Data Logging Using Trend Plots

## Trend + Sequence Mode + Trigger Hold Off = Data Logger

Data Logging is the ability to make multiple measurements of key circuit parameters acquired simultaneously at known times. LeCroy oscilloscopes, equipped with the optional parameter analysis math package have all the tools necessary for data logging up to 4 parameters.

Trend plots of user selected parameters can be drawn with data values measured and time stamped in sequence acquisition mode. The time between individual acquisitions can be determined by an external clock or the internal trigger hold off timer. An example of just such a setup is shown in figure 1. The internal temperature of an oscillator is measured with a thermal probe with a sensitivity of 1 mV / °F. Simultaneously, the average frequency, taken over 50 cycles, is acquired. The 100 measurements in each trend are being acquired using sequence mode which time stamps each acquisition.   The time between acquisitions is set to 10 seconds using trigger hold off. The trigger time stamps are shown in figure 2. Each set of temperature and frequency measurements is date /time stamped using a real time clock with 1 second resolution. A relative time stamp marks the time since the first acquisition using a time to digital converter with a resolution of 1 ns.
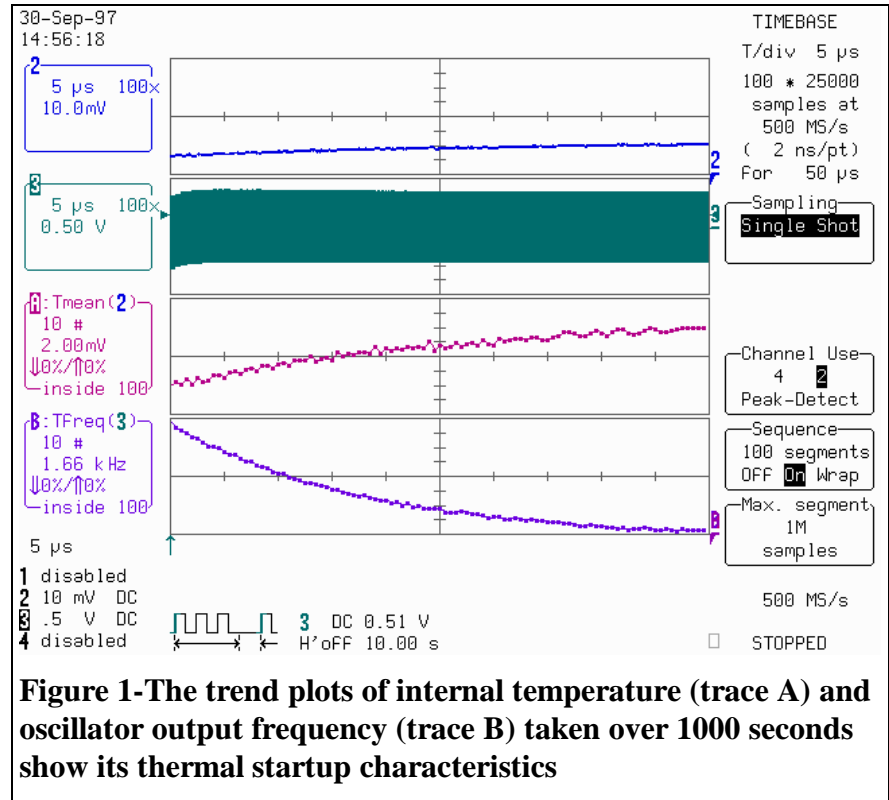
Figure 1-The trend plots of internal temperature (trace A) and oscillator output frequency (trace B) taken over 1000 seconds show its thermal startup characteristics

Once the trend data has been acquired crossplots, using X-Y display mode, can verify functional relationships between the trended parameters as shown in figure 3.
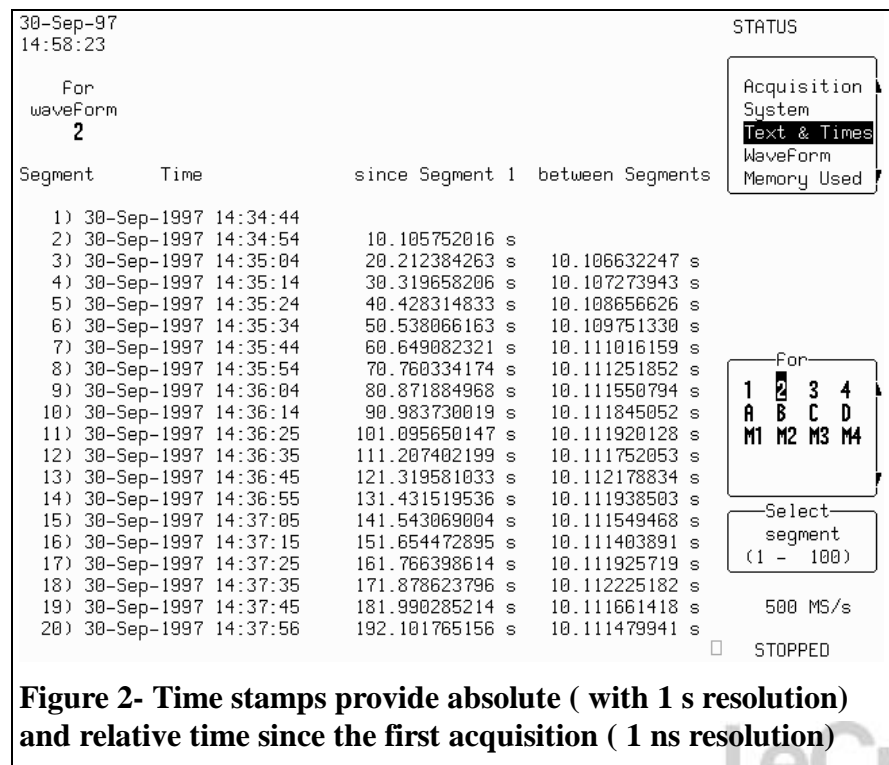
Figure 2- Time stamps provide absolute (with 1 s resolution) and relative time since the first acquisition (1 ns resolution)

The acquisition memory is segmented in sequence mode. Each of the 100 segments holds the data which was measured for the corresponding point in the trend plot. Using zoom, it is possible to recall each segment to review the individual data sources as shown in figure 4.

In setting up this type of measurement there are some things to keep in mind:

1. The number of points in the trend plot should be less than or, at most, equal to the number of segments in the sequence mode acquisition.

2. The trigger source should have a period much shorter than the desired hold off time interval.

3. The user programmable calibrator output can be used as a convenient trigger source for data logging.

This is another example of the high degree of systems integration incorporated into LeCroy oscilloscopes. In this example trend plots, sequence mode acquisition and trigger hold off have been combined to implement a data logging system with built-in plotting and display functions.
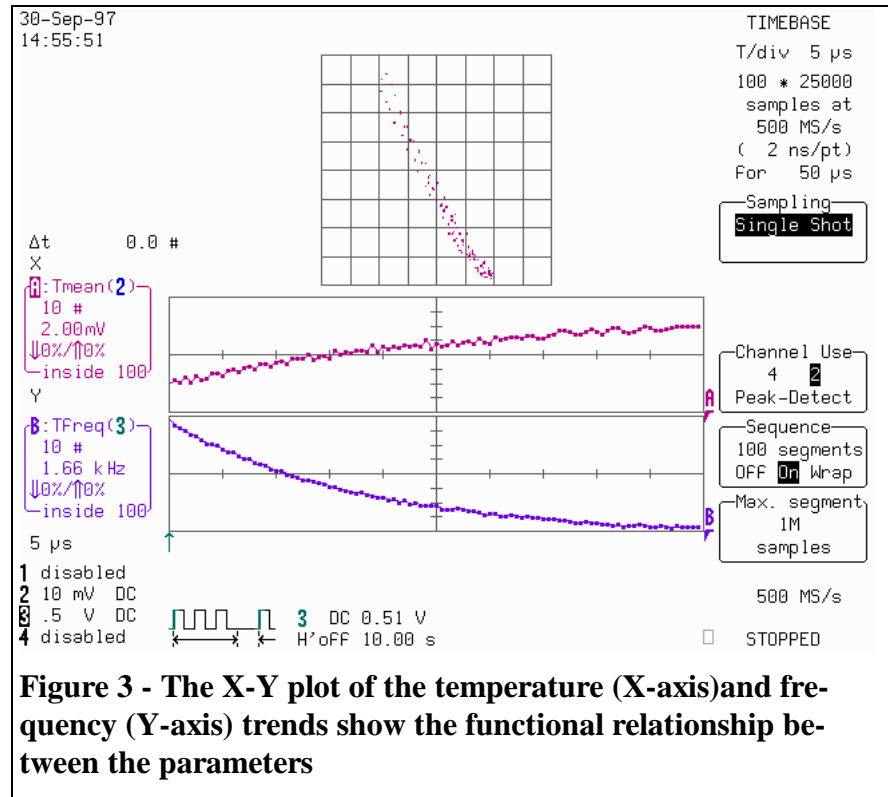
Figure 3 - The X-Y plot of the temperature (X-axis) and frequency (Y-axis) trends show the functional relationship between the parameters
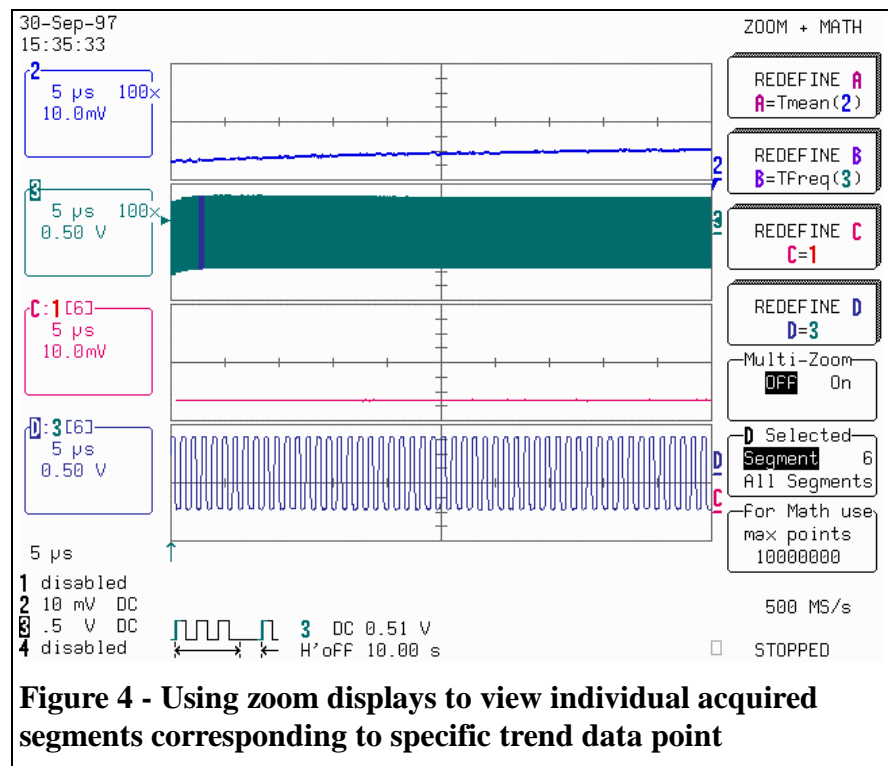
Figure 4 - Using zoom displays to view individual acquired segments corresponding to specific trend data point