

Service and Repair

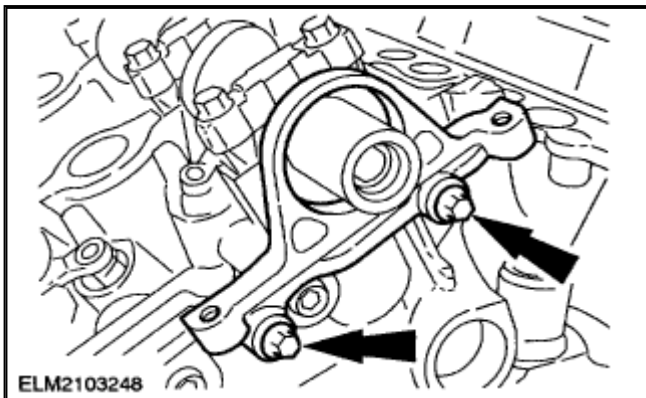
[Notes](#)

Material	
Material	
Engine oil	WSS-M2C153-H

[Zoom](#) [Sized for Print](#)

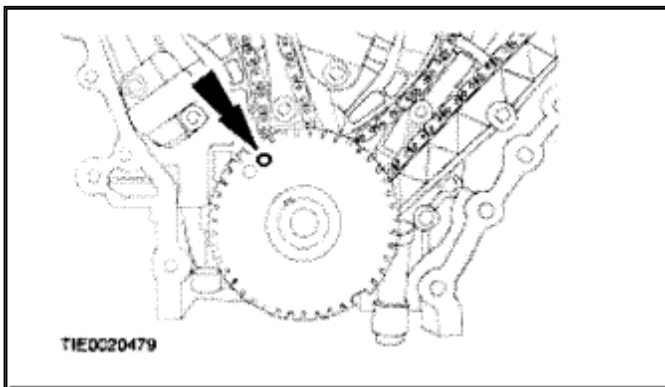
Timing chain

1. Remove and discard the [camshaft](#) seal.
2. Remove the [engine front cover](#).
3. Remove the lower intake manifold.
4. Remove the [camshaft oil seal](#) retainer.



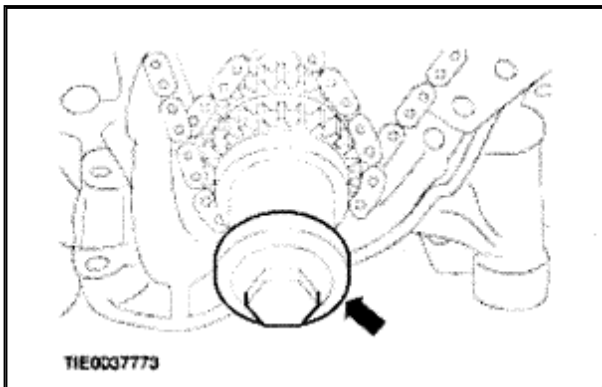
[Zoom](#) [Sized for Print](#)

5. **CAUTION:** This pulse wheel has two keyway slots and is used in several different engines. Install the pulse wheel in the keyway slot stamped 25, color coded blue. Remove the crankshaft position (CKP) sensor pulse wheel



[Zoom](#) [Sized for Print](#)

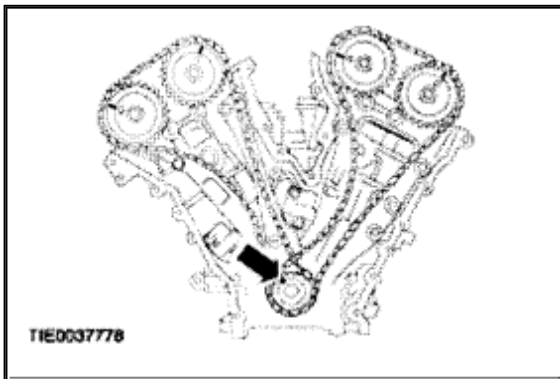
6. Install the crankshaft pulley retaining bolt and washer.



Zoom

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7. Rotate the [crankshaft](#) in a clockwise direction to position [number one cylinder](#) at top dead center (TDC) with the crankshaft keyway at the 11 o'clock position. If the camshafts are not positioned as shown, rotate the [crankshaft](#) one complete revolution.

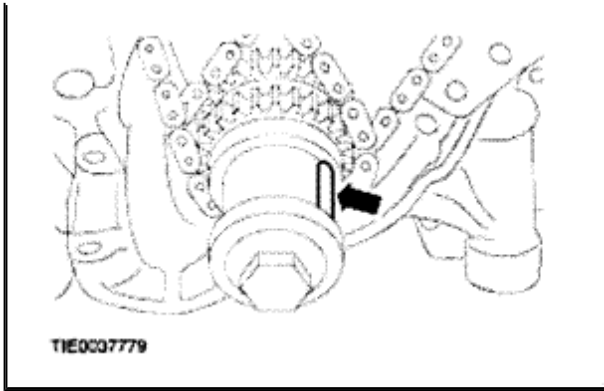


Zoom

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8. Rotate the [crankshaft](#) clockwise to position the crankshaft keyway in the 3 o'clock position.
 - The RH camshafts are in the neutral position.

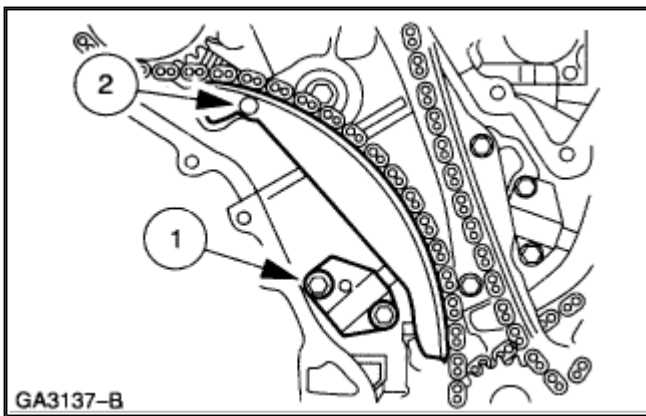




Zoom

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9. **NOTE:** Mark the position of all chain drive components to be sure they are assembled in their original positions. Remove the right-hand [timing chain tensioner](#) and timing chain tensioner arm. -Remove the bolts. -Remove the [timing chain tensioner](#). -Remove the [timing chain tensioner](#) arm.

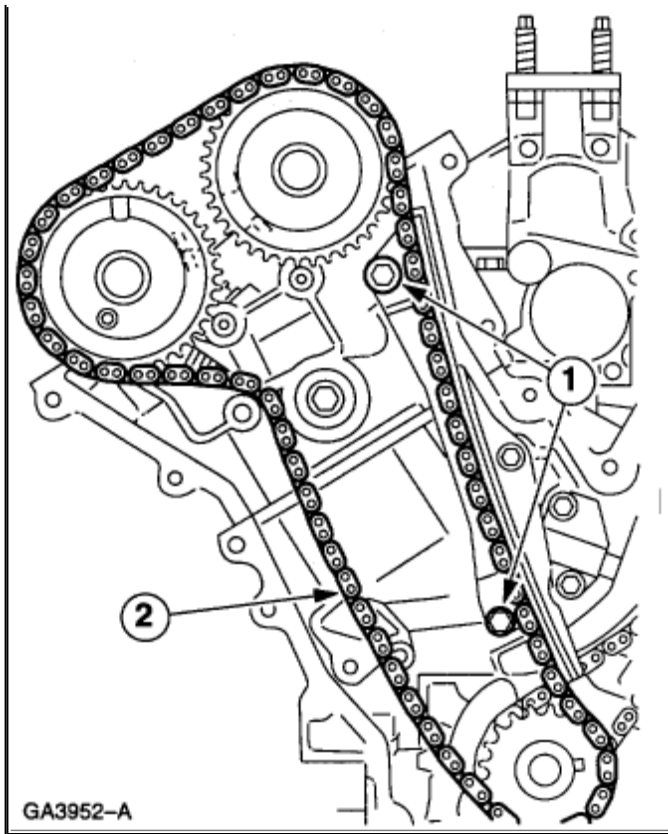


Zoom

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10. Remove the RH timing chain. -Remove the [timing chain guide](#). -Remove the RH timing chain.

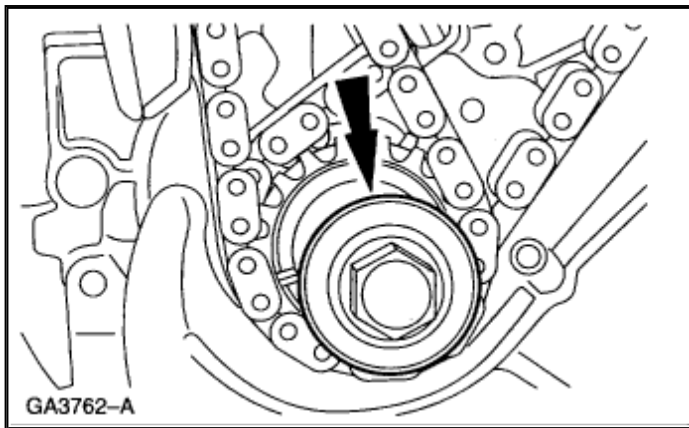




Zoom

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11. Rotate the [crankshaft](#) in a clockwise direction approximately 60 degrees and position the crankshaft keyway at the 11 o'clock position.

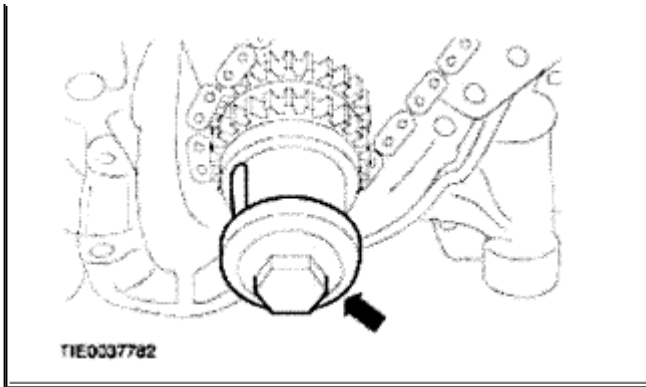


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12. Remove the crankshaft pulley retaining bolt and washer.

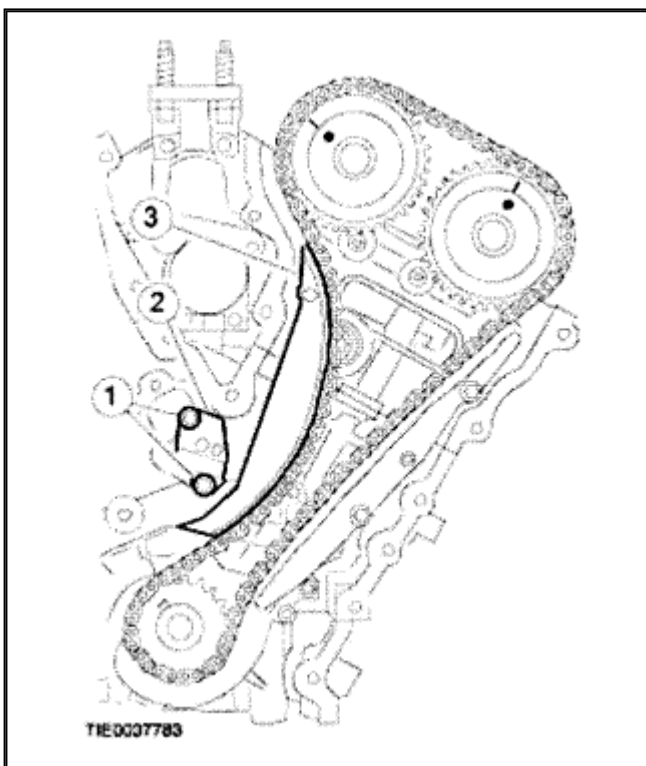




Zoom

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13. **NOTE:** Mark the position of all [timing chain tensioner](#) components to make sure they are assembled in their original positions. Remove the left-hand [timing chain tensioner](#) and timing chain tensioner arm. -Remove the bolts. -Remove the [timing chain tensioner](#). -Remove the [timing chain tensioner](#) arm.



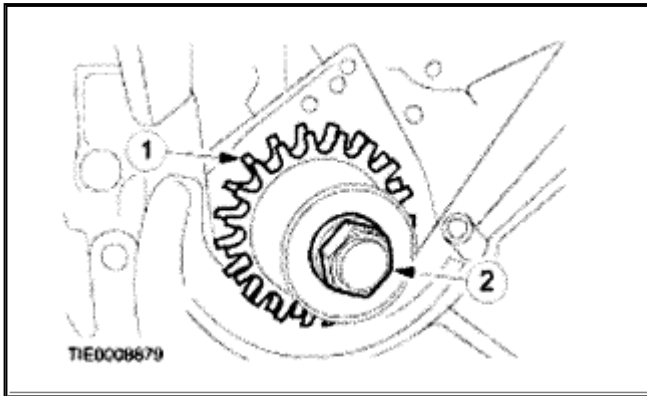
Zoom

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14. Remove the left-hand timing chain. -Remove the left-hand [timing chain guide](#). -
Remove the left-hand timing chain.
15. Remove the timing chain sprockets.

Installation

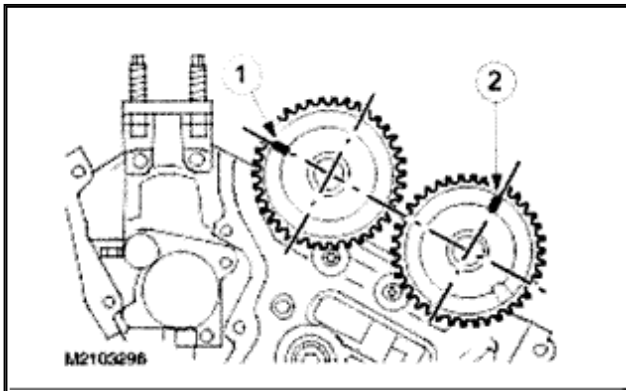
1. Install the timing chain sprockets, crankshaft pulley washer and bolt. -Install the sprockets. -Install the washer and bolt.



Zoom

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2. Position the left-hand camshafts as shown. -The mark on the intake [camshaft](#) at the 9 o'clock position. -The mark on the exhaust [camshaft](#) at the 12 o'clock position.

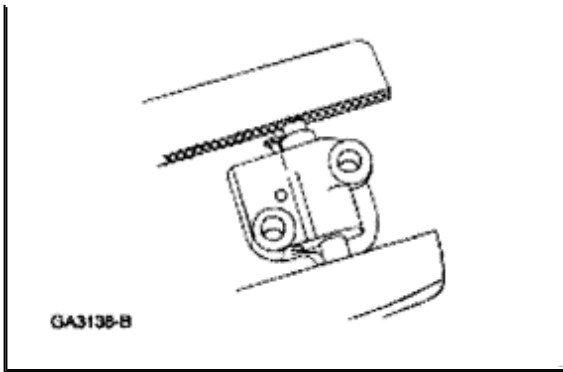


Zoom

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3. Remove the crankshaft pulley retaining bolt and washer.
4. **CAUTION:** Make sure vise jaw protectors are used. Loosely mount the left-hand [timing chain tensioner](#) in a vise.

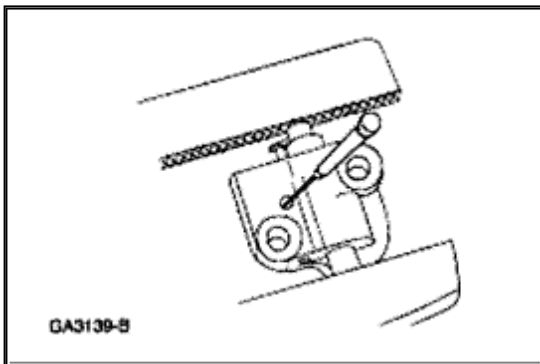




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5. **CAUTION:** During tensioner compression, do not release the ratchet stem until the tensioner [piston](#) is fully retracted into its bore or damage to the ratchet stem will result. Using a suitable pin, release the the left-hand [timing chain tensioner piston](#).

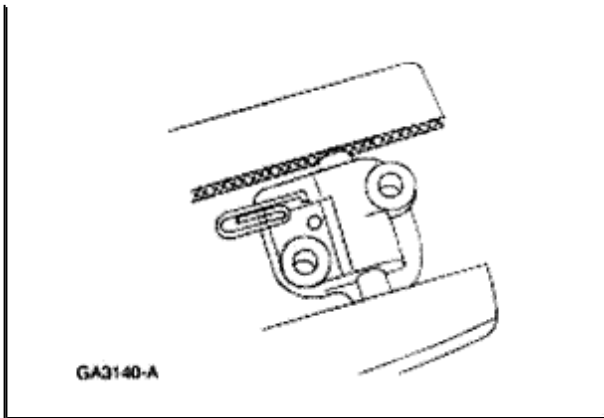


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6. **NOTE:** The [piston](#) should retract with minimal force. If binding occurs, reposition the tensioner in the vise to eliminate side loading. Slowly compress the left-hand [timing chain tensioner](#), by tightening the vise.
7. **NOTE:** The retaining wire or paper clip must remain in position until the [timing chain tensioner](#) has been installed. Using suitable 1.5 mm diameter wire or a paper clip, lock the left-hand [timing chain tensioner piston](#) in position.

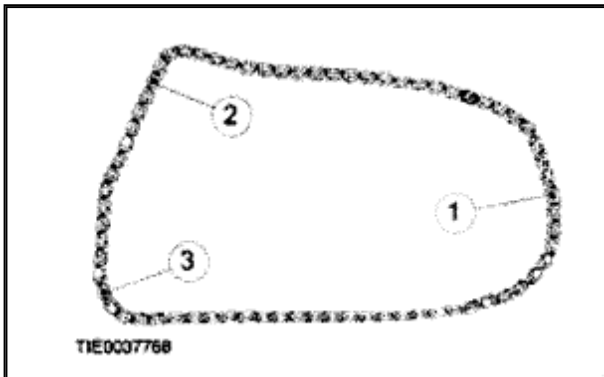




Zoom

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8. If the timing marks on the timing chain are not evident, use a permanent marker to mark the [crankshaft](#) and [camshaft](#) timing marks on the left-hand timing chain. -Mark any link to use as the [crankshaft](#) timing mark. -Count 29 links from the [crankshaft](#) timing mark and mark this link. -Continue counting to link 42 and mark this link.

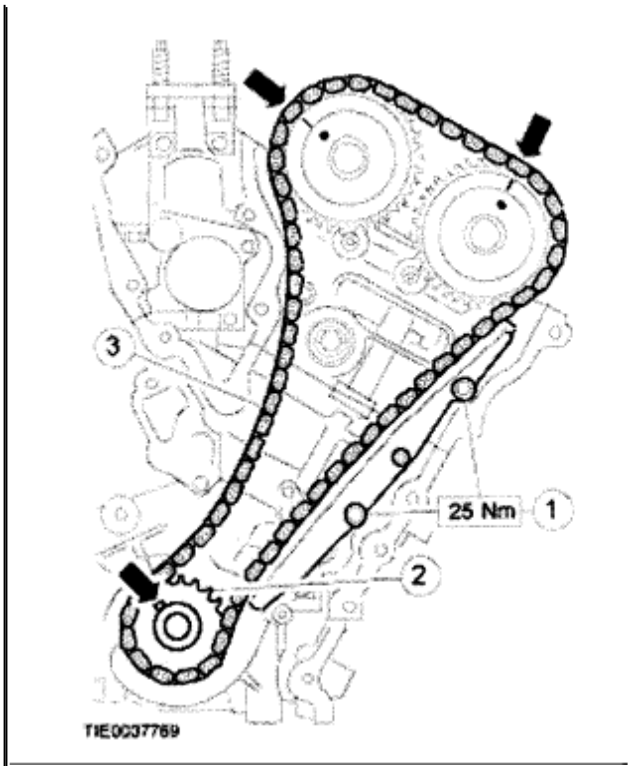


Zoom

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9. **NOTE:** Install the crankshaft sprockets with the timing marks facing outwards. **NOTE:** Align the marks on the timing chain with the marks on the [camshaft](#) and crankshaft sprockets. Install the left-hand timing chain. -Install the left-hand [timing chain guide](#). -Install the crankshaft sprockets. -Install the left-hand timing chain.

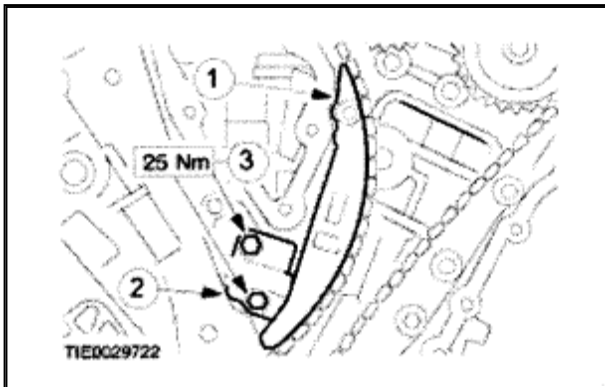




Zoom

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10. Install the left-hand [timing chain tensioner](#). -Install the left-hand [timing chain tensioner](#) arm. -Position the [timing chain tensioner](#). -Install the bolts.

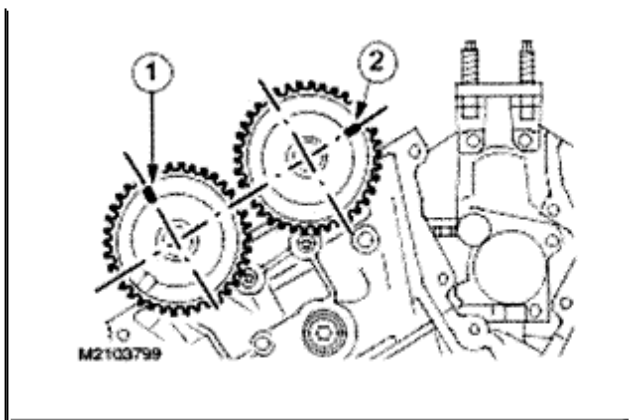


Zoom

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11. Remove the left-hand [timing chain tensioner piston](#) retaining wire.
12. Position the right-hand camshafts as shown. -The mark on the exhaust [camshaft](#) at the 12 o'clock position. -The mark on the intake [camshaft](#) at the 3 o'clock position.

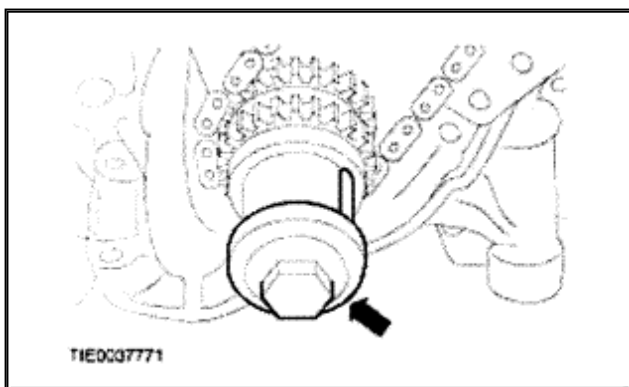




Zoom

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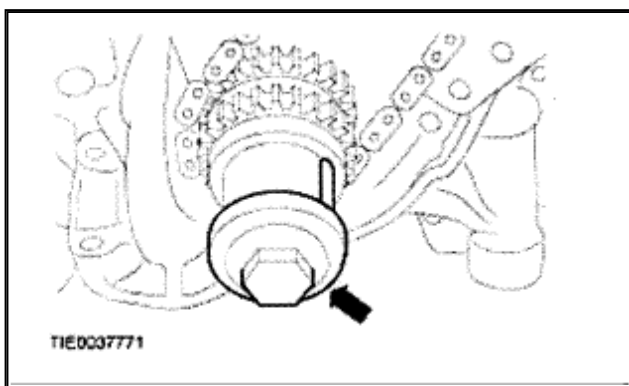
13. Install the crankshaft pulley retaining bolt and washer. -Rotate the [crankshaft](#) in a clockwise direction to position the keyway at the 3 o'clock position.



Zoom

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14. Remove the crankshaft pulley retaining bolt and washer.

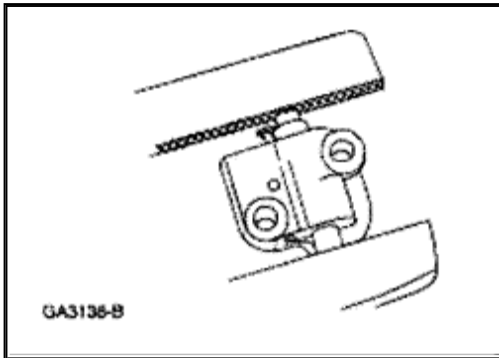


Zoom

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15. **CAUTION** : Make sure vise jaw protectors are used. Loosely mount the

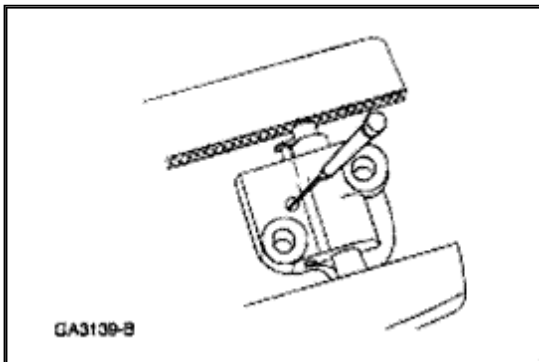
right-hand [timing chain tensioner](#) in a vise.



Zoom

Sized for Print

16. **CAUTION:** During tensioner compression, do not release the ratchet stem until the tensioner [piston](#) is fully retracted into its bore or damage to the ratchet stem will result. Using a suitable pin, release the the right-hand [timing chain tensioner piston](#).

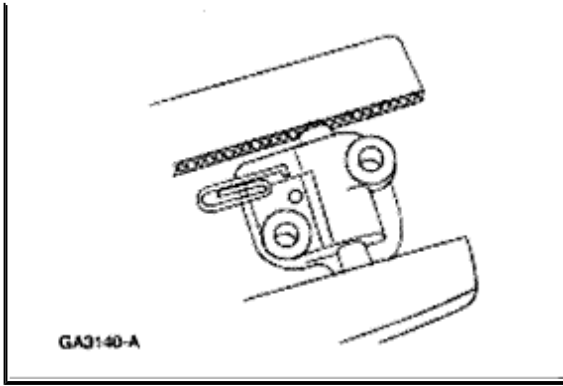


Zoom

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17. **NOTE:** The [piston](#) should retract with minimal force. If binding occurs, reposition the tensioner in the vise to eliminate side loading. Slowly compress the right-hand [timing chain tensioner](#), by tightening the vise.
18. **NOTE:** The retaining wire or paper clip must remain in position until the [timing chain tensioner](#) has been installed. Using suitable 1.5 mm diameter wire or a paper clip, lock the left-hand [timing chain tensioner piston](#) in position.

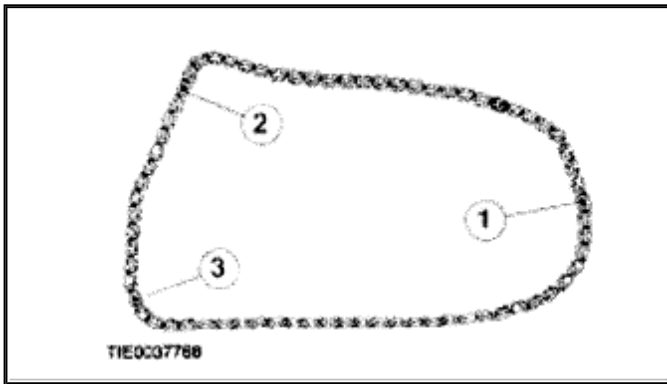




Zoom

Sized for Print

19. If the timing marks on the timing chain are not evident, use a permanent marker to mark the [crankshaft](#) and [camshaft](#) timing marks on the right-hand timing chain. -Mark any link to use as the [crankshaft](#) timing mark. -Count 29 links from the [crankshaft](#) timing mark and mark this link. -Continue counting to link 42 and mark this link.

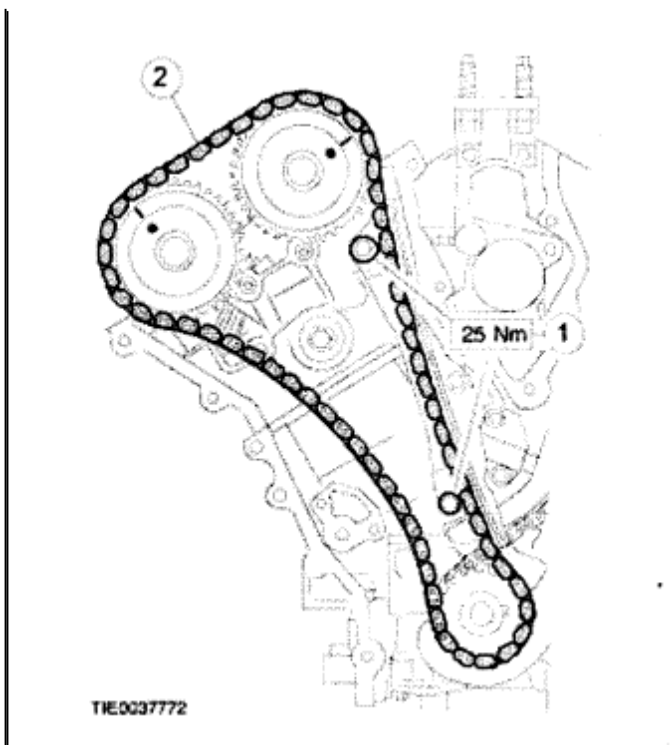


Zoom

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20. **NOTE:** Align the marks on the timing chain with the marks on the [camshaft](#) and crankshaft sprockets. Install the right-hand timing chain. -Install the right-hand [timing chain guide](#). -Install the right-hand timing chain.

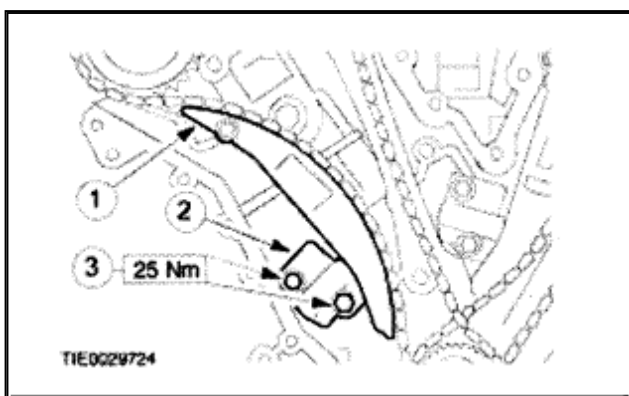




Zoom

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21. Install the right-hand [timing chain tensioner](#). -Install the right-hand [timing chain tensioner arm](#). -Position the [timing chain tensioner](#). -Install the bolts.

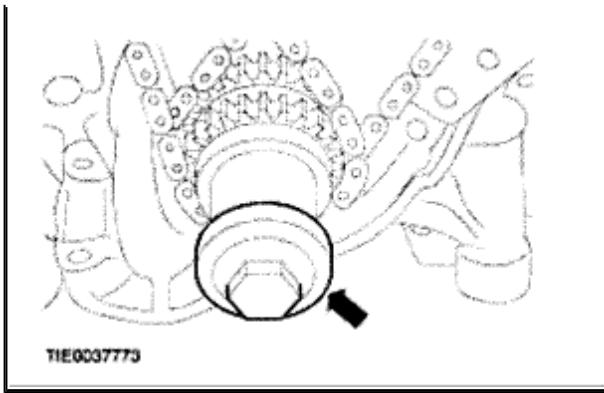


Zoom

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22. Remove the right-hand [timing chain tensioner piston](#) retaining wire.
23. Install the crankshaft pulley retaining bolt and washer.

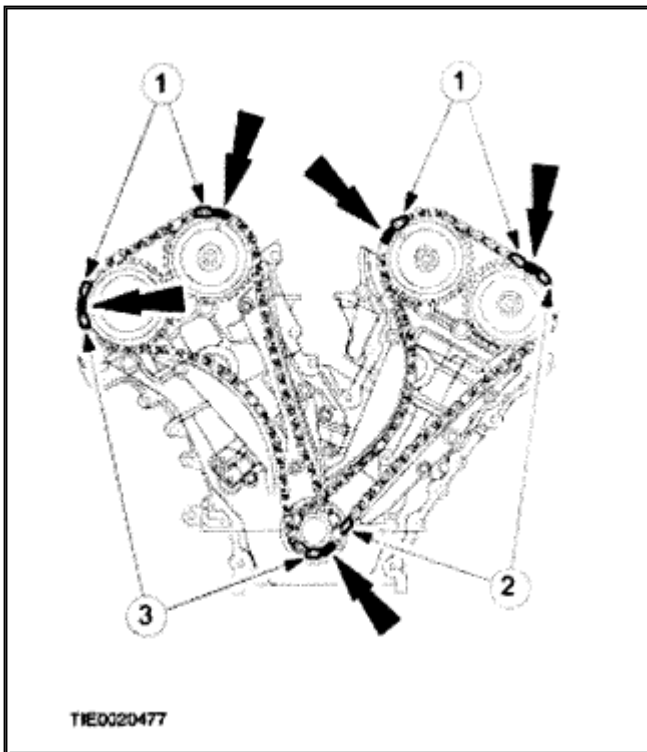




Zoom

Sized for Print

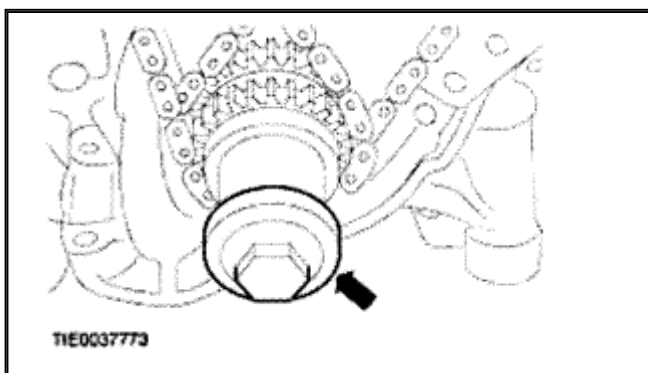
24. **NOTE:** Ignore the timing flags on the rear of the camshaft sprockets. **NOTE:** Check the number of timing chain links between the [camshaft](#) front timing marks and between the camshaft front timing marks and timing marks on the crankshaft sprockets. Rotate the [crankshaft](#) approximately 120 degrees in a counterclockwise direction and check the timing. -There should be 12 chain links between the [camshaft](#) timing marks. -There should be 27 chain links between the [camshaft](#) and [crankshaft](#) timing marks. -There should be 30 chain links between the [camshaft](#) and [crankshaft](#) timing marks.



Zoom

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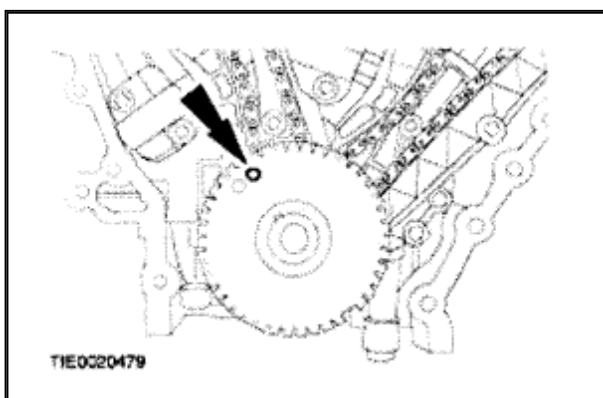
25. Remove the crankshaft pulley retaining bolt and washer.



Zoom

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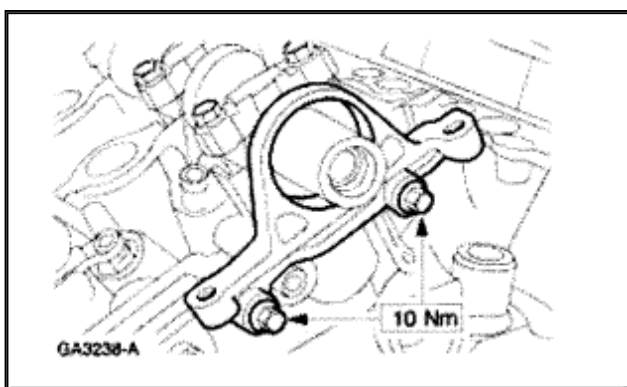
26. **CAUTION:** This pulse wheel has two keyway slots and is used in several different engines. Install the pulse wheel with the keyway in the slot stamped 2.5, color coded blue.



Zoom

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27. Install the [camshaft oil seal](#) retainer.



Zoom

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28. Install a new [camshaft](#) seal.

29. Install the lower intake manifold.
30. Install the [engine front cover](#).