CQ Reviews:

The Palomar Engineers R-X Noise Bridge

BY HUGH R. PAUL*, W6POK

Palomar Engineers is currently marketing an R-X Noise Bridge for $39.95. This is a device that should be in every ham shack worthy of the name. It is an accessory item that is definitely not a luxury. Those of you who are not familiar with the function of an R-X noise bridge, keep reading.

How many times have you installed a new beam or constructed a dipole and then spent hours pruning and adjusting in order to get a low v.s.w.r. across the band? If you are like most amateurs you probably were depending on an s.w.r. bridge to adjust the length of the antenna or to prune the feedline so that your transceiver will see a reasonable v.s.w.r. When you get through, the antenna may or may not be radiating efficiently.

To properly tune an antenna, we must first determine that it is resonant at the point in the band where we wish to obtain the lowest v.s.w.r. Next we must determine the radiation resistance at the feedpoint. This resistance must match the terminal impedance of the feedline if efficient transfer of power is to take place. It is also helpful to determine the reactance of the antenna both above and below the resonant point, since this tells us over what portion of the band our transmitter will be able to operate without suffering from the ill effects created by a high standing wave ratio.

The Palomar Engineers R-X Noise Bridge contains a wideband noise generator. Two arms of the bridge are driven equally by the noise generator through a three-winding broadband ferrite transformer. A third leg of the bridge has a calibrated variable resistor and a calibrated variable capacitor 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 connected across the bridge and functions as a null detector.

When R and C are adjusted for a null (minimum noise out of the receiver) their dial settings can be read to measure the resistance and reactance of the unknown. By tuning the receiver, the R and X of the unknown can be found at different frequencies.

With an antenna connected as the "unknown" its resistance and reactance can be found at frequencies above and below resonance. At frequencies lower than resonance an antenna appears as a capacitor and resistor in series. The values of both are read directly from the R and X dials. At frequencies higher than resonance the antenna appears as an inductor and resistor in series. These values also are read directly from the R and X dials with the inductance read as a "negative capacitance" value. Conversion of X readings into inductive and capacitive reactance is done with a conversion formula calculation. At the resonant frequency X=0 and the radiation resistance is read directly from the R dial. This is assuming that the bridge is connected directly at the antenna feedpoint. Where this is not practical, you can first cut the feedline to an exact electrical half wave length or multiple thereof at the desired resonant frequency and place the bridge at the transmitter end of the feedline and adjust the antenna to resonance.

If the feedline is other than a half wave length, but the electrical length is known, the readings determined by the bridge can quite accurately be converted to the correct antenna resistance and reactance through the use of Smith Charts. Com-

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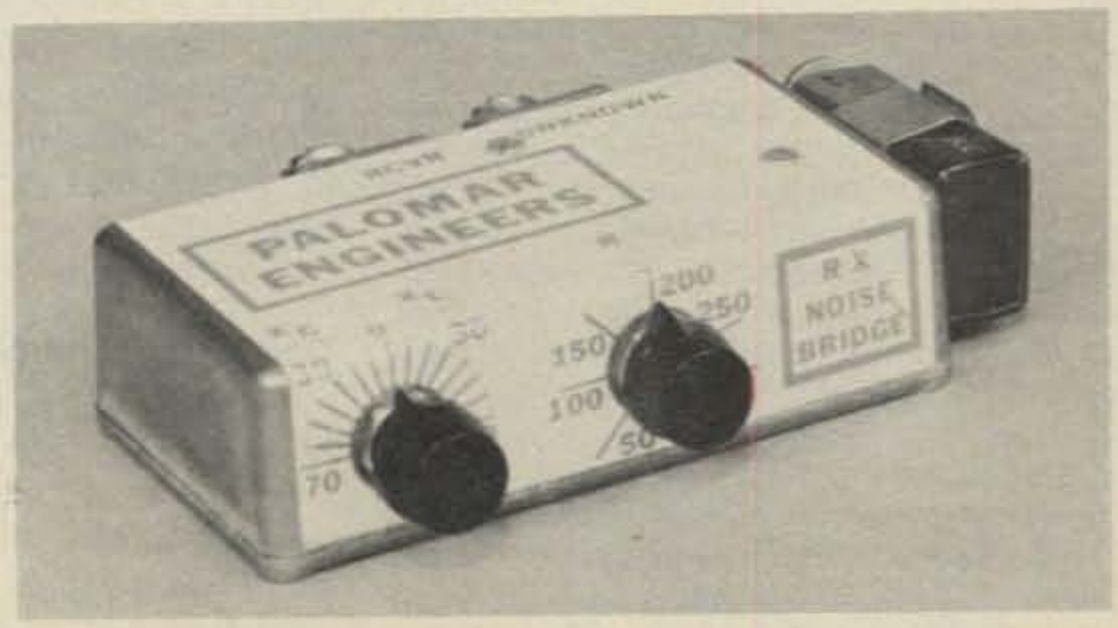

The Palomar Engineers R-X noise bridge.

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Zero Bias *(from page 5)*

timer aware of what topics are covered each month. Sometimes we take for granted that a catch word or phrase will be meaningful to all those who see it. Rather than appear or in fact to be an exclusionary block, we felt that the titles of the columns should do more to promote a better understanding of the material. After all, as I said last month, we cater to some of the busiest people in the world, the most active bunch of amateurs anywhere. We also have the best (and I mean best) group of columnists writing today on amateur radio. We want more of you to take a second look and many of you to take that first look at what's being offered.

One of the things we have in the works for '77 is to increase the number of Reviews of amateur products and products of interest to amateurs. This month for instance Bill DeWitt delves into the Radio Shack SCT-11 stereo cassette tape deck and we have a review coming up by Adrian Weiss on the Heathkit HW-8 QRP c.w. transceiver. Hugh Paul is hard at work generating a number of Reviews for the next several months. Anything you'd like to see? Let me know and I'll try to arrange it.

We have a number of great articles in the works for '77 and my second year as Editor looks even busier than my first. We are looking for new material for *CQ* so why not take some time and send in that article. Give us all a chance to see what you've been doing lately and perhaps get paid for it at the same time.

April is also the month for Dayton. Just the mention of Dayton to most of us is enough to kindle the imagination and produce a roaring fire. For the uninitiated or newcomer, for the old timer who never found the time, for those who just settle for hearing about Dayton from people who have been there let me tell you that it is amateur radio personified and worth the effort to get there. This year marks their 20th Dayton Hamvention and for three solid days and nights you are inundated with amateur radio. There are programs for every interest, an arena full of exhibits, forums, technical sessions and the best flea market I've ever seen with acres and acres of all sorts of marvelous things guaranteed to capture your interest and wallet. Bring an extra suitcase to carry home all the goodies.

CQ will have their booth set up and I look forward to meeting many of you and getting the chance to exchange some ideas. Dick Ross, K2MGA will be out there to help with the booth and we'll probably be joined from time to time by many of the *CQ* columnists who show up each year. It's a lot of fun so why not come on out and join us.

73, Alan, K2EEK

Palomar Noise Bridge *(from page 33)*

only fuse employed is in the cathode circuit of the 8873 to prevent over driving and thus damaging the amplifier tube. A time delay circuit insures proper warmup of the 8873 filament prior to plate voltage being applied.

The amplifier input circuit consists of fifteen 1500 ohm, 2 watt resistors in parallel, which form a 100 ohm, 30 watt resistance. This resistance, in parallel with the 8873's cathode circuit impedance, causes the exciter to look into the desired 50 ohm load on all bands. This resistive network also dissipates a portion of any excess driving power. The 75 to 90 watt output of most transceivers will drive the amplifier to full output on all bands.

The output circuit of the amplifier is a pi-network with additional fixed padding capacitors across the tuning and loading capacitors on the 80 meter band. Ferrite beads are used in the plate lead for parasitic suppression. Metering functions monitor grid and plate current, high voltage and relative power output.

Power output on c.w. ranged from 630 watts to 570 watts, depending on the band in use. Rated input for s.s.b. is 1200 watts PEP on a continuous duty cycle. The c.w. duty cycle is rated as continuous as long as maximum key down time does not exceed 30 seconds. At the reduced input level of 400 watts for RTTY and SSTV the maximum transmit time must not exceed 10 minutes. These ratings are adequate for most operators. Keep in mind the fact that the protection circuits in the amplifier will prevent damage should these ratings be exceeded. Other amplifiers in this power class may not fair as well if their ratings are exceeded.

The slightly higher cost of the SB-230 ($369.95) is justified by the use of the more expensive Eimac 8873. It's other design features are a bonus.

The SB-230 is a clean amplifier. Third order distortion products are better than a −30 db down from the rated output, provided the driving transmitter is at least that good with regard to third order products. A dirty driver signal is going to give you a dirty output signal. Primary power for the amplifier can be either 120 v.a.c., 50/60 Hz at 14 amps or 240 v.a.c., 50/60 Hz at 7 amps. ■

The Heathkit SB-230 *(from page 37)*

plete details for using the bridge in this manner can be found in most good antenna books written for the amateur.

The bridge can also be used to determine the resonant frequencies and impedance of tuned circuits or to assist you in cutting transmission lines to the proper length.

The bridge is accurate enough for most amateur uses up to 100 MHz and with a little practice you will become proficient in its use and wonder how you ever got along without it. ■