

ANTENNA FEED LINES FOR PORTABLE USE

□ The 1981 *Handbook* recommends the use of twin-lead-fed folded dipoles for portable operation, noting that RG-58 and -59 are "quite heavy and bulky for backpacking," and RG-174 is "too lossy."⁴ Always eager to improve my portable station, but leery of the ability of twin-lead to perform under typical backpacking-type portable conditions, I purchased 100 feet ($m = \text{feet} \times 0.3048$) of Belden 8230 300-ohm TV lead for test material. The feed line was strung around my wooden deck (several feet above the ground) and supported by TV standoff insulators, so that the line didn't contact the deck. Far from being typical backpacking conditions, this would simulate near-ideal circumstances.

Next I built two 4:1 baluns on large ferrite cores, putting one at each end of the twin-lead. My 50-ohm dummy load was used to terminate the system, so the cable was running with a 1.5:1 SWR. Cable loss was determined by measuring the power delivered to the load and comparing that to the *net* forward power (i.e., "forward" minus "reflected" power) measured at the input end with a Bird model 43 wattmeter. The balun losses (0.4 dB total) were measured separately at the same power level and subtracted from the result. The frequency for all tests was 21 MHz.

Dry twin-lead measured 0.8 dB loss, about the value given in the *Handbook* for RG-8 foam-insulated line. After about two weeks of dry weather (during which Mount St. Helens did *not* erupt!), a light rain fell, increasing the line loss to 3.7 dB, about twice that of RG-58! Later, when hard rain fell, loss was measured at 2.4 dB, slowly decreasing to 1.5 dB as the cable got "washed." Laying it on the wet deck increased loss to 2.6 dB, and coiling the cable resulted in 4.4 dB loss.

I can only conclude that 300-ohm flat twin-lead is a viable choice for feed line only if it can be kept clean, dry and uncoiled, and out of contact with trees, brush and the ground. These conditions could seldom have been met on trips I've taken in the past!

I would expect that tubular twin-lead would be less susceptible to dirt and water, but it would still have to be kept uncoiled and in the clear (what does one do with excess feed line?), and the potential advantages of bulk and weight would be largely lost.

Since coax isn't sensitive to being coiled (unless coil diameter is very small), wet or dirty, let's take a careful look at some possible candidates. First, I weighed some cables, with the following results (coax types include two BNC connectors):

Cable	Weight (lb) per 100 feet
Surplus RG-174/U-type	0.9
Columbia 1188 RG-58/U-type foam	2.4
Essex 21-024 RG-58/U	2.4
Belden 8230 300-ohm twin-lead	1.5

The *Handbook* shows a loss of about 2 dB per 100 feet for RG-58/U at 21 MHz,⁵ so it would seem to be a good choice for the higher amateur hf bands, or when the feed line must be long. The 60% increase in weight over twin-lead may be a good trade for the predictability of the loss under backpacking portable conditions.

RG-174/U is attractive from a weight standpoint, and it can be packed into a much smaller volume than even TV twin-lead. The *Handbook* shows about 5.3 dB loss per 100 ft at 21 MHz. This may be on the high side; Belden 8216 RG-174/U cable is specified at 8.8 dB loss at 100 MHz⁶ (the *Handbook* shows about 11 dB at this frequency). Using the approximation that loss in decibels is about proportional to the square root of frequency, we could expect the Belden cable to have a loss of about 4.0 dB per 100 feet at 21 MHz. Some time ago I obtained a quantity of surplus RG-174/U style cable which has a silver-plated solid center conductor and a silver-plated shield. It measured 3.3 dB/100 ft at 21 MHz. Naturally, the loss of all lines decreases at lower frequencies, making RG-174/U more attractive for such use.

So what do I recommend for backpacking-type portable feed line? I recommend that you weigh the advantages and disadvantages of each kind, and determine which is best for *your* particular application. I hope that this brief analysis provides information to aid your choice. — Roy W. Lewallen, W7EL, Beaverton, Oregon

⁴The *Radio Amateur's Handbook*, Fifty-eighth ed. (1981), ARRL, p. 10-14.
⁵*Handbook*, Fig. 31, p. 19-15.

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