A96-2-1

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A Splitter Transformer for the Beverage DXer

DXpeditions using Beverage antennas can be the high point of a serious DXer's year. And taking part in such an expedition can be an occasion for DXers to be sociable in what can be an unsociable hobby. But...you and a friend have set up a really good antenna and want to run it to both your receivers. Then you find that one receiver hogs most of the signals, leaving the other one sounding strangely insensitive. It's clear that something is wrong with the hookup. Luckily, there is a simple fix, and with a few parts, you can tie the two rigs to any wire antenna with minimum loss. But first, let's look at what is happening with our unaided set-up.

Generally, the offending receiver has a tuned RF amplifier in its front end, such as the FRG-7, SPR-4, or virtually any of the vacuum tube receivers. A tuned front end helps a receiver handle signals well, but it will suck signal away from other receivers, especially many of the newer ones with broadbanded antenna inputs. Why is this? Most of these tuned RF input receivers are rated at 50 ohms input impedance (especially above 2 MHz), just as the more recent broadband receivers are, so one would expect both types of set to share a signal fairly equally. But it doesn't happen that way.

Figure A shows a simplified typical tuned circuit found at the input of a receiver like the FRG-7 or the SPR-4. The tuned circuit secondary has a very high impedance at the frequency it is tuned to, and through the nature of transformer windings, this high impedance looks like, say 50 ohms, in the primary, at the tuned frequency. Parallel tuned circuits have their highest impedance at resonance (the desired frequency). If this impedance is 100,000 ohms, then the impedance ratio of the transformer would be 100,000:50, that is 2000:1. But if our circuit is tuned to 2.5 MHz, then at 1 MHz, the circuit has a much lower impedance, perhaps only 40,000 ohms, which means the primary winding looks more like 20 ohms (primary Z = 1/2000 x 40,000). At 1 MHz, more antenna current will flow in the lower impedance input, thereby starving the higher impedance input of signal (Figure B). Only when both receivers are tuned to the same frequency will antenna current divide with relative equality.

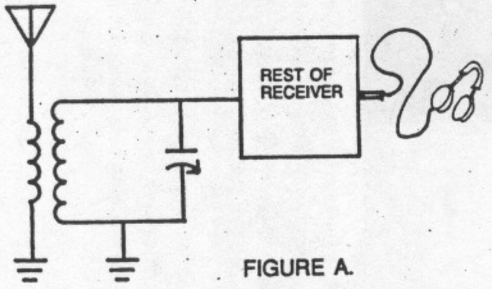


FIGURE A.

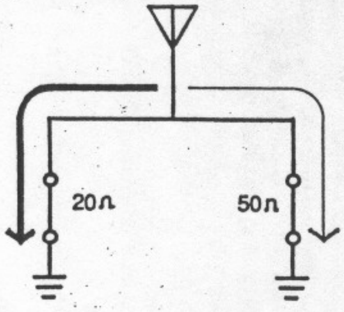


FIGURE B.

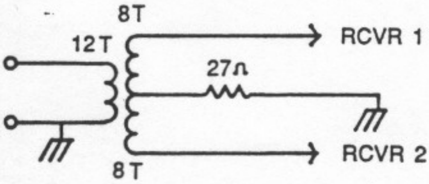
One could use separate antennas to avoid this problem, but that's not always feasible; or one could put a 50 ohm resistor in series between the antenna and the receiver with the tuned RF input. That will leave the other receiver with a "more levàl playing field", but will always knock down the first receiver's signal by 6 dB or so. What we really need is something that will split the available signal between receivers.

About five years ago, Sam Dellitt of DX Australia described such a device in his club's bulletin, and the article was reprinted in the July 1984 issue of CIDX Messenger. The 2-way 50 ohm splitter used a "balun core", a piece of ferrite with 2 holes in it which looks like an oversized ferrite bead. With a few turns of wire, it is a transformer with one input from the antenna and two outputs to the receivers. A 3.6 dB loss was apparently noted from 300 kHz to 30 MHz using the device, but the loss was approximately equal in the two receivers.

A96-2-2

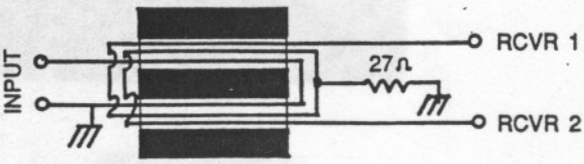
I built this splitter last year for use on a DXpedition, but found 8 or 9 dB loss at MW frequencies, which really wasn't acceptable. So the transformer was rewound with 12 turns on the primary and 16 turns on the secondary as noted in Figure C (the original design used a 3 turn primary and 4 turn secondary).

FIGURE C.



Winding a balun core is not too difficult, and Figure D should convey how it is done, using a view of the core split lengthways along the two holes. For simplicity, only one input winding turn is shown, and two output windings. The holes shown in Figure D are much wider than they really are in relation to the core, for the sake of clarity. The core used is a BLN-73-202 from Amidon Associates, 12033 Otsego St., North Hollywood, CA 91607, at a cost of around 65¢ each. There is a minimum shipping charge of $2. Write to Amidon for recent prices. The core specified in Dellitt's article hasn't been available, but this seems like a good substitute. The wire used was #30 varnished magnet wire, which requires a delicate touch, but larger sizes won't fit through the holes when more than a few turns are used.

FIGURE D.



BLN 73-202 CORE

This splitter works very well, as does one with an 8 turn center tapped secondary and a 6 turn primary which I also built. There is about 3 dB observed loss at MW and tropical SW frequencies, increasing somewhat past 10 MHz. Three dB loss is not really noticeable by ear, but there may be DX situations where it will mean losing an ID while using a quiet Beverage antenna. The quick solution is to disconnect the splitter and use one receiver on those occasions. A professional set-up whould use a low-noise, broadbanded, overload resistant preamplifier between the antenna and the splitter to make up the loss. Such an amplifier is described in Dellitt's article, but is beyond our scope here.

It's important to remember that the input to the splitter is 50 ohm impedance. The Beverage antenna is more like 500 ohm impedance, so a matching transformer should be used between a Beverage and this splitter. See the IRCA Technical Column in DX Monitor, Feb 18 and 25, 1989 or Proceedings 1988, pp. A3, 1-10 for such a transformer. Figure E shows the ideal two DXer set-up:

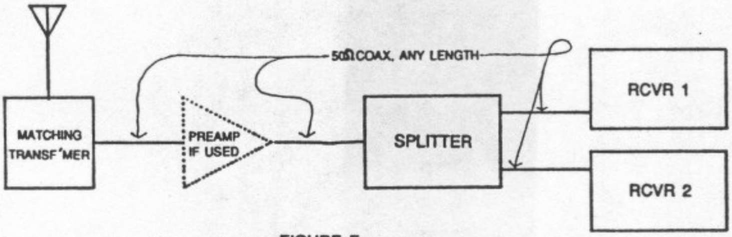


FIGURE E.

For permanent use, the splitter transformer should be securely mounted in a suitable box, as the wire used is easily broken when flexed. I prefer metal boxes for such devices, as they are strong and provide shielding. A small aluminum mini-box should be fine, though I used a little "tin" box formerly containing mustard powder; no wonder it is such a hot performer! The core itself was set in a big glob of silicone seal, and the transformer leads were run to solder lugs or BNC connectors; see Figure F. Mounting isn't critical, just make sure it is solid. Good DX to both of you! --NHP

(the above was originally penned for fine tuning's Proceedings 1989, and as such, was worked over by its editor--a chastening experience for another editor--with illustrations kindly provided by John Bryant)

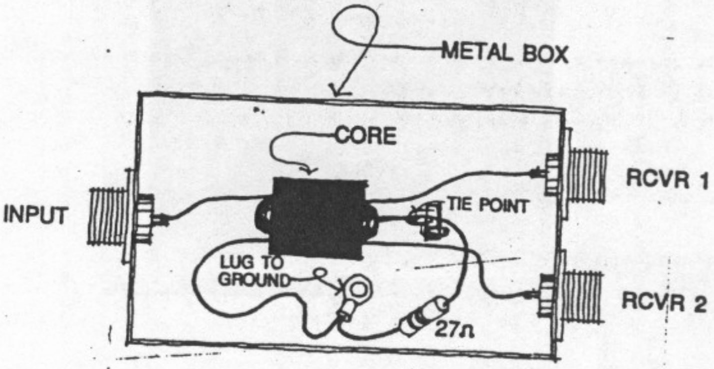


FIGURE F.