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New Termination Control Method for Flag, Pennant, and similar Antennas

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As noted in previous articles *(references 1 and 2)*, the ability to vary the termination resistance value is very useful in getting the most out of the nulling capabilities of Flag, Pennant, Kaz, Delta, Ewe, and similar cardioid-pattern terminated-loop antennas. A Flag antenna, for example, is usually fed at the midpoint of one vertical side through an approximately 1:16 transformer. The termination resistance is connected at the midpoint of the opposite end's vertical side. The direction of expected nulls is the way you're facing if standing at the receiver feedline side of the antenna and looking towards the termination. A typical termination value is about 900 ohms. If this termination can be varied, the horizontal and vertical angular positioning of the best null can be "slewed" to some extent. Plus or minus 30 degrees of null bearing variation is often possible.

One method, documented previously, is termination control by varying the direct current through the LED portion of a Vactrol, a sealed component consisting of a light source mated to a photoresistor. This can work well, but is slightly cumbersome to implement. A problem for constructors is that Vactrols are not commonly-stocked parts at the electronics component suppliers in many countries.

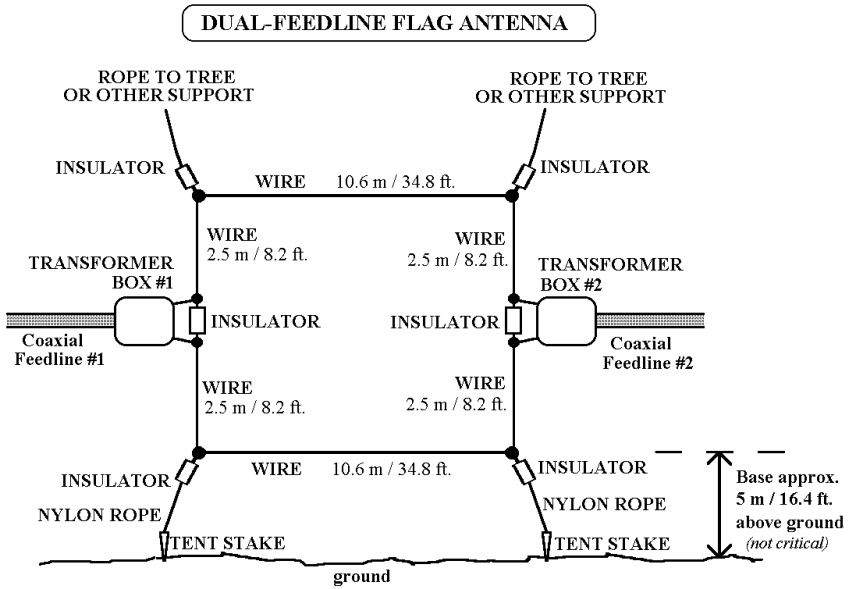

Figure 1

Recent testing has shown that a two-feedline Flag antenna *(Figures 1 and 2)* can be used in conjunction with a 500 ohm potentiometer placed at the "shack" end of the coaxial feedline from a transformer box at the midpoint of the vertical side of the antenna where the termination resistor would normally be installed. Both vertical members of the antenna are fitted with transformers at their midpoints. The ratio used is in the range of 1:15 to 1:20 where the low impedance winding

connects to the coaxial feedline and the high impedance winding to the wires of the upper and the lower halves of the antenna. A Mini-Circuits type T16-6T-X65 transformer can be used or, alternatively, you can use a homebrew type as mentioned by John Bryant *(reference 3)*, e.g. an Amidon FT114-43 toroidal core with 10 turns (low impedance winding) opposite 45 turns (high impedance winding).

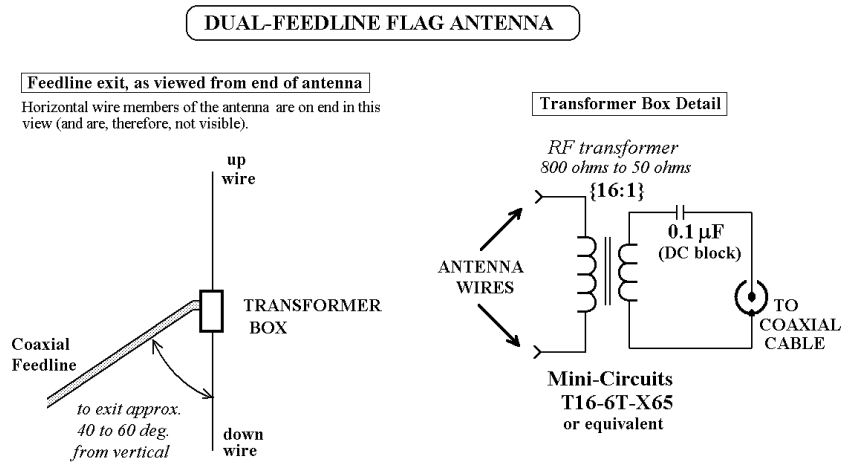

Figure 2

For a simple set-up at the "shack" operating position ends of the two feedlines, the cable from the side to be terminated goes to a 500 ohm potentiometer. The other cable goes to the receiver input (or to an accessory such as a preselector/amplifier or phasing unit ahead of the receiver). Vary the pot setting and look for a "dip" in the strength of interfering signals coming from bearings in the range where nulls can be expected, i.e. in the direction (+/- 30 deg.) that the terminated side is relative to the side whose feedline is going to the receiver.

If the pot is set to 55 ohms and a 1:16 transformer is used, an effective termination of 55 times 16 = 880 ohms will appear at the antenna wires connected to the transformer box of the “pot feedline”. This is close to the ideal termination and it “translates” well through the 50 ohm coaxial feedline. Nulls tend to occur within a range of 320 to 2400 ohms at the antenna leads: this corresponds to pot values of 20 to 150 ohms. Much outside of that range, mismatching, cable capacitance, or transformer limitations prevent the pot’s value from being multiplied the way you’d expect. Since most of the useful nulls are within a range where the pot resistance can be successfully “translated” through the feedline, outlying value settings aren’t of much concern. At least with feedlines of moderate length (30 m / 100 ft. or less), this amazingly simple termination method works very well. Reliability is better since only the transformers are “out in the weather” instead of having outdoor feedboxes / termination boxes containing more sophisticated (and fragile) circuit components.

Since both feedlines are accessible at the “shack” operating position, either side of the antenna can be selected for pot termination. Whichever side is the opposite one will supply RF to the receiver. With an east-west Flag antenna, you can set things up for westward nulls or eastward ones, as your DX activities dictate.

Enter the “Termination Gizmo” (TG-1) …

The effectiveness of the pot termination scheme can be enhanced by packaging the feedline selection switch and the termination potentiometer in a small plastic box. The shields of the two

cables are treated as independent “grounds” that can be kept separate, connected together, and/or connected to receiver chassis (station) ground. Most of the time, varying the ground hook-ups doesn’t make much difference, but occasionally a particular ground connection set-up will permit a deeper null in a given direction.

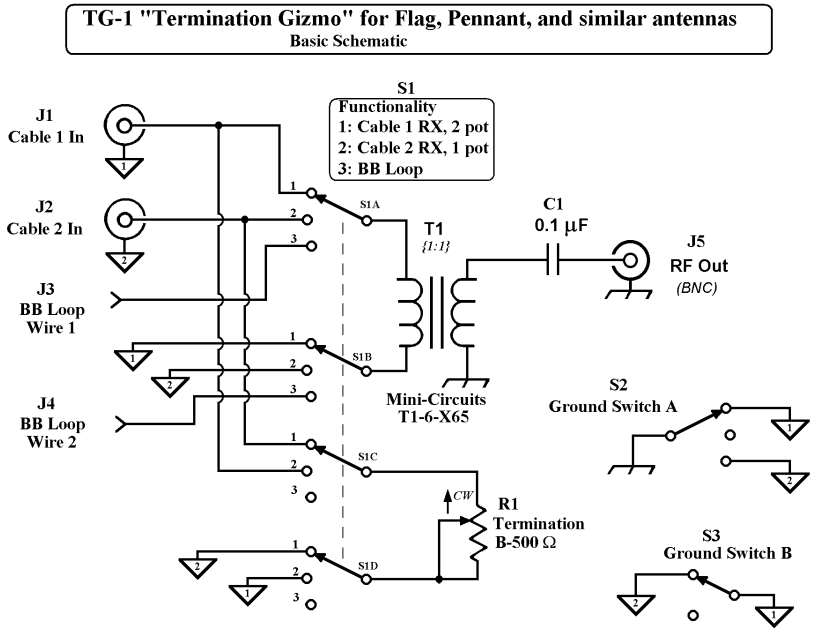

Figure 3

Figure 3 is the “basic” TG-1 schematic. Since Flag, Pennant, and other similar antennas typically have low output levels, a switchable amplifier can be included in the TG-1 box. *Figure 4* shows one possible implementation of this idea.

The two Flag (or similar) antenna feedlines are presented to J1 and J2. There was an extra position available on the 4-pole 3-position rotary switch used for S1 (Feedline Selection). This extra position has been routed to J3 and J4 banana jacks that can be used to connect an unterminated (figure-of-eight) broadband loop. In that mode, the R1 termination pot is not connected.

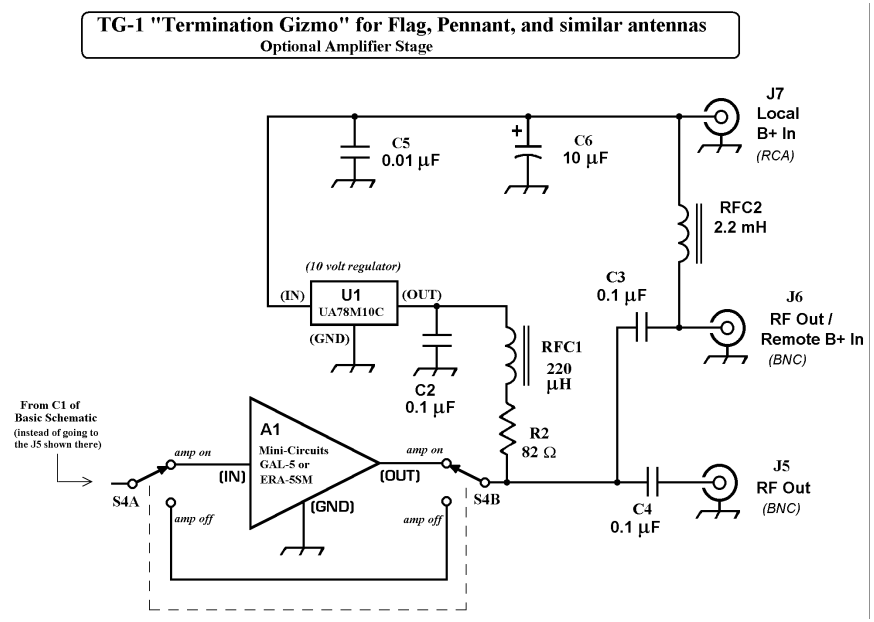

Figure 4

I assembled the TG-1 in a plastic Radio Shack 270-1805 box measuring 6 by 3 by 2 inches (15.2 by 7.6 by 5.1 cm). Placement of components is not too critical. The only exception may be, if the amplifier option is included, to keep amplifier input and output leads short to prevent possible feedback and oscillation.

In use here at Billerica, MA, the nulls provided by the TG-1 controlled Flag antenna are often good enough to remove interference from a desired DX catch. Sometimes the null depth can be enhanced by phasing the TG-1's output against that of a non-directional active or passive vertical antenna placed far enough from the house to be out of the "noise zone".

There are also cases where the best results are obtained by taking the two Flag antenna feedlines directly to the two input channels of the phasing unit, rather than going through the TG-1 box at all.

It is hoped that this article encourages others to do their own experimentation and to report their findings.

References

(Note: Over time Web URL's may change. If this occurs, it may still be possible to retrieve the articles by going to known DXer Web sites or to search engines for links. Hard copies are likely to be available from the National Radio Club and International Radio Club of America reprints services.)

1. "Flag Antenna Construction and Test Results" - M. Connelly, JUL 2002
"http://www.qsl.net/wa1ion/flag/flag_antenna.pdf" (also DX Monitor Vol 40 - No 7)

2. "Pennant Antenna with Remote Termination Control" - M. Connelly, JUL 2000

"http://members.aol.com/DXerCapeCod/pennant.pdf"

3. "Fabricating Impedance Transformers" - J. Bryant, MAY 2001
"http://members.aol.com/DXerCapeCod/z_transformers.pdf" (also DX Monitor Vol 38 - No 20)