New method improves timing in oscilloscopes

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A new method for correcting common timing errors in high-speed oscilloscopes has been developed by researchers at the National Institute of Standards and Technology (NIST). The method improves the accuracy and clarity of measurements performed in the development and troubleshooting of components for wireless and optical communications, military radar and other technologies.

Oscilloscopes display graphical representations of electrical and optical signals as waves, showing how the signals change over time. These instruments often have inaccurate internal clocks that distort output patterns, and they also can exhibit random timing errors called jitter. These errors may lead, for example, to false detection of failure in a communications module that is actually working, or to increased electronic "noise" interference with measurements of microwave signals from radar.

The NIST method, based on an approach developed in laboratory experiments and implemented in freely available software, constructs an alternative time base. The software analyzes an oscilloscope's measurements of both a signal of interest and two reference waves that are offset from each other. The reference waves are generated by an external device and are synchronized in time with the signal being measured. Measurements of the reference waves are compared with a calculation of an ideal wave to produce an estimate of total time errors due to distortion and jitter. These errors then can be corrected automatically for each measurement made by the oscilloscope.

The NIST correction method can be applied to older standard equipment, can correct time records of almost any length and can be applied to electromagnetic signals of almost any frequency. It also provides the user with an estimate of the residual timing error after the correction process has been completed. The Timebase Correction software package is available free of charge at www.boulder.nist.gov/div815/HS … Project/Software.htm