



# Oscilloscopes in Education

## Training EE students to use oscilloscopes effectively

**Agilent's InfiniiVision 2000 & 3000 X-Series oscilloscopes can be configured with an optional built-in function generator and education training kit to help EE students learn how to use an oscilloscope more effectively.**

Entry-level EE teaching labs consist of a variety of basic instruments including function generators, multimeters, power supplies, and scopes. Upper-level university teaching labs often include additional higher performance and specialty-type equipment. But the core instrument that students primarily use to test and document their assigned experiments in almost all teaching labs is the oscilloscope.

Unfortunately, many students never fully grasp how to use an oscilloscope. Their use-model is often one of randomly twisting knobs and pressing buttons until a picture close to what they are looking for “magically” appears on the scope’s display. Less proficient students may simply rely on their lab partners to set up the scope for them. If students struggle with their test equipment — spending a significant amount of time just setting them up — they will spend less time empirically learning the theoretical concepts that experiments are suppose to teach them.

Many EE professors allocate a few hours during student’s first hands-on lab class to teach them the basics of how to setup and use test equipment, as opposed to immediately jumping into assigned experiments. As a resource, some oscilloscope vendors offer and provide simple training guides centered on using either the scope’s probe compensation signal (typically 1 kHz square wave) or an external training board/kit. Agilent also offers an oscilloscope training kit (option DSOXEDK) to assist in training students on what an oscilloscope is and how to use one. Agilent’s oscilloscope training kit, which is different from all others, consists of three key components:

- Professor’s “Oscilloscope Fundamentals” PowerPoint Slide-set
- Student’s “Oscilloscope Lab Guide & Tutorial”
- 11 Built-in Training Signals



The professor’s “Oscilloscope Fundamentals” PowerPoint slide-set can be used to brief students on the basics of oscilloscopes before they ever touch one. This slide-set can be downloaded at no charge. The student’s “Oscilloscope Lab Guide & Tutorial” provides step-by-step instructions on how to set up an oscilloscope for various types of measurements, as well as more detailed written tutorials on triggering, probing, and bandwidth. This guide also can be downloaded by students and/or professors at no charge.



**Figure 1: Student’s downloadable Oscilloscope Lab Guide & Tutorial.**



**Agilent Technologies**

An oscilloscope with its own built-in training signals is what's different about Agilent's oscilloscope training kit. Not only can students use the scope's built-in function generator as a simple stimulus source, but by taking advantage of the hardware capability of the built-in generator, Agilent has created 11 predefined arbitrary waveforms to be used as student training signals. Although the standard function generator signals (sine, square, ramp, pulse, etc.) are output to a dedicated BNC on the oscilloscope, the 11 training signals are routed to two test terminals on the front panel of the scope so that they can be easily accessed using the standard 10:1 passive probes that are supplied with the oscilloscope. The student training signals include:

- Sine
- Sine with Noise
- Phase shifted sine
- Sine with glitch
- Amplitude modulated sine wave
- RF Burst
- Repetitive pulse with ringing
- Single-shot pulse
- Clock with infrequent glitch
- Digital burst
- Digital burst with infrequent glitch

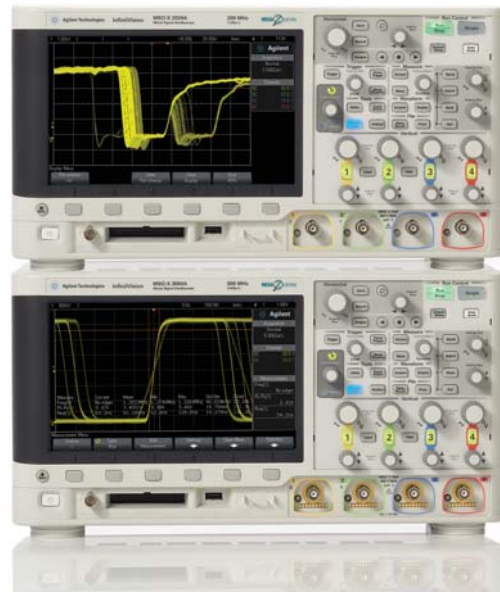
Some of the training signals, such as the sine wave, are very simple. This signal is used to teach students the basics of how to use the volts/div, sec/div, and trigger level settings to scale a waveform on the scope's display, and how to make simple voltage and timing measurements. However, some of the training signals are more complex, such as the "Digital Burst with Infrequent Glitch" signal shown in Figure 2. This particular signal is used to teach students how to use some of the scope's more advanced triggering capabilities and measurement functions.



**Figure 2: The "Digital Burst with Infrequent Glitch" signal is used to teach students how to trigger the scope on complex digital signals and how to perform more advanced measurements.**

## Agilent's InfiniiVision 2000 & 3000 X-Series Oscilloscopes

If you are in the market today to purchase new oscilloscopes for your university's teaching labs, Agilent Technologies' 2000 and 3000 X-Series oscilloscopes come in various bandwidth models ranging from 70 MHz up to 500 MHz. In addition to the education training kit (DSOXEDK), these scopes can also be configured with a built-in function generator. Not only can this help to stretch a tight budget, but it can also help preserve limited bench space in your lab. These scopes come with a standard 3-year warranty, as well as an industry-first 2-year recommended calibration cycle.



To learn more about Agilent's InfiniiVision 2000 & 3000 X-Series oscilloscopes and mixed signal oscilloscopes, go to: [www.agilent.com/find/morescope](http://www.agilent.com/find/morescope)

To learn more about the Education Training Kit and to download the professor's "Oscilloscope Fundamentals" slide-set, as well as the student's "Oscilloscope Lab Guide & Tutorial, go to: [www.agilent.com/find/EDK](http://www.agilent.com/find/EDK).

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