



Hints & Advice About Using Digitizing Oscilloscopes

By: Walter Banzhaf
P.E. Professor of Engineering Technology
University of Hartford
Ward College of Technology

Equipment:

- Agilent 54601B – Oscilloscope

Procedure:

While basic operation of an Agilent digitizing oscilloscope is quite straightforward for someone who is experienced at using an analog 'scope, the following hints may speed your getting "up to speed" with these new measurement instruments:

HARDKEY denotes a button on the front panel of the oscilloscope which has a label printed on it.

SOFTKEY denotes one of six (6) buttons just under the CRT; the function of each button depends on which **HARDKEY** you have previously pressed.

1. When starting out, press **SETUP** , then press **Default Setup**. This sets all controls to their default values, so you are starting fresh and are not stuck with whatever settings the previous user had.
2. Unfortunately(?), the default setting for probe type is a 1X probe. Most measurements are done with a 10X attenuating probe, in order to minimize the loading effects of the probe/oscilloscope system on the circuit under test. Press **1** in the VERTICAL section, which causes channel 1 softkeys to be displayed. Press **Probe** until the probe type is 10 (not 1 or 100), if you are using a 10X probe. Repeat as needed for other channels.
3. Always check, and adjust if needed, the compensation for each probe. The built-in calibration signal (terminal is found under the display) should be used for each channel when a 10X or 100X probe is used.
4. For many repetitive signals ($f \geq 50$ Hz, duty cycle $\geq 1\%$), pressing the **AUTO-SCALE** hardkey will give a very satisfactory *initial* display. Note carefully all the information provided on the top of the display; it may give you clues needed to adjust the display to see more clearly the voltage you are measuring.

For example, there may be a large DC level on which a signal is riding (such as the collector voltage of an amplifier), which is much larger than the peak-to-peak signal voltage.



This will be indicated by the ground symbol at the right side of the display indicating that ground is below or above the display. Perhaps by going to AC coupling (which blocks the DC level) and by decreasing the volts/division, a better display of the signal will result.

5. This oscilloscope has 4 channels, and no external trigger input! If you need to use an external trigger, use one of the 4 channels, and be sure to select that channel as the trigger source.
6. When the oscilloscope has captured and frozen a waveform (indicated by the top left of the CRT showing **STOP**), pressing **Display** and then **Vectors** will turn on **vectors** mode. This "connects the dots", placing lines between adjacent sample points, giving a much easier to read display. The newer "B" models of the Agilent 54600-series scopes have a higher update rate and display algorithms. In these models, vectors ON is the default mode.
7. Partly because the analog-to-digital converter is only 8-bit, and partly due to operating in a noisy environment, waveforms may look "fuzzy". For repetitive waveforms, pressing **Display** and then **Average** will turn on **averaging** mode. You can then select the number of waveforms to be averaged as 8, 64 or 256 (be careful: any changes in the input signal will not appear for a while, until the averaging of 8, 64 or 256 waveforms has occurred).