Data Logging and Digitizing with a Digital Multimeter — It's About Time

KEYSIGHT

Automobiles, appliances, and other products are using more and more electronic components. Engineers use digital multimeters (DMMs) to build, characterize, and test these products. Measuring long-term trends (drift) and short-term (transient) events helps engineers understand their impact on product response and quality.

Keysight's family of Truevolt DMMs provides the accuracy and speed needed to capture events of any duration in a single instrument. From logging drift to digitizing transient events, it's about time.

How Do I Use These Features?

The data logging and digitizing features of Keysight's 34465A 6½-digit and 34470A 7½-digit DMMs operate from the front panel, a simpler alternative to remote programming and data transfer.

Data logging and digitizing processes acquire data. The functions are located under the front-panel "Acquire" key and corresponding "Acquire" soft key, as shown in Figure 1.
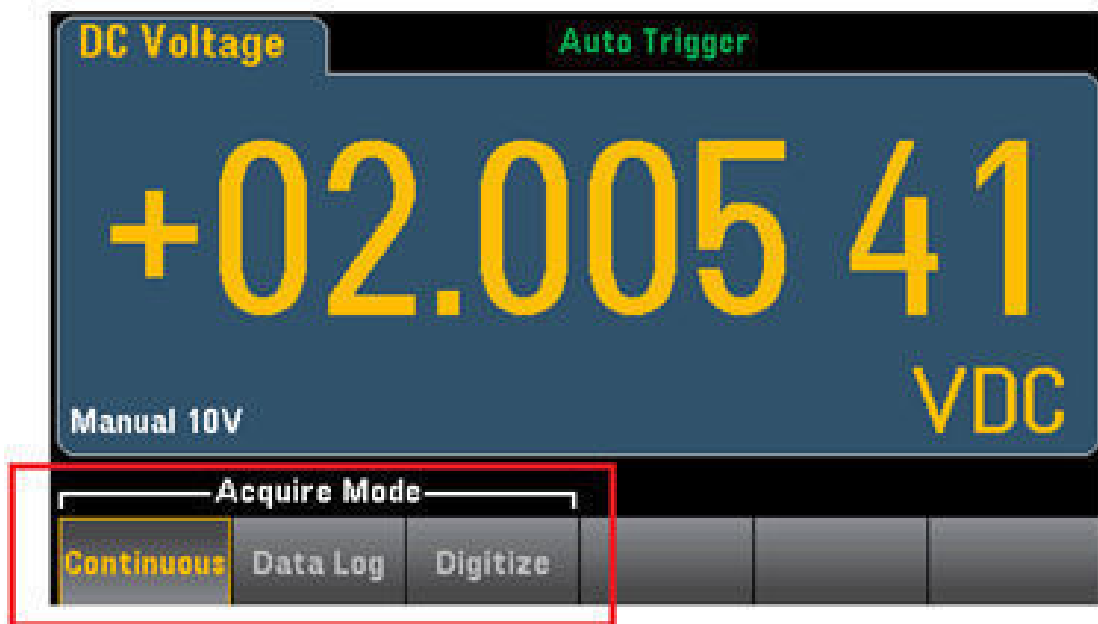

Figure 1. Data logging and digitizing functions on the DMM's front panel

Capturing Data Over Time — Data Logging

Data logging is the collection of data over time, from several minutes to hours or days. It involves recording changes in temperature, accuracy, or any measurable physical quality that you are monitoring.

When conducting data logging, specify the following:

- Sample interval
- A duration (time or the number of readings to log)
- A delay to allow the signal to settle (if necessary)
- Location to log the readings (internal memory or specific internal / external file)

Begin data logging by pressing the front-panel Run / Stop key. When started, the DMM counts down the time remaining and the number of readings it still needs to take.

The trend chart capability of the DMM complements the data logging process by providing a graphic representation of the data over time.
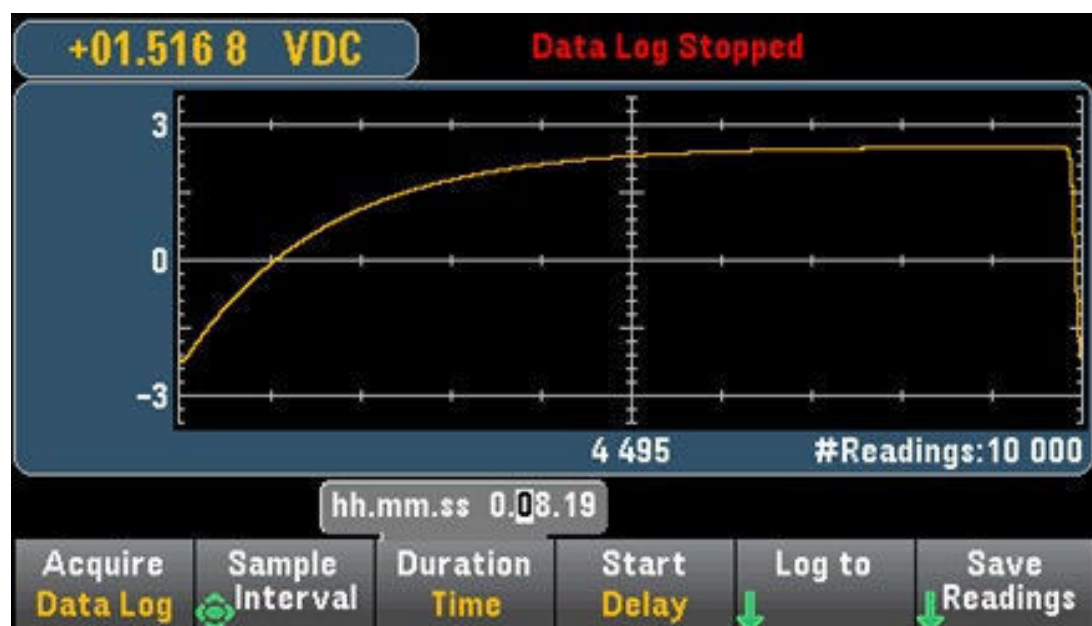

Figure 2. Data logging records changes in temperature, accuracy, and other physical qualities

About the sample interval

The sample interval is the reading-to-reading interval and must be equal to or greater than the actual reading rate. The reading rate within the interval is based on parameters such as integration time, aperture time, autorange, and autozero, all of which you set as part of the measurement configuration.

Capturing Transient Events — Digitizing

Digitizing is the process of converting a continuous analog signal into a series of discrete samples or readings, providing additional insights into the signal's characteristics.

Different from data logging, digitizing often occurs in 1 second or less. The 34465A and 34470A can digitize at a maximum rate of 50,000 readings per second (50 kHz).

When digitizing, you specify the following:

- sample rate
- duration (time or the number of points to digitize)
- specific triggering conditions (level or external triggering, pre-trigger readings)

As with data logging, selecting the DMM's trend chart display provides a graphic representation of the digitized signal that you can compare to the source (input) signal.
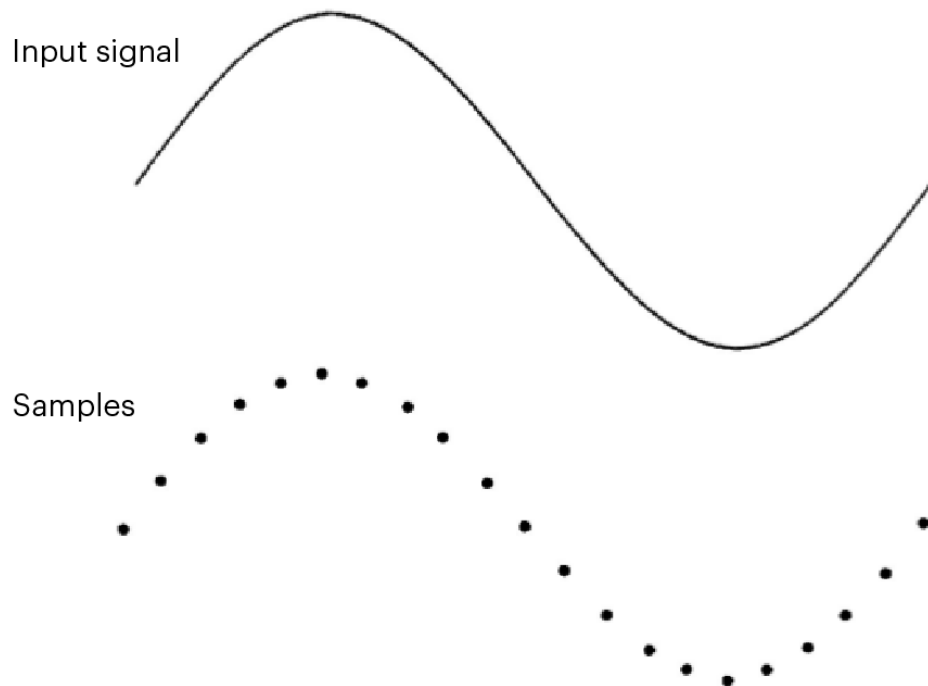
Input signal

Samples

Figure 3. A comparison between an analog input signal (top) and sampled discrete or digitized signal (bottom)
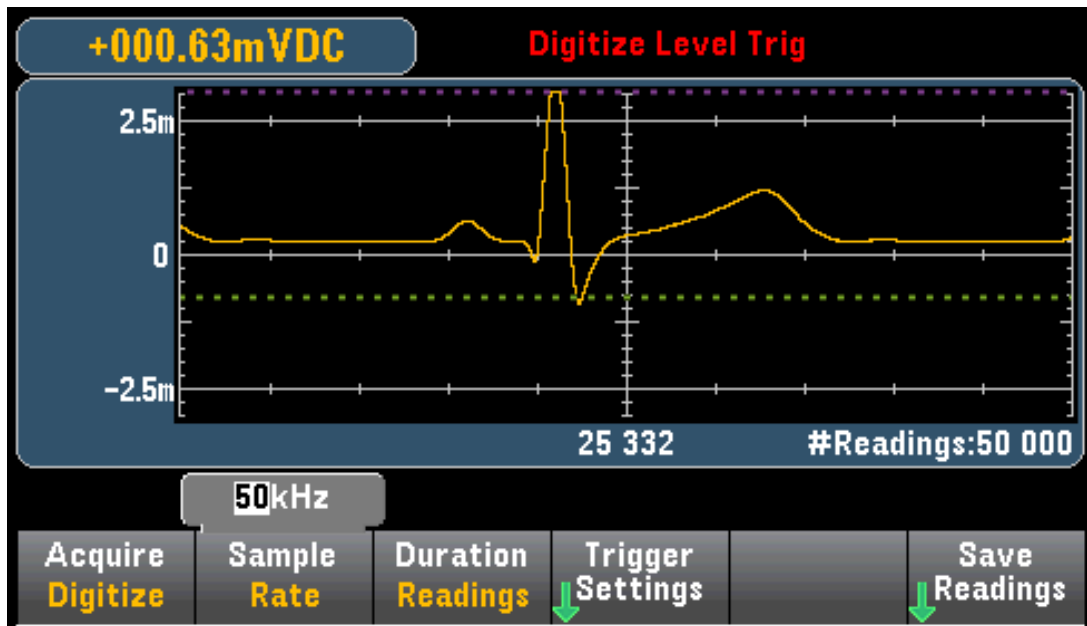
Figure 4. Digitized signal displayed on the front panel display of a DMM

About the sample rate

The sample rate (in hertz) is the inverse of the sample interval (time). It is the reading-to-reading interval and must be equal to or greater than the actual reading rate. The reading rate within the interval is based on parameters such as integration time, aperture time, autorange, and autozero, all of which you set as part of the measurement configuration.

PathWave BenchVue Software Solution

Data logging, digitizing, and triggering are standard in modern DMMs like Keysight's 34465A and 34470A models. Even though the DMMs come with a large 4.3-inch display capable of performing all of those functions, the DMMs come with the PathWave BenchVue software solution.
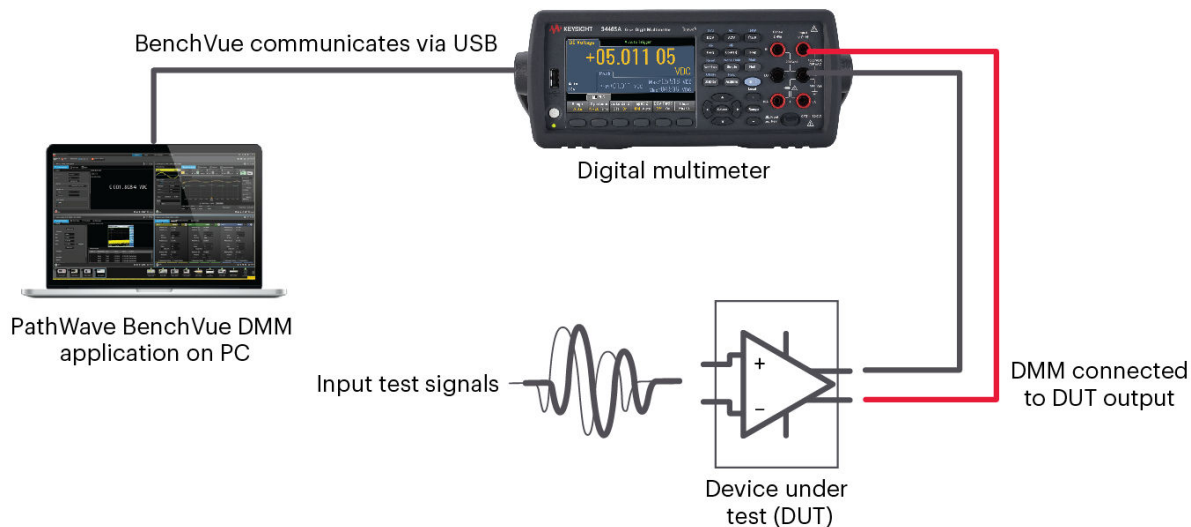
Figure 5. Diagram of PathWave BenchVue software remotely controlling and capturing test signals from a device under test

The PathWave BenchVue software allows you to control, capture, and analyze all the logged and digitized data from a PC. You can quickly set up the DMM through the software's graphical user interface. The software includes dedicated setup and output display for the data logging and digitizing functions. Figures 6 and 7 show the PathWave BenchVue data logging and digitizing screens.
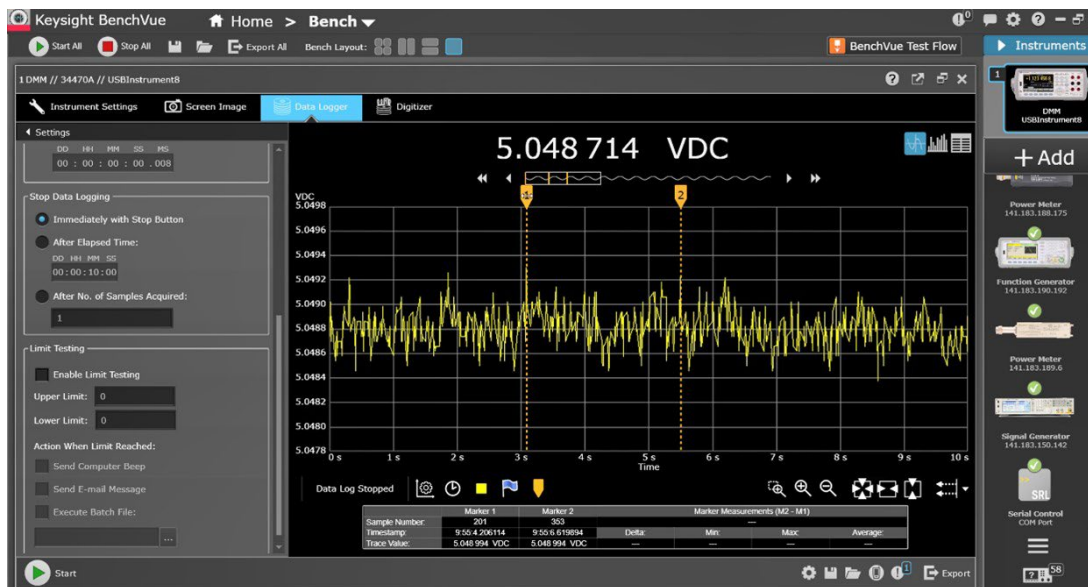

Figure 6. PathWave BenchVue's data logger function screen

Figure 7. PathWave BenchVue's digitizing function screen

References

- Learn more about the versatile Keysight 34465A and 34470A digital multimeters here.
- Learn more about Keysight PathWave BenchVue software here.

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