Rescaling Measurement Units

UseThe Rescale Function For Non-Voltage Measurements

Oscilloscopes principally measure voltage and time. Measuring other electrical quantities, as a function of time, requires the use a transducer which converts the measured quantity into voltage. The Rescale math function in LeCroy Digital Oscilloscopes enables the users to convert this measurement into the proper units.

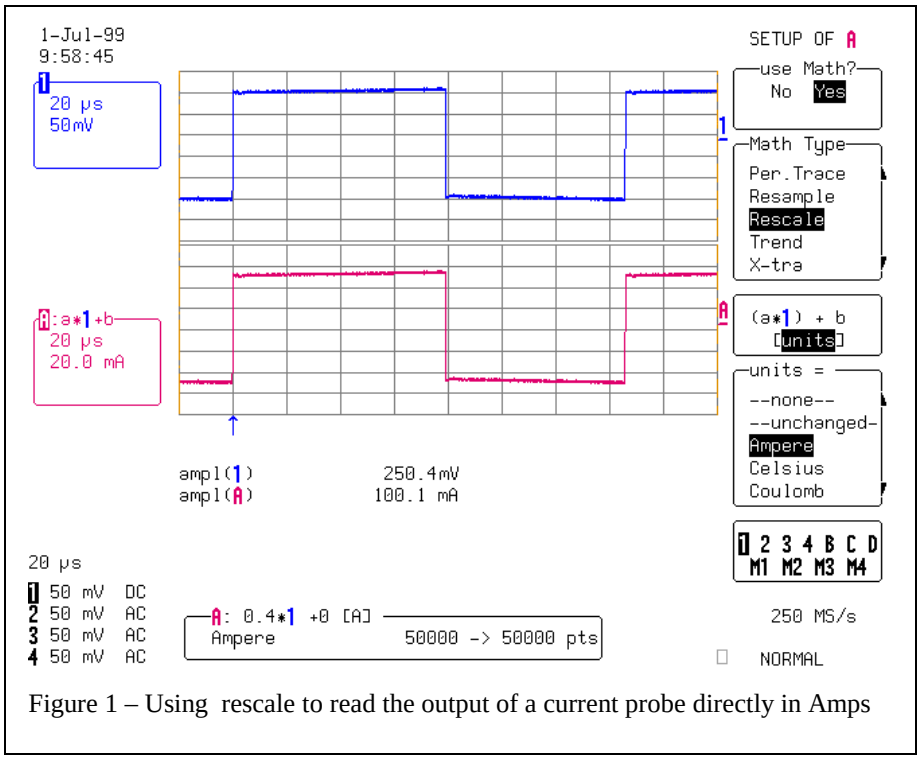

Figure 1 – Using rescale to read the output of a current probe directly in Amps

Figure 1 shows the setup for using rescale to calibrate the output of a current probe, from another manufacturer, so that it reads directly in Amperes (LeCroy current probes automatically read in Amperes without any user intervention). The upper trace, channel 1, is the voltage output of the current probe. The current probe manufacture requires that the oscilloscope vertical sensitivity be set to 50 mV/div. The vertical scaling is then controlled from the front panel of the current probe. In this example the current probe was set to 20 mA/div. Trace A is setup to display the rescale function of channel 1 using the Math Setup button in the Zoom + Math control group on the front panel of the oscilloscope. To set the correct scaling in the rescale math function you need to calculate the sensitivity of the probe in mA/mV, The current sensitivity of the probe (mA/Div) should be divided by the scopes voltage sensitivity (V/Div). For this example, the was set to 20 mA/Div and the scope was at the required 50 mV/Div so the sensitivity was 20/50 = 0.4 mA/mV. As seen figure 1, the multiplicative constant (A) in the rescale math function was set to 4.00 E^{-1} (0.4) and the units were changed to Amperes. The resultant current scale sensitivity was 20 mA/Div which matched the setting on the current probe. The waveform in Trace A shows a 100 mA amplitude.

Note that the dialog box at the bottom of the trace summarizes the setup of the rescale function showing the multiplicative and additive constants as well as the selected units. The rescale function offers a choice of 15 commonly measured electrical units.

Once the units are defined, math operations performed using the rescaled waveform will result in correctly derived units. For example multiplying voltages with current results in instantaneous power, measured in Watts. For a power measurement you should also deskew the current and voltage waveforms using the resample function to align them correctly in time.

Another example of a unit conversion using the rescale function is the measurement of temperature as illustrated in figure 2.

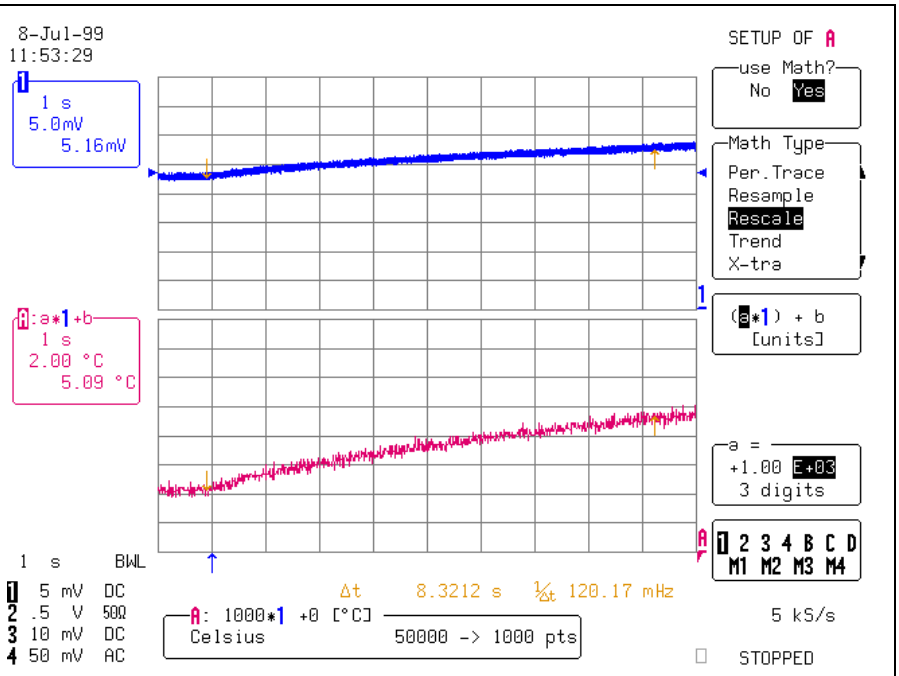

Figure 2 Using rescale to convert voltage into degrees Celsius

The signal source for channel 1 is a temperature probe with a sensitivity of 1 mV / °C. Trace A is used to rescale the input signal. The Setup menu shows that multiplying the voltage reading of channel 1 by the reciprocal of the temperature probe sensitivity (1/[1 mV/°C]) produces a waveform in trace A with vertical calibration in °C. The unit for trace A is selected to reflect this scaling of the measured data.

Note that the relative time cursor reading for trace A is correctly read in °C, reading a 5°C change over 8.3 seconds.

The rescale function extends the usefulness of LeCroy oscilloscopes allowing measurements of electrical quantities, other than voltage, with correctly scaled and labeled axes.