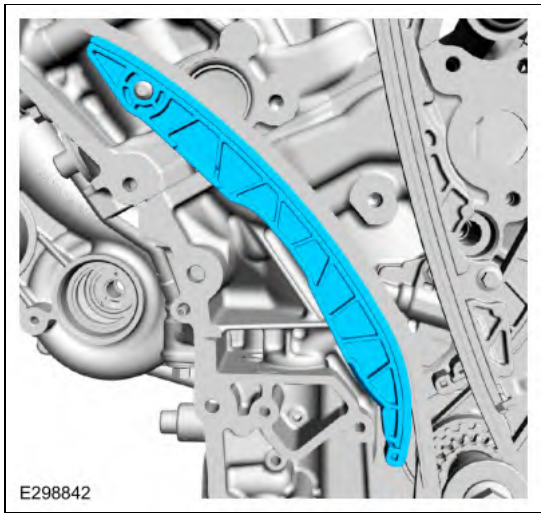
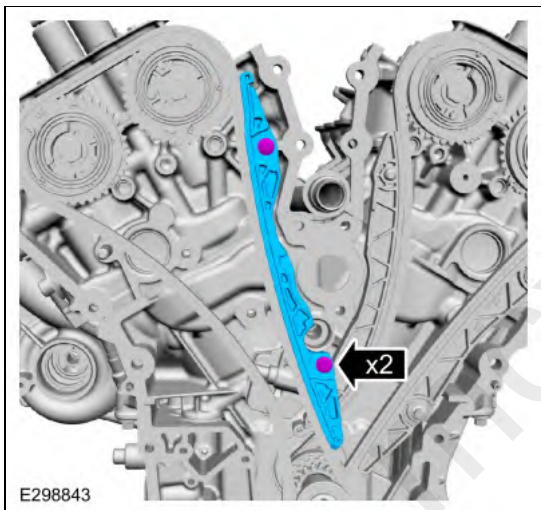
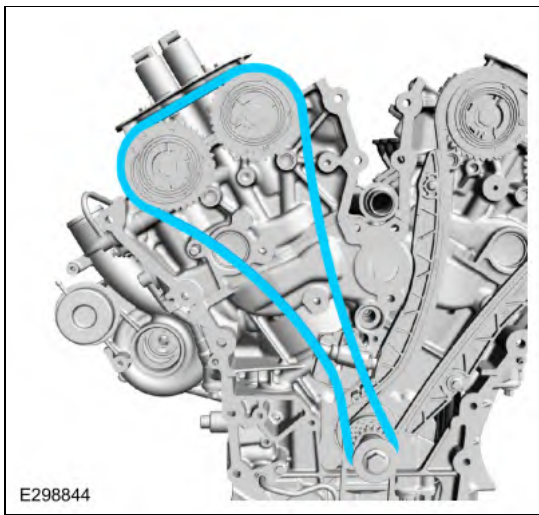




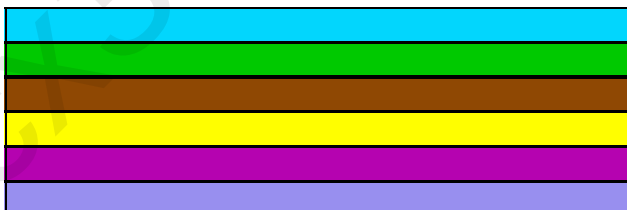
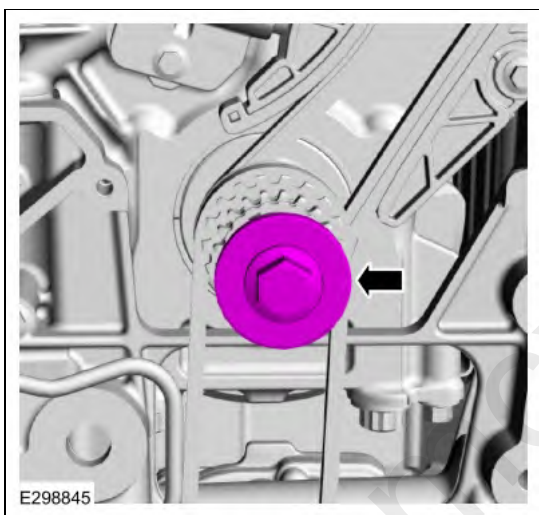
6. Remove the bolts and the RH timing chain guide.



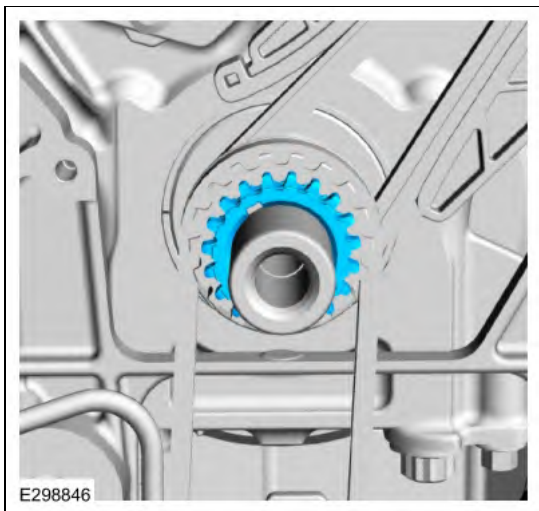
7. Remove the RH timing chain.



8. Remove the original crankshaft pulley bolt.

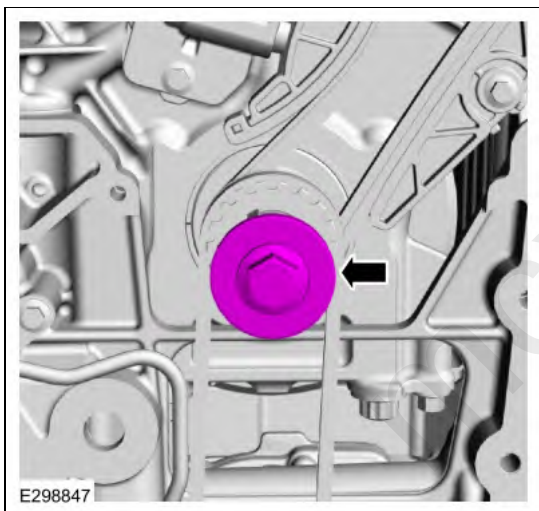


9. Remove the timing chain sprocket.



LH timing chain

10. Install the original crankshaft pulley bolt.



11. **NOTICE: The crankshaft must be rotated clockwise one revolution (360 degrees). Failure to do so will result in incorrect camshaft timing.**

NOTICE: The VCT units have 2 timing marks on them, a triangle and a circle. For removal and installation of the LH side the circle marks are used.

1. Rotate the crankshaft clockwise one revolution (360 degrees).
2. Position the crankshaft sprocket keyway at the 11 o'clock position.
3. The **circle** timing marks on the VCT units will be at the 10 o'clock (intake) and 12:30 (exhaust) positions.



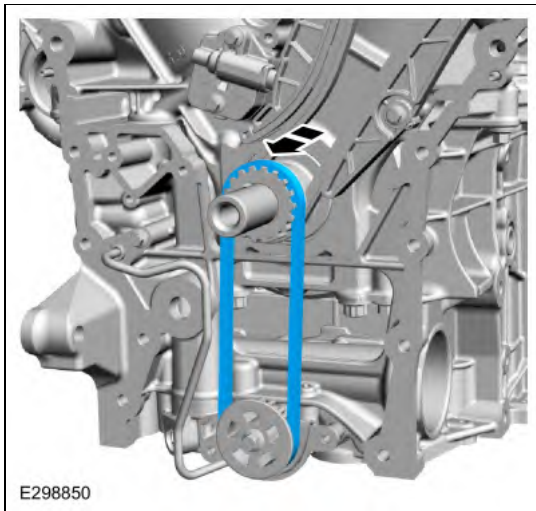
E298847



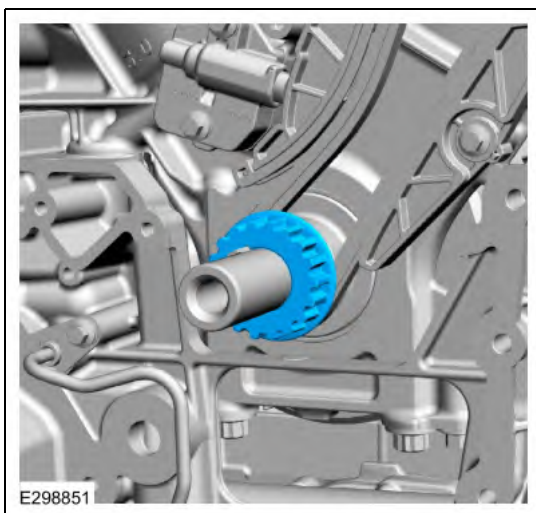
E298849



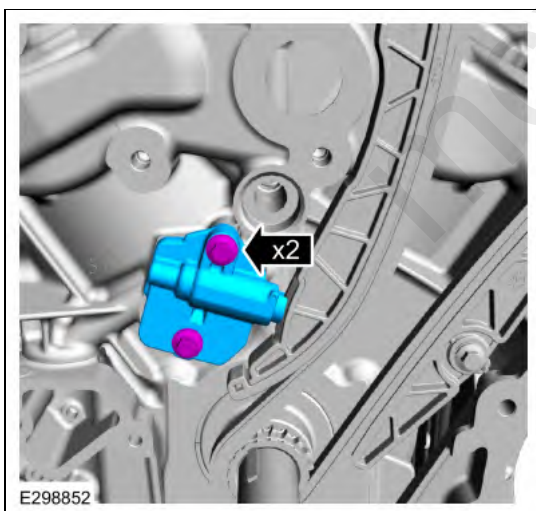
14. Slide the oil pump drive belt off of the crankshaft sprocket and remove the belt.



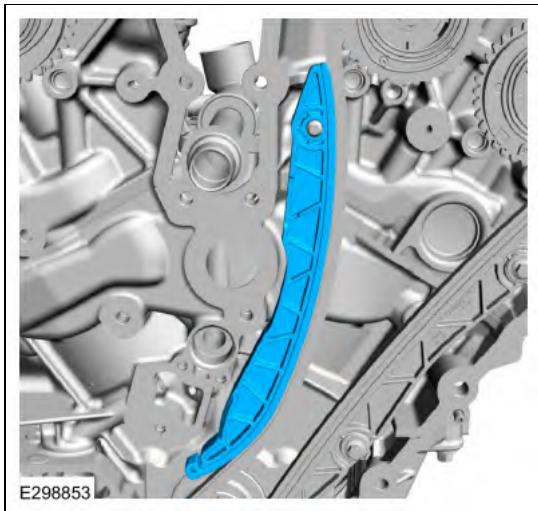
15. Remove the crankshaft sprocket.



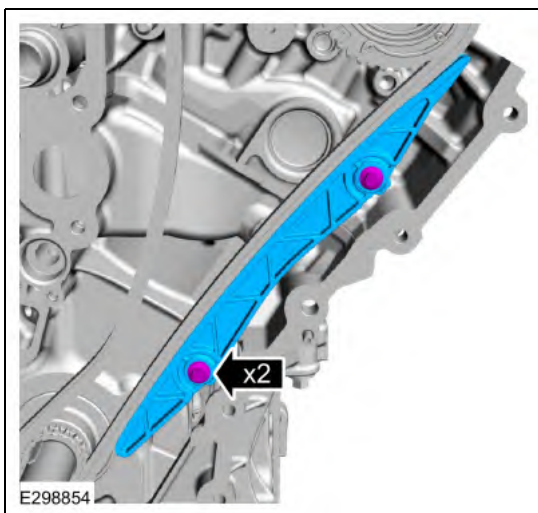
16. Remove the bolts and the LH timing chain tensioner.



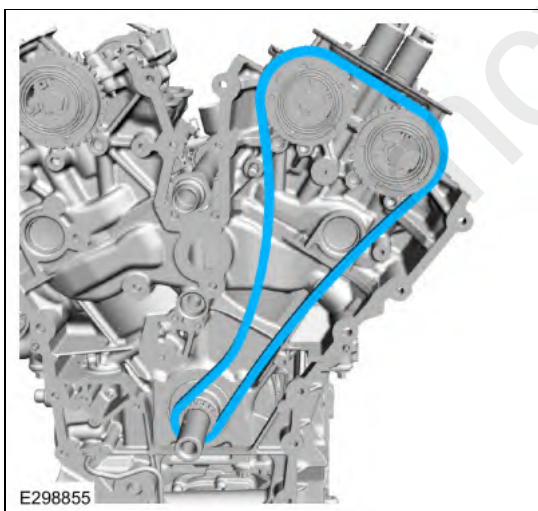
17. Remove the LH timing chain tensioner arm.



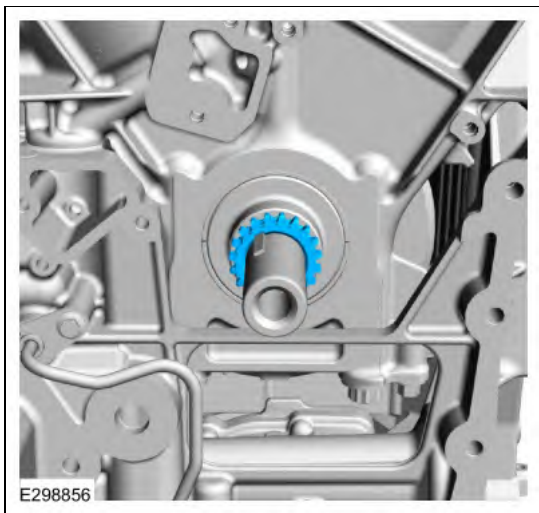
18. Remove the bolts and the LH timing chain guide.



19. Remove the LH timing chain.



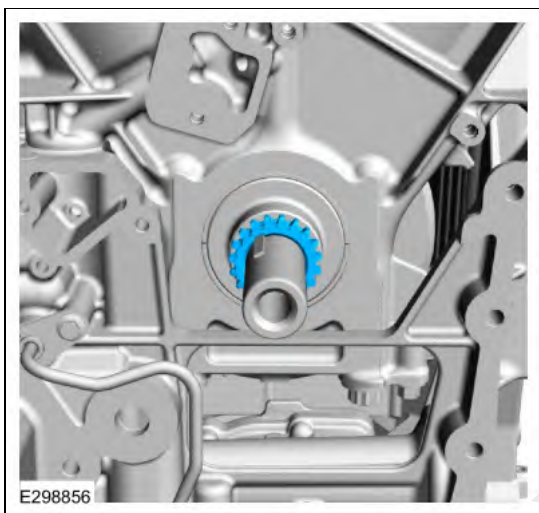
20. Remove the timing chain sprocket.



Installation

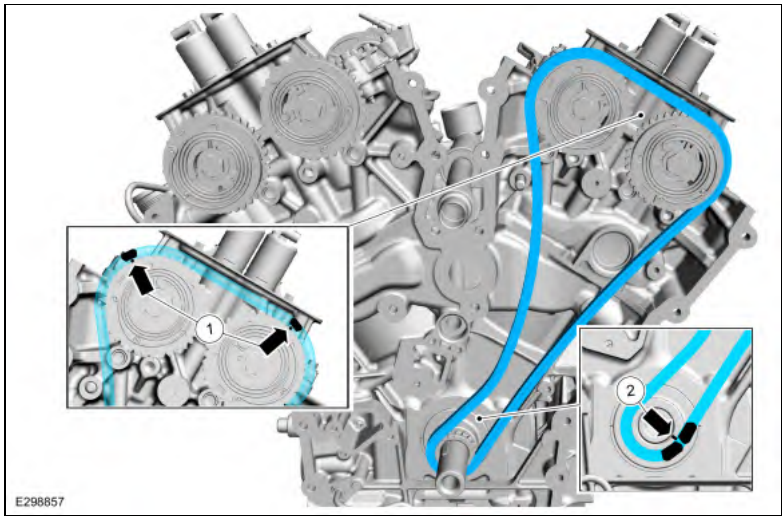
LH timing chain

1. Install the timing chain sprocket.

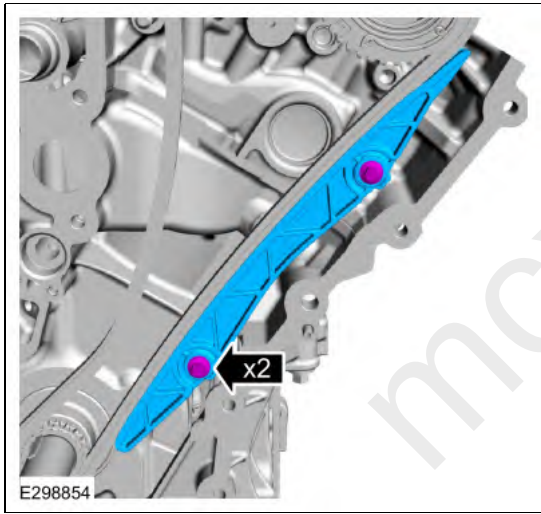


2. **NOTICE: The VCT units have 2 timing marks on them, a triangle and a circle. For removal and installation of the LH side the circle marks are used.**

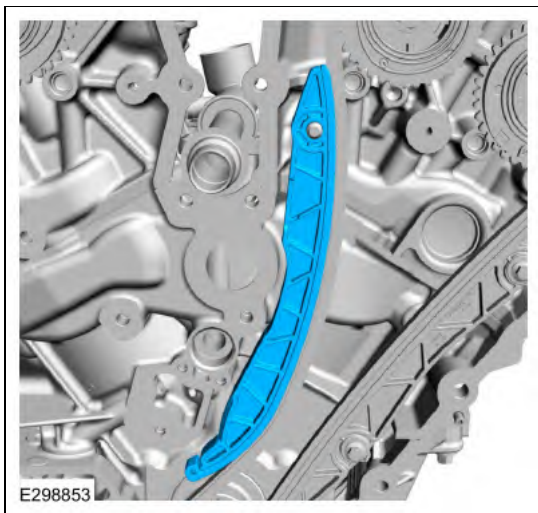
1. Install the LH timing chain with the single colored links aligned with the **circle** timing marks on the VCT units.
2. Install the double colored links so they straddle the timing mark on the crankshaft sprocket.



3. Install the LH timing chain guide and bolts.
Torque: 89 lb.in (10 Nm)



4. Install the LH timing chain tensioner arm.



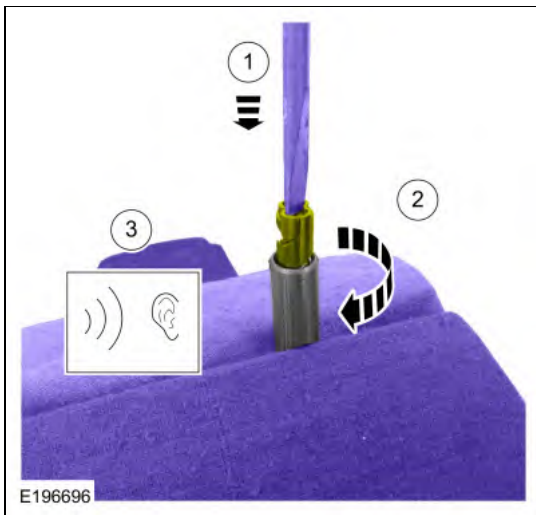
5. Slide the tensioner cylinder out of the LH timing chain tensioner housing.



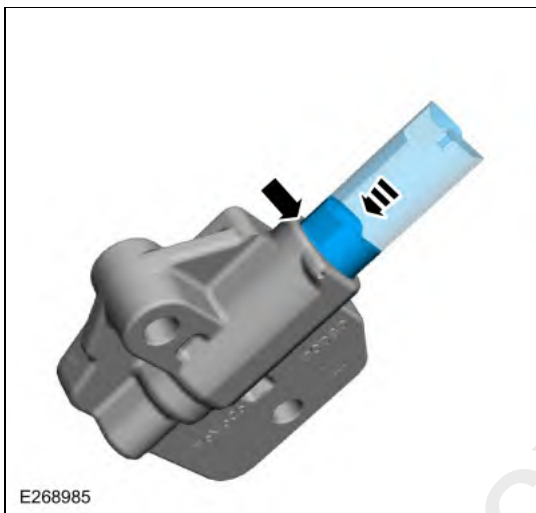
6. **NOTICE:** Use vise jaw protectors or cover the jaws of the vise with clean shop towels to prevent damage to the surface of the tensioner ratchet mechanism.

Mount the flat machined surfaces on the end of the tensioner cylinder into a vise.

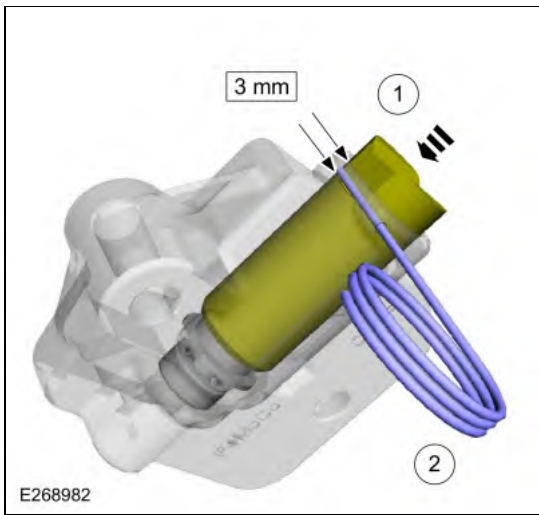
1. Using a flat-bladed screwdriver apply light downward pressure on the end of the tensioner ratchet mechanism.
Use the General Equipment: Vise
Use the General Equipment: Vise Jaw Protectors
Use the General Equipment: Flat-Bladed Screwdriver
2. Rotate the screwdriver clockwise approximately one turn.
3. An audible click will be heard when the tensioner ratchet mechanism locks into place.



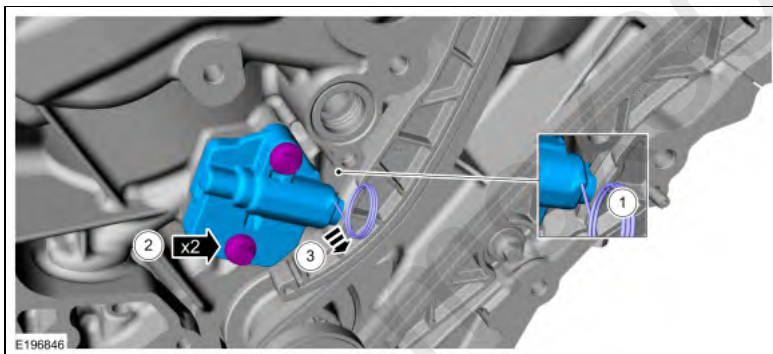
7. Slide the tensioner cylinder into the tensioner housing until it contacts the bottom of the bore. The shoulder of the tensioner cylinder will be flush with the top of the housing.



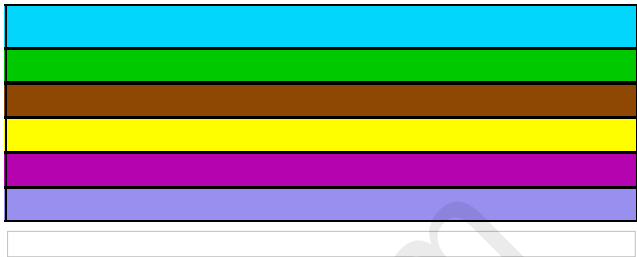
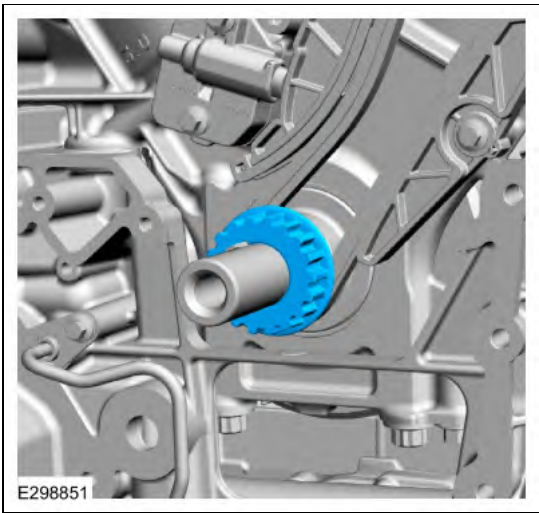
- 8.
1. Firmly press the tensioner cylinder into the tensioner housing until the shoulder of the tensioner cylinder is approximately 3 mm (0.125 in) below the top of the housing.
 2. Install a retaining pin into the hole in the housing to lock the tensioner cylinder in the retracted position.



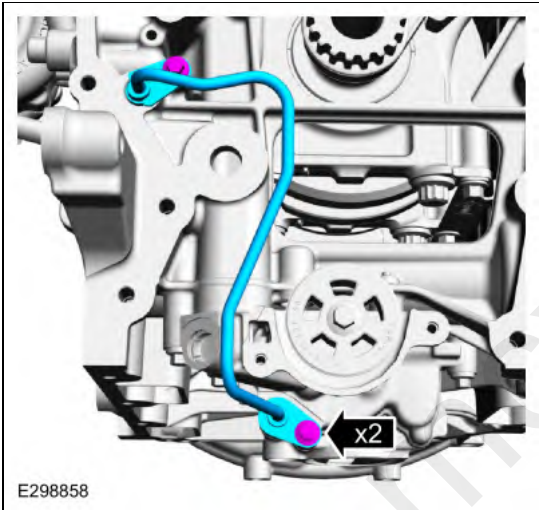
- 9.
1. Position the LH timing chain tensioner with the end of the tensioner correctly engaged to the tensioner arm.
 2. Install the bolts.
Torque: 89 lb.in (10 Nm)
 3. Remove the pin to allow the tensioner cylinder to extend and press against the timing chain tensioner arm.



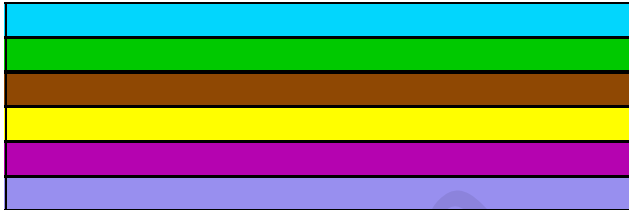
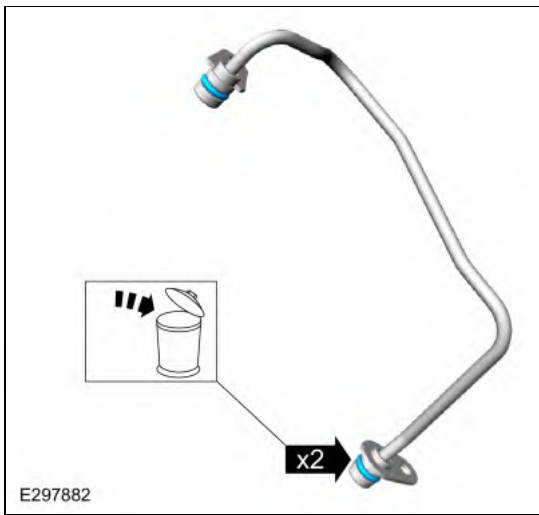
10. Install the crankshaft sprocket.



11. Remove the bolts and the oil pump return tube.

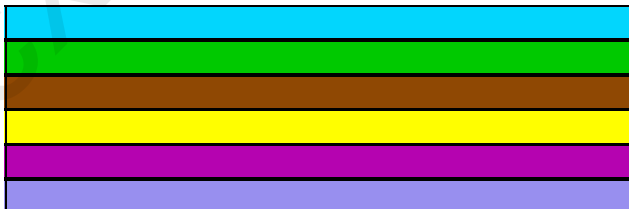
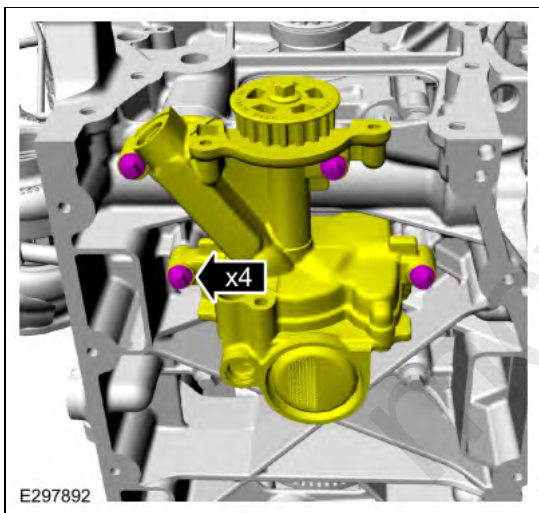


12. Remove and discard the O-ring seals.



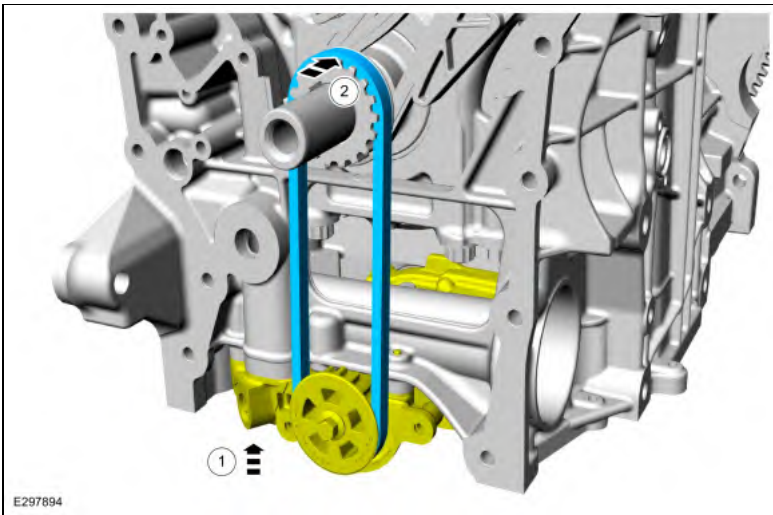
13. **NOTE:** Loosening the oil pump bolts will aid in the installation of the oil pump drive belt.

Loosen the oil pump bolts 5 turns.

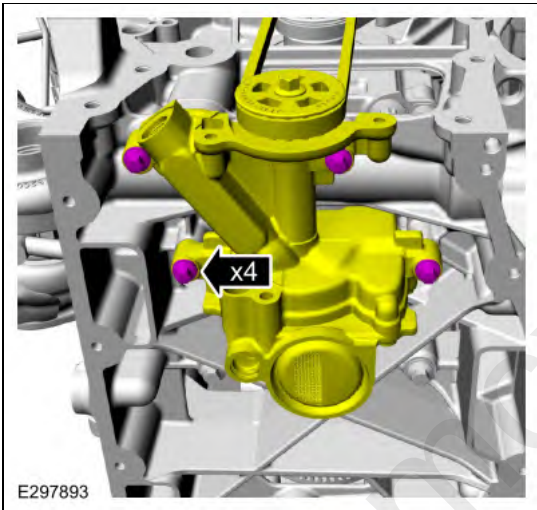


14.

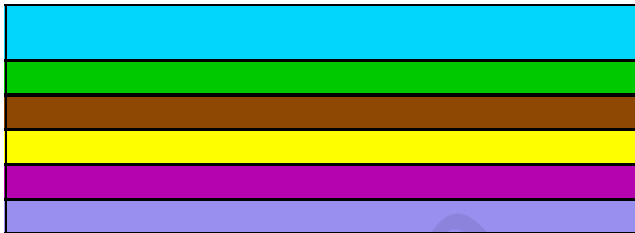
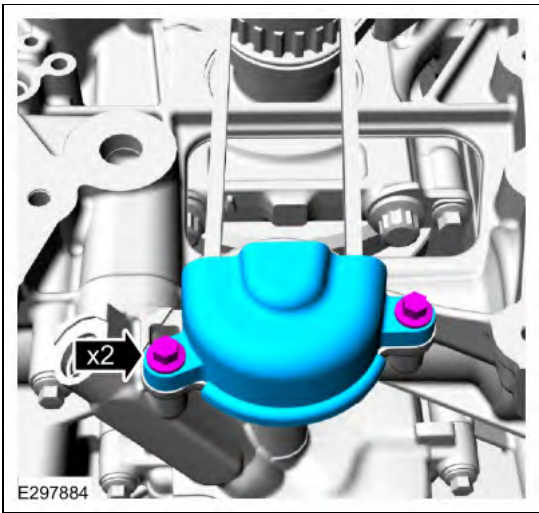
1. Position the oil pump drive belt onto the oil pump sprocket and raise the front of the oil pump.
2. Slide the oil pump drive belt onto the crankshaft sprocket.



15. Tighten the oil pump bolts.
Torque:
 Stage 1: 89 lb.in (10 Nm)
 Stage 2: 45°



16. Install the splash shield and the bolts.
Torque: 89 lb.in (10 Nm)

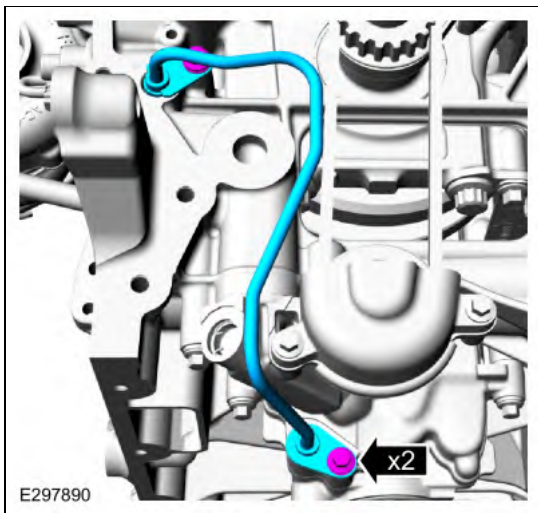


17.

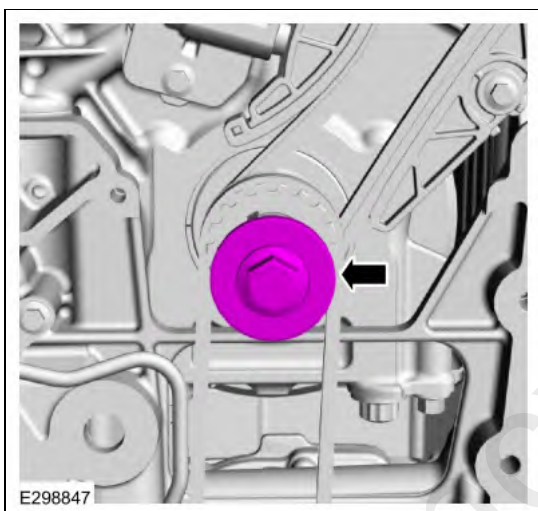
1. Install new O-ring seals.
2. Lubricate the O-ring seals with clean engine oil.



18. Install the oil pump return tube and the bolts.
Torque: 89 lb.in (10 Nm)

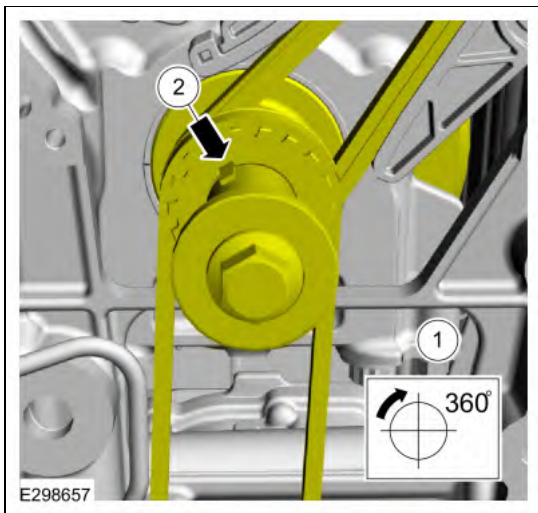


19. Install the original crankshaft pulley bolt.

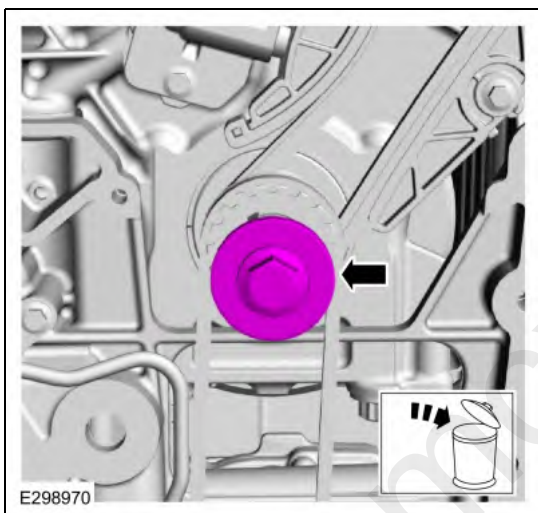


20. **NOTICE:** The crankshaft must be rotated clockwise one revolution (360 degrees). Failure to do so will result in incorrect camshaft timing.

1. Rotate the crankshaft clockwise one revolution (360 degrees).
2. Position the crankshaft sprocket keyway at the 11 o'clock position.

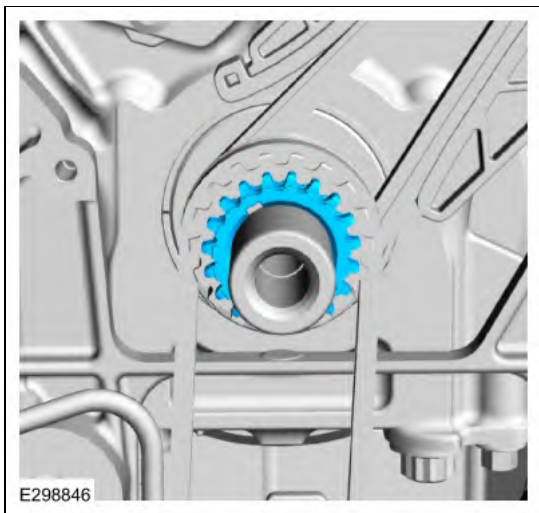


21. Remove and discard the original crankshaft pulley bolt.



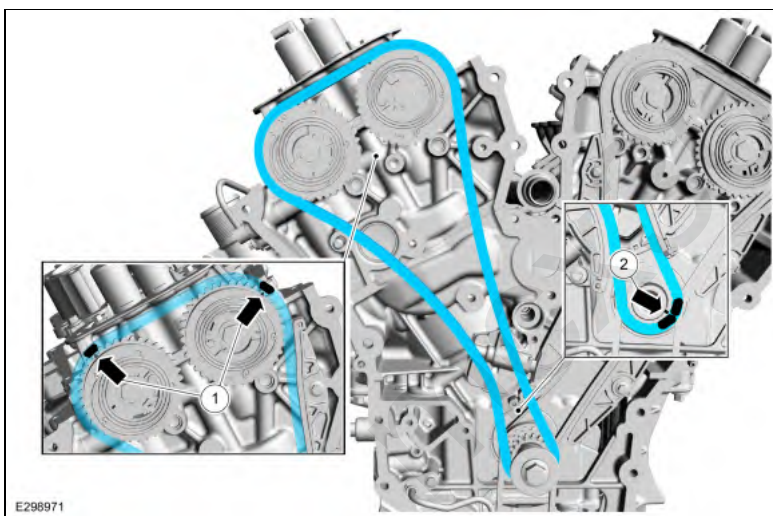
RH and LH timing chains

22. Install the timing chain sprocket.



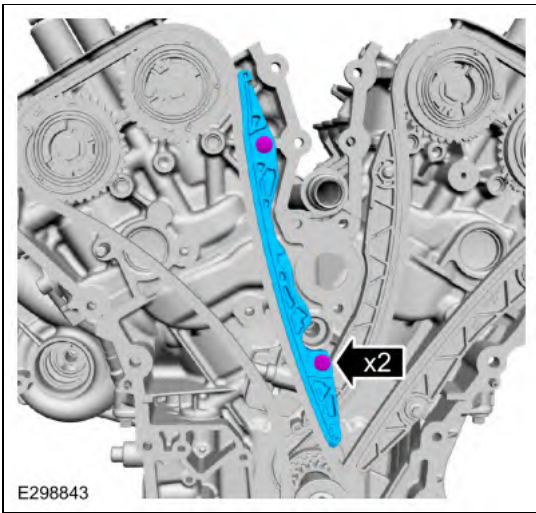
23. **NOTICE: The VCT units have 2 timing marks on them, a triangle and a circle. For removal and installation of the RH side the triangle marks are used.**

1. Install the RH timing chain with the single colored links aligned with the **triangle** timing marks on the VCT units.
2. Install the double colored links so they straddle the timing mark on the crankshaft sprocket.

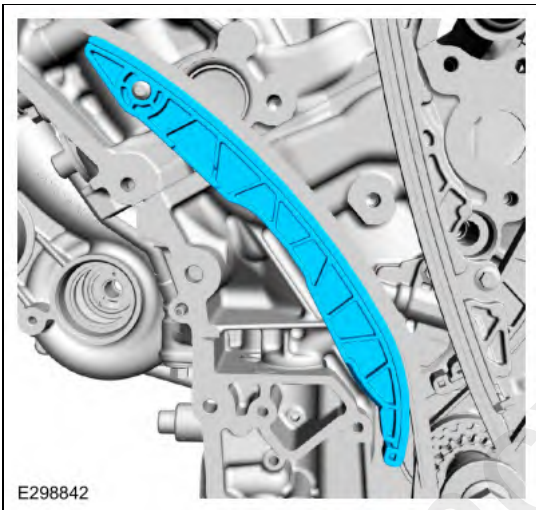


24. Install the RH timing chain guide and bolts.

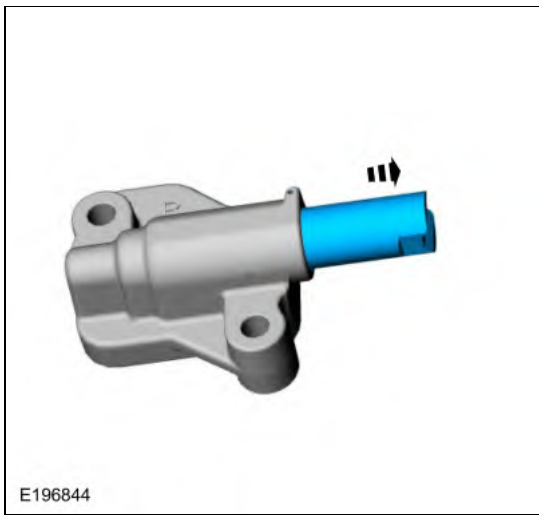
Torque: 89 lb.in (10 Nm)



25. Install the RH timing chain tensioner arm.



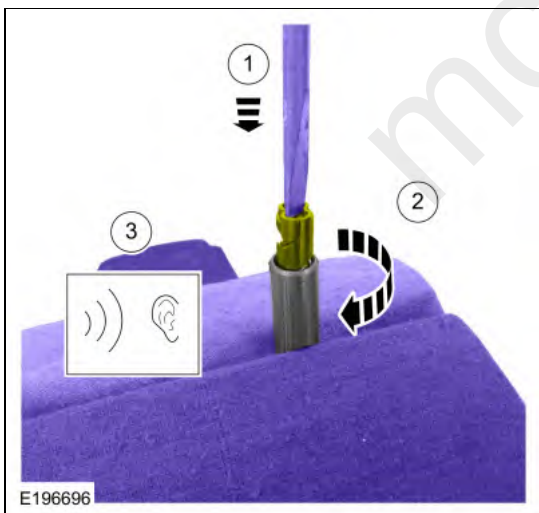
26. Slide the tensioner cylinder out of the RH timing chain tensioner housing.



27. **NOTICE:** Use vise jaw protectors or cover the jaws of the vise with clean shop towels to prevent damage to the surface of the tensioner ratchet mechanism.

Mount the flat machined surfaces on the end of the tensioner cylinder into a vise.

1. Using a flat-bladed screwdriver apply light downward pressure on the end of the tensioner ratchet mechanism.
Use the General Equipment: Vise
Use the General Equipment: Vise Jaw Protectors
Use the General Equipment: Flat-Bladed Screwdriver
2. Rotate the screwdriver clockwise approximately one turn.
3. An audible click will be heard when the tensioner ratchet mechanism locks into place.

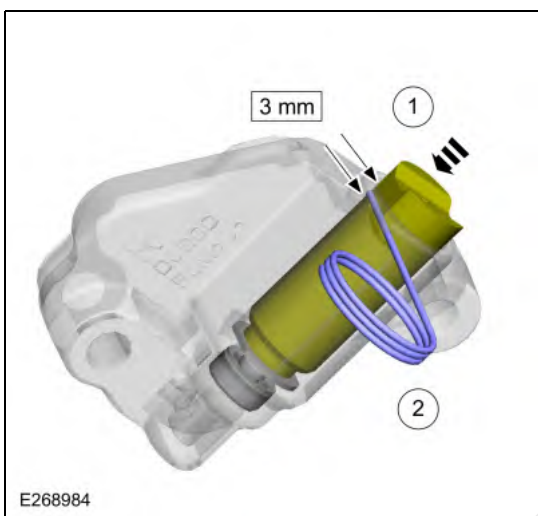


28. Slide the tensioner cylinder into the tensioner housing until it contacts the bottom of the bore. The shoulder of the tensioner cylinder will be flush with the top of the housing.



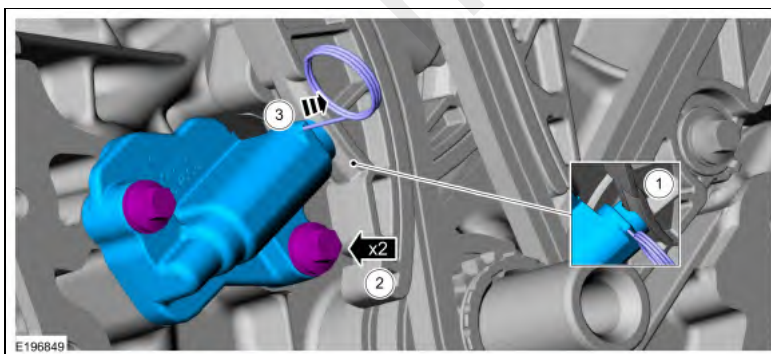
29.

1. Firmly press the tensioner cylinder into the tensioner housing until the shoulder of the tensioner cylinder is approximately 3 mm (0.125 in) below the top of the housing.
2. Install a retaining pin into the hole in the housing to lock the tensioner cylinder in the retracted position.



30.

1. Position the RH timing chain tensioner with the end of the tensioner correctly engaged to the tensioner arm.
2. Install the bolts.
Torque: 89 lb.in (10 Nm)
3. Remove the pin to allow the tensioner cylinder to extend and press against the timing chain tensioner arm.



31. Install the engine front cover.

mcx30.com

Timing Chain Tensioner

Removal and Installation

1. To ensure correct timing of the engine, follow the Timing Chain procedure to service the timing chain tensioners.
Refer to: Timing Chain (303-01B Engine - 3.0L EcoBoost, Removal and Installation).
-

mcx30.com

Vacuum Pump

Special Tool(s) / General Equipment

Plastic Scraper

Materials

Name	Specification
Motorcraft® High Performance Engine RTV Silicone TA-357	WSE-M4G323-A6
Motorcraft® Silicone Gasket Remover ZC-30-A	-
Motorcraft® Metal Surface Prep Wipes ZC-31-B	-
Motorcraft® Metal Brake Parts Cleaner PM-4-A, PM-4-B	-

Removal

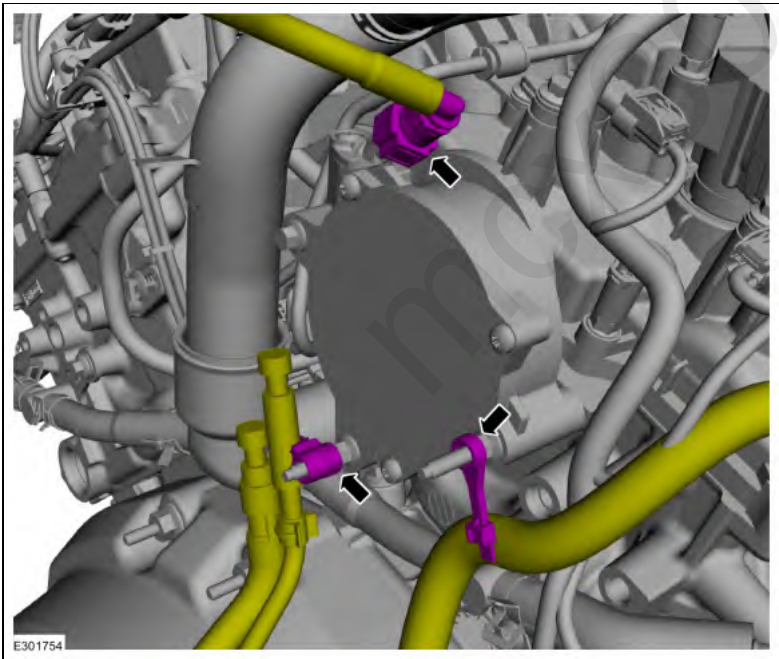
NOTICE: During engine repair procedures, cleanliness is extremely important. Any foreign material, including any material created while cleaning gasket surfaces, that enters the oil passages, coolant passages or the oil pan, can cause engine failure.

1. Remove the cowl panel.
Refer to: Cowl Panel (501-02 Front End Body Panels, Removal and Installation).
2.

1. Disconnect the vacuum tube quick connect coupling.
Refer to: Quick Release Coupling (310-00B) .

2. Detach the wiring harness retainer.

3. Detach the vent hose retainer.



3. Remove the fasteners and the vacuum pump.