ENG-08, Balance Shaft Sprocket Installation and Alignment Check

Introduction

If your 944 is experiencing vibration problems, the cause could be a balance shaft misalignment. This can occur if the balance shaft belt slips a tooth, the balance shaft belt is broken, or if the balance shaft sprockets are installed incorrectly. Quite often, balance shaft sprocket misalignment occurs after water pump, crankshaft oil seal, or balance shaft oil seal replacement. The following procedure will tell you how to correctly install the balance shaft sprockets and how to check them for proper alignment if you suspect that the sprockets may have been installed incorrectly.

Other Procedures Needed

- ENG-13, Locating and Setting Engine to Top Dead Center (TDC), Cylinder 1

Installation

Each balance shaft sprocket has two slotted grooves on the inside diameter. One of the grooves on the sprocket will slide onto a woodruff key which is inserted into a slot near the front end of the balance shaft.

On 1983 and 1984 model 944s, each balance shaft sprocket was stamped on the front with an "O" (Ober or Over) beside one of the slotted grooves and a "U" (Unter or Under) beside the other slotted groove. As one might have guessed, on the upper balance shaft, the groove with the "O" stamped beside it was installed onto the woodruff key, and on the lower balance shaft, the groove with the "U" stamped beside it was installed onto the woodruff key.

I'm not sure what prompted Porsche to do it but, on cars produced after 1984, only the slotted groove with the "O" was stamped. The groove which previously had the "U" stamped beside it, now has nothing. This is when problems started to occur with balance shaft misalignment. Mechanics who weren't previously familiar with 944s and who didn't pay close attention when they disassemble the balance shaft assemblies naturally assumed that on both shafts the "O" should go on the woodruff key. This causes the lower balance shaft to be 180 degrees out of alignment. The resulting vibration is actually worse than if there were no balance shafts at all. So, the important thing to remember is that on the later cars, the groove with the "O" goes on the woodruff key on the upper balance shaft and the groove with nothing stamped beside it goes on the woodruff key on the lower shaft.

Checking Balance Shaft Alignment

One of the most important parts of ensuring proper balance shaft alignment is ensuring the balance shaft sprockets are properly installed. Since we've already discussed proper installation, you should have no trouble installing them correctly. However, if everything is assembled, how do can you tell if the sprockets are correctly installed ?

1. With the balance shaft sprocket covers installed, it is impossible to actually see the woodruff key to determine proper alignment.
2. Each balance sprocket cover has a number of round openings and one rectangular opening. At the rectangular opening, there is a tab on the back of the cover which gets inserted into the groove that does not have the woodruff key.
3. If the sprocket is properly installed on the upper balance shaft, the "O" stamped on the sprocket will be visible in one of the round openings on the cover.
4. If the sprocket is properly installed on the lower balance shaft, the "O" stamped on the sprocket will be visible in the rectangular opening on the cover.

NOTE

The only problem with this method is that sometimes the tabs on the back of the sprocket covers get broken off. If this is the case, the only way to positively determine proper installation is to remove the sprocket retaining bolts, remove the cover plate, and slide a heavy piece of wire or a small probe into each groove to determine the location of the woodruff key.

5. Once you're sure the sprockets are installed correctly, the balance shafts can be checked for proper alignment as follows:
    a. Using ENG-13, set the engine to TDC on cylinder #1.
    b. With the engine at TDC the notch on the back lip of the upper sprocket should align with the notch on the rear timing belt cover (approximately 1 o'clock position).
    c. For the lower balance shaft, the notch on the back lip of the sprocket should align with the raised tab on the inside of the back timing belt cover (approximately 7 o'clock position).
    d. Sometimes you'll find that the notches on the sprockets don't line up exactly. This is not uncommon. About half the 944s I've seen don't. However, with one sprocket dead on it's alignment mark, the other sprocket should be no more than about 1/2 tooth off. If it's out of alignment by 1 tooth or more then it should be realigned.