

TIMING BELT REPLACEMENT

Tools Required

- *J 42069* Timing Belt Alignment Kit. See Special Tools and Equipment .
- *J 42098* Crank Hub TORX(R) Socket. See Special Tools and Equipment .

Removal Procedure

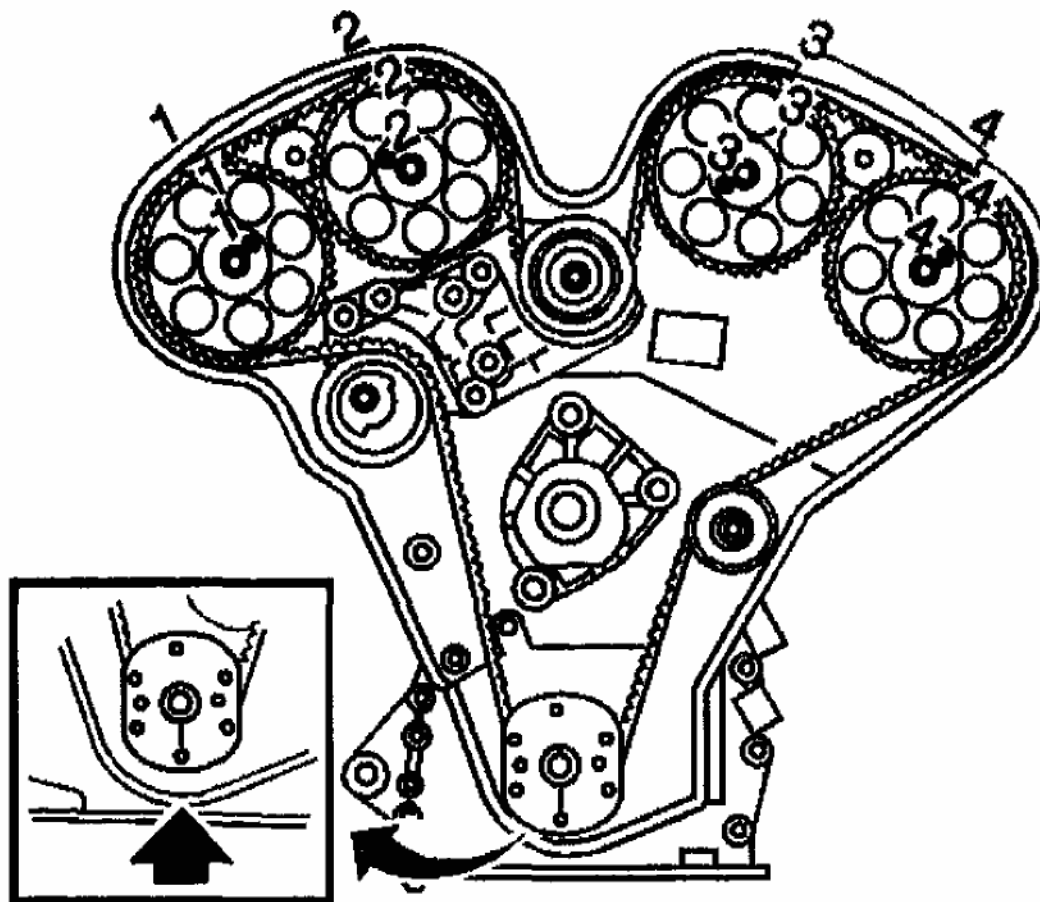
NOTE: **Failure to follow the described timing belt inspection and maintenance may result in a broken timing belt and cause severe engine damage.**

1. Inspect the cold start counter-also called a heavy duty register- with a scan tool. If there are any cold starts below -28°C (-20°F) visually inspect the timing belt for cracks. If cracks are noted, do not reuse the belt. Replace the belt and clear the cold start counter.

If the belt is okay, and is reused, do not clear the cold start counter.

2. Remove the timing belt cover. Refer to TIMING BELT COVER REPLACEMENT .
3. Remove the crankshaft balancer. Refer to CRANKSHAFT BALANCER REPLACEMENT .
4. Rotate the crankshaft in the engine rotational direction, clockwise using the *J 42098* until the #1 cylinder is at Top Dead Center (TDC) on the compression stroke.

The reference marks on the camshaft gears should be aligned with the corresponding notches on the rear timing belt cover, as well as the mark on the crankshaft sprocket and oil pump housing.

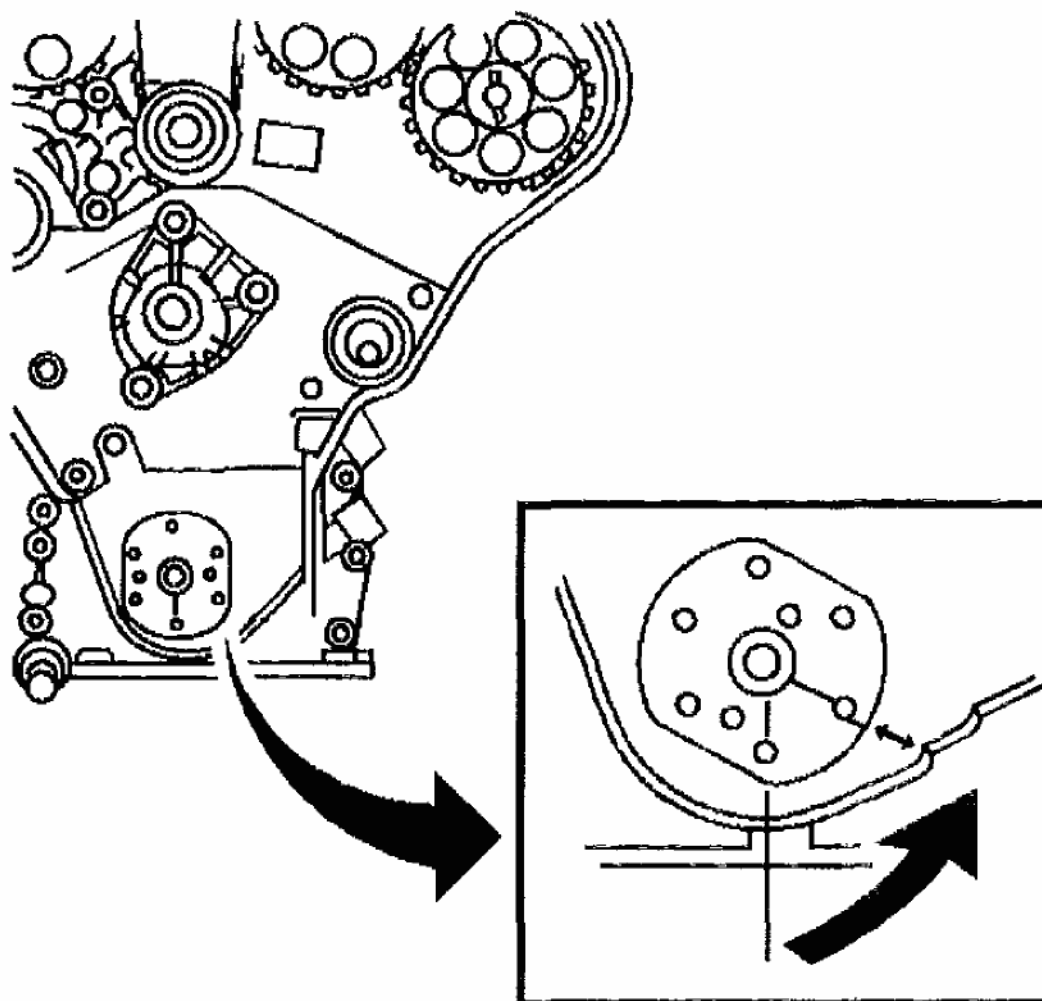


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Fig. 131: View Of Engine Reference Marks At Top Dead Center (TDC)
Courtesy of GENERAL MOTORS CORP.

5. Rotate the crankshaft counter clockwise using the *J 42098* until 60 degrees Before Top Dead Center (BTDC).

The 60 degrees BTDC point can be identified by the index mark on the oil pump cover.



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Fig. 132: View Of Engine Reference Marks At 60 Degrees Before Top Dead Center (BTDC)

Courtesy of GENERAL MOTORS CORP.

Important: Ensure the moveable lever is positioned toward the crankshaft.

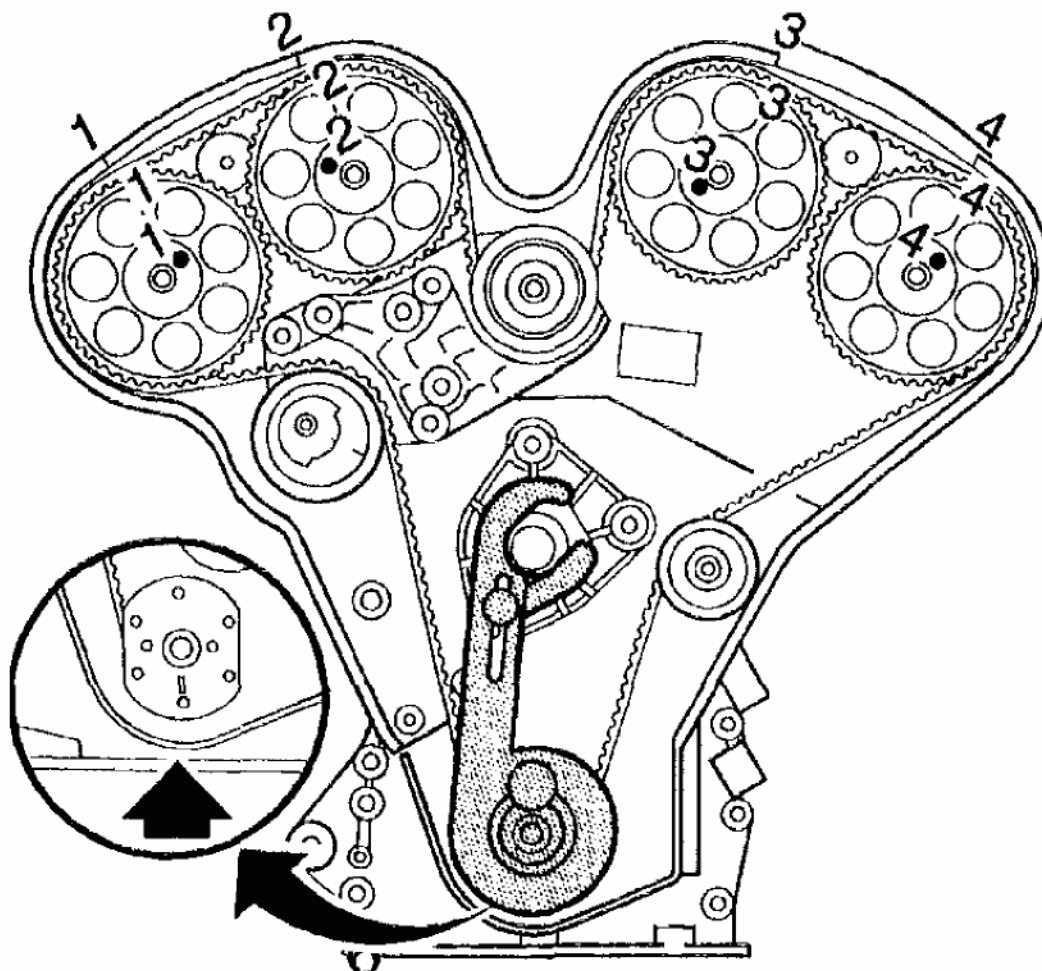
6. Install the *J 42069-10* to the crankshaft sprocket with the knurled bolt.
7. Rotate the crankshaft in the engine rotational direction, clockwise using the *J 42098* until the lever of the *J 42069-10* firmly contacts the water pump pulley flange.

The #1 cylinder is at TDC at this point.

8. Secure the moveable lever of the tool to the water pump pulley flange.

Important: Ensure that the crankshaft is not 180 degrees off TDC.

The reference marks on the camshaft gears should be aligned with the corresponding notches on the rear timing belt cover at this point. If they are not aligned, the engine is 180 degrees off.

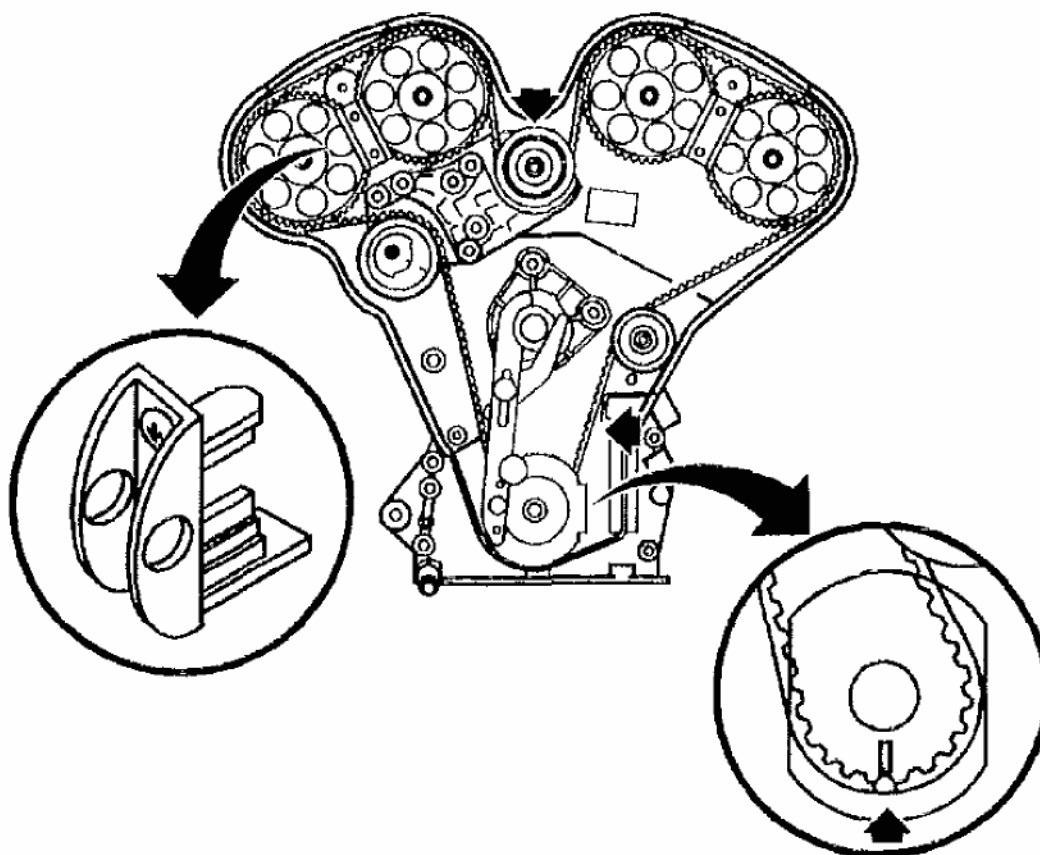


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Fig. 133: Installing J 42069-10 To Crankshaft Sprocket
Courtesy of GENERAL MOTORS CORP.

9. Install the *J 42069-1* and the *J 42069-2* to the camshaft gears.

If the *J 42069-1* or the *J 42069-2* do not fit into the teeth of the camshaft gears, it may be necessary to loosen the upper idler pulley and turn the eccentric or camshaft gears until the tool can be inserted.



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Fig. 134: Installing J 42069-1 & J 42069-2 To Camshaft Gears
Courtesy of GENERAL MOTORS CORP.

10. Loosen the timing belt tensioner nut.
11. Loosen the upper idler pulley bolt.
12. Remove the lower idler pulley bolt.
13. Remove the lower idler pulley and spacer.
14. Remove the *J 42069-10* from the crankshaft sprocket.

NOTE: After timing belt is removed, never turn camshaft and crankshaft independently. If turned, interference may occur among pistons and valves, and parts related to pistons and valves may be damaged.

Important: Do not remove *J 42069-1* and the *J 42069-2* while the belt is removed.

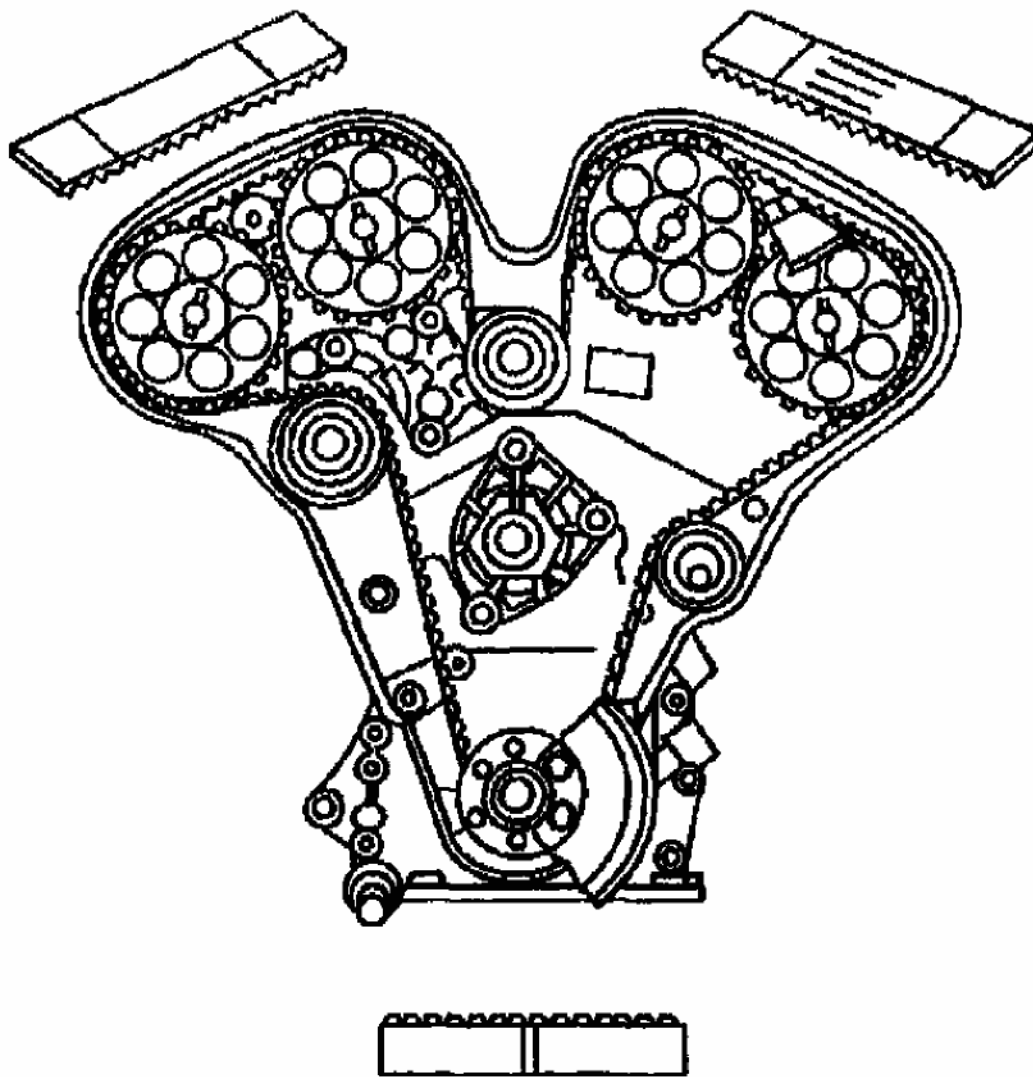
15. Remove the timing belt.

Installation and Initial Adjustment Procedure

NOTE: When installing a new or used timing belt, the directional arrows on the timing belt must be matched with the rotation of the crankshaft. If this precaution is not observed, excessive wear and timing belt failure may occur.

Important:

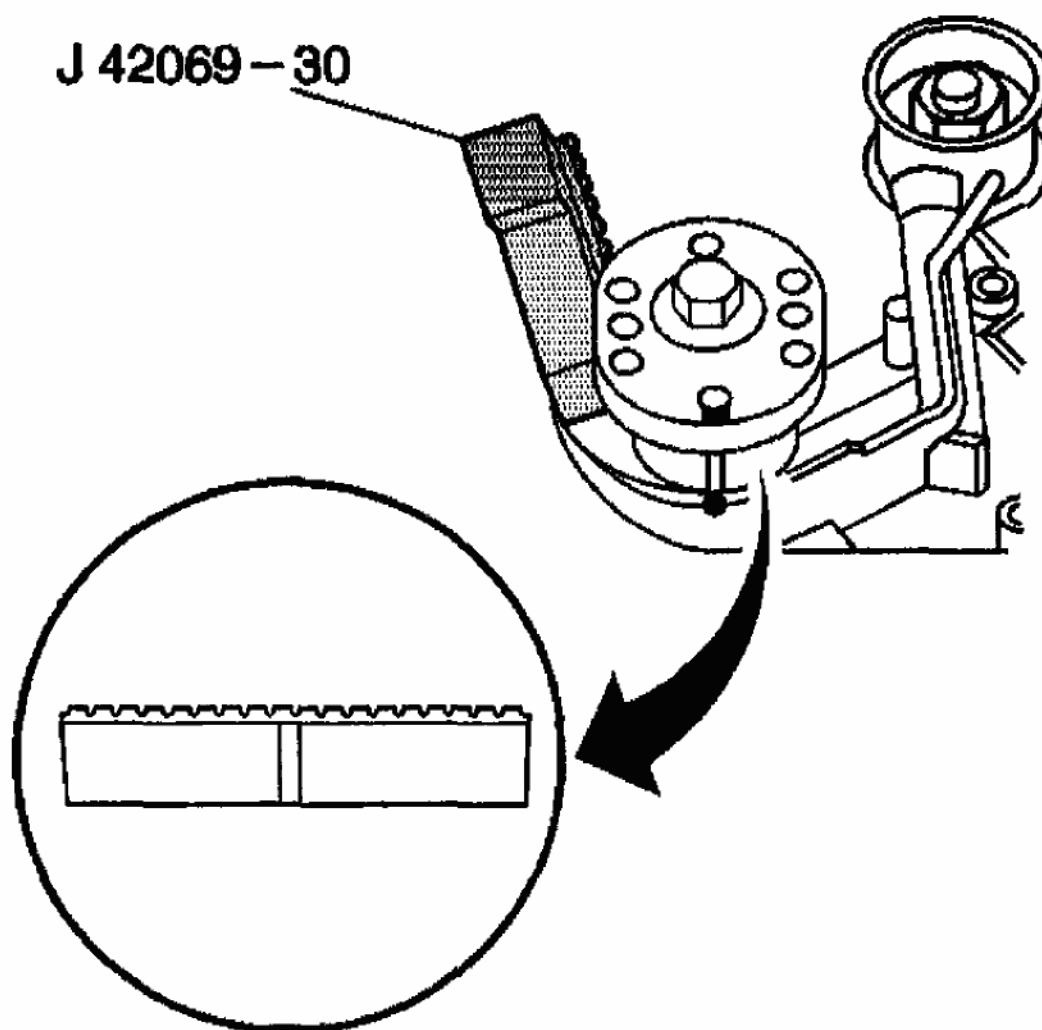
- Guide marks are printed on the timing belt to aid in installation. If these marks are not identifiable, install a new belt.
 - Arrows are printed on the timing belt indicating the required direction of travel. When installing the timing belt, ensure the arrows are traveling in engine rotational direction, clockwise.
 - Install the timing belt with the engine at room temperature.
 - Do not crimp or bind the timing belt when handling or installing.
1. Inspect the timing belt. Refer to **TIMING BELT INSPECTION** .
 2. Start at the crankshaft sprocket by aligning the double dash TDC mark on the timing belt with the marks on the oil pump housing and on the crankshaft sprocket.



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Fig. 135: Aligning Double Dash TDC Mark On Timing Belt
Courtesy of GENERAL MOTORS CORP.

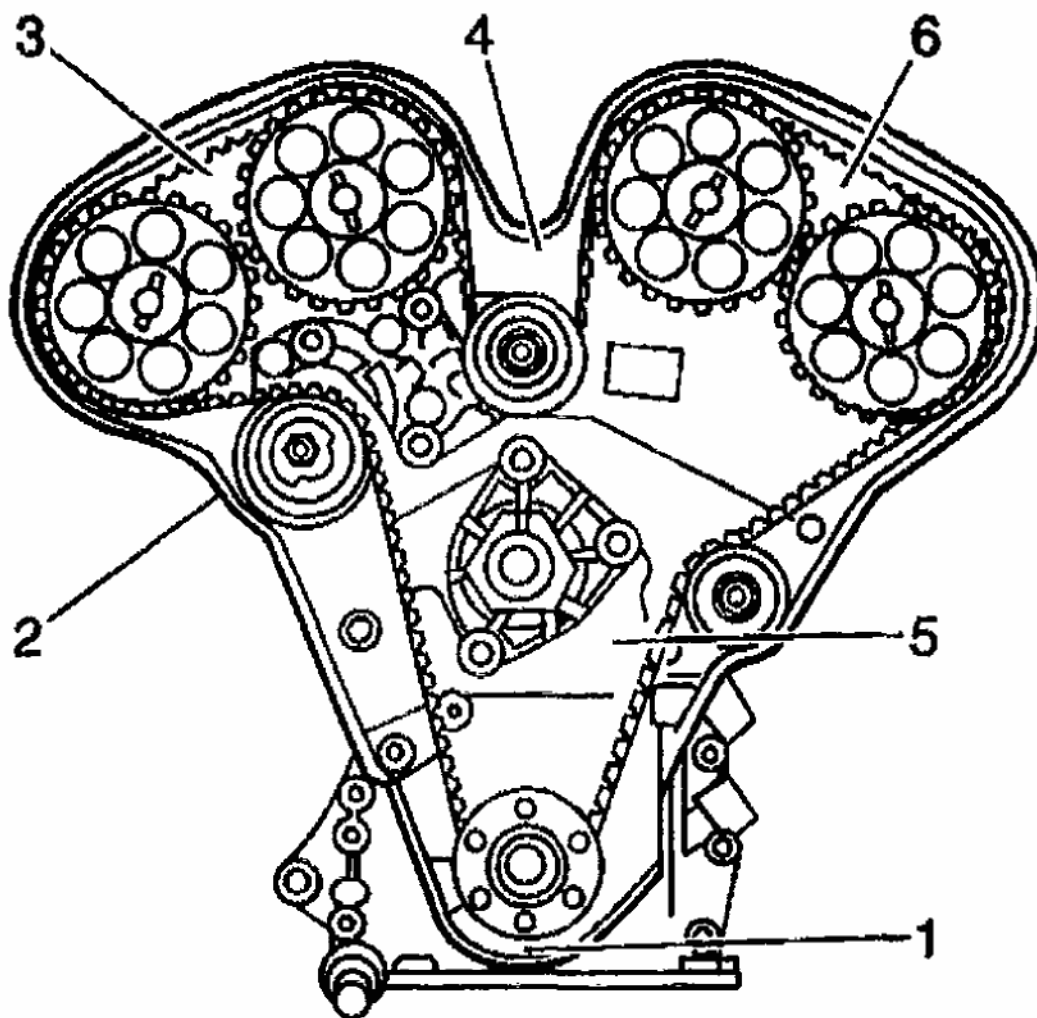
3. Wedge the *J 42069-30* between the oil pump housing and timing belt in order to prevent the belt teeth from jumping the crankshaft sprocket teeth.



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Fig. 136: Wedging J 42069-30 Between Oil Pump Housing & Timing Belt
Courtesy of GENERAL MOTORS CORP.

4. Route the timing belt through the timing belt tensioner (2).
5. Slip the timing belt through camshaft gears 1 and 2 simultaneously (3), ensuring the dash marks on the timing belt align with the marks on the camshaft gears and the notches on the rear timing belt cover.
6. Route the timing belt through the upper idler pulley (4).
7. Slip the timing belt through camshaft gears 3 and 4 simultaneously (6), ensuring the dash marks on the timing belt align with the marks on the camshaft gears and the notches on the rear timing belt cover.



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Fig. 137: Routing Timing Belt Through Timing Belt Tensioner
Courtesy of GENERAL MOTORS CORP.

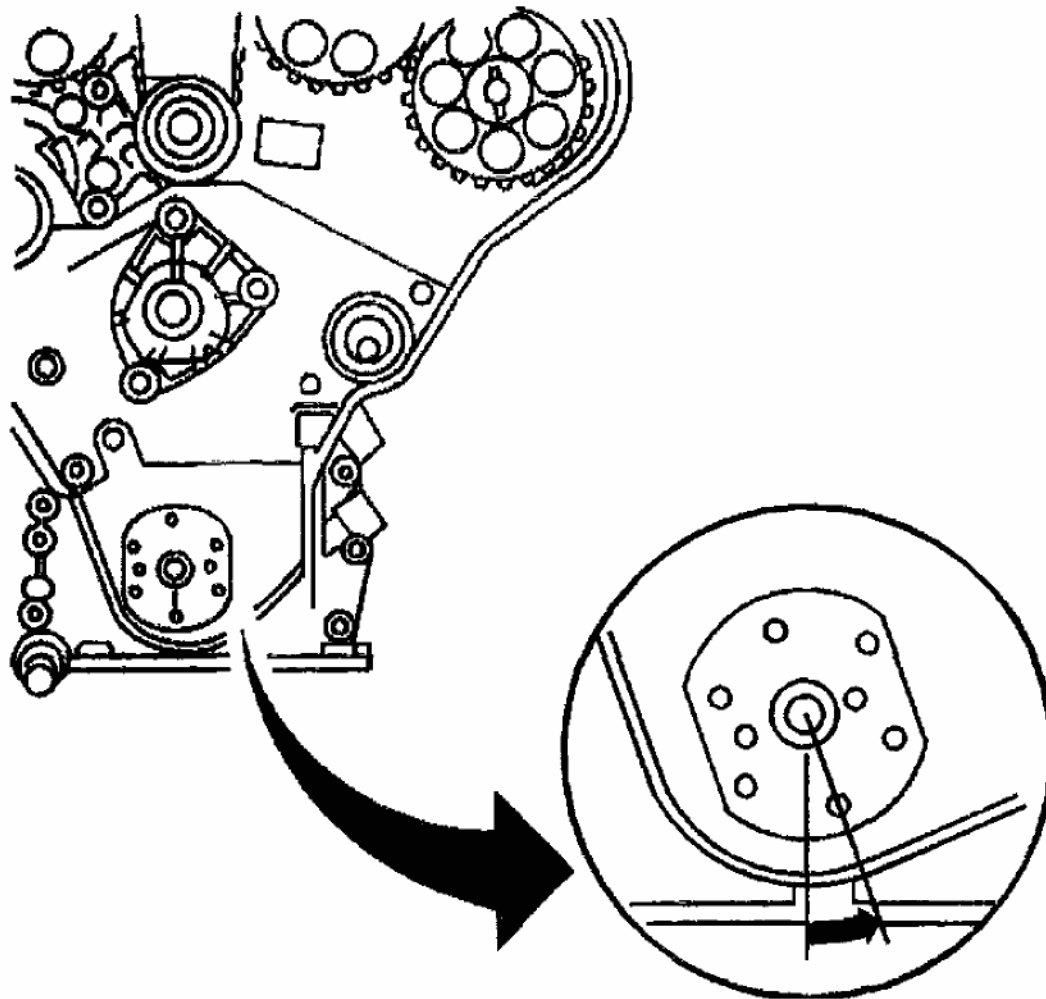
8. Using the *J 42098* rotate the crankshaft counter clockwise to 3 degrees BTDC, allowing the timing belt to slide on the *J 42069-30*.
9. Install the lower idler pulley and spacer with the timing belt.

NOTE: Refer to FASTENER NOTICE in Cautions and Notices.

10. Install the lower idler pulley bolt.

Tighten

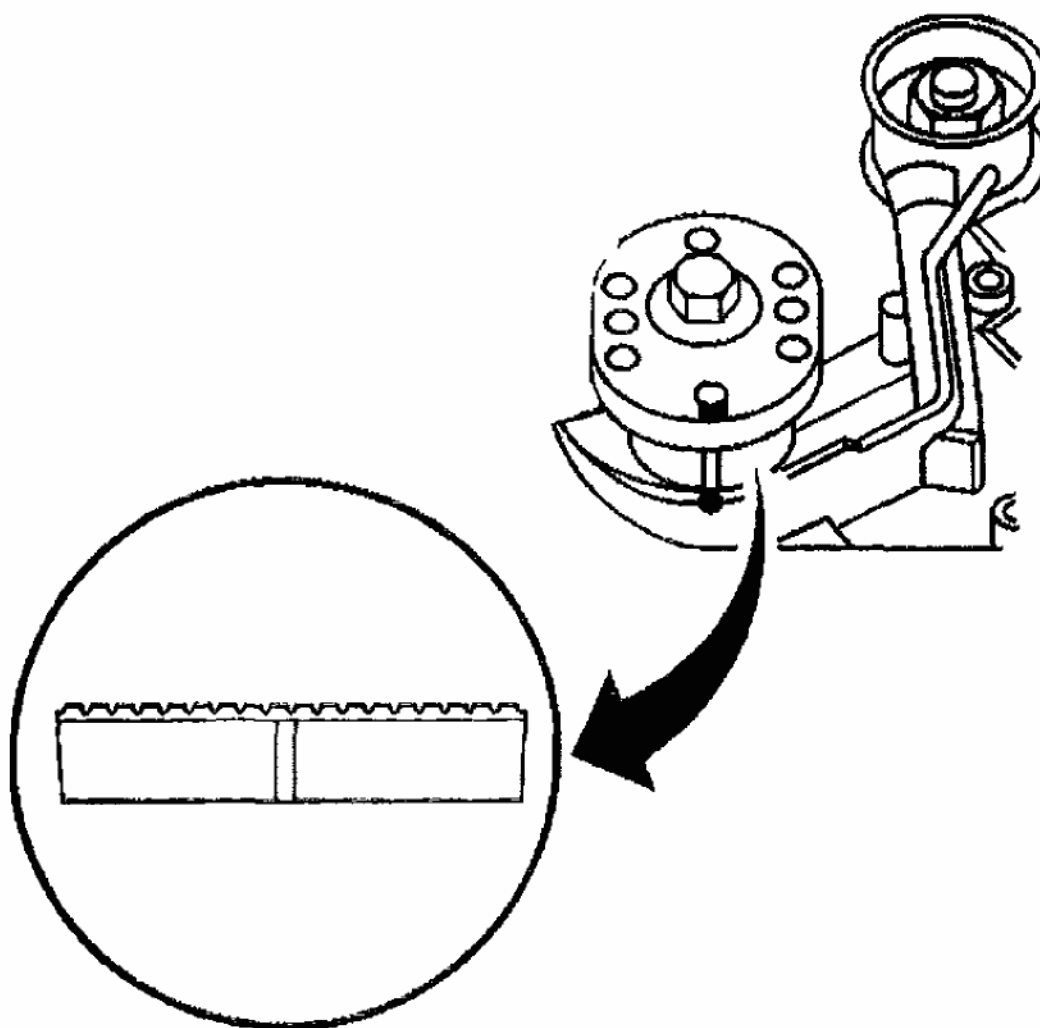
Tighten the lower idler pulley bolt to 40 N.m (30 lb ft).



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Fig. 138: Rotating Crankshaft Counter Clockwise To 3 Degrees BTDC
Courtesy of GENERAL MOTORS CORP.

11. Turn the crankshaft back to TDC, using the *J 42098*.

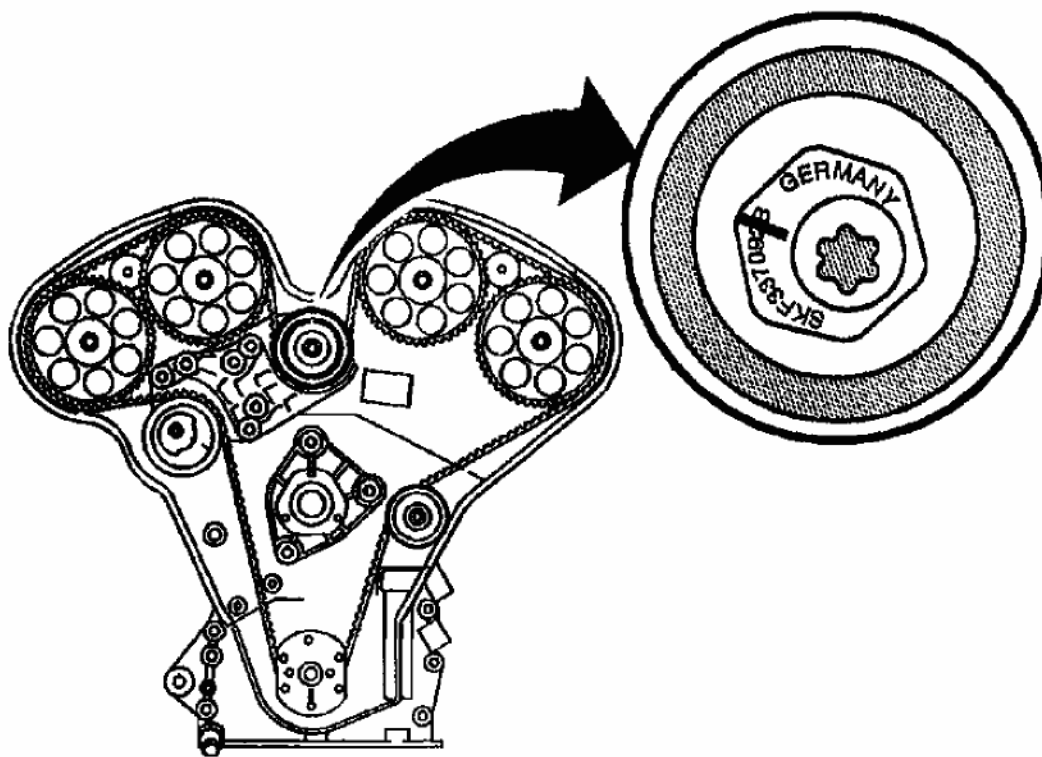


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Fig. 139: View Of Crankshaft At Top Dead Center (TDC)
Courtesy of GENERAL MOTORS CORP.

12. Apply tension to the timing belt, at the upper idler pulley by turning the high point of the eccentric to approximately the 9 o'clock position. Tighten the idler pulley locking bolt, while holding the eccentric with the *J 42069-40*, until snug.

The idler pulley bolt will be tightened to specifications after all final adjustments are made.



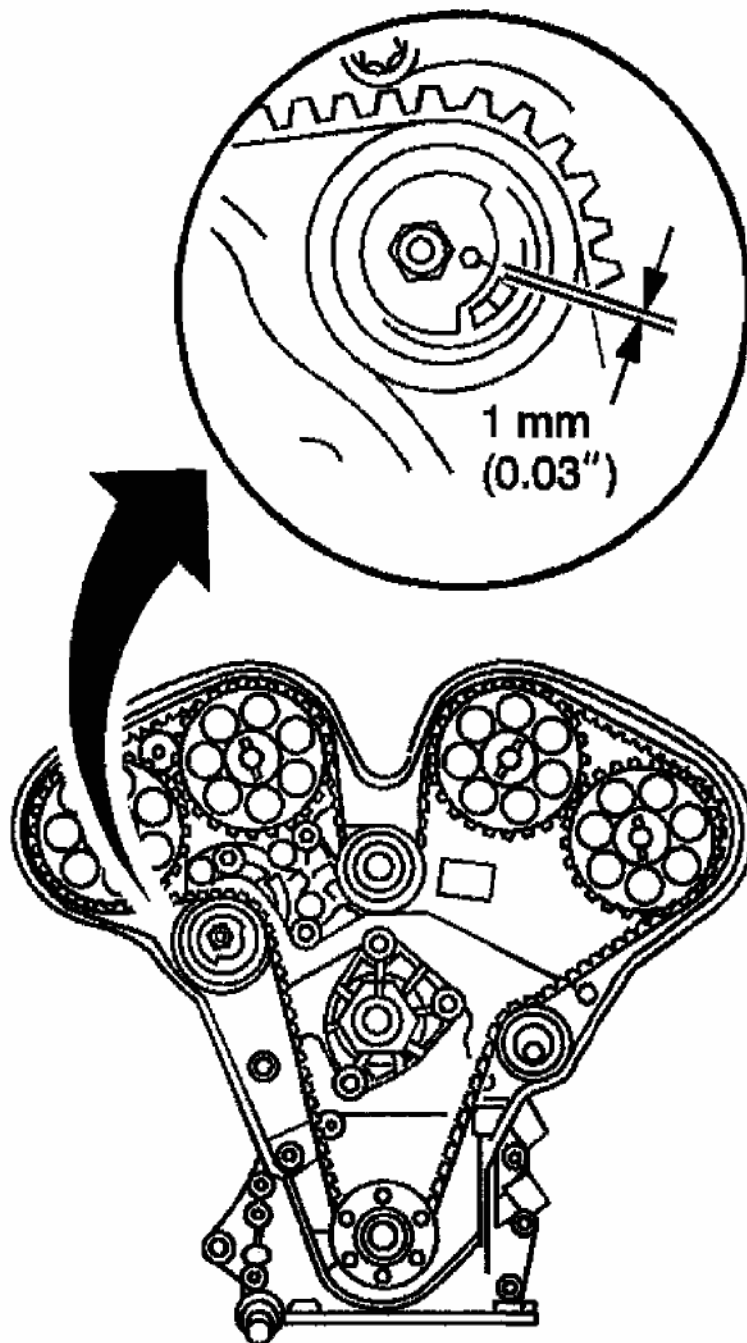
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Fig. 140: View Of High Point Of Eccentric On Idler Pulley At 9 O'Clock
Courtesy of GENERAL MOTORS CORP.

13. Set the initial timing belt tension:

- 13.1. Rotate the tensioner eccentric counter clockwise to full stop, turn the eccentric back until the reference mark is 1 mm (0.03 in) over the flange.
- 13.2. Tighten the timing belt tensioner locking nut until snug.

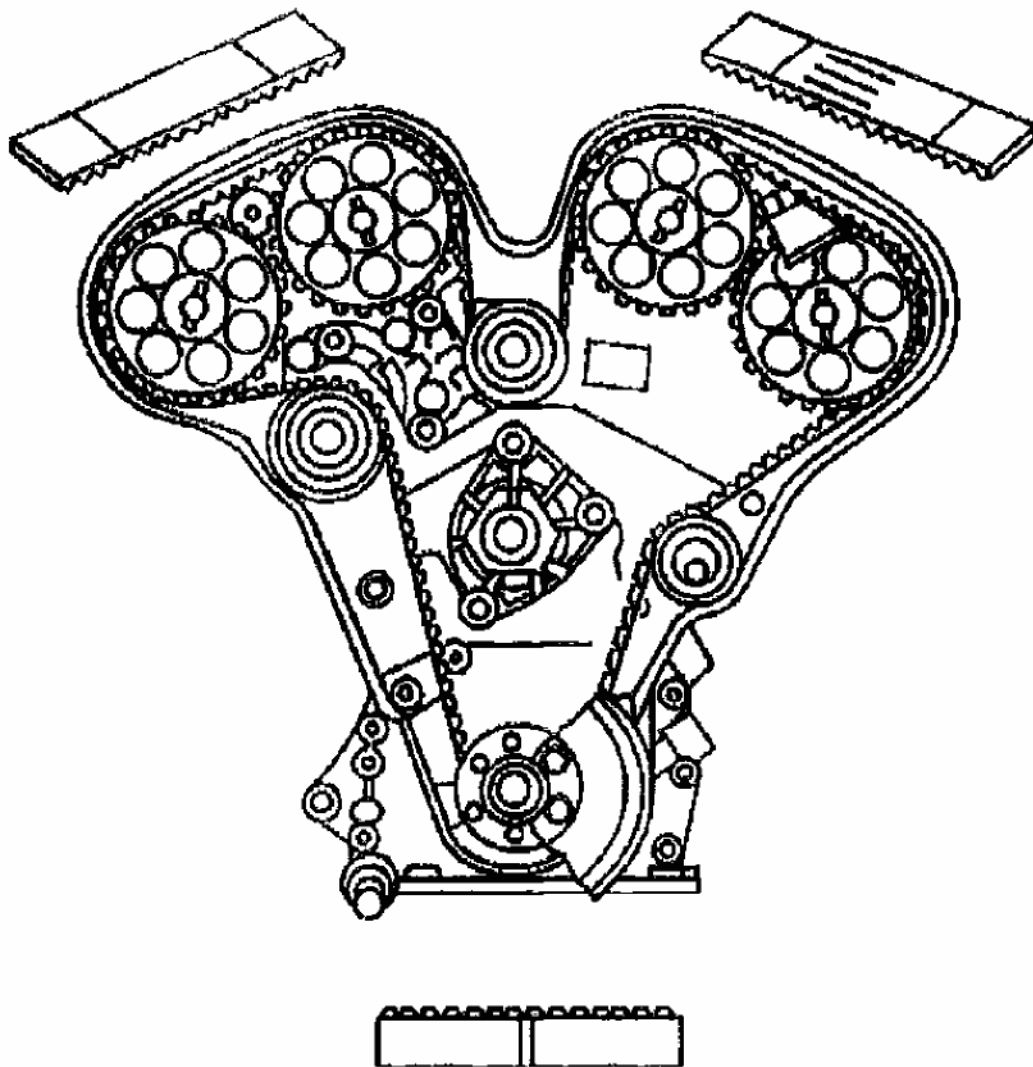
The locking nut will be tightened to specifications after all final adjustments are made.



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Fig. 141: Aligning Timing Belt Tensioner Reference Mark 1 mm Over Flange
Courtesy of GENERAL MOTORS CORP.

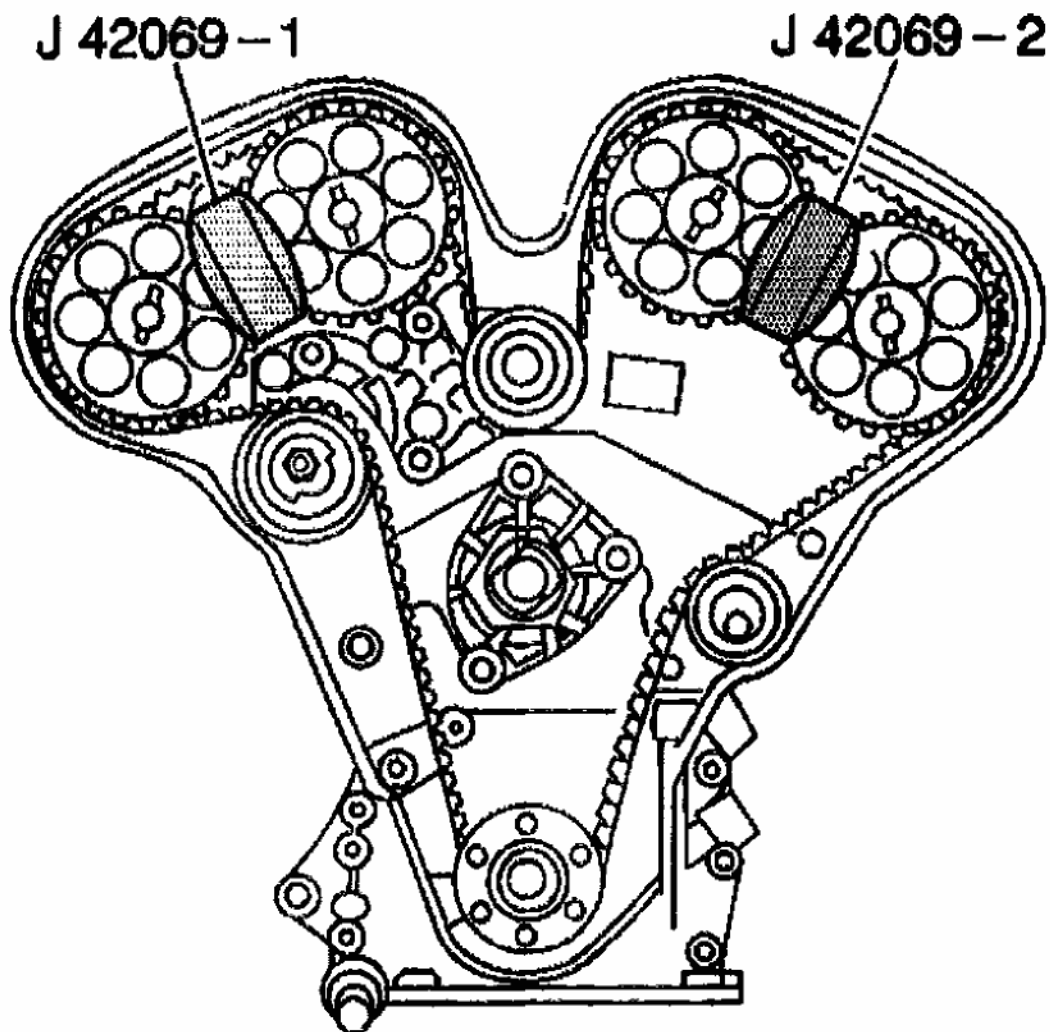
14. Inspect the alignment marks on the timing belt to ensure that they are aligned with the appropriate reference points on the camshaft gears, the rear timing belt cover and on the oil pump housing.



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Fig. 142: Inspecting Alignment Marks On Timing Belt
Courtesy of GENERAL MOTORS CORP.

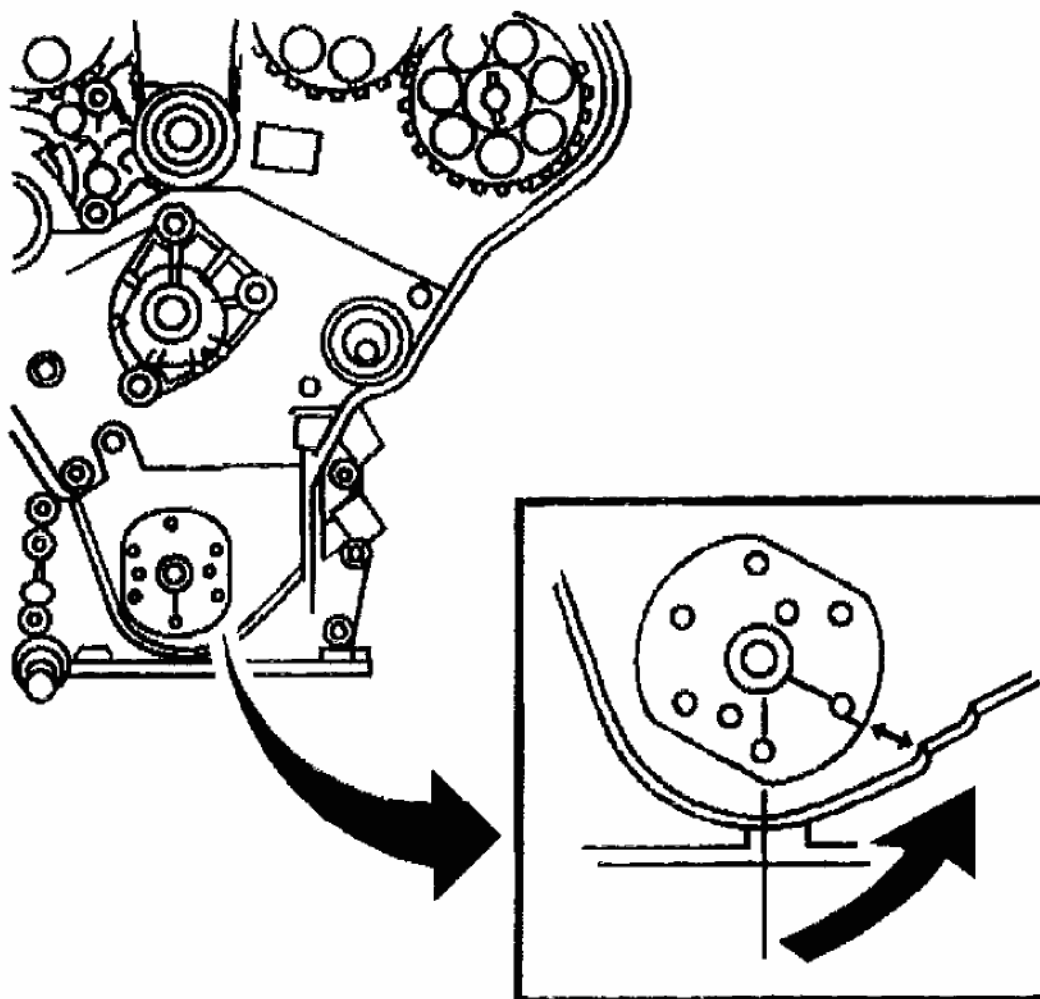
15. Remove the *J 42069-30*, the *J 42069-1* and the *J 42069-2* locking tools from the engine.



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Fig. 143: Locating J 42069-1 & J 42069-2
Courtesy of GENERAL MOTORS CORP.

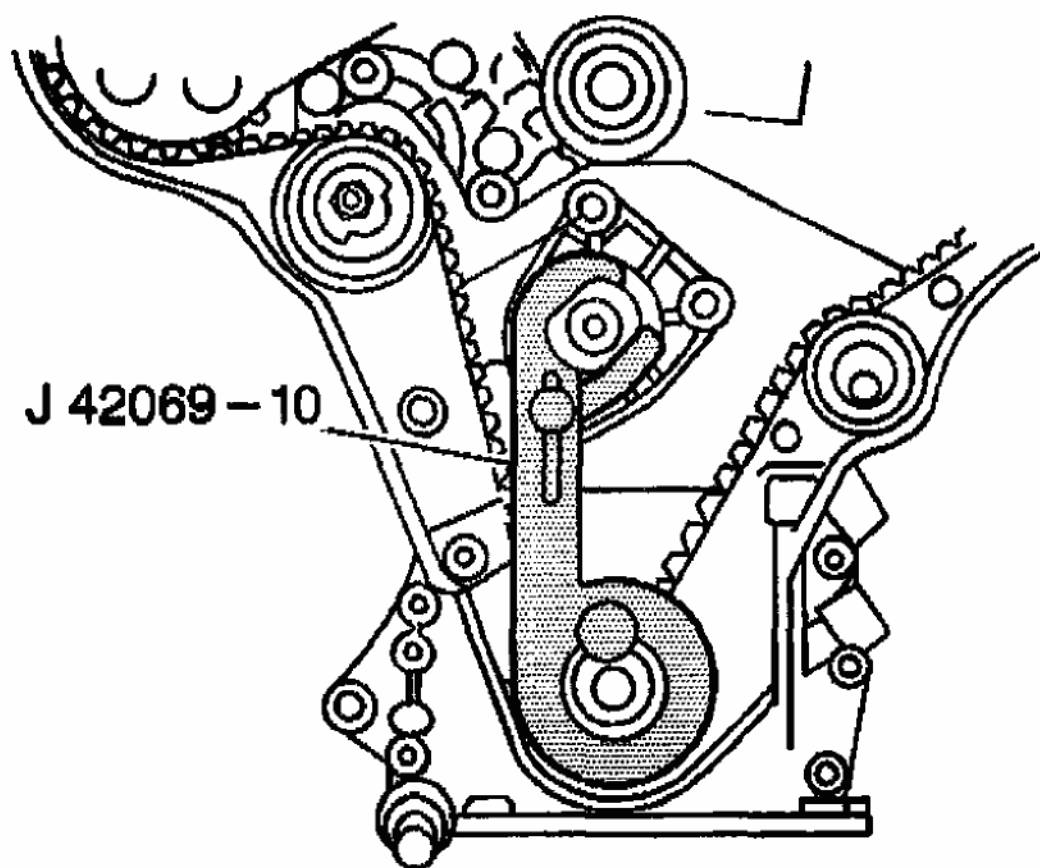
16. Rotate the crankshaft clockwise 2 revolutions using the *J 42098* until the #1 cylinder is 60 degrees BTDC.



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Fig. 144: View Of Crankshaft At 60 Before Top Dead Center (BTDC)
Courtesy of GENERAL MOTORS CORP.

17. Install the *J 42069-10* to the crankshaft sprocket with the knurled bolt.
18. Rotate the crankshaft in the engine rotational direction, clockwise using the *J 42098* until the lever of the *J 42069-10* firmly contacts the water pump pulley flange.
19. Secure the moveable lever of the tool to the water pump pulley flange.

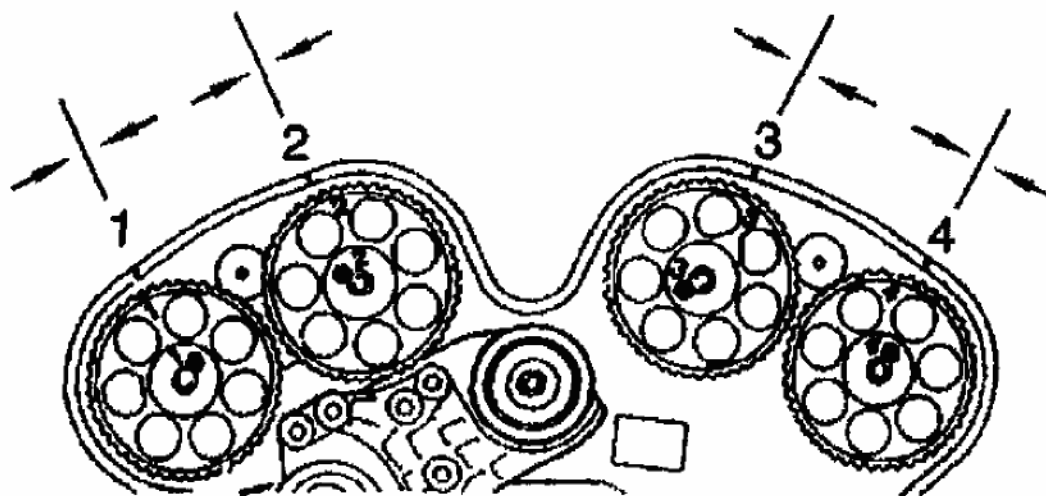


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Fig. 145: Installing J 42069-10 To Crankshaft Sprocket With Knurled Bolt
Courtesy of GENERAL MOTORS CORP.

Important: The alignment marks on the timing belt will no longer align with the marks on the camshaft gears after one or more engine revolutions.

20. Inspect the alignment of the reference marks on the camshaft gears with the notches on the rear timing belt cover, as well as the mark on the crankshaft sprocket and oil pump housing.



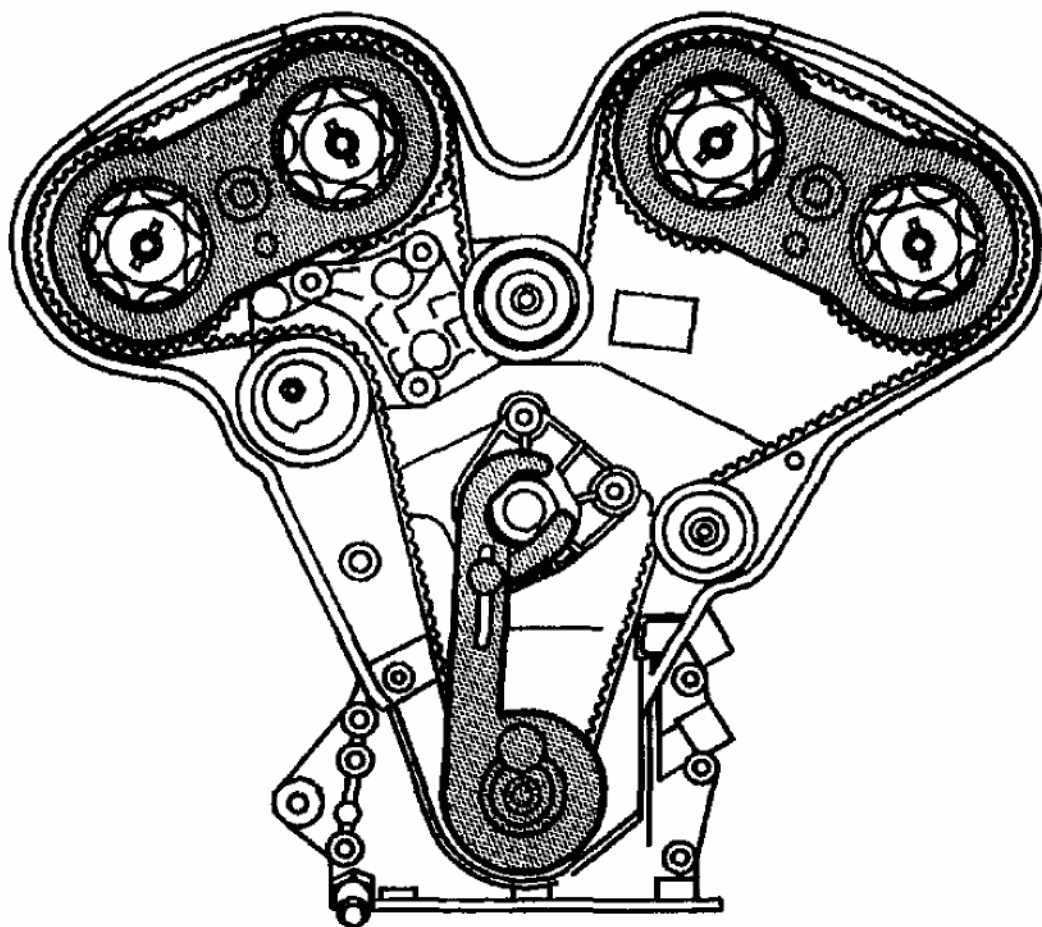
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Fig. 146: Locating Reference Marks On Camshaft Gears & Notches On Rear Timing Belt Cover

Courtesy of GENERAL MOTORS CORP.

Important: The reference marks on both sets of the camshaft gears must match exactly with the marks on the *J 42069-20* checking gage.

21. Use the *J 42069-20* to inspect the alignment of the camshaft gears 3 and 4.
22. Use the *J 42069-20* to inspect the alignment of the camshaft gears 1 and 2.
23. If timing belt adjustment IS REQUIRED, refer to **TIMING BELT TIMING PROCEDURE**.



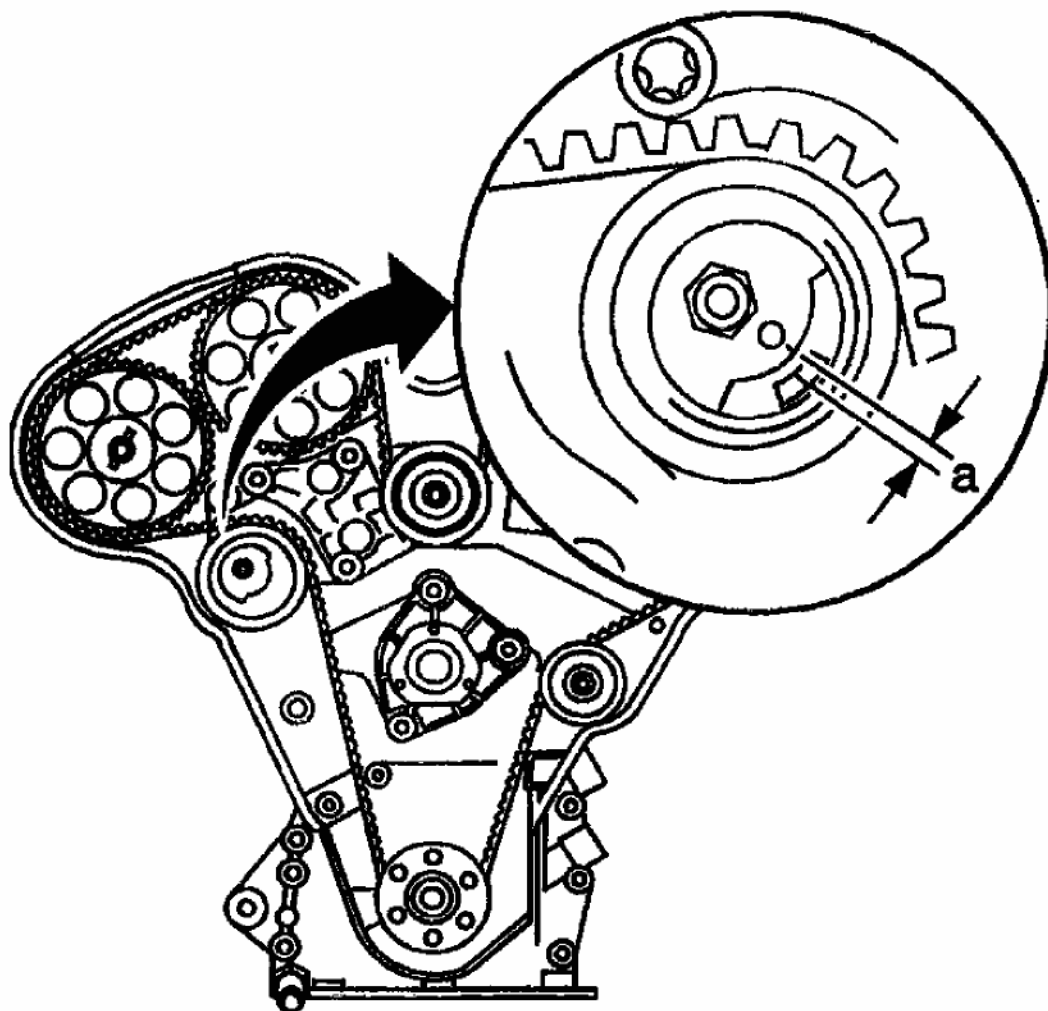
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Fig. 147: Inspecting Alignment Of Camshaft Gears
Courtesy of GENERAL MOTORS CORP.

24. If timing belt adjustment IS NOT REQUIRED, set the final timing belt tension:
- 24.1. Loosen the timing belt eccentric locking nut.
 - 24.2. Turn the eccentric counter clockwise to full stop, then back to the following specification:
 - NEW BELT
 - until the reference mark is 3-4 mm (0.118-0.157 in) (a) above the datum line.
 - USED BELT
 - until the reference mark is aligned with the datum line.

Tighten

Tighten the timing belt tensioner eccentric locking nut to 20 N.m (15 lb ft).



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Fig. 148: Identifying Final Timing Belt Tension Specification
Courtesy of GENERAL MOTORS CORP.

25. Hold the upper idler pulley eccentric in place with the *J 42069-40* .

Tighten

Tighten the upper idler pulley bolt to 40 N.m (30 lb ft).

26. Remove the *J 42069-20* from the camshaft gears.

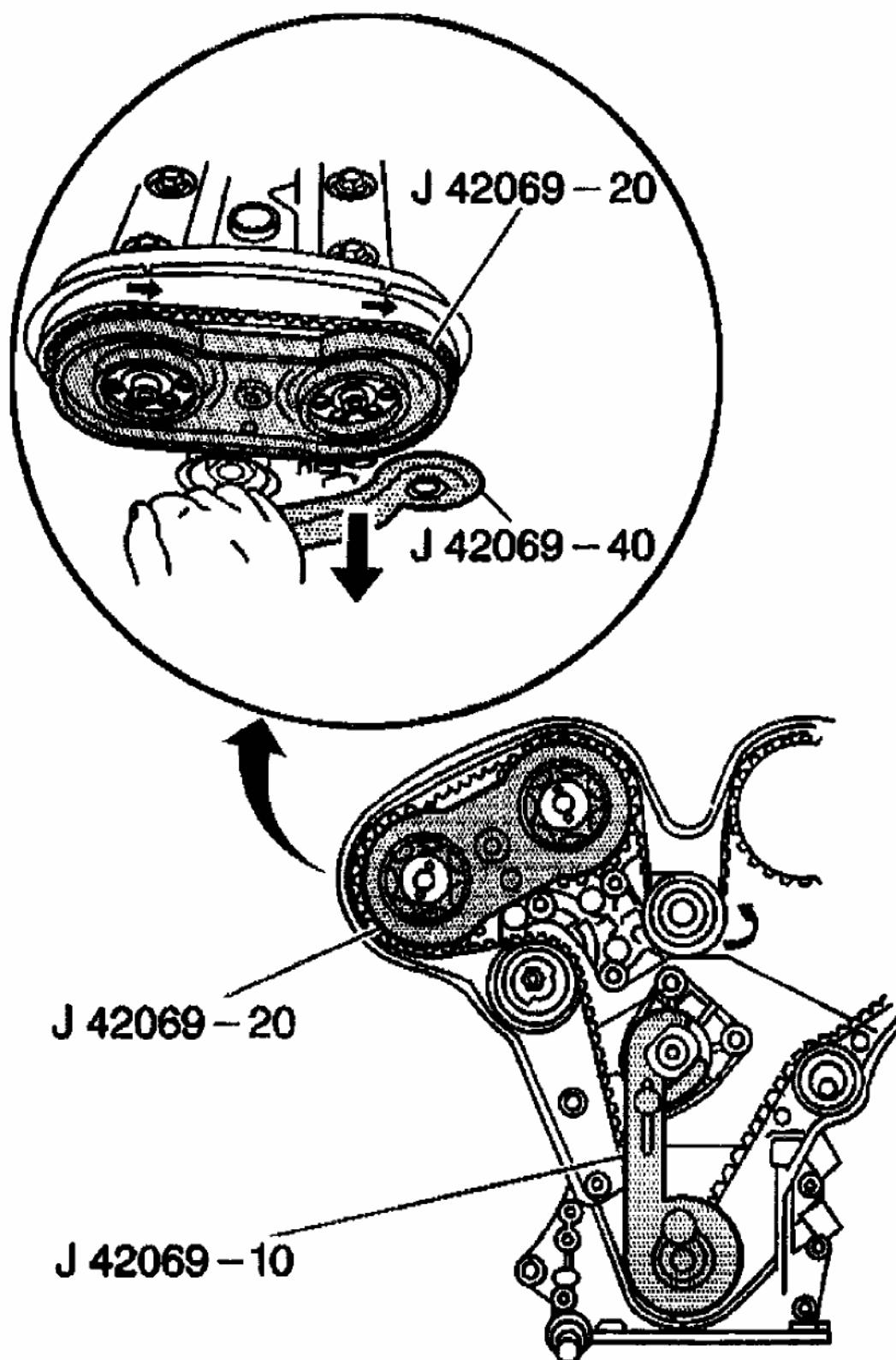
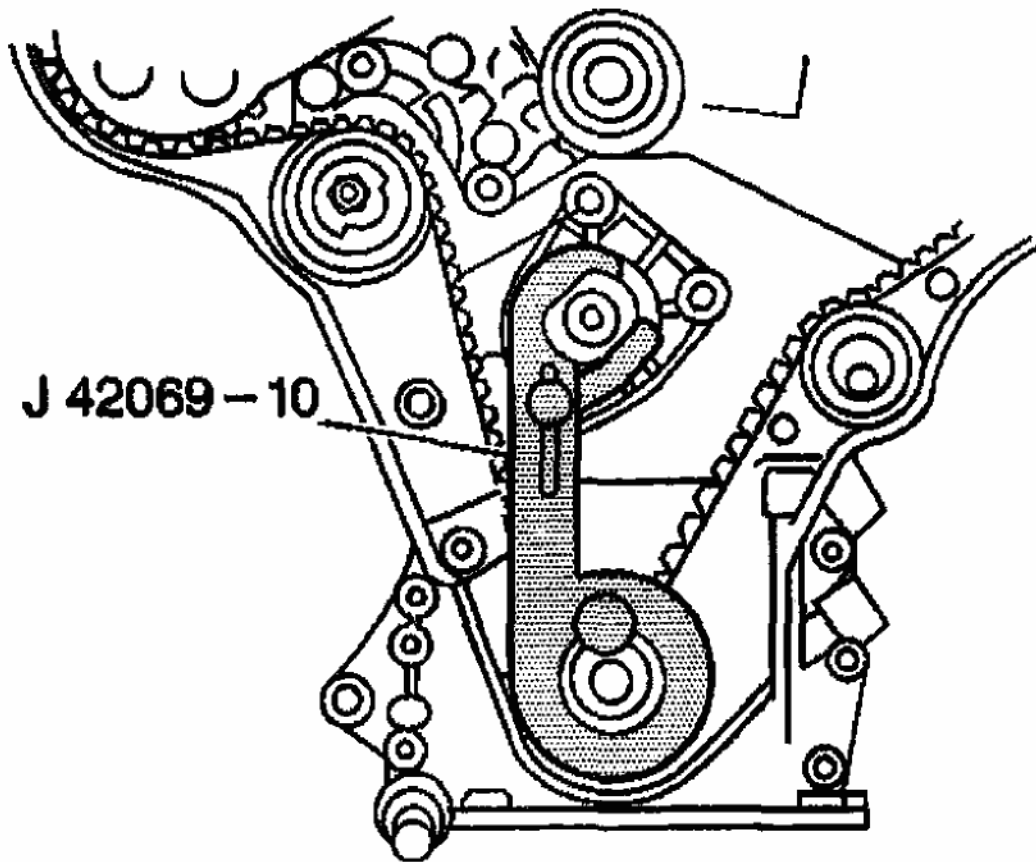


Fig. 149: Securing Upper Idler Pulley Eccentric In Place Using J 42069-20
Courtesy of GENERAL MOTORS CORP.

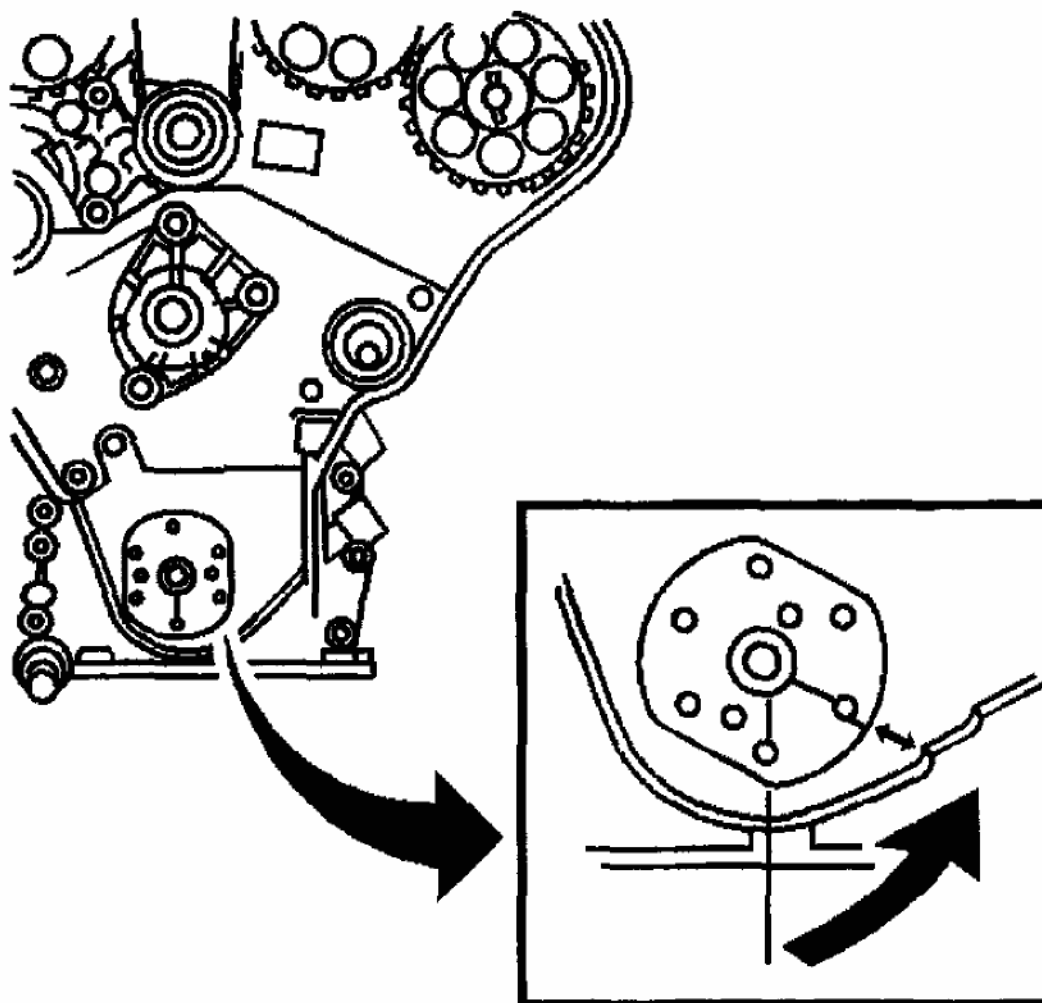
27. Remove the *J 42069-10* from the engine.



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Fig. 150: View Of J 42069-10
Courtesy of GENERAL MOTORS CORP.

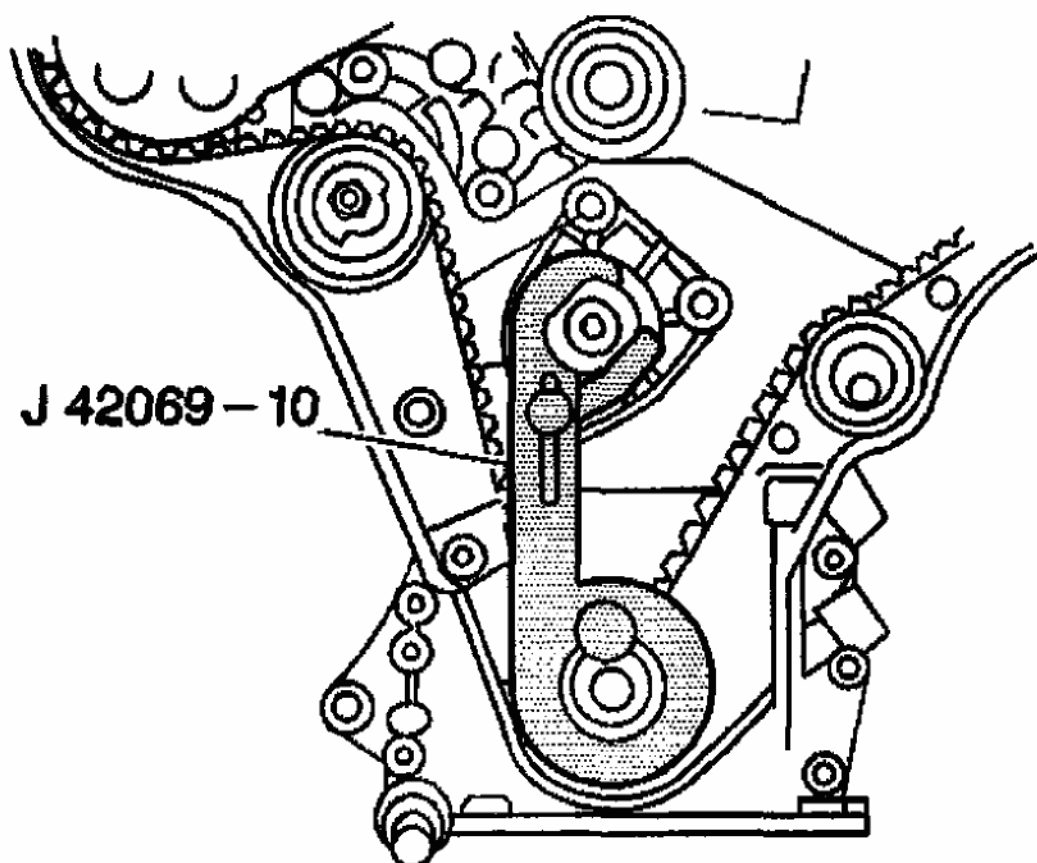
28. For final inspection rotate the crankshaft in the engine rotational direction, clockwise 2 revolutions using the *J 42098* until reaching 60 degrees BTDC.



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Fig. 151: Rotating Crankshaft To 60 Degrees BTDC
Courtesy of GENERAL MOTORS CORP.

29. Install the *J 42069-10* to the crankshaft sprocket.
30. Rotate the crankshaft in the engine rotational direction, clockwise using the *J 42098* until the lever of the *J 42069-10* firmly contacts the water pump pulley flange.
31. Secure the moveable lever of the tool to the water pump pulley flange.

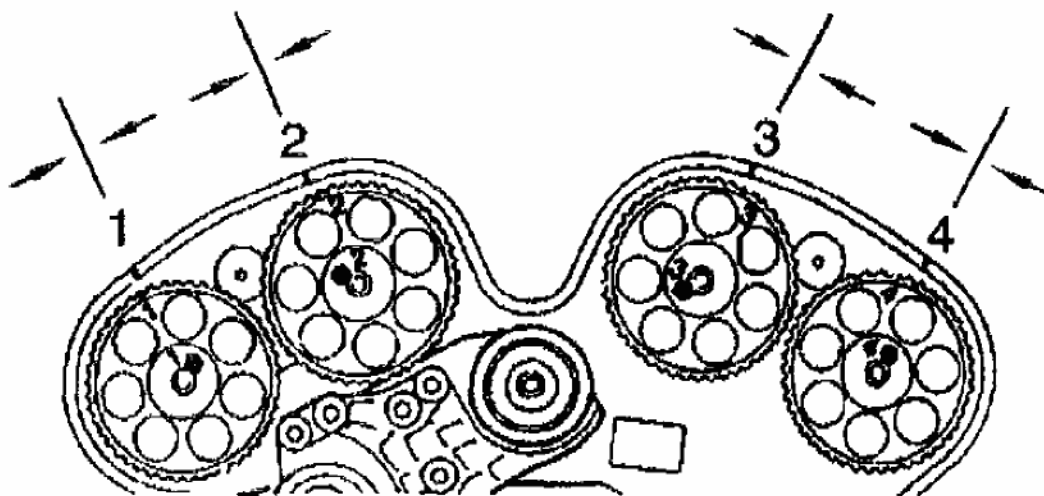


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Fig. 152: Identifying J 42069-10 In Engine
Courtesy of GENERAL MOTORS CORP.

Important: The alignment marks on the timing belt will no longer align with the marks on the camshaft gears after one or more engine revolutions.

32. Inspect the alignment of the reference marks on the camshaft gears with the notches on the rear timing belt cover, as well as the mark on the crankshaft sprocket and oil pump housing.

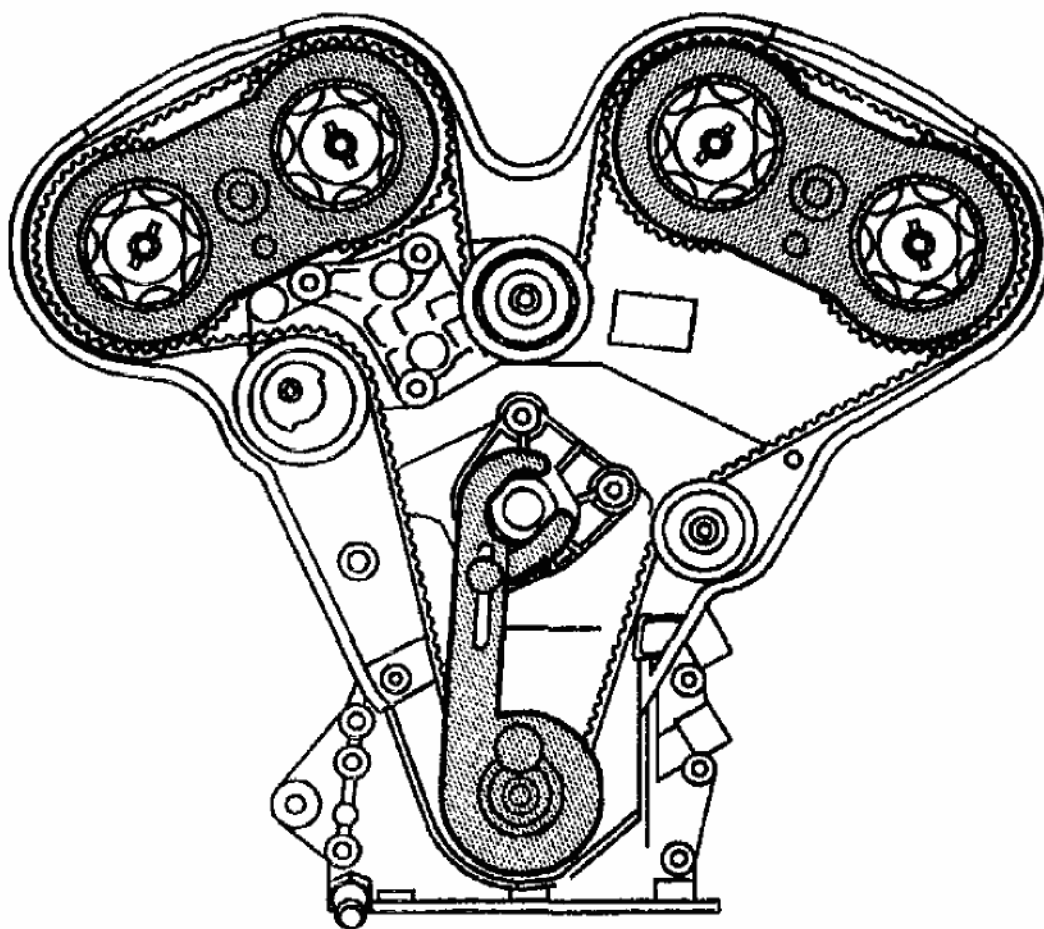


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Fig. 153: Locating Reference Marks On Camshaft Gears & Notches On Rear Timing Belt Cover

Courtesy of GENERAL MOTORS CORP.

33. Use the *J 42069-20* to inspect the alignment of the camshaft gears 3 and 4.
34. Use the *J 42069-20* to inspect the alignment of the camshaft gears 1 and 2.
35. If the reference marks on the camshaft gears do not match exactly, timing belt adjustment IS REQUIRED.



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Fig. 154: Inspecting Alignment Of Camshaft Gears
Courtesy of GENERAL MOTORS CORP.

Refer to **TIMING BELT TIMING PROCEDURE** .

36. If the reference marks match exactly, further timing belt adjustment IS NOT necessary.
Continue with reassembly of the engine.
37. Remove the *J 42069-10* and the *J 42069-20*.
38. Install the crankshaft balancer. Refer to **CRANKSHAFT BALANCER REPLACEMENT** .
39. Install the timing belt cover. Refer to **TIMING BELT COVER REPLACEMENT** .

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