

# A Sensitive Field Strength Meter for Foxhunting

A new use for a popular circuit.

## Woody White, KZ4AK

An article from the June 2001 issue of *QST*, "Simple RF-Power Measurement," by Les Hayward, W7ZOI, and Bob Larkin, W7PUA, introduced me to the AD8307, an integrated circuit from Analog Devices. Available in an eight-pin dual in-line package (DIP), the logarithmic amplifier/detector works from dc to 500 MHz. It produces a dc output proportional to the logarithm of RF power input. Connected to a calibrated meter, it makes a decent log power meter.

I built a meter with a digital readout that works from  $-80$  dBm (.01 nW) to  $+12$  dBm (16 mW). With over 80 dB of range, it seems to work as well as my old lab-grade power meter.

In the September 2008 issue of *QST*, Steve, N2PON, describes a similar meter with a digital readout. Both of these articles can be accessed at [www.arrl.org/arrl-periodicals-archive-search](http://www.arrl.org/arrl-periodicals-archive-search), free for ARRL members.

## Necessities for Foxhunting

I ordered two of the AD8307 chips. With foxhunts in my future, I decided to use the spare chip in a very simple field strength meter (FSM). My digital meter would have worked, but signal trends are harder to follow on digital readouts than with an analog meter.

I have been in several foxhunts over the years, and although I was very close to the hidden transmitter, I could not find it. In spite of using good attenuators, the poorly shielded handheld transceiver/mobile receiver would saturate. There is no way to get a fix on the transmitter when this happens. Extra shielding on the receiver when near the hidden transmitter can help, but it isn't very convenient, and often, the shielding is not good enough. That's where a sensitive, wide dynamic range FSM can take over.

Be aware that the FSM front end is wide open and provides no selectivity. Any RF energy will register, up to about 500 MHz. This is great for a general-purpose FSM, but it's a bit confusing when used for foxhunting. Signals that aren't from the hidden transmitter may come and go. A narrow bandwidth antenna will provide some selectivity, and a simple band-pass filter between the antenna and the FSM helps. However, strong signals could register on the meter by bypassing the antenna and filter and leaking directly into the FSM box. To minimize this, I plan to build a circuit board shield around the AD8307 circuit.



## HAMSPEAK

**Foxhunting:** A contest where participants try to locate a hidden transmitter. The transmitter is the *fox* and those trying to find it are the *hunters*.

My power meter, as built from the 2001 *QST* article, "Simple RF-Power Measurement," by Les Hayward, W7ZOI, and Bob Larkin, W7PUA. [Woody White, KZ4AK, photo]

## Circuit Simplifications

For foxhunting, only relative readings matter, so I could take a few shortcuts. For more sensitivity, I left out the 50  $\Omega$  resistor at the AD8307 input. With no termination resistor, the input is 1,000 – 2,000  $\Omega$ . If you need a 50  $\Omega$  termination, add it externally using a BNC T adapter and a BNC 50  $\Omega$  load. Unlike in my digital power meter, there is a short run of coax to the input of the chip. If this coax is not properly terminated, it may affect the readings at high frequencies. My coax is short and seems to work fine. The circuit is built on unetched PC board with a “dead bug” style. For operation up to UHF, use small monolithic ceramic capacitors, and keep all leads very short. Almost any 5 V regulator and rail-to-rail, single supply op-amp can be used. Diode D2, type-2N2001 or similar, is for reverse-battery protection. A conventional single-turn carbon potentiometer can be used in place of the 20-turn precision unit, but ease of setting and stability may suffer. The LED (D1) with dropping resistor R10, reminds me the unit is on. The 9 V drain is about 30 mA total, so an alkaline battery should provide 16 hours of operating time.

I used a 250  $\mu$ A meter scaled 0 – 40 that I had on hand. With a sensitive meter (50  $\mu$ A or less), you may not have to use the op-amp buffer, just the right series resistor. The AD8307 output ranges from about 0.2 to about 2.5 V at 200  $\mu$ A at full output. My meter needed a buffer circuit. With the buffer amp shown, full-scale output from the AD8307 will drive the amp output to about 5 V.

With a VHF “rubber duck” antenna connected to the rear BNC connector, stray RF around the house regis-



The field strength meter version. [Woody White, KZ4AK, photo]

ters from 0 to 3 on the meter (with no known transmitters running). It reaches full-scale with a 2-meter hidden transmitter a few feet away. Once you get that close, you should easily find the fox.

Amateur Extra-class licensee Woody White, KZ4AK, was first licensed in the mid-1960s. He has been homebrewing amateur equipment since he was first licensed. More details of this project and some of his other projects can be seen in the amateur radio section of his website ([www.kz4ak.com](http://www.kz4ak.com)). He is active from 160 meters to 70 centimeters, mostly working FT8. Before retiring, Woody worked for the Research and Development divisions of nuclear energy firms for over 45 years. For 30 years, he ran their scanning electron microscope labs. Woody can be reached at [woody@kz4ak.com](mailto:woody@kz4ak.com).

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