

High Frequency Measurements Web Page

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Using a Two AA Cell USB Charger to Power a Comb Generator (A Handy Power Source for Any USB Powered Device)



Figure 1. Two AA Cell USB Charger and USB Powered Comb Generator

Abstract: Sometimes a device can have a use that is quite different than its intended purpose. In this case, a two AA cell charger for mobile phones and USB devices is used to provide power for a comb generator RF source used in EMC measurements. The output of the comb generator is checked with a fast digital scope.

Discussion: Figure 1 shows an AET USB-S-1.84 RF Source comb generator (so called because its frequency spectrum looks like a comb on the display of a spectrum analyzer) and a small charger powered by two AA cells intended for charging mobile phones and USB devices. Although intended to charge USB devices until the batteries are exhausted, it makes a great 5 Volt USB power supply for many devices including the comb generator shown. During operation, the charger draws about 380 mA from the AA cells while powering the USB powered comb generator. That could translate to 5 or more hours of operation per pair of AA cells. The unit also seems to run well on a pair of AA nickel metal hydride batteries although I have not tried to see how long NiMH batteries will power the charger.

The test setup is shown in Figure 2. The charger is connected to the comb generator using a small cable furnished with the charger and the comb generator itself is directly coupled to the input of the scope to achieve the fastest possible edge rates by avoiding dispersion and loss in coaxial cables which slows edge rates. A close-up of the test setup is shown in Figure 3.



Figure 2. Test Setup With Charger and Comb Generator



Figure 3.Close-up of Power Source and Comb Generator

Figure 4 shows the fast portion of the output of the comb generator. There are slower features on the output that can be seen on a longer time scale, but the part of the waveform shown is the source of most of the harmonics in the output of the generator. The pulse has about a 1 1/2 Volt amplitude with a rise time of a little less than a nanosecond. The generator is working well powered from the charger.

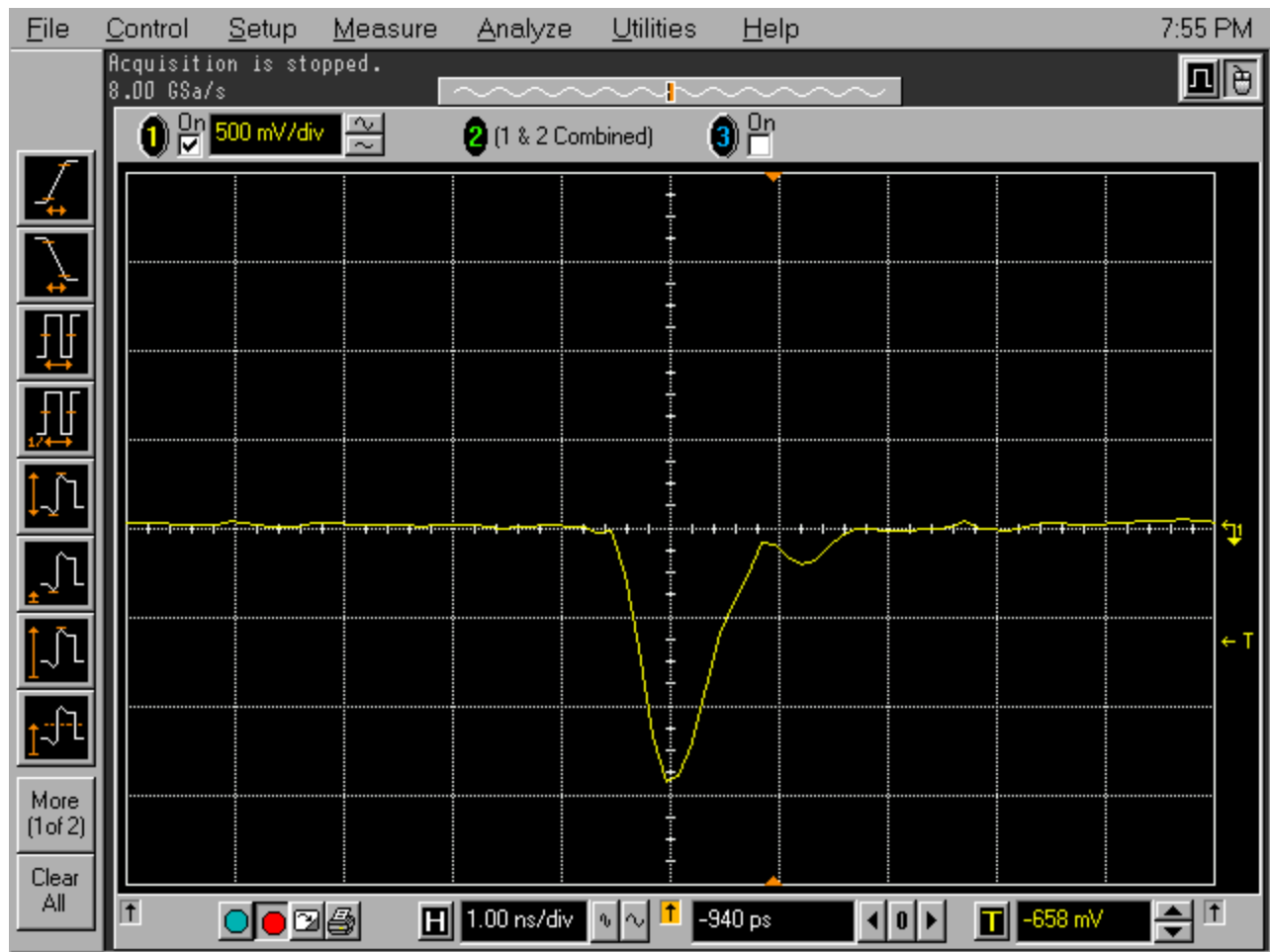


Figure 4. Plot of USB Powered USB Comb Generator Output

I have seen this charger at Costco and Staples. It is widely available from other outlets as well. This charger would work well for field work where USB devices need to be powered up, such as the comb generator RF source shown above.

Summary: The two AA cell USB charger described can be very useful for powering up USB devices in the field. Used to power up the USB powered comb generator RF source shown makes a great combination for EMC field work or seminar demonstrations.

Additional articles on this website related to this topic are:

1. [August 2009, The Square Shielded Loop - Part 6, Measurements in the Time Domain Using a Comb Generator](#)
(An unusual use for a comb generator)

Equipment used for this article:

1. [USB powered Comb Generator](#)
2. [Agilent Infinium 54845a scope](#)

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