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QST Issue: Mar 2002
Title: The Noise Bridge (sidebar to Taming the Trap Dipole)
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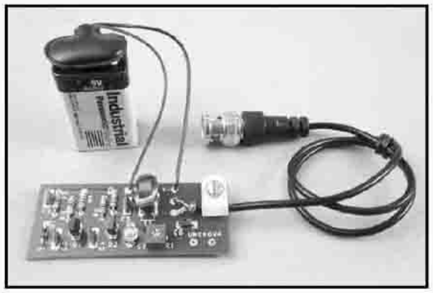
The Noise Bridge

Diode D1 is a source of broadband noise. This noise is amplified to useful levels by the two-stage circuit comprising Q1, Q2 and associated components. Although there's no attempt made to frequency-compensate this noise source, there's plenty of signal for our purposes—its output level ranges from S9+20 dB at 1.8 MHz to S7 at 30 MHz. In practice, when the impedances connected to points B and U are equal, this "bridge" circuit is in a balanced condition and output to the receiver is at a null. The only "tricky bit" in this circuit consists of the trifilar winding T1. [The circuit board project offering uses color-coded wire for this toroid, so hookup is pretty much foolproof.]

So Now What?

Let's put this to practical use: Connect a 100-Ω ¼ W resistor across the "unknown" terminals and connect to your receiver with a length of coax. Apply dc power (8-15 V) to the noise bridge circuit and you should hear a loud rushing noise in the receiver. Adjust control R1 for minimum S-meter indication and then C1. Once these are both adjusted carefully, the noise level in the receiver should drop to its internal noise level alone. The noise bridge is now adjusted for a null—the impedance presented by the 100-ohm resistance and stray capacitance is now balanced by the bridge's R1 and C1 settings.



Putting it all Together

If you add the trap—a parallel L-C circuit—at its resonance frequency across that 100-ohm resistor, there'd be no disturbance to the null since its impedance at the intended operating frequency is theoretically infinite. Away from the resonance frequency, the noise level will rise as the receiver is tuned off to either side. Finding the trap's resonant frequency amounts to tuning your receiver until you've located the noise null. This null will be fairly broad; however, it should be easy to locate using 1-MHz and then 100 kHz tuning steps.

Once you've found the null, bunch the toroid turns together to lower the trap resonance frequency or spread the turns apart to raise the resonance frequency. There's a fair amount of adjustment possible without resorting to changing the toroid turns count—the 21 MHz traps, for instance, could be tuned in this manner to cover a range of 19-22 MHz.

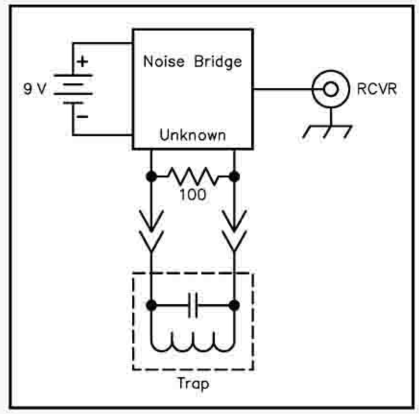


Figure B—How to hook up the noise bridge.

Caution

My initial attempts at repeatable resonance measurements were inconsistent—the "casual" approach using clip leads yielded well over a MHz of variation in resonance frequency at 25 MHz! It's critical to make the leads from the "unknown" terminals on the bridge to the traps as rigid as is practical. I used 2-inch lengths of no. 20 magnet wire to the 100-Ω parallel load and installed solder lugs outboard of that resistor. This allowed the traps to be added and removed with a minimum of change in stray capacitance, which affects the resonance measurement significantly. Once these precautions were taken, the measurements became reassuringly repeatable. *Note: Once these trap hookup connections are ready to go and prior to adding the traps, be sure to readjust C1 for a noise null—this effectively tunes out the test setup stray capacitance.*

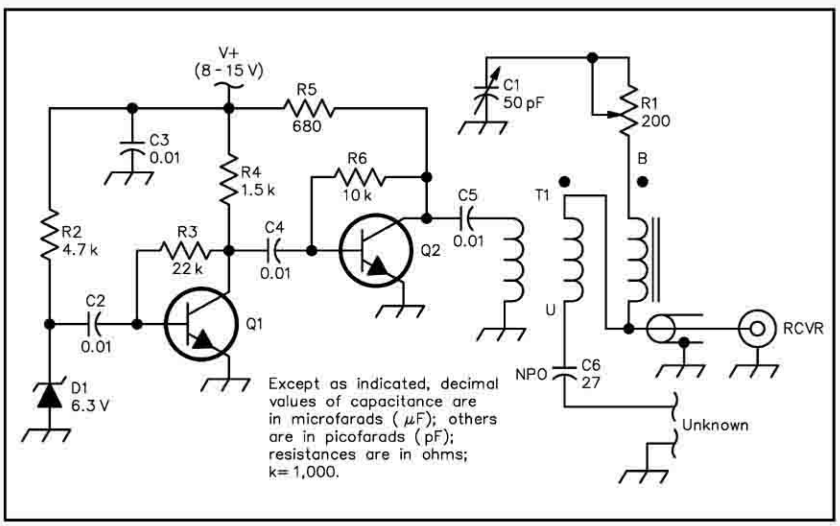


Figure A—The schematic diagram of the noise bridge, based on a design that appears in *The ARRL Antenna Book*. All resistors are 5%, ¼-W carbon composition.
D1—6.3-V, 0.5-W Zener diode, 1N753A or equiv.
Q1, Q2—High-speed NPN switch, PN2222A, 2N4401 or equiv.
T1—4 turns trifilar-wound on FT37-43 toroid; observe phasing.

analyzers. If you don't have access to either of these tools, though, despair not! If you have an HF transceiver with general coverage capability, you've already got most of what you need.

The remaining piece of equipment required is a noise bridge. Despite the arcane-sounding name, this is a simple circuit that is easily duplicated. The sidebar shows the schematic diagram for this circuit, and this is taken largely intact from *The ARRL Antenna Book*.[2] A printed circuit-board kit was developed as a club project and is available to interested builders.[3]

Antenna Adjustment

This antenna was developed by starting with the innermost (10-meter) section and working outward one band at a time. With a 4-inch spacing between the ends of the 8-foot channel sections, the 10-meter antenna simply worked on the first try. Resonance for this dipole was at 28.1 MHz and SWR characteristics were fairly broad due to the element thickness.

Upon adjustment of a pair of 10-meter traps, these were added to the element