By John D. Noakes, VE7NI

The "No Fibbin'" RF Field Strength Meter

The field strength meter is simple, effective and easy to construct. This project answers that age-old question—is anything radiating from this antenna?

The RF Signal Strength meter responding to my Kenwood TH-26AT transmitting on 147.900 MHz with 1 W, 2 feet away from the meter. The sensitivity control is set at mid range.

This low budget homebrew project will pay big dividends in making sure you get the best signal out of your antenna system. And it needs no batteries.

In the 25 years I have spent working as a telecommunications technician, one of the most useful, yet simple, pieces of test gear I have used is the RF field strength meter. Its only job is to give you a relative signal strength reading of near field RF signal radiated from a transmitting antenna. After the bench testing is done and antenna VSWR is measured, nothing else will give you a better idea of transmitter and antenna performance than the RF field strength meter.

Any ham who has a 146 MHz or a 440 MHz hand-held transceiver is at the mercy of the sales brochures when choosing the best flexible [rubber duck] antenna for your radio. How many times have you *not* been able to work a repeater or work simplex nearly as well as someone else who has a similar radio or one with even less RF output power than yours? How can you tell if the wire inside a flexible antenna has broken or if the antenna doesn't radiate well? The RF field strength meter will soon reveal how well (or how poorly) your antenna is radiating. The meter is great for determining the front to back ratio and forward gain of a Yagi or quad. You can also compare relative signal strength between a ¼, ½ and 5/8 wavelength antenna on your vehicle. You might be surprised at the results!

The "No Fibbin'" field strength meter can be made using parts that many hams already have around the shack. The best results will be obtained using germanium or Schottky small signal diodes, a metal enclosure and an analog meter movement (which has a low full-scale deflection current). The other component values are not critical; close is good enough. All the parts can be mounted on a small pre-punched PC board or they can be wired point-to-point without a PC board. In either case, keep the component leads as short as pos-

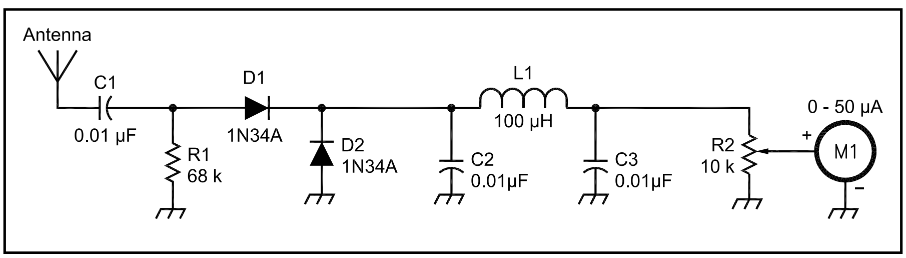

Figure 1—Schematic diagram of the signal strength meter. RS = Radio Shack (www.radioshack.com/).

C1-C3—0.01 µF capacitors (RS 272-1051 or equiv).
D1, D2—1N34A diodes (RS 276-1123).
L1—100 µH inductor (RS 273-102).
M1—Analog meter, 50 µA (RS 910-0360).
R2—Sensitivity control potentiometer, 10 kΩ (RS 271-1715).
Antenna—BNC female chassis mount socket. Antenna selection should match the frequency band for VHF and UHF. A random length of wire might work best for close field measurements on HF to 40 meters. Metal box enclosure is mandatory.

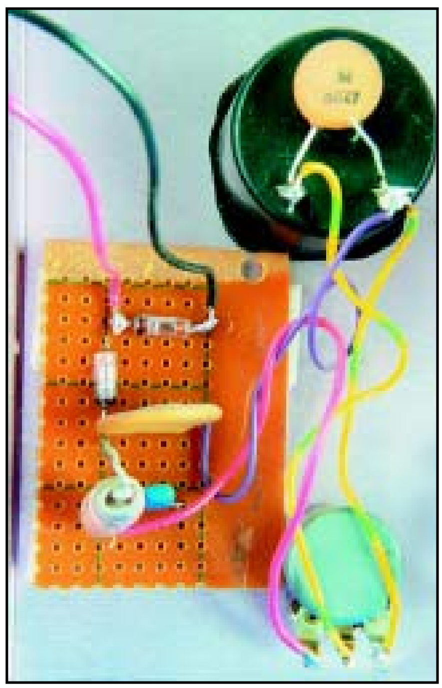

Figure 2—Close up of the circuit board.

Some Comments on Field Strength Meters

Diodes are the Key

Field strength meter sensitivity is largely determined by the diodes. D1 and D2 act as both rectifier and voltage doubler. Schottky and Germanium diodes are used for their low forward voltage (0.2 V to 0.4 V) and fast switching speed. If you typically run the legal limit, you may be able to get by with some run-of-the-mill Silicon PN diodes. The slow reverse recovery time will limit use to HF frequencies, however. If you want to use a higher current meter movement—1 mA or thereabouts—you can drive it with a simple one-transistor amplifier. Doug DeMaw, W1FB, describes this in the ARRL publication *W1FB's QRP Notebook,* pp 147-148.

Are you Looking at what you Think You're Looking At?

The field strength meter is a simple and effective tool but can lead you astray if you're not careful. This is particularly true when measuring VHF and UHF rubber duck performance. These antennas require a good RF ground (usually your body) and are very sensitive to proximity effects. The same goes for the field strength meter.

Make sure both the transmitting antenna and the field strength meter have an adequate RF ground. Also be aware that the pattern of a HT antenna is highly influenced by the person holding it. Ken Pierpont, KF4OW, and Ed Brummer, W4RTZ, discuss this in detail in their article *An Investigation of 2-Meter HT Antenna Performance,* found in the ARRL publications *Vertical Antenna Classics* and *The ARRL Antenna Compendium Volume 4*.

sible. If you have no separate meter to mount in the metal enclosure, simply supply two test points where you can plug in an external meter you may already have.

From my experience with VHF and UHF testing, the best results are obtained by using an antenna made for the band you are measuring. In other words, if you're measuring field strength from a transmitting VHF antenna, use a VHF antenna on the field strength meter.

Start your measurements by using low transmitter power and a near-minimum sensitivity on the field strength meter. The variable resistor on the field strength meter will save a lot of hassles moving the meter closer and further away from the transmitter antenna. I like to adjust the sensitivity control for 50% to 75% meter deflection. Antenna pruning or transmitter power changes will show up clearly as a visible change in meter deflection.

Various antenna problems have been discovered and corrected by the use of a field strength meter. Horizontal to vertical polarization (cross polarization) makes a huge difference on the field strength reading (50% or 3 dB). Radiation from a mobile HF antenna system can also be measured; you can see for yourself if a certain antenna lives up its advertised claims.

I think that most hams could do well for themselves and their stations by having an RF field strength meter. It's easy to build, inexpensive and useful. Have fun building one, and "good radiating"!

John Noakes, VE7NI, was first licensed in 1979 as VE3LDM when he lived in London, Ontario. He earned his Advanced Amateur license about a year later. He has worked as a telecommunications engineer since graduating from Radio College of Canada and has been employed by Canadian General Electric. He presently works for an authorized Motorola shop in Kamloops, British Columbia. John operates HF, primarily on CW, and earned QRP DXCC earlier this year. He is presently working on his first homebrew 20-meter QRP transmitter. A member of the ARRL as well as FISTS, he is president of the Thompson River ARC. The author can be reached at 769 Venables Pl, Kamloops, BC V2B 5Z2, Canada; **ve7ni@rac.ca**.

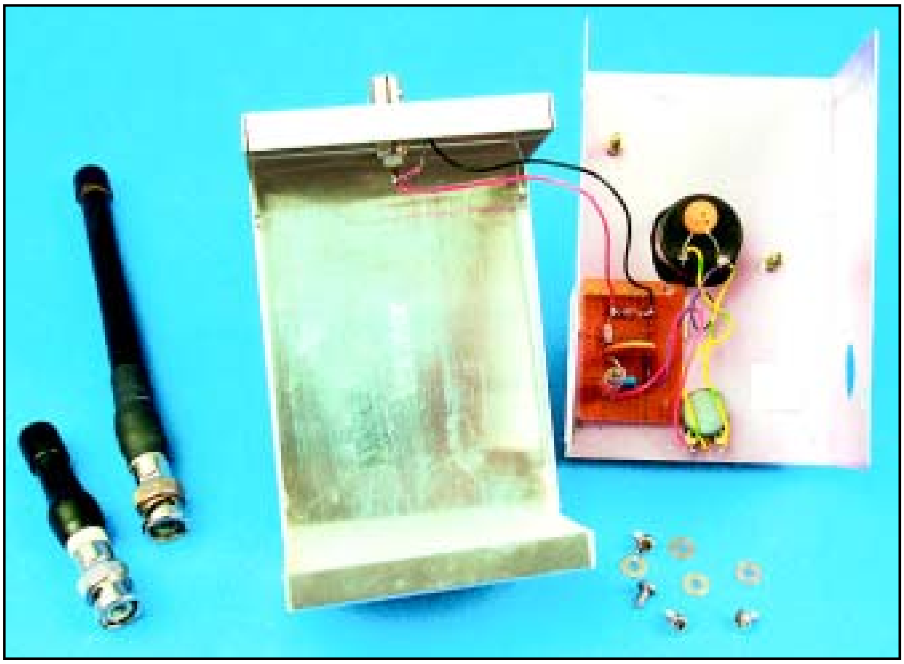

Figure 3—The case, circuit board and antennas for the field strength meter.

FEEDBACK

◊ An error appears in Figure 1 of "The 'No Fibbin' RF Field Strength Meter" (Aug 2002 *QST*, p 28). The correct way to wire D2 is the anode to ground and the cathode to the anode of D1 (also the junction of R1 and D1). As shown in the photos, C1 is optional and an additional 0.01 µF bypass capacitor can be installed across the meter movement.—*John Noakes, VE7NI*

STRAYS

MILITARY RADIO COLLECTORS TO MEET

◊ The Military Radio Collectors Association will hold its third annual meet at the West End Fairgrounds, Gilbert, Pennsylvania, September 6-8, 2002. Hours are 0800 to 1700 local time. Activities include equipment displays, on the air operation, formal presentations and a swapmeet. For more information, see **www.milradio.org/** or contact Pete Hamersma, WB2JWU, PO Box 467, Holderness, NH 03245, e-mail **pehamers@worldpath.net**.

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FEEDBACK

◊ In the item concerning magnetic headings in "The Doctor is IN," *QST*, Jul 2002, p 47, the Doctor reversed his plus and minus signs. The first paragraph should read:

The ARRL maps are calibrated in True degrees, referred to True North ("straight up" on the maps). Magnetic headings are calculated by taking the True headings and subtracting the Magnetic Declination (also called the Magnetic Variation in nautical applications). For example, if the map shows a variation (declination) of 12° east, this means that Magnetic North is 12° east of "straight up." So, a heading of 45° True is equivalent to a magnetic heading of 45° – 12° east = 33° magnetic. For a westerly variation (for example 6° west), add the value for variation. Thus, 45° True + 6° west = 51° magnetic. An old mariner's ditty, "east is least; west is best," can help you remember that you subtract an easterly declination or add a westerly declination to convert True to Magnetic.

◊ An error appears in Figure 1 of "The 'No Fibbin' RF Field Strength Meter" (Aug 2002 *QST*, p 28). The correct way to wire D2 is the anode to ground and the cathode to the anode of D1 (also the junction of R1 and D1). As shown in the photos, C1 is optional and an additional 0.01 µF bypass capacitor can be installed across the meter movement.—*John Noakes, VE7NI*

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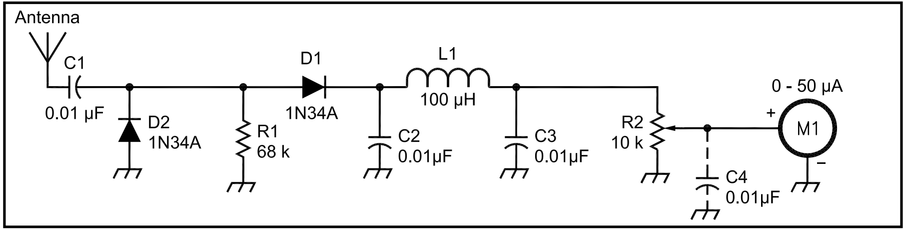

Revised Figure 1