

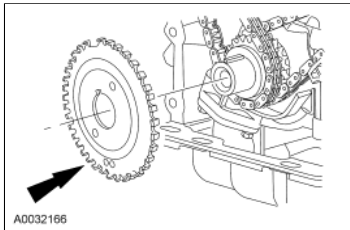
Timing Drive Components — Windsor Engine**Special Tool(s)**

<p>ST1335-A</p>	Crankshaft Holding Tool 303-448 (T93P-6303-A)
	Camshaft Holding Tool 303-557 (T96T-6256-B)
	Camshaft Positioning Tool 303-S568 (T96T-6256-AR)

Removal

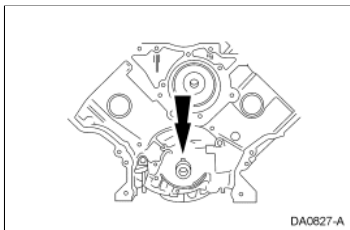
⚠ CAUTION: Since the engine is not free wheeling if the crankshaft (6303) or the camshafts (6250) are moved in any manner during removal and installation the crankshaft and camshafts must be resynchronized. These steps are located in Engine Assembly Steps 36 to 48.

1. Remove the engine front cover (6019); refer to [Engine Front Cover — 5.4L](#) in this section.
2. Remove the crankshaft sensor ring from the crankshaft.

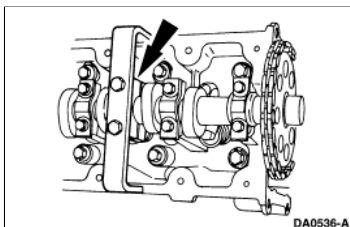


3. **⚠ CAUTION:** Unless otherwise instructed, at no time when the timing chains are removed and the cylinder heads are installed is the crankshaft or camshaft to be rotated. Severe piston and valve damage will occur.

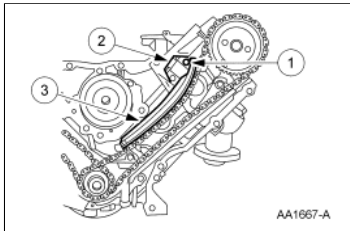
Position the crankshaft with the Crankshaft Holding Tool as shown.



4. Install and fully tighten the Camshaft Holding Tools on both camshafts.



5. Remove the timing chain tensing system from both timing chain/belts (6268).
 1. Remove the bolts.
 2. Remove the timing chain tensioners (6L266).
 3. Remove the timing chain tensioner arms (6L253).

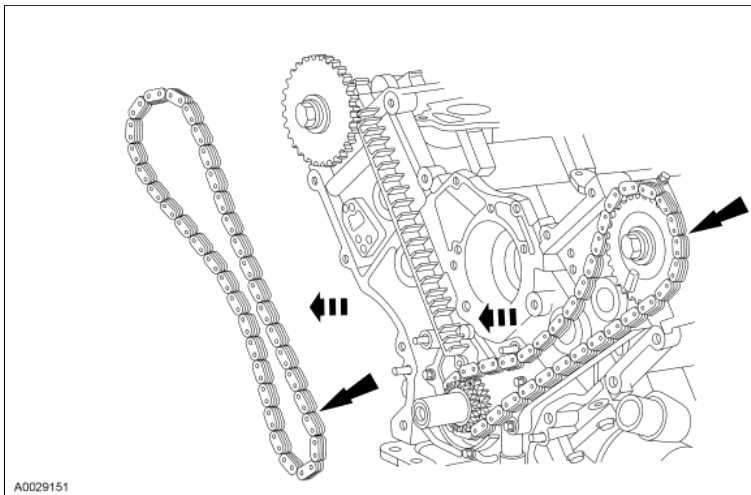


6. **CAUTION:** Unless otherwise instructed, at no time when the timing chains are removed and the cylinders heads are installed is the crankshaft or camshaft to be rotated. Severe piston and valve damage will occur.

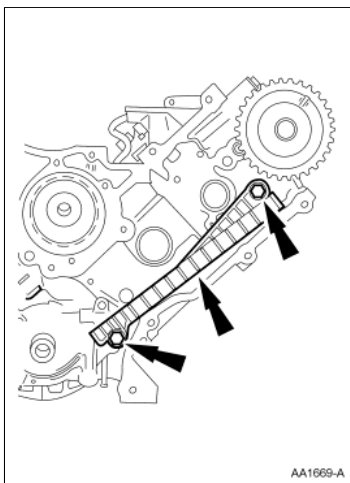
CAUTION: Do not remove the Camshaft Holding Tool.

Remove the LH and RH timing chains and the crankshaft sprockets (6306).

- Remove the Crankshaft Holding Tool.
- Remove the RH timing chain from the camshaft sprocket.
- Remove the RH timing chain and outer crankshaft sprocket from the crankshaft.
- Repeat for the LH timing chain and crankshaft sprocket.




7. Remove both timing chain guides (6K297).
 - Remove the bolts.
 - Remove both timing chain guides.

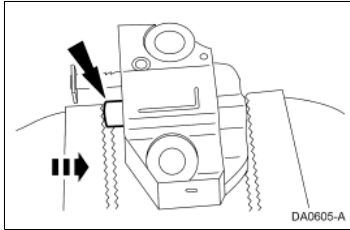


Installation

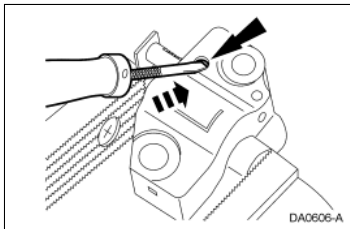
1.  **CAUTION:** Timing chain procedures must be followed exactly or damage to valves and pistons will result.

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

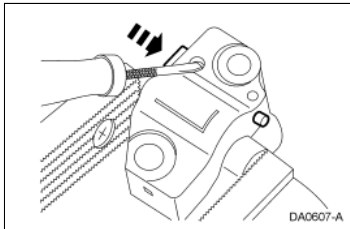
Compress the tensioner plunger, using an edge of a vise.



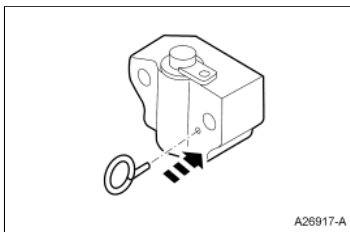
2. Using a small screwdriver or pick, push back and hold the ratchet mechanism.



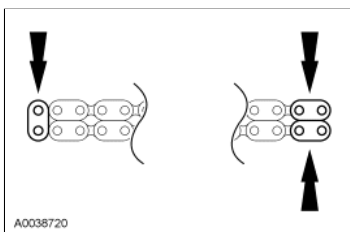
3. While holding the ratchet mechanism, push the ratchet arm back into the tensioner housing.



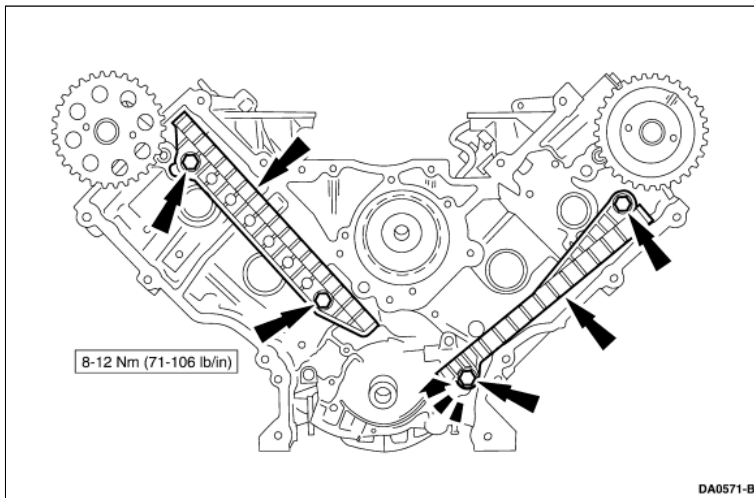
4. Install a paper clip into the hole in the tensioner housing to hold the ratchet assembly and plunger in during installation.



5. Remove the tensioner from the vise.
6. If the copper links are not visible, mark one link on one end and two links on the other end, and use as timing marks.



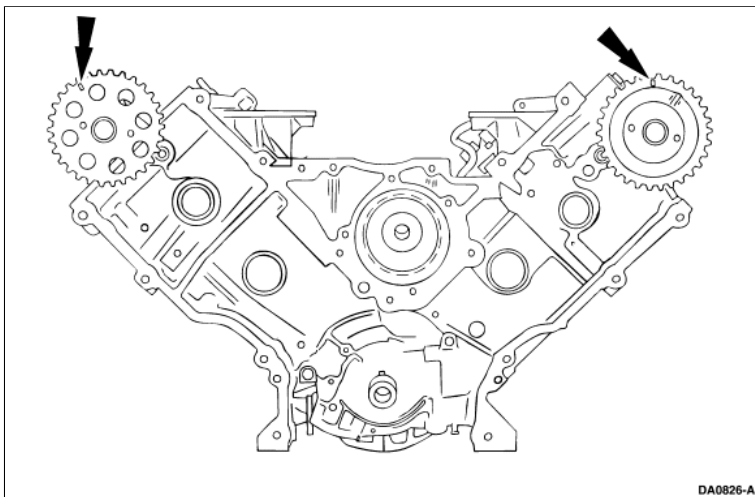
7. Install the timing chain guides.



8. **CAUTION:** Do not turn the engine over with the camshaft positioning tool or damage to the camshaft sprocket or the bolt may occur.

Install the Camshaft Positioning Tool.

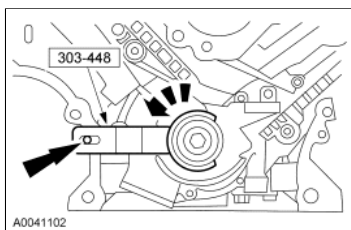
9. Slightly loosen the camshaft holding tools to allow slight camshaft movement. Rotate the LH camshaft with the Camshaft Positioning Tool until the timing mark is approximately at 12 o'clock. Rotate the RH camshaft with the Camshaft Positioning Tool until the timing mark is approximately at 11 o'clock. Tighten the Camshaft Holding Tools to maintain camshaft pre-positioning.



10. **CAUTION:** Unless otherwise instructed, at no time when the timing chain/belts are removed and the cylinder heads are installed is the crankshaft or camshaft to be rotated. Severe piston and valve damage will occur.

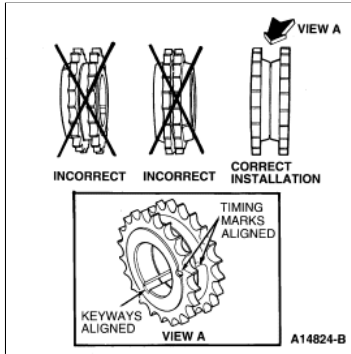
CAUTION: Rotate the crankshaft counterclockwise only. Do not rotate past position shown or severe piston and/or valve damage can occur.

Position the crankshaft with the Crankshaft Holding Tool.

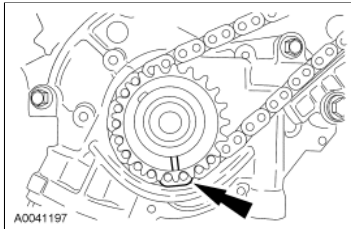


11. Remove the Crankshaft Holding Tool.
12. **NOTE:** Crankshaft sprockets are identical. They may only be installed one way. Refer to the following illustration for correct crankshaft sprocket installation.

If removed, install the LH and RH crankshaft sprockets.



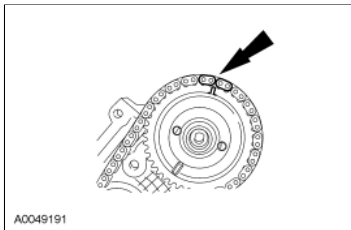
13. Install the LH timing chain onto the crankshaft sprocket, aligning the one copper (marked) link on the timing chain with the slot on the crankshaft sprocket.



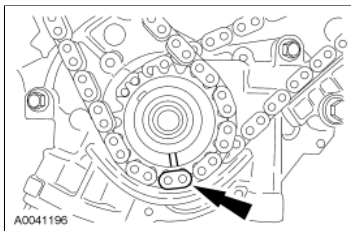
14. **NOTE:** Make sure the upper half of the timing chain is below the tensioner guide dowel.

NOTE: If necessary, adjust the camshaft sprocket slightly to obtain timing mark alignment

Position the LH timing chain on the camshaft sprocket with the two copper (marked) chain links and the camshaft sprocket timing mark aligned.

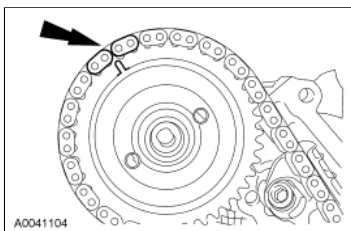


15. Position the RH (outer) timing chain on the crankshaft sprocket, aligning the copper (marked) link with the timing mark on the sprocket.

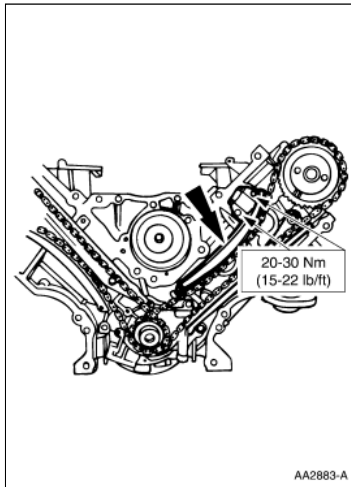


16. **NOTE:** If necessary, adjust the camshaft sprocket slightly to obtain timing mark alignment with the Camshaft Positioning Tool.

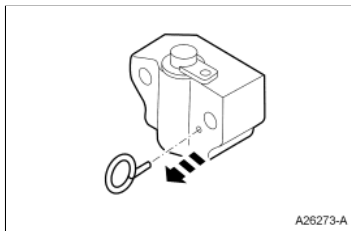
Position the RH timing chain/belt on the camshaft sprocket. Make sure the two copper-colored links align with the camshaft sprocket timing mark.



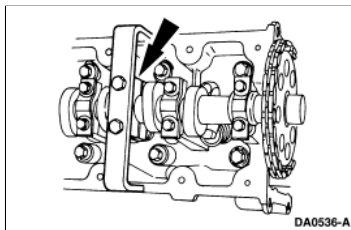
17. Position the LH and RH timing chain tensioner arms on the dowel pins. Position the timing chain tensioner assemblies, and install the bolts.



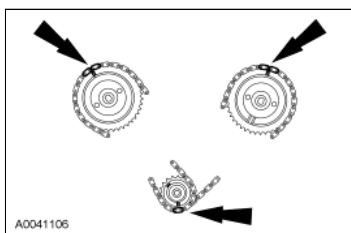
18. Remove the pins from the RH and LH timing chain tensioner assemblies.



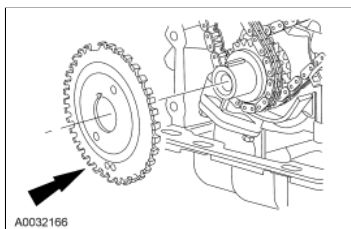
19. Remove the Camshaft Holding Tool.



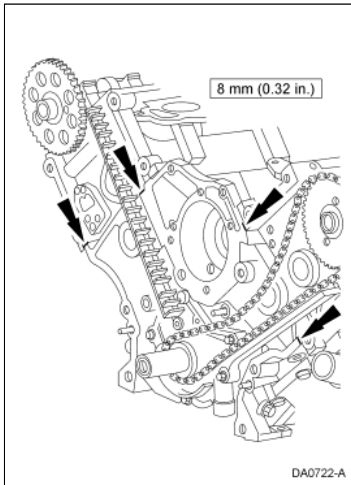
20. As a post-check, verify correct alignment of all timing marks.



21. Position the crankshaft sensor ring on the crankshaft.



22. Apply a bead of silicone along the head-to-block surface and the oil pan-to-block surface as specified.
- Use Silicone Gasket and Sealant F6AZ-19562-AA or equivalent meeting Ford specification WSE-M4G323-A6.



23. Install the engine front cover; refer to Engine Front Cover—5.4L in this section.
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