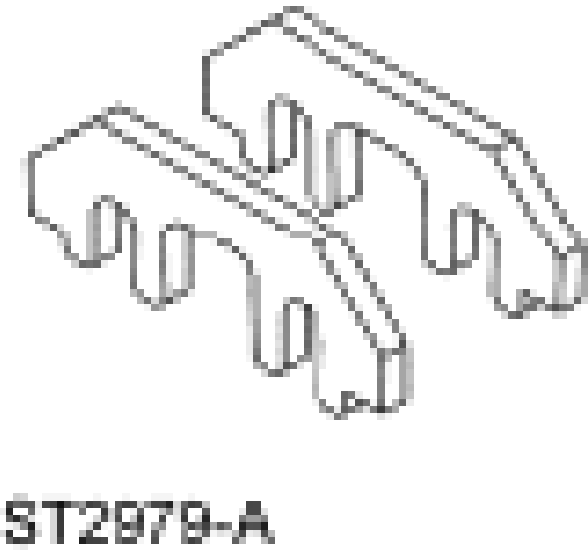


COOLANT PUMP**Special Tool(s)****SPECIAL TOOL DESCRIPTION CHART**

 ST2979-A	Camshaft Holding Tool 303-1248
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Material**MATERIAL SPECIFICATIONS**

Item	Specification
Motorcraft® SAE 5W-20 Premium Synthetic Blend Motor Oil XO-5W20-QSP (US); Motorcraft® SAE 5W-20 Super Premium Motor Oil CXO-5W20-LSP12 (Canada); or equivalent	WSS-M2C930-A

Removal

NOTE: 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.

NOTE: On early build engines, the timing chain rides on the inner side of the RH timing chain guide. Late build engines are equipped with a different design RH timing chain guide that requires the timing chain to ride on the outer side of the RH timing chain guide. For service, all replacement RH timing chain guides will be the late build design.

All vehicles

1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to **JACKING AND LIFTING**.
2. Drain the cooling system. For additional information, refer to **Cooling System Draining, Filling and Bleeding**.
3. Remove the engine front cover. For additional information, refer to **ENGINE - 3.5L**.
4. Remove and discard the engine oil filter.

Engines equipped with early build RH timing chain guides

5. Rotate the crankshaft clockwise and align the timing marks on the Variable Camshaft Timing (VCT) assemblies as shown in illustration.

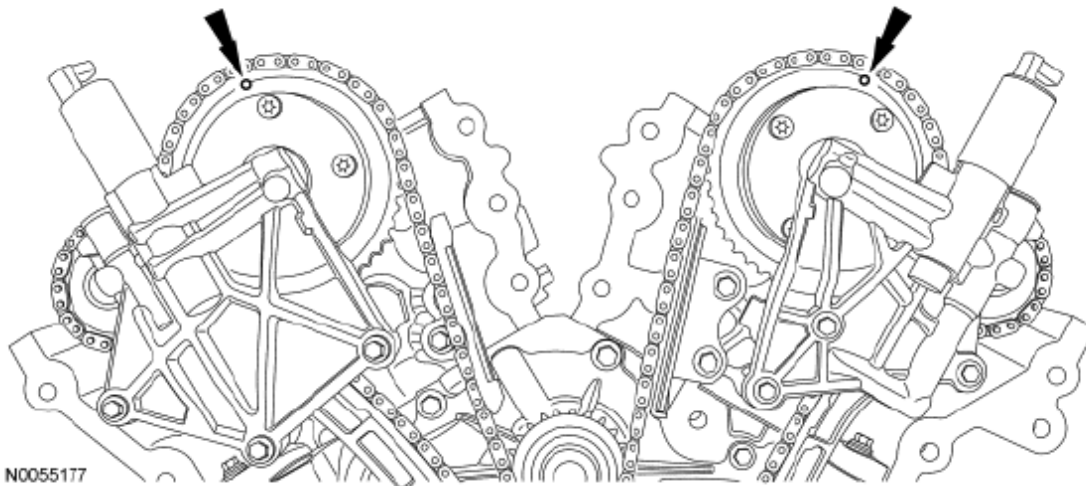


Fig. 11: Locating Timing Marks On Variable Camshaft Timing (VCT)
Courtesy of FORD MOTOR CO.

Engines equipped with late build/replacement RH timing chain guides

6. Rotate the crankshaft clockwise and align the timing marks on the VCT assemblies as shown in illustration.

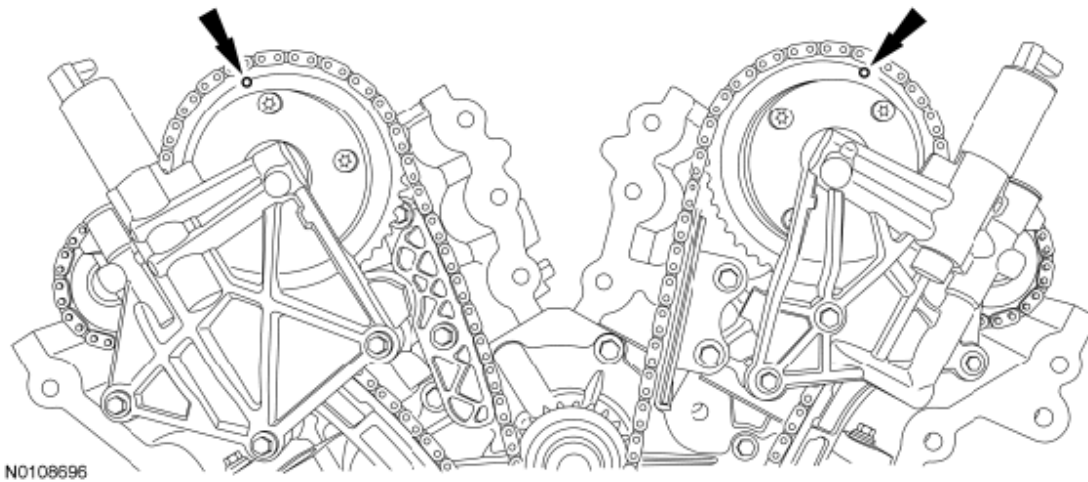


Fig. 12: Locating Timing Marks On Variable Camshaft Timing (VCT)
Courtesy of FORD MOTOR CO.

All vehicles

NOTE: The Camshaft Holding Tool will hold the camshafts in the Top Dead Center (TDC) position.

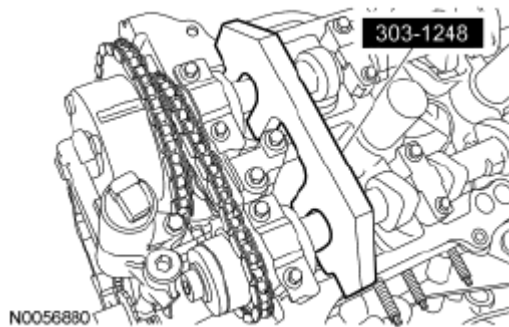


Fig. 13: Identifying Camshaft Holding Tool
Courtesy of FORD MOTOR CO.

7. Install the Camshaft Holding Tool onto the flats of the LH camshafts.

NOTE: The Camshaft Holding Tool will hold the camshafts in the TDC position.

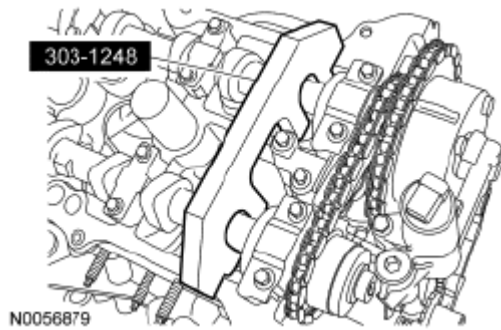


Fig. 14: Identifying Camshaft Holding Tool
Courtesy of FORD MOTOR CO.

8. Install the Camshaft Holding Tool onto the flats of the RH camshafts.
9. Remove the 3 bolts and the RH VCT housing.

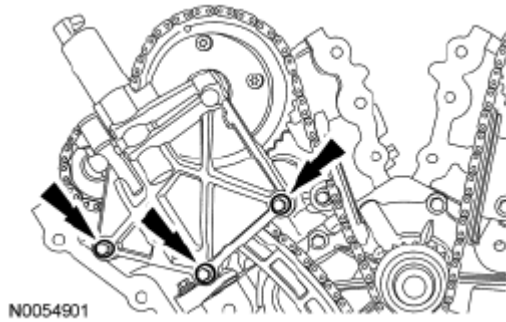


Fig. 15: Locating VCT Housing Bolts - RH
Courtesy of FORD MOTOR CO.

10. Remove the 3 bolts and the LH VCT housing.

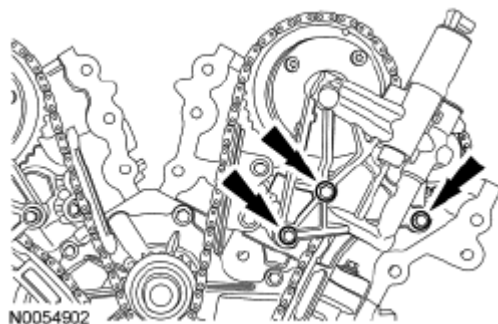


Fig. 16: Locating VCT Housing Bolts - LH
Courtesy of FORD MOTOR CO.

11. Remove the 2 bolts and the primary timing chain tensioner.

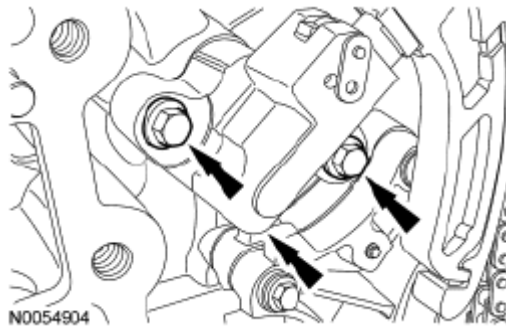


Fig. 17: Locating Primary Timing Chain Tensioner Bolts
Courtesy of FORD MOTOR CO.

12. Remove the primary timing chain tensioner arm.

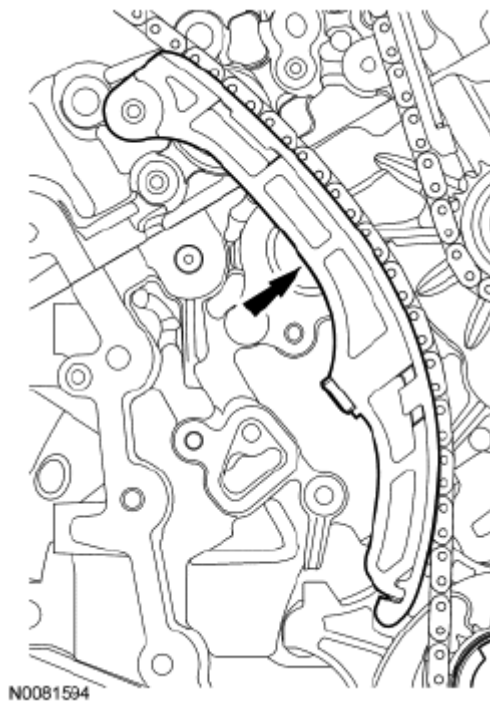
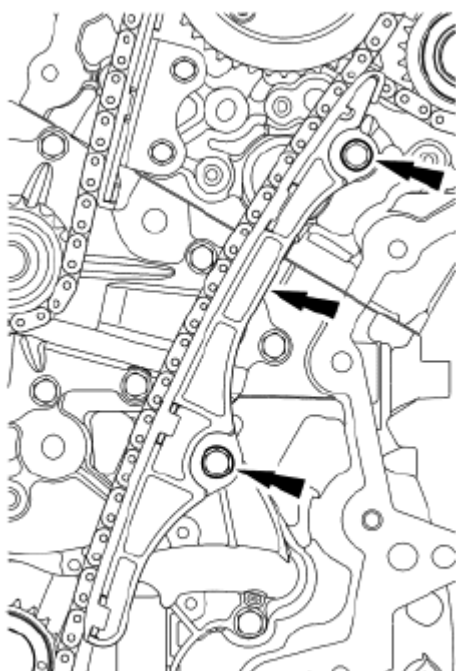


Fig. 18: Locating Primary Timing Chain Tensioner Arm
Courtesy of FORD MOTOR CO.

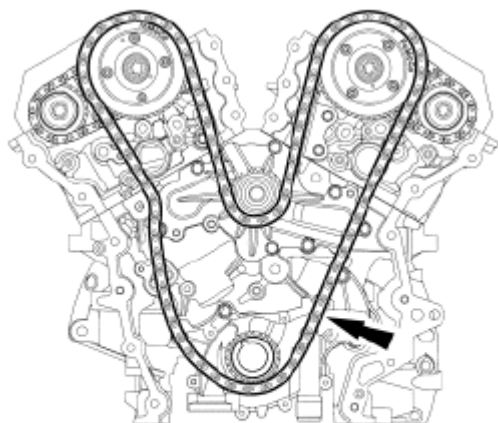
13. Remove the 2 bolts and the lower LH primary timing chain guide.



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Fig. 19: Locating Lower LH Primary Timing Chain Guide And Bolts
 Courtesy of FORD MOTOR CO.

14. Remove the primary timing chain.



N0054908

Fig. 20: Locating Primary Timing Chain
 Courtesy of FORD MOTOR CO.

15. Remove the 2 bolts and the upper LH primary timing chain guide.

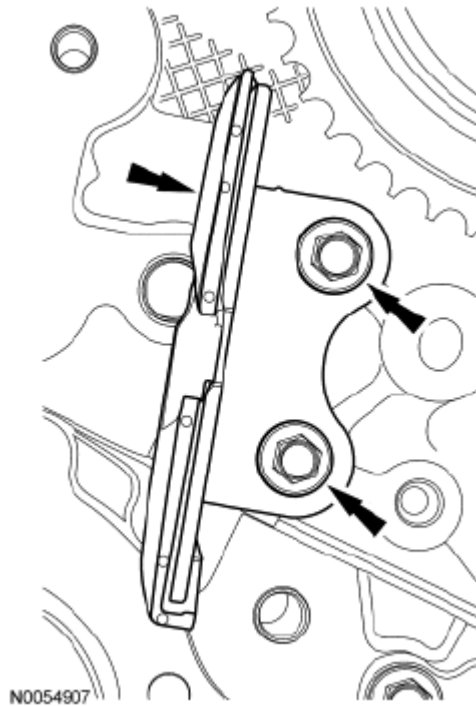


Fig. 21: Locating Upper LH Primary Timing Chain Guide And Mounting Bolts
Courtesy of FORD MOTOR CO.

Engines equipped with early build RH timing chain guides

16. Remove the RH primary timing chain guide lower bolt.

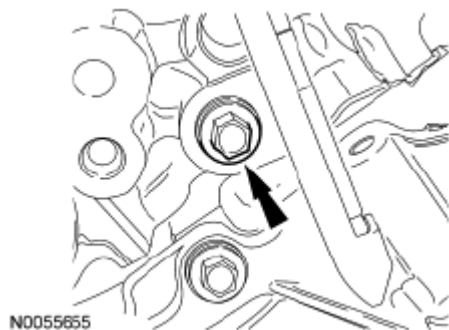


Fig. 22: Locating Primary Timing Chain Guide Lower Bolt - RH
Courtesy of FORD MOTOR CO.

NOTE: The RH primary timing chain guide must be repositioned to allow the coolant pump to be removed.

17. Loosen the RH primary timing chain guide upper bolt.
 - Rotate the guide and tighten the bolt.

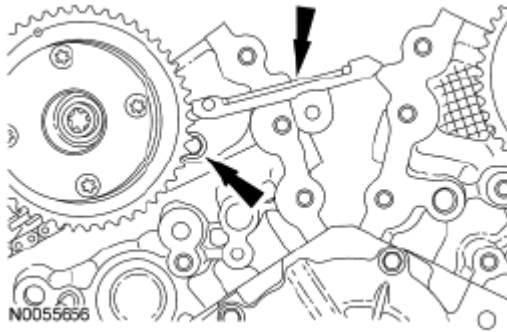


Fig. 23: Locating Primary Timing Chain Guide And Upper Bolt - RH
Courtesy of FORD MOTOR CO.

Engines equipped with late build/replacement RH timing chain guides

18. Remove the RH primary timing chain guide lower bolt.

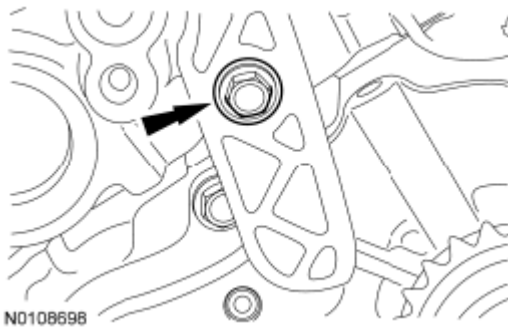


Fig. 24: Locating RH Primary Timing Chain Guide Lower Bolt
Courtesy of FORD MOTOR CO.

NOTE: The RH primary timing chain guide must be repositioned to allow the coolant pump to be removed.

19. Loosen the RH primary timing chain guide upper bolt.
 - Rotate the guide and tighten the bolt.

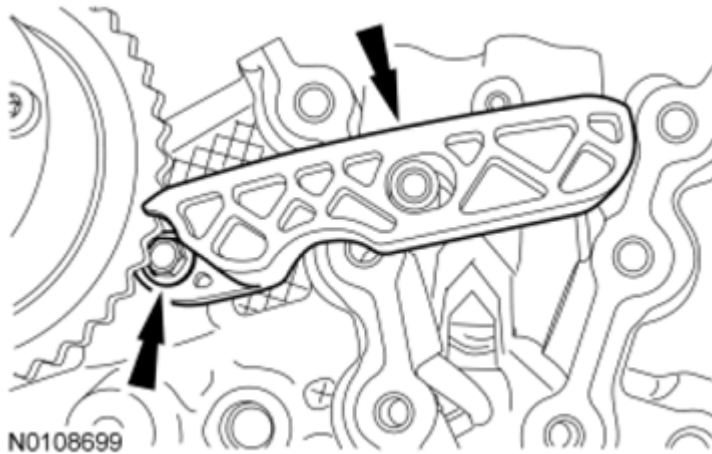


Fig. 25: Locating RH Primary Timing Chain Guide And Upper Bolt
Courtesy of FORD MOTOR CO.

All vehicles

20. Place clean lint-free shop towels in the oil pan opening to prevent coolant from entering the oil pan during coolant pump removal.
21. Remove the 8 bolts and the coolant pump.

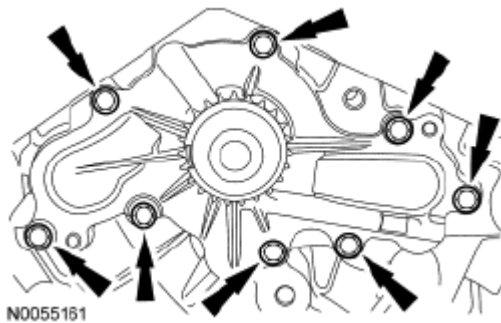


Fig. 26: Locating Coolant Pump Bolts
Courtesy of FORD MOTOR CO.

Installation

All vehicles

NOTE: Clean and inspect all sealing surfaces.

1. Install the coolant pump and the 8 bolts.
 - Tighten in the sequence shown in illustration to 10 Nm (89 lb-in).

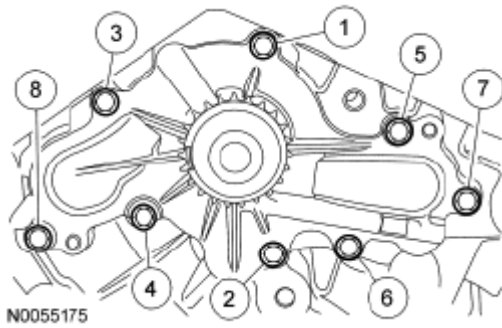


Fig. 27: Tightening Sequence Of Coolant Pump Bolts
Courtesy of FORD MOTOR CO.

2. Remove all of the shop towels from the oil pan opening.

NOTE: Any coolant that has accumulated in the oil pan must be drained from the pan and any residual coolant cleaned from the front of the engine and oil pan. Failure to remove all traces of the coolant can result in oil contamination and severe engine damage.

3. Remove the oil pan drain plug and allow any accumulated coolant to drain.
 - Remove any residual coolant from the front of the engine and the oil pan using regulated compressed air and clean lint-free shop towels.
 - Install the oil pan drain plug and tighten to 27 Nm (20 lb-ft).

Engines equipped with late build/replacement RH timing chain guides

4. Loosen the RH primary timing chain guide upper bolt.
 - Position the RH primary timing chain guide and install the lower bolt.
 - Tighten the 2 bolts to 10 Nm (89 lb-in).

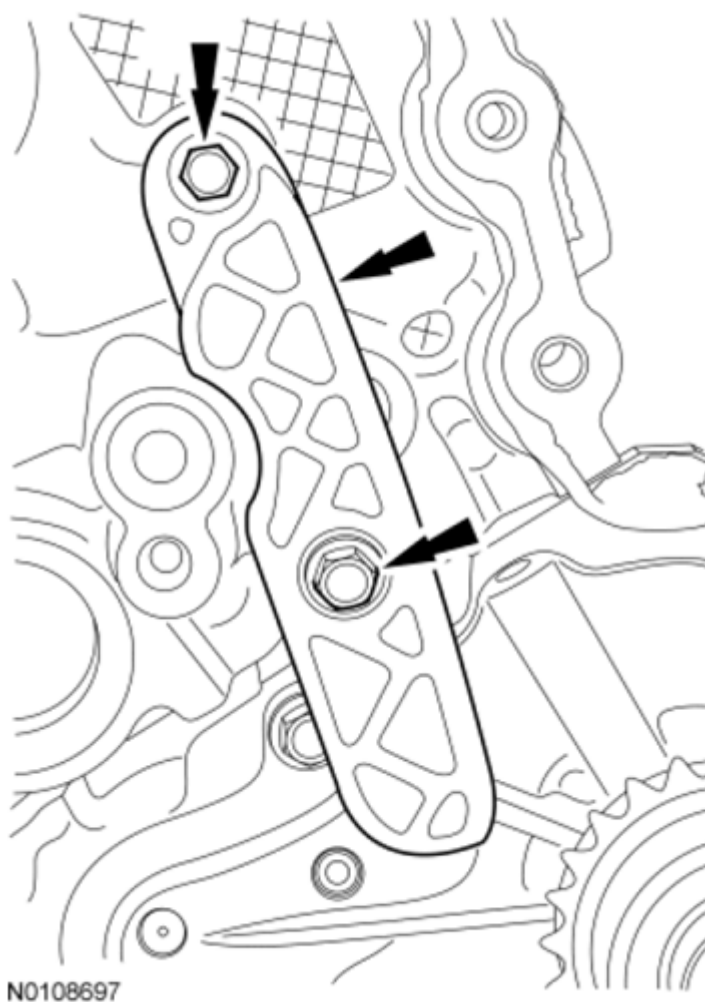


Fig. 28: Locating RH Primary Timing Chain Guide And Lower Bolts
Courtesy of FORD MOTOR CO.

Engines equipped with early build RH timing chain guides

5. Loosen the RH primary timing chain guide upper bolt.
 - Position the RH primary timing chain guide and install the lower bolt.
 - Tighten the 2 bolts to 10 Nm (89 lb-in).

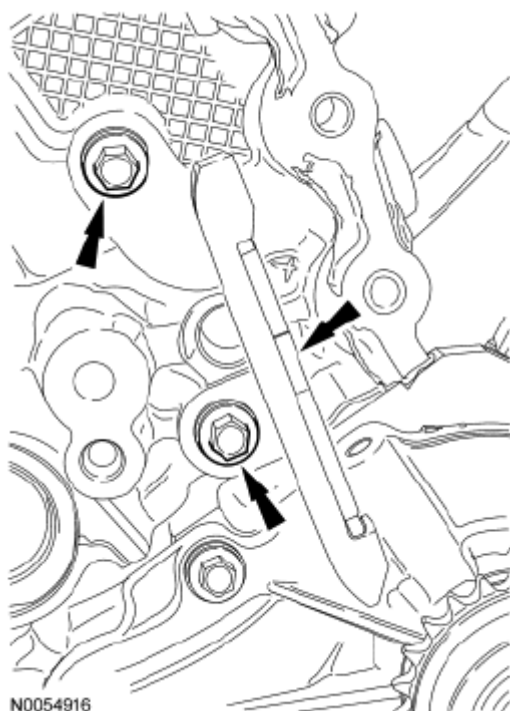
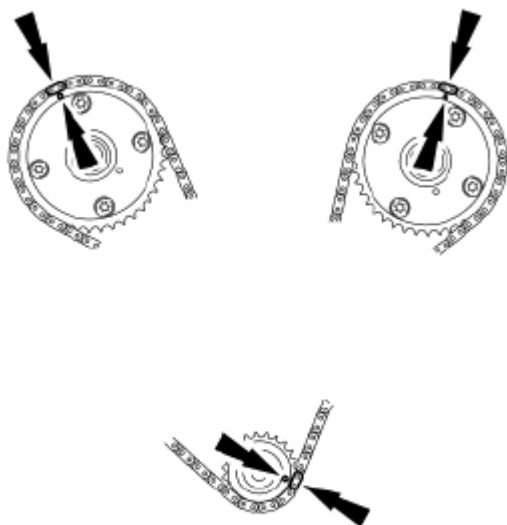


Fig. 29: Locating Primary Timing Chain Guide And Lower Bolt - RH
 Courtesy of FORD MOTOR CO.

All vehicles

6. Install the primary timing chain with the colored links aligned with the timing marks on the VCT assemblies and the crankshaft sprocket.



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Fig. 30: Aligning With Timing Marks On VCT Assemblies And Crankshaft Sprocket
Courtesy of FORD MOTOR CO.

7. Install the upper LH primary timing chain guide and the 2 bolts.
 - Tighten to 10 Nm (89 lb-in).

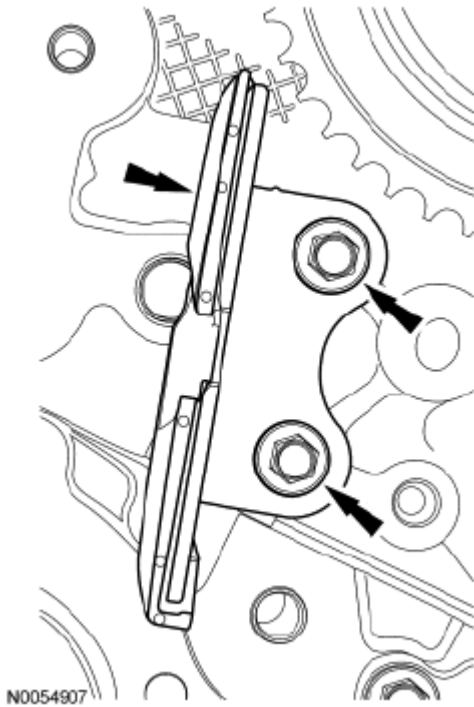


Fig. 31: Locating Upper LH Primary Timing Chain Guide And Mounting Bolts
Courtesy of FORD MOTOR CO.

8. Install the lower LH primary timing chain guide and the 2 bolts.
 - Tighten to 10 Nm (89 lb-in).

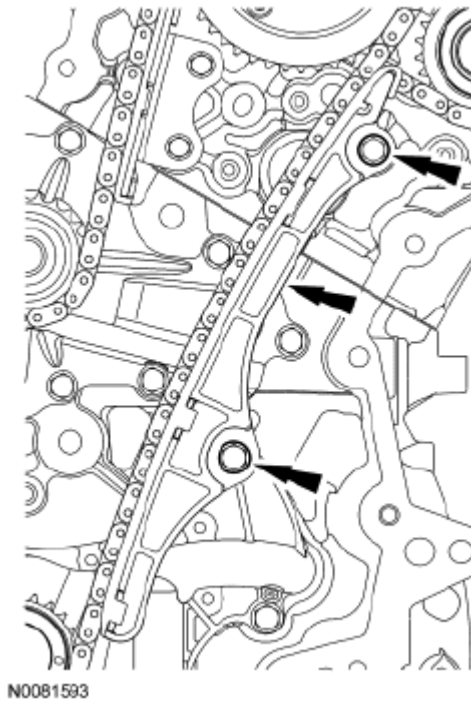


Fig. 32: Locating Lower LH Primary Timing Chain Guide And Bolts
Courtesy of FORD MOTOR CO.

9. Install the primary timing chain tensioner arm.

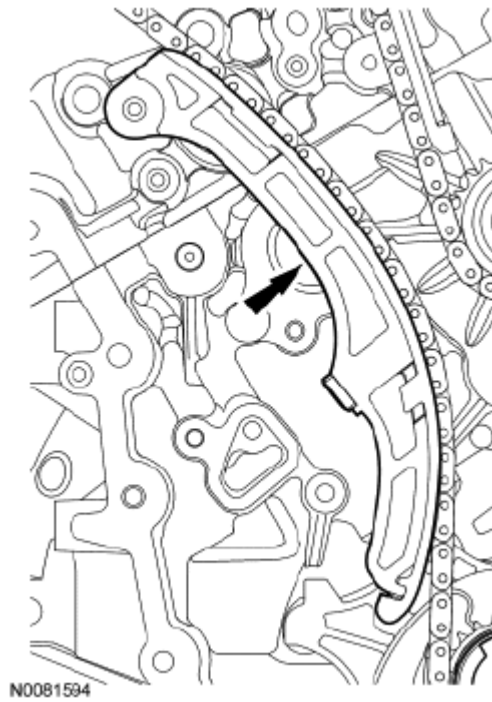


Fig. 33: Locating Primary Timing Chain Tensioner Arm
Courtesy of FORD MOTOR CO.

10. Reset the primary timing chain tensioner.

- Rotate the lever counterclockwise.
- Using a soft-jawed vise, compress the plunger.
- Align the hole in the lever with the hole in the tensioner housing.
- Install a suitable lock pin.

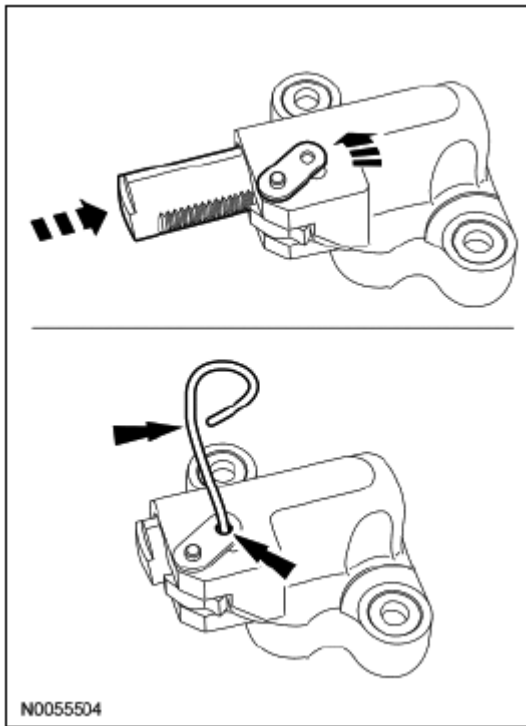


Fig. 34: Resetting Primary Timing Chain Tensioner
Courtesy of FORD MOTOR CO.

NOTE: It may be necessary to rotate the crankshaft slightly to remove slack from the timing chain and install the tensioner.

11. Install the primary tensioner and the 2 bolts.

- Tighten to 10 Nm (89 lb-in).
- Remove the lock pin.

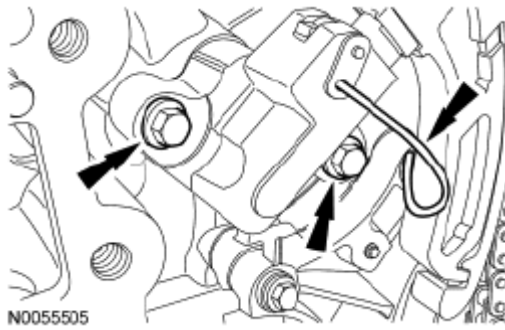


Fig. 35: Locating Primary Tensioner Bolts And Lockpin
Courtesy of FORD MOTOR CO.

12. As a post check, verify correct alignment of all timing marks.



Fig. 36: Aligning Timing Marks
Courtesy of FORD MOTOR CO.

13. Inspect the VCT housing seals for damage and replace as necessary.

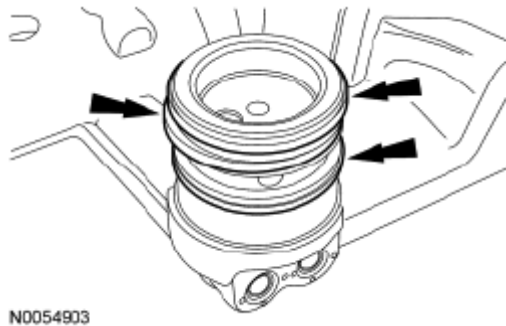


Fig. 37: Locating VCT Housing Seals
Courtesy of FORD MOTOR CO.

NOTE: Make sure the dowels on the Variable Camshaft Timing (VCT) housing are fully engaged in the cylinder head prior to tightening the bolts. Failure to follow this process will result in severe engine damage.

14. Install the LH VCT housing and the 3 bolts.
 - Tighten in the sequence shown in illustration to 10 Nm (89 lb-in).

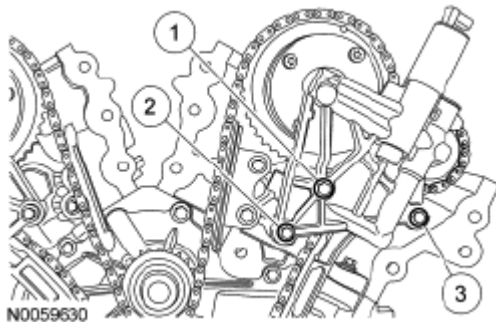


Fig. 38: VCT Housing Bolts Tightening Sequence - LH
Courtesy of FORD MOTOR CO.

NOTE: Make sure the dowels on the Variable Camshaft Timing (VCT) housing are fully engaged in the cylinder head prior to tightening the bolts. Failure to follow this process will result in severe engine damage.

15. Install the RH VCT housing and the 3 bolts.
 - Tighten in the sequence shown in illustration to 10 Nm (89 lb-in).

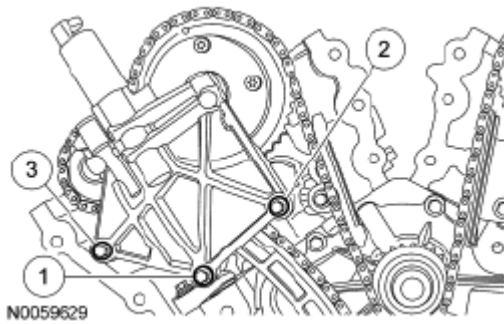


Fig. 39: VCT Housing Bolts Tightening Sequence - RH
Courtesy of FORD MOTOR CO.

NOTE: Lubricate the engine oil filter gasket with clean engine oil prior to installing the oil filter.

16. Install a new engine oil filter.
 - Tighten to 5 Nm (44 lb-in) and then rotate an additional 180 degrees.
17. Install the engine front cover. For additional information, refer to **ENGINE - 3.5L** .
18. Fill and bleed the cooling system. For additional information, refer to **Cooling System Draining, Filling and Bleeding** .