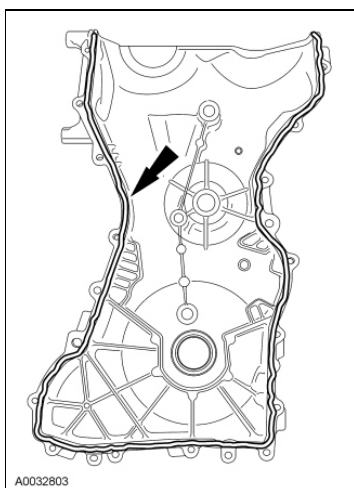
Installation

1. **NOTICE:** Do not use metal scrapers, wire brushes, power abrasive disks or other abrasive means to clean sealing surfaces. These tools cause scratches and gouges which make leak paths.

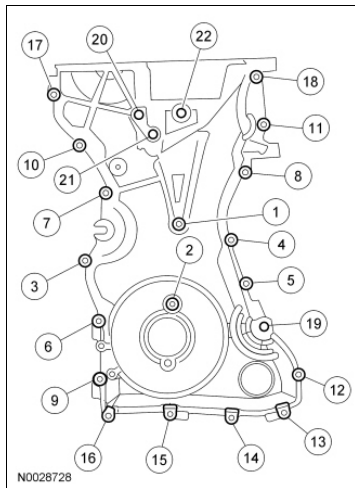
Clean and inspect the mounting surfaces of the engine and the front cover.

2. **NOTE:** The engine front cover must be installed and the bolts tightened within 4 minutes of applying the silicone gasket and sealant.

Apply a 2.5 mm (0.09 in) bead of silicone gasket and sealant to the cylinder head and oil pan joint areas. Apply a 2.5 mm (0.09 in) bead of silicone gasket and sealant to the front cover.



3. Install the engine front cover. Tighten the bolts in the sequence shown, to the following specifications:
 - Tighten the 8-mm bolts to 10 Nm (89 lb-in).
 - Tighten the 13-mm bolts to 48 Nm (35 lb-ft).



4. Connect the vehicle high voltage electrical connector to the DC/DC converter and attach the wiring retainer.

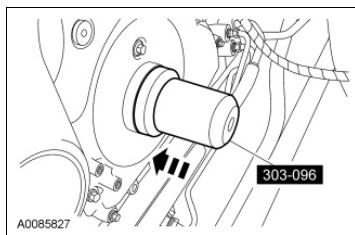
5. Install the A/C tube bracket bolt to the strut tower.

- Tighten to 6 Nm (53 lb-in).

6. **NOTE:** Remove the through bolt from the Camshaft Front Oil Seal Installer.

NOTE: Lubricate the oil seal with clean engine oil.

Using the Camshaft Front Oil Seal Installer, install the crankshaft front seal.



7. Install the coolant pump pulley and the 3 bolts.

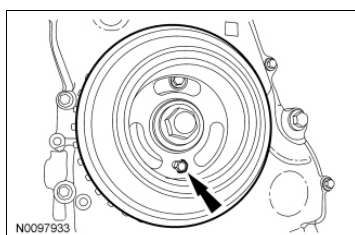
- Tighten to 20 Nm (177 lb-in).

8. Install the engine mount. For additional information, refer to [Engine Mount](#) in this section.

9. Install the crankshaft pulley. For additional information, refer to [Crankshaft Pulley](#) in this section.

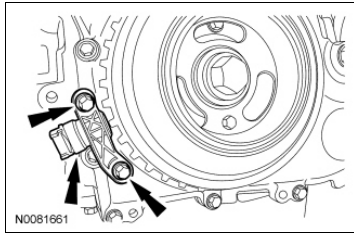
10. **NOTICE:** Only hand-tighten the bolt or damage to the front cover can occur.

Install a standard 6 mm (0.23 in) x 18 mm (0.7 in) bolt through the crankshaft pulley and thread it into the front cover.

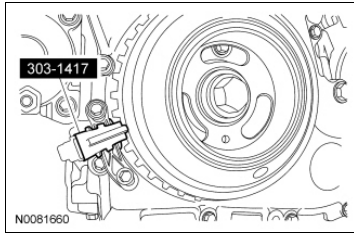


11. Install the CKP sensor and the 2 bolts.

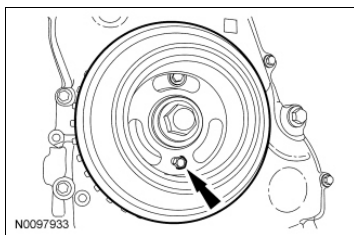
- Do not tighten the bolts at this time.



12. Using the Crankshaft Sensor Aligner, adjust the CKP sensor.
 - Tighten the 2 CKP bolts to 7 Nm (62 lb-in).



13. Connect the CKP sensor electrical connector.
14. Remove the 6 mm x 18 mm bolt.



15. Install the accessory drive belt and tensioner. For additional information, refer to [Section 303-05D](#).
 16. Repower the vehicle high voltage electrical system. For additional information, refer to [Section 414-03](#).
-

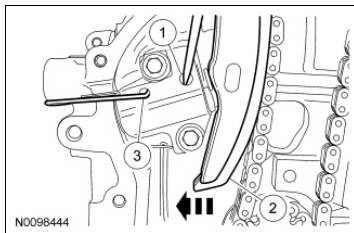
Timing Drive Components

Removal

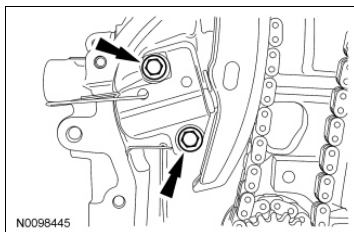
NOTICE: Do not loosen or remove the crankshaft pulley bolt without first installing the special tools as instructed in this procedure. The crankshaft pulley and the crankshaft timing sprocket are not keyed to the crankshaft. The crankshaft, the crankshaft sprocket and the pulley are fitted together by friction, using diamond washers between the flange faces on each part. For that reason, the crankshaft sprocket is also unfastened if the pulley bolt is loosened. Before any repair requiring loosening or removal of the crankshaft pulley bolt, the crankshaft and camshafts must be locked in place by the special service tools or severe engine damage can occur.

NOTICE: During engine repair procedures, cleanliness is extremely important. Any foreign material, including any material created while cleaning gasket surfaces, that enters the oil passages, coolant passages or the oil pan can cause engine failure.

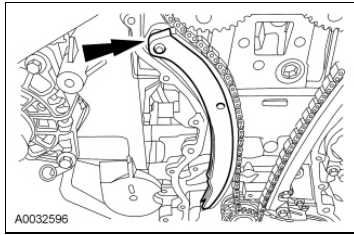
1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to [Section 100-02](#).
2. Remove the engine front cover. For additional information, refer to [Engine Front Cover](#) in this section.
3. Compress the timing chain tensioner in the following sequence.
 1. Using a small pick, release and hold the ratchet mechanism.
 2. While holding the ratchet mechanism in the released position, compress the tensioner by pushing the timing chain arm toward the tensioner.
 3. Insert a paper clip into the hole to retain the tensioner.



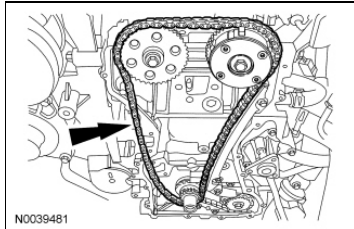
4. Remove the 2 bolts and timing chain tensioner.



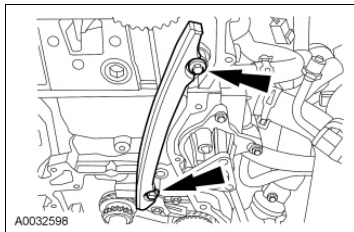
5. Remove the timing chain tensioner arm.



6. Remove the timing chain.

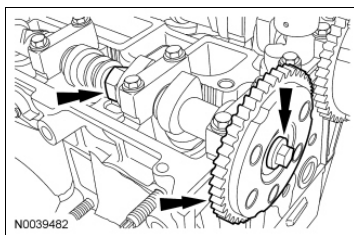


7. Remove the 2 bolts and the timing chain guide.



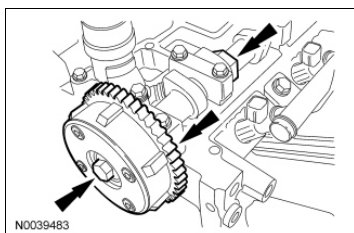
8. **NOTICE:** The Camshaft Alignment Plate is for camshaft alignment only. Using this tool to prevent engine rotation can result in engine damage.

Using the flats on the camshaft to prevent camshaft rotation, remove the bolt and the exhaust camshaft sprocket.



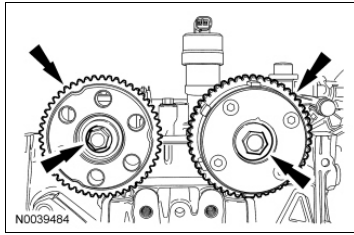
9. **NOTICE:** The Camshaft Alignment Plate is for camshaft alignment only. Using this tool to prevent engine rotation can result in engine damage.

Using the flats on the camshaft to prevent camshaft rotation, remove the bolt and the camshaft phaser and sprocket.

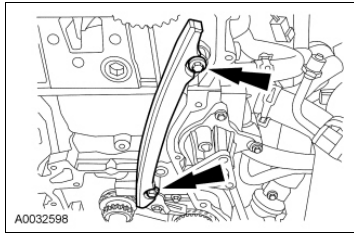


Installation

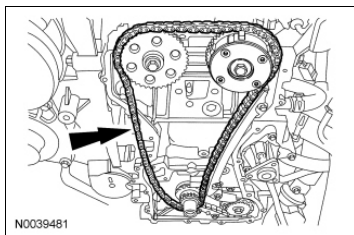
1. Install the camshaft sprockets and the bolts. Do not tighten the bolts at this time.



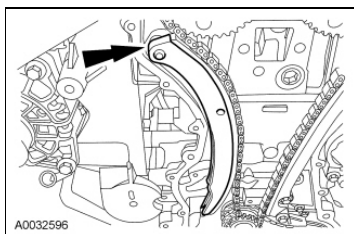
2. Install the timing chain guide and the 2 bolts.
 - To install, tighten to 10 Nm (89 lb-in).



3. Install the timing chain.



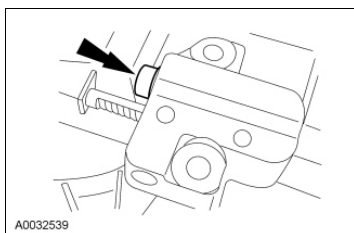
4. Install the timing chain tensioner arm.



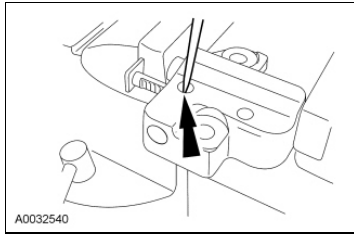
NOTE: If the timing chain tensioner plunger and ratchet assembly are not pinned in the compressed position, follow the next 4 steps.

5. **NOTICE:** Do not compress the ratchet assembly. This will damage the ratchet assembly.

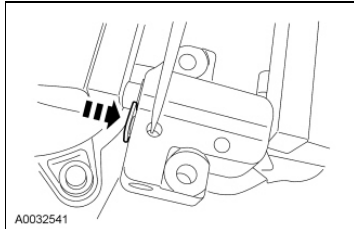
Using the edge of a vise, compress the timing chain tensioner plunger.



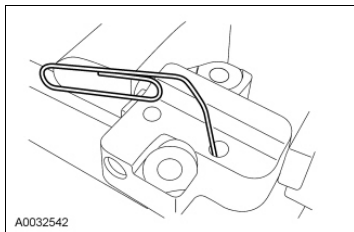
6. Using a small pick, push back and hold the ratchet mechanism.



7. While holding the ratchet mechanism, push the ratchet arm back into the tensioner housing.

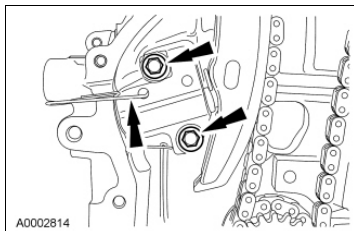


8. Install a paper clip into the hole in the tensioner housing to hold the ratchet assembly and the plunger in during installation.



9. Install the timing chain tensioner and the 2 bolts. Remove the paper clip to release the piston.

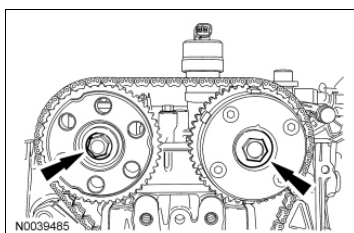
- Tighten to 10 Nm (89 lb-in).



10. **NOTICE:** The Camshaft Alignment Plate is for camshaft alignment only. Using this tool to prevent engine rotation can result in engine damage.

Using the flats on the camshafts to prevent camshaft rotation, tighten the bolts.

- Tighten to 72 Nm (53 lb-ft).



11. Install the engine front cover. For additional information, refer to [Engine Front Cover](#) in this section.

