

# Viewing Graphical Results on a DMM Display



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# Introduction

Digital multimeters (DMMs) measure and display various parameters such as voltage, current, resistance, and temperature in an easy-to-read number format. However, you may need more than a single reading to display. The 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. However, transferring data to a PC may take more time than you want to spend.

Now, **Keysight's Truevolt Series DMMs (34460A, 34461A, 34465A, 34470A)** give you insight into your measurement data without transferring your data to a PC. The Truevolt Series feature a large graphical display and built-in math functions that display measurement trends, statistics, and histograms — all in a single, compact unit.

## Easily perform these three key functions with Keysight's Truevolt DMMs:

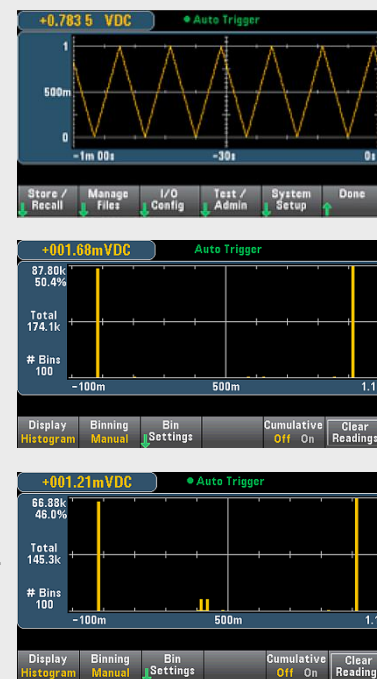
1. Digit masking to show just the resolution you need.
2. Electronic screen labeling to easily identify the signals you are measuring.
3. Alternate viewing of data displays for better data analysis.

## 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.

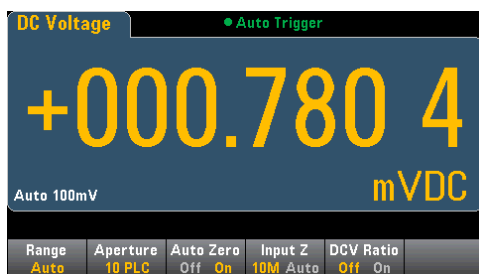
The engineers set up the Keysight Truevolt DMM to measure the on/off output voltage of the detector circuit and displayed the results using the histogram mode. At frequencies below 1 Hz, the display clearly showed a binary distribution, which was the desired result.

However, the customer found the circuit exhibited an anomaly that caused an intermediate output value for higher frequencies. This deviation occurred when waving a hand across the solar panel. 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.

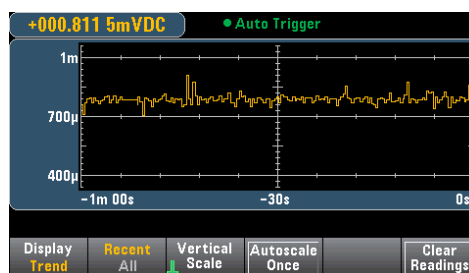


## Display modes

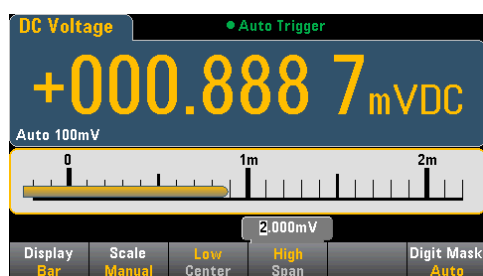
Four different display modes give you accurate and fast results.



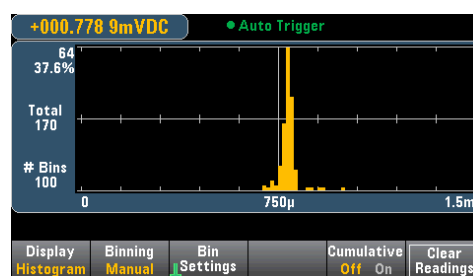
Number display



Trend chart



Bar meter



Histogram

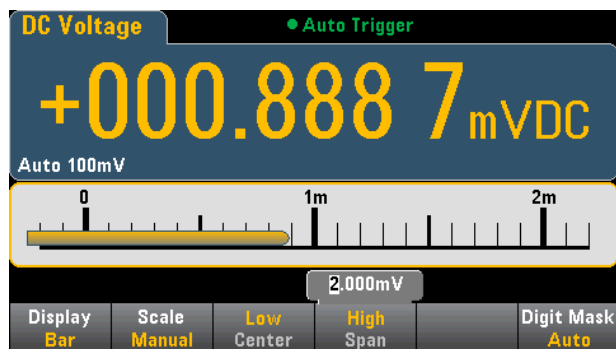
Truevolt's DMMs simple, intuitive user interface gives you quick and intuitive access to different views of your data. You can easily access the structured display and math menus with a single key on the front panel (Figure 1). The menu options appear on the soft keys directly under the display. The 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

## Qualitative data

The bar meter display is ideal for showing an analog indication of the value in addition to the digital readout (Figure 2). Sometimes you need a quick qualitative glance of the measurement to ensure the test is proceeding as planned. The bar meter gives you the limits function in the math menu to provide an informative display.

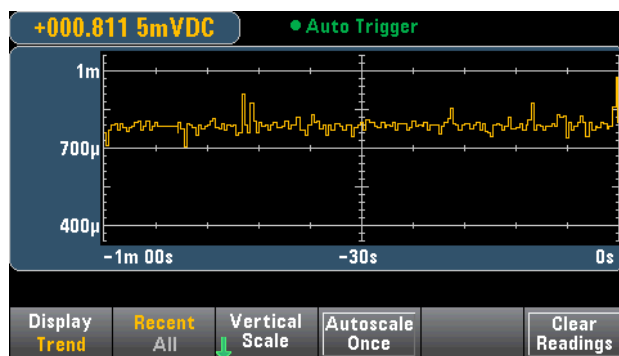


**Figure 2.** The bar meter display gives you a quick qualitative view of your measurement

## Trend chart

You only need to make a measurement once if you expect a measured parameter to remain constant. However, in reality, values drift with time, sometimes track other parameters, or vary in complex ways with outside influences.

You can set the trend chart display on the Truevolt DMM to display the most recent data (Figure 3). Additionally, you can view the collected data from the previous readings. You would use this innovative capability to monitor a power supply design under changing loads. You can easily set up multiple DMMs to monitor the output voltage, load current, and various temperature points inside the unit. As the load current is varied, you would 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

## Data histograms

When the lowest digits of a reading are continually changing, it is important to know the nature of that variation. The histogram (Figure 4) gives you insight by displaying the distribution of the measured values. The average, distribution shape, and standard deviation are critical data for understanding the variation phenomena.

The histogram binning sets automatically, or you can set it to values of 10, 20, 40, 100, 200, or 400. The setting depends on your requirements for the display resolution. You can set up outer bins to capture values that occur outside the histogram range. This gives you insight into the occurrences of occasional outside influences such as power glitches or EMI from other equipment.

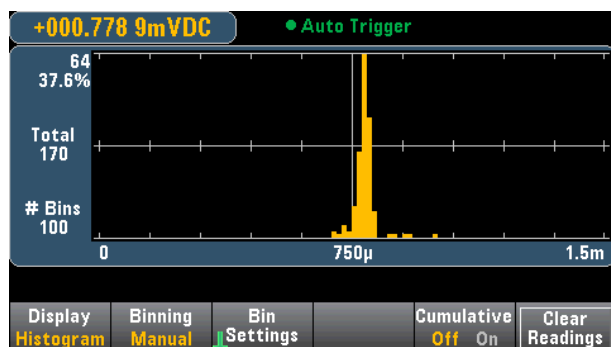


Figure 4. A histogram shows the distribution of your measured values

## Math functions

Null is 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 by pressing the null front-panel key. The deviations from the measured value are now visible. If you have predetermined a null value, you can enter that value using the arrow keys (Figure 5). There is no need to make a measurement first.



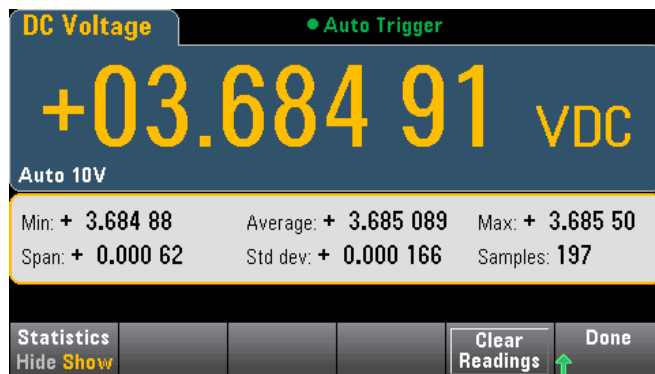
Figure 5. Setting null values are easy on the front-panel display

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. 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).



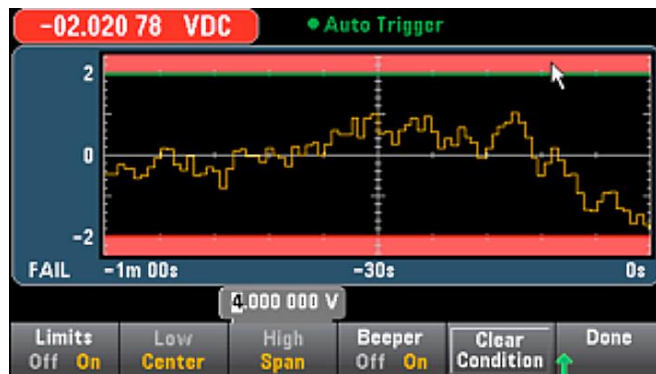
Figure 6. Automatic scaling provides a convenient logarithmic readout relative to a user-set reference

Statistical data displays are always available for the readings in memory, or you can clear the readings to start a new series of statistics for the collected data (Figure 7). These statistical data are useful for determining the stability of a measured value and 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 tone (beep) to alert you when it exceeds a preset condition (Figure 8). For example — 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 a measurement readout.



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

# Three DMM Measurement Tips

## 1. Digit masking

If you are displaying noisy signals where the lowest digits constantly change, use the Truevolt DMM's digit masking feature to display just the resolution you need (Figure 9).

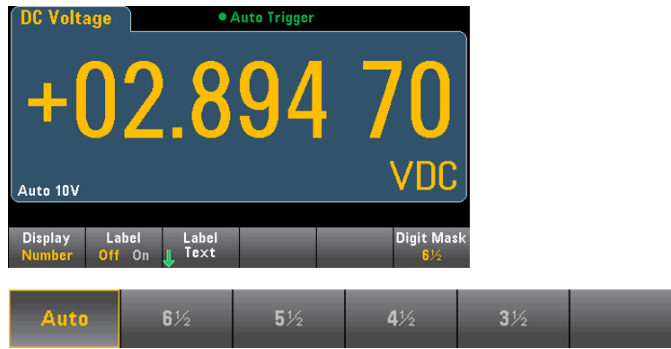


Figure 9. Digit masking capability

## 2. Labeling your signals

When you have several DMMs on the bench or in a rack measuring a variety of points and parameters, it is difficult to keep track of all the parameters. The usual solution for identifying them is a taped-on label or adhesive-backed note. Now you can add an electronic 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 (Figure 10).

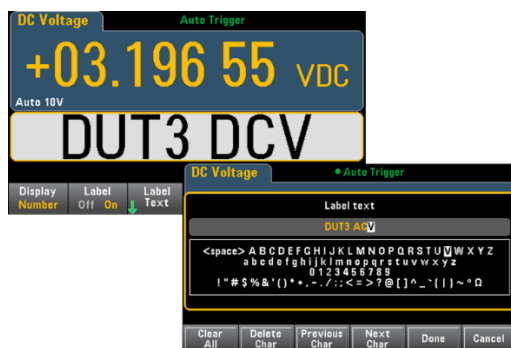
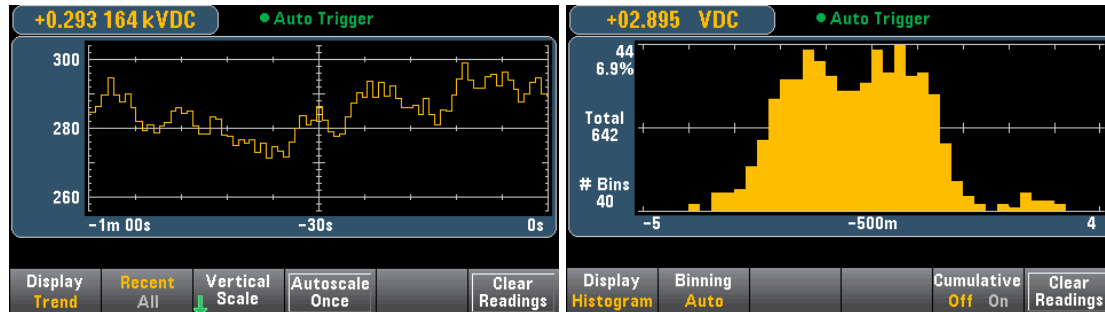


Figure 10. DMM screen labeling

### 3. Multiple data displays

It is 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 necessary. For example, you can start with the trend chart that contains the latest “Recent” data, then switch to “All” to view all the data collected. You can also switch to the histogram display to view all the data (Figure 11).

Other capabilities include math and statistics so that you can see the average and standard deviation of the histogram data.



**Figure 11.** A trend chart displaying recent data points or a histogram displaying all data points

## Conclusion

A single point measurement value does not provide much insight into the performance of your device under test over time or in response to outside interference. Setting up a computer connection for data collection and analysis is often time-consuming and can delay the testing schedule.

Keysight's Truevolt DMM's graphical display and front-panel menu with built-in math functions ease monitoring and accelerate statistical analysis. You have access to the most useful time-cumulative and data-cumulative analysis results. You can now meet your testing goals faster than ever before.



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