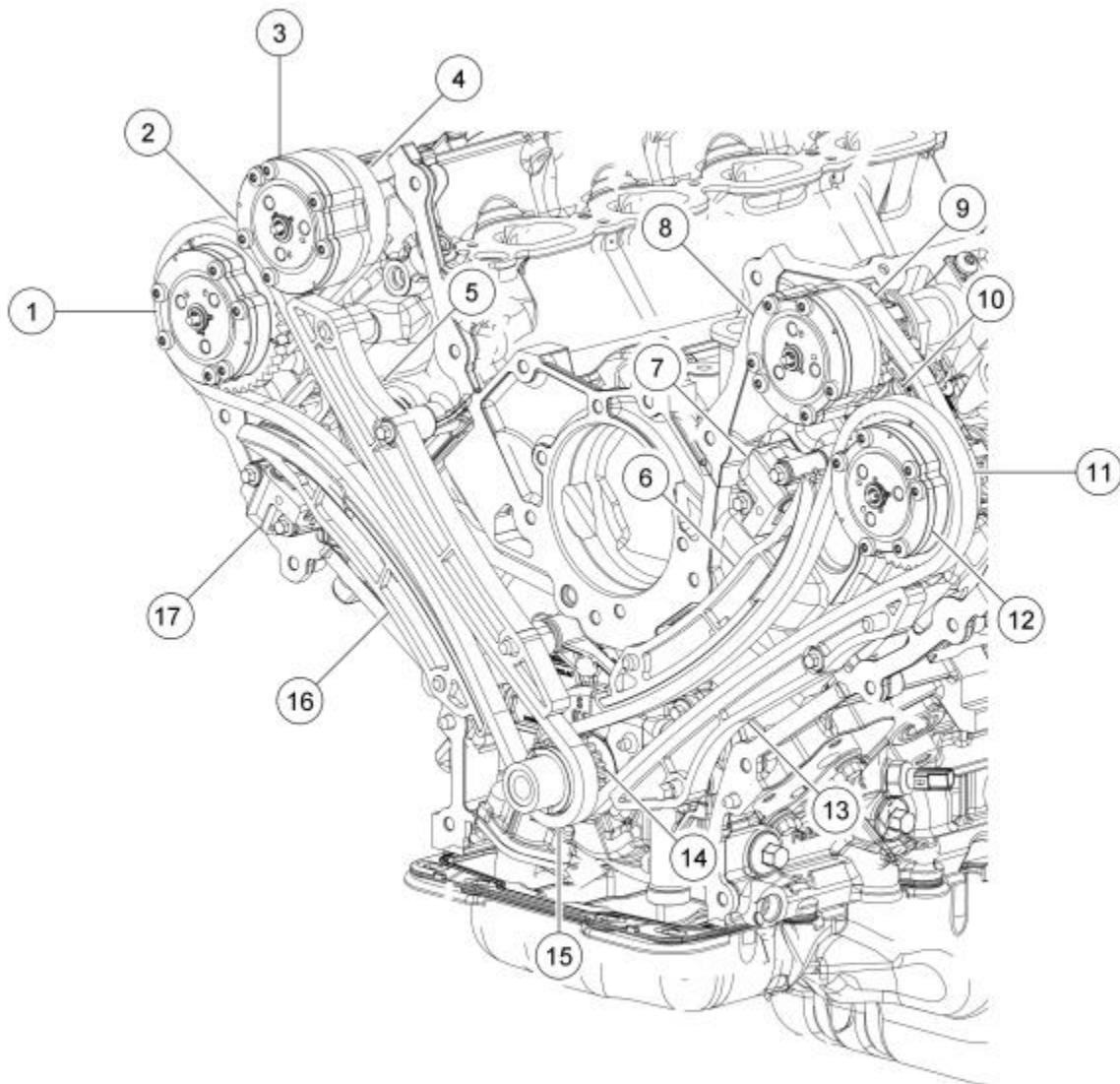


## Timing Drive Components

Special Tool(s)	
 <p>ST1335-A</p>	Holding Tool, Crankshaft 303-448 (T93P-6303-A)



N0115713

Item	Part Number	Description
1	6256	RH exhaust camshaft Variable Camshaft Timing (VCT)
2	6K254	RH secondary tensioner
3	6256	RH intake camshaft <u>VCT</u>
4	6268	RH secondary timing chain
5	6M256	RH timing chain guide

6	6K255	LH timing chain tensioner arm
7	6L266	LH primary tensioner
8	6256	LH intake camshaft <u>VCT</u>
9	6268	LH secondary timing chain
10	6K254	LH secondary tensioner
11	6268	LH primary timing chain
12	6256	LH exhaust camshaft <u>VCT</u>
13	6B274	LH timing chain guide
14	6306	Crankshaft sprocket
15	6268	RH timing chain
16	6K255	RH timing chain tensioner arm
17	6L266	RH primary tensioner

## 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.

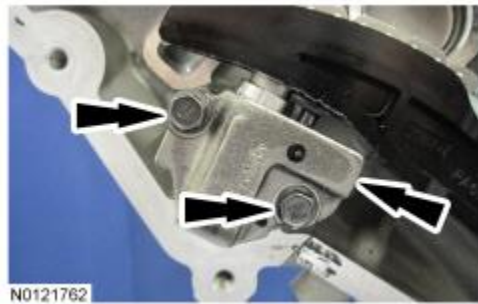
1. Remove the engine front cover. For additional information, refer to [Engine Front Cover](#) in this section.
2. Using the crankshaft holding tool, rotate the crankshaft clockwise until the keyway is at the 12 o'clock position.



3. Verify the data matrix on the camshafts is facing up, if not, rotate the crankshaft clockwise one revolution.



4. Remove the 2 bolts and the RH primary timing chain tensioner.



5. **NOTE:** It may be necessary to rotate the crankshaft slightly to provide enough slack in the chain to remove the RH timing chain tensioner arm. Return the crankshaft keyway to the 12 o'clock position after removing the RH timing chain tensioner arm.

Remove the RH timing chain tensioner arm.



6. **NOTE:** It may be necessary to rotate the crankshaft slightly to provide enough slack in the chain to remove the RH timing chain guide. Return the crankshaft keyway to the 12 o'clock position after removing the RH timing chain guide.

Remove the bolt and the RH timing chain guide.



7. Remove the RH primary timing chain.



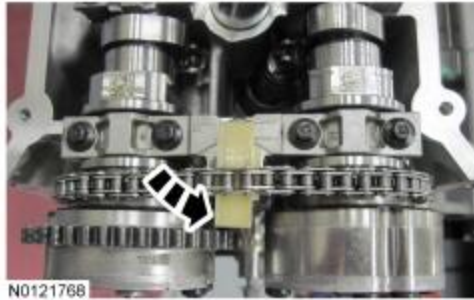
8. Remove the 3 RH intake Variable Camshaft Timing (VCT) assembly bolts and the 3 RH exhaust VCT assembly bolts.



9. Slide the RH VCT assemblies and secondary timing chain forward 2 mm (0.078 in).



10. Depress the RH secondary timing chain tensioner and turn the tensioner 90 degrees.



11. Remove the RH VCT assemblies and the RH secondary timing chain.

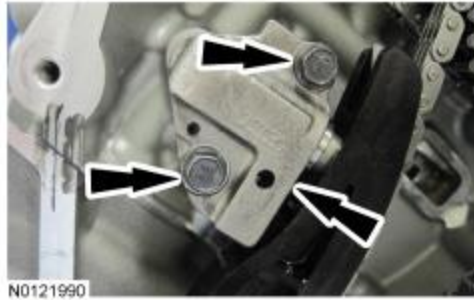


12. Using the crankshaft holding tool, rotate the crankshaft counterclockwise until the crankshaft keyway is at the 9 o'clock position.



13. **NOTICE: IF EITHER THE PRIMARY TENSIONER OR TIMING CHAIN TENSIONER ARM REQUIRE REPLACEMENT, BOTH THE PRIMARY TENSIONER AND TIMING CHAIN TENSIONER ARM MUST BE REPLACED. FAILURE TO REPLACE BOTH THE PRIMARY TENSIONER AND TIMING CHAIN TENSIONER ARM MAY RESULT IN OVERLOADING OF THE TIMING CHAIN AND UNDER CERTAIN CONDITIONS COULD LEAD TO TIMING CHAIN FAILURE.**

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



14. **NOTICE:** IF EITHER THE PRIMARY TENSIONER OR TIMING CHAIN TENSIONER ARM REQUIRE REPLACEMENT, BOTH THE PRIMARY TENSIONER AND TIMING CHAIN TENSIONER ARM MUST BE REPLACED. FAILURE TO REPLACE BOTH THE PRIMARY TENSIONER AND TIMING CHAIN TENSIONER ARM MAY RESULT IN OVERLOADING OF THE TIMING CHAIN AND UNDER CERTAIN CONDITIONS COULD LEAD TO TIMING CHAIN FAILURE.

**NOTE:** It may be necessary to rotate the crankshaft slightly to provide enough slack in the chain to remove the LH timing chain tensioner arm. Return the crankshaft keyway to the 9 o'clock position after removing the LH timing chain tensioner arm.

Remove the LH timing chain tensioner arm.



15. **NOTE:** It may be necessary to rotate the crankshaft slightly to provide enough slack in the chain to remove the LH timing chain guide. Return the crankshaft keyway to the 9 o'clock position after removing the LH timing chain guide.

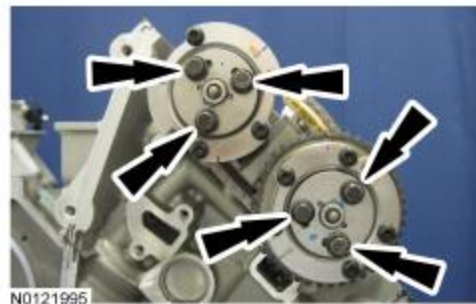
Remove the bolt and the LH timing chain guide.



16. Remove the LH primary timing chain.



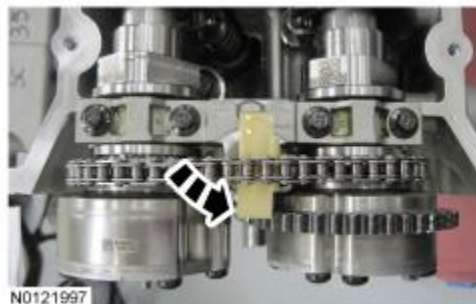
17. Remove the 3 LH intake Variable Camshaft Timing (VCT) assembly bolts and the 3 LH exhaust VCT assembly bolts.



18. Slide the LH VCT assemblies and secondary timing chain forward 2 mm (0.078 in).



19. Depress the LH secondary timing chain tensioner and turn the tensioner 90 degrees.





20. Remove the LH VCT assemblies and the LH secondary timing chain.



21. Remove the crankshaft sprocket.



## Installation

1. Install the crankshaft sprocket with the flange facing forward.



2. Install the secondary timing chain onto the LH VCT assemblies. Align the colored links on the secondary timing chain with the timing marks on the VCT assemblies as shown in the illustration.

1. The timing mark on the intake VCT assembly should align between the 2 consecutive colored links.
2. The timing mark on the exhaust VCT assembly should align with the single colored link.



N0122000

3. Install the LH VCT assemblies and the secondary timing chain onto the LH camshafts to a position 2 mm (0.078 in) from fully seated. The timing mark on the exhaust VCT assembly should be in the 11 o'clock position.



N0122011

4. **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.

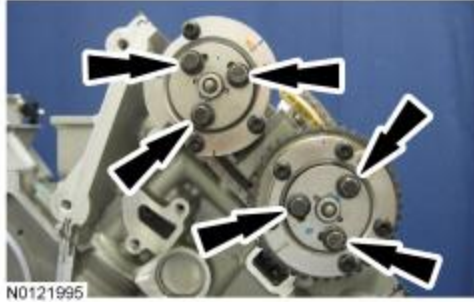


N0122017

5. **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.



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



7. Align the remaining colored link on the timing chain with the timing mark on the crankshaft sprocket.



8. **NOTE:** It may be necessary to rotate the crankshaft slightly to provide enough slack in the chain to install the LH timing chain guide. Return the crankshaft keyway to the 9 o'clock position after installing the LH timing chain guide.

Install the LH timing chain guide and bolt.

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



9. **NOTICE:** IF EITHER THE PRIMARY TENSIONER OR TIMING CHAIN TENSIONER ARM REQUIRE REPLACEMENT, BOTH THE PRIMARY TENSIONER AND TIMING CHAIN TENSIONER ARM MUST BE REPLACED. FAILURE TO REPLACE BOTH THE PRIMARY TENSIONER AND TIMING CHAIN TENSIONER ARM MAY RESULT IN OVERLOADING OF THE TIMING CHAIN AND UNDER CERTAIN CONDITIONS COULD LEAD TO TIMING CHAIN FAILURE.

**NOTE:** It may be necessary to rotate the crankshaft slightly to provide enough slack in the chain to install the LH timing chain tensioner arm. Return the crankshaft keyway to the 9 o'clock position after installing the LH timing chain tensioner arm.

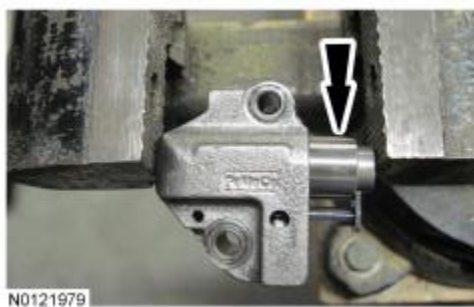
Install the LH timing chain tensioner arm.



**NOTE:** Complete the following 3 steps on both the LH and RH primary timing chain tensioners.

10. **NOTICE:** Do not compress the ratchet assembly or damage to the tensioner will occur.

Compress the primary timing chain tensioner plunger, using an edge of a vise.



11. Using a small screwdriver or pick, push back and hold the ratchet mechanism, then push the ratchet arm back into the tensioner housing.



12. Install a suitable pin into the hole of the tensioner housing to hold the ratchet assembly and plunger in place during installation.



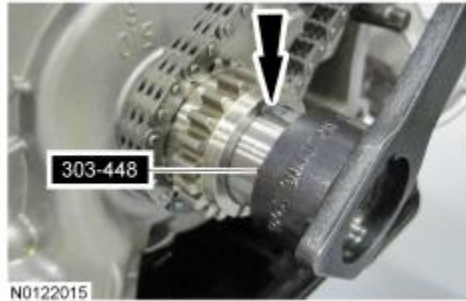
13. **NOTICE: IF EITHER THE PRIMARY TENSIONER OR TIMING CHAIN TENSIONER ARM REQUIRE REPLACEMENT, BOTH THE PRIMARY TENSIONER AND TIMING CHAIN TENSIONER ARM MUST BE REPLACED. FAILURE TO REPLACE BOTH THE PRIMARY TENSIONER AND TIMING CHAIN TENSIONER ARM MAY RESULT IN OVERLOADING OF THE TIMING CHAIN AND UNDER CERTAIN CONDITIONS COULD LEAD TO TIMING CHAIN FAILURE.**

Install the LH primary timing chain tensioner and 2 bolts.

- Tighten to 10 Nm (89 lb-in).
- Remove the holding pin from the tensioner.

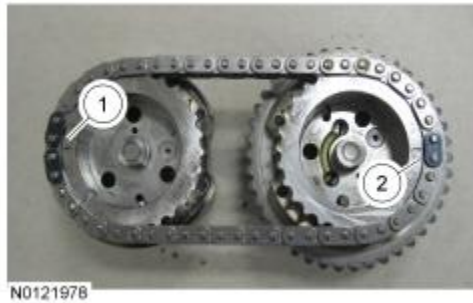


14. Using the crankshaft holding tool, rotate the crankshaft clockwise until the crankshaft keyway is at the 12 o'clock position.



15. Install the secondary timing chain onto the RH VCT assemblies. Align the colored links on the secondary timing chain with the timing marks on the VCT assemblies as shown in the illustration.

1. The timing mark on the intake VCT assembly should align between the 2 consecutive colored links.
2. The timing mark on the exhaust VCT assembly should align with the single colored link.



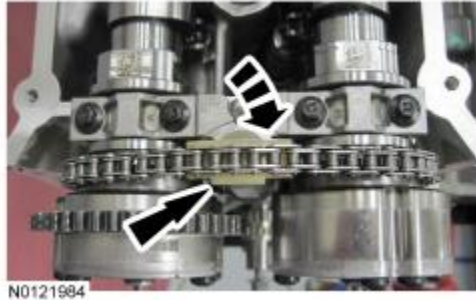
16. Install the RH VCT assemblies and the secondary timing chain onto the RH camshafts to a position 2 mm (0.078 in) from fully seated. The timing mark on the exhaust VCT assembly should be in the 1 o'clock position.



17. **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.



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

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

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



19. Install the RH primary timing chain.

- Align the colored link on the timing chain with the timing mark on the RH VCT assembly.



20. Align the remaining colored link on the timing chain with the timing mark on the crankshaft sprocket.



21. **NOTE:** It may be necessary to rotate the crankshaft slightly to provide enough slack in the chain to install the RH timing chain guide. Return the crankshaft keyway to the 12 o'clock position after installing the RH timing chain guide.

Install the RH timing chain guide and bolt.

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



22. **NOTICE: IF EITHER THE PRIMARY TENSIONER OR TIMING CHAIN TENSIONER ARM REQUIRE REPLACEMENT, BOTH THE PRIMARY TENSIONER AND TIMING CHAIN TENSIONER ARM MUST BE REPLACED. FAILURE TO REPLACE BOTH THE PRIMARY TENSIONER AND TIMING CHAIN TENSIONER ARM MAY RESULT IN OVERLOADING OF THE TIMING CHAIN AND UNDER CERTAIN CONDITIONS COULD LEAD TO TIMING CHAIN FAILURE.**

**NOTE:** It may be necessary to rotate the crankshaft slightly to provide enough slack in the chain to install the RH timing chain tensioner arm. Return the crankshaft keyway to the 12 o'clock position after installing the RH timing chain tensioner arm.

Install the RH timing chain tensioner arm.





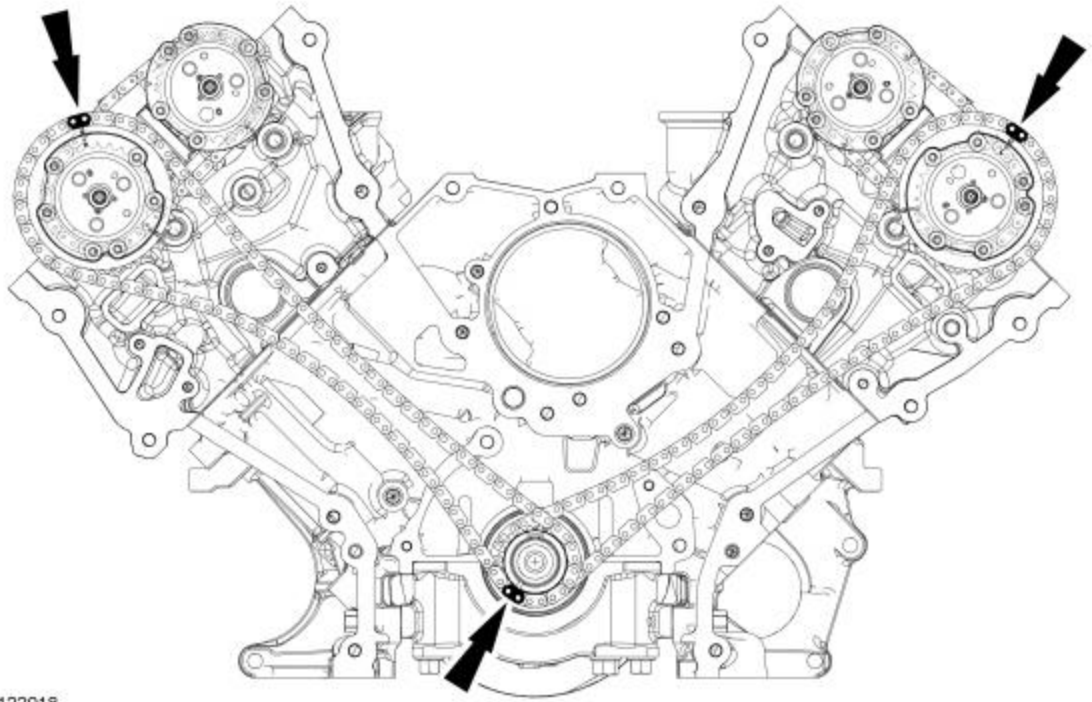
23. **NOTICE:** IF EITHER THE PRIMARY TENSIONER OR TIMING CHAIN TENSIONER ARM REQUIRE REPLACEMENT, BOTH THE PRIMARY TENSIONER AND TIMING CHAIN TENSIONER ARM MUST BE REPLACED. FAILURE TO REPLACE BOTH THE PRIMARY TENSIONER AND TIMING CHAIN TENSIONER ARM MAY RESULT IN OVERLOADING OF THE TIMING CHAIN AND UNDER CERTAIN CONDITIONS COULD LEAD TO TIMING CHAIN FAILURE.

Install the RH primary timing chain tensioner and 2 bolts.

- Tighten to 10 Nm (89 lb-in).
- Remove the holding pin from the tensioner.



24. With the crankshaft keyway still at the 12 o'clock position, verify the timing mark alignment is correct.



N0122018

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