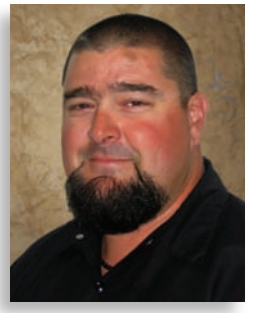
Understanding the Slide-Bump Shift



by Lance Wiggins

It sounds like the name of a '60s era dance craze… something you'd see on one of those afternoon teen dance shows. But the slide-bump shift is a real transmission problem… one that's easy to fix, once you understand what causes it.

A slide-bump is the combination of a slow, slip shift that finishes suddenly with a firm "bump." Customers are less likely to notice the slide, simply complaining about a harsh shift, a lurch, or a thump during a shift. This is why it's critical to begin any diagnosis with a road test of your own, to verify the complaint.

Make sure you find out exactly which shift the customer is complaining about, because a slide-bump will usually only occur during one shift, such as the shift from 1st to 2nd, or 2nd to 3rd.

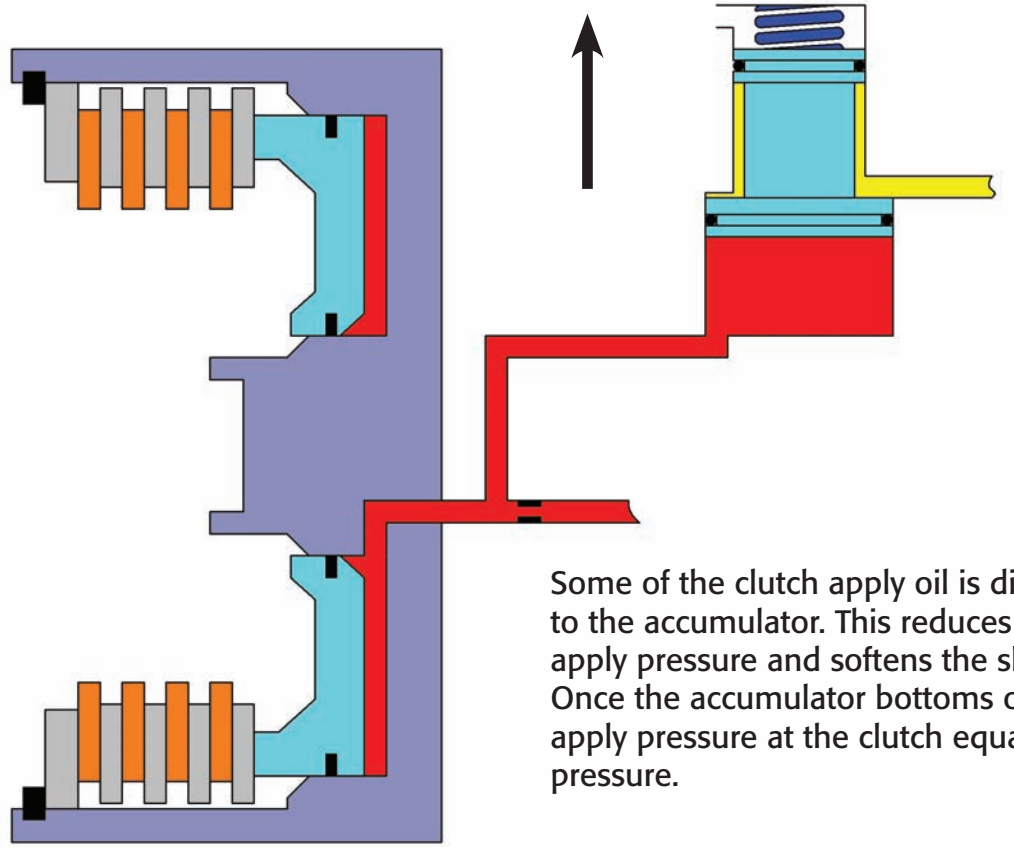
Once you understand the customer's complaint, go for a road test to verify it. Chances are, you'll notice the nuances of the slide-bump that escape the customer's attention; in this case the slow, long beginning, followed by the harsh finish.

What Causes the Slide-Bump Shift?

To understand what causes a slide-bump shift, first let's discuss a normal shift, and what should be happening:

During a normal shift on most units, the shift valve strokes. This redirects apply oil to the clutches or bands necessary to create the next gear range.

Most circuits also include an accumulator. The accumulator is a type of shock absorber, designed to smooth out the shift by using some of the shifting oil that would otherwise go to a clutch or servo. Think of it as a controlled



Some of the clutch apply oil is diverted to the accumulator. This reduces clutch apply pressure and softens the shift. Once the accumulator bottoms out apply pressure at the clutch equals line pressure.

Figure 1: An accumulator acts as a shock absorber for the clutch circuit, to cushion the apply.

leak. An accumulator consists of a piston with a spring and/or hydraulic pressure behind it; if the transmission uses a shifting band, the servo may act as an accumulator as the band releases. An example of this is a 46RE kickdown servo that serves as an accumulator for the 2-3 shift. An important point to recognize is that it's the *speed* by which the accumulator strokes that determines how it'll affect the shift. The faster the accumulator strokes during the shift the softer the shift will be. The slower it strokes during the shift the firmer the shift will be. If it moves too fast you get a slide bump because the accumulator is diverting so much oil from the shifting element that it can't apply. Then, when the accumulator bottoms out the pressure at the apply element *spikes* to normal, causing a harsh shift; that's the bump we're talking about.

Another consideration is the placement of the spring. If the spring is compressed during the shift then a stronger spring will slow down the speed of the accumulator during the shift. If the spring relaxes during the shift then a weaker spring will slow down the speed of the accumulator during the shift. Before you replace an accumulator spring for shift-feel reasons you'll need to know whether the spring compresses or relaxes during the shift. In our example we'll refer to a system that compresses the spring during the shift (figure 1). We also use this system for the test at the end of this article.

As the apply pressure fills the front of the accumulator, the accumulator moves back in its bore; consuming oil that would otherwise go to the clutch. This slows the pressure rise in the clutch circuit. The spring or hydraulic pressure behind the accumulator resists the accumulator's movement, to adjust the shift feel characteristics.

When working properly, the shift will complete before the accumulator reaches the end of its stroke (figure 2).

If the spring behind the accumulator is too strong, or there's too much pressure behind the accumulator, the shift will be firm; even harsh (figure 3).

If the spring behind the accumulator is too weak or broken, there's a leak in the accumulator, or there isn't

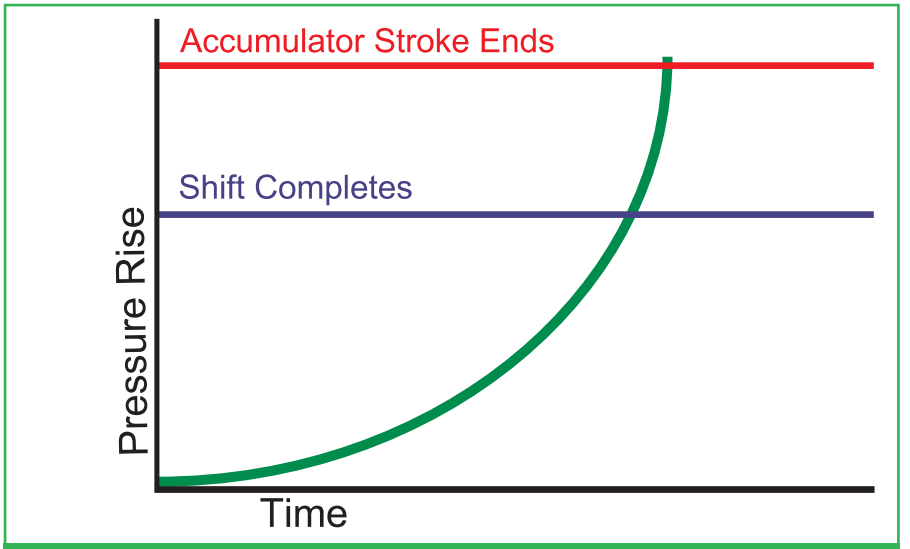


Figure 2: During a normal shift, the shift will finish before the accumulator reaches the end of its travel.

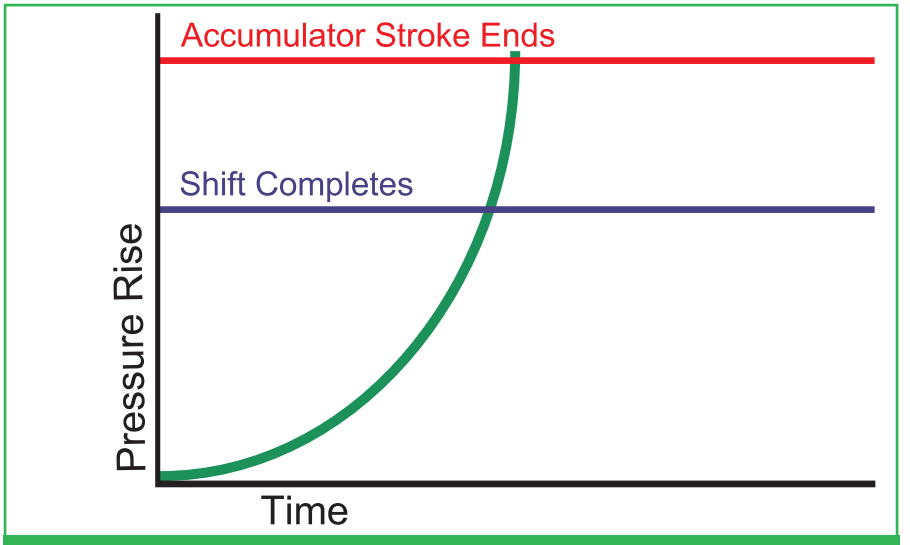


Figure 3: If the accumulator spring is too heavy, or the accumulator has too much pressure behind it, the shift will occur too quickly, and it'll feel harsh.

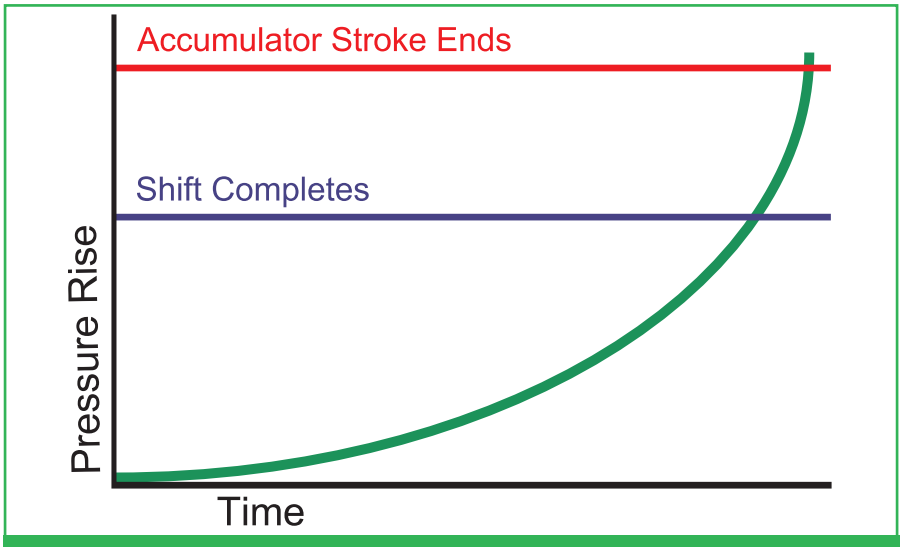


Figure 4: If the accumulator spring is too weak, or there's a leak in the accumulator pressure, the shift will be soft and mushy.

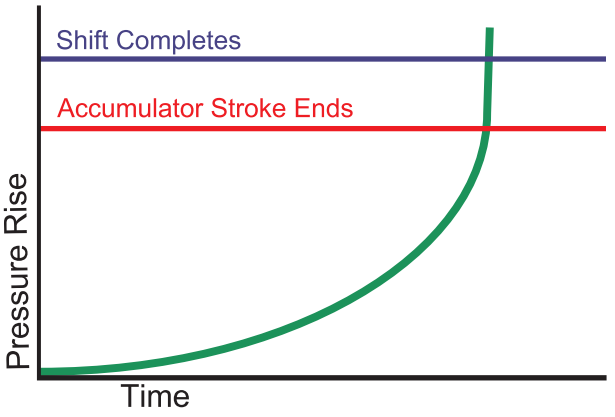


Figure 5: If the spring is even weaker or there's a big leak in the accumulator pressure, the shift will complete after the accumulator bottoms out; this creates a slide-bump shift.

enough pressure behind the accumulator, you may have a soft, mushy shift (figure 4).

But if the spring or pressure behind the accumulator is weak enough that the accumulator reaches the end of its travel *before* the gear apply is complete, it'll cause a slide-bump shift (figure 5).

Correcting the Slide-Bump Shift

Probably the first step in correcting a slide-bump shift is to open the accumulator and inspect it thoroughly (figure 6). Look for anything obvious, such as a damaged sealing ring or a broken spring; a broken accumulator spring is probably the most common cause for a slide-bump shift.

Don't forget to check the accumulator bore; wear in the bore can easily cause a slide-bump shift, especially if the system is supposed to apply pressure to the back of the accumulator. A leak in that part of the circuit lowers the accumulator resistance, so the accumulator moves too easily.

If you find anything wrong in the accumulator circuit, take care of that problem, reassemble the unit, and go for another test drive. Chances are the slide-bump will be gone.

But if there's nothing obviously wrong, then you're going to have to use your understanding of the system to correct the problem. In most cases, that's going to involve installing a stronger spring behind the accumulator, to firm up the shift a little and force the shift to finish before the accumulator strokes all the way.

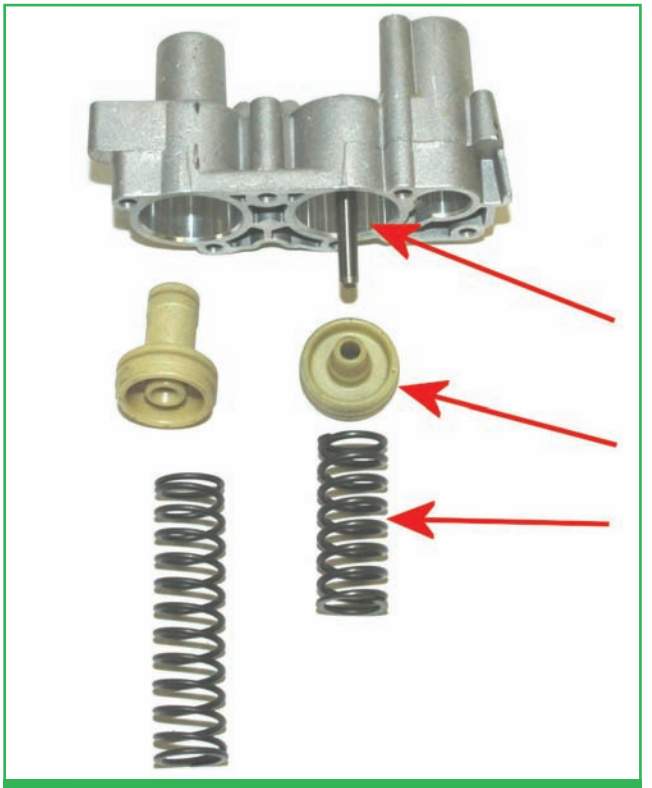


Figure 6: Look over the accumulator assembly and circuits for anything obvious; a broken spring, a damaged sealing ring. Fixing that should take care of the slide-bump shift.

Some transmissions have an accumulator regulator valve that controls the pressure applied to the back of the accumulator. If the accumulator regulator uses a spring, increasing the spring tension will increase the pressure behind the accumulator.

Regardless of the root cause of the problem, a slide-bump shift is easy to fix… once you understand how the system's supposed to work.

Keeping Up Quiz

1. Which of these problems ***won't*** cause a slide-bump shift?
   A. A leaking accumulator circuit
   B. A burnt clutch pack
   C. A broken accumulator spring
   D. All of the problems could cause a slide-bump shift

2. Tech A says a slide-bump shift could mean the accumulator spring is too heavy.
   Tech B says high line pressure can cause a slide-bump shift.
   Who's right?
   A. A only
   B. B only
   C. Both A and B
   D. Neither A nor B

3. Tech A says a slide-bump shift is caused when accumulator reaches the end of its travel before the shift is complete.
   Tech B says some units use the band servo as an accumulator.
   Who's right?
   A. A only
   B. B only
   C. Both A and B
   D. Neither A nor B

4. Tech A says, when a slide-bump shift occurs, most customers will complain of a soft shift.
   Tech B says it's important to verify the complaint when dealing with a slide-bump shift.
   Who's right?
   A. A only
   B. B only
   C. Both A and B
   D. Neither A nor B

5. Which of these repairs ***won't*** correct a slide-bump shift?
   A. Decreasing line pressure
   B. Replacing the accumulator spring with a heavier one
   C. Replacing the accumulator regulator spring with a heavier one
   D. Replacing a damaged accumulator sealing ring

Answers: 1. B; 2. D; 3. C; 4. B; 5. A

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