Rev. A-8/97

FLUKE®

Accurate Low Resistance Measurements

Application Note

Accurate resistance measurements are dependent upon the equipment you use and the way you use it. Specifications for low resistance fuel injectors, speed sensors, temperature sensors and ignition coils are so close that test lead resistance can throw off the results.

The Fluke 88 is designed to automatically subtract the test lead resistance from all of your measurements with the push of a single button, **ZERO** Δ.

Make sure that the component you are replacing deserves replacing. Demand the best in your test equipment, demand Fluke.

An example

Resistance, measured in ohms (Ω), can vary greatly, from a few milliohms (mΩ) for contact resistance to billions of ohms for insulators. Resistance measurements are calculated from the meter's input terminals, therefore resistance in the test leads must be subtracted from the total resistance measured for accurate low resistance measurements.

In Figure 1, the specification for the low resistance throttle body fuel injector is 1Ω to 2Ω. There is no room for error when evaluating a defective injector. Note that the resistance of this injector is 2.9Ω, obviously bad. **Or is it?**

The Fluke 88 has a feature called **Zero**. This powerful function will automatically subtract one reading from another, such as the instrument's test lead resistance from all future measurements. The results are more accurate and reliable.

Figure 1. Normal fuel injector measurement

To engage the Zero function, simply rotate the rotary knob to OHMS (Ω), short the test leads together, and press the ZEROΔ key. The display will change from displaying the test lead resistance (Figure 2) to **000.0Ω**. The test lead resistance has been stored in the meter's memory and is now subtracted from future measurements. Note the Δ (delta) symbol illuminated in the lower left of the display. Delta is a finite increment in a variable, or a known amount for the meter to deal with.

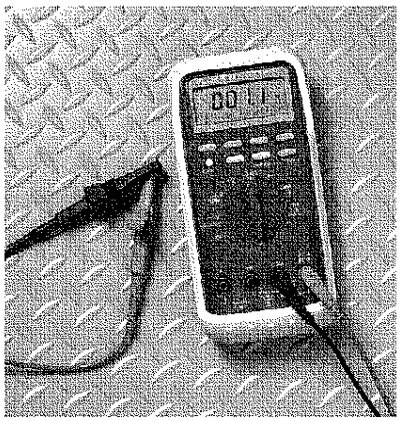

Figure 2. Test lead resistance

With the ZERO function engaged, measure the fuel injector again. Note that the actual resistance of this fuel injector is within specs at 1.8Ω (Figure 3).

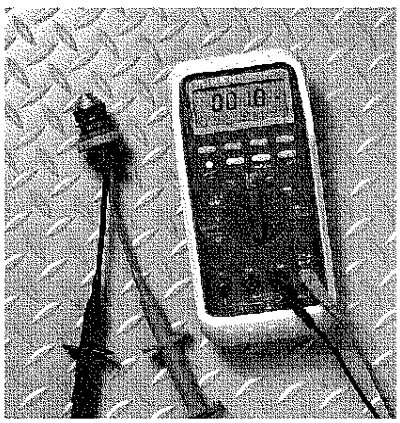

Figure 3. Fuel injector resistance with zero function

The ZERO function can be applied to other measurements made with the Fluke 88, such as current, frequency and voltage. With the optional 80TK thermocouple module, differential temperature measurements are easy.

There is an additional feature found on the Fluke 88 that is mandatory when measuring low resistances, such as those found on ignition coils. The feature is a "Power-up Option." To view the instrument's power-up options, remove the meter from its holster and read the back case. By pressing down the yellow button for 2 seconds while turning the meter on, the **LOW OHMS / HIGH RESOLUTION** function is entered.

Now short out the test leads again while in the ohms mode and measure the test lead resistance (Figure 4). Note that the test lead resistance reading is more accurate than before and has an extra digit of resolution to the right of the decimal point.

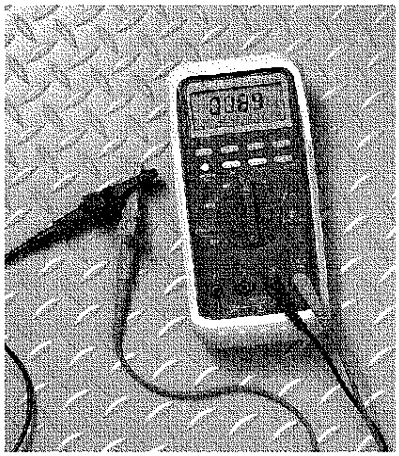

Figure 4. Test lead resistance with low ohms function entered

This feature is valuable when measuring very low resistances, such as the ignition coil in Figure 5. The specifications for this coil are .5Ω to .9Ω. If you were to unknowingly add the test lead resistance (.89Ω) to the actual coil resistance, you would have incorrectly identified a coil pack with excessive resistance in the primary.

Figure 5. Ignition coil primary resistance

Fluke. *Keeping your world up and running.*

To see a complete list of the QuickMarks which have notification turned on, look in the QuickMark Notification pane in the Manage QuickMarks window. Check the red checkmark at the end of the Control Center to open the Mange QuickMarks window.