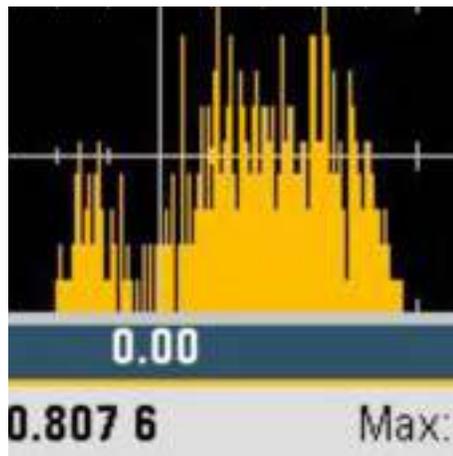
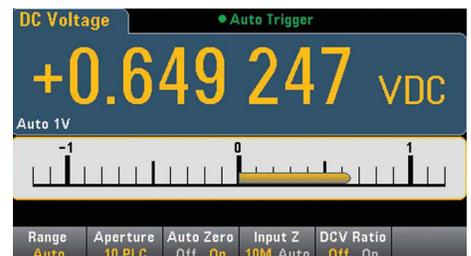
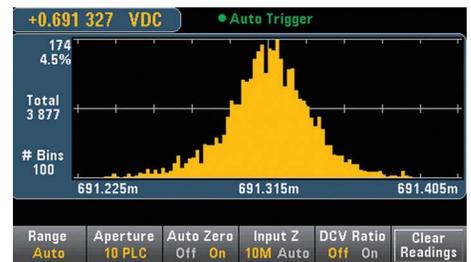
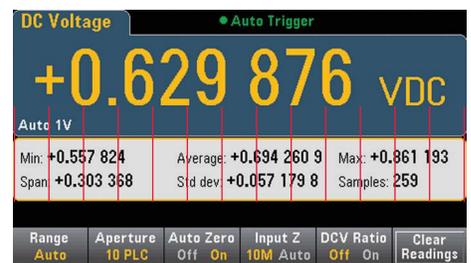
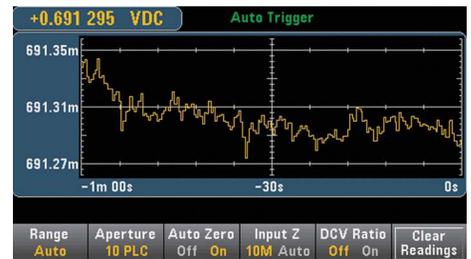


# Keysight Technologies

## Viewing Graphical Results on a DMM Display

### Application Note



## Introduction

Digital multimeters measure and display various parameters such as voltage, current, resistance, and temperature in an easy-to-read number format. However, many times you are looking for more than a single reading in the display. Often, the really meaningful information lies in the trend or statistics of a series of readings. If your DMM offers connectivity, such as LAN or USB ports, you can transfer your readings to a computer for computation and display. But transferring data to a PC may take more time than you want to spend.

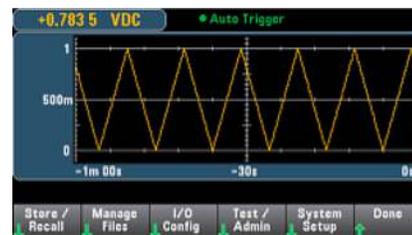
Now, a new DMM, the Keysight Technologies, Inc. 34461A, offers a way to get insight into your measurement data without transferring your data to a PC. The 34461A features a large graphical display and built-in math functions that show measurement trends, statistics, and histograms all in a single, compact unit.

## Snapshot

A company designing a high-power solar charger for smart phones and tablets needed to rigorously test the circuit that detected low solar-cell power for shutting down and restarting the charging circuit smoothly. This circuit was necessary because the charger had no internal battery to act as a buffer. To simulate changing solar radiation, the design team used a triangle waveform from an arb/function generator as a source.

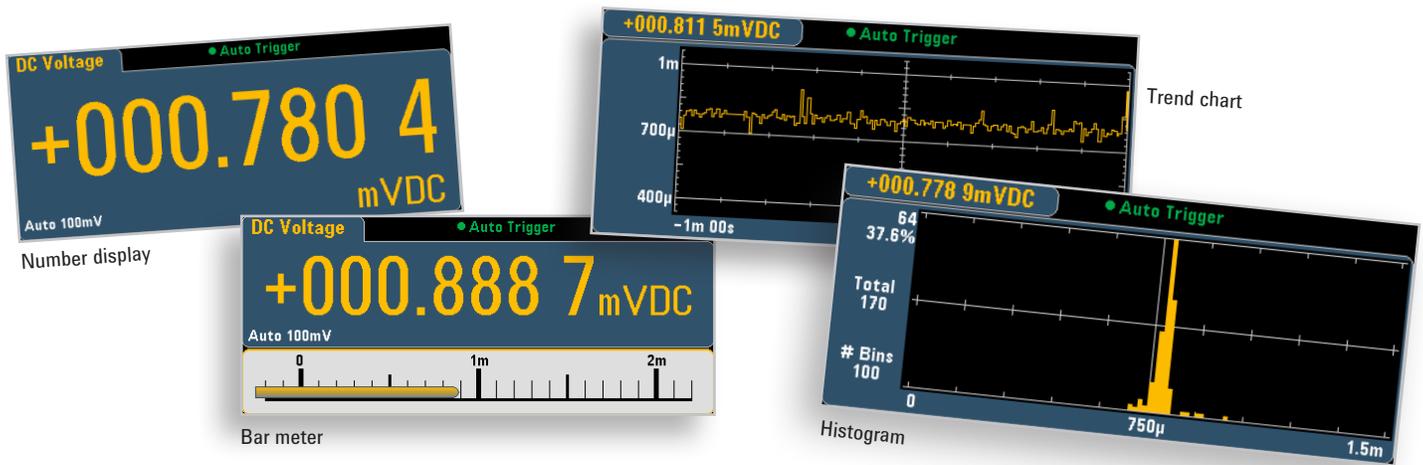
The engineers set up the Keysight 34461A to measure the on/off output voltage of the detector circuit and displayed the results using the histogram mode. At frequencies below one Hertz, the display clearly showed a binary distribution, which was the desired result.

However, they found that for higher frequencies, which occurred when they waved a hand across the solar panel, the circuit exhibited an anomaly that caused an intermediate output value. This anomaly clearly interfered with the proper output charging operation. A relatively simple design change to the cutoff frequency in the detector circuit solved the problem and eliminated potential customer warranty claims.



## Display DMM results in ways you never have before

Four different display modes give you fast insight



The 34461A's simple, intuitive user interface gives you quick and intuitive access to different views of your data. You can easily access the structured display and math menus with a single key on the front panel. The menu options appear on the soft keys under the display. The six soft keys and a set of navigation buttons on the front panel eliminate the need for an external computer and software.



Figure 1. When you press the Display button, the soft keys show the choices available for the different display modes.

### Info at a glance saves time

The bar meter display is ideal for showing an analog indication of the value in addition to the digital readout. Sometimes you just need a quick qualitative glance at a measurement to be assured that the test is proceeding as you planned. The bar meter also can be enhanced with the limits function in the Math menu to provide an even more informative display.

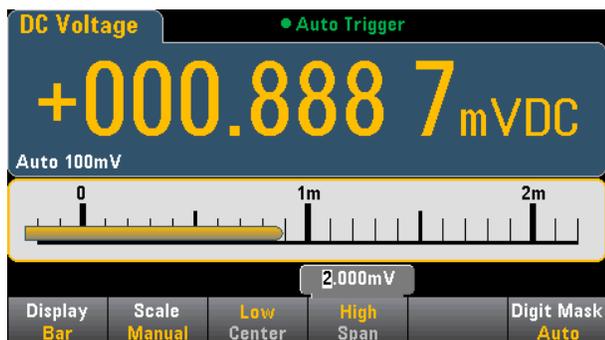


Figure 2. The bar meter display gives you a quick qualitative view of your measurement.

### A trend chart shows direction

If you expect a measured parameter to remain constant, you only need to measure it once. But in the real world, values drift with time, track other parameters, or vary in complex ways with outside influences. You can set the trend chart display on the Keysight 34461A to display the most recent data over the last minute, or all the data collected since the last time the readings were cleared. You could use this innovative capability, for example, for monitoring a power supply design under changing loads. You would set up multiple DMMs to monitor vthe output voltage, load current, and various temperature points inside the unit. As the load current is varied, you could see the change in voltage and temperature as a function of time.

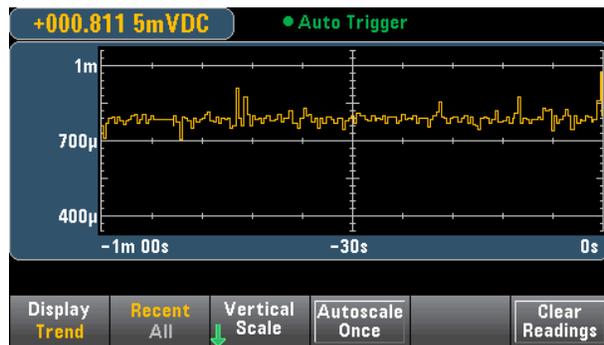


Figure 3. A trend chart shows you changes in your measurements over time.

### Histograms tell all about the data

When the lowest digits of a reading are changing constantly, it is important to know the nature of that variation. The histogram provides insight by showing the distribution of the measured values. The average, distribution shape, and standard deviation are all critical information for understanding the variation phenomena.

The histogram binning can be automatic set or you can set it to values of 10, 20, 40, 100, 200, or 400, depending on your need for resolution of the display. You can set up outer bins to catch values that occur outside the histogram range. This can give you insight into the occurrences of occasional outside influences such as power glitches or EMI from other equipment.

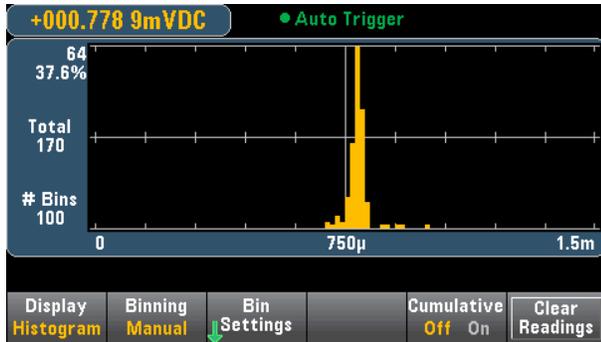


Figure 4. A histogram shows the distribution of your measured values.

### Adding math to displays brings data to a new level

Null is most useful for zeroing out lead resistance when you measure small values of resistance. You can also set other measured values such as voltage or temperatures as null values simply by pressing the Null front-panel key so that deviations from the measured value can be easily observed. If you have predetermined a null value, you can enter that value using the arrow keys. There is no need to make a measurement first.



Figure 5. Setting null values is easy on the front-panel display.

When the range of measured values exceeds a decade or more, dB/dBm scaling provides a convenient logarithmic readout relative (dB) to a user-set reference. Or to see an absolute value (dBm) referred to 1 mW across a given resistance value, simply select a value ranging from 50 to 8000 ohms, using the front panel.



Figure 6. Automatic scaling provides a convenient logarithmic readout relative to a user-set reference.

#### MEASUREMENT TIP #1

##### Digit masking

If you are displaying noisy signals where the lowest digits constantly change, use the 34461A's digit masking feature to show just the resolution you need.

Statistical data displays are always available for the readings in memory or you can clear readings to start a new series of statistics on collected data. These statistical data are especially useful for determining the stability of a measured value and also for detecting outlying data via the min/max displays.

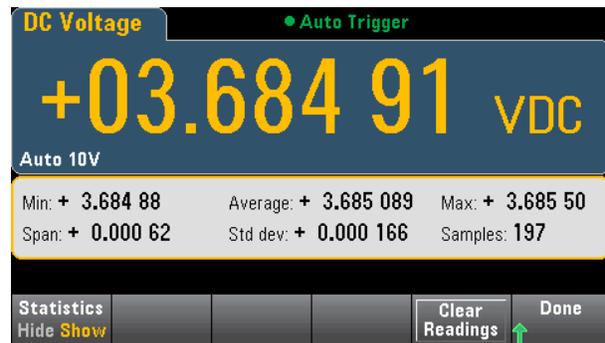


Figure 7. Use the statistical display to determine the stability of a measured value.

Limits provide both a visual indicator and an audio “beeper” tone to alert you when a preset condition has been exceeded. For example, if you are monitoring internal temperatures on prototype circuits in a heat-soak oven, it is critical to get a warning before a valuable prototype overheats and suffers damage. You can set and apply limits to all four display modes for maximum flexibility in measurement readout.

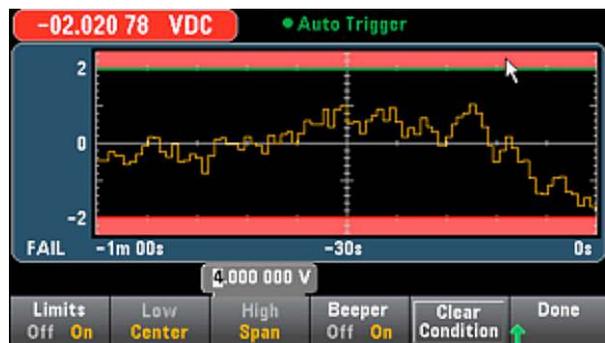


Figure 8. An example of limits with the trend chart.

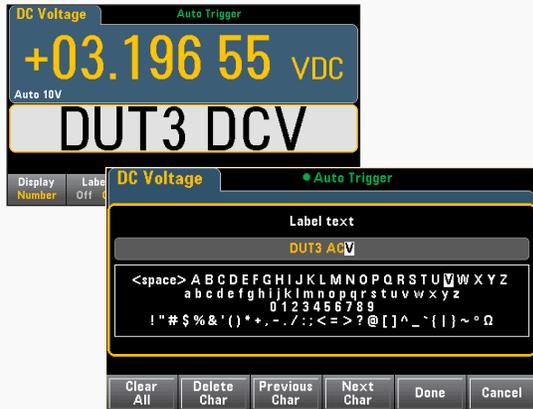
### Conclusion

Whether you are measuring a parameter on a single point or multiple points, it is clear that a single value does not provide much insight into the performance of your DUT over time or in response to outside interference. Setting up a computer connection for data collection and analysis often takes too much time and can delay the testing schedule. Now with the new Keysight 34461A DMM's graphical display and built-in math functions, the most useful time-cumulative and data-cumulative analysis results are available at your fingertips, using simple front-panel menu entries. You can meet your testing goals faster than ever before.

## MEASUREMENT TIP #2

### Labeling your signals

When you have several DDMs on the bench or in a rack measuring a variety of points and parameters, the usual solution for identifying them is a taped-on label or adhesive-backed note. Now you can add the label to the display using the front-panel keyboard. These labels remain in memory even after a power-off situation and they never fall off the unit.

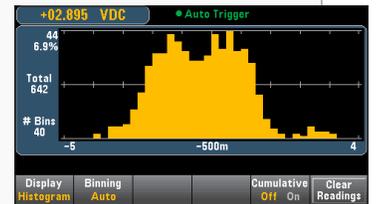


## MEASUREMENT TIP #3

### Alternate views of the data

It's important to know that the display view initially chosen is not the only way to look at the data in memory. You can switch back and forth between display views and math applications as required. For example, you can start with the Trend Chart, Recent display of the last minute of data, then switch to All to view all data collected, and later switch to the Histogram display of all data.

Other capabilities include the Math, Statistics function where you can also see the average and standard deviation of the histogram data.



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