

How The SC61 PPV Test Finds Interfering Signals Missed By The CRT Alone.

The SC61 Waveform Analyzer's CRT and digital readout may, at times, show slightly different peak-to-peak voltage readings. These different peak-to-peak readings indicate there is either a problem with the circuit or there is part of the normal waveform you can't see on the CRT. This Tech Tip covers these discrepancies and how you can use the information to your advantage.

Digital And CRT Readings Are Independent

The SC61 was designed to bring digital accuracy to waveform analyzing. The digital readout provides the measurements needed to analyze the waveform on the CRT. However, the digital readings remain independent of the CRT controls, so that you can adjust the CRT any way you like without causing errors. No other oscilloscope with digital readings makes measurements in this way.

The SC61 measures the true peak-to-peak amplitude of any signal applied to the channel A or B input. The frequency response of the digital circuits closely matches the CRT response for accurate peak-to-peak readings of any waveform the CRT is capable of displaying.

The CRT and the digital readout share a few circuits, and then separate into different paths. Both use the same probe, input connection, and input amplifiers. This lets you use a single probe to analyze any signal. The digital readings remain independent, however, because the signals are routed to the microprocessor before the CRT controls.

The Digital Display Is Error-Proof

You don't even have to display the signal to make digital readings. The digital display reads the actual peak-to-peak voltage of

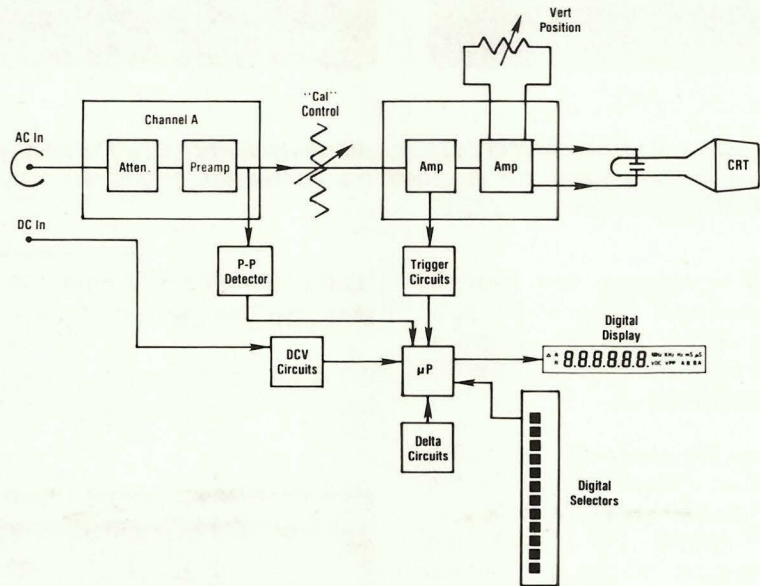


Fig. 1: The SC61 routes the measured signals to the digital measuring circuits ahead of the CRT controls to let you adjust the CRT anyway you like without causing measuring errors.

the waveform, whether the waveform is displayed on the CRT or not. If you do have the signal on the CRT, you can adjust the waveform the way you want it, without upsetting the digital readings.

Which Is More Accurate, The CRT Or The Digital Meter?

You may find at times that the digital readout of the SC61 shows a different value than is displayed on the CRT. If the two readings are not the same, the difference may be caused by one of two reasons.

First, the digital peak-to-peak readout is much more accurate. The peak-to-peak meter has an accuracy of 2% and frequency response of 0.5 dB.

Secondly, if the digital readout shows a higher value than the CRT, an extra signal

may be present, which is not showing on the CRT. The digital circuits measure the full signal amplitude, even if the entire signal is not showing on the CRT.

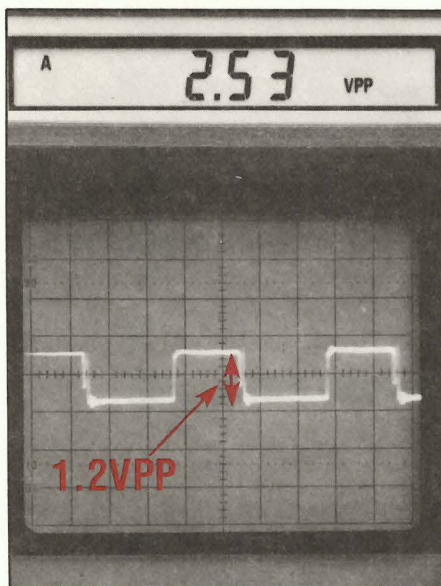
What Kind Of Signals Cause A Difference In Readings?

Two types of waveform imperfections cause the SC61 digital meter to show higher value than when using only the CRT to measure amplitude: overshoot and random spikes.

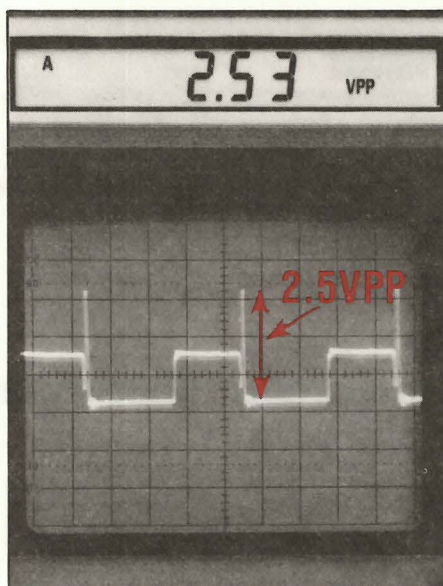
Overshoot

The first type of imperfection is overshoot or other interference that is present on the waveform, but not noticeable at normal CRT trace intensity. Increasing the CRT trace intensity to full brightness often shows the hidden signal, allowing direct comparisons between the CRT and the digital readout. Figure 2a shows an

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2A



2B

Fig. 2: The peak-to-peak readings in 2a show a difference in amplitude. The trace intensity is turned up in 2b, showing the overshoot that caused the difference. Channel A's VOLTS/DIVISION switch is set at 1V/DIV.

example of a waveform that measures higher peak-to-peak voltage on the digital meter than on the CRT itself. Figure 2b shows the same waveform with the CRT trace intensity turned up.

You can see the reason why the SC61's digital circuits showed a higher voltage than what the CRT showed with the trace intensity at normal. The SC61's digital circuits measured the full peak-to-peak amplitude, even though some of the waveform was not displayed on the CRT.

Random Spikes

The second type of interference may occur randomly, and be off the edge of the CRT. In digital pulse trains, for example, an extra spike may occur every 100 pulses and therefore not appear on the CRT at normal sweep rates.

In most cases, you can slow your sweep rate by a factor of ten and you will see the added signal. If this doesn't work, use the Delta Peak-to-Peak bars to measure the waveform on the screen. Start with a dot, and gradually widen the Delta bar until you fill the entire scope screen. If the Delta Peak-to-Peak reading tracks with what you see on the CRT, the problem is off the face of the CRT. If, on the other hand, the Delta PPV reading suddenly increases as you widen the intensified area on the CRT, you know the last area covered contains the interfering signal as shown in figure 3.

Using The Delta PPV Function To Measure The Desired Signal

If you wish to measure the peak-to-peak voltage of the waveform without the noise

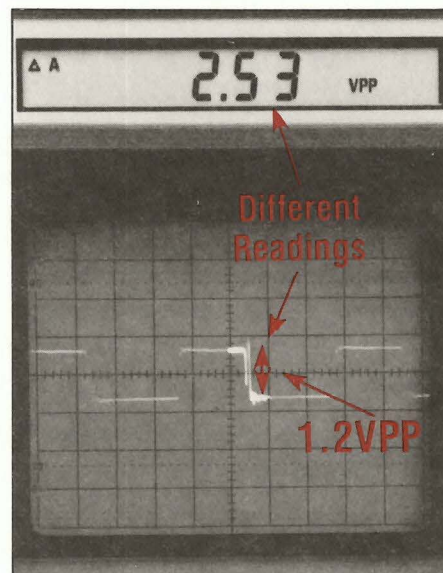


Fig. 3: Expanding the Delta PPV bar shows where the interfering signal lies when the PP readings don't match.

spike, simply use the SC61 Delta peak-to-peak function. Just intensify the

leading or lagging edge of the waveform, without spike as shown in figure 4. The SC61's digital meter will read the peak-to-peak voltage without the unwanted spike. It's that simple.

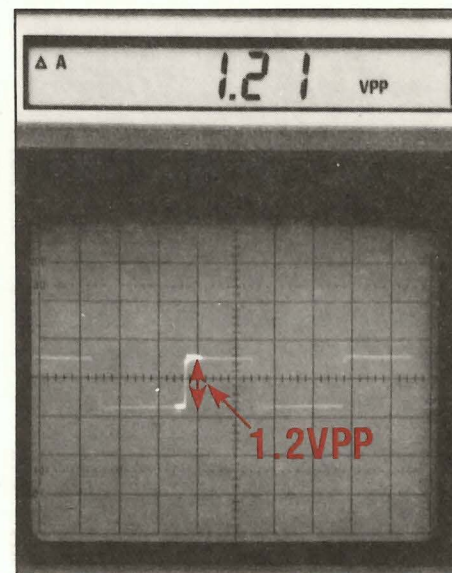


Fig. 4: Simply intensify the portion of the waveform you want to measure with the Delta PPV function.

The Difference Is Telling You Something

Always remember that something is causing the peak-to-peak voltage to read high. Turning up the trace intensity or slowing your sweep speed will usually reveal the cause of the difference. The important thing to remember, however, is that the digital readout is always the more accurate of the two peak-to-peak measuring methods.

for more information

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