



# RX-100 Noise Bridge Original Operators Manual



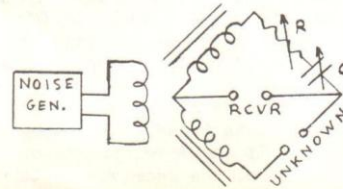
# R-X NOISE BRIDGE

## OPERATOR'S MANUAL

# PALOMAR ENGINEERS

# R-X NOISE BRIDGE

**General Description.** The R-X Noise Bridge contains a wideband noise generator and an r-f impedance bridge. Two arms of the bridge are driven equally by the noise generator through a broadband ferrite transformer. A third leg of the bridge has a calibrated variable resistor R and a calibrated variable capacitor C in series. The antenna or other "Unknown" circuit to be measured is connected as the fourth leg of the bridge. A short-wave receiver is used as the detector.



When R and C are adjusted for a null (minimum noise out of the receiver) their dial settings can be read to find the resistance and reactance of the unknown. A capacitor is in series with the unknown so that, if the unknown is a pure resistance, capacitor C is at half scale for balance. Thus both capacitive and inductive impedances can be measured. By tuning the receiver, the R and X of the unknown can be found at different frequencies.

The useful range of the Noise Bridge is 1-100 MHz. It measures R = 0-250 ohms and C =  $\pm 70$  pf.

**Antenna Resonance.** Connect the antenna to the "Unknown" terminal, a receiver to the "Receiver" terminal (through any convenient length of line), and a 9-v transistor battery to the clips provided.

Tune the receiver to the expected resonant frequency of the antenna and turn the Noise Bridge on. A loud noise will be heard. Adjust the R and X controls for null; the controls interact and must be adjusted alternately until a deep null is obtained.

If the reading is on the  $X_L$  side of zero, the receiver is tuned to a frequency above resonance. If the X reading is on the  $X_C$  side of zero, the receiver is tuned

below resonance. Using the X reading as a guide, retune the receiver and readjust the R and X dials for null. With this procedure it is easy to find the resonant frequency of an antenna.

At the resonant frequency ( $X = 0$ ) the R reading is the antenna resistance at the measurement point. If the measurement is made at a current loop (the center of a dipole antenna, for example) the indicated resistance is effectively the antenna radiation resistance.

Sometimes it is not possible to make the measurements at the antenna. Instead the R-X Noise Bridge can be connected to the antenna's coax feedline. There are two ways to do this:

1. If the feedline is an electrical half wave long, or some multiple of a half wave, then the readings taken at the end of the feedline are exactly the same as though they were taken at the antenna. Of course there is just one frequency where the feedline is a half wave long so all measurements must be taken at this frequency,

2. If the feedline length is known, readings taken at the end of the feedline at any frequency can be converted using the Smith chart to find the antenna resistance



and reactance. The procedure is described in detail in the ARRL Antenna Book (13th edition, 1974).

**Antennas Off-Resonance.** With the antenna connected as the "Unknown" its resistance and reactance off resonance can be found. At frequencies lower than resonance an antenna appears as a capacitor and resistor in series. Above resonance it appears as an inductor and resistor in series. The resistance is read directly from the R dial. The reactance is found from the X dial reading and the impedance chart. The chart gives reactance in ohms for a measurement frequency of 1-MHz. To find the reactance at higher frequencies, divide the tabulated values by the frequency in MHz.

**Series Tuned Circuits.** To find the resonant frequency of a series tuned circuit, connect it across the "Unknown" terminals. Set the R control to minimum resistance (most tuned circuits used in communications work have very low series resistance). Set the X control to zero. Tune the receiver for a null. The X control can be used as described above to determine whether resonance is above or

below the frequency to which the receiver is tuned.

**Parallel Tuned Circuits.** A coupling link of two turns or so should be connected to the "Unknown" terminal. The link is then brought close to the tuned circuit and the procedure described above is used to find the resonant frequency.

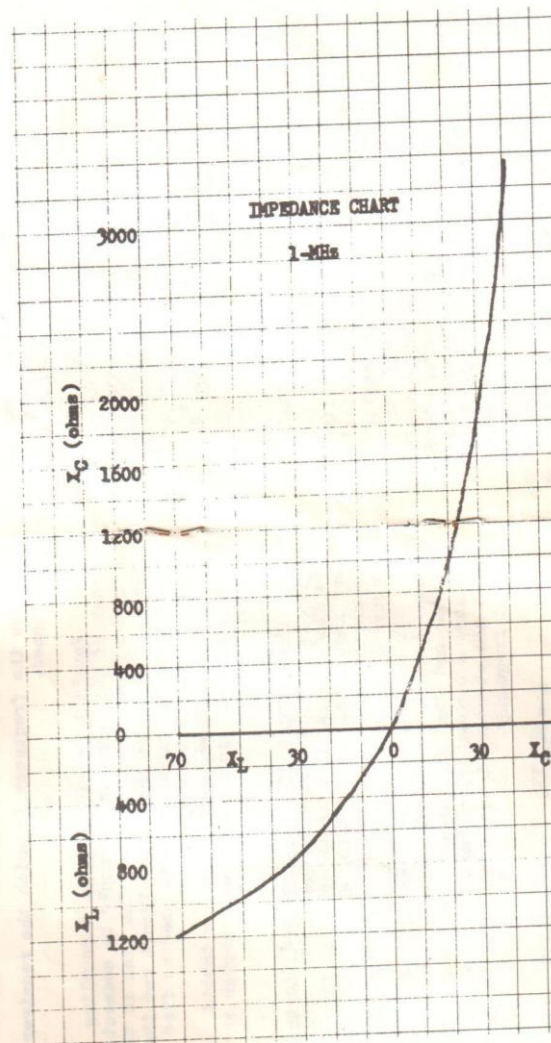
If the tuned circuit uses a toroid inductor, the link must thread through the toroid core.

**Measurement of Inductance and Capacitance.** The R-X Noise Bridge can be used to find the values of unknown capacitors and inductors. To do this, a standard capacitor (100-pf mica) and a standard inductor (5 microhenry) are used.

To measure the inductance of a coil connect it in series with the standard capacitor and find the resonant frequency. To measure a capacitor, connect it in series with the standard inductor and find the resonant frequency.

$$L = \frac{25,330}{f^2 C} \quad C = \frac{25,330}{f^2 L}$$

where: f = resonant frequency in MHz  
L = inductance in microhenrys  
C = capacitance in picofarads







The impedance chart shows this last relationship with reactance values given for  $f = 1\text{-MHz}$ . To find the reactance at higher frequencies divide the tabulated values by the frequency in MHz.

**Warranty Policy.** Palomar Engineers warrants this equipment against defects in material and workmanship for a period of one year from the date of original purchase.

Do not ship to the factory without prior authorization. First write and describe the difficulty. Many times we can diagnose and correct problems by mail.

This warranty is limited to replacing or repairing the defective parts and is not valid if the equipment has been tampered with, misused or damaged.

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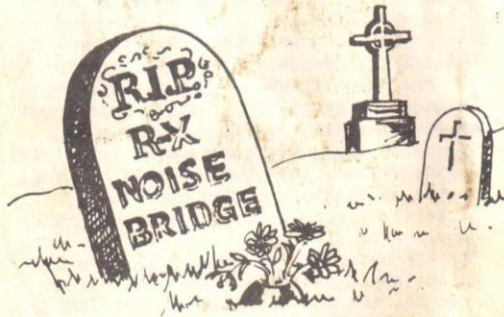
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**Trap Dipoles.** The noise bridge will give a null on each band that the trap dipole resonates. Start with the highest frequency band and measure the resistance and reactance as described for a dipole. Adjust the center (or lower) section if necessary to resonate. Then repeat the procedure on the next lower band. The method works with either horizontal or vertical trap antennas.

**Beams.** Connect the noise bridge to the driven element. Tune your receiver to the operating frequency and read the resistance and reactance. Adjust the element to resonance if needed.

With the noise bridge still connected to the driven element nulls will be found at the resonant frequencies of the parasitic elements because of their close coupling to the driven element. The correct frequencies for these nulls depends on the exact design of the beam. As an example, the tri-band quad in the ARRL Antenna Book has directors resonant at .980 and reflectors at 1.025 of the driven element resonant frequency.

**CAUTION!**



Do not turn on transmitter or let VOX turn it on when R-X Noise Bridge is connected to antenna.

Product produced in 1970's  
Over 10,000 made  
In black and red finishes