

Timing Belt: Service and Repair

Timing Belt Replacement

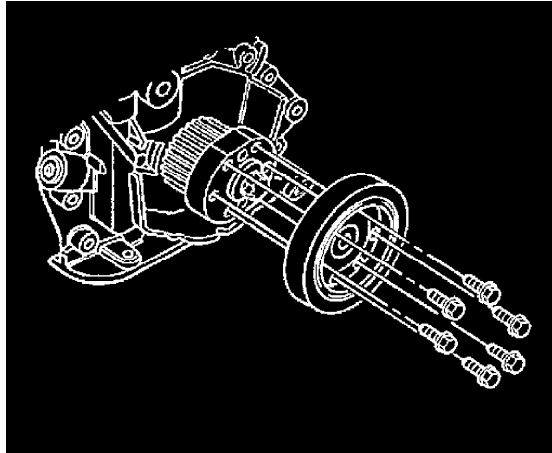
TIMING BELT REPLACEMENT

Removal Procedure

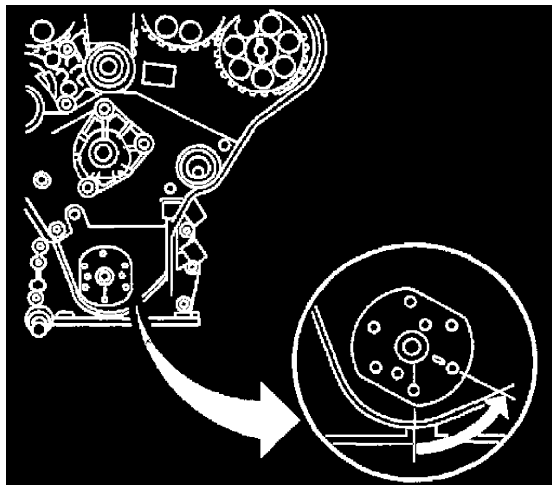
^ Tools Required

- J 42069 Timing Belt Alignment Kit
- J 42098 Crank Hub Torx Socket

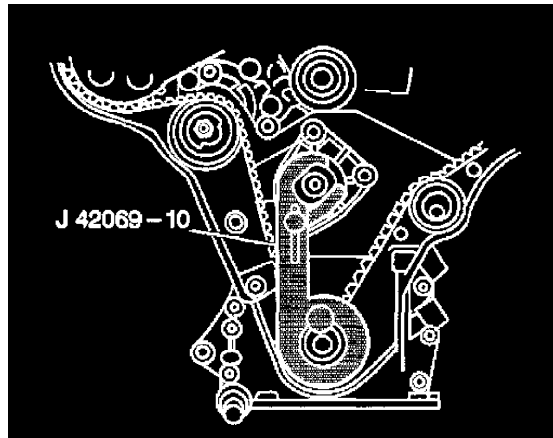
Notice: Failure to follow the described timing belt inspection and maintenance may result in a broken timing belt and cause severe engine damage.



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 or -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 intake air resonator. Refer to Intake Air Resonator Replacement in Powertrain Management.
3. Remove the intake plenum. Refer to Intake Plenum Replacement.
4. Remove the timing belt cover. Refer to Timing Belt Cover Replacement.
5. Remove the crankshaft balancer bolts.
6. Remove the crankshaft balancer from the crankshaft sprocket.



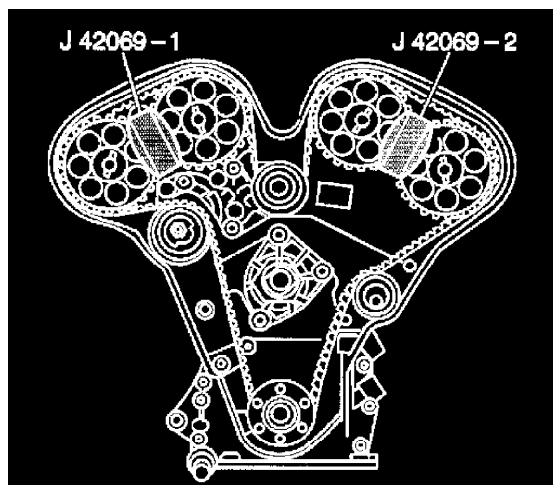
7. Rotate the crankshaft clockwise to 60 degrees Before Top Dead Center (BTDC).



8. Install the J 42069-10 to the crankshaft sprocket with the knurled bolt.
9. Use the J 42098 to carefully turn the crankshaft in the engine rotational direction (clockwise) until the lever of the J 42069-10 firmly contacts the water pump pulley flange.
10. 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.



11. 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 relevant timing belt idler pulley and turn the cam until the J 42069-1 or the J 42069-2 can be inserted.

Notice: 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.

12. Loosen the timing belt tensioner and idler pulleys.

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

13. Remove the timing belt.

Installation and Initial Adjustment Procedure

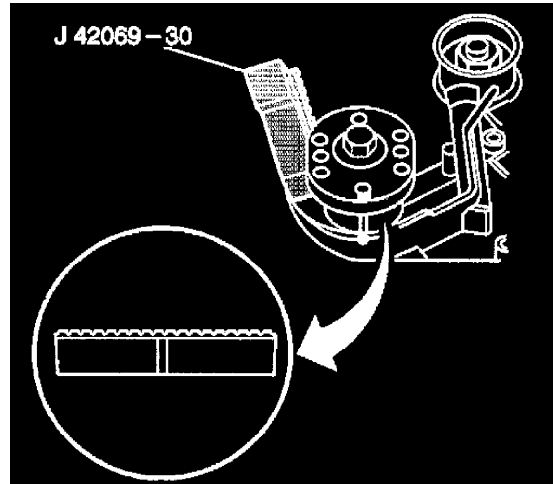
^ Tools Required

- J 42069 Timing Belt Alignment Kit
- J 42098 Crank Hub Torx Socket

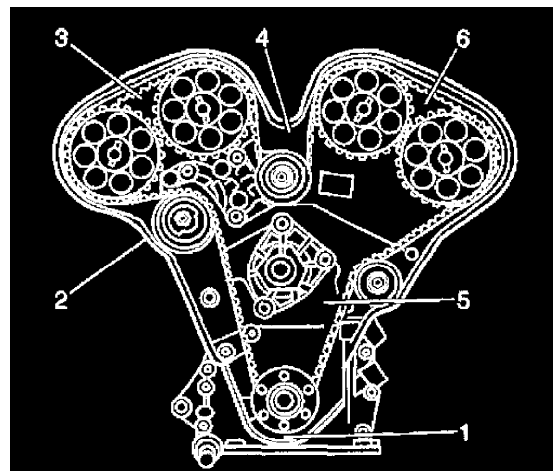
Notice: When installing a new or used timing belt, the directional arrows on the timing belt must be matched with the rotation of the crankshaft. If this precaution is not observed, excessive wear and timing belt failure may occur.

Important: Guide marks are printed on the timing belt to aid in installation. If these marks are not identifiable, install a new belt.

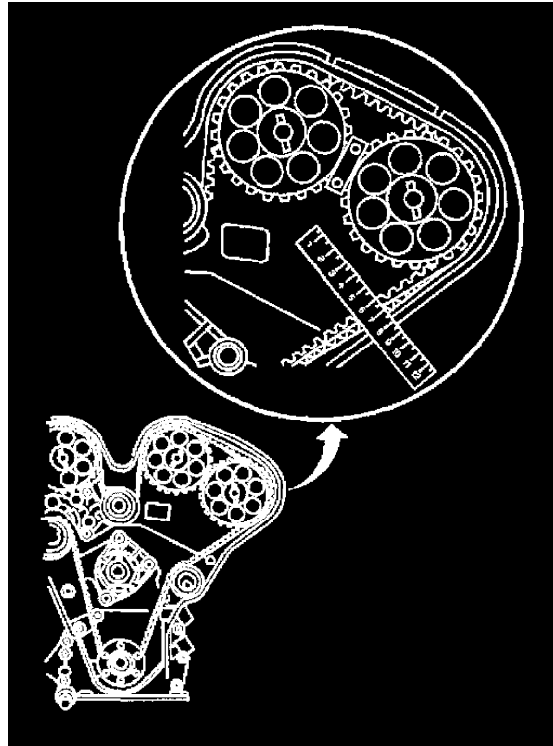
Install the timing belt with the engine at room temperature.
Do not crimp or bind the timing belt when handling or installing.



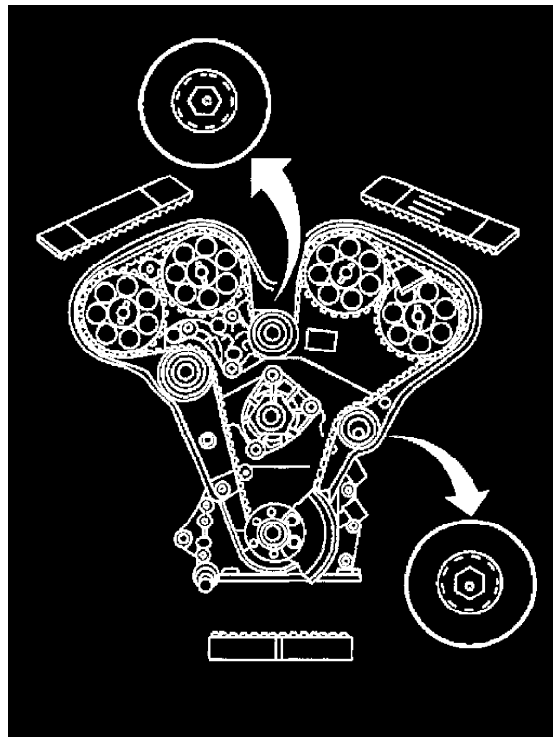
1. Remove the J 42069.
2. Raise and support the vehicle. Refer to Vehicle Lifting.
3. Start at the crankshaft sprocket and install the timing belt with the double dash (TDC) mark on the belt aligned with the marks on the oil pump and on the belt drive gear.
4. Use the J 42069-30 to pinch the belt to prevent the teeth from jumping.
5. Lower the vehicle.



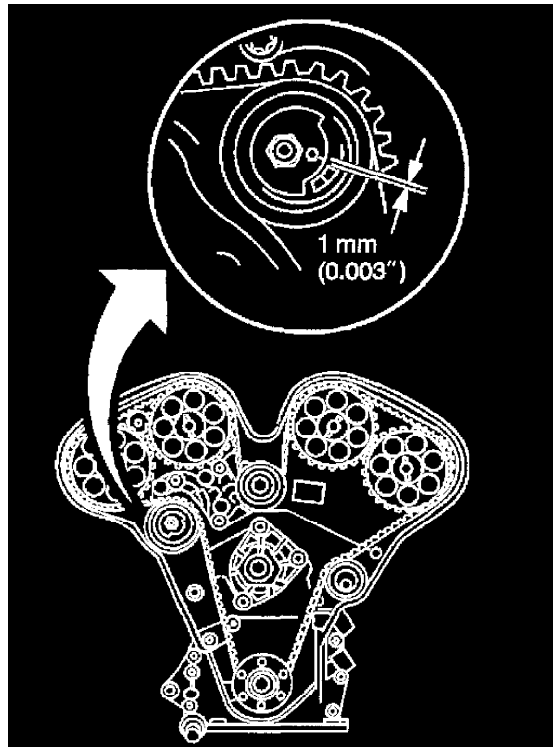
6. Route the timing belt through the timing belt tensioner (2).
7. Slip the timing belt through camshaft gears 1 and 2 simultaneously (3), ensuring the dash marks on the timing belt align with the marks on the camshaft gears and the notches on the rear timing belt cover.
8. Route the timing belt through the idler pulley for camshafts 1 and 2 (4).
9. Route the timing belt through the idler pulley for camshafts 3 and 4 (5).
10. 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.



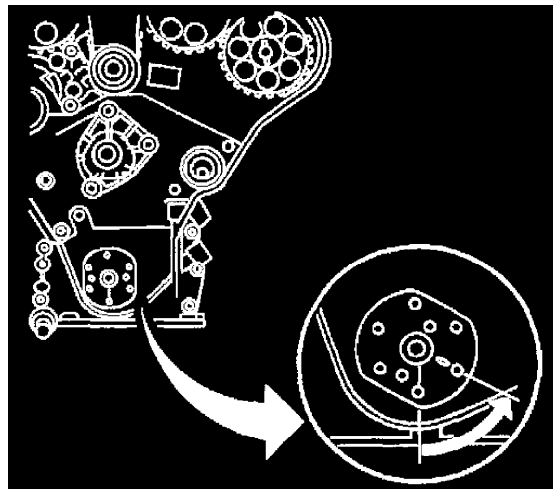
11. Measure the timing belt deflection between camshaft gear number 4 and the idler pulley for camshafts 3 and 4, the deflection must be no more than **1 cm (0.4 inch)**.



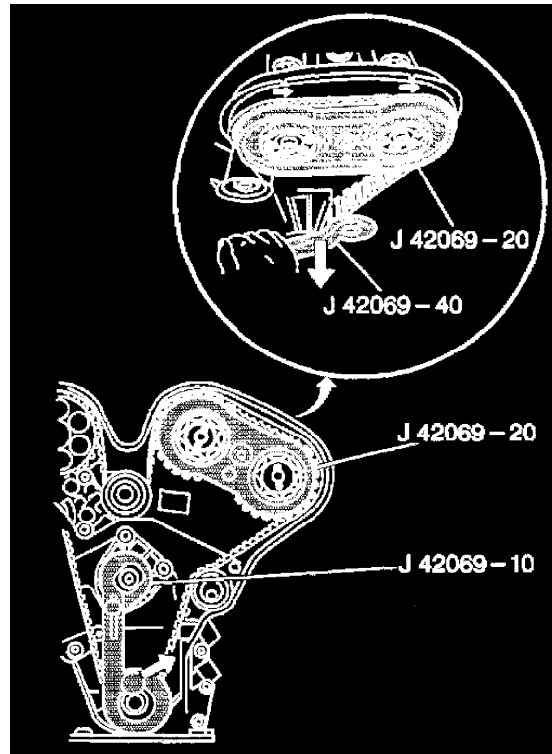
12. If timing belt deflection adjustment is necessary:
 - 12.1. Turn the timing belt idler pulley nut for camshafts 3 and 4 **COUNTERCLOCKWISE**, with J 42069-40 until the high point of the nut is in approximately the 12 o'clock position.
 - 12.2. Tighten the idler pulley locking bolt, while holding the nut with J 42069-40, until snug. The idler pulley bolt will be tightened to specifications after all final adjustments are made.
13. Apply additional tension to the timing belt, at the idler pulley for camshafts 1 and 2, by turning the high point of the nut to approximately the 9 o'clock position. Then, tighten the idler pulley locking bolt, while holding the nut with J 42069-40, until snug. The idler pulley bolt will be tightened to specifications after all final adjustments are made.



14. Set the initial timing belt tension:
 - 14.1. Turn the tensioner nut COUNTERCLOCKWISE to full stop, then, turn the nut back until the reference mark is 1 mm (0.003 inch) over the flange.
 - 14.2. Tighten the timing belt tensioner locking nut until snug, the locking nut will be tightened to specifications after all final adjustments are made.
15. 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.



16. Remove the J 42069-30, the J 42069-1 and the J 42069-2 locking tools from the engine.
17. Rotate the engine, with J 42098 in the clockwise direction two revolutions stopping at 60 degrees BTDC.



18. Install the J 42069-10 to the crankshaft sprocket with the knurled bolt.
19. Turn the crankshaft until the lever of the J 42069-10 firmly contacts the water pump pulley flange.
20. Secure the moveable lever of the tool to the water pump pulley flange.

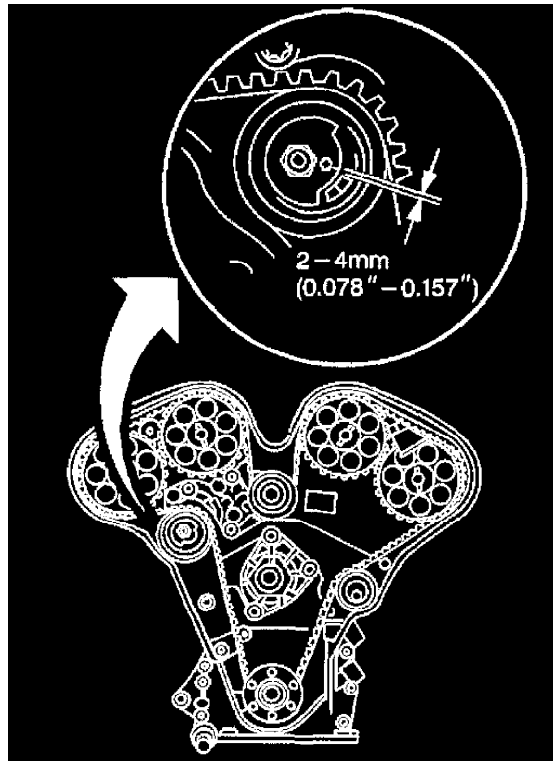
Important: The alignment marks on the timing belt will no longer align with the marks on the camshaft gears after one or more engine revolutions.

21. 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.
22. Use the J 42069-20 to inspect the alignment of camshaft gears 3 & 4.
23. Use the J 42069-20 to inspect the alignment of camshaft gears 1 & 2.

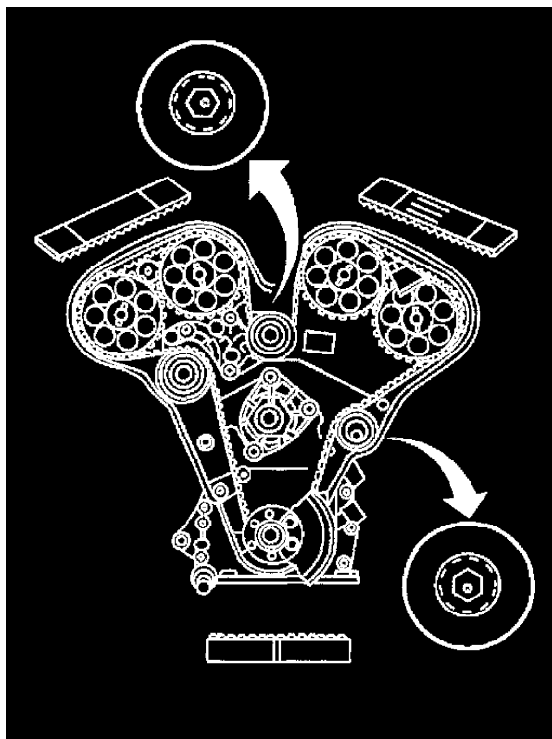
Important: The reference marks on both sets of the camshaft gears must match exactly with the marks on the J 42069-20.

If timing belt adjustment is necessary, always set the adjustment for camshafts 3 and 4 first.

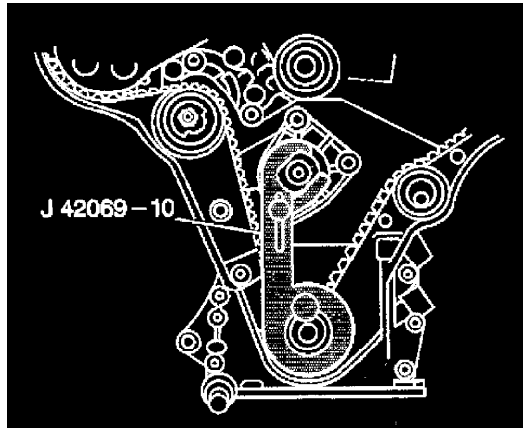
24. If timing belt adjustment IS required, refer to Timing Belt Timing Procedure.



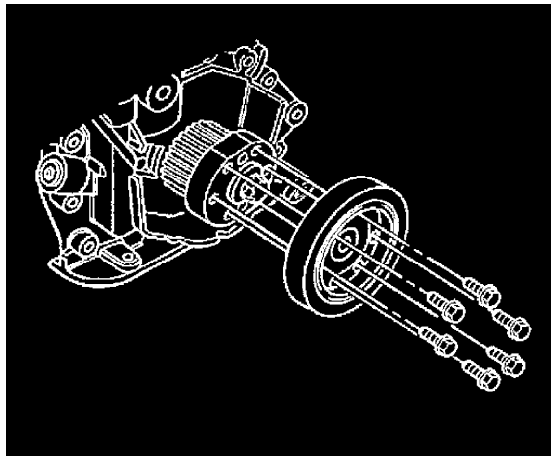
25. If timing belt adjustment IS NOT required, set the final timing belt tension:
- 25.1. Loosen the timing belt tensioner locking nut.
 - 25.2. Turn the locking nut counterclockwise to full stop, then back until the reference mark is 2-4 mm (0.078-0.157 inch) ABOVE the reference mark on the flange.
Tighten
Tighten the timing belt tensioner locking nut **20 Nm (15 ft. lbs.)**.
 - 25.3. Hold the timing belt idler pulley nut in place for camshafts 1 & 2 and 3 & 4 with the J 42069-40.
Tighten
Tighten both idler pulley bolts to **40 Nm (30 ft. lbs.)**.



26. Inspect the high points of the timing belt tensioner nut. The idler pulley nut high point for camshafts 3 and 4 will be in approximately the 12 o'clock position. The idler pulley nut high point for camshafts 1 and 2 will be in approximately the 9 o'clock position.
27. Remove the J 42069-20 and the J 42069-10.
28. For final inspection, rotate the engine in the clockwise direction two revolutions until reaching 60 degrees BTDC.



29. Install the J 42069-10 to the crankshaft sprocket with the knurled bolt.
30. Turn the crankshaft 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.
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 gear and the mark on the oil pump housing.
33. Use the J 42069-20 to inspect the alignment of camshaft gears 3 and 4.
34. Use the J 42069-20 to inspect the alignment of camshaft gears 1 and 2.
35. If the reference marks on the camshaft gears do not match exactly, adjust the timing belt. Refer to Timing Belt Timing Procedure.
36. If the reference marks match exactly and further timing belt adjustment IS NOT necessary, continue with reassembly of the engine:
37. Ensure all tools are removed from the engine.



38. Install the crankshaft balancer to the crankshaft sprocket.
Tighten the crankshaft balancer bolts to **20 Nm (15 ft. lbs.)**.
39. Install the timing belt cover. Refer to Timing Belt Cover Replacement.
40. Install the intake plenum. Refer to Intake Plenum Replacement.
41. Install the intake air resonator. Refer to Intake Air Resonator Replacement in Powertrain Management.