

1994 Mazda MX-5 Miata

MAZDA 1.8L 4-Cylinder - BP Engine

MAZDA

1.8L 4-Cylinder - BP Engine

NOTE: Engine identification code is on machined pad at left rear end of engine, at transmission mating flange.

MANUFACTURER'S SUGGESTED SCHEDULED MAINTENANCE

For 1994-96 vehicles, the manufacturer recommends the belt be replaced at 60,000 mile intervals for vehicles sold outside of California. For vehicles sold in California, inspect timing belt at 60,000 and 90,000 miles, and replace timing belt at 105,000 miles.

For 1997-98 vehicles, the manufacturer recommends the belt be replaced at 60,000 mile intervals for vehicles sold outside of California and Massachusetts. For vehicles sold in California and Massachusetts, inspect timing belt at 60,000 and 90,000 miles, and replace timing belt at 105,000 miles.

For 1999-00 vehicles, the replacement interval is 60,000 miles except for vehicles registered in California, Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Vermont, Virginia and Washington D.C. For these states, inspect timing belt at 60,000 and 90,000 miles, and replace timing belt at 105,000 miles.

For 2001-05 MX-5 Miata, the replacement interval is 60,000 miles.

REMOVAL & INSTALLATION

TIMING BELT

Removal (MX-5 Miata)

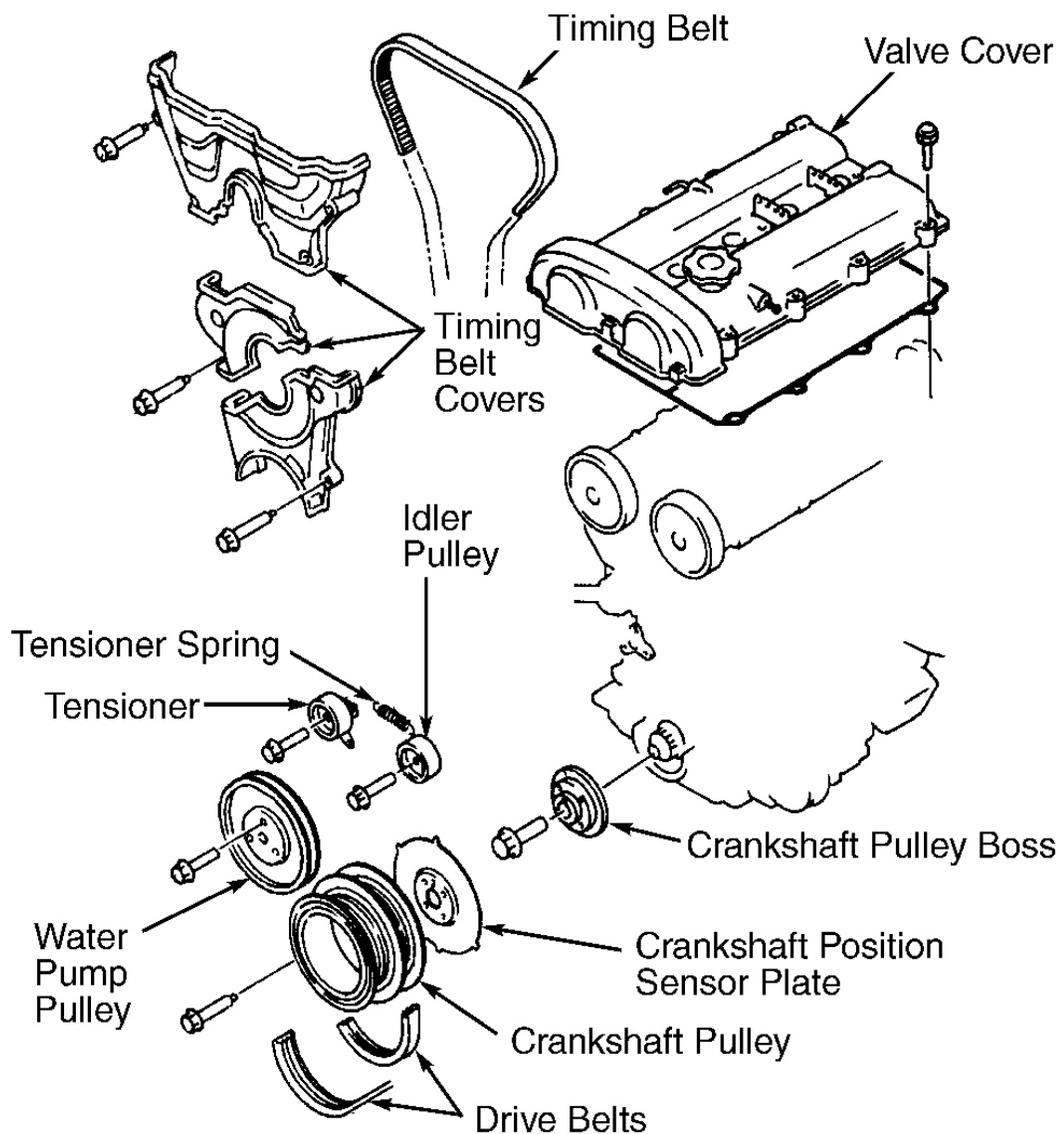
1. Disconnect negative battery cable. Drain cooling system. Remove front strut bar and strut brackets, if equipped.
2. Disconnect Intake Air Temperature (IAT) sensor harness connector. Remove air cleaner cover and necessary air hoses or pipes. Remove drive belt(s).
3. Remove Camshaft Position (CMP) sensor, if equipped. Remove Crankshaft Position (CKP) sensor.
4. Remove high tension leads and ignition coil(s). Remove spark plugs.
5. Remove upper radiator hose and by-pass hoses from thermostat housing. See **Fig. 1** or **Fig. 2**.
6. If equipped with an control valve and pipe, remove oil pipe and cover with a shop rag to prevent oil spill. Remove Oil Control Valve (OCV) case.
7. Remove water pump pulley, crankshaft pulley and crankshaft position sensor plate. See **Fig. 1** or **Fig. 2**.
8. Remove crankshaft pulley from crankshaft pulley boss. Remove plate with crankshaft pulley. Ensure crankshaft pulley boss locating pin faces straight up. Holding crankshaft pulley boss stationary, remove crankshaft pulley boss bolt. Remove pulley boss.
9. Remove upper, middle, and lower timing belt covers. If timing belt is to be reused, mark timing belt with

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arrow to indicate rotation direction.

10. Install pulley boss on crankshaft to temporarily tighten with pulley lock bolt. Ensure timing marks on camshaft sprockets and crankshaft sprockets are aligned. See **Fig. 3**.
11. Loosen timing belt tensioner lock bolt. Move tensioner away from belt with spring fully expanded, and tighten lock bolt. Remove timing belt.

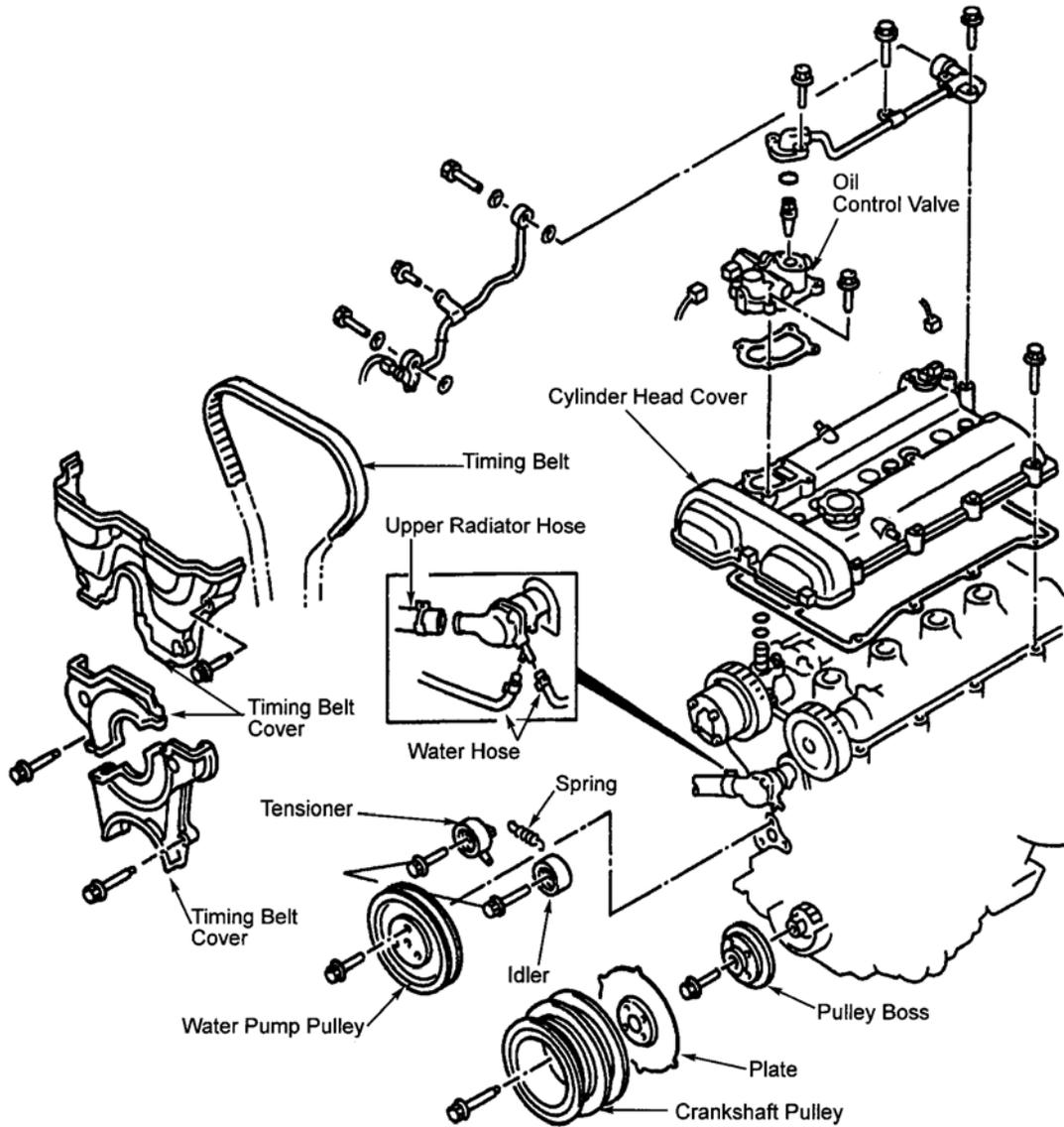


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Fig. 1: Exploded View Of Timing Belt & Components (1994-00 MX-5 Miata)
Courtesy of MAZDA MOTORS CORP.

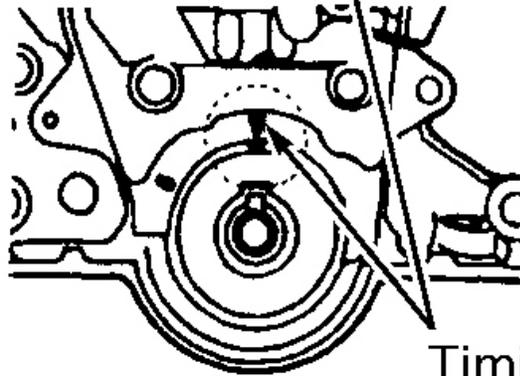
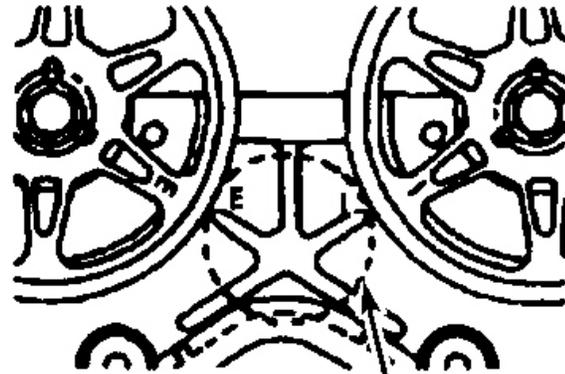
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Fig. 2: Exploded View Of Timing Belt & Components (2001-04 MX-5 Miata)
Courtesy of MAZDA MOTORS CORP.



Timing Marks

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Fig. 3: Aligning Camshaft & Crankshaft Timing Marks
Courtesy of MAZDA MOTORS CORP.

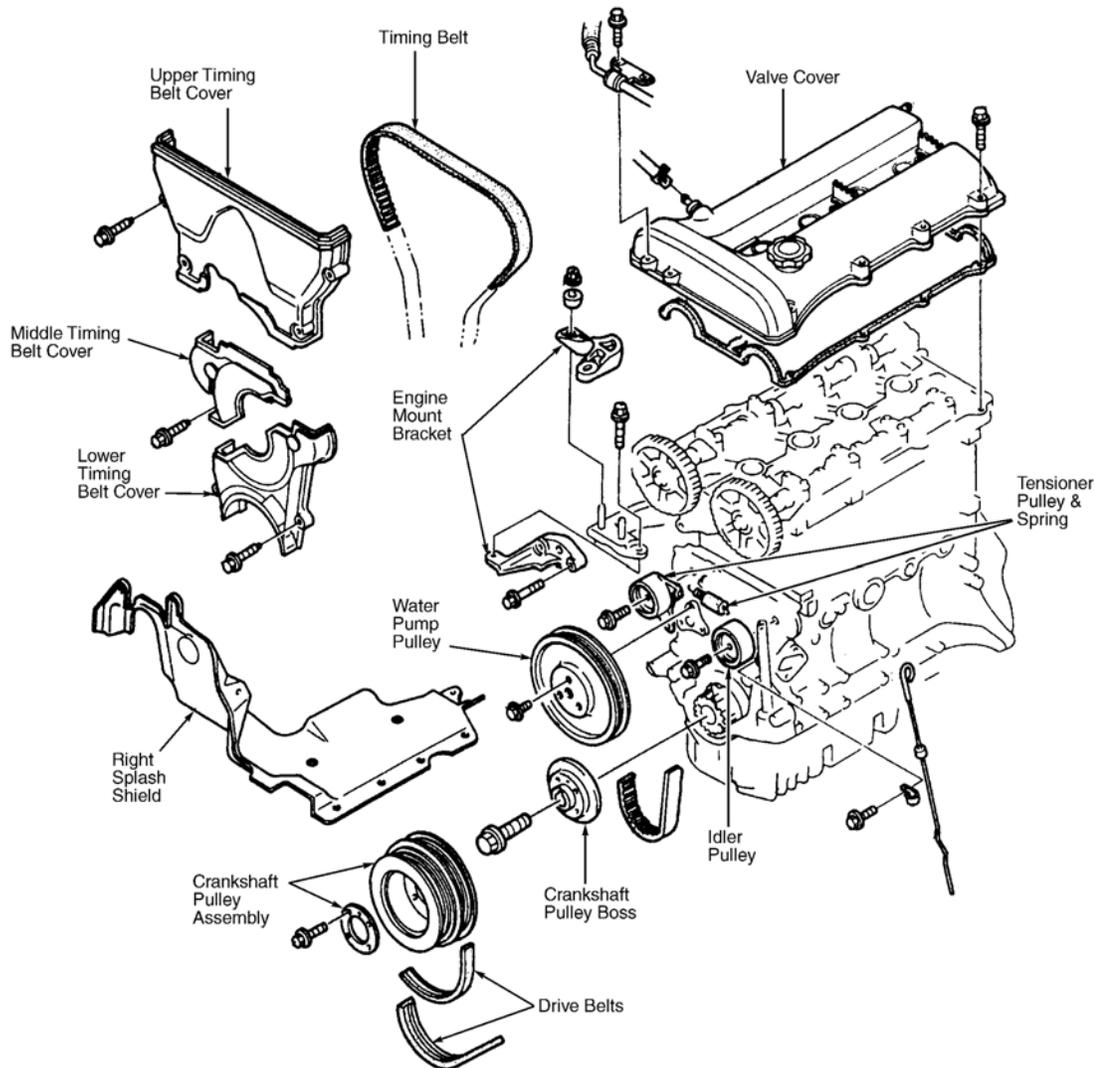
Removal (Protege)

1. Disconnect negative battery cable. Raise and support vehicle. Remove right front wheel. Remove right splash shield from wheelwell.
2. Remove drive belts and water pump pulley. Align crankshaft pulley timing mark with cylinder No. 1 at TDC of compression stroke. Hold crankshaft stationary, and remove crankshaft pulley from crankshaft pulley boss. See **Fig. 4** .
3. Remove spark plug wires from spark plugs. Remove valve cover. Remove dipstick pipe. Remove upper timing belt cover. If timing belt is to be reused, mark timing belt rotation direction.
4. Support engine from above, and remove engine mount bracket from timing belt end of engine. Remove middle and lower timing belt covers.
5. Holding crankshaft stationary, remove crankshaft pulley boss. Align timing marks on crankshaft and camshaft sprocket(s). See **Fig. 3** . Loosen timing belt tensioner lock bolt. Temporarily secure tensioner

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away from belt with spring fully expanded. Remove timing belt.



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Fig. 4: Exploded View Of Timing Belt & Components (Protege)
Courtesy of MAZDA MOTORS CORP.

Inspection (All Models)

1. Check timing belt for cracks, peeling, abrasion or other damage. Check tensioner and idler pulley bearing for looseness or roughness of rotation. Replace parts as necessary.
2. Inspect tensioner spring for stretching. Replace tensioner spring if free length is not greater than 2.33" (59.2 mm). Free length is measured between inside edges of hooked portions of spring.

Installation (All Models)

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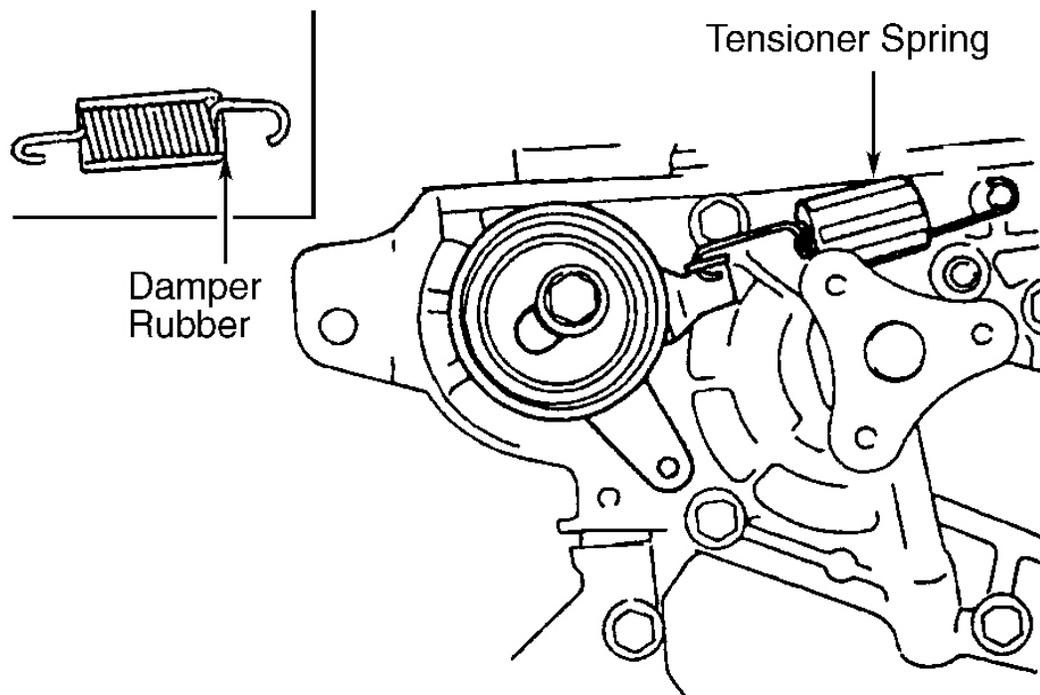
1. Position notch on crankshaft sprocket to 12 o'clock position (aligned with mark on oil pump). See **Fig. 3** . Align timing marks on camshaft sprocket(s). Timing mark on intake camshaft sprocket is an "I"; timing mark on exhaust camshaft is an "E".
2. Install timing belt tensioner spring with damper rubber closing face away from tensioner. See **Fig. 5** . Temporarily secure the timing belt tensioner with tensioner spring fully expanded.
3. Install timing belt around crankshaft sprocket, then working in a counterclockwise direction, route belt around idler pulley, camshaft sprocket(s), and tensioner pulley. Ensure there is no slack in belt between crankshaft sprocket, idler pulley, and camshaft sprockets.
4. Temporarily install the crankshaft pulley boss and bolt. Rotate crankshaft about 2 turns in direction of normal engine rotation. Align timing belt pulley boss mark with tensioner set mark for correct timing belt tension adjustment. See **Fig. 6** .
5. Holding crankshaft stationary, remove the crankshaft pulley boss and bolt. Ensure the crankshaft and camshaft timing marks are still aligned. Loosen timing belt tensioner lock bolt to apply tension to timing belt. Without moving tensioner, tighten tensioner lock bolt to specification. See **TORQUE SPECIFICATIONS** .
6. Install crankshaft pulley boss, and final tighten bolt to specification. Rotate crankshaft 1 5/6 times. Camshaft timing marks should be aligned with marks on rear cover, and the crankshaft pulley boss locating pin should point straight up. If timing marks are not aligned, remove belt, realign all timing marks, and repeat installation procedure.
7. Check timing belt deflection with 22 lbs. (10 kg) of pressure applied to belt. See **Fig. 7** . Ensure timing belt deflection is .35-.45" (8.5-11.5 mm).
8. To install remaining components, reverse removal procedure. While installing valve cover gasket, apply light bead of silicone sealer to 6 corners where gasket meets ends of camshafts. Tighten all valve cover bolts in the correct sequence. See **Fig. 8** .

CAUTION: When installing OCV case, do not damage "O" ring of OCV adopter on camshaft cap, or it may cause hydraulic leakage. When installing oil pipe, no load should be applied on any connection part, or it may cause oil leakage.

9. On MX-5 Miata, install OCV case using several steps to tighten bolts to specification in the sequence shown. See **Fig. 9** . Install OCV filter so that it aligns with the projected part on flange end of oil pipe. See **Fig. 10** . Apply engine oil to new washer. Temporarily install upper and side oil pipe.
10. Using several steps, tighten top oil pipe bolts in the sequence shown. See **Fig. 11** . Temporarily tighten lower side oil pipe bolt to 26-61 INCH lbs. (3-7 N.m). Tighten upper side oil pipe bolt to 9-13 ft. lbs. (12-18 N.m). Using several steps, tighten side oil pipe bolts in the sequence shown. See **Fig. 12** .
11. On all models, fill and bleed cooling system. Fill with 50/50 mix of water and coolant. To bleed system, fill system. Run engine at 2500 RPM for 5 minutes. Run engine at 3000 RPM for 5 minutes. Recheck coolant level and fill as necessary. On Protege, check ignition timing.

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Fig. 5: Installing Timing Belt Tensioner Spring
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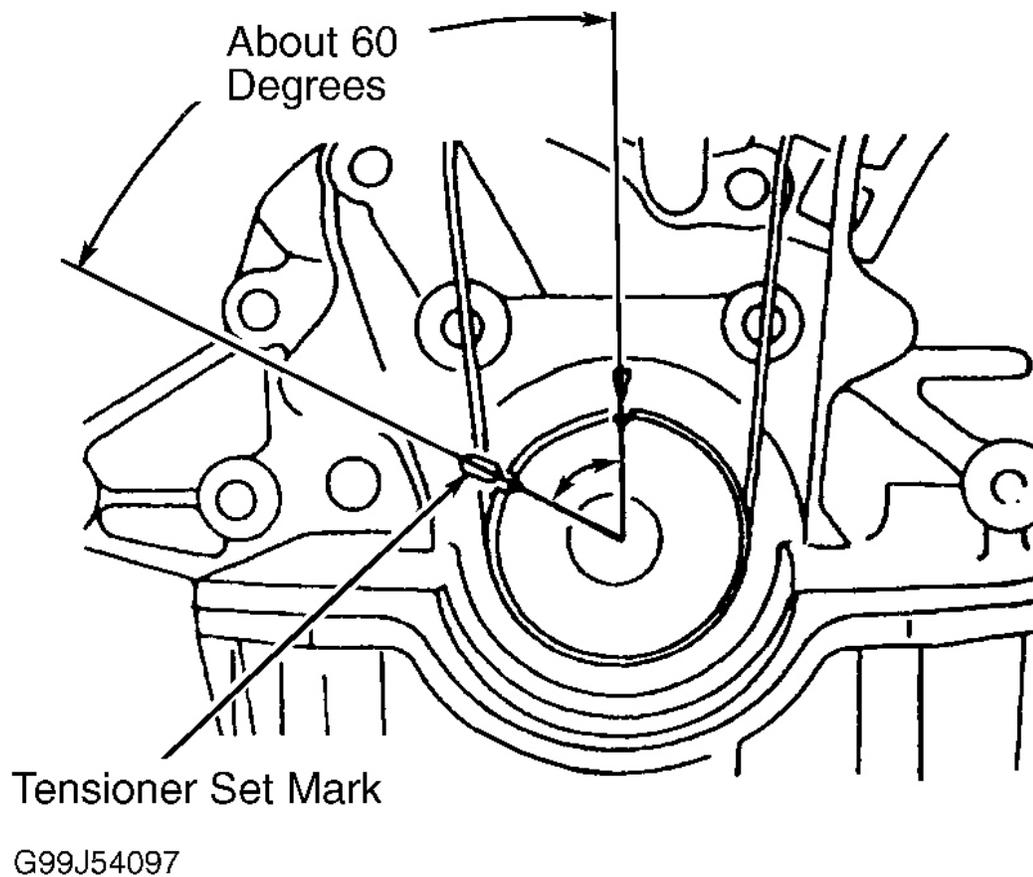
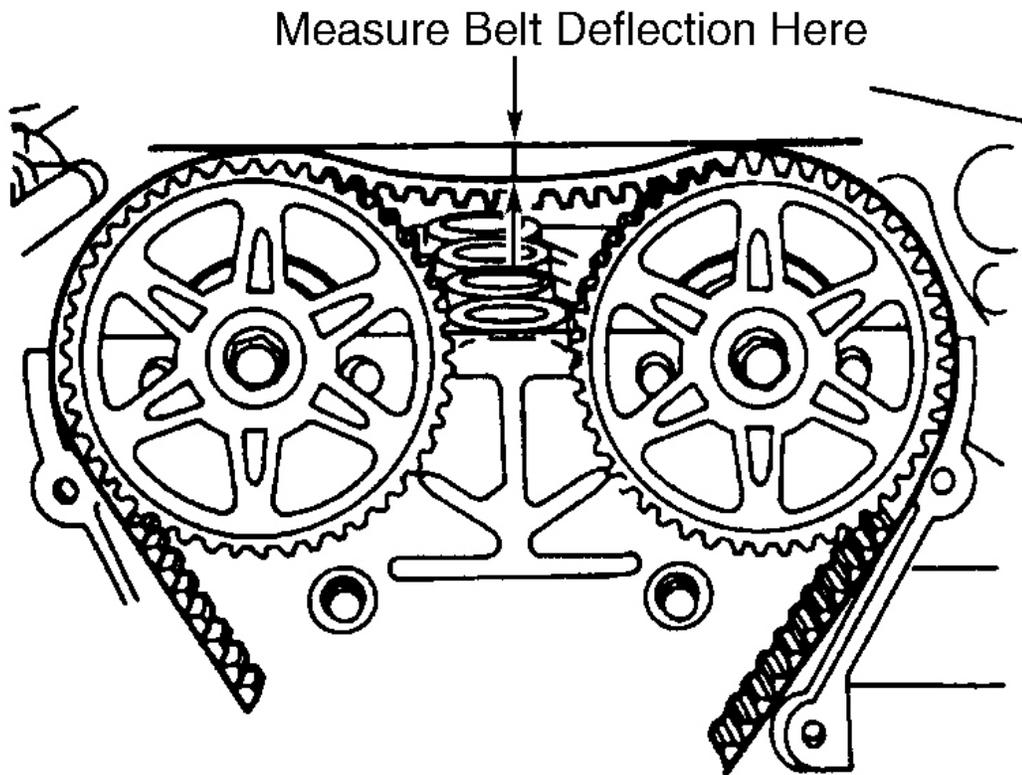


Fig. 6: Aligning Timing Belt At Tensioner Set Mark
Courtesy of MAZDA MOTORS CORP.

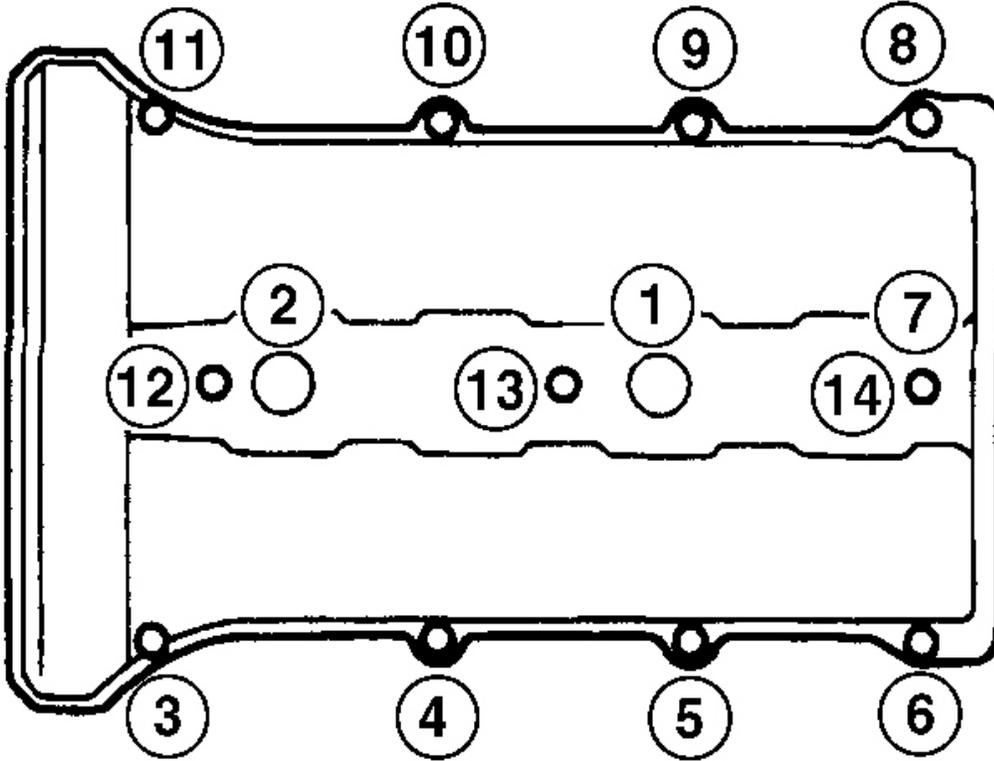


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Fig. 7: Measuring Timing Belt Deflection
Courtesy of MAZDA MOTORS CORP.

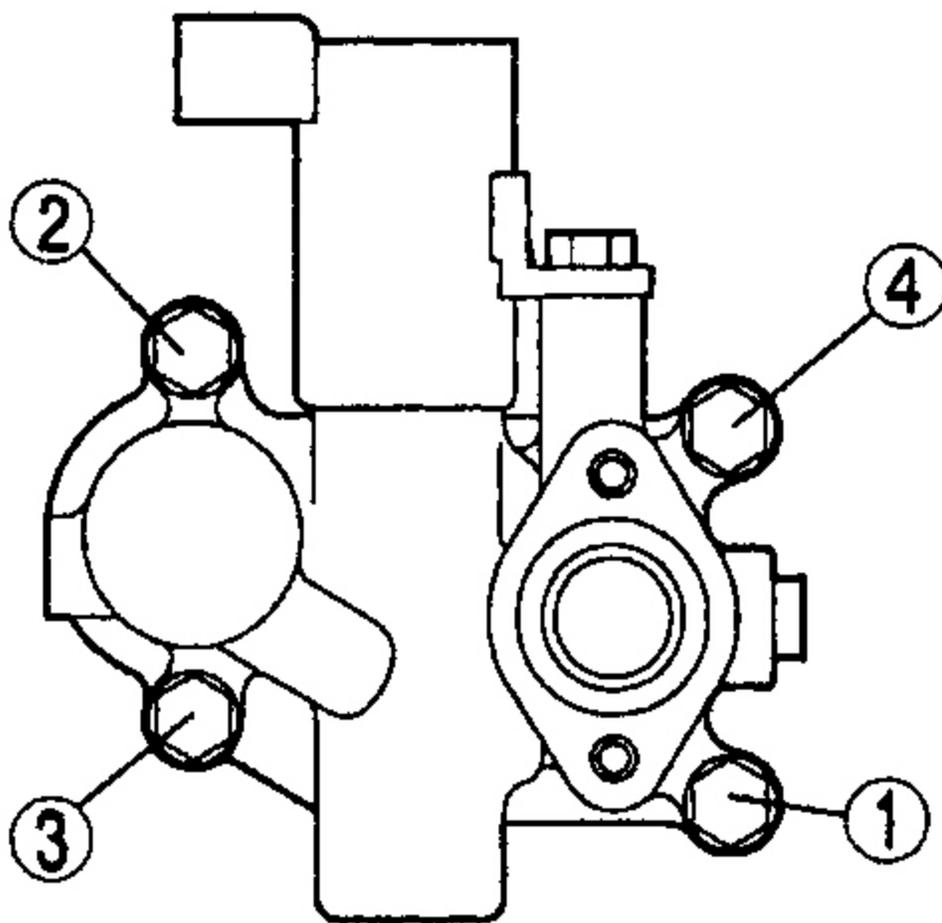
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Fig. 8: Identifying Valve Cover Bolt Tightening Sequence
Courtesy of MAZDA MOTORS CORP.



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Fig. 9: Identifying OCV Case Bolts Tightening Sequence (MX-5 Miata)
Courtesy of MAZDA MOTORS CORP.

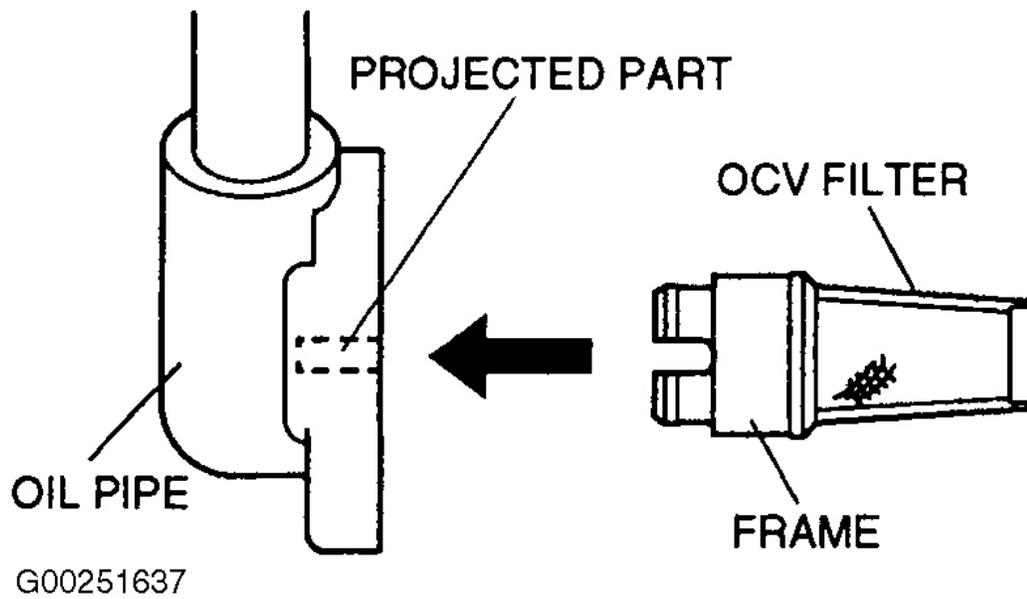
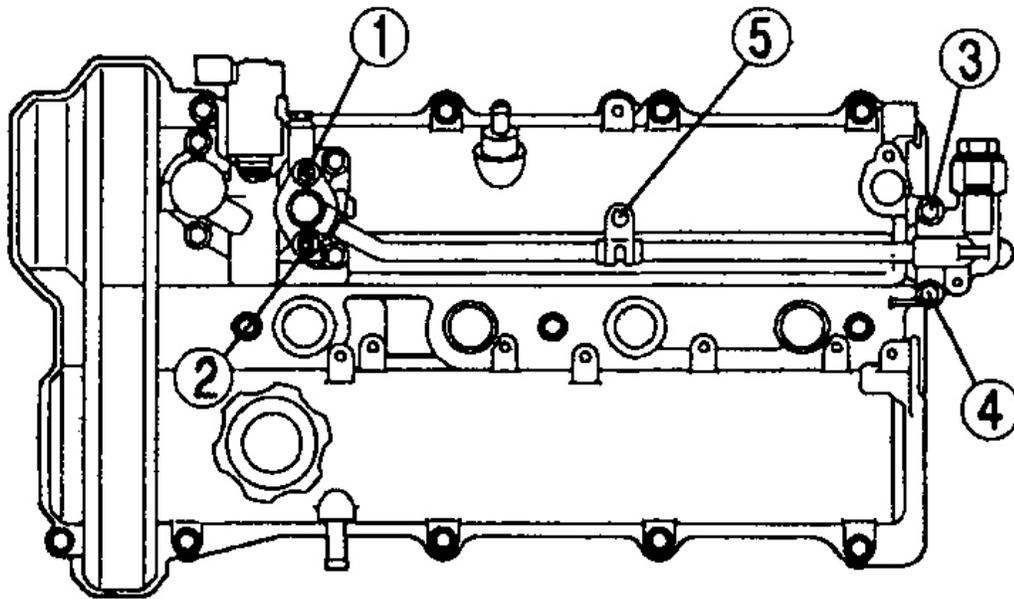


Fig. 10: Installing OCV Filter (MX-5 Miata)
Courtesy of MAZDA MOTORS CORP.

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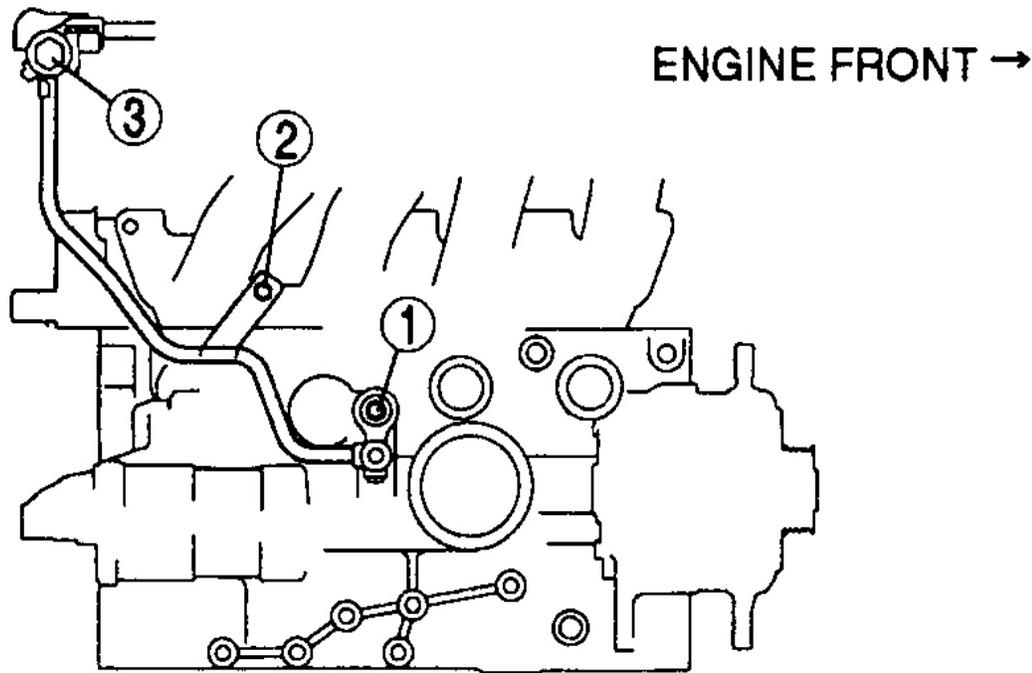
← ENGINE FRONT

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Fig. 11: Identifying Top Oil Pipe Bolt Tightening Sequence (MX-5 Miata)
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Fig. 12: Identifying Side Oil Pipe Bolt Tightening Sequence (MX-5 Miata)
Courtesy of MAZDA MOTORS CORP.

TORQUE SPECIFICATIONS

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Application	Ft. Lbs. (N.m)
Alternator Pivot Bolt	28-38 (38-51)
Alternator Top Bolt	14-18 (19-25)
Camshaft Sprocket Bolt	37-44 (50-60)
Crankshaft Pulley Boss Bolt	116-123 (157-167)
Crankshaft Pulley-To-Pulley Boss	9-13 (12-18)
Engine Mount Bracket Nuts (Protege)	55-77 (75-104)
Idler Pulley Bolt	28-38 (38-51)
Ignition Coil Mounting Bolt (1999-00)	14-18 (19-24)
Spark Plugs	11-16 (15-22)
Strut Bar Bolt	12-16 (16-22)
Strut Bar Bracket Nut	22-27 (30-37)
Timing Belt Tensioner Bolt	28-38 (38-51)

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Wheel Lug Nut (Protege)	66-94 (89-127)
	INCH Lbs. (N.m)
Ignition Coil Mounting Bolt (2001-04)	70-95 (8-11)
Oil Pipe Bolt (MX-5 Miata)	
Side Oil Pipe	
Top Oil Pipe	70-95 (8-11)
Radiator Drain Plug	7-10 (0.7-1.1)
Timing Belt Cover Bolt	71-97 (8-11)
Valve Cover Bolt	
Except 2001-03 MX-5 Miata	43-78 (5-9)
2001-03 MX-5 Miata	71-97 (8-11)

① Tighten bolt No. 1 to 12-17 ft. lbs. (16-24 N.m). Tighten bolt No. 2 to 70-95 INCH lbs. (8-11 N.m). Tighten bolt No. 3 to 25-35 ft. lbs. (34-47 N.m). See **Fig. 12** .