CROWD SUPPLY

Aeroscope: Wireless Oscilloscope

A wireless, ultra-portable oscilloscope with impressive specs – debug circuits in their natural environment.

As Featured In

Hackaday

"... we can't wait to see what kind of work this thing enables."

Small, Portable, Powerful

Aeroscope is a wireless oscilloscope probe that pairs to a user's tablet or phone. It was designed with both portability and performance in mind. Aeroscope crams an impressive amount of measurement power into a small package. It includes a rechargeable battery, for a full day of measurements, and has a wireless range of 100+ feet.

Aeroscope is small enough that it can be embedded inside mobile systems. This opens up new measurement possibilities for anyone working in fields like robotics or drones. Imagine measuring the power draw of your robot as it is driving around, in real-time, or debugging your autonomous vehicle in the field from a safe distance away. You can even monitor signals on your drone while it is in flight.

In addition to Aeroscope's embeddability, its small size and battery power make it perfect for fieldwork - no more lugging heavy test equipment or searching for AC outlets. Easily bring your oscilloscope with you to even the most remote locations.

Aeroscope is a great fit for anyone who is space constrained. Its small size allows users to work on electronics wherever they like - a small apartment, a coffee shop, a brewery, or even in the backcountry.

Since Aeroscope is wireless, it is fully isolated from mains ground. This means that you can ground Aeroscope wherever you like and you don't have to worry about damaging it or shorting out your circuit. This comes in handy when probing things like switch mode power supply switching nodes.

Aeroscope is the perfect tool for probing on a whim, drones, robots, remote installations, off-grid locations, enclosed systems, and automotive work.

Features & Specifications

Technical Specifications

- **Analog Bandwidth:** 20 MHz
- **Sample Rate:** 100M samples/second
- **Sample Resolution**: 8 bits
- **Connectivity:** Bluetooth 4.0 with 100-ft+ range
- **Input Range:** +/-40V
- **DC Accuracy:** +/- 3%
- **Offset Range:** +/- 40V
- **Sample Memory Depth:** 4k
- **Input Impedance:** 1MΩ || 17pF
- **Input Coupling:** AC/DC
- **Resolution:** 100 mV/division to 10 V/division
- **Compatibility:** IOS (Android and Windows coming soon), open source app and protocol
- **All day battery life:** 8+ hours depending on settings
- **Dimensions:** 20 mm x 30 mm x 118 mm
- **Weight:** 56 g

Interactive 3D Model

This model is also hosted at autodesk360.com

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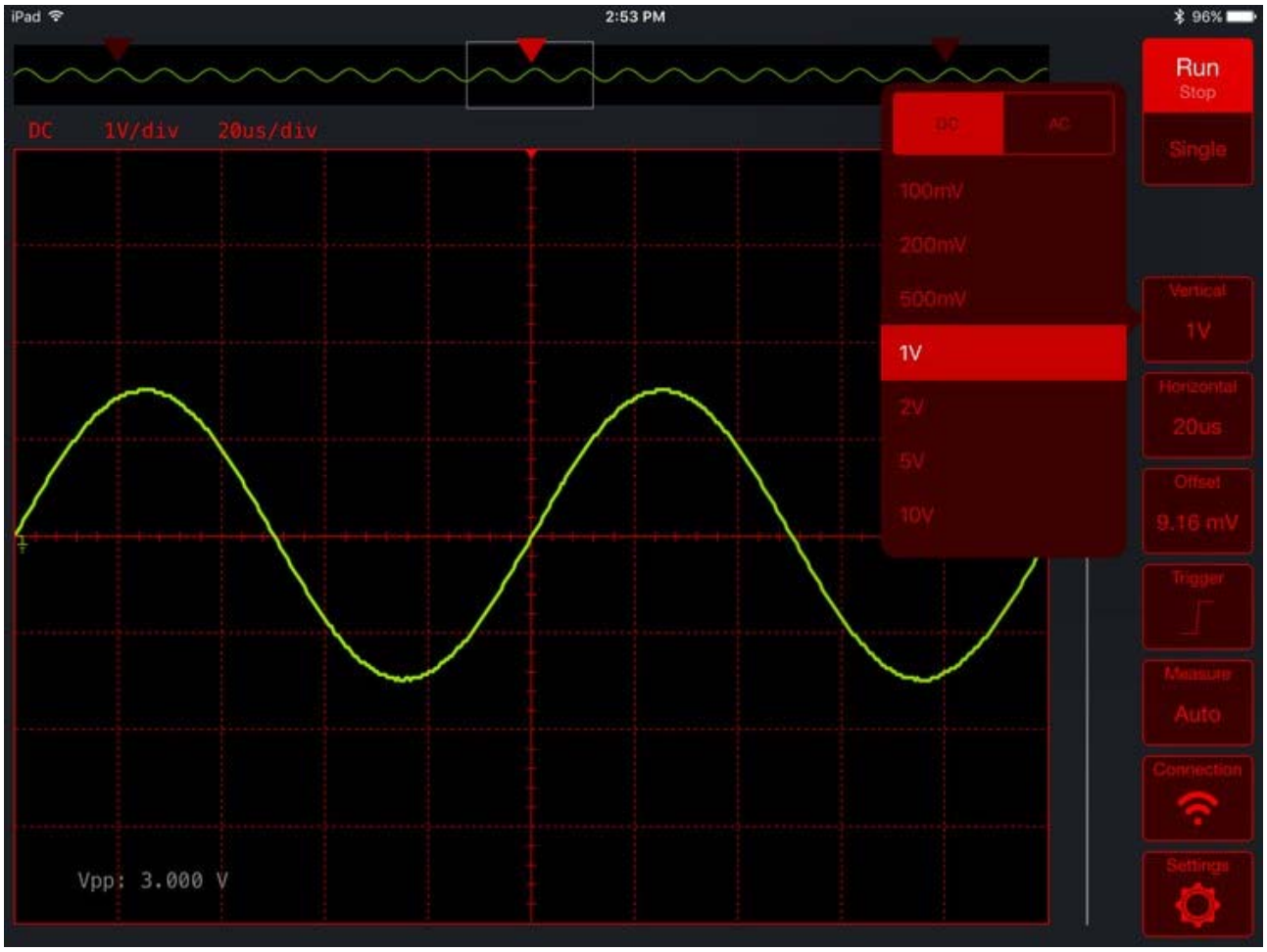
App Features

Aeroscope's app and protocol will be completely open source. You can use our app or write your own for whatever unique application you have.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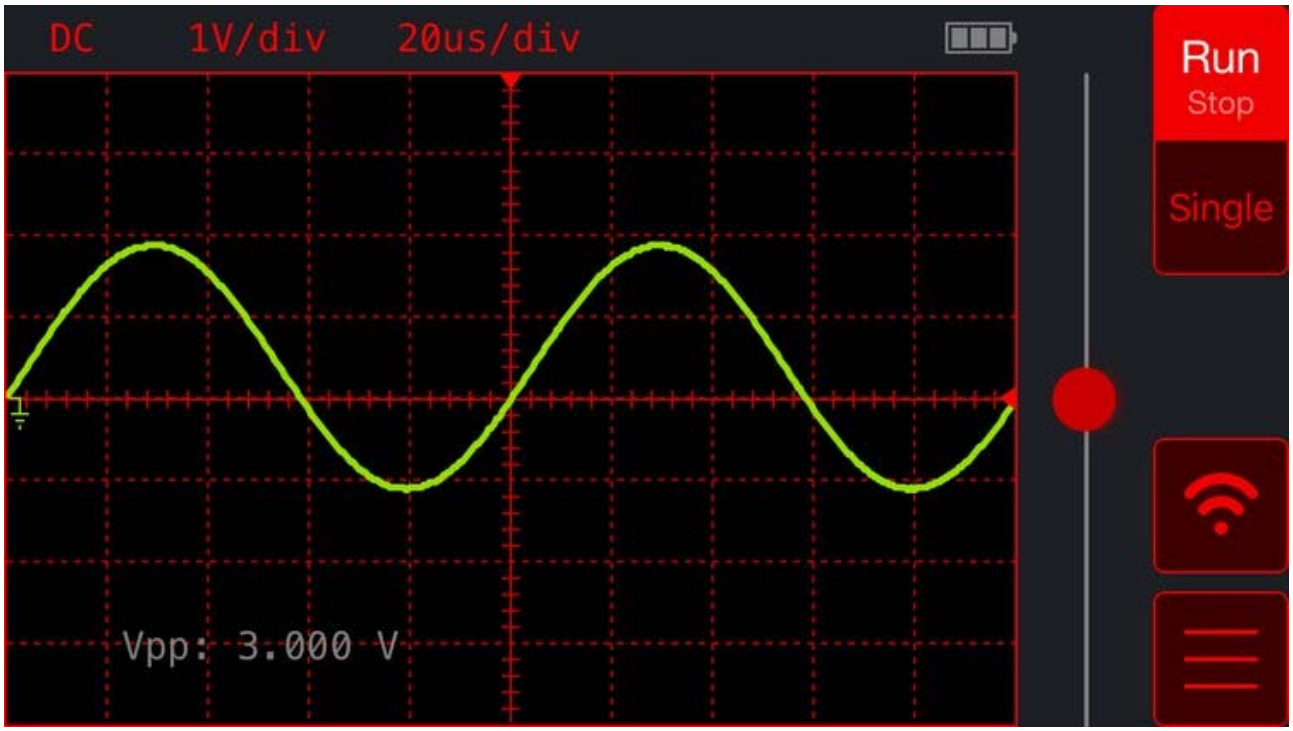

iPhone app

- Compatible with iOS 9 devices that support Bluetooth 4.0 (iPhone 4S and later, iPad 3 and later, iPod touch 5th generation and later, iPad mini, and iPad pro)
- **Touch Gesture support** for offset, trigger delay, horizontal, and vertical scales
- **Trigger Control** (Rising Edge, Falling Edge, Any Edge, Glitch Filter)
- **Measurements** - amplitude available upon ship (Vpp, Vmax, Vmin, Vavg), time based measurements coming soon via an app update (frequency, period, duty cycle)
- Open Source

Comparisons

	Wireless	Analog Voltage Range (V)	Analog Voltage Resolution (per division)	Analog BW (Mhz)	Analog Sample Rate per Channel (MSPS)	Number of Analog Channels	Record Length	Battery Run Time (hrs)
Aeroscope	Yes	-40 to +40	100 mV - 10 V	20	100	1	4k	8+
Tektronix: TDS2012C	No	300 Vrms	20 mV - 50 V	100	1000	2	2.5k	N/A

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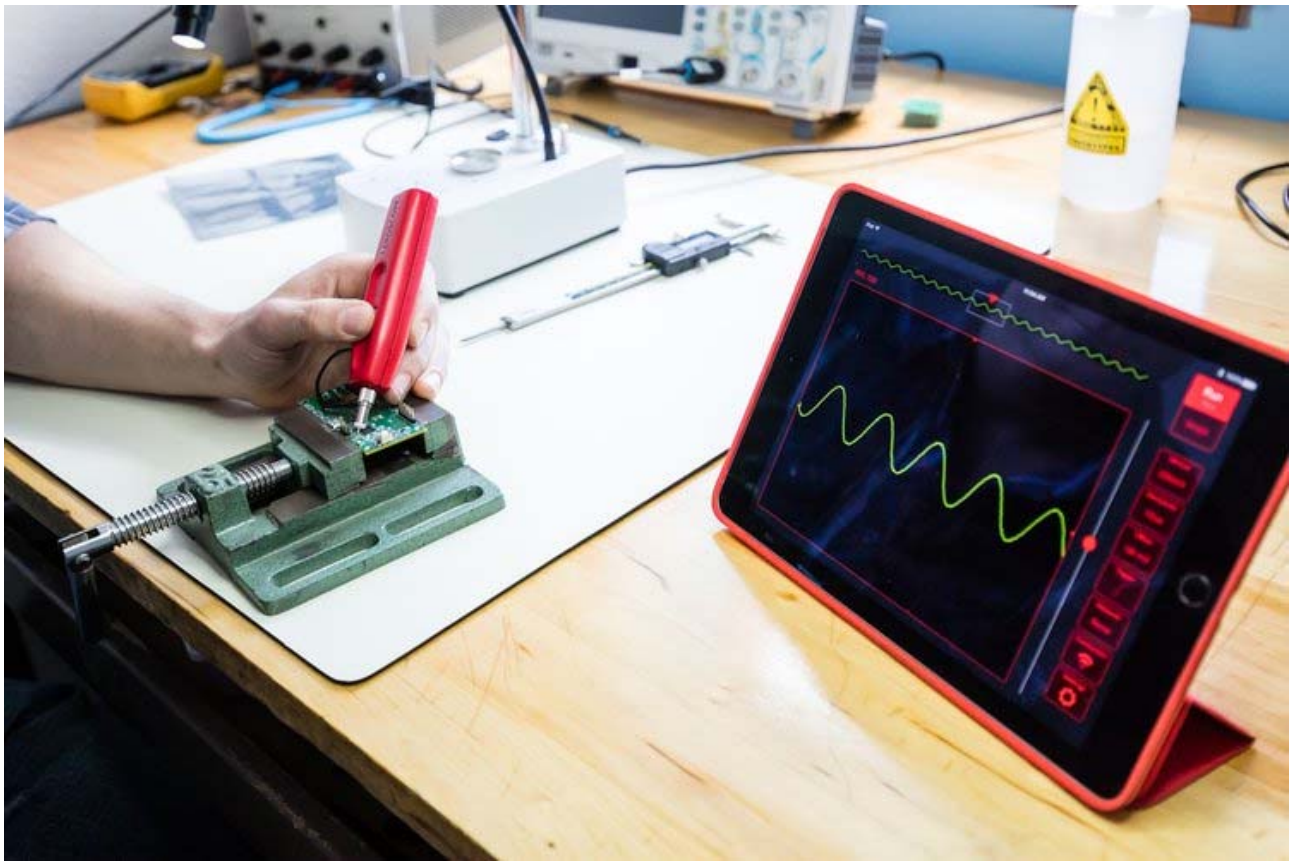
Keysight: U1610A	No	600 Vrms	20 mV - 500 V	100	500	2	60k	3
Rigol: DS1104Z	No	300 Vrms	10 mV - 100 V	100	250	4	12M	N/A
PicoScope: PicoScope210	No	-20 to +20	100 mV - 20 V	25	100	1	24k	N/A
LabNation: LabNation	No	-35 to +35	20 mV - 10 V	30	100	2	4M	N/A
Oscium: iMSO-240L	No	-40 to +40	500 mV - 20 V	5	50	2	1k	N/A
Saleae: Logic Pro 8	No	-10 to +10	Fixed Gain 12 bit ADC	5	50	8	User Mem	N/A

Manufacturing Plan

We are performing Aeroscope's final assembly and testing in our Boulder, CO office. The various pieces, e.g., PCB, plastic case, battery, etc., are shipped to us here in Boulder. We put it all together, test the final product, and ship it to you. We have found that doing assembly and testing ourselves makes sense for our current production volume, is cheaper, and gives us more control over the final product's quality. We have already started our first production run which will be finished by the time the campaign ends.



Risks & Challenges

Risk has been significantly reduced by starting production prior to launching the campaign. We have already run through our production process and worked out the kinks, we understand the long lead time for some parts in our design, and since we are performing final assembly and test ourselves we have removed a level of reliance on third party vendors. The first batch of 90 units is already on hand and in the process of being tested. There is some risk that the second batch could be delayed beyond our stated eight weeks due to vendor delays or part shortage issues. However, since we have already run through this process once we feel that eight weeks is a conservative estimate.

The Aeroscope team has a combined 20 years of experience bringing new products to market; we are confident they can handle any challenges that may arise. We have built a margin into our schedule to allow for any unforeseen delays and will let our backers know immediately if there are any problems that will affect the ship date.

FAQ

Q: When will the Android and Windows versions of the app be available?

A. The Aeroscope team is working on a cross platform app that will support both Android and Windows at first with other platforms (Linux and Mac OS) rolled out over time. The team is targeting a release date of September 2017 with beta versions available sooner.

Q: How is it possible to operate a high sample rate oscilloscope over Bluetooth data rates?

A: Aeroscope can operate over Bluetooth (BT) data rates because the "guts" of the oscilloscope all reside within the probe itself. The analog section, ADC, and memory are all located inside the Aeroscope probe. The BT link is only used to display the video frames of the data that Aeroscope has captured. Like other oscilloscopes, data is not streamed continuously from the ADC to the display (phone or tablet in this case). The step-by-step process is this: Aeroscope captures enough data for a video frame at 100 MSPS, this data is stored in a memory buffer, the frame data is then read from memory and sent over the BT link to be displayed on the user's device. This process happens repeatedly for as long as the capture section receives a valid trigger.

Q: What is an oscilloscope?

A: An oscilloscope is an instrument used to visualize electrical signals. Humans can't perceive electricity the way we can perceive physical things. A mechanic can generally look at and feel an automotive component to check for problems, but electrical systems are more elusive. Electrical engineers need tools to help diagnose problems with electronics. Much as doctors use EKG machines to analyze the heart's electrical signals and make diagnoses, electrical engineers and technicians use oscilloscopes to visualize the electrical signals inside electronics to find bugs and other faults.

Q: How is an oscilloscope different than a multimeter?

A: The first difference is what is measured. Oscilloscopes typically only measure voltage whereas multimeters also measure current and resistance. But, the biggest difference is the time scale of measurement. An oscilloscope can be compared to a high-speed movie camera while a multimeter would be more similar to a conventional movie camera. With a multimeter, you can only make measurements at the rate that you can perceive numbers on a screen. An oscilloscope like Aeroscope makes voltage measurements at 100 million times per second which gives you insight into what is happening at time scales much smaller than humans can perceive. With today's high speed electronics, this insight is often essential to figuring out what is wrong with a circuit.

Q: Why is analog bandwidth important?

A: In addition to sample rate, analog bandwidth is a key spec for oscilloscopes. Technically, it is the maximum frequency sine wave the scope can capture. With today's high speed electronics and digital signals, analog bandwidth is more important than ever for general

signal accuracy. Square waves (like digital signals) are made up of many harmonics (or multiples) of the fundamental frequency. A rule of thumb for accurately measuring a square wave is to capture frequencies up to the fifth harmonic. So, with Aeroscope's 20 MHz bandwidth, you can accurately measure square waves up to 4 MHz.

Q: Is Aeroscope appropriate for new users or in education?

A: Yes! We have made Aeroscope attractive for professionals while still making it easy to use. Our app's interface and touch screen gestures are intuitive for today's smartphone generation. Imagine how useful it could be for a class to view an instructor's oscilloscope on a large display during a lecture. Also, since the interface is an open source app, custom versions can be written to specifically target an educational audience.