

CompuScope digitizer Time Stamping

CS12400, CS14200, CS14105 and all Octopus CompuScope models all provide an on-board feature called *Time-Stamping*, which is used to determine the arrival time of waveform trigger events. Time stamping is most useful when used in Multiple Record mode.

Without Time Stamping in Multiple Record, the user has no idea of how much time has elapsed between the acquisitions of sequential Multiple Records. In Single Record mode, the user may obtain a time value from the operating system upon downloading each record. However, these time values are generally of low resolution and may even be unreliable because of multiple uses of timing references by the operating system.

CompuScope models with on-board Time-Stamping are equipped with a 44-bit on-board numerical counter. The clock source for the counter may be selected as the CompuScope sampling clock or a fixed on-board clock source. The user may choose to reset the value of the Time Stamping counter to zero at the beginning of each acquisition sequence. With this selection, Time Stamps for a Multiple Record sequence will all be referenced to the start of the Multiple Record acquisition. Alternatively, the user may choose to reset the value of the TimeStamping counter to zero from software only at some reference time, such as the occurrence time of some experimental event or at some known absolute time, which may be supplied, for instance, by an IRIG device.

During a CompuScope acquisition and upon each trigger event, the current output value of the Time Stamping counter is latched and is stored in CompuScope memory as a footer to the current record. After acquisition, the TimeStamp value associated with each acquired record may be downloaded. When dividing the TimeStamp value by the known counter source frequency, the user obtains the occurrence time of each trigger event.

Users may exploit CompuScope Time Stamping functionality in many different applications. For instance, in a particle counting experiment, the Time Stamp values may be used to determine the frequency of arrival of particle pulses. The same technique may be exploited for the counting of lightning or particulate flow pulses. For the acquisition of waveforms that regularly repeat at a rapid rate, the time stamp values may be used to verify that no triggers have been missed. In the event of a missed trigger, the elapsed time between time stamp values for acquired waveforms will be measured as twice the expected value. Finally, a user may obtain an absolute time reference value from an IRIG device. If the user also synchronizes the CompuScope sampling clock with a 10 MHz reference frequency from the same IRIG device, all CompuScope timing measurements may obtain an absolute timing accuracy that is measured in parts-per-billion.