

# Trends in automotive testing

Auto techs tool up to match wits against the smartest vehicles ever

**Application Note**

They don't build 'em like they used to. Sometimes that's a good thing.

Crammed with sophisticated electronics, today's cars and trucks score unprecedented marks for fuel economy, performance and longevity.

But like the kid in the nursery rhyme – the little girl with the

little curl – when these complex vehicles go bad, the tantrums they throw at the technician can be horrid. The multiple sensors and electronic systems in modern vehicles can create mind-boggling diagnostic problems. It's almost enough to make you wish for the days of breaker points and carbs.

## Driving full throttle into the age of electronics

Electronics have replaced mechanical systems as major contributors to automotive control and performance – and a major cause of repair issues. Corey Glassman, automotive program manager for Fluke, agrees. "What I've learned from the shop owners I've talked to is that many of their repairs are electronic in nature. They're not dealing with catastrophic mechanical failures any more. But people want their creature comforts, and they're being added by layering on more and more electronics."

"There are even cars out there where there's no throttle cable," says Rich Barnett, technician at California Auto Plaza in Concord, Calif. "With direct ignition, there's no distributor. Every year it changes even more." New cars feature global positioning systems, Bluetooth wireless connections, satellite radio, multiple airbags, sophisticated alarms and electronic stability and traction control. For would-be top guns, the 2005 Corvette even has a "heads-up" display that projects RPM, speed and other data on the windshield, jet fighter style.

Popular hybrid vehicles, with their complex, high-voltage storage, charging, drive and control systems, bring other challenges. Add pressure to fix it fast and right the first time, and it's easy to see why a sharp automotive technician, equipped with the right tools, is in very high demand.



Though they're sophisticated, the advanced systems in contemporary vehicles still obey the laws of electricity. Sensor signals must achieve the right amplitude and timing, or the vehicle won't perform up to spec. Grounds must be complete; connectors must have minimum resistance. In this environment, electrical test tools are essential. Onboard diagnostic systems are more capable than ever, yet a technician using test tools is able to look beyond the trouble codes cranked out by a vehicle's computer, and verify the performance of individual system components.

The diagnosis of electrical systems has become a core skill for professional auto technicians and hobbyists alike. "It's not getting any simpler," says Kevin Giles, who teaches diesel and truck technology to students at Lincoln Tech in Dallas. "I was talking to a tech who said the luxury cars at his dealership have 32 computers in them. There's a lot of multiplexing, so you really have to be careful. You can damage a computer real easily if you don't know what you're doing."

Or damage yourself. The demand for power to feed those hungry electronics means 42-volt supply systems will soon appear. And hybrids pack even higher, potentially dangerous levels of power.

"You have not just high voltage, but you have banks of batteries that are capable of maintaining a current flow at a much higher rate," says Glassman. "You could literally be electrocuted. So it is much more dangerous — it's coming more in line with the dangers faced by commercial and residential electricians."

In such a fast-changing industry, how can the technician get ahead . . . or even keep up? Three keys are knowledge, tools, and safety.

### **Get smart**

As always in a technical field, continuous learning is essential to success. Key organizations in automotive technology education and testing are the National Institute for Automotive Service Excellence (ASE) and its associated organization, the National Automotive Technicians Education Foundation (NATEF), as well as ATMC, the Automotive Training Managers' Council.

"There are eight ASE (Institute for Automotive Service Excellence) repair areas," says Tony Martin, a FlukePlus member who spent ten years as a heavy equipment and turbine technician before teaching auto and diesel technology for the University of Alaska in Juneau. "It goes from engine repair through engine performance and so on. The lion's share, more than half of the hours we spend, are on two things: engine performance and electrical and electronic systems." The new hybrid vehicles, Martin observes, will require techs to move to another level of excellence.

ASE operates technician testing and certification programs, while NATEF evaluates and certifies technical school education programs. For technicians looking to upgrade their skills, and for those just starting out, the NATEF website includes a directory of accredited programs, searchable by state and specialty. Many of these programs operate in cooperation with major automotive manufacturers. The NATEF web address is <http://www.natef.org/about.cfm>.

### **Tool up**

Knowing what to test goes hand in hand with having the right test tool.

Though automotive suppliers offer truckloads of sophisticated, sometimes brand-specific diagnostic tools, many technicians prefer to keep it simple. Like his

diesel and truck technology students, FlukePlus member Giles relies on his Fluke 78 automotive multimeter. In fact, each new student gets books, a class schedule and a Fluke 78 DMM.

"The Fluke 78 — I just love that meter because it's so simple," says Giles, "and you can do 98 percent of the stuff that you want to do, when it comes down to it. I always tell my guys it's the first tool you should have."

"No matter how sophisticated the equipment you have, there's always the need for just a plain basic meter. You don't need to drag out that expensive tool and wait for it to power up, and scroll through to find the test you want. You just turn your DMM to DC, it auto ranges, you just hook the leads up and you've got a reading." Such tests include voltage drop to determine connectivity in between components, testing to determine the presence of voltage and how much, and using the ohm function, which can measure the resistance of a component. This function can also be used to check if a circuit is complete.

Rich Barnett finds his favorite a bit higher on the scale: the Fluke 98 Series II ScopeMeter® Test Tool. In six years, Barnett has used his Fluke 98 to collect 1,500 ScopeMeter® Test Tool screen shots from sensors and components from all over the vehicles that passed through his shop. These graphics, copies of the readings displayed by his ScopeMeter® Test Tool, show the signals generated by cam and crank sensors, alternator diodes, temperature sensors and other devices on the vehicles Barnett fixes. On the ScopeMeter® Test Tool, such readings help Barnett find problems. In his files, they serve as reference material he can use when the next troubled vehicle shows up.



Martin recently reviewed Fluke's new Electrical Measurement Safety video and came away impressed. "Most automotive guys years ago would have looked at it and said 'what the heck am I watching this for?'"

"Guess what, there's between 600 to 1000 volts in some areas on those hybrid cars. They're telling guys they've got to be standing on rubber mats if they're going to be doing any testing on these things. So now you're looking at the specifications on your meter and saying that Brand X meter isn't going to do it any more. According to new industry standards, you've got to have a CAT III or CAT IV meter." Most Fluke DMMs, including the brand new Fluke 88V automotive DMM, are rated to at least IEC CAT (category) III, 600 volts.

While Fluke no longer offers the 98 ScopeMeter® Test Tool Series, the replacement 190 Series ScopeMeter® Test Tool is equally useful to auto technicians. Plus, higher bandwidth and sample rates on the 190 make it much easier to review CAN Bus and other high data rate signals. The 190 Series also has a built-in flight recorder to catch anomalies and dual isolated A to D converters that protect the user from sharing grounds with other sensors by isolating A and B channels.

For simpler tasks, like determining charging system voltage, checking for voltage in a wiring harness or at any discrete sensor, for voltage drop testing when seeking a bad ground, voltage drop between a connector or switch, and ohm testing relays and solenoids, Barnett relies on his Fluke 87 DMM. Together, the two tools can replace special-purpose testers.

"Most guys rely on (a special-purpose electrical system tester) to test charging systems," says Barnett. "To me, that is a waste of money as long as you know how to use your tools. Most guys don't. You need three tools when testing a charging system. A carbon pile load tester, a volt meter, and an ammeter. So, I need both the Fluke 98 ScopeMeter with a current clamp (amp test) and a Fluke 87 DMM (volt test), along with the load tester. Using these three tools is also more accurate than using some expensive charging system tester. A lot of shops will spend the money for the special charging system tester for the simple reason that

even a first year apprentice can push a button and watch for a green light, but testing charging systems is more complex than that."

For Martin, who uses a high-end Fluke 189 DMM, one particular Fluke accessory stands out: the new SureGrip™ alligator clips. Fluke has come out with some great alligator clips," he says. "You can hook onto a tiny little resistor lead, if you want to, or wrap it right around a big old starter or battery cable."



### Work safely

Hybrids that pack enough voltage and energy to propel a car pose a safety threat that goes beyond a finger in a fan belt. Now automotive technicians too have to understand electrical safety principles, such as proper use of personal protective equipment and the International Electrotechnical Commission (IEC) category system for electrical testing.

### Conclusion

Today's automotive technician must master a world where electronics calls the tune. It's a far different world than we knew even a dozen years ago. But in the end, the solution lies where it always has: in the hands, the tools and the knowledge of the technician.

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