

Diagnosing Chrysler PCI Communications



by Wayne Russell

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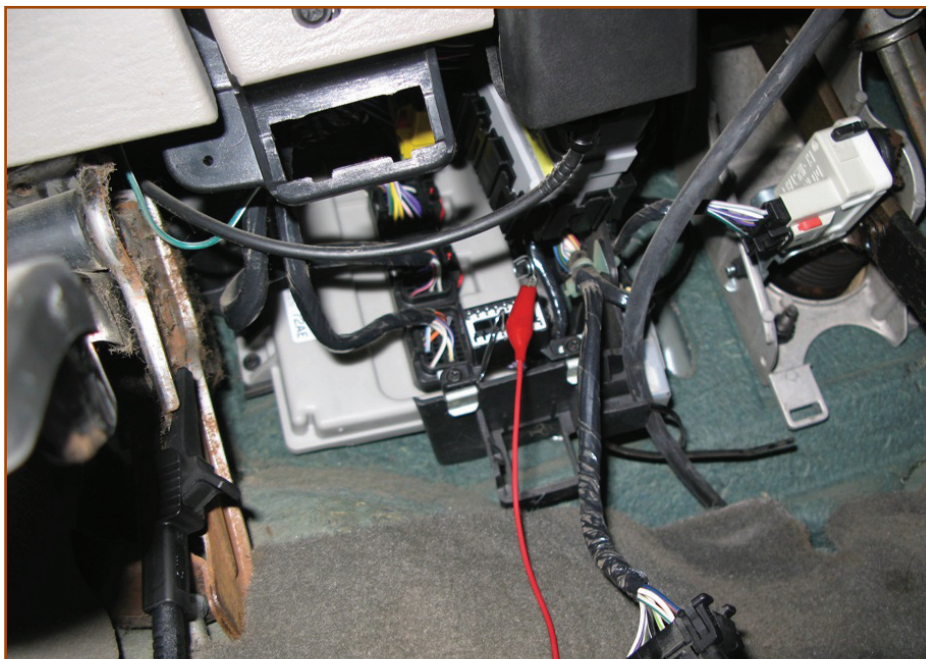


Figure 1

Chrysler can use two communication formats, often in the same vehicle. The format we've become used to seeing since 1989, Chrysler Collision Detection (CCD), is a 2-wire system; the system introduced almost a decade ago is PCI, which is a single-wire system. Of course, we now have the OBD-II required CAN BUS.

As Randall Schroeder, ATRA Senior Technician, mentioned in a past ATRA Tech seminar, "It took one computer to put a man on the moon; it takes three to get a Caravan to shift down the road." We need the PCM, TCM and BCM to make this system work.

Here's a real situation that I recently faced in my shop: A 2002 Dodge Caravan had the check engine light on (code P1698; no TCM communication), no backup lights, and the gear selector display was lit up. The vehicle worked fine otherwise. Simple enough.

What I quickly realized is just how much I didn't know and how little good information there was to guide me. To survive in the wilderness we needed a compass and a map. To survive in the

wilderness of computer system diagnosis, instead of a compass we need a scan tool; instead of a map we need wiring diagrams and system knowledge.

Like most shops, we use aftermarket equipment and information, which is good. But these pose challenges when communication is an issue. Some of the best diagnostic tools for a 41TE transmission are a TCM/PCM, a solenoid block, and a battery charger. These three "tools" can help you diagnose the unit much faster than your scan tool when you're faced with no communication. Although the Chrysler DBR scan tool would be the best choice, it isn't always an option.

We began by substituting a known-good TCM (from a prior model Caravan), which wasn't particularly helpful: Same code, symptoms and the Caravan worked fine otherwise. The transmission and engine both worked great. How can that be if the control modules aren't communicating?

Our scan tool looks at Programmable Communication Interface (PCI) communication through the OBD-II connector. The TCM and PCM are

connected to each other through the Serial Data Communication Interface (SCI) HI and LO wires, a 2-wire communication protocol still used on our 2002 Caravan.

Next we began to look at the PCI path. With help from the ATRA 2007 seminar book, we had a good overview of the system. We found the Diagnostic Junction Port (DJP), which is where all PCI wires go and are connected to each other through the terminals in the cover (figure 1). From there we checked the continuity of the PCI circuits between the TCM, PCM and other modules. We didn't find any opens or shorts to ground.

Any module on the PCI bus can bring the system down, so which one? How would we know what we were looking for? ATRA has access to Chrysler OEM information and we pored over numerous pages to find out.

What we needed to look for at the Diagnostic Junction Port was "activity of about 7.5 volts" on the module PCI wire (figure 2). For example, when we looked at the HVAC module, the scope would be flatlined (0 volts) until we pushed a button on the heat control to cause the module to do something; then we observed activity. The body module was active all the time, so you have to keep activity in mind while observing the PCI wire for each respective module.

One significant obstacle: the Front Control Module (FCM), ABS and TCM are tied together in the Intelligent Control Module (ICM). When we were checking PCI activity at the Diagnostic Junction Port, what were we looking at? Chrysler's DRB-III scan tool can



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identify which modules are communicating on the PCI bus where ours can only report that it isn't communicating with the TCM. Not quite the same thing. Now what?

Why not unplug the ABS? Because we couldn't reach the module! We removed the fuses for the module and solenoid and still had communication with the ABS. We checked the wiring again and it shouldn't be.

Now we were faced with replacing a module. Which one first? To choose, we needed to understand the logic of which module is doing what. Because the TCM and ABS are both tied directly to the Front Control Module, we decided to start there. We were lucky: A local salvage yard had one with the exact label code, so we purchased it, installed it, and were faced with the same results.

Disappointed, I reexamined the situation. Does the BCM filter the TCM info and feed it to the PCM and Instrument Cluster Panel (ICP) module, or does the Instrument Cluster Panel module do the work? The BCM turns the backup lights on. The Instrument Cluster Panel module lights up the chosen gear display, but who's the traffic cop? I opted for the Instrument Cluster Panel module.

Again, the local yard had the module. We installed it, and again, no change. Frustrated is an understatement. We're not comfortable that the BCM would do this, but couldn't find any documentation that specified which module is responsible for the decision making. Perhaps the engineers didn't think it worthwhile to document this logic. The BCM isn't a module to simply swap out. It has learned functions and shouldn't be swapped from another vehicle.

This is when I called Randall on the ATRA HotLine. Randall suggested I read some material Cliff McCormick wrote for ATRA's 1995 Technical Seminar Book (pages 61-88) regarding networking the CCD bus and how it works, along with suggestions for dealing with no communication issues.

I decided to go back and reconfirm my PCI communication from the TCM. The TCM is located in front of the inner fender cover of the driver's front wheel (a great location in our snow belt).

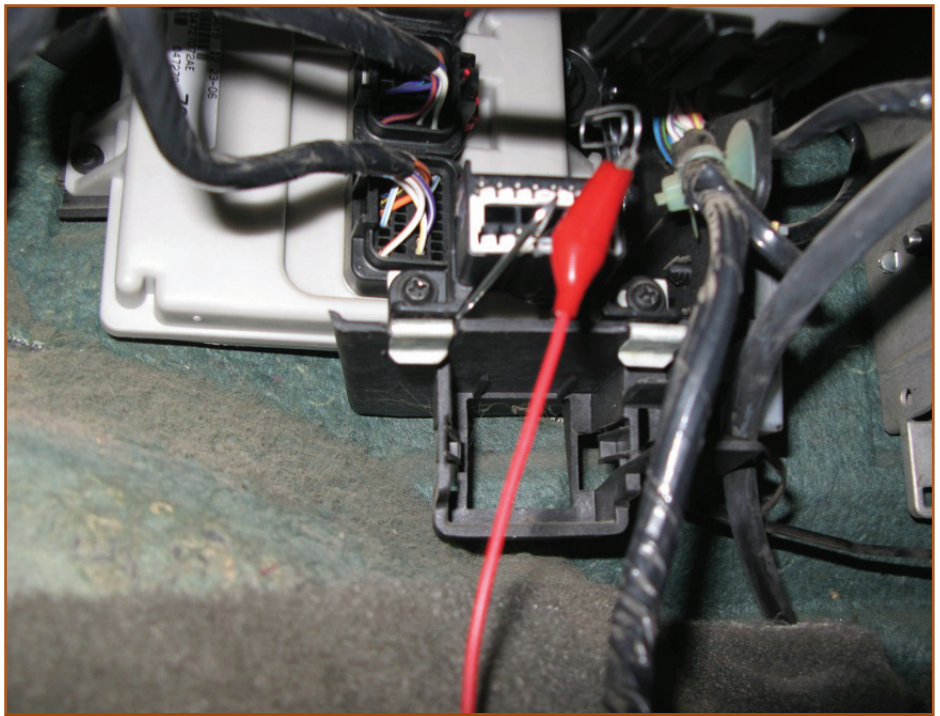


Figure 2

Knowing the TCM, ABS and Front Control Module are tied together, I cut the PCI wire near the TCM (from pin 43) and checked for PCI activity with the scope and found none! What a terrific discovery after numerous hours of anxiety.

I went back to previous years' wiring diagrams to learn that pin 43 is part of the SCI bus and the PCI bus didn't exist yet. In simple terms, we messed up by using the wrong TCM for this model year. We replaced the TCM with correct one and all issues resolved.

Why write about a stupid mistake? SCI, PCI and CAN bus communications are now part of our lives. Sooner or later you'll be dealing with them. Unfortunately, most of us don't really know or understand them. We're faced with fixing transmission issues without ever touching the transmission.

Too many shops pass this type of problem off to the dealer. In today's economy, we need to be capable of doing all we can to resolve our customers' problems. We need good information, system knowledge and understanding, and the right tools.

ATRA has a wealth of knowledge, information, and experience. Don't wait until you're desperate to ask for help. Become familiar with your tools. Take a minute and look at PCI, SCI, and CAN bus communication signals

with your scope and learn what you should see. That will help when you have a problem like this.

I remember a VSS problem I ran into a few years ago. At first glance the signal looked fine. Later, after great frustration, I discovered that the voltage amplitude was too low (2 volts vs 6+ volts); moving the sensor deeper into case corrected the problem.

It took a lot of reading to learn that we were looking for 7.5-volt PCI signal on this Caravan. Now we know that we needed to verify the PCI signal from the TCM, knowing that the TCM, ABS and Front Control Module are tied together.

The Instrument Cluster Panel module contains the Front Control Module, fuses, relays and wiring connectors for a good deal of the system. It can easily become corroded and should be a good place to begin your diagnosis. We could have cut the PCI wire here as well. Typical wiring schematics don't provide the connector wiring information, so you may need ATRA to help here.

The key to any of these diagnoses is to learn the system, and use the tools that are available to you. And maybe the most important tool of all is the ATRA HotLine.



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