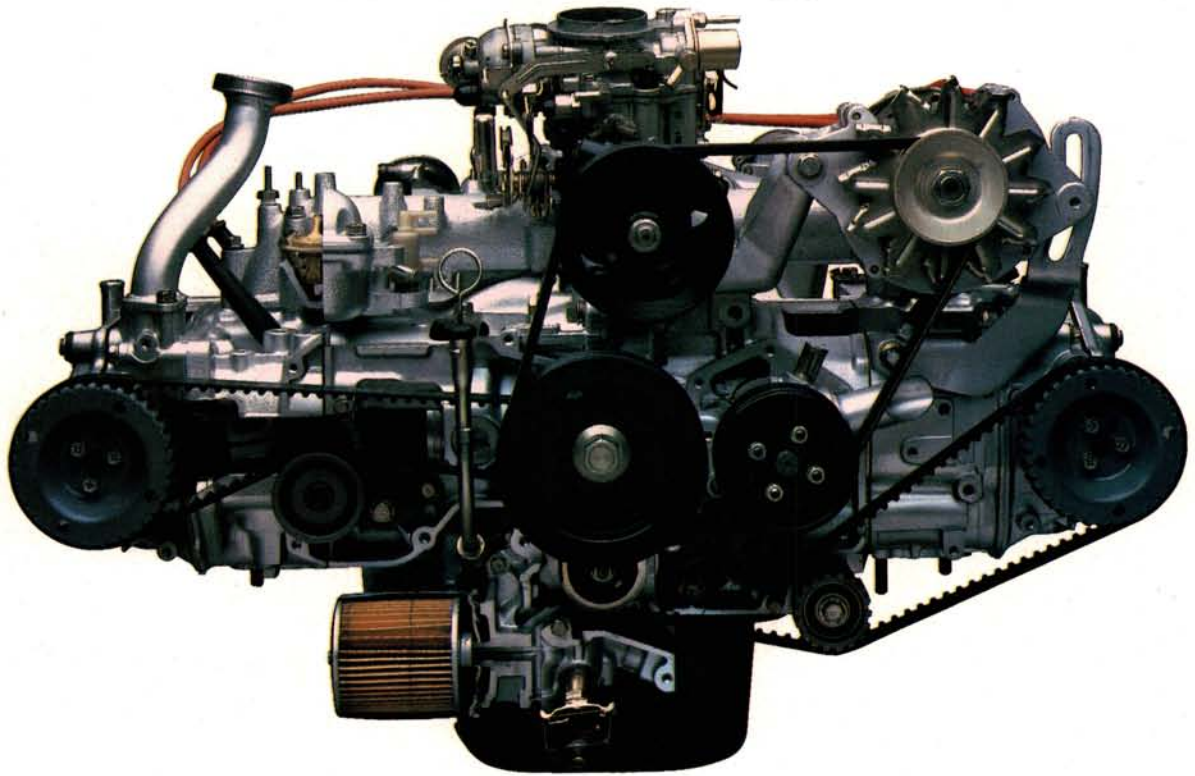


Subaru OHC Timing Belts



A maintenance procedure that's becoming increasingly important is the periodic replacement of toothed rubber camshaft drive belts. Suggested replacement intervals will vary among different manufacturers. And sometimes, belts will need to be replaced before the suggested intervals.

Neglected oil changes can be a major cause of premature belt failure. Asking the cam belt to constantly drag the cam or cams through pounds of frozen sludge is a little unfair. The belts will stretch prematurely. As a result, they can get noisy, and may even jump time along the way.

The old Subaru horizontally opposed push rod engine now uses timing belts to drive an overhead camshaft in each cylinder head. The new design also uses hydraulic valve adjusters, eliminating the need for periodic valve adjustments. Each cam is driven by

its own toothed belt.

The horizontally opposed six-cylinder engine uses a very similar, but not identical belt drive system, requiring some slightly different procedures. The six-cylinder engine uses a sealed, hydraulic belt tensioner, and the belts used are not the same as those used on the four-cylinder engine. The six-cylinder also requires you to use some different special tooling.

The procedures highlighted in this article apply to the more common four-cylinder engine.

Highlights and Cautions

- The right side cam belt runs between the crankshaft drive sprocket and the camshaft sprocket. Belt tension is maintained by an adjustable tensioner.
- The left side camshaft drive belt powers the oil

pump sprocket on its path from crankshaft to camshaft sprocket. The left side belt also has an adjustable tensioner, but runs around an additional toothed idler sprocket.

- Always replace belts as a set. Never replace only one of the belts.
- Camshaft sprockets are made of stamped steel, and are interchangeable.
- Tensioners turn on sealed bearings. Always check for damaged bearings, or for tensioners out of square with belt travel.
- The cam belt protective cover is made up of six main pieces. These are pretty easy to keep track of when it comes time to put the puzzle back together. There are quite a few spacers, bolts, and seals that could be a little confusing, however, unless you pay close attention during teardown. If your memory is like mine, you may want to grab a scratch pad and make yourself a diagram the first time you do this job. Note the relative location of seals and hardware. We don't want an improperly installed cover interfering with the belts.
- When performing a related repair such as an oil pump replacement, you may choose to reuse low mileage belts that are still serviceable. If you do, be sure you mark the rotational direction of each belt with a piece of chalk. Do not reverse belt direction when reinstalling the belts.
- Subaru recommends that you replace, not adjust, the belts at 60,000 miles. You can correct belt tension once, if needed, during the service life of the belts. Access holes are provided in the front cover for the bolts securing the tensioners.
- Check for excessive belt wear as you would on any chain or belt-driven camshaft. Remove the distributor cap. Move the crankshaft back and forth, a few degrees in each direction. There should be no delay between

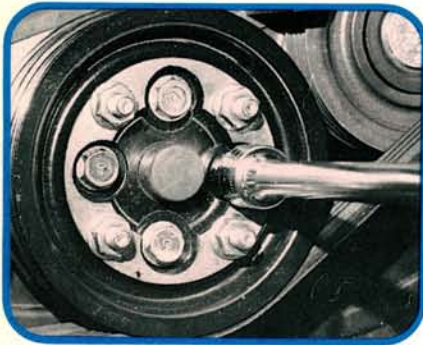
crank and distributor movement. Since the distributor is driven by the left camshaft, any play in the drive belt will delay camshaft, and as a result, distributor movement.

In extreme cases, a loose belt will result in a noise at the distributor that will sound a bit like marbles rattling around inside the distributor cap. This happens when the belt gets loose enough to let the distributor driven gear slap or chuck against the camshaft drive gear. (See this month's **Tech Tips**.)

- Pay careful attention to belt tensioning procedures. Quiet operation and long belt life depend on proper belt tension.
 - Check for proper alignment of sprockets, tensioners, and oil pump and idler sprockets. Make sure everything is running square and true. Also check for free movement of tensioner bearings.
 - Don't leave any spare nuts, bolts, washers, or sockets inside the cover. This sounds ridiculously obvious, but things happen. And this last caution sounds less silly when you get to do the job over again.
 - Keep the belt and drive sprockets clean and dry. Make sure the belt is free from all oil and grease.
 - In addition to the items listed below, you'll also need to remove the wire from the oil light/gauge switch.
 - Timing belt tightening procedures are given below. You'll need the camshaft sprocket belt tension wrench shown, and a torque wrench to properly adjust belt tension. There are two sets of specifications, however, depending on whether or not the timing belt replacement was done at the same time as head gasket replacement.
- When both the belts and the head gaskets are replaced, the torque applied to the cam sprockets is 34 Nm (25.3 ft-lb).

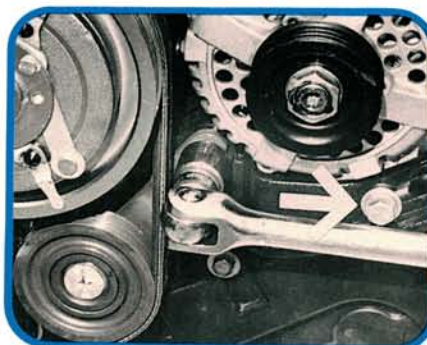
When the belts alone are replaced, the torque applied to the camshaft sprocket is 24.5 Nm (18 ft-lb).

—By Ralph Birnbaum



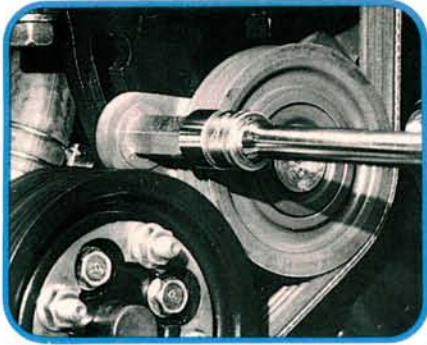
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Before removing the accessory belt, loosen these bolts holding the water pump pulley to the pump flange. We'll have to remove the pulley before we remove the front timing belt cover. Belt tension should be enough to hold the pulley while you break the bolts loose.



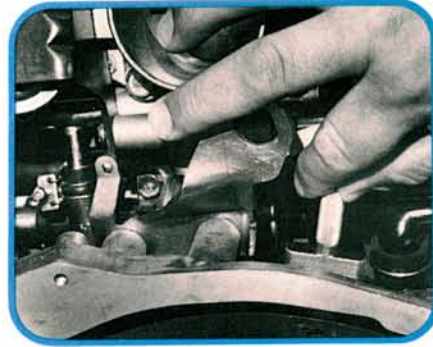
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Loosen the pinch bolt in the alternator adjusting bracket (arrow). Also loosen, but don't remove, the pivot bolt. Swing the alternator on its pivot and remove the alternator drive belt. On this model, the pivot bolt being loosened is for the belt tension idler pulley for the air conditioning belt.



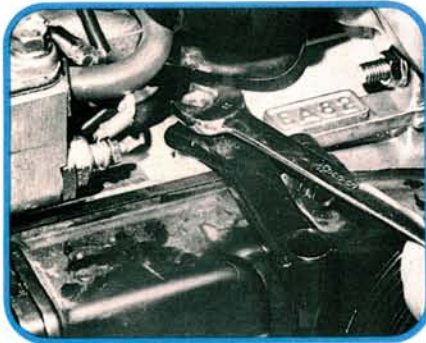
3

The location of accessory mounting bolts will vary depending on the accessories used. On this model, we loosen, but don't remove, this pinch bolt on the adjusting slide for the belt idler/tensioner. Remove the air conditioning compressor/water pump drive belt. Don't remove the idler or bracket.



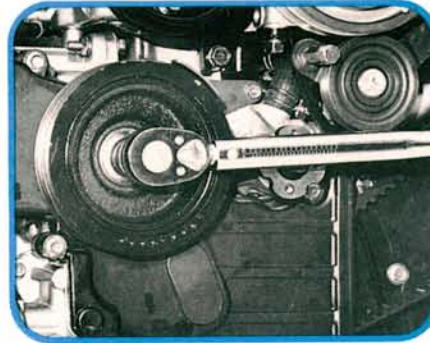
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Lock the flywheel or drive plate. Subaru has two separate locking tools. The drive plate tool, P/N 498497000, drops through the timing mark access hole and catches the head of a torque converter bolt. The flywheel lock, P/N 498277000, fits into one of six small holes located every 60 degrees in the flywheel.



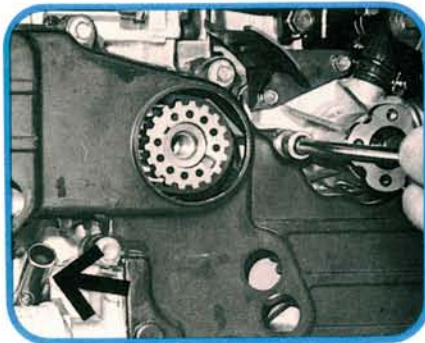
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The dipstick tube extension straddles the front of the timing belt cover, so you'll have to remove it. It seals in a lower tube with an o-ring and bolts to the engine case as shown. On some models, the tube is attached to the front of the right timing belt cover. Replace the o-ring and lube it with engine oil.



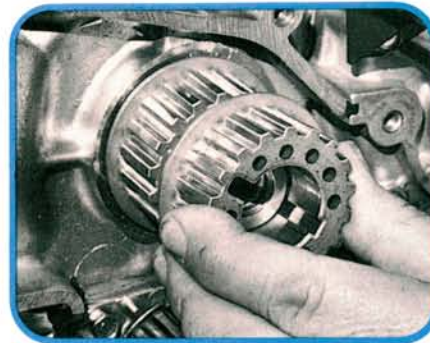
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With the flywheel locked, remove the crankshaft pulley retaining bolt. Tightening torque at reinstallation is 89-107 Nm (66-79 ft-lb). Here we've already removed the accessory drive belt and water pump pulley (right behind the wrench handle). Remove the crankshaft drive pulley.



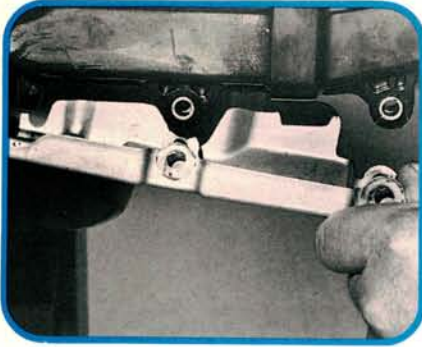
7

With the pulleys removed, we can see where all those timing belt cover bolts were hiding. Pay careful attention to the length and position of all bolts and spacers. They're not all the same. Always cover the lower dipstick tube (arrow) to keep dirt and debris out of the engine.



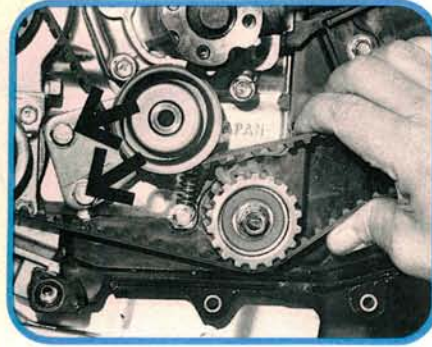
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When you pull the crankshaft drive pulley, make sure this sprocket doesn't stick to the pulley face just long enough to clear the engine and fall on the floor. The gear locates in a woodruff key on the crankshaft. Always clean any debris from the sprocket teeth before installing the new belt.



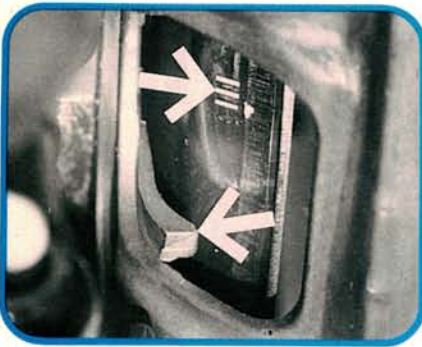
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This heat shield is found only on turbo models at the lower edge of the timing belt cover. It may be tough to see with the engine in the car, so don't forget it. Tightening torque for all retaining bolts on the front cover and belt cover plate is only 4.4-5.4 Nm (3.3-4.0 ft-lb). Easy does it.



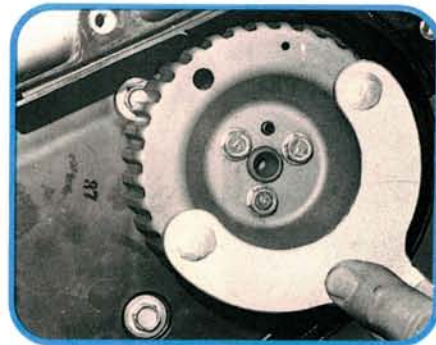
10

With the covers gone, we can remove the belts. Loosen the two bolts at the tensioner. Squeeze the belt as shown to rotate the tensioner away from the belt. Retighten the lower bolt to hold the tensioner in place against the return spring. Remove the belt. Do the same for the other belt.



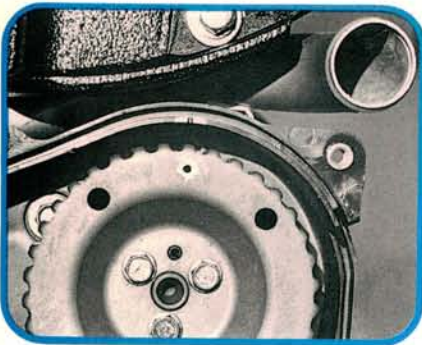
11

Install the crank pulley and bolt. Don't use the bolt alone or it'll bottom in the hole, damaging threads. Turn the flywheel until the center of these three marks on the drive plate lines up with the boss on the bell housing. The marks indicated must be aligned. This is the crankshaft reference mark.



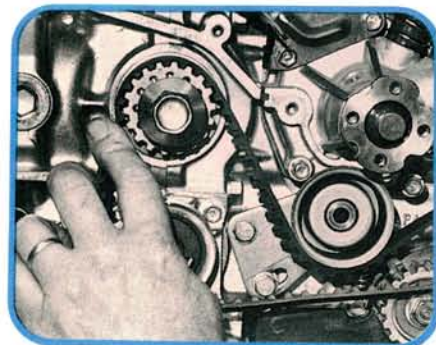
12

We need to turn the cam sprockets to synchronize camshaft and crankshaft timing. Don't turn the cam with the sprocket retaining bolt. Subaru suggests you turn the sprocket with a spanner that locates in two opposing holes in the sprocket face. Looks like this tool would be fairly easy to make.



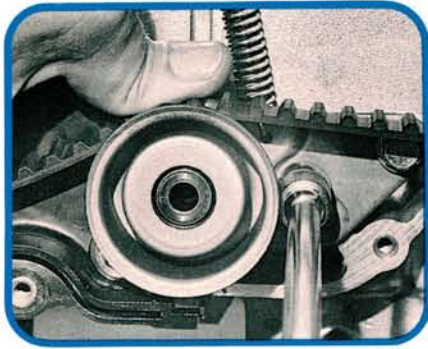
13

Turn the left camshaft until the small reference hole in the cam sprocket comes to 12 o'clock and lines up with the notch in the inner timing belt cover. Install the new belt. Make sure that any slack in the belt is on the side of the belt facing the tensioner. Loosen the bolts in the tensioner.



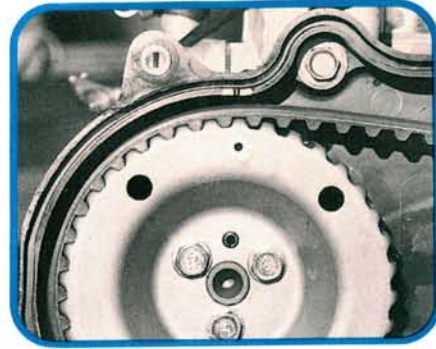
14

Here's a better view of the left side belt routing. Make sure the belt is properly centered in the camshaft and crankshaft sprockets, the idler, the oil pump, and the idler/tensioner. Don't twist the belt when installing it and never, ever pry it into place with a screwdriver. That's a no-no.



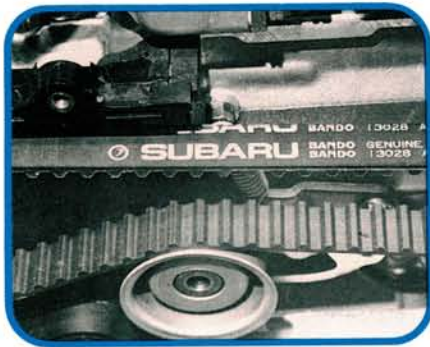
15

Loosen the retainer bolts on the tensioner arm. The tensioner return spring will pull the tensioner against the belt, removing the slack. Snug the bolts. If you didn't leave all the slack on the tensioner side, the cam and crank sprockets will want to rotate away from each other and may change timing.



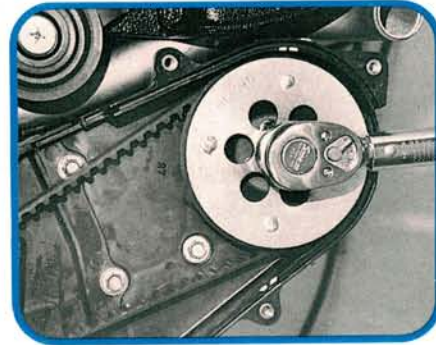
16

Rotate the crankshaft one complete turn and realign the marks on the flywheel as we did in step number 11. The timing mark on the left cam sprocket will now be at 6 o'clock. Turn the cam sprocket on the right to 12 o'clock. Install the new belt as you did for the left side and release the tensioner.



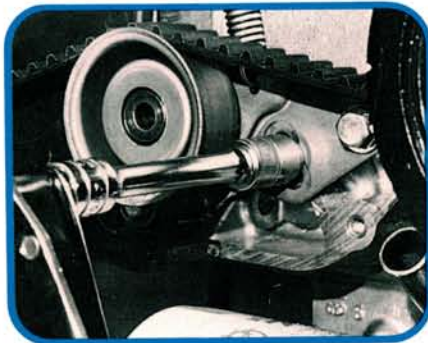
17

Snug the retaining bolts on the tensioner arm as you did for the left side belt. Now turn the crankshaft over at least three full revolutions by hand to completely center the belts. This is a very important step. Without it, you may not get an accurate final tension adjustment.



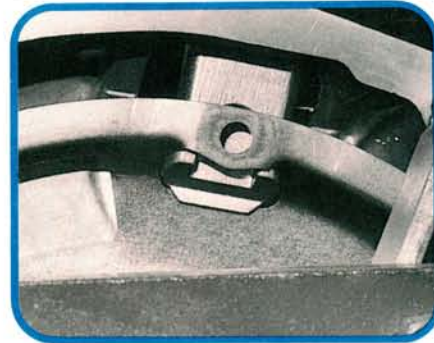
18

The belt tension wrench and a torque wrench are used to make the final belt tension adjustment. The plate has four pins that fit into sprocket holes and a hex head welded in the center. Lock the flywheel again. Loosen the retainer bolts on the tensioner and make sure it rotates freely against the spring.



19

Apply the specified torque to the belt in a counter-clockwise direction. The tensioner spring will remove any additional slack. When you reach the specified torque, tighten the retainer bolts on the spring tensioner as shown, maintaining that torque on the belt as you do so.



20

Rotate the engine again and double check the timing marks. Reinstall the covers and pulleys. Reassemble in reverse order of disassembly. Don't forget to remove the flywheel or drive plate lock after reinstalling the crank pulley, or there will be no joy in Mudville when you hit the key.