WF 3144 Enhanced Mode

Abstract

This white paper explains the Enhanced Accuracy Mode of the WF3144 resistor emulator module and compares it to the Normal mode

Normal mode

The WF 3144 is really an advanced decade resistor with nonlinearly spaced resistor steps. At the low end of its resistive range the steps are very small giving it very low error. At higher resistive values the steps are bigger and the error increases.
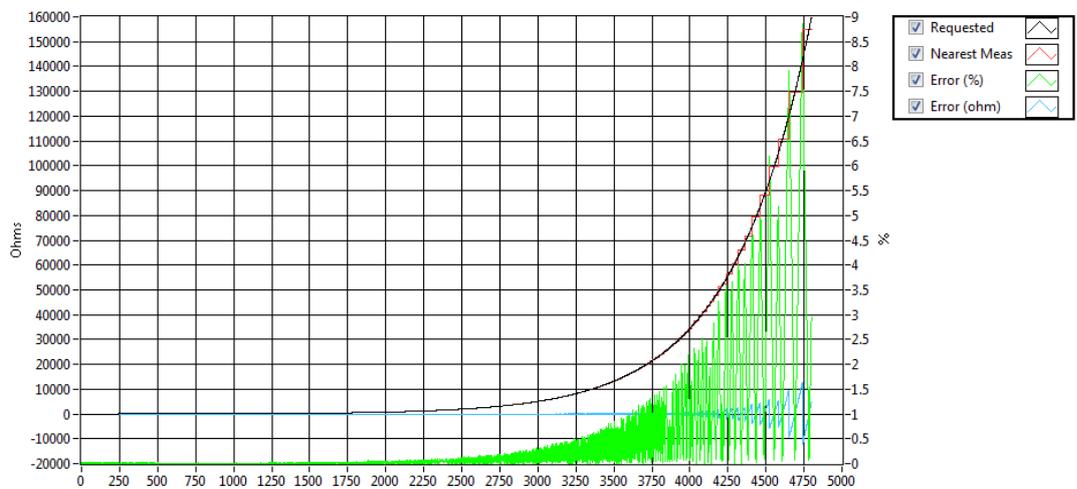

Figure 1. 5000 values distributed between 16 Ω - 160 k Ω in Normal mode.

Another way to illustrate its nonlinear accuracy is to plot the relative Error vs. Resistance:
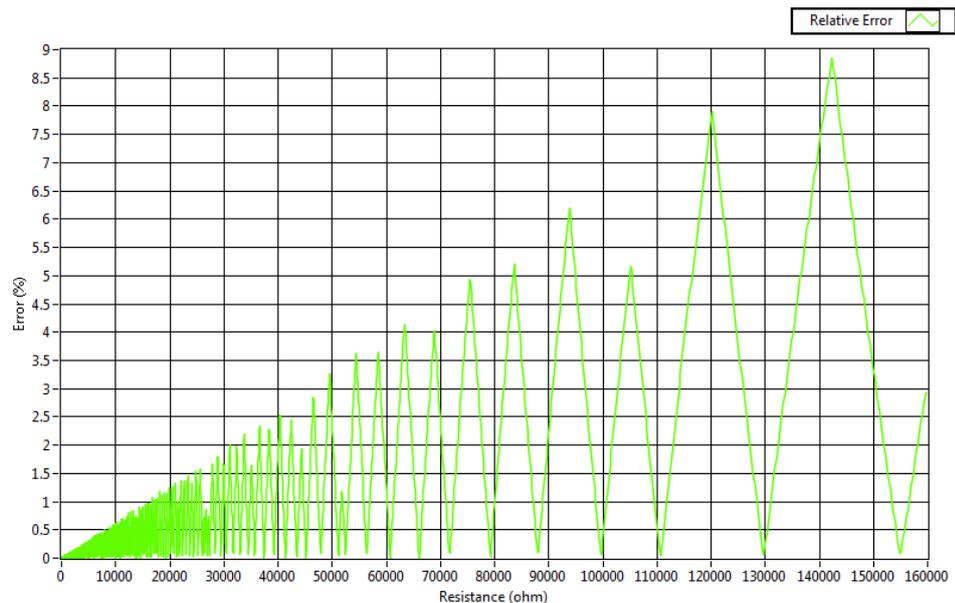

Figure 2. Error vs. Resistance in Normal mode.

Enhanced mode

If better accuracy at higher resistance values is needed, an obvious solution would be to connect the WF 3144 in series with a known preset resistor.

Preset Resistor	WF 3144 Ch n
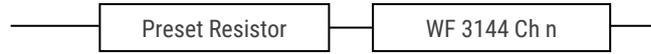
This would let the WF3144 work at lower resistance values where its accuracy is better while the effective resistance would be much higher. The downside to this arrangement is that the range of the compound resistor emulator will be limited in the low end by the preset resistor. In order not to sacrifice range for accuracy, there would have to be a number of different preset resistors depending on the requested resistance.

The solution to this problem is to use the adjacent WF 3144 channel as a variable preset resistor.

WF 3144 Ch n	WF 3144 Ch n+1

Depending on the requested resistance, a suitable, calibrated, preset resistance value is selected automatically by the driver. Using this technique vastly improves the accuracy while the range is almost unchanged. This is what we call Enhanced mode.
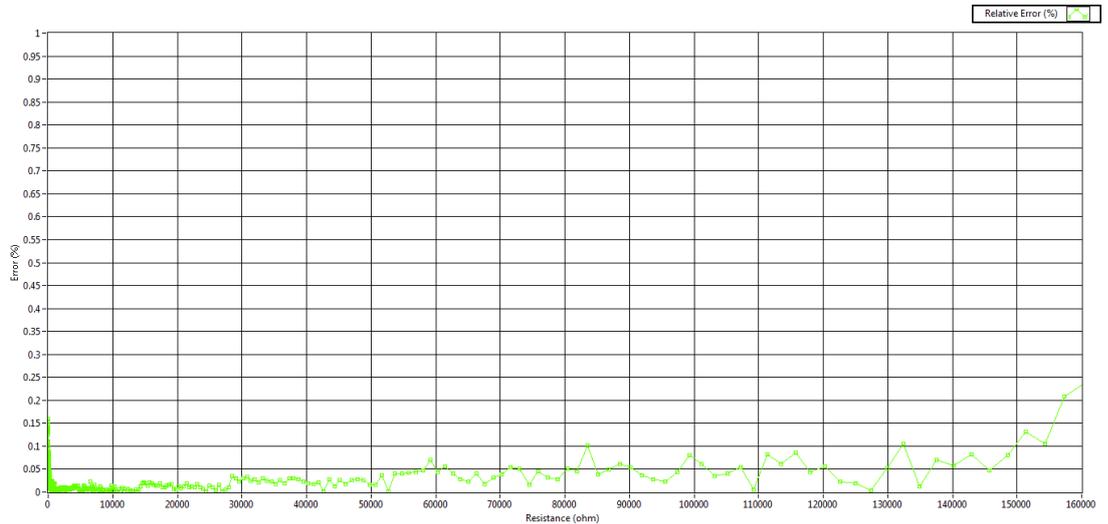

Figure 3. Error vs. Resistance in Enhanced mode.

A physical channel can be used either in Normal or Enhanced mode, it's only a matter of which I/O node in the driver you use. The modes of the four channels in one WF 3144 can be mixed, but an Enhanced channel always uses two adjacent physical channels.