It's a common adage that the difference between a digital multimeter (DMM) and a digital storage oscilloscope (oscilloscope) is like the difference between numbers and pictures. But what does that mean in any real-world testing or troubleshooting environment? First, the adage about numbers and pictures. While most DMMs have single displays, more advanced models can have dual displays for showing multiple signal parameters at the same time. These displays do typically display only numeric values.

**DMMs** come in several flavors, including high accuracy (5 to 8 digits resolution), **bench type**, line-powered models that are not intended for field use. These DMMs are used in the lab, mostly for research and development or for production systems. An advanced model DMM can cost as much as a portable oscilloscope.

Oscilloscopes are designed for engineering work or for troubleshooting systems that might contain complex signals that send at speeds much faster than a DMM can capture (see illustration of a oscilloscope display). Scopes have much faster measurement engines and much wider measurement bandwidths than DMMs. They also have the ability to visually display complex signals (that “picture” in the adage), but typically do not have the accuracy and resolution of a high-accuracy multimeter.

Handheld DMMs typically have 3.5 to 4.5 digits of resolution and good accuracy. They are portable and lightweight, used typically for front-line testing and general purpose measurements. They also contain advanced functions, such as fast min/max, conductance, relative reference, duty cycle/pulse width, and logging, for special-purpose testing.

**Oscilloscopes** generally have a resolution equivalent to a 3.5 to 4 digit DMM.

Oscilloscopes can be line powered or battery powered; they can be big or small. Battery power and smaller size, for portability, are typically required for field use. Some oscilloscopes have built-in multimeters.

For general-purpose maintenance or general electronic testing a DMM is fine, but when testing or troubleshooting machine controls or other complex systems, or doing electronic design work, an oscilloscope is needed.

An oscilloscope with two isolated inputs and 60 MHz, 100 MHz, or 200 MHz bandwidth is the choice for industrial electronic applications like automation and process control. A oscilloscope with four isolated input channels and 100 MHz or 200 MHz bandwidth is ideal for industrial machine applications measuring three-phase power electronics, or three-axis control systems comparing and contrasting multiple signals. For industrial network applications, some oscilloscopes add industrial network physical layer analog measurement algorithms to validate the network bus health.