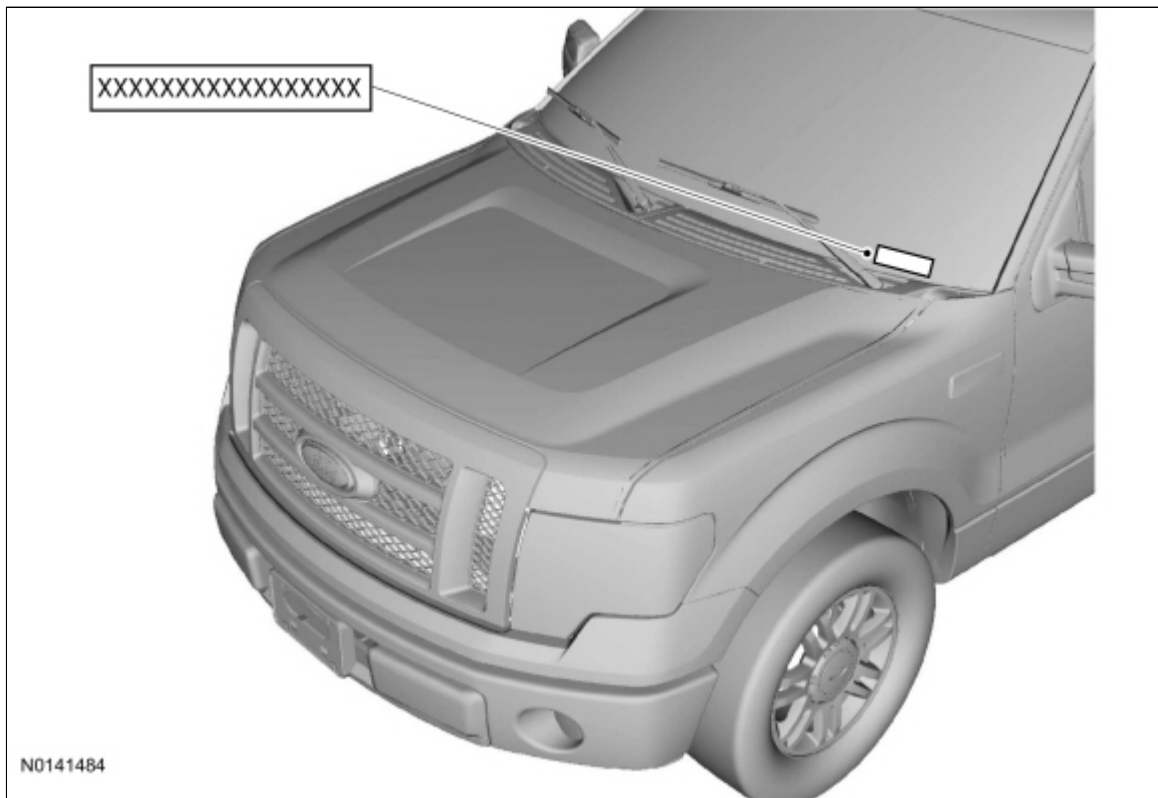


Identification Codes

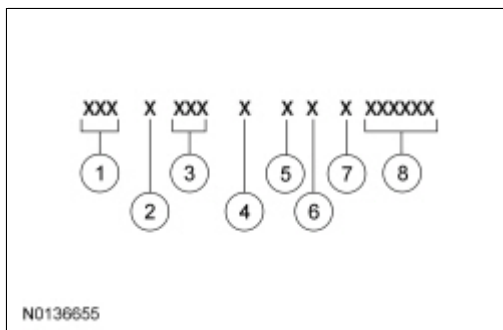
Vehicle Identification Number (VIN)

Vehicle Identification Number (VIN) Tag Locator



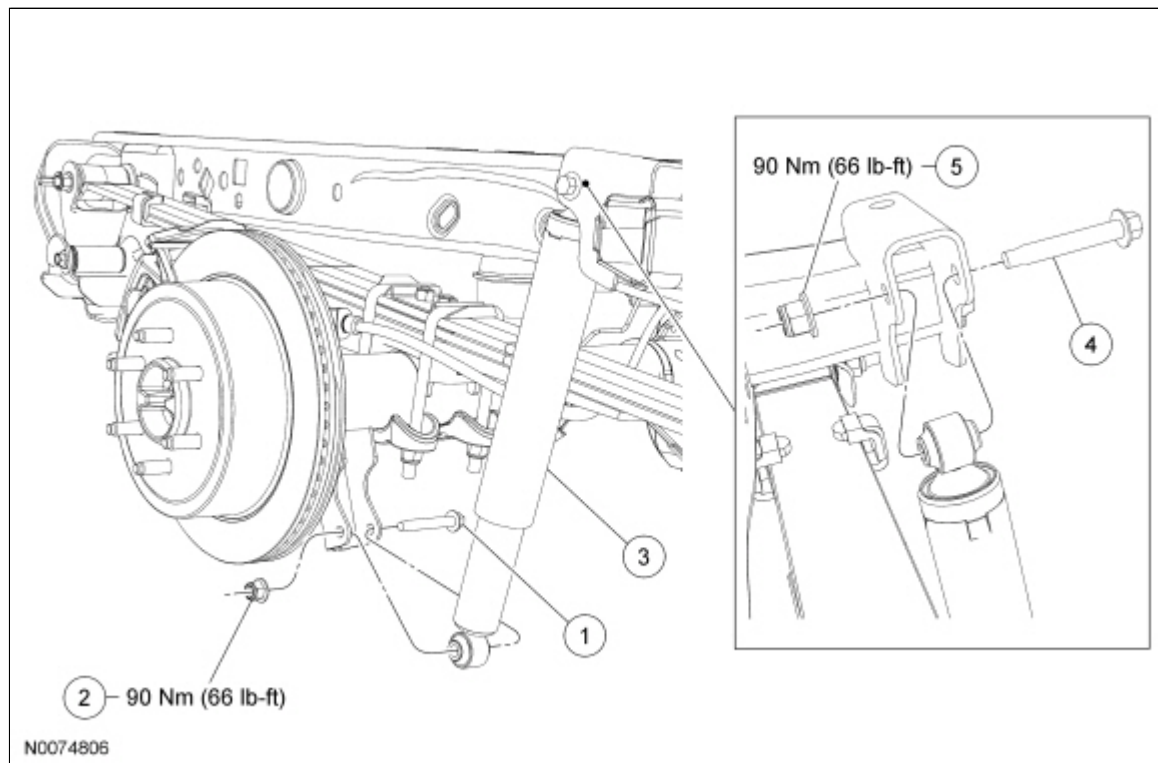
The Vehicle Identification Number (VIN) is a 17-digit combination of letters and numbers. The VIN is stamped on a metal tab riveted on the instrument panel, top upper left of the dash. The VIN is also found on the Vehicle Certification (VC) label.

If the VIN plate requires replacement, authorized dealers must contact their respective regional office.



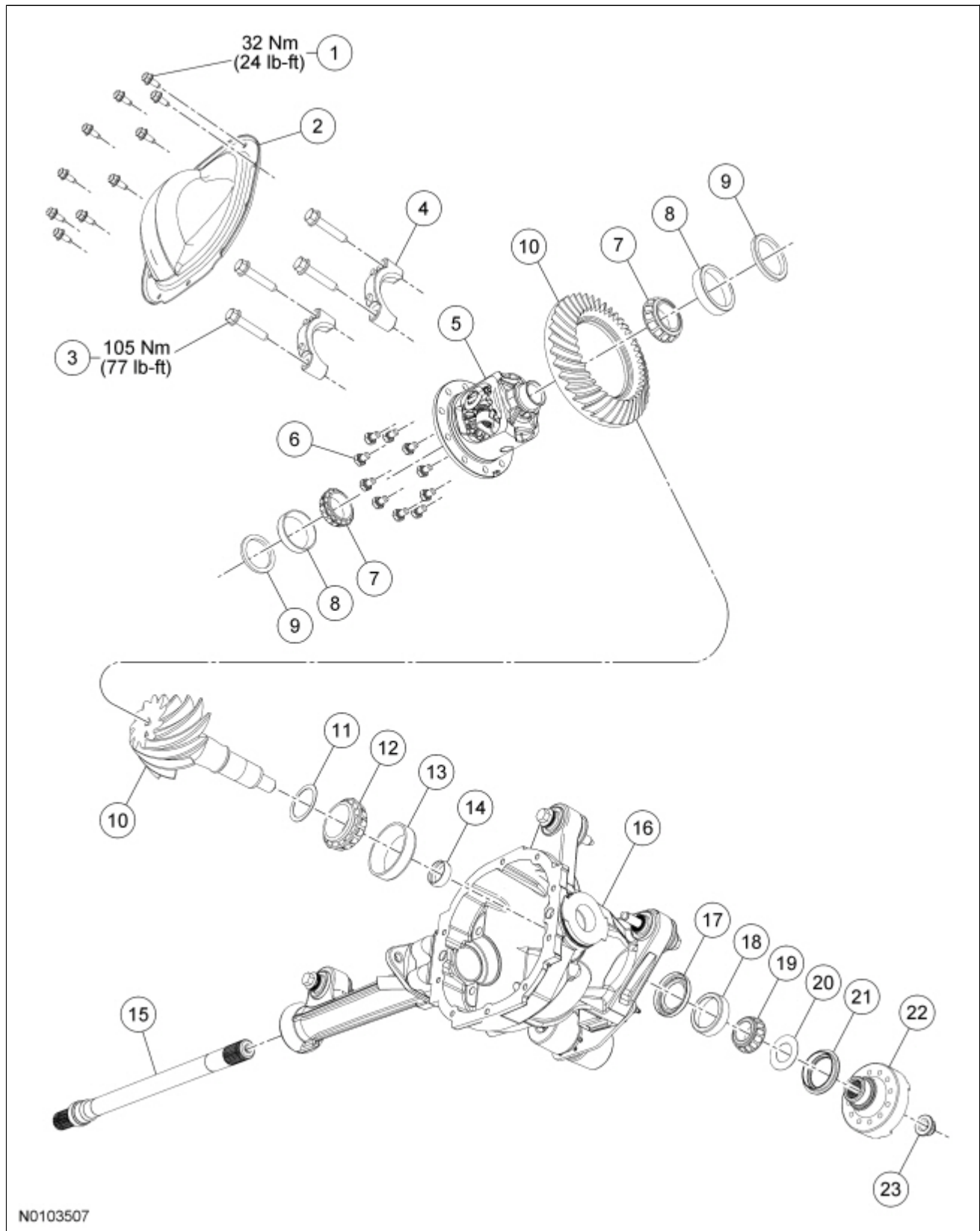
Shock Absorber

All Except SVT Raptor



Item	Part Number	Description
1	W506545	Shock absorber lower bolt
2	W520214	Shock absorber lower nut
3	18125	Shock absorber
4	W506545	Shock absorber upper bolt
5	W520214	Shock absorber upper nut

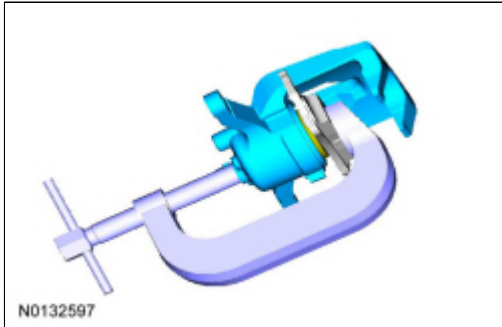
SVT Raptor



Item	Part Number	Description
1	390919	Differential housing cover bolt (10 required)

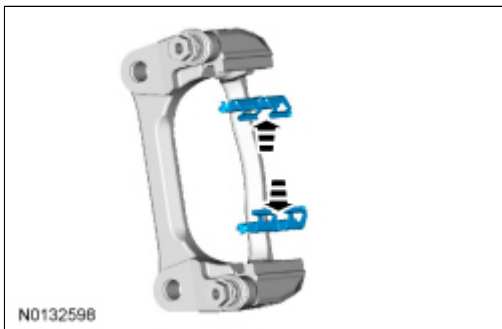
NOTE: If installing new brake pads, make sure to install all new hardware and specified lubricant supplied with the brake pad kit. Refer to the brake pad instruction sheet when applying lubricant.

1. **NOTICE:** Protect the caliper pistons and boots when pushing the caliper piston into the caliper piston bores or damage to components may occur.

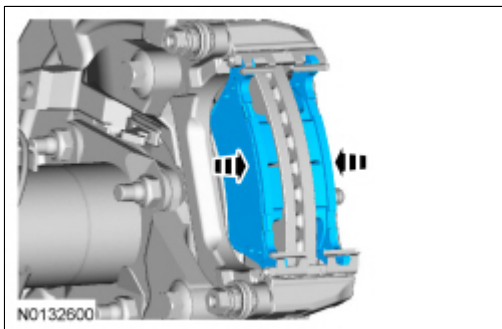


2. **NOTICE:** Do not allow grease, oil, brake fluid or other contaminants to contact the pad lining material or damage to components may occur. Do not install contaminated pads.

NOTE: Install all new hardware supplied with the pad kit.



- 3.



4.
 - Tighten to 33 Nm (24 lb-ft).

<ul style="list-style-type: none"> mph) ■ turn the headlights ON ■ lightly apply the brakes for more than 5 seconds ■ activate the left and right turn signals ● Ignition OFF. ● Ignition ON. ● Wait at least 10 seconds for all modules to wake up and prove out. ● Enter the following diagnostic mode on the scan tool: <u>TBC</u> Module Self-Test . ● Is DTC C2806 or C2807 present? 	
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Pinpoint Test B: The Trailer Brakes are Inoperative

NOTE: Carry out all pinpoint tests **without** a trailer connected to the vehicle.

Refer to Wiring Diagrams Cell [95](#), Trailer/Camper Adapter for schematic and connector information.

Normal Operation

The braking energy provided to the trailer is varied with a Pulse Width Modulated (PWM) signal that switches between 0 volts and battery voltage, the higher the duty cycle the more braking power available. The Trailer Brake Control (TBC) module varies the PWM signal based on various inputs such as the brake torque message, the manual slider switch and the gain buttons. With the vehicle stationary and the manual slider switch fully to the left with a gain of 10, there should be more than 10-12 volts supplied to the trailer tow connector.

The TBC module receives stoplamp switch information from the PCM and information from the ABS module over the High Speed Controller Area Network (HS-CAN). If there is a problem in the ABS module that is preventing this information from being sent to the TBC module, the TBC module enters a limited operating mode. The TBC module receives fused battery voltage from Battery Junction Box (BJB) fuse 17 (30A) and fused ignition voltage from Body Control Module (BCM) fuse 37 (10A).

This pinpoint test is intended to diagnose the following:

- Fuse(s)
- Wiring, terminals or connectors
- Trailer tow connector
- TBC module
- Customer trailer

PINPOINT TEST B: THE TRAILER BRAKES ARE INOPERATIVE



NOTICE: Use the Flex Probe Kit for all test connections to prevent damage to the wiring terminals. Do not use standard multi-meter probes.

NOTE: Make sure the trailer brakes are electric-magnet actuated drum-type brakes before proceeding with this pinpoint test.

Test Step	Result / Action to Take
B1 CHECK FOR ANY PCM DTCs	

Power Steering System Purging

Special Tool(s)

 <p>ST2670-A</p>	<p>Evacuation Cap, Power Steering 211-265</p>
 <p>ST1176-A</p>	<p>Vacuum Pump Kit 416-D002 (D95L-7559-A) or equivalent</p>

Material

Item	Specification
<p>Motorcraft® MERCON® LV Automatic Transmission Fluid XT-10-QLVC (US); CXT-10-LV12 (Canada)</p>	<p>MERCON® LV</p>

NOTICE: If the air is not purged from the power steering system correctly, premature power steering pump failure may result. The condition may occur on pre-delivery vehicles with evidence of aerated fluid or on vehicles that have had steering component repairs.

1. **NOTE:** A whine heard from the power steering pump can be caused by air in the system. The power steering purge procedure must be carried out prior to any component repair for which power steering noise complaints are accompanied by evidence of aerated fluid.

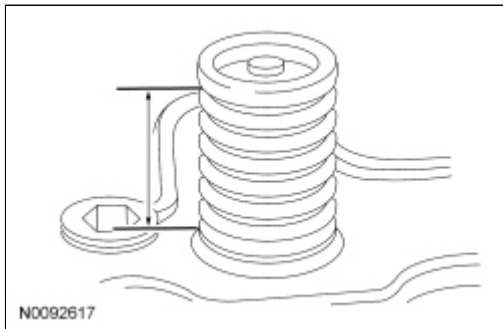
Remove the power steering reservoir cap. Check the fluid.

2. Raise the front wheels off the floor. Refer to the appropriate section in Group [100](#) for the procedure.
3. Tightly insert the Power Steering Evacuation Cap into the reservoir and connect the Vacuum Pump Kit.

Valve Spring Installed Length

NOTE: Refer to the appropriate Section 303-01 for the specification.

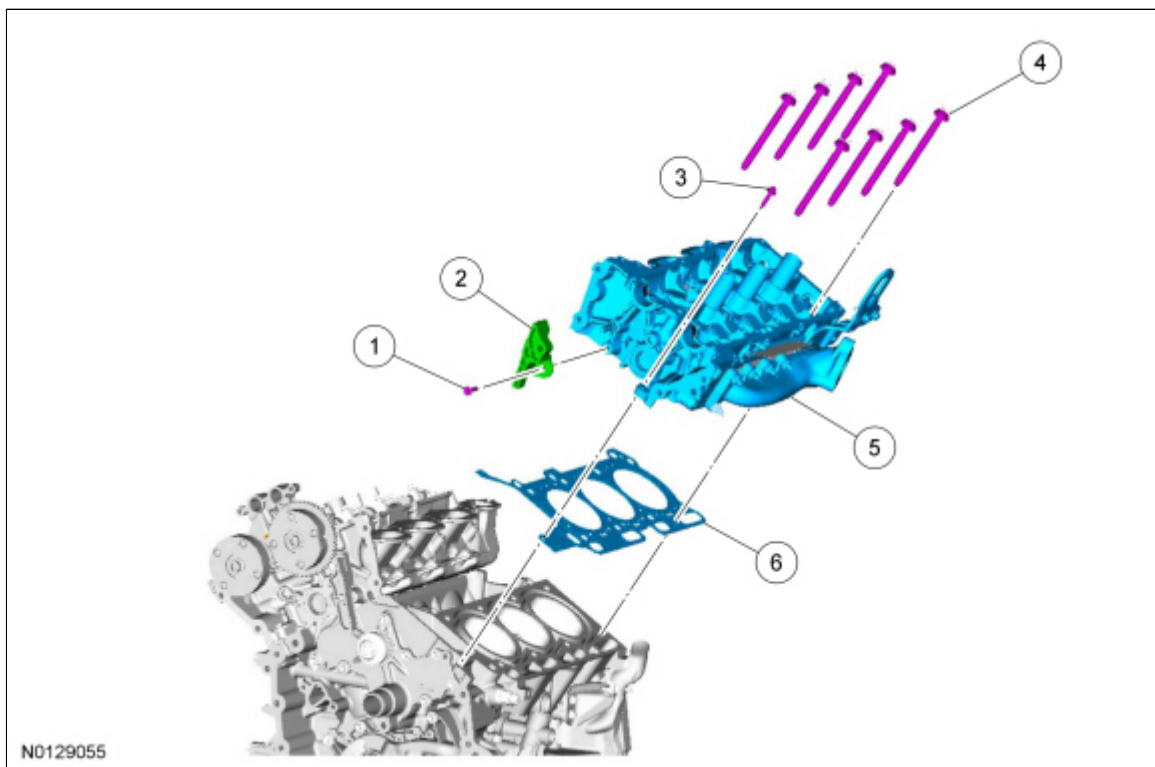
1. Measure the installed length of each valve spring.



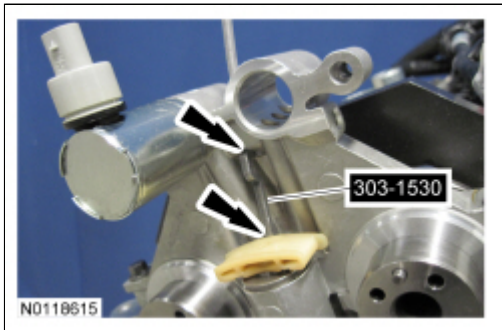
Cylinder Head — LH

Material

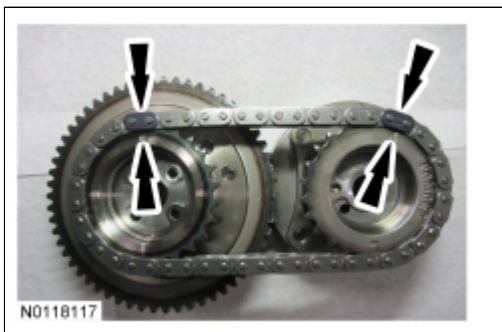
Item	Specification
Motorcraft® Metal Surface Prep ZC-31-A	—
Motorcraft® SAE 5W-30 Premium Synthetic Blend Motor Oil (US); Motorcraft® SAE 5W-30 Super Premium Motor Oil (Canada) XO-5W30-QSP (US); CXO-5W30-LSP12 (Canada)	WSS-M2C946-A
Motorcraft® Silicone Gasket Remover ZC-30	—



Item	Part Number	Description
1	W709818	LH upper primary timing chain guide bolt
2	6K297	LH upper primary timing chain guide
3	W710702	Cylinder head M6 bolt
4	6065	Cylinder head bolt (8 required)

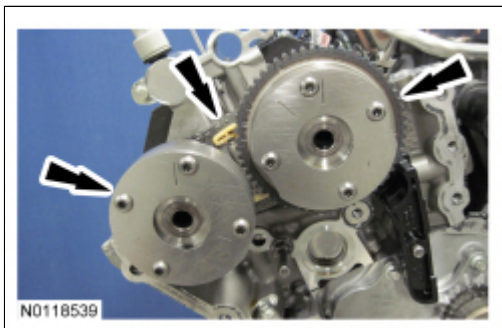


20. Assemble the RH VCT assembly, the RH exhaust camshaft sprocket and the RH secondary timing chain.
- Align the colored links with the timing marks.



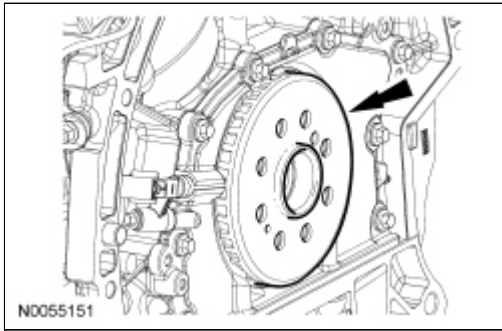
21. **NOTE:** It may be necessary to rotate the camshafts slightly, to install the RH secondary timing assembly.

Position the 2 RH VCT assemblies and secondary timing chain onto the camshafts by aligning the holes in the VCT assemblies with the dowel pins in the camshafts.

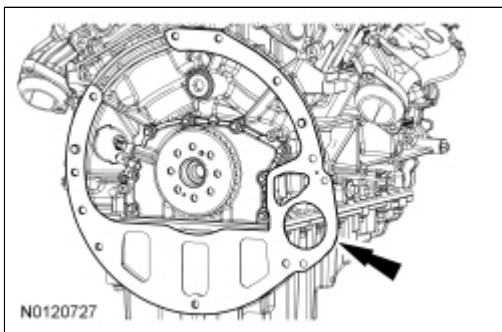


22. Install the 2 new RH VCT bolts and tighten in 4 stages.
- Stage 1: Tighten to 40 Nm (30 lb-ft).
 - Stage 2: Loosen one full turn.
 - Stage 3: Tighten to 25 Nm (18 lb-ft).
 - Stage 4: Tighten an additional 180 degrees.

174. Install the crankshaft sensor ring.

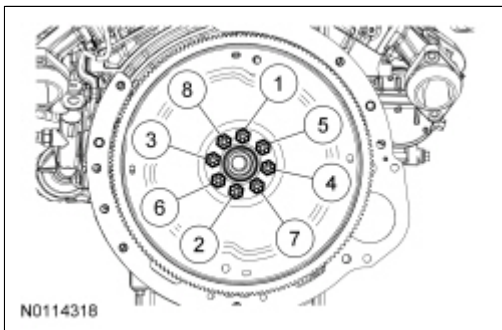


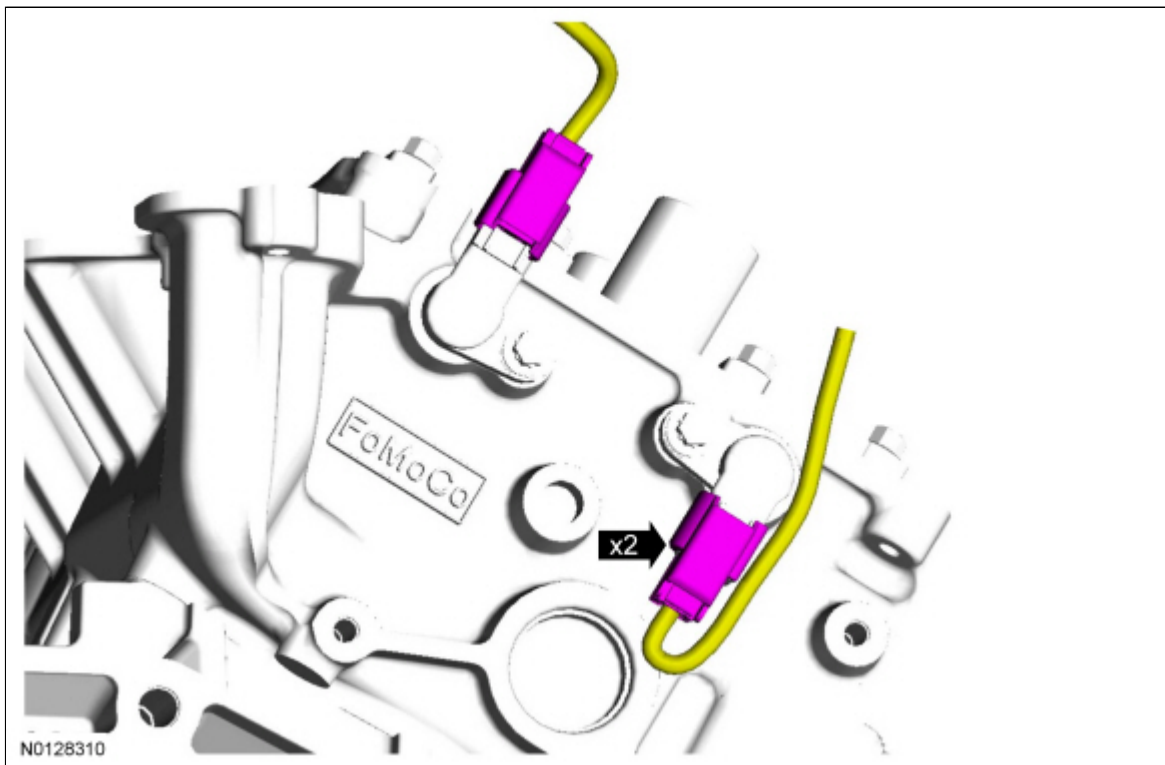
175. Install the spacer plate.



176. Install the flexplate and the 8 bolts and tighten in sequence shown.

- Tighten to 80 Nm (59 lb-ft).

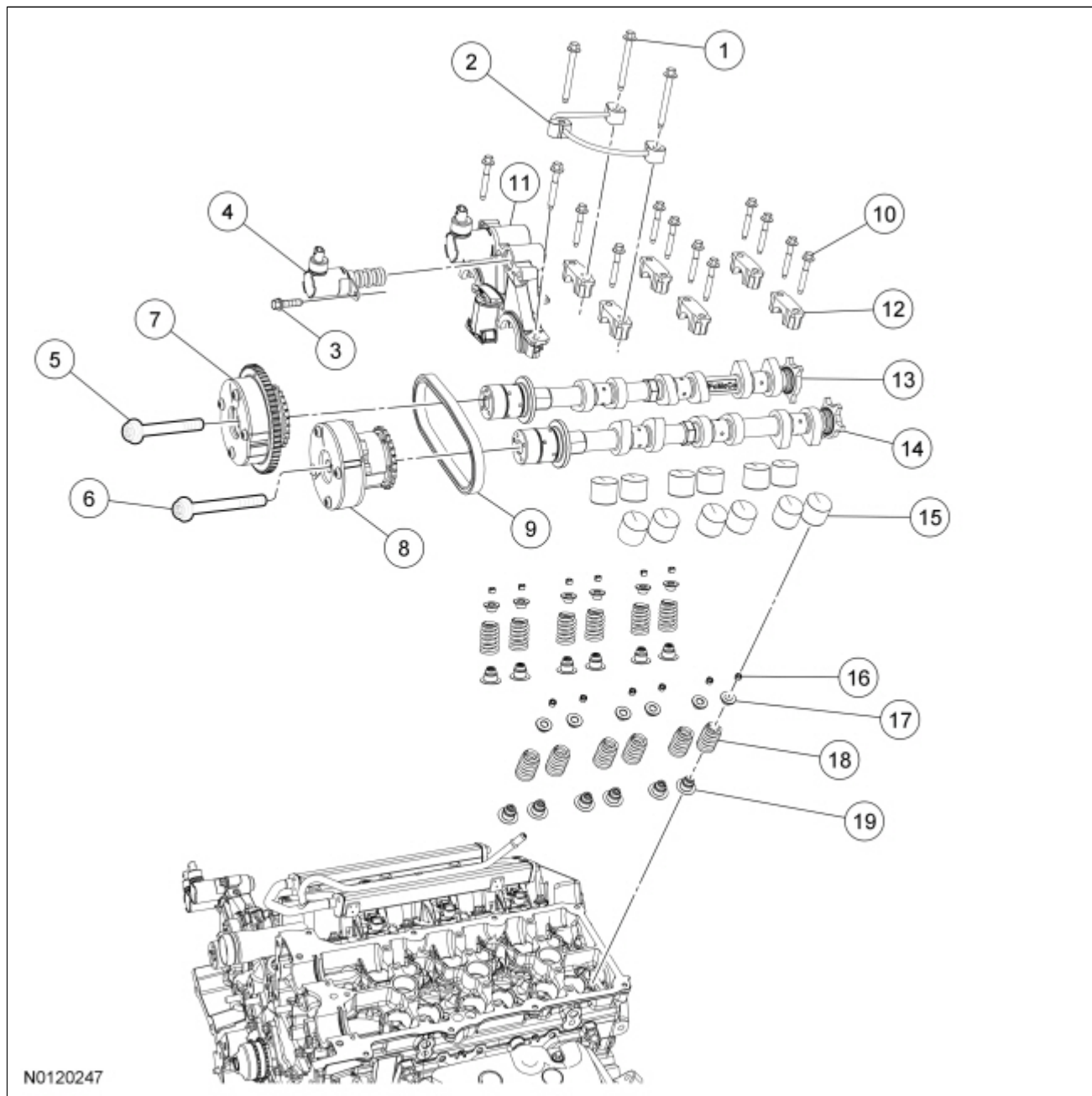




7. Install the RH upper primary timing chain guide and the bolt.
 - Tighten to 10 Nm (89 lb-in).
8. Connect the CHT sensor electrical connector.
9. Install the lower intake manifold. For additional information, refer to [Lower Intake Manifold](#) in this section.
10. Install the RH camshafts. For additional information, refer to [Camshaft — RH](#) in this section.
11. Raise the catalytic converter and install the new LH and RH catalytic converter-to-exhaust manifold nuts.
 - Tighten to 45 Nm (35 lb-ft).
12. Position the exhaust Y-pipe dual catalytic converter-to-exhaust intermediate pipe and install the 2 new bolts.
 - Tighten the inner exhaust Y-pipe dual catalytic converter-to-exhaust intermediate pipe bolt to 63 Nm (46 lb-ft).
 - Tighten the outer exhaust Y-pipe dual catalytic converter-to-exhaust intermediate pipe bolt to 63 Nm (46 lb-ft).

Valve Train Components — Exploded View

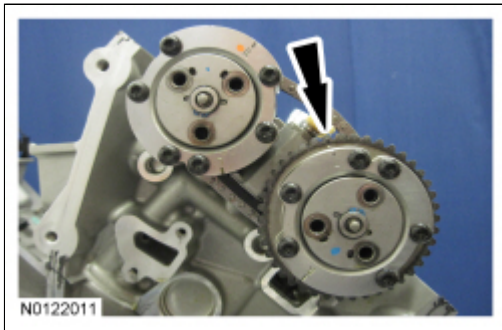
NOTE: LH shown, RH similar.



N0120247

Item	Part Number	Description
1	W500305	Valve train oil tube bolt (3 required)
2	6K602	Valve train oil tube

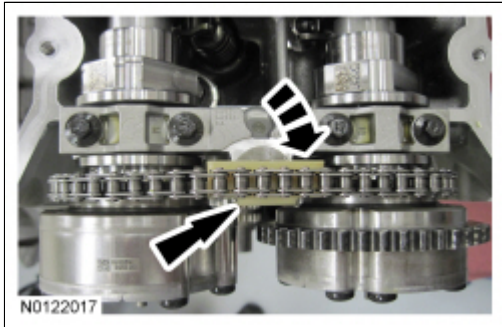
Engine weight	197.3 kg (435 lb)
Cylinder Head and Valve Train	
Combustion chamber volume	54.5-57.5 cc (3.33-3.51 cu in)
Valve stem diameter — intake	5.975-5.995 mm (0.2352-0.2360 in)
Valve stem diameter — exhaust	5.950-5.970 mm (0.2342-0.2350 in)
Valve stem-to-guide clearance — intake	0.020-0.069 mm (0.0008-0.0027 in)
Valve stem-to-guide clearance — exhaust	0.045-0.094 mm (0.0018-0.0037 in)
Valve head diameter — intake	37 mm (1.45 in)
Valve head diameter — exhaust	31 mm (1.22 in)
Valve face runout	0.05 mm (0.0019 in)
Valve face angle	45 degrees
Valve seat width — intake	1.3-1.5 mm (0.051-0.059 in)
Valve seat width — exhaust	1.4-1.6 mm (0.059-0.063 in)
Valve seat runout	0.04 mm (0.0016 in)
Valve seat angle	120/90/60 degrees
Valve spring free length — intake	51.32 mm (2.02 in)
Valve spring free length — exhaust	51.32 mm (2.02 in)
Valve spring perpendicularity — intake	3 mm (0.118 in)
Valve spring perpendicularity — exhaust	3 mm (0.118 in)
Valve spring compression force — intake	650 N
Valve spring compression force — exhaust	650 N
Valve spring installed height — intake	40 mm (1.5748 in)
Valve spring installed height — exhaust	40 mm (1.5748 in)
Valve spring installed force — intake	265 N
Valve spring installed force — exhaust	265 N
Roller follower ratio	2:1
Head gasket surface flatness	0.025 mm (0.001 in) in any 25 mm (1 in) x 25 mm (1 in) area; 0.050 mm (0.002 in) in any 150 mm (6 in) x 150 mm (6 in) area; 0.1 mm (0.004 in) overall
Hydraulic Lash Adjuster	
Diameter — intake	11.89-12.00 mm (0.4681-0.472 in)
Diameter — exhaust	11.89-12.00 mm (0.4681-0.472 in)
Clearance-to-bore	0.018-0.050 mm (0.0007-0.0019 in)
Hydraulic leakdown rate — intake	0.45-3 seconds ^a
Hydraulic leakdown rate — exhaust	0.45-3 seconds ^a
Collapsed lash adjuster gap	0.35-0.85 mm (0.0137-0.0334 in)
Camshaft	



55. **NOTE:** It may be necessary to rotate the exhaust camshaft slightly (using a wrench on the flats of the camshaft) to seat the VCT assemblies onto the camshafts.

Rotate the secondary timing chain tensioner 90 degrees so the ramped area is facing forward and fully seat the VCT assemblies onto the camshafts.

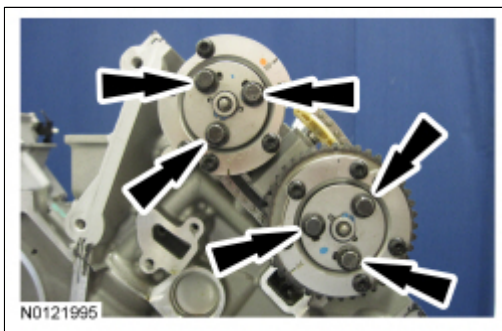
- If the secondary timing chain is not centered over the tensioner, reposition the VCT assemblies until they are fully seated on the camshafts.



56. **NOTE:** Use a wrench on the flats of the camshaft to hold the camshafts while tightening the VCT assembly bolts.

Install the 3 LH intake VCT assembly bolts and the 3 LH exhaust VCT assembly bolts.

- Tighten to 15 Nm (133 lb-in) plus an additional 90 degrees.



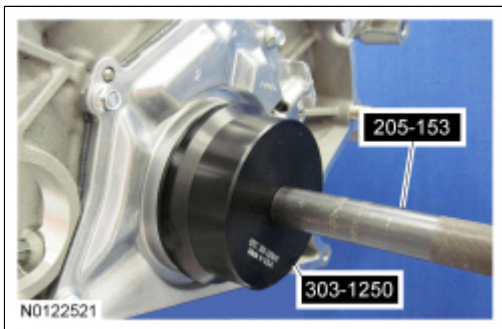
57. Install the LH primary timing chain.
- Align the colored link on the timing chain with the timing mark on the LH VCT assembly.

Removal

1. Remove the flexplate. For additional information, refer to [Flexplate or Flywheel and Crankshaft Rear Seal — Exploded View](#) and [Flexplate](#).
2. Remove the engine separator plate.
3. **NOTE:** Inspect the crankshaft sensor ring for damage. If the crankshaft sensor ring has been dropped or has any visual damage, it must be discarded.

Remove the crankshaft sensor ring.

4. Remove the oil pan. For additional information, refer to [Engine Lubrication Components — Exploded View](#) and [Oil Pan](#) in this section.
5. Disconnect the Crankshaft Position (CKP) sensor electrical connector.
6. Remove the bolt and the [CKP sensor](#).
7. Using the Slide Hammer and the Crankshaft Rear Oil Seal Remover, remove and discard the crankshaft rear seal.



8. Remove the 6 bolts and the crankshaft rear seal retainer plate.

Installation

1. **NOTICE:** Do not use metal scrapers, wire brushes, power abrasive discs or other abrasive means to clean the sealing surfaces. These tools cause scratches and gouges which make leak paths. Use a plastic scraping tool to remove all traces of old sealant.

NOTE: Clean the sealing surfaces with silicone gasket remover and metal surface prep. Follow the directions on the packaging.

Clean and inspect the mating surface.

2. **NOTE:** If the rear crankshaft seal retaining plate is not secured within 4 minutes, the sealant must be removed and the sealing area cleaned with silicone gasket remover and metal surface prep. Follow the directions on the packaging. Allow to dry until there is no sign of wetness, or 5 minutes, whichever is longer. Failure to follow this procedure may cause future oil leaks.

Apply a 3.75 mm (0.147 in) bead of silicone sealant to the rear crankshaft seal retainer mating surface on the engine block.