

Foreign Service



Dan
Marinucci

dmarinucci@motor.com

A new drive belt component may cause some underhood head-scratching. Dan explains the operation and diagnosis of the isolator decoupler pulley, a crafty noise reducer and mileage increaser.

Have you seen something unusual on the newest Toyotas? For instance, does the alternator pulley look different from earlier designs? If you noticed a change here (see photo below), you're very observant *and* you've caught an important trend—increasing usage of the Overrunning Alternator Decoupler Pulley OAD.

The OAD has become commonplace on Toyota/Lexus products as well as on many Saabs and Volvos. Meanwhile, OADs are appearing on more and more domestic vehicles such as those from General Motors and Chrysler. The burgeoning popularity of OADs emphasizes how serious automakers are about reducing noise, vibration and harshness as well as improving overall engine efficiency. Back in the shop, the OAD is newsworthy because it affects the way we test charging systems. Fortunately, diagnosing problems with an OAD is fairly easy once you learn the technique. Here's what you need to know.

Litens Automotive Group invented, developed and patented the OAD. Litens, which is based in Ontario, Canada, specializes in power transmission-related products for a wide variety of engines and applications. The component is an outgrowth of and a big improvement on the overrunning alternator pulley

(OAP). The OAP, which has been in service on certain alternators since the 1990s, contains a one-way clutch that enables the drive belt to spin the pulley and drive the alternator in the normal manner. But it also allows the *alternator* to freewheel or spin faster

than the drive pulley under certain conditions. The alternator pulley freewheels during sudden engine decelerations, eliminating drive belt noise that often occurs at this time.

Remember two important points here: First, the engine rapidly decelerates to a stop whenever you shut off the ignition switch. It also decels rapidly during hard transmission shifts. This particular condition is usually more noticeable when a driver shifts gears with the pedal to the metal—wide-open throttle.

Second, the heart of any alternator is the rotor, a spinning bundle of iron and copper. Denser, heavier rotors are characteristic of the high-output alternators used on most of today's accessory-laden vehicles. The spinning mass of the rotor tries to drive the alternator pulley when the engine decels suddenly. This means the alternator pulley is trying to turn against the normal rotation of the drive belt! On some drive belt systems, this causes the belt to slip. (Note that the potential for or risk of slippage varies from one drive belt system design to another.) Slippage, meanwhile, aggravates belt wear and may cause annoying chirping or squealing noises during sudden engine deceleration. This condition is common on *some* gasoline as well as *most* diesel engines.

However, as the OADs name suggests, it does more than just freewheel or “decouple” when the engine decels. Besides having a one-way clutch, the Litens OAD also has a special spring inside it, in series between the drive pulley and the rotor. To grossly simplify, this thing looks like a horizontal coil spring connecting the drive pulley to the rotor. So when the engine is driving the alternator, the power flows from the drive belt to the pulley, then through this special spring to the rotor. Not only does the spring transmit power to the rotor, it also isolates or cushions the rotor from the alternator pulley and the drive belt system.

Belt-driven accessories affect efficiency because they unavoidably consume or demand a certain amount of horsepower. According to a Litens engineer, automakers sometimes have coped with belt-slippage and noise issues by increasing drive-belt

continued on page 16



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Foreign Service

tension. Unfortunately, increasing tension increases the load the entire accessory drive system places on the engine. This increased load boosts the system's "parasitic" power losses. Today's energy- and fuel-conscious engineers are looking closer and closer at minimizing all parasitic losses—especially those from accessory-drive systems.

Often, the engineer said, incorporating an OAD into a vehicle's design allows an automaker to operate the accessory-drive system with less belt tension than with previous systems. (Remember, the OAD eliminates belt-related noise and minimizes belt slippage.) Typically, lowering drive belt tension increases the durability of the belt itself as well as the

bearings of all the components in the system—alternator, water pump, power steering pump, tensioner pulley, etc. But lowering drive belt tension also saves precious energy by reducing parasitic power losses; the engine wastes less fuel driving those accessories.

There are only a few details you need to remember about diagnosing problems with an OAP or OAD. Both components have an overrunning or one-way clutch. Experience shows that the single most common problem on higher mileage units is bearing noise. That is, the drive belt system and all accessories work fine. But a worn bearing inside that one-way clutch causes a brief buzzing sound during engine shut-down. The customer also may hear this momentary buzzing when the transmission makes the 1-2 shift.

To verify this, ask a coworker to sit in the vehicle and rev the engine to about 3000 to 4000 rpm. Then shut off the ignition switch while the revs are up; listen for a telltale buzzing sound from the front of the alternator.

Occasionally, the one-way clutch breaks, allowing the alternator pulley to freewheel in both directions. Then the vehicle comes in with a dead battery and a no-charge condition. Suppose you shut off the ignition switch and try to turn the alternator pulley with a strap wrench or turning/holding tool of some kind. If the pulley freewheels in both directions, the one-way clutch has failed. What's more, you may be able to watch the rotor and/or an internal cooling fan through the air openings on some alternators. If so, carefully shine a light in there while the engine is running. If the alternator pulley is turning but the rotor isn't, the one-way clutch has failed.

So far, OAD spring breakage has been rare. But if the spring did break, it would cancel the OAD's cushioning effect. This would cause noticeably excessive fluttering or movement of the belt tensioner.

As of press time, the only specialty tools I could find for these components are offered by Vensel Enterprises (www.venselenterpriss.com). Depending on the mileage and age of the alternator, some MOTOR readers may opt to replace the entire alternator assembly instead of just the OAP or OAD. 

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