Hobby Scene

By John McVeigh, Technical Editor

ANTENNA LENGTH CALCULATIONS

Q. I am writing with reference to your article, "Choosing a Mobile CB Antenna," which appeared in the April 1978 issue. In the article, it was stated that at CB frequencies, a vertical half-wave dipole would have a length of 5.2 meters. Using the formula $\lambda = c/f$, with $c = 2.9971 \times 10^8$ m/s (speed of light in air) and f = 27.0 MHz, I come up with $\lambda = 11.10$ meters, or a half-wavelength of 5.55 meters. Working backwards, I find the frequency corresponding to a half-wavelength of 5.2 meters to be 28.818 MHz, which isn't even close to actual CB frequencies. Could you explain to me why this difference exists? I have searched through my technical references, but have been unable to come up with an answer. —Jim Sloot, Calgary, Alberta, Canada.

A. Your calculations are correct, but the length of a "half-wave" antenna is not exactly one half-wavelength. Rather, a resonant dipole has an *electrical* length of one half-wavelength. The length of conductor required for a resonant antenna depends on several factors, including the ratio of its length to its diameter. The smaller the ratio (the thicker the conductor), the shorter the antenna for a given electrical length. Practically speaking, the diameter of the conductor accounts for a 2-to-5-percent shortening.

The *end effect* also reduces antenna length. That is, the strain insulators and wire loops wound on the insulators (in the case of a dipole) contribute a small amount of capacitance, which lowers the resonant frequency. To compensate, the antenna must be shortened by a few percent.

Finally, your calculations are based on a frequency of 27.0 MHz. Generally, an antenna will best cover a range of frequencies when it is tuned to the center frequency. For the 40-channel Citizens Band, which extends from 26.965 to 27.405 MHz, channel 19 at 27.185 MHz is the median frequency. That's 0.185 MHz above the frequency you used in your calculations and further explains the disparity between my statement and your result.

RFI

Q. I have amateur and CB radio equipment as well as an audio system. Whenever I'm recording an 8-track or cassette tape and using one of my rigs, my transmissions come through the stereo system and are recorded on the tape. All the components are well grounded, and I've inserted low-pass filters at the outputs of the transmitters. The problem still exists. What can I do to cure it? —Bill Columa, KA4DAP, Rocky Mount, NC.

A. The space we have here is far too small to permit a detailed discussion of the RFI problem, but what basically happens is this. At some point in the audio system r-f enters and is rectified (detected), giving up the information used to amplitude modulate it. The detected audio is then processed by the rest of the system, which cannot distinguish between it and the desired audio signals.

The key to solving an RFI problem is to locate the point of entry and treat it with shielding and/or filtering. I wrote a comprehensive article on the RFI problem for the May 1977 issue of our sister publication *Stereo Review*. That article contained a methodical, step-by-step procedure for eliminating RFI, and I suggest you either locate that issue or order a reprint fo the article (ask for Reprint No. 21) at a cost of $1.50 from Stereo Review Reprints, Box 278, Pratt Station, Brooklyn, NY 11205. Residents of CA, CO, DC, FL, IL, MI, MO, NY, TX, or VT must add applicable sales tax. P.S.—I don't get royalties on reprint sales!

Have a problem or question in circuitry, components, parts availability, etc? Send it to the Hobby Scene Editor, POPULAR ELECTRONICS, One Park Ave., New York, N.Y. 10016. Though all letters can't be answered individually, those with wide interest will be published.