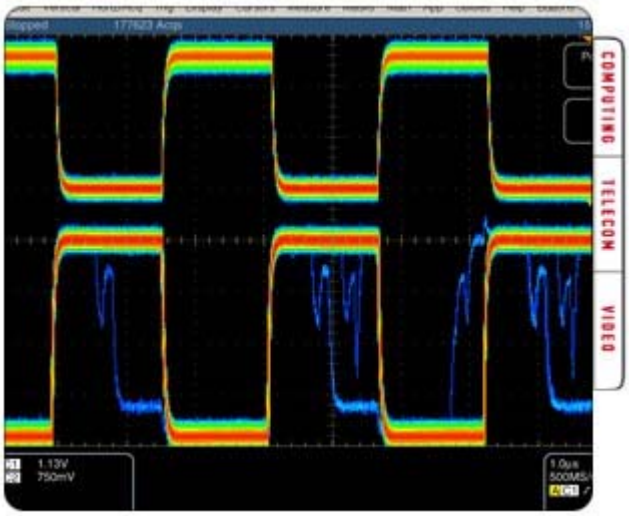
See A World Others Don't with DPO



Going Beyond Banner Specifications

Oscilloscope selection has many variables beyond banner specifications that can be easily quantified and compared. With most users, the primary factors used in consideration of product selection are: bandwidth, sample rate, record length, and number of channels. Unfortunately, many people use only these specifications for consideration without looking at the single most fundamental criteria in oscilloscope selection -- the best, most accurate representation of the signal under test.

It is a fact that most performance oscilloscope manufactured today can capture and display complex real world signals if you know what to look for. That means being able to properly adjust the oscilloscope controls. In this process, different control settings are needed for different signal types such as low PRF signals, RF burst, complex signals with AM or FM modulation, serial data, noise, gated signals. These controls determine how the signal is acquired and displayed by today's digital oscilloscopes and may include adjusting memory, persistence, acquisition mode, zoom, scale and other oscilloscope functions. When signal acquisition controls are correct, one can begin to apply the needed sophisticated trigger routines available from most oscilloscope manufacturers to properly examine the signal.

Today's digital oscilloscopes are excellent in many ways, but even with digital oscilloscope advantages there is still a skill and familiarity level required of the user to properly set oscilloscope controls so that the artifacts and anomalies that exist with the signal can be identified. The days are gone when simplicity and ease of use combined with the accurate real-time signal analysis found in analog oscilloscope products, such as the Tektronix' 2465 and 2467, could be taken for granted, with one exception; using DPO.

With one button on Tektronix' digital phosphor oscilloscopes (DPO), the entire oscilloscope subsystem is immediately optimized for the investigative debug process and has an unprecedented waveform capture speed (up to 400,000 waveforms/sec). All that is left to the user is vertical and horizontal scale, as well as intensity, making it very similar to its analog predecessors. With DPO, it is easy to see the artifacts and

characteristics of complex signals. Consider the following screen shots of common signals that offer inherent qualities that are difficult to quantify.

Little Effort to Capture Complex Signals

The following screen shots show the capture of complex signals with little effort on the part of the user. The shots were gathered by pressing only the AUTOSET, then perhaps adjusting only scale factors. An AM signal is used in all screen shots from both the TDS7000 DPO Series and a competitor's oscilloscope, along with the Tektronix 2467 analog oscilloscope. This is a simple and common type of modulation.

Figure 1 shows the signal using Tektronix' 2467 analog oscilloscope (the 2467 offered a visible CRT writing speed of 4cm/ns -- *100 times faster than any other conventional analog oscilloscope*.) Hence, the power of DPO is invoked in a digital oscilloscope with an update rate up to 400,000 waveforms/sec.

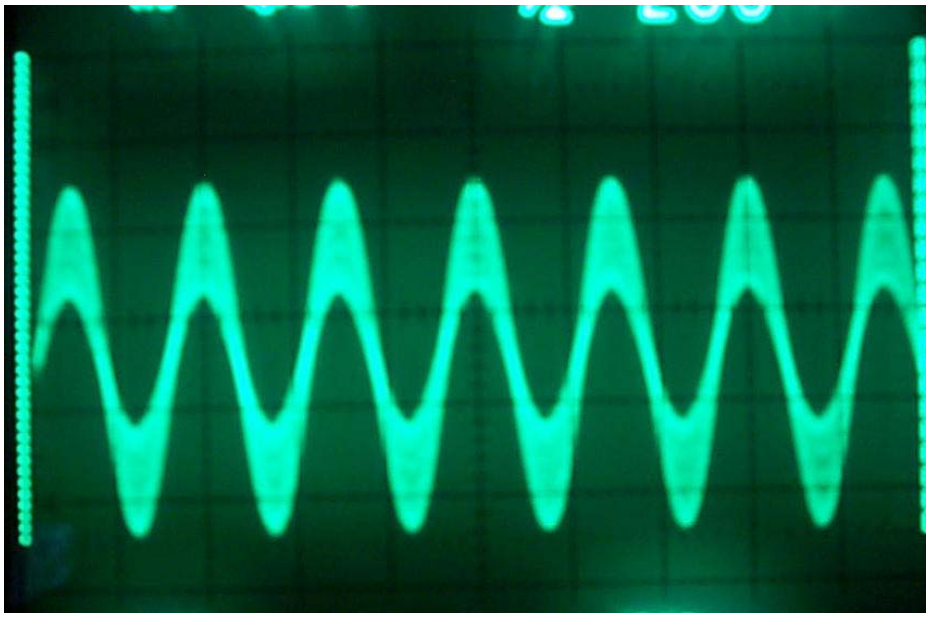


Figure 1. *Tektronix 2467 oscilloscope*

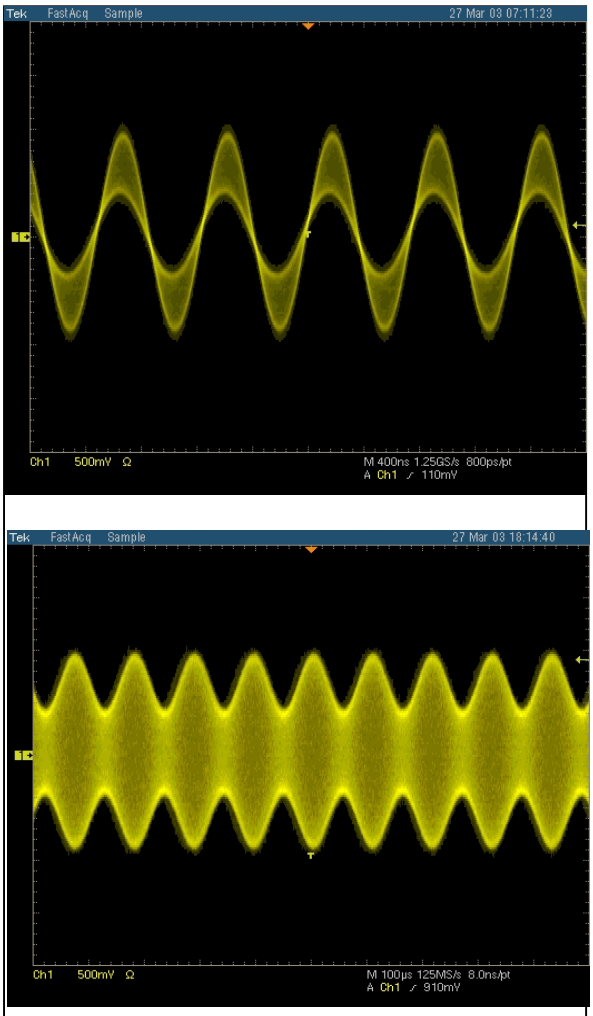


Figure 2. *TDS7000 DPO*

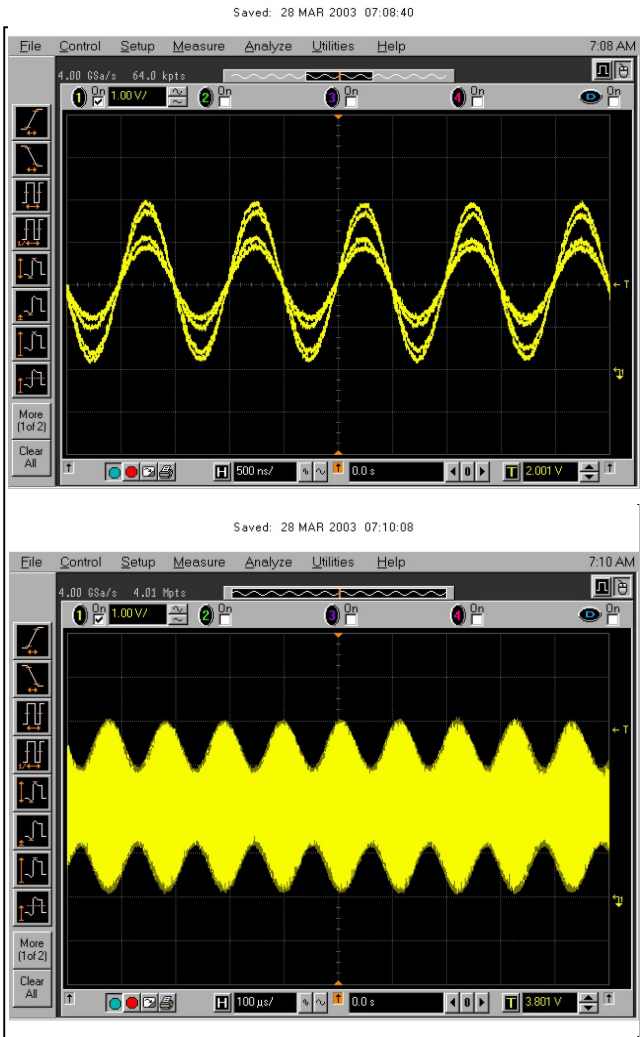


Figure 3. *Agilent 54832*

The TDS7000 DPO (Fig. 2) depicts the very same signal clearly, like a real-time analog oscilloscope, just as one would expect. The Agilent 54832 oscilloscope captured the signal, though the gray scale/intensity is simply not available (Fig. 3). The signal displayed on the Agilent oscilloscope is not representative of smooth modulation, as is the case with the AM signal (only AUTOSET was used for Fig. 2, while time base needed further adjustment to get the images in Fig. 3).

FM modulation has similar characteristics to the waveforms shown above. The DPO image below, captured by the TDS7000, is clear and nicely representative of the FM modulation image (Fig. 4).

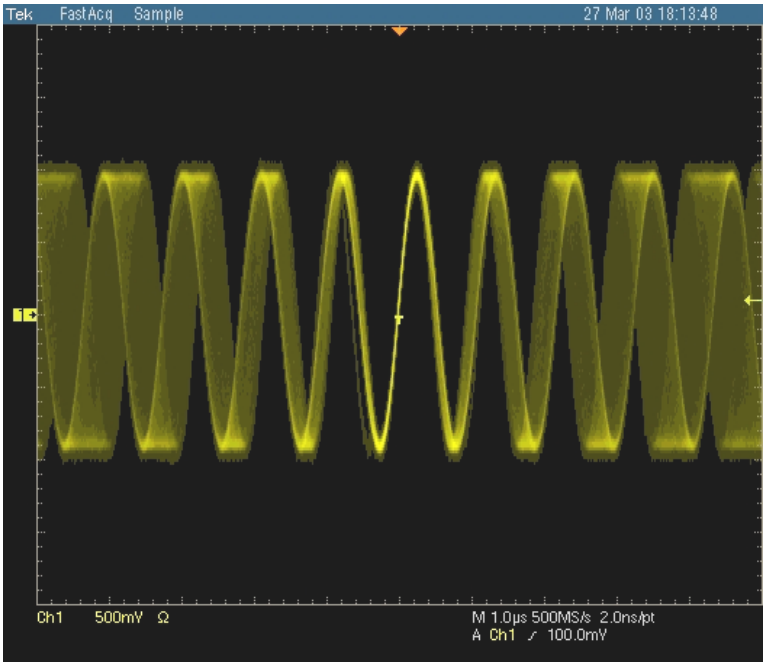


Figure 4

This is the same image as seen on a Tektronix 2467 analog oscilloscope (Fig. 5).

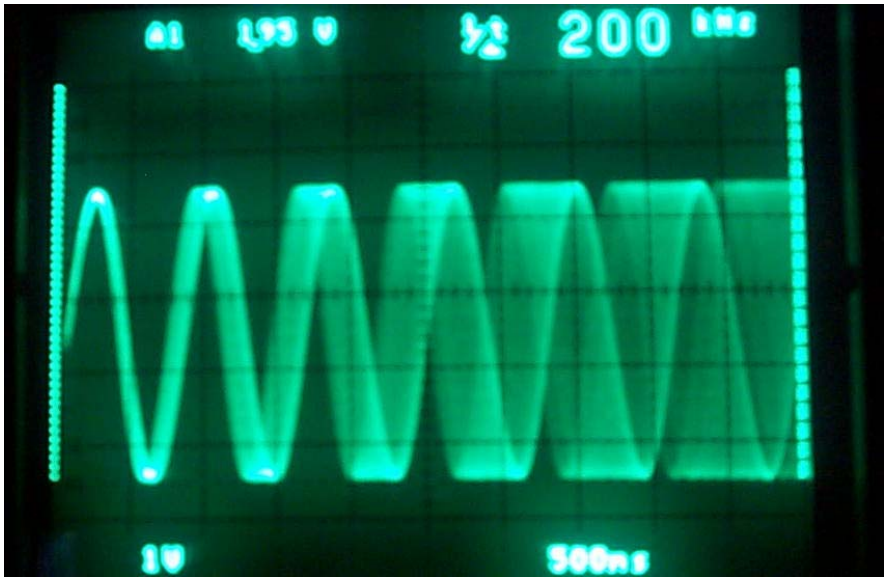


Figure 5. *Trigger is shown at the beginning of the display*

The bottom screen captured on the Agilent oscilloscope is much less clear (Fig. 6). Obviously, one can again see the difference in the power of DPO.

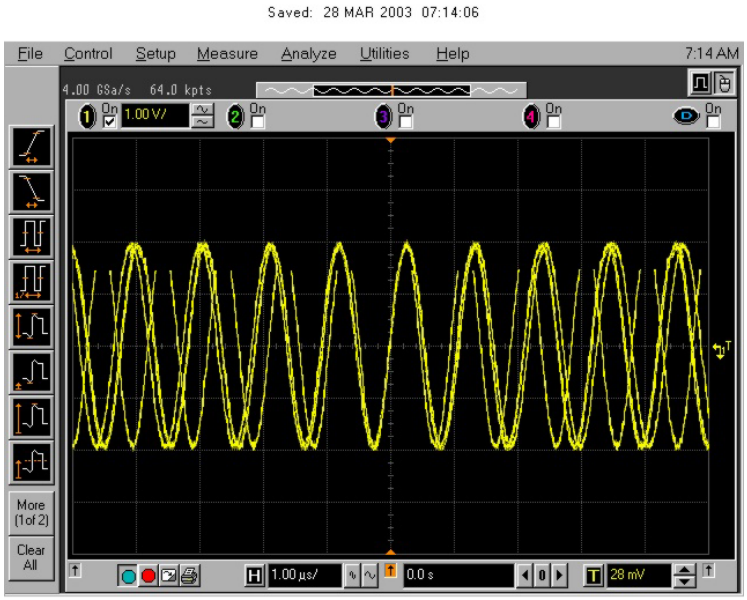


Figure 6

Consider the images in Figures 7, 8, and 9. These represent an intermittent signal error. These errors occur at a very low rate relative to the overall data rate of the signal. These errors are immediately noticeable with Tektronix' DPO (Fig. 7). This is due to the tremendous waveform capture rate available with DPO -- up to 400,000 waveforms/sec. Notice that the Tektronix screen image depicts a narrow pulse, a glitch and a small pulse.

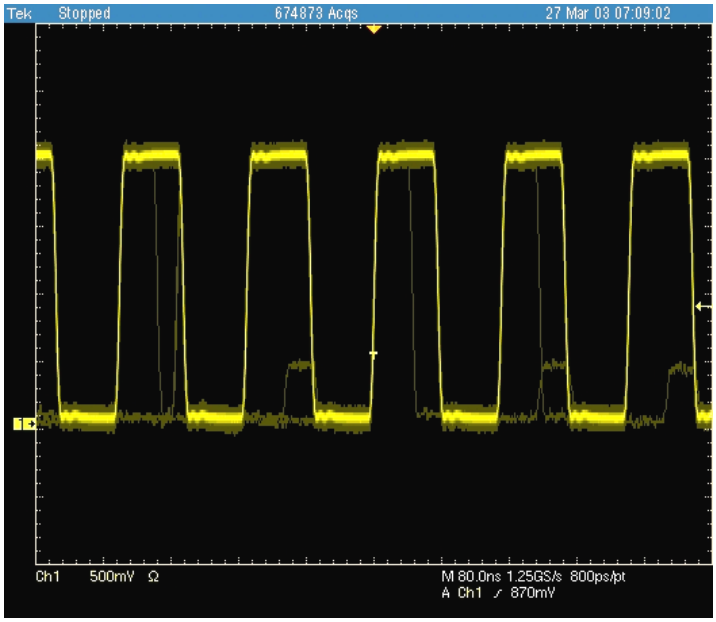


Figure 7

The image from the DPO again simulates the appearance of an analog oscilloscope, specifically the Tektronix 2467 (Figure 8), which offered incredible update rate and screen persistence.

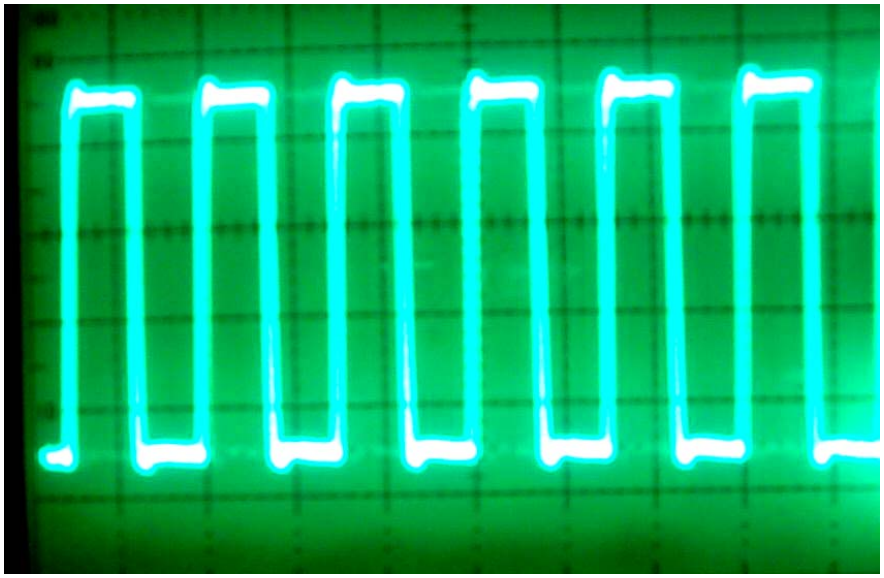


Figure 8

The competitor's oscilloscope can rarely see the anomalies (Figure 9). The screen capture shown below was taken with the competitor's infinite persistence engaged for a full 10 seconds and it failed to capture a single anomaly. This contrast again stresses the importance of update rate of the oscilloscope's capture system (only AUTOSET was used on all images).

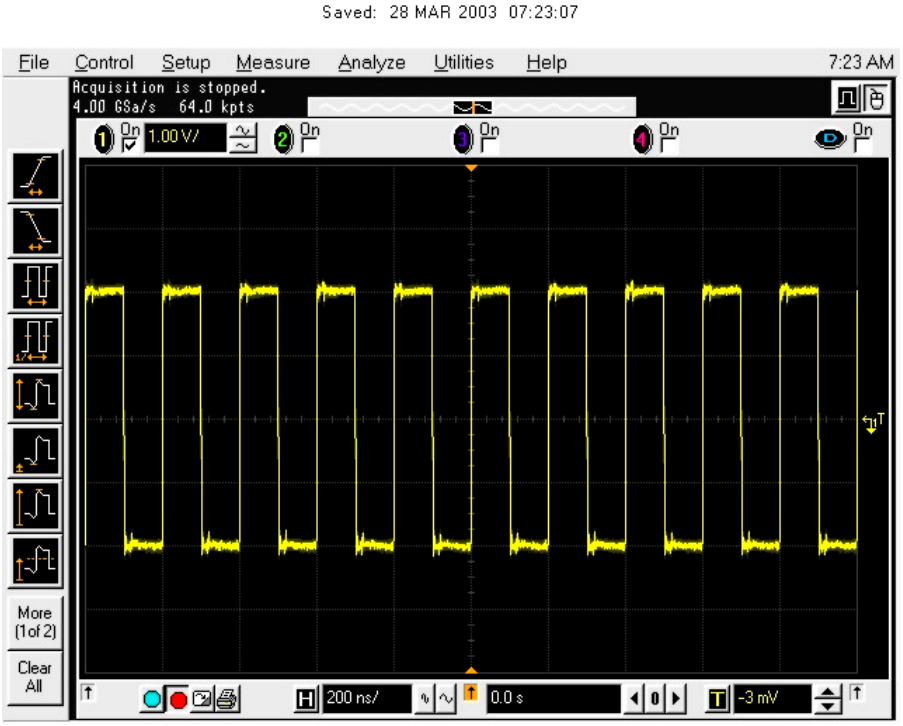


Figure 9

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Consider now a signal that is buried in the noise. The signal below (Figure 10) is a sine wave at half of the amplitude of the surrounding noise. The duty cycle of sine wave to noise is 5%. The Tektronix DPO (Figure 10) indeed depicts that a signal exists surrounded by noise.

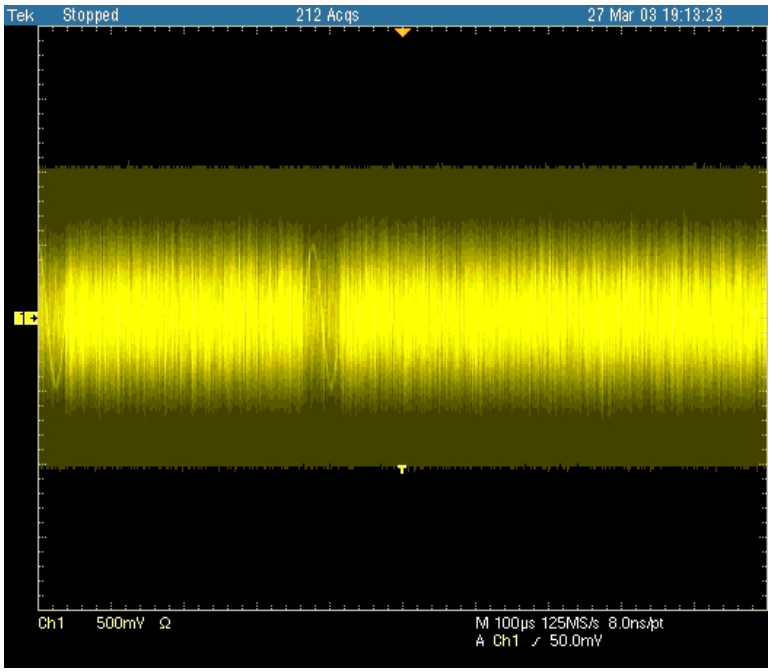

Figure 10

The signal below (Fig. 11) taken from the Agilent oscilloscope, is much less representative of the real signal environment.

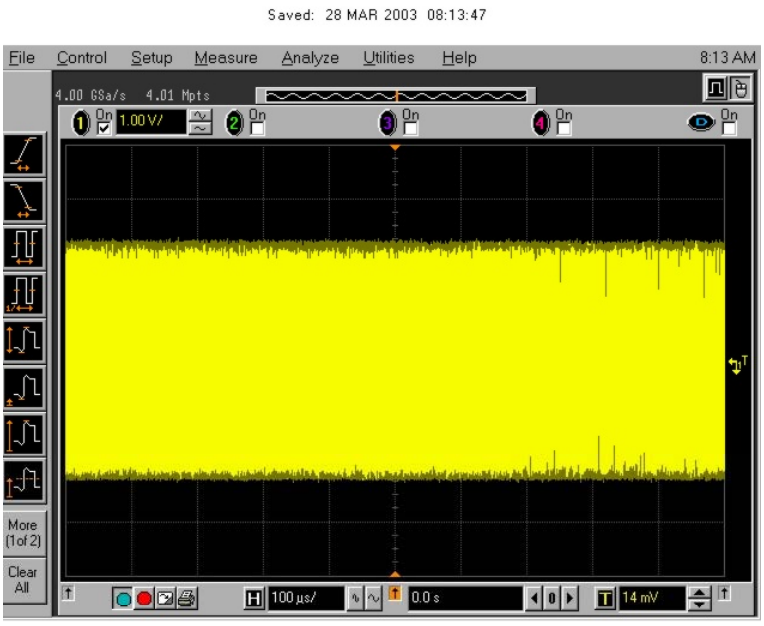

Figure 11

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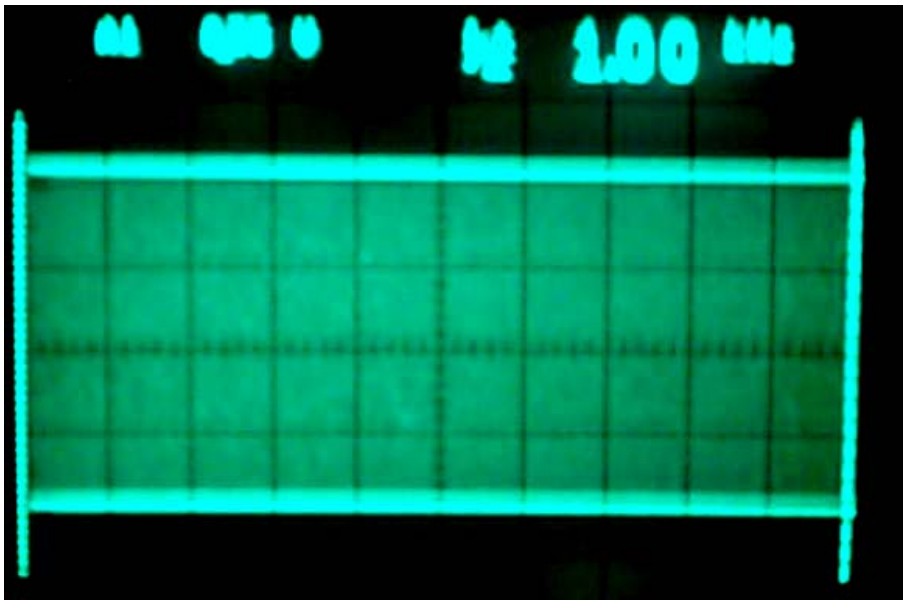

Figure 12. *– Analog oscilloscope depicting same sine wave*

A comparison of Figures 10, 11, and 12 highlight the update rate and gray scale capabilities. This examination highlights the DPO's update rate and gray scale capabilities.

In closing, Tektronix' extensive family of DPOs – the TDS3000B, TDS5000, and TDS/CSA7000 Series – provide simplicity and ease-of-use, combined with accurate real-time signal analysis, to quickly set the oscilloscope controls to identify the anomalies that can exist within a signal. DPOs give you the power to acquire your fastest waveforms with crystal clarity, and quickly capture the most elusive random events with confidence.