

COMMUNICATIONS CORNER



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Noise isn't always bad

OVER THE YEARS I HAVE HANDLED MANY transmitters—everything from flea-powered QRP's to 20-kW FM blockbusters—and, with the exception of the QRP's, you were warned to tune most of them fast—or else.

You had to tune up fast in order to keep heat dissipation in the final amplifier to a minimum, because excessive heat dissipation can damage or destroy an amplifier, be it a vacuum-tube or a solid-state device.

I tuned UHF TV-relay transmitters by literally opening the door of the cabinet; I dipped (resonated) finals by tuning until the color of an amplifier's plate changed from deep red to orange; and I sent many finals up in smoke in the early days of solid-state RF power amplifiers. In most instances my hand was quicker than the eye, or at least the heat, so I could tune up faster than the gremlins could destroy the final.

But when it came to antenna tuners, particularly those for long-wire antennas, the heat may outrace the fingers, because it can take much fiddling with two or three knobs before the input impedance of the tuner is within the range of the transmitter's adjustments. In fact, I often wondered how much damage I caused a transmitter when it took a long time to adjust an antenna tuner.

Of course, until recent times I didn't have the luxury of a Palomar Engineers (Box 455, Escondido, CA 92025) model PT-340 Tuner-Tuner, shown in Fig. 1. The Tuner-Tuner is a noise bridge that's specifically designed for pre-adjusting the antenna tuner before the transmitter is ever keyed (turned on).

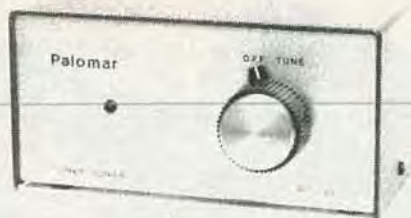


FIG. 1

The Noise Bridge

For those of you who have never used a noise-bridge, fear not; this will not be a three-part tutorial on noise-bridge design. We'll stick with the *Tuner-Tuner*.

To understand how it works, examine the simplified bridge circuits shown in Fig. 2-a and Fig. 2-b. In Fig. 2-a, the T1 and T2 connections may appear unusual, but the

ohms, the bridge is balanced. Therefore, no signal will flow through the headphones.

Now imagine that we unbalance the bridge by changing R2's value to something other than 50 ohms. The arms of the bridge are no longer balanced, so a signal will be heard in the headphones. In actual practice, a single transformer would replace T1 and T2; the circuit would resemble the one shown in Fig. 2-b.

Now let's show how the *Tuner-Tuner* works. Rather than a 1000-Hz tone, the signal source will be a white-noise generator that produces a range of signals at frequencies throughout the VHF spectrum. Also, T3 (in Fig. 2-b) will be replaced by an RF transformer; the headphones will be replaced

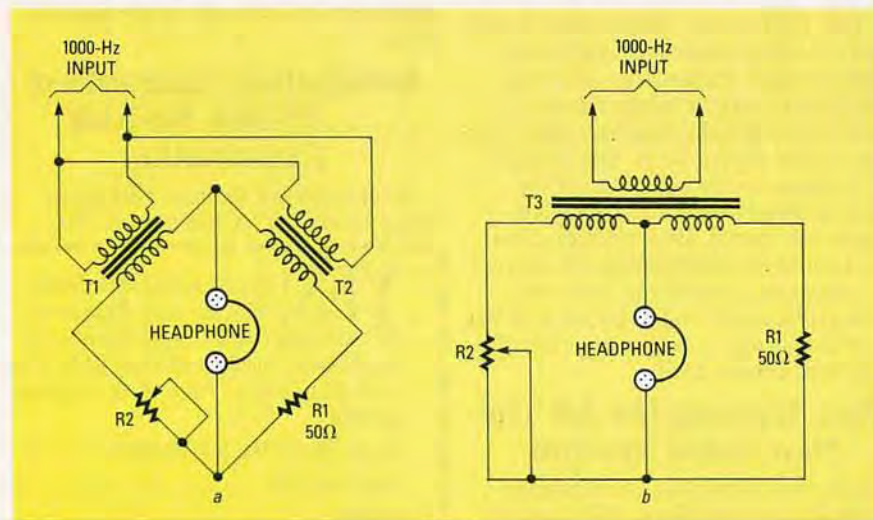


FIG. 2

circuit simply shows how to couple a 1000-Hz signal into the bridge so that both "arms" of the bridge conduct equal current. Resistor R1 is 50 ohms, so, if R2 is set for 50

by the receiver section of a transceiver; and R2 will be replaced by the input to an antenna tuner. Figure 3 shows the circuit that results.

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Tuning the tuner

The purpose of an antenna tuner is to convert the only-heaven-knows impedance of a non-

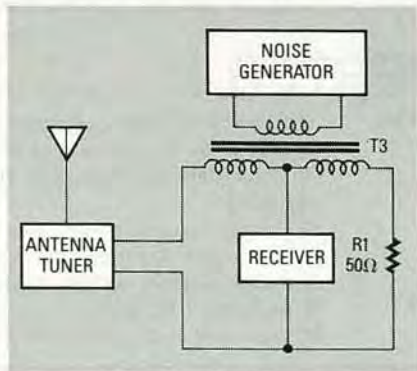


FIG. 3

standard antenna to about 50 or 72 ohms. We'll use 50 ohms for the sake of discussion.

Rather than keying the transmitter and trying to adjust the tuner before the RF power amplifier burns out, we can use the noise bridge shown in Fig. 3 and pre-

adjust the tuner before the transmitter is turned on.

To do so, first adjust the receiver to the desired operating frequency, and then turn on the noise generator. You'll hear a strong noise from the receiver, and the S-meter should indicate a moderate to strong signal. Next, tweak the antenna tuner's controls for minimum noise, as indicated by the S-meter reading. When the antenna tuner is adjusted precisely, its input appears to be 50 ohms, the same value as R1. The bridge will be in perfect balance, so the noise will "null out" and the S-meter reading will drop to its normal minuscule value, or to a very low value if the tuner cannot be adjusted to a precise 50-ohm resistive impedance. When the transceiver is keyed now, it will see the required 50-ohm load.

Naturally, you don't want to go through a connect-disconnect hassle every time you change frequency, so the Palomar unit contains internal on-off switching that controls the power from a 9-volt battery and also bypasses the *Tuner-Tuner*. **R-E**