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Subject:
Code 17090

Unit:
01J CVT

Vehicle Applications:
Audi A4

Essential Reading:
- ☑ Rebuilder
- ☐ Shop Owner
- ☐ Center Manager
- ☑ Diagnostician
- ☐ R & R

01J CVT: Diagnosing and Repairing Code 17090

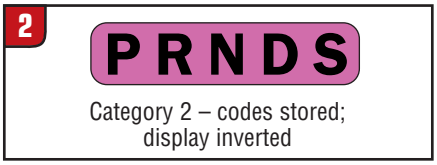
A 2003 Audi A4 with an 01J continuously variable transmission (CVT) came to our shop. The customer complained that the vehicle was sluggish in forward and had no reverse and that this would take place only when all the lights in the gear indicator "lighted up and flashed."

CVTs are starting to show up in our shops, so we have to be prepared to diagnose and repair these units. To do so we have to understand how they are designed to work. Wayne Colonna has written a number of articles on this transmission that have appeared in *Transmission Digest*, such as "The Bucking Audi" in April 2007. He also provided excellent information in ATSG's 2008 and 2010 seminars. All this information is recommended reading if you're planning to do repairs on this transmission.

Let's start by explaining how codes are stored in the 01J CVT. Audi has categorized transmission codes in three categories. First are the non-critical-state codes. In this state a fault code is stored and the transmission control module (TCM) will substitute a program to enable continued operation of the vehicle with some restrictions. Since this state is not critical, it's not indicated to the driver (**Figure 1**), although the driver may notice the fault by the different way the vehicle is operating.

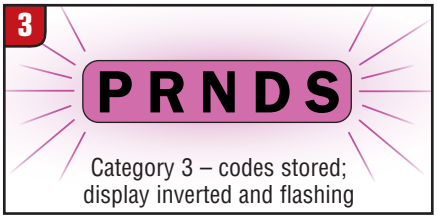
Non-critical state

The second state we can call non-critical, but with restrictions. In this state the TCM stores the code and substitutes a program to enable continued operation, but with some restrictions, and the TCM informs the driver by inverting the display of the gear-selector-position indicator (**Figure 2**).



Non-critical with restrictions

The third state we can call the critical state. In this state the TCM stores the code and substitutes a program for continued operation with restrictions, at least until the vehicle comes to a stop. Then it will put the vehicle into a failsafe state and inform the driver by inverting the gear-selector-position indicator and causing it to flash (**Figure 3**). In this state, in some instances the vehicle will not be drivable but in others the driver can resume operation of the vehicle by restarting it.



Critical state and failsafe

When we scanned the vehicle for codes, we obtained code 17090 "Transmission Range Sensor (F125)" (**Figure 4**), but since the

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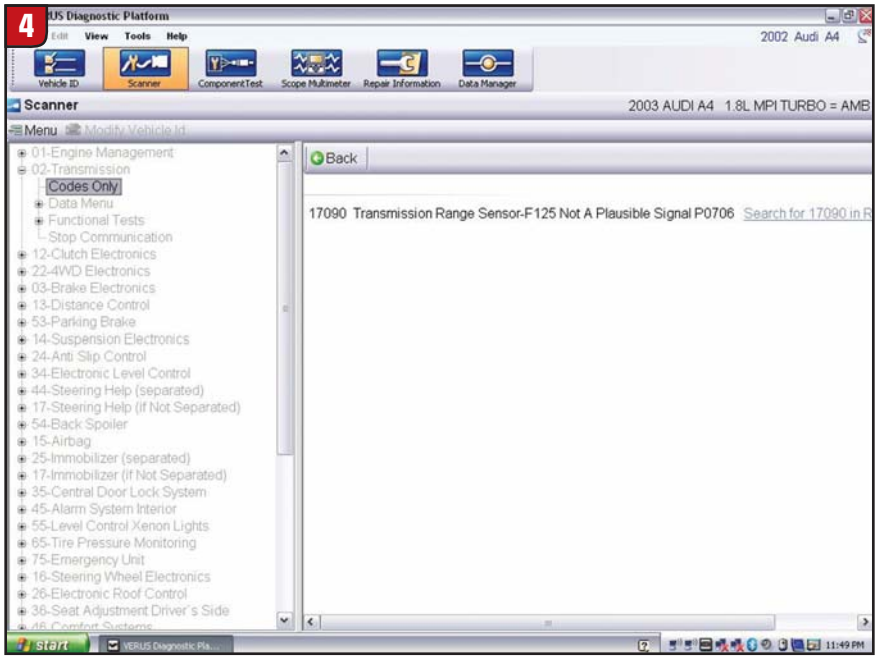

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Gear-selector-lever position	Hall-effect sensor states			
	A	B	C	D
P	0	1	0	1
Between P & R	0	1	0	0
R	0	1	1	0
Between R & N	0	0	1	0
N	0	0	1	1
Between N & D	0	0	1	0
D	1	0	1	0
Faulty logic combinations	0	0	0	0
	0	0	0	1
	0	1	1	1
	1	0	0	0
	1	0	0	1
	1	0	1	1
	1	1	0	0
	1	1	0	1
	1	1	1	0
	1	1	1	1

malfunction was intermittent we could not detect the problem of which the customer was complaining.

After a couple of road tests the problem the customer had complained of appeared and the gear-selector-indicator lights were inverted and flashing, telling us there was a critical-state code.

The transmission multi-function range sensor (F125) provides a logic state that informs the TCM of the gear selected. The sensor is composed of four Hall-effect sensors that are controlled by the magnetic gate on the selector shaft and can produce both high and low voltage readings. A high voltage reading means the switch is closed and is given a value of "1." A low voltage reading means the switch is open and is given a value of "0." Thus, a Hall-effect sensor can generate two signals: 1 and 0. These four sensors can produce 16 different gearshift combinations: four for the gear selected (P, R, N and D); two for intermediate positions (P-R and R-N-D); and 10 combinations that are considered faulty (**Figure 5**). One thing worth mentioning here: If Hall-effect sensor D fails, starting the vehicle may not be possible.

By using the data parameters (see example in **Figure 6**) we checked the logic state of the transmission range sensor and found it to be in the fault state.

Since the range sensor is part of the TCM, we had to remove the TCM from the valve body (**Figure 7**).

We had three options. We could buy a new TCM from the Audi dealer or buy a used one, either of which would require sending the vehicle to the Audi dealer to pro-

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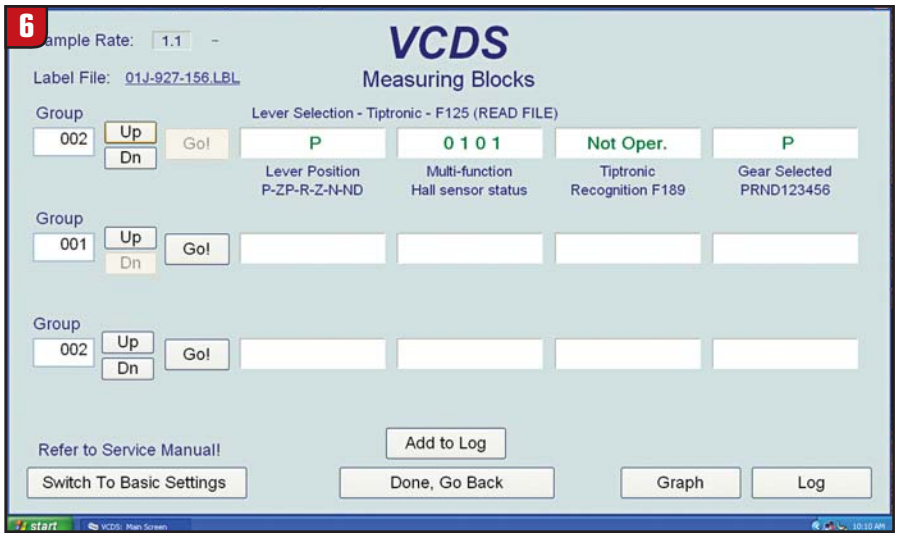

Using a scan tool to see the status of the multi-function sensor

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The TCM is fastened to the valve body with three bolts.

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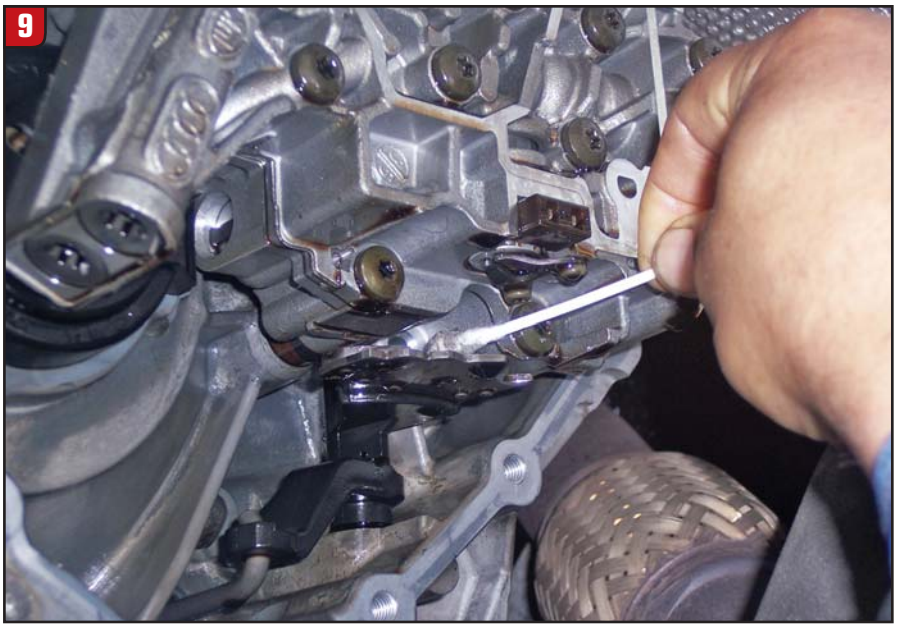
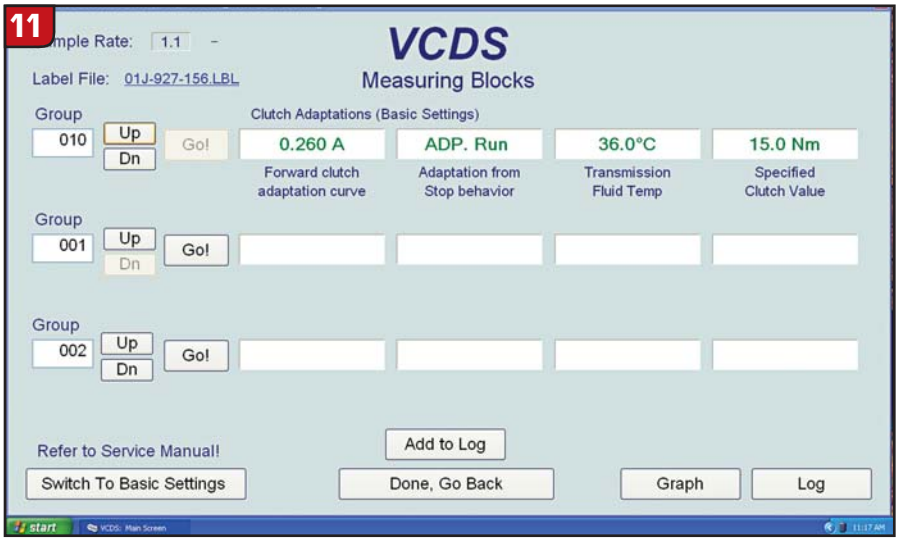
When you remove the spring tension from the detent and remove it from the selector shaft, be careful not to lose the small wheel in it, as it can fall off easily.



Checking for metal particles on the selector-shaft magnetic gate



gram the TCM to the vehicle and to reset the adaptations. The third option was to have the vehicle's own TCM rebuilt. This option would not require sending the vehicle to the dealer for reprogramming because it was the original TCM.

So we sent the vehicle's TCM to BBA-REMAN to have it rebuilt, and it took only four days round trip. By going to the company's Web site, www.bba-reman.com, we were able to handle everything online, including printing a UPS call tag. One piece of advice here: Once you are on the Web site, make sure you click on the right flag for the country you are in. You also can accomplish the transaction by phone.

When we removed the TCM we checked for metal particles on the selector-shaft magnetic gate (**Figure 9**). These metal particles can cause false readings by exciting the Hall-effect sensors; however, we did not find any indication of that on this vehicle, so the problem had to be inside the TCM.

When we received the rebuilt TCM we installed it and replaced the seal, gasket and rear-cover bolts. According to Audi these are stretch bolts that are made to be used only once.

To fill with CVT special fluid #G-052-180-A2, we used a Honda power-steering pump that is driven by the speedometer, together with a drill (**Figure 10**). After we road-tested the vehicle, the fluid level had to be checked with the fluid temperature at 35°-45° Celsius (**Figure 11**).

This repair was not complicated; it was in our opinion an easy fix, and the satisfaction of seeing the smile on the customer's face, when everyone else wanted to sell him a new transmission, was, as they say in the credit-card commercial, "priceless." TD

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