Little Benz with No 3-4 Shift

by Pete Huscher

Recently, I received a call from Daniel on the ATRA Hotline. Daniel was working on a 93 Mercedes Benz 190E with a 722.4 transmission. The car had already been to several other shops, but they couldn't fix the problem, so the owner brought it to Daniel.

Daniel said the transmission wouldn't shift 3-4; all other shifts seemed to be okay. The shifts were on time and smooth, but the transmission wouldn't upshift into 4th gear. After discussing his problem, I asked him to perform a few basic checks.

Basic Checks

One of the first checks was a visual inspection of the components that control the 3-4 shift. This included making sure the vacuum line to the modulator was connected and not kinked, checking the vacuum line to the throttle valve actuator (this car had been updated to the new-design throttle actuator which didn't use vacuum control), and a look at the kickdown solenoid, just in front of the rear transmission mount. The modulator had vacuum and the kickdown solenoid appeared to be okay.

The next step was to disconnect the kickdown solenoid and see if the transmission would make a 3-4 shift. The transmission still didn't upshift 3-4 with the kickdown solenoid disconnected, so the problem wasn't being caused by the kickdown solenoid being commanded on all the time.

Next it was time to install a pressure gauge.

The Diagnosis

Based on the checks so far, it appeared that Daniel was dealing with an internal transmission problem. The next step was to perform pressure tests to see if the transmission was producing the correct pressures to allow for a 3-4 shift.

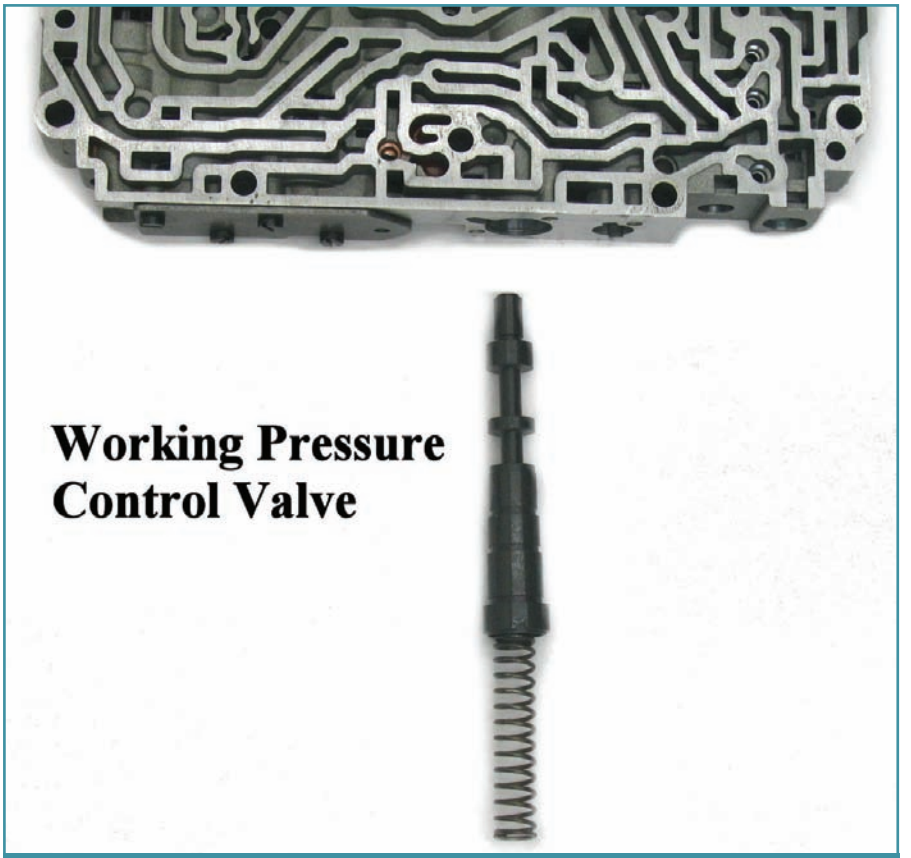

Figure 1: working pressure control valve & bore worn

First he performed a modulator pressure test. To perform this test you:

- Connect your pressure gauge to the modulator pressure tap.
- Disconnect the vacuum line from the modulator.
- Put the vehicle within these test parameters:
  - Transmission in drive
  - Hold the vehicle at 31 MPH
  - Full throttle

Daniel found the modulator pressure to be extremely low: 25 PSI. Knowing that modulator pressure would affect the working pressure, and in turn, transmission operation, Daniel knew he had to adjust the modulator to bring the modulator pressure within specifications.

It took almost four turns to get the modulator pressure up to specs. This wasn't normal; usually modulator adjustment is in quarter turn increments

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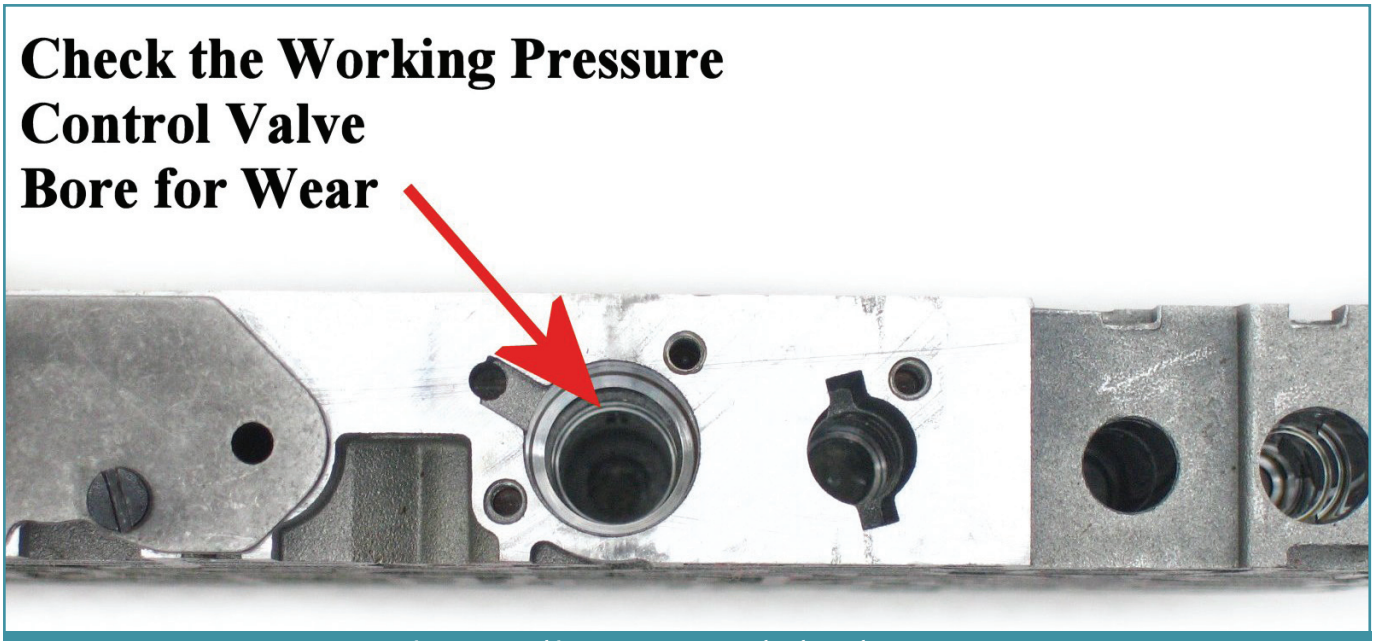

Figure 2: working pressure control valve & bore worn

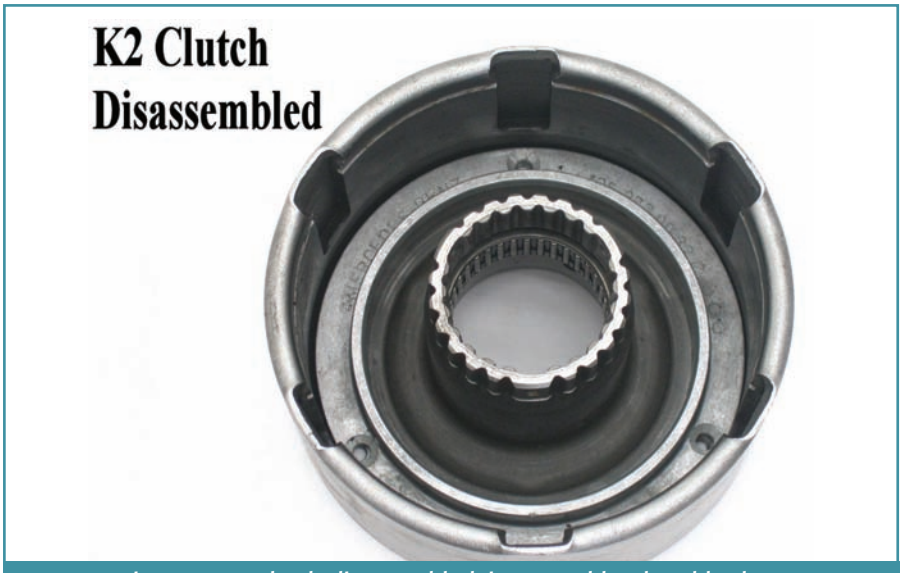

Figure 3: K2 clutch disassembled, inner seal hard and broken

and the pressure rise is immediate.

Next, Daniel installed the pressure gauge on the working pressure tap. Working pressure maxed out at around 80-90 PSI. This is extremely low — working pressure should be 197–222 PSI — which explained why the modulator pressure was low.

Finally Daniel installed the pressure gauge on the governor pressure tap. While running the speed up with the car on the rack, governor pressure rose normally, and was within 2-3 PSI of specifications. Knowing that the governor pressure was operating properly, Daniel was confident that the valve body had to be preventing the 3-4 shift. The next step was to remove the valve body for inspection.

Valve Body Inspection

After removing the main valve body from the transmission, Daniel removed the damper housing and disassembled the valve body. Daniel found the working pressure control valve and bore were excessively worn (figures 1 and 2). The rest of the valve body seemed to be in fair condition, but with the working pressure control valve bore being worn, the valve body would have to be replaced.

Confident that the valve body was the problem, Daniel ordered a rebuilt one. When the rebuilt valve body arrived, he installed it, replaced the pan, and refilled the transmission. Then he checked transmission operation. During the previous pressure tests, Daniel installed three pressure gauges, allowing him to monitor the modulator, working, and governor pressures at the same time. After readjusting the modulator, all pressures seemed to be within specifications.

The transmission seemed to upshift okay on the rack, but Daniel couldn't tell if the transmission made a 3-4 shift. He knew it was time to go for a test drive to check transmission operation. He backed the vehicle out of the shop and went for test drive. It had 1st gear; 2nd gear shifted a little bit firm but was right on time; 3rd gear came in on time, but the transmission wouldn't shift to 4th gear.

After several attempts to force the shift to 4th gear — moving the shifter lever back and forth between 3rd and drive range, and letting off the accelerator to allow modulator pressure to drop — the transmission still wouldn't shift into 4th gear. Daniel rechecked the pressure gauges while heading back to the shop; all of the pressures were within specifications. This indicated that the valve body was capable of doing its job.

Back at the Shop

After returning to the shop, Daniel went back over his pressure readings. He was confident that the valve body was capable of producing the pressures needed to allow for a shift into 4th gear. The question was, is the 3-4 shift valve stroking, or did he have a K2 clutch

problem? The next step was to try to force the 3-4 shift valve to stroke.

Daniel connected regulated shop air to the governor pressure port; this would allow him to increase governor pressure manually, to force the 3-4 shift valve to stroke. With the car running on the rack, the transmission in drive, and regulated shop air pressure connected to the governor pressure port, Daniel added air pressure to the governor pressure port and increased the governor circuit pressure to over 50 PSI. The transmission still didn't shift to 4th gear. Since he'd replaced the valve body, the only possibility left was a K2 clutch problem.

In the Transmission

Daniel removed and disassembled the transmission to inspect the K2 clutch. During disassembly, Daniel air checked the K2 clutch circuit and found it was leaking. The inner clutch seal was hard as a rock, broken and leaking (figures 3and 4). Evidently the previous repair shops missed the inner seal. The clutches weren't worn or damaged; the inner seal was just leaking.

After resealing the K2 clutch and reassembling the transmission, Daniel rechecked the K2 clutch and found it would apply with as little as 10 PSI. After installing the valve body and pan, the transmission was ready to be installed.

Rechecking Transmission Operation

With the transmission installed, refilled and rechecked for leaks, it was time to recheck operation. The transmission engaged in each range as Daniel moved the shifter lever. With the shifter in drive and his foot off the brake, Daniel felt the wheels turn.

As the wheel speed increased, the transmission shifted from 1st gear to 2nd and then to 3rd, but still no 4th gear. Daniel continued to accelerate and then the transmission shifted to 4th gear. Needless to say, Daniel was happy to finally get 4th gear. With the transmission completing all the shifts on the rack, it was time to take this little Benz out on the road and see what it was going to do.

The Road Test

After rechecking the fluid level and checking for leaks, Daniel backed the car out of the shop and headed out for a test drive. During the test drive, the 1-2 shift was a bit firm but the transmission shifted through all of the gears. The most important thing was the transmission had a nice 3-4 shift. After driving several miles through stop and go traffic, the transmission seemed to work perfectly except for the harsh 1-2 shift.

After the test drive, Daniel called back to discuss the harsh 1-2 shift. I searched through ATRA Online and found an old *GEARS* article related to solving problems on the 722.3 and 722.4 transmissions. Published in the December 1999 issue, the article was titled *Mercedes Six Bolt: Going with the Flow.*

We found that this article had a lot of information related to fine tuning the shifts. According to the article, the B1 accumulator control valve controls the 1-2 shift feel. Installing a weaker spring would provide a softer shift; a stiffer spring would cause a firmer 1-2 shift. After removing the valve body, disassembling the damper housing and inspecting the B1 accumulator, sealing rings and springs (Figure 5), Daniel replaced the B1 accumulator control valve spring with a 10% lighter spring and reassembled the valve body.

Final Test Drive and Inspection

Daniel backed out of the shop once more and started off on his test drive. This time the transmission shifted perfectly. The 1-2 shift was just right and the other shifts seemed to be on time and felt good. Needless to say, Daniel was happy with the final test drive and headed back to the shop for the final inspection.

Everything looked great, there were no leaks, and the transmission seemed to work perfectly. Daniel rechecked the transmission operation several times, and each time, the transmission worked just the way it was supposed to. After verifying that the transmission was repaired, Daniel called to let me know the car was ready to go.

I complimented Daniel on doing a great job on this little Benz and reminded him that ATRA Online has a lot of good information and it's just a key stroke away (ATRAonline.com).

Until next time, remember: With the right information (ATRA Online) and the right help (ATRA Technical Hotline) you too can *keep those trannys rolling.*

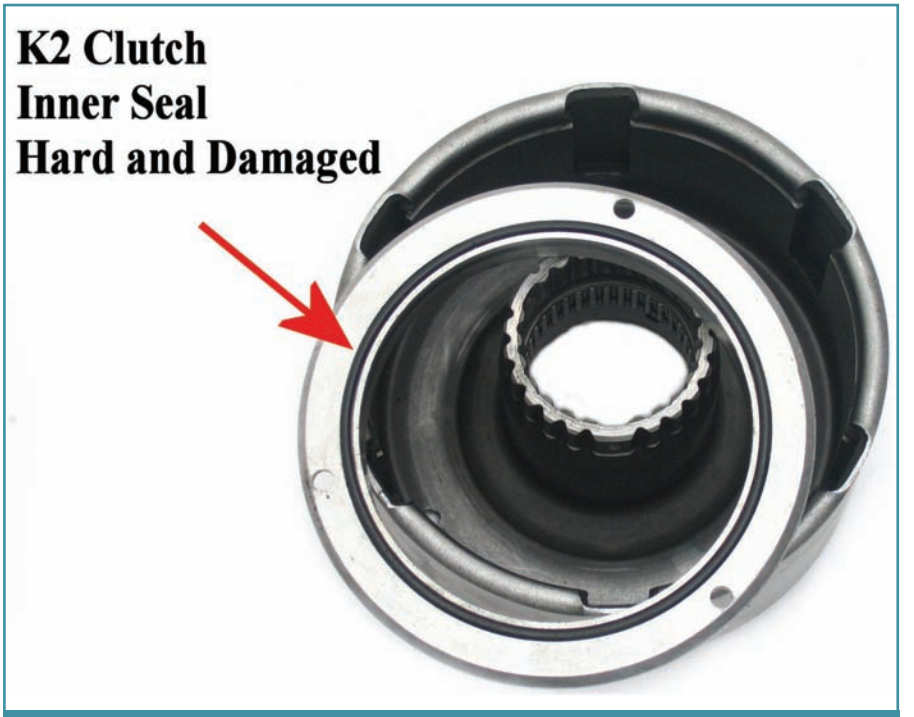

Figure 4: K2 clutch disassembled, inner seal hard and broken

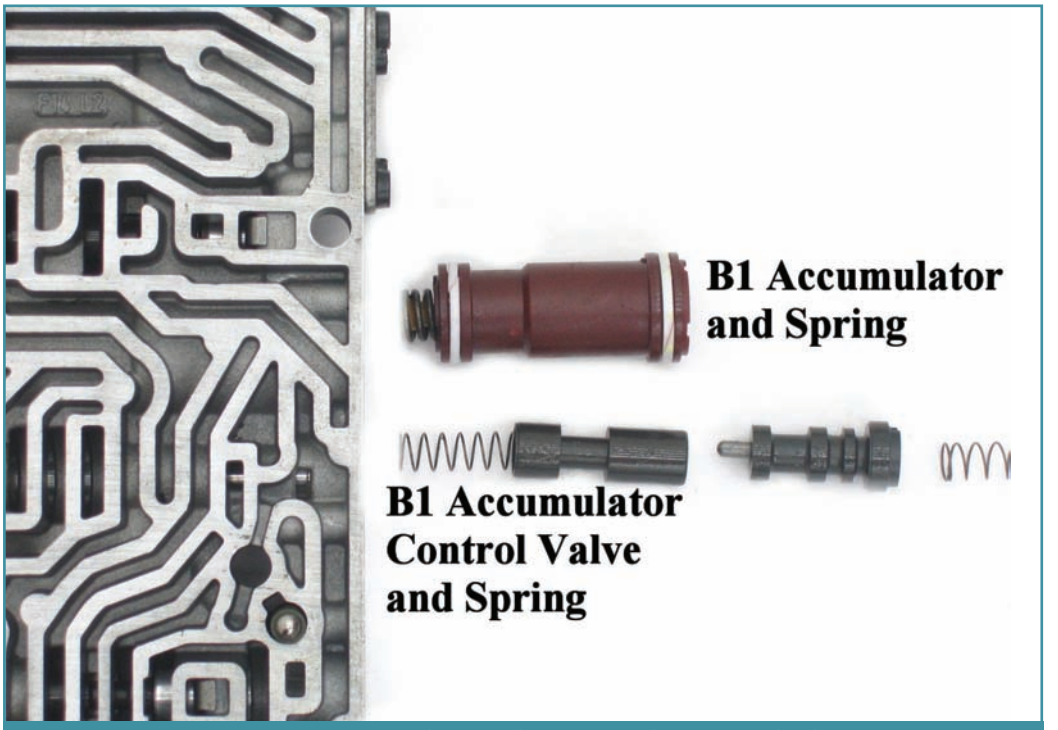

Figure 5: B1 accumulator and B1 accumulator control valve

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