



VCERTT NEWS

VCERTT: VERMONT CENTER FOR EMISSIONS
REPAIR AND TECHNICIAN TRAINING
A PARTNERSHIP OF VERMONT TECHNICAL
COLLEGE AND THE VT DEPARTMENT OF
ENVIRONMENTAL CONSERVATION TO
PROVIDE OBDII INFORMATION AND
TRAINING TO VERMONT TECHNICIANS

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Meet one of our trainers and hear what one of his students says



Look for help in VCERTT's upcoming OBD II Electronics I and II courses.

As we've reported in a previous issue, CAN (Controller Area Network) protocol is a new OBD II communication protocol currently being used on a small number of 2003 and 2004 model year vehicles (see list below). Each year, more new vehicles will use CAN, and by the 2008 model year all new vehicles must use CAN. Not all scan tools currently support CAN protocol, and therefore will not communicate with vehicles using CAN.

Of the scan tools most commonly used to conduct the OBD II test in Vermont, the Autoxray scan tools currently support CAN, and a CAN update kit is currently available for the Snap-on MT2500. Kal-Equip and Ease Diagnostics plan to have updates and/or new scan tools that support CAN available by this summer. For further information on these scan tools, contact Autoxray at 800-595-9729 (www.autoxray.com), Snap-on at 800-370-5290 (www.snapon.com), Kal-Equip at 800-253-9880 (www.actron.com), and Ease Diagnostics at 888-366-3273 (www.obd2.com). Most other scan tool manufacturers are also in the process of integrating CAN into their scan tools. How scan tool manufacturers update their products to add CAN capability varies depending on the tool. Some will require only software updates and a new cable, some will require both software and hardware changes, and some will need to be traded in for a new model. Contact your scan tool manufacturer for further information.

If you are an inspection station, DMV has the following policy on conducting OBD II inspections of 2003 and 2004 model year vehicles that use CAN communication protocol: If your station's scan tool does not currently support CAN, vehicles on this list may still re-

ceive an inspection sticker provided the vehicle passes the visual MIL checks (i.e., MIL illuminates at key-on-engine-off, and MIL is not illuminated with engine running) and the safety inspection standards. The fact that the vehicle was passed according to this policy should be noted on both the OBD II Inspection form and the Inspection Sticker Log sheet. If the vehicle owner prefers a complete OBD II test, the customer can be referred to an inspection station with a scan tool that supports CAN. This policy applies only to the vehicles on this list, and is in effect only through December 31, 2004. Effective January 1, 2005, all inspection stations must have their scan tools updated to support CAN protocol.

2003 and 2004 Vehicles Using CAN

Make	Year	Model
Buick	2004	Rendezvous
Cadillac	2004	CTS, SRX, XLR
Dodge	2004	Durango
Ford	2003	Focus w/ 2.3L engine, Thunderbird
	2004	Explorer, F-150, Focus w/ 2.3L engine, Taurus, Thunderbird
Lexus	2004	LS 430
Lincoln	03-04	LS
Mazda	2003	Mazda 6
	2004	Mazda 3, Mazda 6, RX 8
Mercury	2004	Sable
Porsche	03-04	Cayenne S, Cayenne Turbo
Saab	03-04	9-3 Sedan
Saturn	03-04	Ion
Toyota	2004	Prius
Volvo	2004	S40 w/ 2.4L & 2.5L engines

ABOUT VCERTT NEWS:

The purpose of this newsletter is to provide specialized information to the front line: you, the technicians, service advisors and managers in the field handling repairs and customers. The OBD Inspection Program is now over four years old. While the inspection itself is an easy addition to the VSI we know that repairing OBD II faults may not be as simple. The success of the OBD Inspection Program falls largely on your ability to perform effective repairs. VCERTT is committed to trying to help. We offer this newsletter to provide information and a forum for discussion. We ask you to call or email us with your questions or suggestions. When you have a troublesome vehicle repair related to OBDII, we'd like to hear about it. If you have problems with a particular vehicle or a scan tool, give us a call. We may be able to help and we can pass along relevant information. We're always looking for test vehicles for our Case Studies - let us take your problem vehicle and attempt a repair, no charge for our time, just help for everyone.

CALL US AT: 802-238-3211

OR EMAIL US AT: OBDNEWS@VTC.EDU

MIL ON: GM TRANNY DTCS

A wide range of GM vehicles are affected by a condition that may set DTCs P0716, P0717, P0730, P0753, P1860, P1887 or other miscellaneous transmission DTCs. The condition may be intermittent and may create very harsh shifts. MY 2000-2002 Buick Century, LeSabre, Park Avenue, Regal, Chevy Cavalier, Impala, Malibu, Monte Carlo, Venture, Oldsmobile Alero, Aurora, Intrigue, Silhouette, and Pontiac Bonneville, Grand Am, Grand Prix, Montana and Sunfire along with the 02 Rendezvous, 01-02 Lumina, and 01-02 Aztec models with either a 4T65-E, 4T40-E, or 4T45-E transaxle.

The conditions may be caused by a poor or intermittent connection at the 20-pin connector on the transaxle. The wiring harness between the transaxle and the PCM may be stretched or have components forcing it downward. If so; re-route the harness or move the components to relieve tension from the connector. Also check that the connector is fully seated and locked into the transaxle. If no problems are found yet, open the connector. Make sure that the terminals are fully seated in their cavities and that none of the male pins are bent. Also check that the female terminals are not spread and that the crimp connections are secure.

TECH TIP: INJECTOR PROBLEMS

From national information gathered from IATN (International Automotive Technician's Network at www.iatn.com) many manufacturers are having troubles with partially clogged, sticking or poorly spraying fuel injectors. These conditions may result in rough idle and stumbling or misfire DTCs. The misfire DTC may be on a single cylinder or may jump around when multiple injectors are involved. Eliminate ignition problems as a source of trouble first. Also remember to check for a vacuum leak at the injector o-rings or manifold gasket. When your diagnosis leads you to the fuel system verify proper fuel pressure first; no injector can perform properly without adequate fuel pressure. Next you can use an injector balance tester to pick out the faulty injector(s). This test may be available on a scan tool or there is an injector balance tester available at parts stores for a modest price. Come to VCERTT's Misfire Diagnosis and Repair course for full details on using this technique. Some technicians are correcting these issues with a Motorvac or other pressurized fuel system cleaners. Pour-in fuel injector cleaner seems to be moderately successful. Many technicians have found that the only long term solution is to replace the injectors, often as a full set.

**VERMONT TECH AUTOMOTIVE**

Could you use some in depth training? Are you on top of the electrical and electronic diagnostic procedures needed today? Do you want to know how to diagnose and repair automatic transmissions? Do you have a son or daughter interested in exploring the automotive industry?

Vermont Tech offers real world, updated training in a variety of formats. Our main program is a two year Associates Degree Program yielding an A.A.S. in Automotive Technology. Ninety eight percent of graduates are hired immediately within the field. Graduates of this widely respected program advance rapidly within the field and are highly sought.

Practicing technicians can take individual courses either at the Vermont Tech Campus in Randolph or in Essex at the Center for Technology. In addition, VCERTT courses are offered in Essex, Rutland, Brattleboro, Bennington, Barre, and Lyndonville. Look for a new program in Heavy Duty Service starting in Middlebury in conjunction with the Hannaford Career and Technical Center this Fall.

If you'd like to come visit a class, talk about options, or sign up for a course, call VTC's automotive faculty and VCERTT's Coordinator, Betsy Dorries directly at 802-238-3211. To learn more about Vermont Tech and financial aid, call the Admissions Office at 802-728-1000.

VCERTT CASE STUDY: P0455 EVAPORATIVE EMISSIONS SYSTEM GROSS LEAK

The evaporative emissions control system is designed to minimize the evaporative emissions from the fuel tank. The EVAP system manages the fuel tank pressure and purges the fuel vapors from the tank into the intake manifold rather than the atmosphere. The charcoal canister serves as a storage chamber for the fuel vapors. Monitored EVAP systems began in 1996 and by 2002 every OBD II certified vehicle had to have full (enhanced) system monitoring capabilities. Between 1996 and 2001, some vehicles don't have EVAP monitoring at all, some monitor only for leaks or for purge, and some monitor for both. Enhanced EVAP systems provide for full monitoring of the system by checking the system for purge (vapor) flow and for leaks.

A 2001 Ford Explorer was brought to us with an evaporative emissions (EVAP) system fault after a couple of unsuccessful repair attempts at a dealership. The MIL light was on and the DTC was P0455 for an EVAP system gross leak detected. The fuel cap had been replaced at the dealership and the code had been cleared only to reappear shortly afterwards.

First we made a thorough visual inspection of the system. The spare tire had to be removed to view the evaporative canister, purge solenoid, and canister vent solenoid. The components and vacuum, purge and tank lines all looked intact.

Next we looked for any technical service bulletins (TSB) on the system and found one that related to our DTC. The TSB covered P0455, P0456, P0442, P1443, P1450; these are all EVAP DTCs indicating a leak in the system. The TSB cites the frequency of loose or broken filler caps and a leak at the top of the fuel filler pipe neck between the filler pipe and the plastic insert. We carefully inspected those areas but found no faults. It then describes a diagnostic procedure using a smoke leak detector and the Ford factory scan tool to determine the cause of the leak. We will describe this procedure and use parts of it in the paragraphs that follow.

To fully understand how this system works and to check out how well the auto manufacturers are complying with the service information rule, we went to the Ford technical service website @ www.motorcraft.com. To choose a single vehicle and model year techs can obtain a 72-hour subscription to Ford Technical Service Information for \$12.95. A 72-hour subscription for all makes and model years is \$19.95. Under "Technical Re-



sources" the site also has free information about the OBD II system for model years 1996 through 2004. The articles give a fairly thorough description of the OBD II operation and monitoring strategies. Our subscription proved to be quite a deal as we were able to download all the information we wanted about the EVAP system and still have plenty of time to download information about other systems we were interested in. We were on a fast cable link and we were able to pull up anything we wanted quickly and easily. We also tried the system on a dial-up line and found it a bit slower but fully functional since most of the documents were in manageably sized PDF format.

The EVAP system found on the 2001 Explorer uses a fairly common strategy to check for system leaks. The fuel tank has a vent line that leads to the charcoal canister. The charcoal absorbs the fuel vapors from the tank and stores them until the EVAP system can purge those vapors to the manifold. A line from the canister leads to a canister vent solenoid. This normally open solenoid allows a small, calibrated leak to the atmosphere to prevent excess pressure or vacuum from building in the fuel tank when purging cannot occur and to allow fresh air into the tank when the system is purging. The purge line out of the canister leads to the normally closed purge solenoid (Ford call this a vapor management valve). The solenoid has power normally applied and the PCM opens the purge solenoid to vent fuel vapors into the manifold through a duty cycle controlled ground signal. When the car is warmed up, the PCM energizes the purge solenoid at different percentages depending on engine speed and load. It is open at some percentage most of the time the vehicle is running. The system uses a fuel tank pressure (FTP) sensor, similar to a manifold absolute pressure (MAP) sensor, on the tank and a fuel level input for use in system monitoring.

To check the operation of the system the EVAP system monitor performs a couple of active tests. To test for leaks the first step the PCM takes is to close the canister vent solenoid. This seals the system from the atmosphere. Then it turns on the purge solenoid to create a vacuum in the system. When the FTP sensor indicates a small vacuum ($7''\text{H}_2\text{O}$) the purge solenoid is closed. If the system cannot generate the required vacuum a DTC P0455 for a gross leak is set. If the system reaches the required vacuum level the PCM monitors the vacuum level over a period of time with both solenoids closed. If the system is properly sealed the vacuum level will remain stable. If the vacuum bleeds off, typically termed vacuum decay, the PCM determines that a small (.04" or less) leak is detected. (Vehicles meeting California emissions standards check for a .02" leak.) The PCM also needs to

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MEET VCERTT'S BILL McCOLGAN

"I have been involved in the automotive industry for the last 30 years. After graduating from college with a degree in Business Administration, I spent the majority of 20 years as an independent shop owner/technician. For the last ten years I have been teaching the auto tech program at the Barre Tech Center. I've seen a lot of changes in the industry. Breaker point ignitions transformed into complex multi-coil computer driven systems. In 1980 OBD was introduced and in 1996 the sophisticated OBD II system was standard. These changes caused a lot of problems in the repair industry because technicians had limited access to training. I got involved with VCERTT when I was asked to participate in the OBD Inspection training program. I'm a strong advocate for training; if you understand how systems work you have a better chance of making the correct repair. We receive excellent training for each new course. I enjoy teaching the VCERTT classes and working with the technicians; I hope to see the classes continue to grow."

We recently spoke with Henry Shaw from The Car Store in Norwich, VT, a technician who has taken Bill's VCERTT classes. He's been in the industry for 17 years and says "every tech should take these classes...each course has helped me in lots of ways." "Bill is on the ball and very patient; he wants to do a *great* job, not just get it done." Bill teaches VCERTT courses at the Barre Tech Center in Barre. Call 238-3211 to register!

check that the purge valve is actually flowing vapors. On this model the PCM opens the purge solenoid a set amount and watches the idle air control (IAC) motor duty cycle requirements to stabilize the idle speed. When the purge solenoid is actually venting the IAC motor should close slightly because the flow allows an extra air bleed that will boost idle speed. If the IAC motor duty cycle does not change the PCM interprets this as the purge flow being insufficient.

Let's get back to our test vehicle. We knew the system had a gross leak. Our visual inspection had turned up nothing so we had to find a way to locate a leak. We had access to a smoke machine. This generates a non-toxic low pressure smoke that can be blown through the system. You can see leakage as a visual stream of smoke from the faulty component. If we lacked this equipment we would close the vent solenoid, pull a vacuum on the system at the purge solenoid line coming from the fuel tank and check for leaks by sound and feel. Enhanced EVAP systems have a test port with a green cap and a Schrader valve through which you can apply smoke.



Before testing for a leak by applying smoke or vacuum to the system we needed to close the normally open vent solenoid. We did not have access to a scan tool with an actuator test that would close the vent solenoid. The manufacturer's scan tool provides that function for this purpose. We provided power and ground to the solenoid to energize it and force it closed. When we applied the power and ground we heard no tell tale click from the solenoid indicating mechanical function. The smoke billowed from the vent solenoid. We could blow right through the valve when it should have been closed. We used our digital multimeter and

checked the resistance across the solenoid's two terminals. It was about 40 ohms indicating that it was not electrically open (OL or Mega ohms) or electrically shorted (5 ohms or less). If it had been electrically faulty we would expect to see a DTC for the vent solenoid open or shorted. We had a mechanically defective canister vent solenoid. In this case when the PCM commanded the vent solenoid closed to run a check of the integrity of the EVAP system it assumed the vent solenoid closed. Because it was mechanically stuck open the system was unable to pull adequate vacuum on the system and DTC P0455 was set.

We replaced the canister vent solenoid and cleared the codes. Now when we supplied the solenoid with power and ground and applied smoke no leaks were seen. Ideally we would have tried to get the PCM to run another test of the system to verify our repair. In this case the test is only initiated after a six hour engine off condition (and several other conditions) and we did not have access to the vehicle overnight. But the repair proved to be successful as the customer has reported no problems since the repair several months ago.

This was just a quick look at parts of one EVAP system. Manufacturers use many types of EVAP system operation and monitoring. Some systems generate a pressure in the EVAP system and watch for a leak that way. Other systems use a more complex arrangement of valves and solenoids to detect even smaller leaks (.020") and minimize the venting of the canister. To learn more about EVAP systems look for our upcoming VCERTT course: Evaporative Emissions System Operation and Diagnosis due out this spring.

WHAT'S COMING UP FROM VCERTT

You have asked for a course on Evaporative Emissions Systems and it is coming this Spring. Also in development are our OBD II Electronics I and II courses handling practical electrical testing of OBDII systems and more advanced diagnostics using the digital multimeter, a scan tool and a lab scope. Courses on EGR systems and revised and updated versions of our basic OBD II course and our Oxygen Sensor course are all coming up.

What else would you like to see? Let us know what courses would help you fix today's OBD II vehicles; that's why we're here. Call us at 802-238-3211 or email us at OBDNews@vtc.edu. We want to hear from you!