

## GENERAL MOTORS

## 3.2L V6

**MANUFACTURER'S SUGGESTED SCHEDULED MAINTENANCE**

The manufacturer recommends that the timing belt be replaced at 100,000 miles or every 96 months, whichever occurs first.

**REMOVAL & INSTALLATION**

**CAUTION:** This application is an interference engine. Do not rotate camshaft or crankshaft when timing belt is removed, or engine damage may occur.

**TIMING BELT****Removal**

1. Using scan tool, inspect the cold start counter (also known as heavy duty register). If there are any cold starts below -20°F (28°C), visually inspect timing belt for cracks and replace as necessary. If belt is replaced, clear the cold start counter. If belt is not replaced, do not clear the cold start counter.
2. Disconnect air intake duct hose from Mass Airflow (MAF)/Intake Air Temperature (IAT) sensor. Remove bolt securing intake air resonator to cooling fan assembly. Disconnect air intake duct hoses from throttle body. Lift intake air resonator from front frame to access the electrical connector and vacuum hoses. Disconnect intake resonance switchover solenoid connector.

**NOTE:** Note vacuum hose routing for reassembly.

3. Disconnect vacuum hoses from the coolant by-pass solenoid, intake plenum switchover solenoid and vacuum brake booster hose. Positioning the surge tank inlet and upper radiator hoses aside, remove intake air resonator.
4. Remove intake plenum air inlet hose clamps and hoses from throttle body. Disconnect fuel pressure regulator atmospheric vent tube from bottom of throttle body. Remove throttle body from intake plenum and crankcase vent adapter, and allow it to be supported by the throttle body inlet heater hose. Remove throttle body "O" ring seals.
5. Remove 3 bolts holding crankcase vent adapter to intake plenum. Lift crankcase vent adapter from intake plenum, and position aside. See **Fig. 1**. Disconnect crankcase

- ventilation dirty air hose retainer from fuel pipe. Remove remote power steering fluid reservoir bottom and side mounting bolts, and position aside.
6. Disconnect electrical connector and vacuum hose from switchover valve at rear of plenum. See **Fig. 2** . Remove bolt holding throttle body heater inlet hose/pipe to intake plenum. Disconnect vacuum brake booster hose from vacuum source. Remove 2 bolts securing Engine Control Module (ECM) bracket to intake plenum. See **Fig. 3** .
  7. Remove intake plenum bolt caps and bolts. Lift intake plenum from intake manifold. Remove intake plenum "O" ring seals. Mask off intake manifold ports to prevent foreign objects from entering engine.
  8. Rotate drive belt tensioner clockwise to release drive belt tension. Slide drive belt from water pump pulley. Allow drive belt tensioner to return to relaxed position. Remove accessory drive belt. Remove drive belt tensioner. Remove water pump pulley. See **Fig. 4** .
  9. Remove power steering pump mounting bolts ONLY. Remove power steering pump from accessory mounting bracket, and position aside. Remove timing belt cover. Remove crankshaft balancer from crankshaft sprocket.
  10. Using Crank Hub Torx Socket (J-42098), rotate engine clockwise until No. 1 cylinder is at TDC on the compression stroke. Timing marks on camshaft gears should be aligned with corresponding notches on rear timing belt cover, and marks on crankshaft sprocket and oil pump housing should align. See **Fig. 5** .
  11. Using crank hub torx socket, rotate crankshaft counterclockwise until 60 degrees BTDC. The 60 degree BTDC point can be identified by index mark on oil pump cover. See **Fig. 6** .

**NOTE:**      **Ensure moveable lever is positioned toward crankshaft.**

12. Install the Crankshaft Holder (J-42069-10) from Timing Belt Alignment Kit (J-42069) to the crankshaft sprocket with the knurled bolt. See **Fig. 7** . Using crank hub torx socket, rotate crankshaft clockwise until lever of crankshaft holder firmly contacts water pump pulley flange. Ensure No. 1 cylinder is at TDC. Secure moveable lever of tool to water pump pulley flange.

**CAUTION:** **Ensure crankshaft is not 180 degrees off TDC. Reference marks on camshaft gears should be aligned with corresponding notches on rear timing belt cover at this point. If they are not aligned, engine is 180 degrees off.**

13. Install the Camshaft Gear Holders (J-42069-1 and J-42069-2) to camshaft gears. See **Fig. 8** . If either tool does 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 tool can be

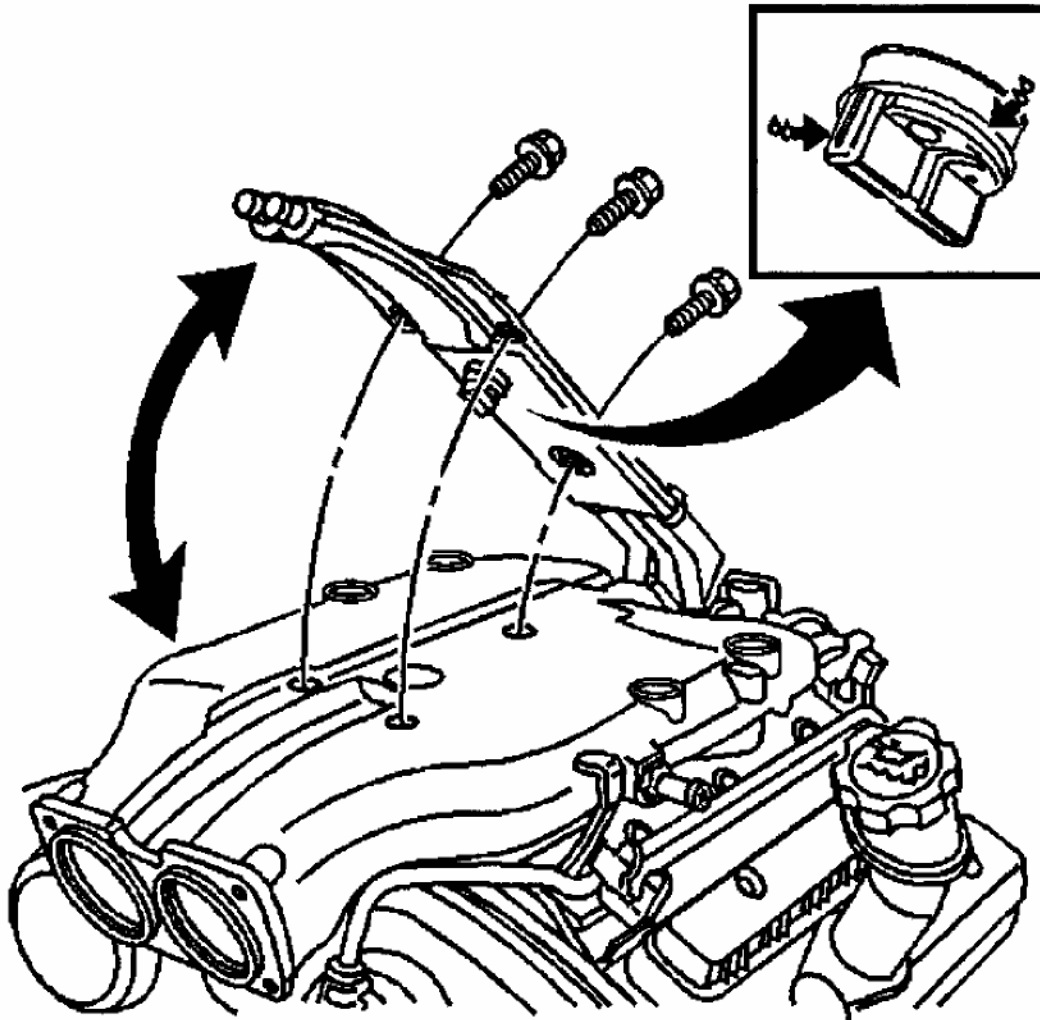
inserted.

14. Loosen timing belt tensioner nut. Loosen upper idler pulley bolt. Remove lower idler pulley bolt. Remove lower idler pulley and spacer.

**CAUTION: DO NOT turn camshaft and crankshaft independently after timing belt is removed. If turned, interference may occur among pistons and valves, and related components may be damaged.**

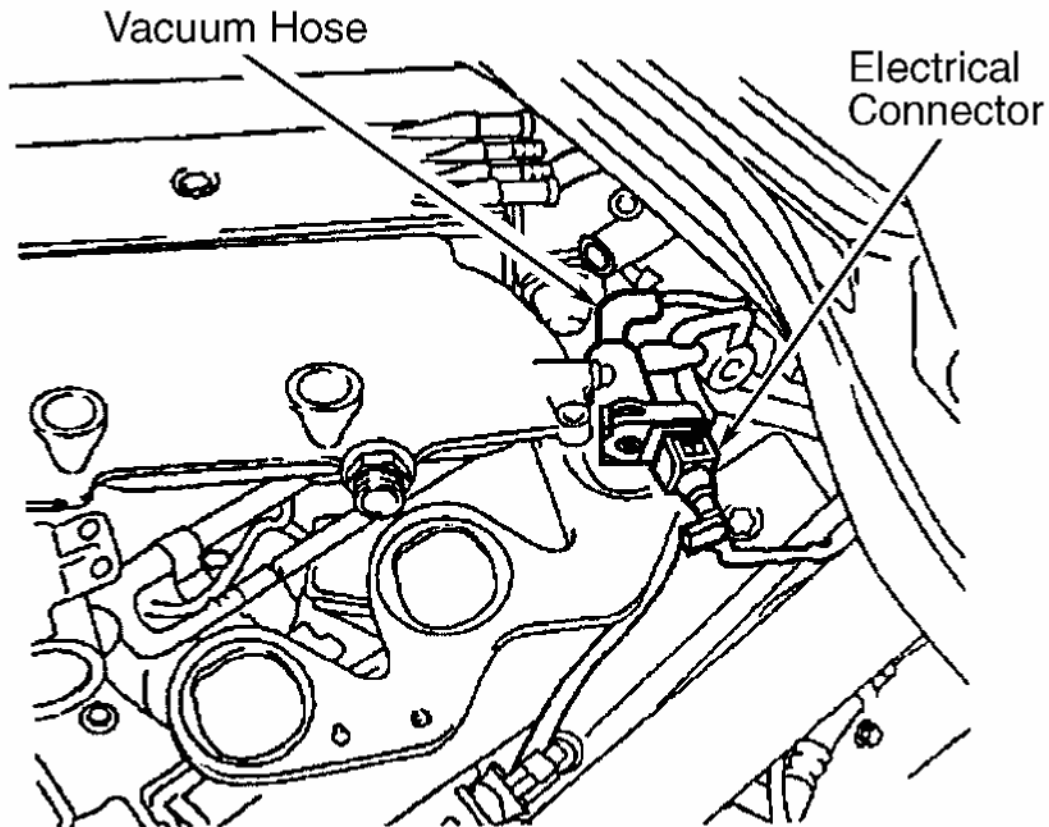
**CAUTION: DO NOT remove the camshaft gear holders from camshaft gears while timing belt is removed.**

15. Remove the crankshaft holder from crankshaft sprocket. If belt is to be reused, mark direction of rotation for reinstallation reference. Remove timing belt.



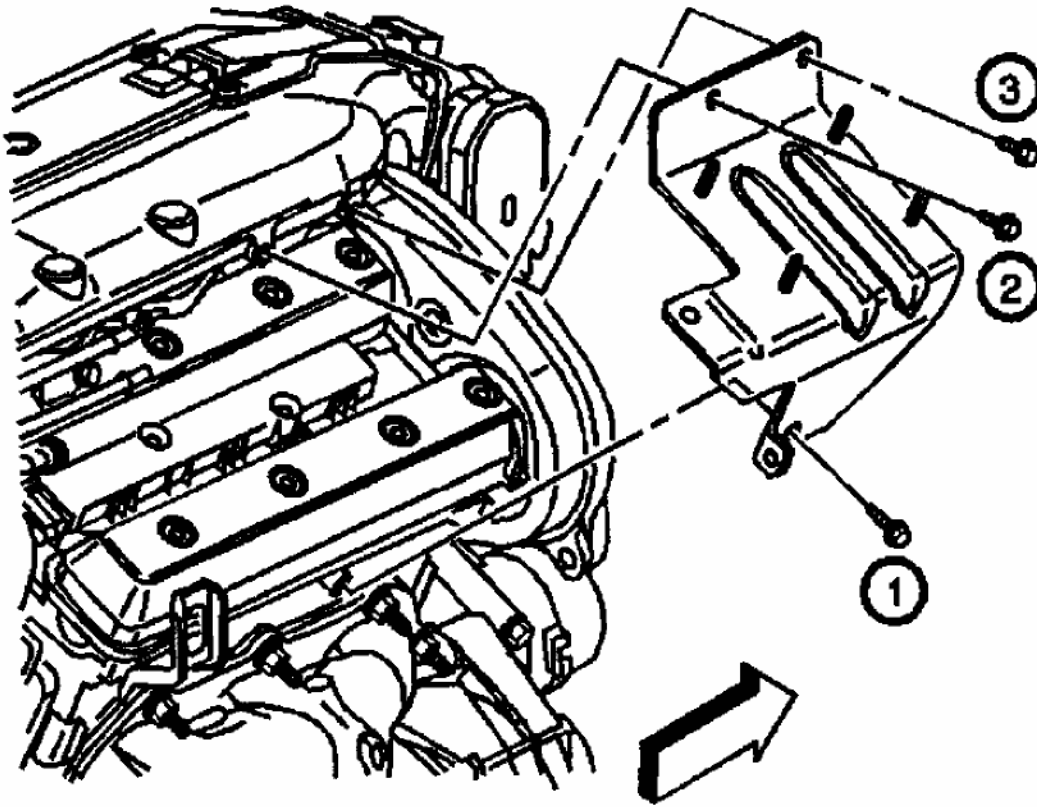
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**Fig. 1: Removing Crankcase Vent Adapter**  
Courtesy of GENERAL MOTORS CORP.



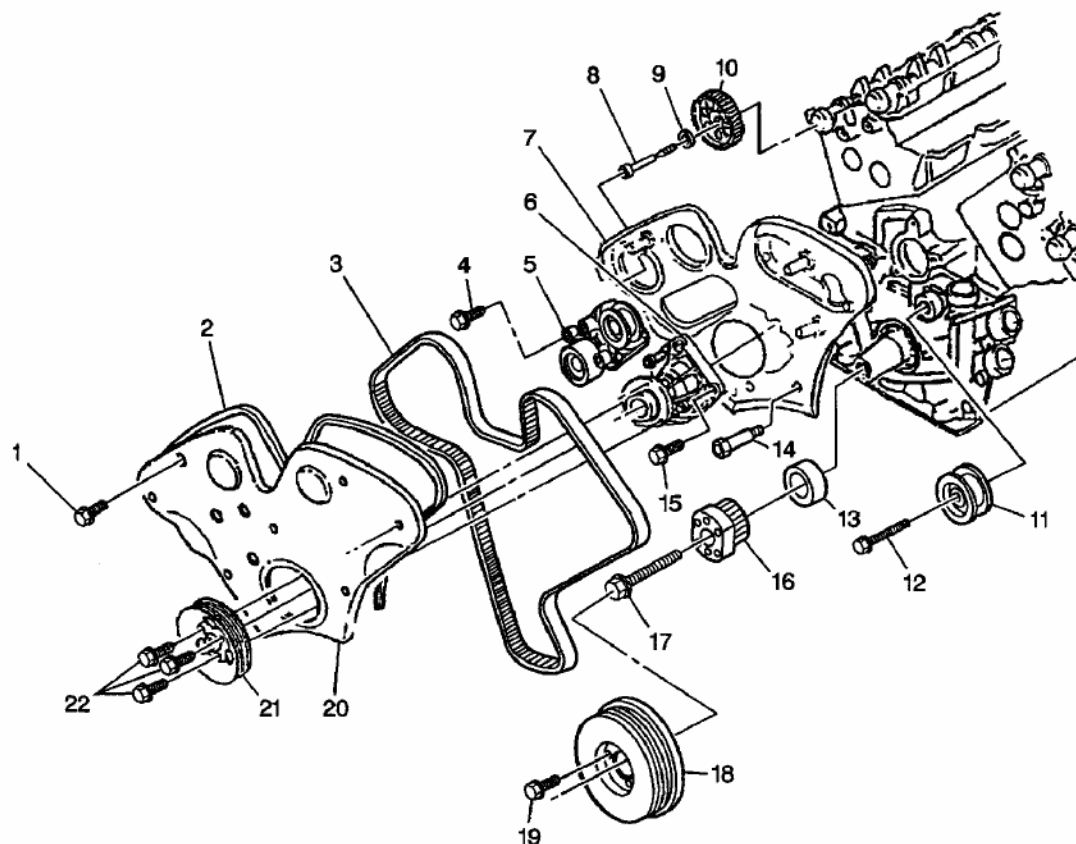
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**Fig. 2: Disconnecting Electrical Connector & Vacuum Hose From Switchover Valve**  
Courtesy of GENERAL MOTORS CORP.



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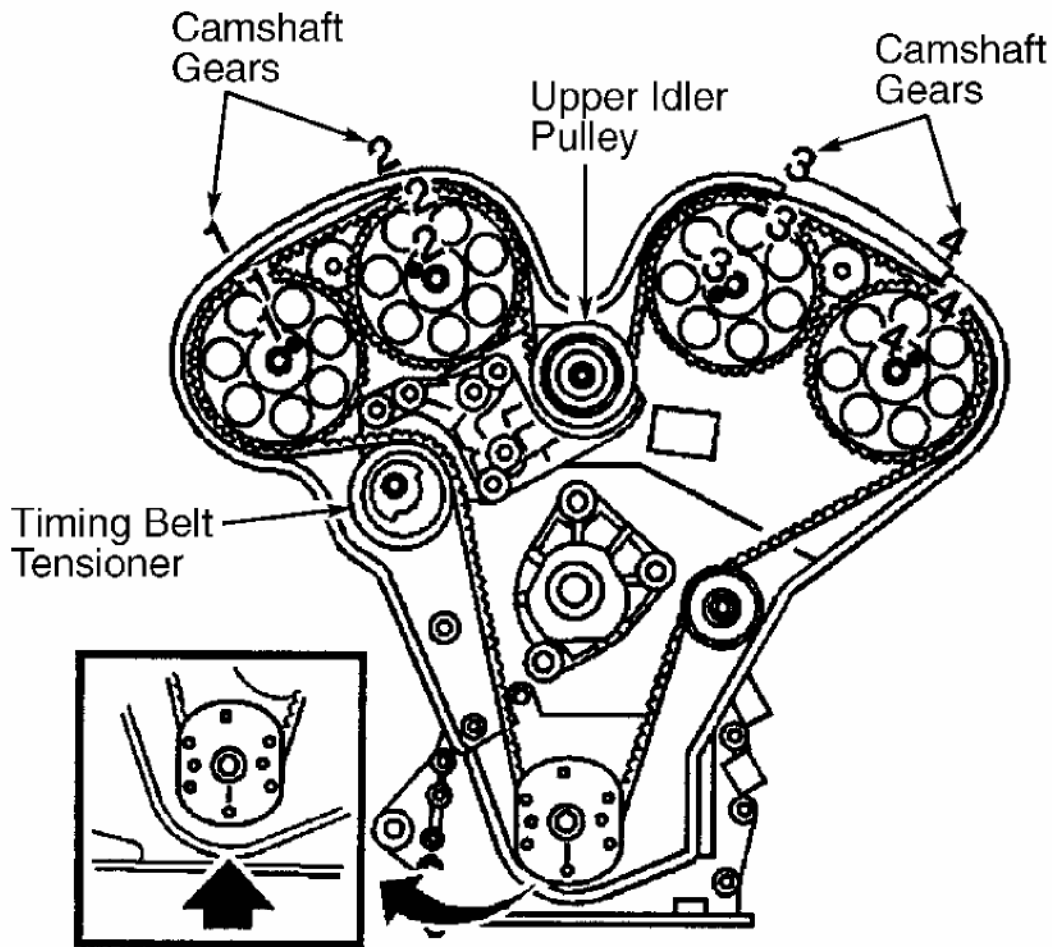
**Fig. 3: Removing & Installing ECM Bracket**  
Courtesy of GENERAL MOTORS CORP.



- |                                                                               |                                  |
|-------------------------------------------------------------------------------|----------------------------------|
| (1) Timing Belt Front Cover Bolt                                              | (12) 3-4 Timing Belt Idler Bolt  |
| (2) Timing Belt Front Cover Seal                                              | (13) Oil Pump Collar             |
| (3) Timing Belt                                                               | (14) Timing Belt Rear Cover Bolt |
| (4) Timing Belt Tensioner Bracket Bolt                                        | (15) Water Pump Bolt             |
| (5) Timing Belt Tensioner Bracket, Includes<br>1-2 Idler Pulley and Tensioner | (16) Crankshaft Pulley           |
| (6) Water Pump                                                                | (17) Crankshaft Pulley Bolt      |
| (7) Timing Belt Rear Cover                                                    | (18) Crankshaft Balancer         |
| (8) Camshaft Sprocket Bolt                                                    | (19) Crankshaft Balancer Bolt    |
| (9) Camshaft Sprocket Washer                                                  | (20) Timing Belt Front Cover     |
| (10) Camshaft Sprocket                                                        | (21) Water Pump Pulley           |
| (11) 3-4 Timing Belt Idler                                                    | (22) Water Pump Pulley Bolts     |

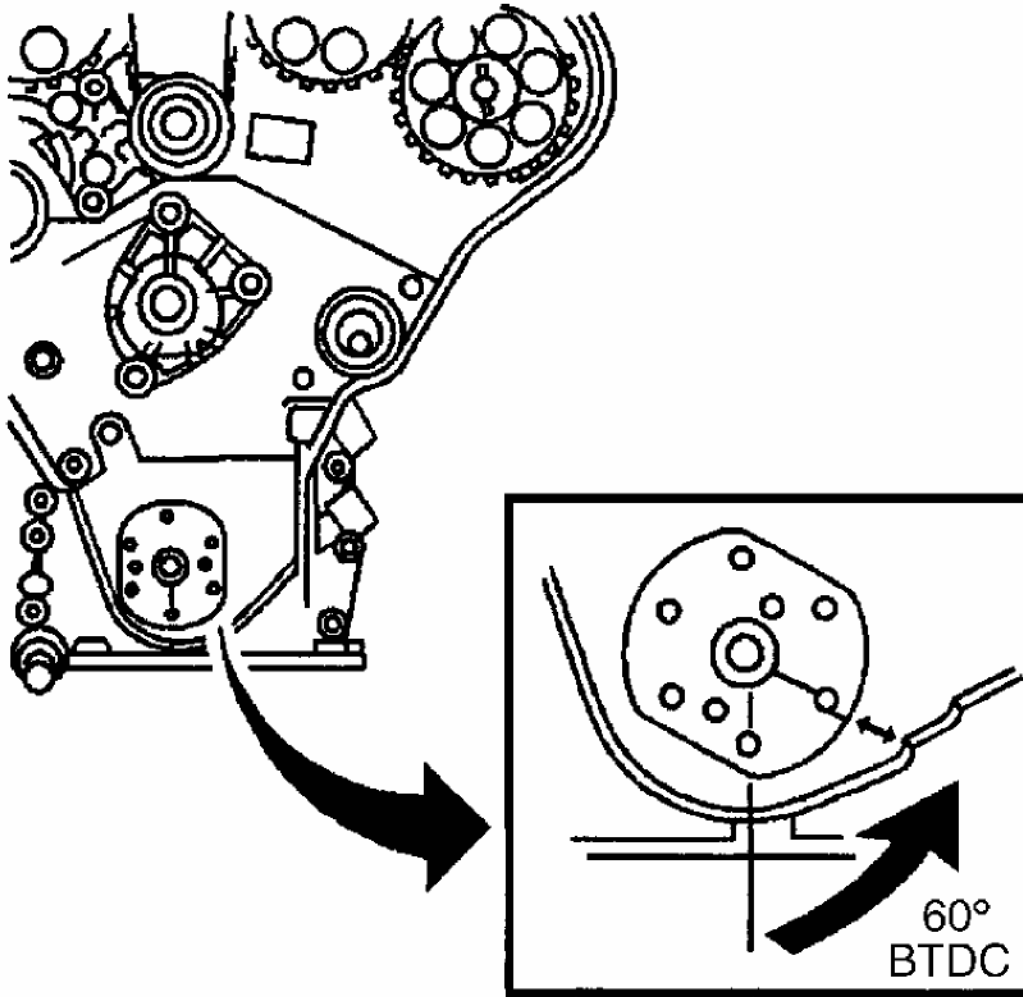
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**Fig. 4: Exploded View Of Timing Belt & Components**  
**Courtesy of GENERAL MOTORS CORP.**



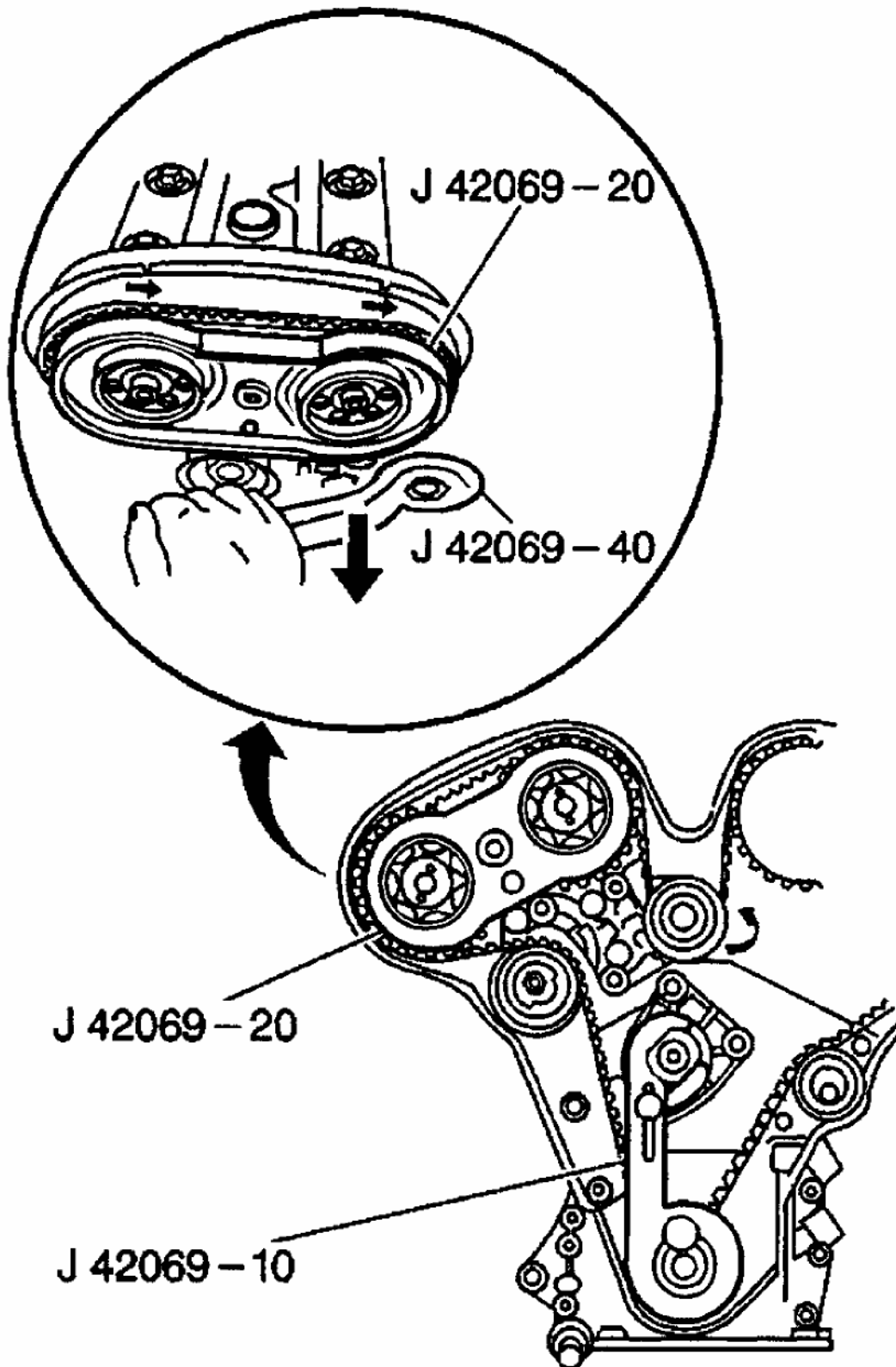
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**Fig. 5: Rotating Crankshaft Clockwise**  
**Courtesy of GENERAL MOTORS CORP.**

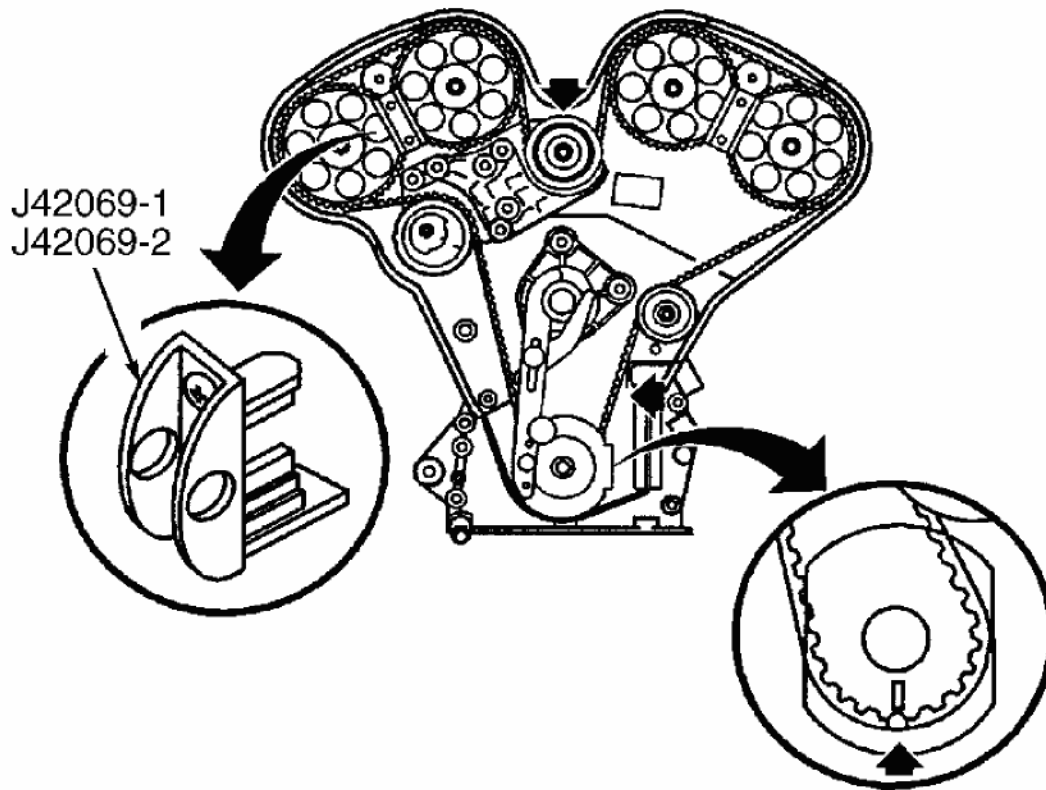


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**Fig. 6: Positioning Crankshaft At 60 Degrees BTDC**  
**Courtesy of GENERAL MOTORS CORP.**



**Fig. 7: Installing Crankshaft Holder & Other Tools**  
Courtesy of GENERAL MOTORS CORP.



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**Fig. 8: Installing Locking Tools To Camshaft Gears**  
Courtesy of GENERAL MOTORS CORP.

#### Inspection

1. Check if a tooth is broken and/or a tooth root is cracked. Possible causes are a jammed camshaft, damaged camshaft, damaged crankshaft oil seal and/or coolant leak, old age or malfunctioning tensioner.
2. Check if the back surface of the belt is cracked, worn, scratched or scored. Possible causes are excessive cold starts, jammed tensioner, overheated engine or belt cover interference.
3. Check if the side of the belt surface is worn. Possible causes are improper belt installation, overload or misalignment of cam drive components, jammed tensioner, heavy thrust loading against idler guide flanges or damaged idler guide.

4. Check if the teeth are worn. Possible causes are poor belt cover sealing, excessive belt tension, jammed tensioner, or rough and/or scored cam sprockets.
5. Check if there is a clean break across the fibers. Possible causes are kinked belt before and/or during assembly or foreign material under belt.
6. Check if oil or coolant is impregnated and/or there is a swollen belt. Possible causes are poor oil sealing, coolant leak at pump or poor belt cover seal.

### Installation

**CAUTION: Install timing belt with engine at room temperature. Ensure directional arrows on timing belt are matched with the clockwise rotation of the crankshaft, or excessive wear and timing belt failure may occur.**

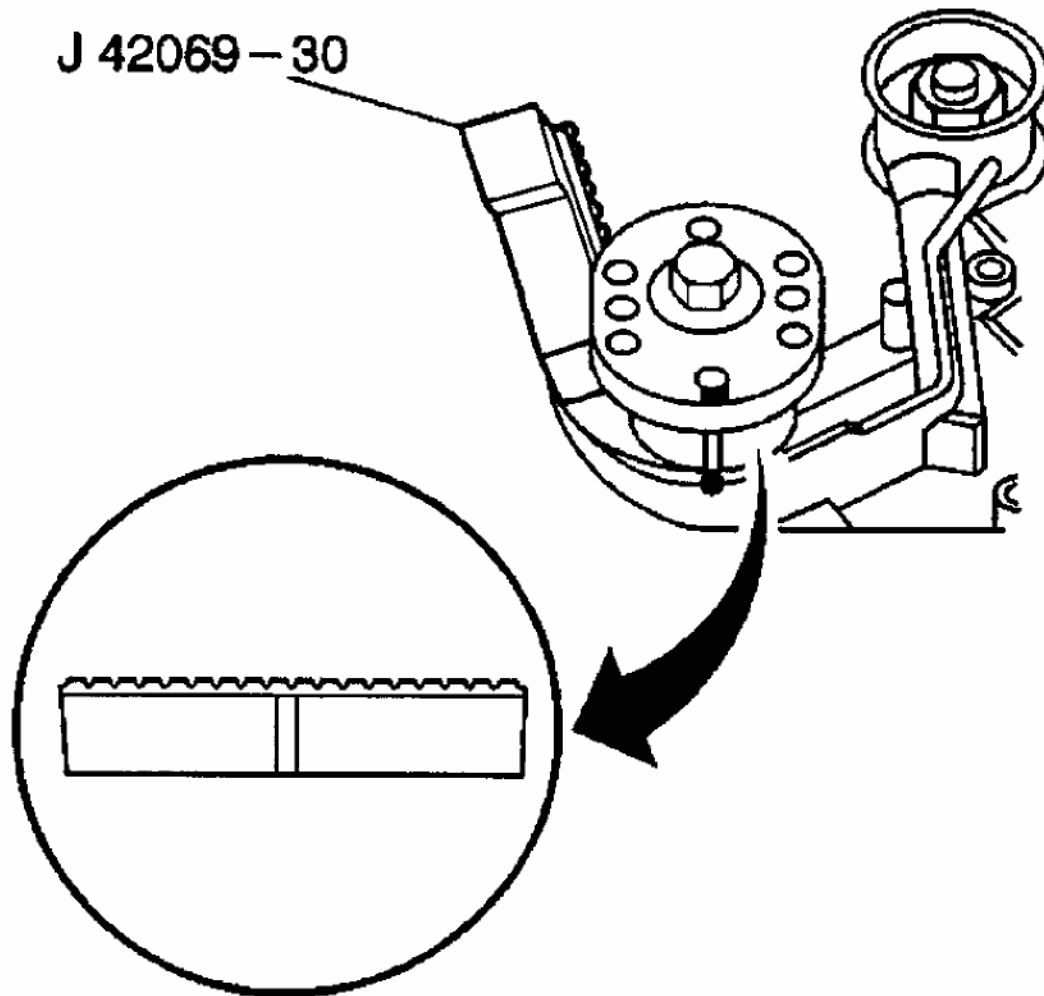
1. Starting at crankshaft sprocket, align double dash TDC mark on timing belt with marks on oil pump housing and crankshaft sprocket. Wedge the Timing Belt Holder (J-42069-30) between oil pump housing and timing belt in order to prevent the belt teeth from jumping the crankshaft sprocket teeth. See **Fig. 9**.
2. Route timing belt through timing belt tensioner. See **Fig. 5**. Slip the timing belt through camshaft gears No. 1 and 2 simultaneously, ensuring dash marks on timing belt align with marks on camshaft gears and notches on rear timing belt cover. Route belt through upper idler pulley. Slip belt through camshaft gears No. 3 and 4 simultaneously, ensuring dash marks on timing belt align with marks on camshaft gears and notches on rear timing belt cover.
3. Using Crank Hub Torx Socket (J-42098), rotate crankshaft counterclockwise to 3 degrees BTDC, allowing timing belt to slide on the timing belt holder. See **Fig. 10**. Install lower idler pulley and spacer with the timing belt. Install lower idler pulley bolt, and tighten to specification. See **TORQUE SPECIFICATIONS**. Rotate crankshaft clockwise back to TDC.
4. Apply tension to timing belt at upper idler pulley by turning high point of eccentric to approximately the 9 o'clock position. While holding eccentric with the Wrench (J-42069-40), tighten idler pulley locking bolt until snug. See **Fig. 5**.
5. To set initial timing belt tension, rotate tensioner eccentric counterclockwise to full stop, then turn eccentric back until reference mark is 0.03" (1 mm) over the flange. See **Fig. 11**. Tighten tensioner locking nut until snug.
6. Ensure alignment marks on timing belt are aligned with timing marks on camshaft gears, rear timing belt cover and oil pump housing. See **Fig. 12**. Remove the timing belt holder and the Camshaft Gear Holders (J-42069-1 and J-42069-2) from engine. See **Fig. 8** and

**Fig. 9** .

7. Using crank hub torx socket, rotate crankshaft clockwise 2 revolutions until No. 1 cylinder is 60 degrees BTDC. See **Fig. 6** . Install the Crankshaft Holder (J-42069-10) to crankshaft sprocket with the knurled bolt. See **Fig. 7** . Rotate crankshaft clockwise until lever of the crankshaft holder firmly contacts water pump pulley flange, and secure lever to flange.

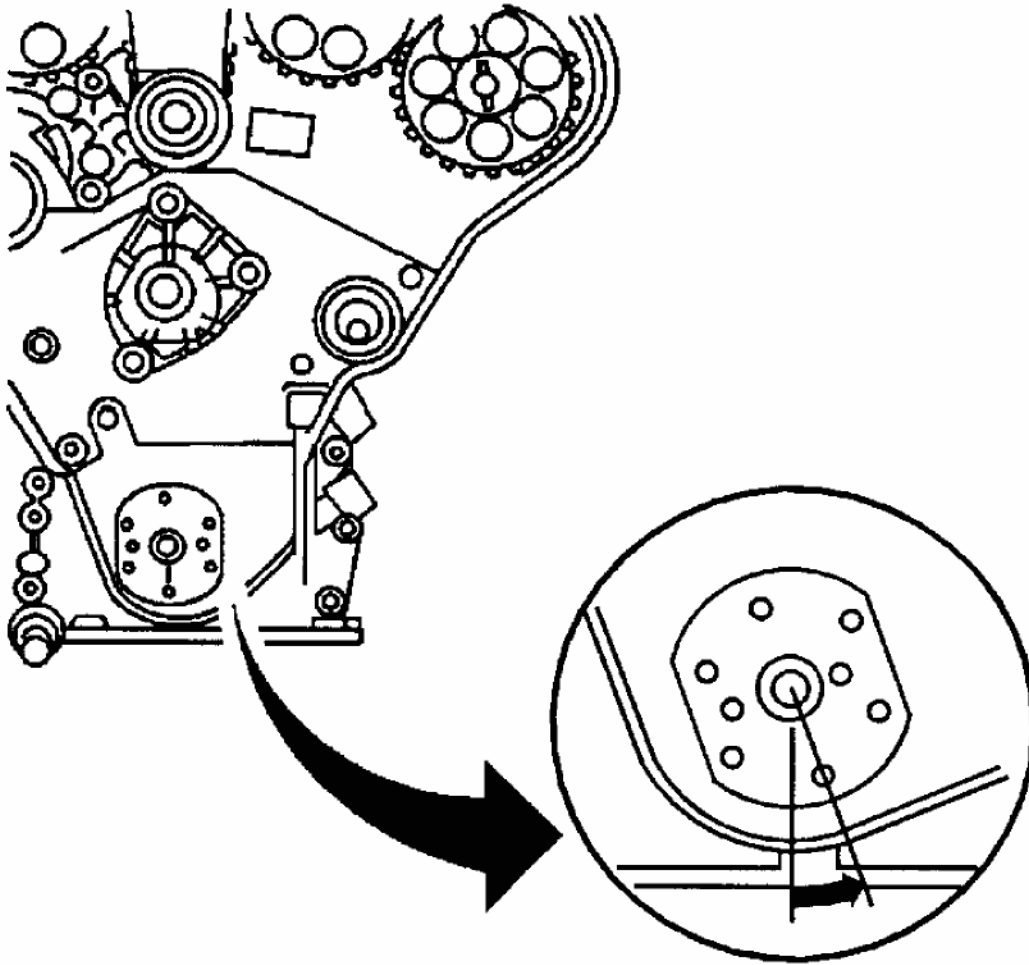
**NOTE:**      **After one or more engine revolutions, alignment marks on timing belt will no longer align with marks on camshaft gears.**

8. Ensure timing marks on camshaft gears are aligned with notches on rear timing belt cover, and marks on crankshaft sprocket and oil pump housing are aligned. See **Fig. 13** . Using the Checking Gauge (J-42069-20), inspect alignment of camshaft gears No. 3 and 4, then gears No. 1 and 2. See **Fig. 7** . If adjustment is required, see **TIMING BELT ADJUSTMENTS** .
9. If adjustment is not required, loosen timing belt eccentric locking nut. If installing a new belt, turn eccentric counterclockwise to full stop, then back until reference mark is 0.118-0.157" (3-4 mm) above datum line. See **Fig. 14** . If installing a used belt, turn eccentric counterclockwise to full stop, then back until reference mark is aligned with the datum line. Tighten timing belt tensioner eccentric locking nut to specification. See **TORQUE SPECIFICATIONS** .
10. Using the wrench, hold upper idler pulley eccentric in place, and tighten pulley bolt to specification. See **Fig. 7** . See **TORQUE SPECIFICATIONS** . Remove the checking gauge from camshaft gears. Remove the crankshaft holder from engine.
11. For final inspection, repeat steps 7 and 8 . If timing marks are aligned, remove tools from engine. To complete installation, reverse removal procedures. Tighten all fasteners to specification. See **TORQUE SPECIFICATIONS** . Lightly coat intake plenum "O" ring seals and crankcase vent adapter seal with clean engine oil. Adjust driving belt tension.



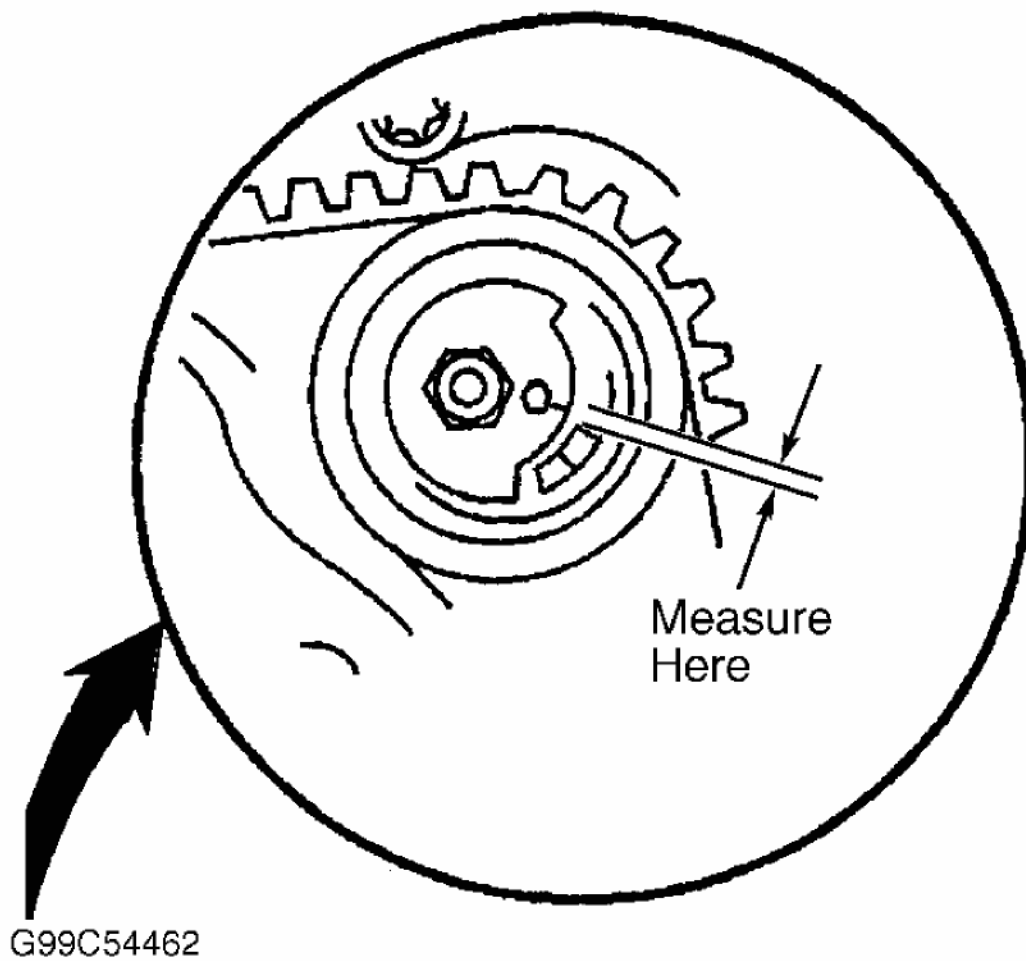
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**Fig. 9: Aligning Timing Belt Marks On Crankshaft Pulley**  
Courtesy of GENERAL MOTORS CORP.

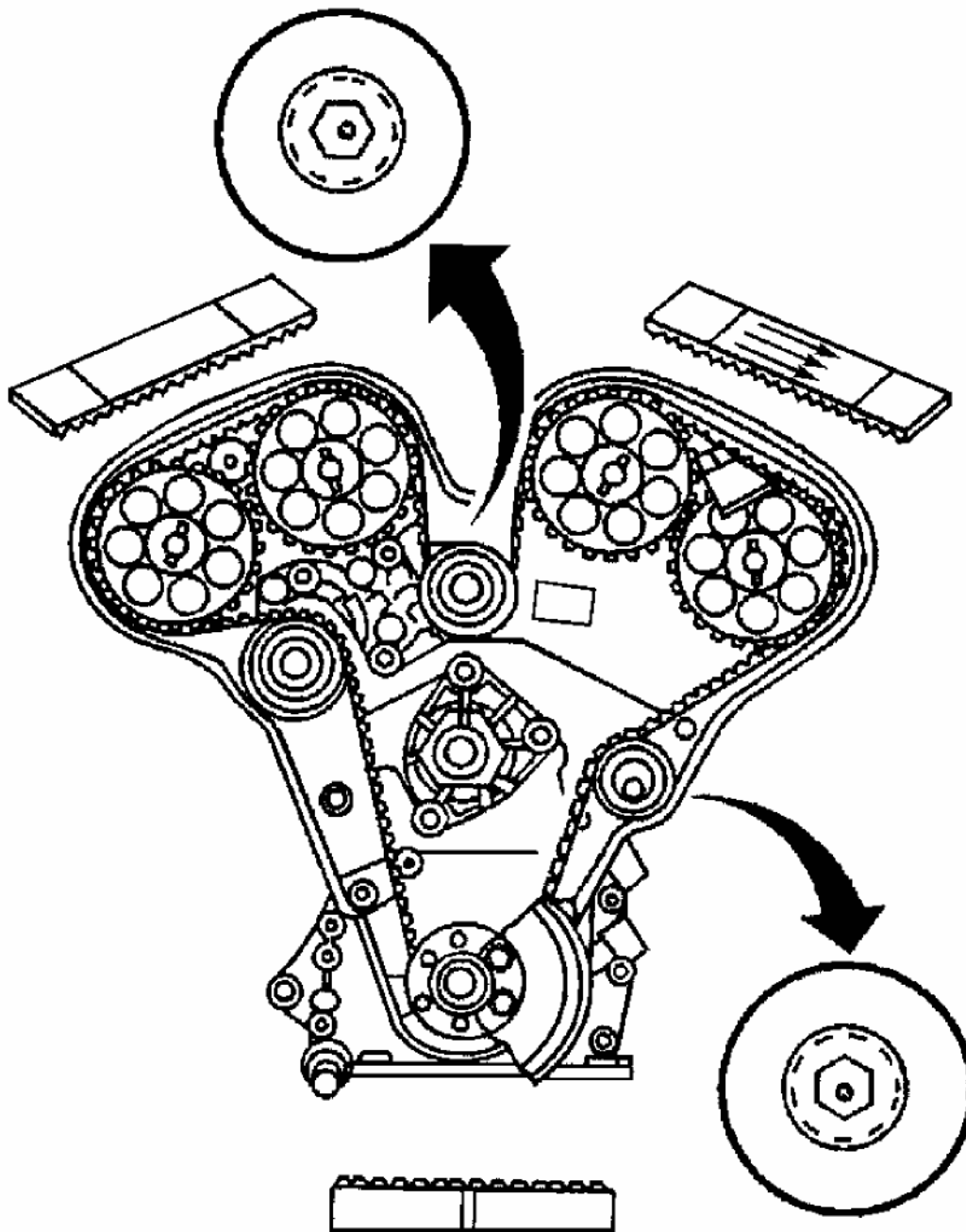


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**Fig. 10: Positioning Crankshaft At 3 Degrees BTDC**  
**Courtesy of GENERAL MOTORS CORP.**

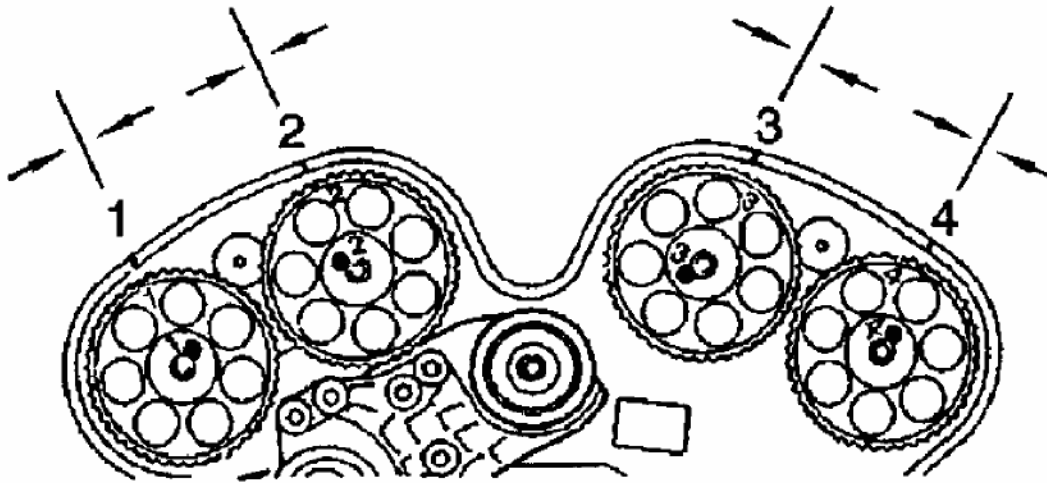


**Fig. 11: Adjusting Timing Belt Tension**  
**Courtesy of GENERAL MOTORS CORP.**



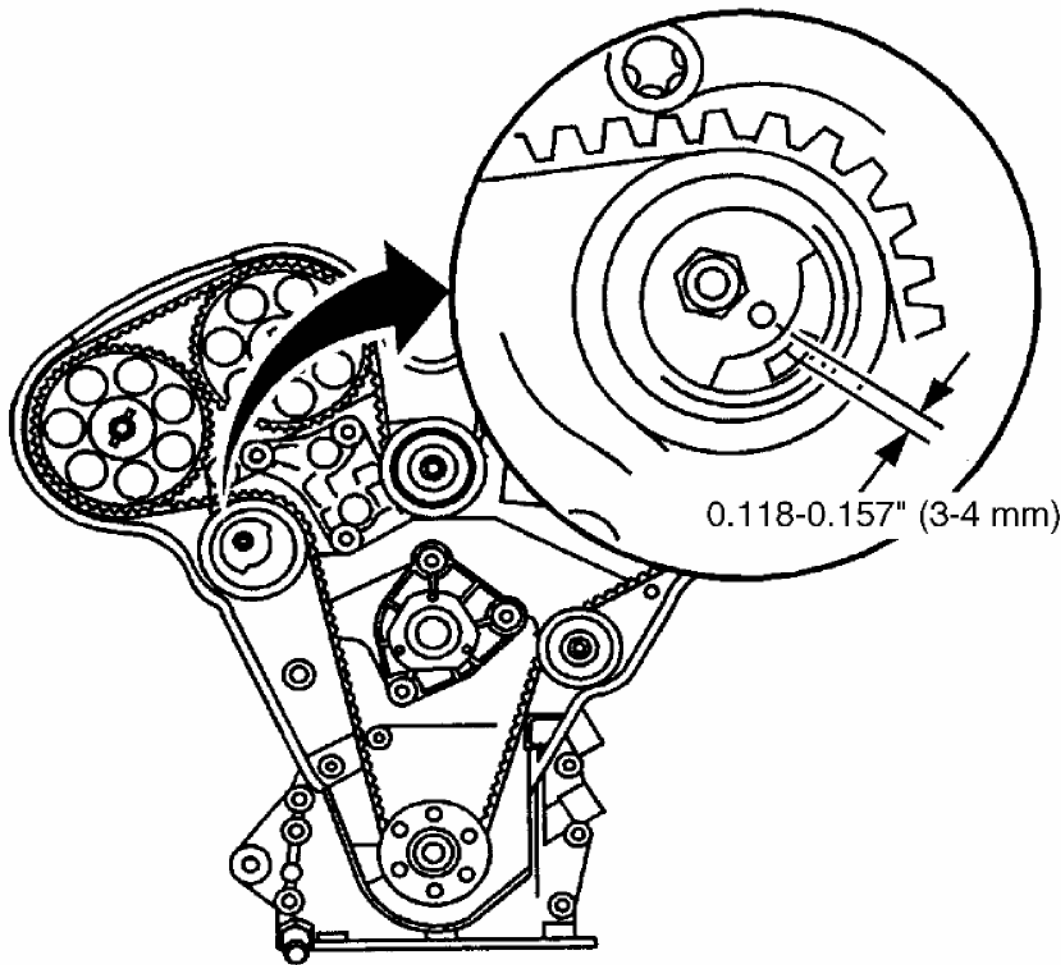
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**Fig. 12: Aligning Timing Belt Marks With Rear Cover Marks**  
**Courtesy of GENERAL MOTOR CORPS.**



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**Fig. 13: Inspecting Alignment Of Reference Marks**  
**Courtesy of GENERAL MOTORS CORP.**



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**Fig. 14: Setting Final Timing Belt Tension**  
Courtesy of GENERAL MOTORS CORP.

#### **TIMING BELT ADJUSTMENTS**

##### **Timing Belt Adjustment Check**

**CAUTION:** This procedure must not be performed as a stand-alone operation.

**NOTE:** It is not uncommon to repeat steps and make several engine revolutions to achieve the proper level of timing belt adjustment.

1. Apply the Checking Gauge (J-42069-20) to the camshaft gears No. 1 and 2. See **Fig. 7**.
2. Inspect the relationship of the marks on the camshaft gears to the marks on the checking gauge. They must match exactly. If not, timing belt adjustment is required. Go to next applicable procedure.

#### Timing Belt Readjustment (Left Bank Camshafts)

1. Loosen the upper idler pulley bolt. Use the Wrench (J-42069-40) to turn the eccentric on the upper idler pulley counterclockwise until the marks on the camshaft gears and on the Checking Gauge (J-42069-20) are in alignment. The high point of the idler pulley eccentric will be in approximately the 9 o'clock position. See **Fig. 7**.
2. Tighten the upper idler pulley bolt, while holding the eccentric in place with the wrench to prevent movement. See **TORQUE SPECIFICATIONS**. Remove the Crankshaft Holder (J-42069-10) and the checking gauge.
3. Rotate the crankshaft in the engine rotational direction (clockwise) 2 revolutions using the Crank Hub Torx Socket (J-42098) until reaching 60 degrees BTDC. See **Fig. 6**. The 60 degrees BTDC point can be identified by the index mark on the oil pump cover.

**NOTE:** Ensure the moveable lever is positioned toward the crankshaft.

4. Install the crankshaft holder to the crankshaft sprocket with the knurled bolt. See **Fig. 7**. Rotate the crankshaft in the engine rotational direction (clockwise) using the crank hub torx socket until the lever of the crankshaft holder firmly contacts the water pump pulley flange. The No. 1 cylinder is at TDC at this point.
5. Secure the moveable lever of the tool to the water pump pulley flange. 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.
6. Install the checking gauge to camshaft gears No. 1 and 2. Inspect the alignment of the marks on the camshaft gears in reference to the marks on the checking gauge.
7. Repeat the procedure again if the marks do not align. If camshaft gears No. 1 and 2 are now properly aligned, go to **FINAL TIMING BELT TENSIONING & INSTALLATION**.

#### Timing Belt Readjustment (Right Bank Camshafts)

1. Loosen the upper idler pulley bolt. Slacken the timing belt by turning the eccentric on the upper idler pulley clockwise with the Wrench (J-42069-40) until the marks on the camshaft gears and the marks on the Checking Gauge (J-42069-20) are in alignment. The high point of the idler pulley eccentric will be in approximately the 9 o'clock position. See **Fig. 7**.

2. Tighten the upper idler pulley bolt, while holding the eccentric in place with the wrench to prevent movement. See **TORQUE SPECIFICATIONS** . Remove the Crankshaft Holder (J-42069-10) and the checking gauge.
3. Rotate the crankshaft in the engine rotational direction (clockwise) 2 revolutions using the Crank Hub Torx Socket (J-42098) until reaching 60 degrees BTDC. See **Fig. 6** . The 60 degrees BTDC point can be identified by the index mark on the oil pump cover.

**NOTE:**      **Ensure the moveable lever is positioned toward the crankshaft.**

4. Install the crankshaft holder to the crankshaft sprocket with the knurled bolt. See **Fig. 7** . Rotate the crankshaft in the engine rotational direction (clockwise) using the crank hub torx socket until the lever of the crankshaft holder firmly contacts the water pump pulley flange. The No. 1 cylinder is at TDC at this point.
5. Secure the moveable lever of the tool to the water pump pulley flange. 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.
6. Install the checking gauge to camshaft gears No. 1 and 2. Inspect the alignment of the marks on the camshaft gears in reference to the marks on the checking gauge.
7. Repeat the procedure again if the marks do not align. If camshaft gears No. 1 and 2 are properly aligned, set the final timing belt tensioner as outlined in **FINAL TIMING BELT TENSIONING & INSTALLATION** .

#### Final Timing Belt Tensioning & Installation

**CAUTION:** The following steps are the **COMPLETION** of adjusting the timing belt, and must not be performed as a stand-alone operation.

1. With the Crankshaft Holder (J-42069-10) in place locking the crankshaft at TDC, loosen the timing belt eccentric locking nut. Turn the eccentric counterclockwise to full stop, then back to the following specification:
  - **New Belt** - Until the reference mark is 0.118-0.157" (3-4 mm) above the datum line. See **Fig. 14** .
  - **Used Belt** - Until the reference is aligned with the datum line.Tighten the timing belt tensioner eccentric locking nut. See **TORQUE SPECIFICATIONS** .
2. If the timing belt upper idler pulley bolt has not been previously torqued to specification,

tighten the timing belt upper idler pulley bolt while holding the eccentric in place with the Wrench (J-42069-40) to prevent movement. See **Fig. 7** . See **TORQUE SPECIFICATIONS** .

3. Remove the crankshaft holder and the Checking Gauge (J-42069-20). For final inspection, once again rotate the crankshaft in the engine rotational direction (clockwise) 2 revolutions using the Crank Hub Torx Socket (J-42098) until reaching 60 degrees BTDC. See **Fig. 6** .
4. Install the crankshaft holder to the crankshaft sprocket. Rotate the crankshaft in the engine rotational direction (clockwise) using the crank hub torx socket until the lever of the crankshaft holder firmly contacts the water pump pulley flange.
5. Secure the moveable lever of the tool to the water pump pulley flange. The alignment marks on the timing belt will no longer align with the marks on the camshaft gears after one or more engine revolutions.
6. 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. See **Fig. 13** .
7. Use the checking gauge to inspect the alignment of the camshaft gears No. 3 and 4. Use the checking gauge to inspect the alignment of the camshaft gears No. 1 and 2. Repeat the procedure again if the marks do not align exactly.
8. If the reference marks match exactly, further timing belt adjustment is not necessary. Continue with reassembly of the engine.
9. Remove the crankshaft holder and the checking gauge. To complete installation, reverse removal procedures.

## TORQUE SPECIFICATIONS

### TORQUE SPECIFICATIONS

| Application                                 | Ft. Lbs. (N.m) |
|---------------------------------------------|----------------|
| Crankshaft Balancer Bolts                   | 15 (20)        |
| Drive Belt Tensioner Bolts                  | 26 (35)        |
| Intake Plenum Bolts                         | 15 (20)        |
| Lower Idler Pulley Bolt                     | 30 (40)        |
| Power Steering Pump Mounting Bolts          | 26 (35)        |
| Timing Belt Tensioner Eccentric Locking Nut | 15 (20)        |
| Upper Idler Pulley Bolt                     | 30 (40)        |
| INCH Lbs. (N.m)                             |                |
| Crankcase Vent Tube Adapter Bolts           | 71 (8)         |
| Engine Control Module (ECM) Bracket Bolts   | 71 (8)         |

**2003 Cadillac CTS**

GENERAL MOTORS 3.2L V6

|                                                      |        |
|------------------------------------------------------|--------|
| Intake Air Resonator Retaining Bolt                  | 80 (9) |
| Remote Power Steering Fluid Reservoir Mounting Bolts |        |
| To Cylinder Head                                     | (1)    |
| To Intake Plenum                                     | 80 (9) |
| Throttle Body Bolts                                  | 71 (8) |
| Throttle Body Heater Inlet Hose/Pipe Bolt            | 80 (9) |
| Timing Belt Cover Bolts                              | 71 (8) |
| Water Pump Pulley Bolts                              | 71 (8) |
| (1) Tighten to 18 ft. lbs. (25 N.m).                 |        |