

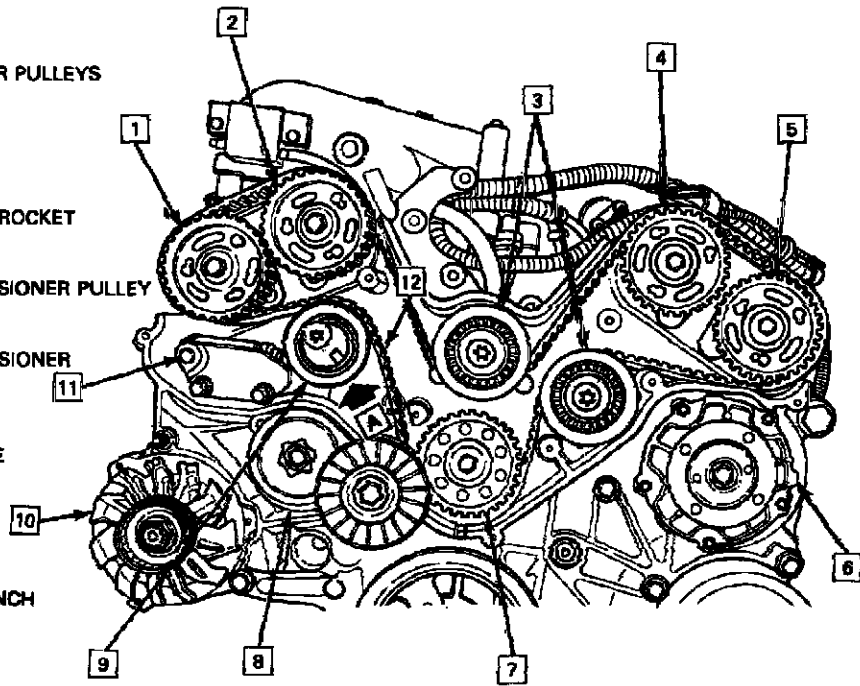
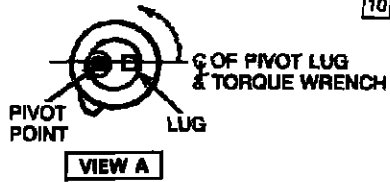
Timing Belt: Service and Repair

Camshaft Timing

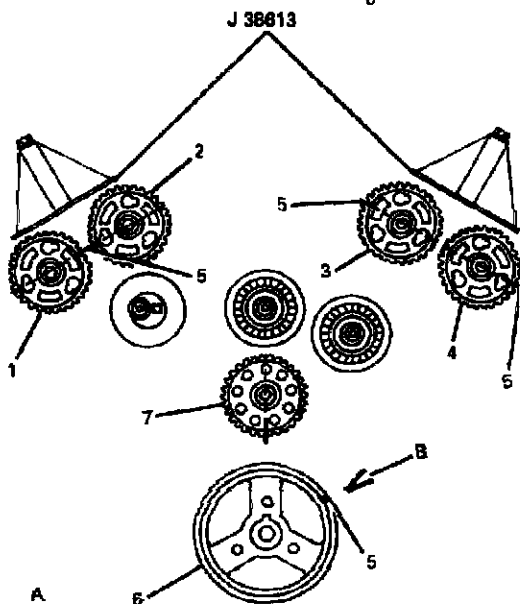
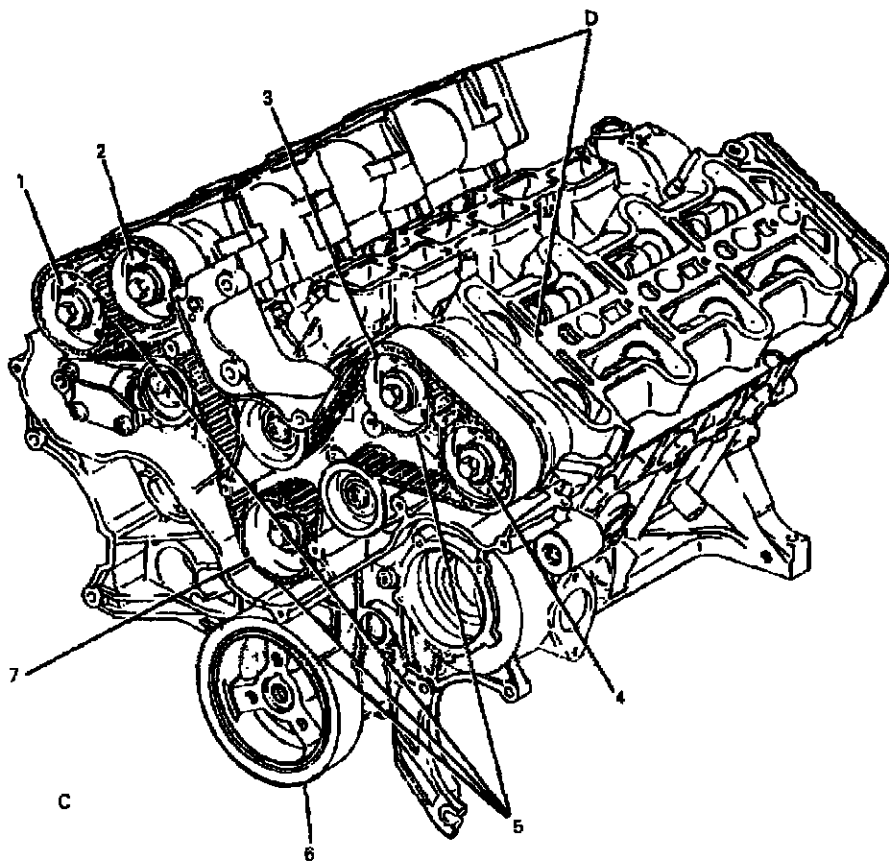
COMPLETE CAM TIMING PROCEDURE

- 1 EXHAUST CAMSHAFT (RIGHT)
- 2 INTAKE CAMSHAFT (RIGHT)
- 3 SECONDARY TIMING BELT IDLER PULLEYS
- 4 INTAKE CAMSHAFT (LEFT)
- 5 EXHAUST CAMSHAFT (LEFT)
- 6 COOLANT PUMP
- 7 INTERMEDIATE SHAFT BELT SPROCKET
- 8 SERPENTINE BELT TENSIONER
- 9 SECONDARY TIMING BELT TENSIONER PULLEY
- 10 GENERATOR
- 11 SECONDARY TIMING BELT TENSIONER
- 12 SECONDARY TIMING BELT

**NOTE: START AT #7
AND INSTALL COUNTERCLOCKWISE**



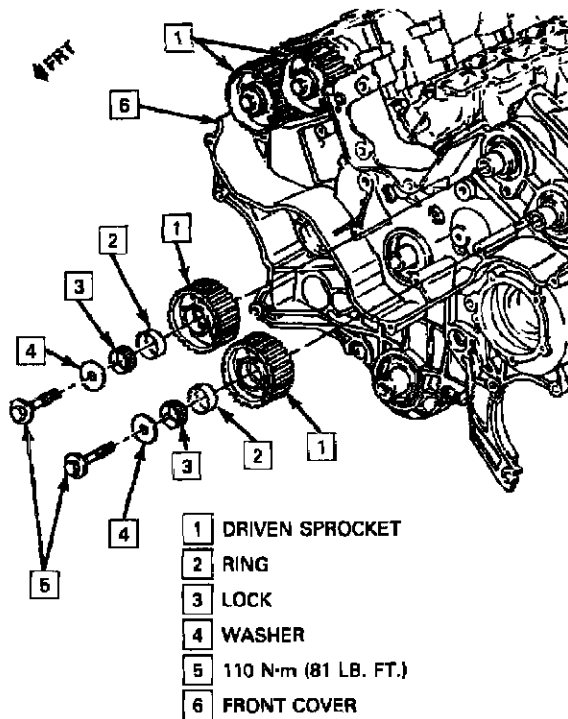
Timing Belt Routing



- A LOCATION OF TIMING MARKS WITH CAM HOLD DOWN TOOLS J 38813 INSTALLED
- B FRONT COVER TIMING MARK
- C LOCATION OF TIMING MARKS WITH DRIVE BELT INSTALLED
- D LOCATION WHERE CAM HOLD DOWN TOOLS ARE INSTALLED

- 1 RH EXHAUST CAMSHAFT SPROCKET
- 2 RH INTAKE CAMSHAFT SPROCKET
- 3 LH INTAKE CAMSHAFT SPROCKET
- 4 LH EXHAUST CAMSHAFT SPROCKET
- 5 PERMANENT MARKS PAINTED DOTS REMOVE PREVIOUS MARKS IF TIMING IS BEING CHANGED AND MARK AGAIN IN THESE LOCATIONS
- 6 TORSIONAL DAMPER
- 7 INTERMEDIATE SHAFT SPROCKET

NOTE: THIS TDC #1 EXHAUST. INTERMEDIATE SHAFT BELT SPROCKET TIMING MARK IS AT 6 O'CLOCK (POINTING TOWARDS DRAIN NOTCH)



Cam Carrier Sprockets

NOTE: GM does not provide a timing mark diagram for belt installation without using the special tool(s) listed below.

TOOLS REQUIRED:

- ^ J 38613 Cam Hold Down Tool
- ^ J 38614 Cam Sprocket Holding Tool

NOTICE: If only one (1) bank is to be timed, make sure bank to bank cam timing relationship is one (1) revolution a part. Timing flats should be 180 degrees opposite (right bank versus left bank) when finally timed.

1. Remove all spark plugs.
2. Remove all camshaft sprockets.

IMPORTANT: Remove oil from cam hold down tool bolt hole in carrier before installing and tightening bolt.

3. Rotate camshaft flats "up" and install J 38613. Tighten cam hold down tool bolt to 30 Nm (22 lb. ft.).
4. Install all camshaft sprockets.
5. Timing belt by routing it around the idlers and sprockets. DO NOT bend, kink, or pry on belt as damage may occur.
 - A. Start at intermediate cam sprocket and work counterclockwise.
 - B. Make sure the belt is installed in direction of rotation.
 - C. Engage teeth into all sprockets, place rubber hose behind belt at intermediate sprocket and accumulate slack at tensioner location.
6. Tensioner pulley to mounting base.
 - ^ Use flat magnet, tape or cup plug to hold pivot tube in pulley during this step. Otherwise, pivot tube may fall out.
 - ^ After starting pivot bolt, rotate arm counterclockwise to position square lug at 6 o'clock.

TIGHTEN

- ^ Tensioner pulley bolt to 15 Nm (11 lb. ft.) + 400, using J 36660, or
- ^ Tensioner pulley bolt to 50 Nm (37 lb. ft.).

IMPORTANT: The arm bushing and pivot must be clean and NOT LUBRICATED.

7. Actuator and side plate.

INSPECT

- ^ The installed actuator assembly to assure it is free and rotates under its own weight.

8. Pull paper clip (retaining pin), using needle pliers, and discard allowing the pulley to move into the belt.
9. Gently rotate the tensioner pulley 10-15 Nm (89 lb. in. - 11 lb. ft.) counterclockwise in to the belt using the square lug in the arm and

engage the actuator shaft in the arm socket.

10. Rotate engine clockwise (direction of engine rotation as viewed from the front) 3 times minimum to seat the belt. Align the crankshaft reference marks during final rotation to TDC.
 - ^ DO NOT REVERSE ROTATION OF ENGINE.
11. Rotate the tensioner pulley counterclockwise applying 16-20 Nm (12-15 lb. ft.) torque.
 - ^ Use a helper to hold the crankshaft at TDC, and keep it from springing back.
12. Seat lock ring on the right exhaust and right intake camshaft into the bore by threading in the attaching bolt.

TIGHTEN

- ^ Hold sprocket from turning using J 38614.
 - ^ Running torque that is, before seating) of bolt should be 6-90 Nm (44-66 lb. ft.).
 - ^ If less torque is required before seating, the shim ring and lock ring must be replaced and inspect the nose of the camshaft for brinelling.
 - ^ If more torque above 90 Nm (66 lb. ft.) is encountered before seating, the shim ring and lock ring must be replaced and inspect the attaching bolt threads for burrs and/or foreign material.
 - ^ Seating of the lock ring is accomplished when edge is flush with sprocket hub.
 - ^ Bolt to 110 Nm (81 lb. ft.) to complete this step.
13. Remove J 38613 - right hand side only.
 14. Rotate engine clockwise one revolution and realign the balancer marks at TDC. DO NOT REVERSE ROTATION OF ENGINE.
 - ^ Make sure timing mark on damper lines up with front cover timing mark.
 - ^ Use a helper to hold crankshaft from springing back.
 15. Repeat step 12 for the left intake camshaft and then the left exhaust camshaft.
 16. Remove J 38613 - left side.
 17. Remove old timing marks. Mark the positions of each sprocket at TDC # 1 exhaust position with permanent paint.
 18. Secondary timing belt cover.
 19. Install cam carrier covers.

ALIGNING TIMING MARKS

If a valve timing driveability problem is discovered, it is not always necessary to go through a complete retiming of the valve train. Check to find the cause of the problem. If the problem is found to be a slipped belt, find the reason for the slipping and retime the valve train. If the problem is caused by the cam sprockets moving position in reference to the camshafts, a complete retiming will have to be performed.