

Works for me! Automotive technicians reveal their favorite tests

Application Note

Spend enough time exploring the hidden world of automotive electronics, and you start to see a pattern.

Like a shortcut you take each morning on the way to the shop, you discover tests and techniques so useful that you use them, again and again.

We asked FlukePlus members in the automotive industry to reveal their favorite tests for this story. Here are some of their favorites – some as basic (and essential) as tying your shoes, others more sophisticated.

Technician: Rich Barnett, senior technician, California Auto Plaza, Concord, California

Experience: 32 years in business, including six years collecting auto electronics test data

Fluke Tools: Fluke 98 Series II ScopeMeter® Test Tool, Fluke 87 DMM

Working at a general auto repair shop, one of Barnett's specialties is figuring out the tougher problems, such as no start conditions or failure to run right.

"The test no one seems to have done is checking parasitic draw with the Fluke 98 ScopeMeter®," says Barnett. "I've found that real helpful, and you don't have to unhook the battery to do it. You can use any Fluke DC low current clamp."

Because modern vehicles rely on a steady source of low-amperage current to keep computer system memories alive, techs often have to rig up an alternate power source before disconnecting the battery. And that's a hassle. They can head off the problem by testing without disconnecting.

"These days you don't want to have to disconnect the battery and put an ammeter in series," says Barnett. "You use a little

clamp-on ammeter (current clamp) and you can see current flow on the scope with very good resolution. I can probably get down to between 10 and 20 mA on the meter. To me that's pretty amazing, to be able to see that type of small current."

Why a scope and not a DMM? Rich says the DMM would work, but he finds it more difficult to confirm the range ("where the decimal is") with the DMM. The ScopeMeter® Test Tool allows him to set the scaling factor when using current clamps, eliminating confusion.

Barnett connects the current clamp to his Fluke 98 Series II ScopeMeter® Test Tool using a BNC (coaxial) cable, then sets the ScopeMeter® Test Tool to read 20 mV per division. "I can tell down to about 10 or 20 mA – that's enough to get an idea," he says. "At 100 to 200 mA I can get very good resolution. I've even done it to check that there's no draw at all.



Parasitic draw test from Toyota 4Runner® '93.

"I was testing a vehicle where the battery was going dead. Everything was off, but it still had this current draw. I see it here on the scope — I'm actually looking at the waveform I took. Turned out it was the aftermarket alarm. Actually it was drawing 430 mA, with everything else on the vehicle turned off. A lot of the newer cars draw 25 or 30 mA — that's normal. But you know if you get over 100 mA, something is drawing on it."

In addition to testing for parasitic draw, Barnett has used his Fluke ScopeMeter® Test Tool to test a multitude of sensors and systems, and he stores the waveform charts for reference.

"I'm looking at fuel injectors, square wave patterns, AC patterns for magnetic sensors on cars, camshaft position sensors, crank sensors, O2 sensors, fuel pumps, all kinds of electric motors," he says, "the list goes on and on. I also love being able to

capture and save these waveforms on my computer. I have over 1,500 of them!" Collecting the charts is both a hobby for Barnett and a business tool. Comparing the signal from a known good part helps him confirm if a part in question is bad. And showing the customer graphically what's wrong helps cement Barnett's reputation as a pro.

Technician: Kevin Giles, instructor, Lincoln Tech, Dallas

Experience: Five years as automotive technician, two years as instructor

Fluke Tools: Fluke 78 Automotive DMM

A favorite and fundamental test for Diesel and Truck Technology instructor Kevin Giles is the voltage drop test.

"I am always amazed by the number of experienced techs I have in class that do not understand this simple technique," says Giles. "I had a tech working for me who was trying to diagnose a starter problem. His DVOM (digital voltage ohm meter) showed 12 V at the starter and what appeared to be a good ground. The starter was bench checked and found to be OK, but a new one was

installed anyway — with the same no start condition. Even the tech's test light showed power. But when a voltage drop was taken across the supply wire to the starter, a voltage drop in excess of 4 V was found." Only 8 VDC was ever reaching the starter.

The beauty of a voltage drop test, is that it will determine if there is resistance in the circuit by measuring the voltage drop across each connection and component in the starter circuit while cranking the engine. Measure the voltage drop between the battery

post and the connecting cable, the solenoid posts and the wires that attach to them, and across the solenoid itself. Also check the connection on the starter, alternator (feed and ground side) and the ground strap connection to the engine block and body. Current must be flowing to make the test, so crank the engine.

And Giles offers this tip: Where the test leads plug into his meter, Giles ties them together with a simple overhand knot. That helps keep the leads together and untangled.

Technician: Tony Martin, instructor, University of Alaska Southeast

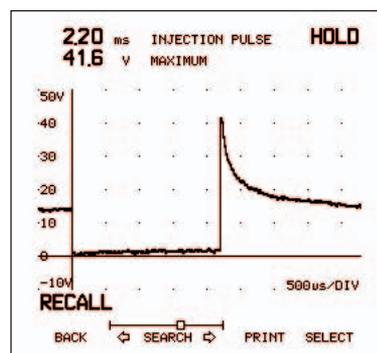
Experience: Ten years as heavy equipment and turbine technician, nine years teaching auto and diesel technology

Fluke Tools: Fluke 189 DMM

Auto Technology instructor Tony Martin uses the fast min/max recording on his Fluke 189 DMM to gain insight into the health of auto fuel injector coils. (The new Fluke 88V automotive DMM has a similar fast min/max capability.) "What I use it for is measuring the inductive kick from fuel injectors on port fuel injected engines," says Martin. "When the injector turns off, it will generate an inductive kick of all the way up to 100 volts. And that's actually a health indicator on the coil in the injector.

"You've got basically a little coil inside there that's operating the armature to open and close the injector. The strength of the

inductive kick is going to give you a very good indication of the condition of that coil. If you've got a real low spike, one that's way below specifications, it's probably a shorted injector. That is a very short event, but with the 189, with its fast min/max, you can actually capture that inductive kick," recording occurrences as fast as 250 µs.



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