



# Step-by-Step: Timing Belt Inspection and Replacement

Timing belt inspection and replacement are critical to safeguarding the life of every modern Subaru engine. Here's a step-by-step look at these important procedures

If the timing belt that keeps the engine's crankshaft and camshaft synchronized should break or slip due to wear, engine damage can occur. To save your customer the expense of repairing the damage caused by piston-to-valve collisions, always stick to the Subaru-recommended inspection and replacement intervals.

The inspection and replacement procedures vary by model, so be sure to follow the correct ones for the vehicle you are servicing by referring to the specific service manual or the Subaru Technical Information System website at <http://techinfo.subaru.com>.

## Subaru Timing Belt Inspection and Replacement Intervals

- **1995 and Prior:** *All models*  
Inspect every 30,000 miles, replace every 105,000 miles on California vehicles; 60,000 miles on all others.
- **1996-1997:** *Impreza & SVX 1.8L, 2.2L and 3.3L*  
Inspect every 30,000 miles, replace every 105,000 miles on California vehicles; 60,000 miles on all others.

### *Legacy, Outback and Outback Sport*

2.2L: Inspect every 30,000 miles, replace every 105,000 miles on California vehicles; 60,000 miles on all others.

2.5L: Inspect every 30,000 miles, replace every 105,000 miles.

- **1998:** *Impreza, Legacy, Outback and Outback Sport*

2.2L: Inspect every 30,000 miles, replace every 105,000 miles on California vehicles; 60,000 miles on all others.

2.5L: Inspect every 30,000 miles, replace every 105,000 miles.

### *Forester*

Inspect every 30,000 miles, replace every 105,000 miles.

- **1999 and Later:** *All models*

Inspect every 30,000 miles, replace every 105,000 miles.

Be sure to check the warranty and maintenance book for specific details regarding belt inspection and replacement intervals for the vehicle you are servicing.

For this article, we are replacing the timing belt on a 1998 Forester 2.5L DOHC. The repair procedures, tool references, and specifications used are all specific to this vehicle.

This Forester has over 200,000 miles on it and is receiving its second replacement belt, third overall. We'll take you step-by-step through the camshaft timing belt inspection and replacement procedures.

## Getting Started

You're going to need some working room to swing ratchets and other tools, so there are a few components you'll need to get out of the way at the outset. First, remove the cooling fans and shrouds. Just be careful to not damage the radiator when swinging tools around near it.

1. Disconnect the ground cable (-) from the battery.
2. Remove the undercover.
3. Remove the coolant reserve tank from the cooling fan shroud.
4. Remove the radiator fan motor connector and A/C fan motor connector.
5. Loosen the four bolts from the lower side of the fan shrouds, then remove the upper four bolts.
6. Lift out fans and lay them aside.



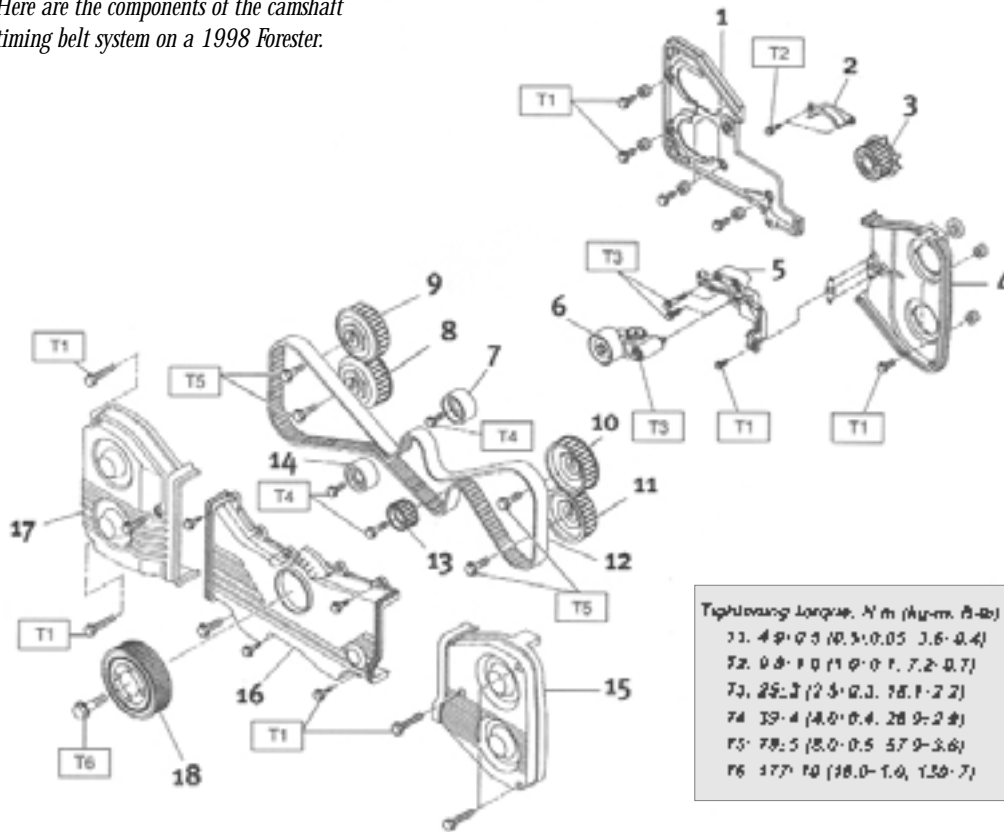
*Removing the cooling fans gives you a little more room to swing tools.*

## Access to Timing Belt

7. Remove the cover over the front accessory (power steering, oil pump and alternator drive) belt and rear (air conditioner drive) belt.
8. Remove each belt by loosening its tensioning lock bolt on the slider bolt, then the slider bolt.

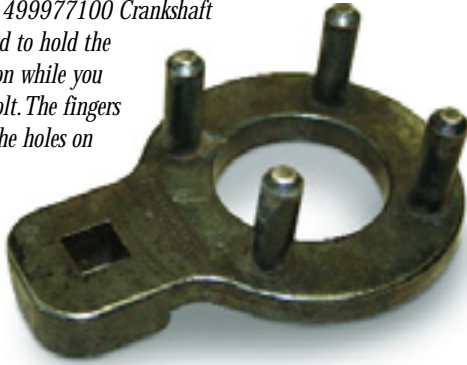
## Timing Belt Inspection & Replacement

Here are the components of the camshaft timing belt system on a 1998 Forester.



- 1) Right-hand belt cover No. 2
- 2) Timing belt guide (MT vehicles only)
- 3) Crankshaft sprocket
- 4) Left-hand belt cover No. 2
- 5) Tensioner bracket
- 6) Automatic belt tension adjuster ASSY
- 7) Belt idler
- 8) Right-hand exhaust camshaft sprocket
- 9) Right-hand intake camshaft sprocket
- 10) Left-hand intake camshaft sprocket
- 11) Left-hand exhaust camshaft sprocket
- 12) Timing belt
- 13) Belt idler No. 2
- 14) Belt idler
- 15) Left-hand belt cover
- 16) Front belt cover
- 17) Right-hand belt cover
- 18) Crankshaft pulley

*Subaru Special Tool 499977100 Crankshaft Pulley Wrench is used to hold the crankshaft in position while you remove the pulley bolt. The fingers of the tool fit into the holes on the crank sprocket.*



9. Remove the crankshaft pulley bolt. To hold the crankshaft in position use Subaru Special Tool 499977100 Crankshaft Pulley Wrench.
10. Remove the crankshaft pulley.
11. Remove the left-hand timing belt cover.
12. Remove the right-hand timing belt cover.
13. Remove the front timing belt cover.

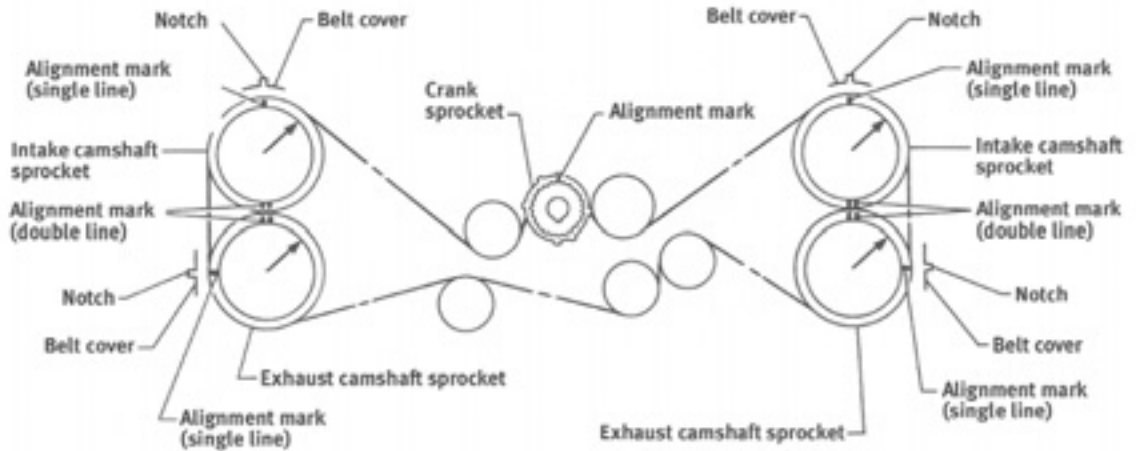
### Removal of Timing Belt

1. For manual transmission models only, remove the timing belt guide over the top of the crank sprocket.
2. At this point, observe the position of the timing belt with relation to the camshaft pulleys. Assuming that the timing belt is in the primary timing alignment position, note that two alignment marks on the timing belt line up with the notches at the top of the upper left and right intake camshaft sprockets and two additional alignment marks on the belt also line up with notches on the side of the lower left and right exhaust camshaft sprockets. A fifth alignment mark lines up with the top of the crankshaft sprocket.
3. If you are removing the timing belt for inspection to determine its condition, make sure you can readily read the alignment marks on the belt to ease re-installing it. If the alignment marks on the timing belt and/or the arrow that indicates the rotation direction have faded, put new marks on the belt before removing it. Use the following steps:
  - Turn the crankshaft using Subaru Special Tool 499987500, Crankshaft Socket, and line up the belt alignment mark with the mark at the top of the crankshaft sprocket. The belt alignment marks should also now line up with the notches on the top of the upper left and right intake camshaft sprockets and notches on the side of the lower left and right exhaust camshaft sprockets.
  - Using white paint, or any other easily-seen marker such as a yellow tire crayon, put alignment marks and/or the directional arrow on the belt.



## Timing Belt Inspection & Replacement

The correct timing alignment marks are shown in this diagram.



Use Subaru Special Tool 499987500 Crankshaft Socket to turn the crankshaft sprocket to line with up the belt alignment mark.



To avoid movement of the camshafts during timing belt replacement, a special tool, such as this J-45443 Cam Sprocket Holder must be used.

4. Remove the idler, idler No. 2 and automatic belt tension adjuster assembly.
5. The timing belt can now be safely removed.

**Caution:** After the timing belt has been removed, never rotate the intake and exhaust camshaft sprockets. Any movement could cause the intake and exhaust valves to strike each other, causing bent valve stems.

To avoid camshaft movement during timing belt removal and replacement, Subaru suggests the use of Kent-Moore Special Tool J-45443 Cam Sprocket Holder Phase 1 for 1998 and prior DOHC applications; for 1999 and later DOHC applications, use special tool J-42908. These tools should be installed prior to removing the timing belt.



This photo shows the special Cam Sprocket Holder tool in place to prohibit movement of the camshafts.

## Timing Belt System Inspection

### Timing Belt

1. Check the timing belt back and teeth for breaks, cracks and wear. Replace the belt if any such conditions are found.
2. Be careful to not let oil, grease or coolant contact the belt. Remove any such liquids quickly and thoroughly.
3. Do not bend the timing belt sharply as doing so will damage the belt. The maximum bending radius is 2.36 in. (60mm), or more.

### Automatic Belt Tension Adjuster

1. Visually check oils seals for leaks, and rod ends for abnormal wear or scratches. If necessary, replace the assembly. Note: Slight traces of oil at the rod's oil seal do not indicate a problem.

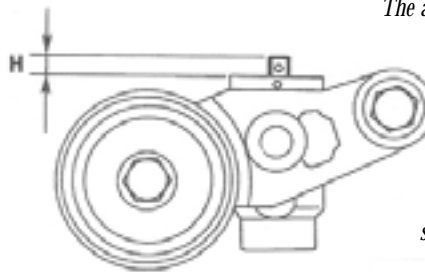
2. Check adjuster rod stiffness. The adjuster rod should not move when a pressure of 66 lbs. (30kg) is applied. If the adjuster rod is not stiff and moves freely when applying 66 lbs., check it using the following procedures:
3. Slowly press the adjuster rod down to the end surface of the cylinder. Repeat his motion 2 or 3 times.
4. With the adjuster rod moved all the way up, apply a pressure of 66 lbs. and recheck the stiffness.
5. If the adjuster rod is not stiff and moves freely, replace the automatic belt tension adjuster assembly.

**Caution:**

- Always use a vertical-type pressing tool to move the adjuster rod down. Do not use a lateral-type vise.
- Push the adjuster rod vertically.
- Press in the adjuster rod gradually, taking more than three minutes.
- Do not let the press pressure exceed 2,205 lbs. (1,000 kg).
- Press the adjuster rod only as far as the end surface of the cylinder.
- Do not press the adjuster rod into the cylinder. Doing so may damage the cylinder.

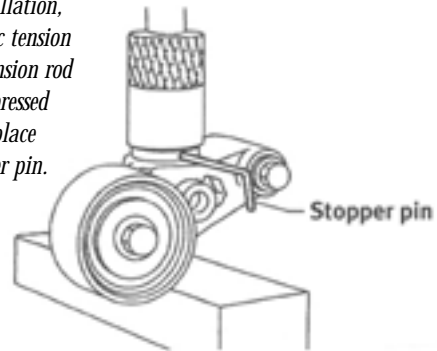
6. Measure the extension rod beyond the body. If it is not within the specification of  $0.244 \pm 0.20$  in. ( $5.7 \pm 0.5$ mm), replace the automatic belt tension adjuster assembly.
7. Prior to installing the automatic belt tension adjuster assembly, it must be compressed and a stopper pin inserted to retain the tension for installation.
8. Affix the automatic belt tension adjuster assembly to the vertical pressing tool.

9. Slowly move the adjuster rod down with a pressure of 66 lbs. (30kg) until the adjuster rod is aligned with the stopper pin hole in the cylinder.
10. Secure the adjuster rod with a 0.08 in. (2mm) stopper pin or hex wrench inserted into the hole.



*The automatic tension adjuster extension rod length (H) must fall within the required specification of  $0.244 \pm 0.20$  in. ( $5.7 \pm 0.5$ mm). If it does not meet the specs, replace the assembly.*

*Prior to installation, the automatic tension adjuster extension rod must be compressed and held in place with a stopper pin.*



## Timing Belt Inspection & Replacement

### Belt Tension Pulley

1. Check the mating surfaces of the timing belt and the contact point of the adjuster rod for abnormal wear or scratches. Replace the belt tension pulley if faulty.
2. Check the belt tension pulley for smooth rotation.
3. Replace it if noise or excessive play is noted.
4. Check the belt tension pulley for grease leakage.

### Belt Idlers

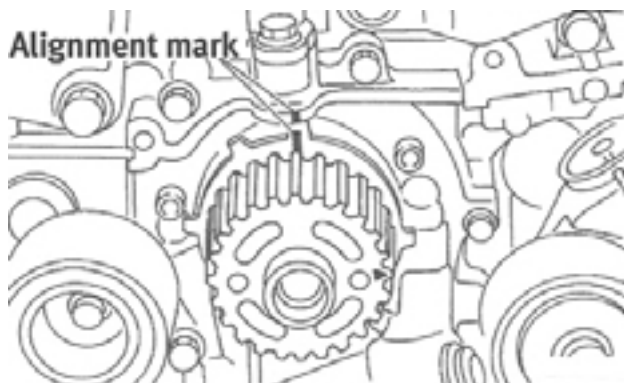
1. Check the idler for smooth rotation. Replace it if noise or excessive play is noted.
2. Check the outer contacting surfaces of the idler pulley for abnormal wear or scratches.
3. Check the idler for grease leakage.

### Crankshaft Sprocket

1. Check the sprocket teeth for abnormal wear and scratches.
2. Make sure there is no free play between the sprocket and key.
3. Check the crankshaft sprocket sensor protrusion for damage and foreign matter contamination.

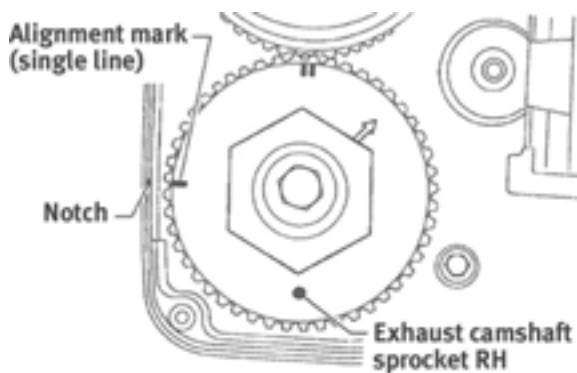
## Aligning and Installing Timing Belt

### Sprocket Alignment



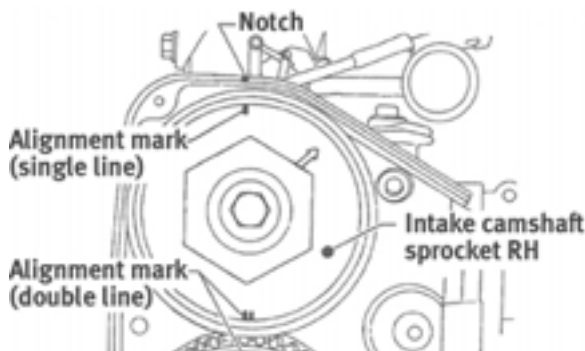
Note the alignment of the timing marks on the crankshaft sprocket and the oil pump cover.

1. Before installing the camshaft timing belt, make sure the alignment marks for the camshafts and crankshaft are properly situated.
2. Align mark on crankshaft sprocket with the mark on the oil pump cover at the cylinder block.
3. Align the single line mark on the right-hand (lower) exhaust camshaft sprocket with the notch on the belt cover.



The single alignment mark on the right-hand exhaust camshaft sprocket must line up with the notch on the belt cover.

4. Align the single line mark on the right-hand (upper) intake camshaft sprocket with the notch on the belt cover. Make sure the double lines on the intake camshaft and exhaust camshaft sprockets are aligned.

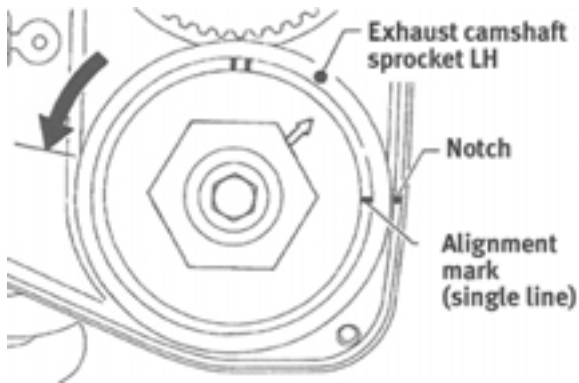


The single mark on the right-hand intake camshaft sprocket lines up with the notch on the belt cover and the double lines align with the double lines on the exhaust camshaft sprocket.

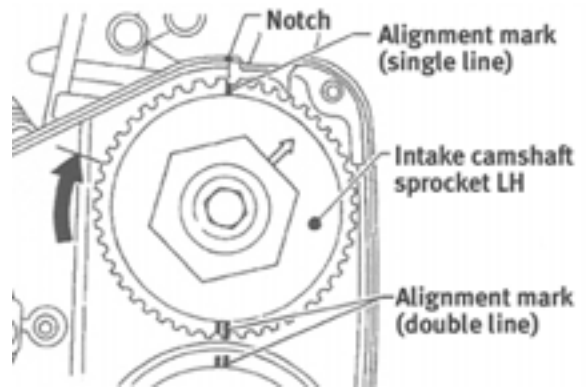
5. Align single line mark on the left-hand (lower) exhaust camshaft sprocket with the notch on the belt cover by turning the sprocket counter-clockwise (as viewed from the front of the engine).

**Note:** If you have locked the intake and exhaust sprockets in place with a cam sprocket holder before removing the old timing belt, they should already be aligned.

6. Align the single line mark on the left-hand (upper) intake camshaft sprocket with the notch on the belt cover by turning the sprocket clockwise (as viewed from the front of the engine). Make sure the double lines on the intake camshaft and exhaust camshaft sprockets are aligned.



*Note the alignment of the left-hand intake camshaft sprocket.*



*Note the alignment of the left-hand intake camshaft sprocket.*

7. Make sure the camshaft and crankshaft sprockets are aligned as shown.

### Timing Belt Installation

1. After ensuring the proper alignment of the camshaft and crankshaft sprockets, the timing belt can be installed: