THE CASE FOR LOAD TESTING ALL WIRES.

Today's vehicles have two “uses” for wire. One is for “carrying the current” that gets the physical work done, such as moving a window up and down, seat back and forth, providing resistive heat in a defogger to melt ice, etc. The other use is for “carrying communication signals” to turn logic gates in the various electronic control modules on or off, so that ultimately some form of work is accomplished.

Whether the wire goes to a switch contact in a relay or the relay coil winding, a computer, brake, or memory seat module, it can carry current or a voltage threshold.

Knowing the amount of current that a particular wire normally carries is important if you want to be an effective troubleshooter. The wire may carry a large amount of current if it is connected to a power window or seat motor circuit, or to a rear window defogger element. It will carry a very small amount of current if it is connected to a relay coil circuit, or to a tell-tale LED. It will carry almost no current if its purpose is to provide a voltage threshold high enough to turn on the base circuit to a transistor.

The type of current carried is the same regardless of the end result it performs. Keeping this in mind, it seems elementary to simply test the wire to see if it can do its job. Have you ever had a battery load test give you false results? Think about it. The load test for a battery, with a VAT 40 or 45, has been a standard in the industry for decades.

Why not apply that kind of standard to your everyday troubleshooting by load testing the wires that make up the current paths. This is exactly what needs to be done if we are to prove out any wire on a vehicle. Know how much current the wire in question carries when the load is operating, remove the load and load that wire with the same amount of current to test it.

If you don’t know how much current is suppose to flow when the load is on, all you need to know is the wire diameter. This is available from the wiring diagram, or can be measured with a wire gage or against other known wire sizes.

With the wire size known, use the chart below to find the amperage carrying capacity of the wire in question, then load test the wire to prove that it can carry current.

WIRE USED IN VEHICLES THROUGH 2004

WIRE GAUGE METRIC / AWG mm^2		DIAMETER (Millimeters)	OHMS Per 1000 ft.	SAFE CURRENT CAPACITY	MAXIMUM CURRENT CAPACITY
5.0	10	2.588mm	0.998Ω	14.8A	30A
1.0	12	2.053mm	1.588Ω	9.3A	20A
2.0	14	1.628mm	2.525Ω	5.8A	15A
3.0	16	1.291mm	4.016Ω	3.6A	10A
.8	18	1.024mm	6.385Ω	2.3A	7A
.5	20	0.812mm	10.15Ω	1.4A	5A
.35	22	0.644mm	16.14Ω	.918A	2A
.22	24	0.511mm	25.67Ω	.577A	1A

Note: The above chart is for 25*C still air ambient conditions for copper wire.

If the wire carries the amperage shown in the chart for its gage, without any significant voltage drop, then the load it was attached to must operate as designed. When load testing all voltage feed wires and all ground wires attached to any computer or module, you can prove if the wires can do their job. If the computer or module does not work, and the wires are good, then you know that expensive computer is really bad.

Most wires used to carry communication, such as a low voltage signal from one electronic control module to another (in the case of a Class II communication signal on a modern OBD II system), are .22 gage. Even though there is no significant amount of current flowing when this wire is working in the circuit, if it is suspect, out of the circuit, you can load it to 1 amp and check for a voltage drop. If there is no voltage drop at that amperage, you can be sure it will work to carry its signal when back in the circuit. The higher the current flow, the greater the voltage drop. Computer wires can not tolerate more than a 50mV drop.