Diagnosing noises has always been tough, and it’s even tougher over the phone. Don’t laugh; I’ve had technicians hold the phone next to a car more than once, looking for help with a stubborn noise. We’ve covered noise diagnosis in GEARS more than once, but I think it’s good to go through it from time to time. Since the last time we covered this topic a lot has changed with transmission design. So let’s see how the rules we used for noise diagnosis then, apply today.

Diagnosing a noise can be one of the greatest challenges of transmission repair. One reason is because a component that creates a noise doesn’t always look damaged. There are many types of noises that are transmission-related:

- Torque Converter
- Pump
- Hydraulic (valve buzz)
- Planetary
- Final Drive
- Isolation (caused by bad mounts)

Note: Torque converter, planetary and final drive also include any associated bearings. You’ll see how this works as we go through the diagnostic procedure.

This list doesn’t cover anything outside the transmission, and obviously there’s a host of components that can make noise or vibrations. Many of the techniques we use for diagnosing noise generators will work on other components as well. There are two basic rules that will help isolate which component is causing the problem:

Rule 1: A component can’t generate a noise if it isn’t moving. This sounds straightforward enough, but it’s often overlooked.

Rule 2: If the noise is pressure-related, it will change when the demand for pressure changes.

A word of caution: All transmissions make a certain amount of noise. One reason for using rubber mounts is that they isolate the noise from the rest of the vehicle. A broken mount can amplify a normal noise. Always check the engine and transmission mounts carefully when trying to identify a noise. Keep in mind that a mount may appear to be in good shape but be installed improperly. This can also cause excessive amplification of a normal noise.

One more thing — there are two properties of a noise that we’ll discuss several times: volume and pitch. Volume is easy: It’s how loud the noise is. Pitch, on the other hand, is a change in the frequency of the sound. It’s sort of like plucking a guitar string, and then turning the tuning peg; you can make the note higher or lower. When the pitch of a noise changes, or gets higher, in a transmission, it often gets louder as well. That’s because, to change the pitch of the noise coming from a rotating part, it must rotate faster. A part that’s rotating very slowly typically doesn’t make as much noise as when it...
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Okay, let's get started. The following is a list of common noise generators, and simple methods of diagnosing them.

**Torque Converter Noises**

Most torque converters consist of a pump, turbine and stator. Many also use some type of clutch. The converter clutch can be applied hydraulically or through centrifugal force. A split-torque converter, like the one used in the early ATX, has a planetary gear set.

Still others, like those used in the AOD, ZF4HP-18, and VW096 (phases 0 and 1) have a damper assembly, which is physically connected to the main housing. The damper assembly, being connected to the main housing, always turns with the engine (this will be important later). Most of the units you'll come across are plain ol' lockup converters, but we'll go through the odd ones anyway, to make the story complete.

A torque converter noise is easy to isolate. When the transmission is in park or neutral, the entire converter (pump, turbine stator and clutch components) turn as an assembly, so a converter noise will go away in these ranges.

When the transmission is in gear (and the drive wheels are held stationary) the turbine and lockup plate will stop rotating. This is because the turbine shaft is stationary. And it's when the bearing between the turbine and main housing of the converter is working (figure 1). If you only hear the noise when the unit's in gear, with the drive wheels stationary, and it goes away in neutral, suspect the torque converter. There are, however, a few exceptions:

Remember the split-torque, and damper-assembly converters? When the transmission is in gear, and the drive wheels are stationary, there's always something in the transmission that's turning. For example, the direct drum of an AOD is always turning while the engine is running. That's why it's easy to confuse a torque converter noise with a noise from one of the direct drum bearings. The intermediate drum used in the ATX (with a split-torque converter) also turns any time the engine is...
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running, regardless of whether the transmission is in gear or not.

Here’s another tip: A torque converter noise will get quieter as the drive wheels begin rolling slowly from a stop. So if you hear a noise with the unit in gear — with the wheels stationary — try letting the vehicle roll a bit and see if the pitch of the noise goes down. If it does, suspect the converter.

Pump and Hydraulic Noises

Pump noises are simple: They change when the demand for pressure changes. For example, a 4T60E has a noise whether it is in or out of gear. Because of this, the torque converter can be ruled out. Putting the transmission in gear will stop the entire gear train from turning. That rules out the entire gear train. See how easy it is? At this point, the only suspect is the pump (or some other hydraulic component like the pressure regulator valve).

The test here is to vary the vacuum to the modulator, which will vary line pressure. If the noise varies with a change in pressure, it’s time to look at the pump (including the pump driveshaft). If this were a 4L60, pulling the TV cable would do the trick. With a 4R100, altering the EPC solenoid signal will work.

A word of caution: If you suspect a pump or hydraulic noise on a transmission that uses a solenoid to control line rise, use a transmission tester to control line rise, rather than simply disconnecting the wiring harness. Most transmissions will make noise at maximum pressure while idling. If you’re not careful you can confuse the new noise created by high line pressure with the one you’re trying to diagnose. If you vary line rise with a tester, you have a better chance of keeping track of the noise you’re dealing with.

Pump noises can also be caused by a restricted filter. You can check for this problem with a pressure gauge. If the noise is caused by a clogged filter, the needle jump around when the demand for pressure increases.

One more thing to consider is the fit of the pump gear on the converter neck. Pumps that use a set of gears and a crescent, such as the 4L80E, can make a pump noise simply by having a worn (or undersized) converter neck. That’s because the converter neck holds the inner gear in line with the centerline of the pump (Figure 2a & 2b). If the inner gear has a loose fit on the neck, hydraulic pressure will force the gear into the crescent. And as pressure increases, so will the volume of the noise, because the higher pressure is forcing the gear harder into the crescent.

The problem here is that you can identify the noise properly as coming from the pump, replace the pump, and still have the noise. This is where you say “I’ve put three pumps in this thing and it’s still making noise!” Ultimately, you find that it’s the converter neck causing the problem. You replace the converter, and the noise goes away.

Final Drive Noises

Final drive noises are perhaps the easiest noises of all to diagnose: The noise will increase in pitch as the speed of the vehicle increases. It won’t change with engine RPM or with gear range; it only changes with vehicle speed.

Noises coming from the final drive can originate from the final drive pinions, the ring gear, the sun gear, or the carrier bearings (Figure 3). On some front wheel drive units, such as the 41TE, you also have to consider the countershaft gears and bearing, the pinion and final drive gears, and carrier bearings because they turn with the final drive, at a proportional speed (Figure 4). Endplay and preload settings of these parts can also have an affect on the noise.

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CD4E that have a drive chain on the output side of the gear train (figure 5). All of these components are suspect: Be careful!

Keep in mind, too, it's easy to mistake a final drive noise with a bad mount. If the mount is bad or installed improperly, it can allow a normal noise to sound much louder than it really is. Here again, check the mounts carefully first.

**Planetary Noises**

Planetary and bearing noises are by far the most difficult noises to diagnose. This is where the first rule is important to remember: *A component can’t make noise if it isn’t moving.* The trick is to remember that when two components are rotating in the same direction at the same speed, they are, in effect, not moving in relation to one another. This is the most important point to keep in mind.

For example, an AX4S has a noise in neutral and while driving down the road. The noise goes away when the transmission is in gear and the vehicle is stationary. Right away, you can rule out the torque converter. Torque converter noises show up when the transmission in gear and the drive wheels are stationary. Because the pump is producing the same pressure in neutral as it is in drive, it can be ruled out as well. The final drive can’t be the culprit because the noise is there when the vehicle stopped.

This is where you must exercise careful scrutiny: The first rule of noise diagnosis states that a component can’t make a noise if it isn’t moving. And we know that two components rotating at the same speed, in the same direction,
aren’t moving in relation to one another. Knowing that third gear has a one-to-one ratio means that the planetaries aren’t rotating in relation to one another in third gear. So, if the noise is caused by either planet, it must go away when the transmission shifts to third gear.

Unfortunately, on this unit the noise was still there in third gear, although it did become quieter. Further diagnosis requires an intimate knowledge of the unit being tested; in this case, the AX4S.

The noise didn’t go away in third gear, but it did change in pitch as the unit shifted from one gear to the next. If the noise isn’t coming from a planet, and it changes pitch as the transmission shifts from one gear to the next, it must be a component that’s connected to the turbine shaft. This leaves the two sprockets and their related bearings (figure 6); all other components were already eliminated.

All diagnosis is a process of elimination. Proper diagnosis begins with knowing which components are unable to make the noise. If you understand when the components of the transmission you’re working on can and can’t make noise, you’re on your way. Don’t touch those bell housing bolts until you know.

And don’t forget isolation. The worst thing that could happen is that you identify the problem component and replace it, only to find that you had a bad mount all along!