Q & A

READERS' QUESTIONS, EDITORS' ANSWERS

Blast From The Past

Q *Around 1960-1962 your magazine, then called* ***Radio-Electronics****, had a column called "Noteworthy Circuits" in which a regenerative broadcast receiver was published. It worked surprisingly well, but I've lost track of it. Could you please print it again in "Q&A"? I'm sure others would be interested too. — R. G., Gig Harbor, WA*

A You have a good memory—the receiver was in our January 1962 issue, which credited it to the British magazine *Wireless World*. Figure 1 here shows the circuit, slightly reworked to use currently available parts. You can connect high-impedance headphones in place of R3.

A regenerative receiver is an oscillator that is biased so that it doesn't quite oscillate. It then operates as an amplifier with tremendous gain at the frequency to which it is tuned, and good rejection of all other frequencies. It also clips in such a way as to demodulate AM signals. This was an old-fashioned circuit even in 1962, but it produces a remarkably sensitive and selective radio with just one transistor or tube.

Using R4, you adjust the bias so that the gain is high but the receiver doesn't oscillate; that adjustment has to be tweaked every time you tune in a station, since the best setting depends on the strength of the incoming signal. When we breadboarded it, we heard AM stations 1000 miles away using just a 4-foot antenna; local stations came in loud and clear with no antenna.

You'll note that C3 is a 365-pF tuning capacitor. Those are not quite as easy to find as they used to be, but you can salvage one from an old, non-working radio or order one from Antique Electronic Supply, 6221 S. Maple Ave., Tempe, AZ 85283 (Tel: 602-820-5411). You could also substitute a 125-pF capacitor from a newer transistor radio, but you'll need to wind twice as many turns on L1.

And if you like simple radios, take a look at our December 1995 column, which featured an 8-component TRF radio built with the Ferranti ZN414 IC.

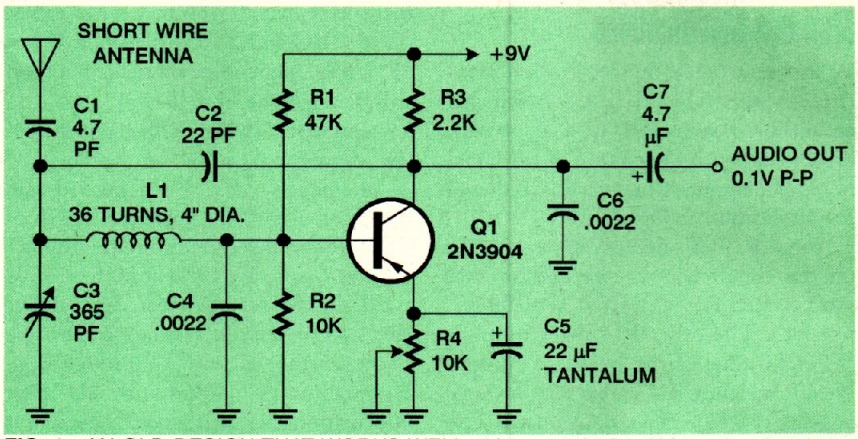

FIG. 1—AN OLD DESIGN THAT WORKS WELL, this regenerative AM receiver has been updated to use parts that are commonly available today.

Old Tube Needed

Q *I have a Philco portable radio that needs a new 3LF4, 3LE4, or 3V4 tube. I have not been able to find one. Is it possible to make changes in the wiring to use some type of transistor? — J. C. J., Denver, CO*

A You can get the 3LF4 and 3V4 from Antique Electronic Supply at the address given earlier in this column. It would be a pity to transistorize such an interesting and potentially valuable antique radio.

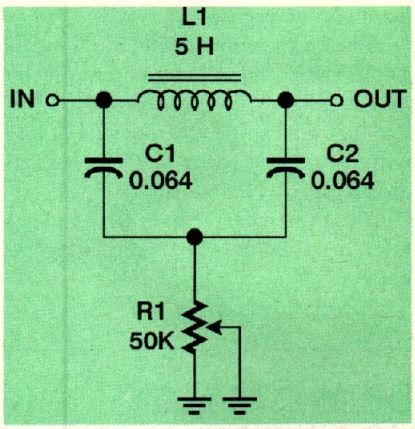

FIG. 2—AN OLD DESIGN THAT *DOES NOT* work well, coil L1 would be extremely hard to find these days, and the results produced by this circuit would not be worth the effort or the cost.

Audio Notch Filter

Q *I want to design a transistorized version of the distortion meter in the Gernsback book* ***High Fidelity****, published in the 1960s. I need to know the design specifics of the bridged-T network used as a null audio filter. Can you help? — J. S., Lakewood, NJ*

A To test an amplifier for distortion, you need a notch filter that eliminates one frequency from the signal. What you do, then, is apply a pure sinewave to the input, measure the output level, and then insert the notch filter to eliminate the original sinewave. What's left is total harmonic distortion plus noise.

The circuit that you describe uses a bridged-T filter as shown in Fig. 2, with a special, high-Q, 5-henry choke. That choke was hard to find 30 years ago, and is probably completely unavailable now. If you can find one, it might cost $50 or more. And even then, it won't give an

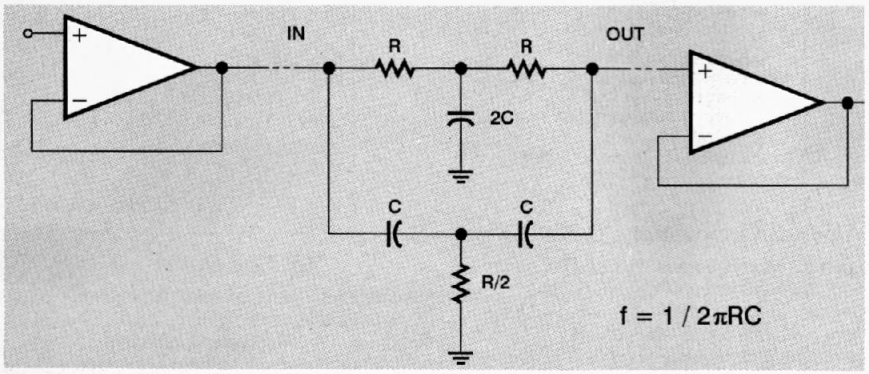

FIG. 3—THIS TWIN-T FILTER gives a better notch and is cheaper to build than the circuit in Fig. 2, though you should use precision components for best results.

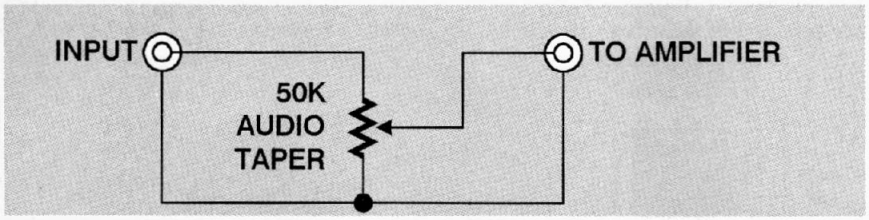

FIG. 4—HERE'S THE RIGHT WAY to hook up a volume control. For two channels, use a dual-gang potentiometer.

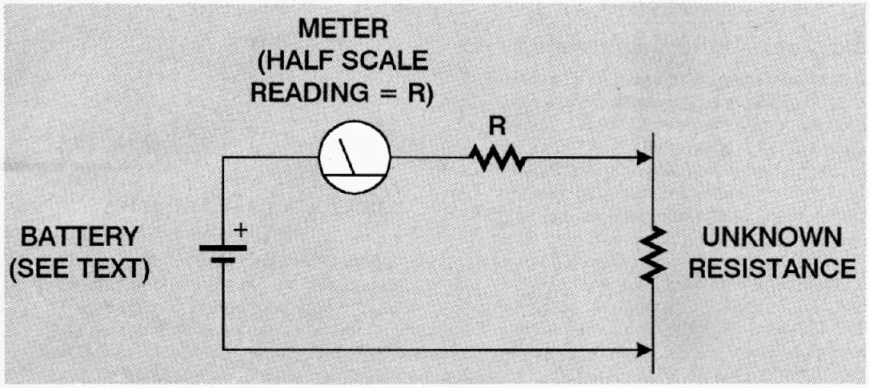

FIG. 5—HERE'S HOW TO BUILD AN OHMMETER. To compensate for battery aging, make R adjustable.

especially good notch, because any coil with an inductance of 5 henrys is going to have enough resistance to impair its performance.

Modern distortion analyzers use the twin-T network shown in Fig. 3. It gives a very sharp notch at a fixed frequency, and the components are cheap—just three resistors and three capacitors. Use 1% precision components and make one of them adjustable, so you can compensate for small errors in the values. For 1 kHz, R can be 1.6K, in which case R/2 is 800 ohms, C is 0.1 μF, and 2C is 0.2 μF. Better yet, instead of the 800-ohm resistor, use a 680-ohm resistor and a 200-ohm trimmer. For best performance, put the filter between two op-amp buffers as shown in the diagram.

A disadvantage of the twin-T network is that the frequency isn't variable. If you need multiple frequencies, build several networks and choose between them with a selector switch. For more about filters, see *The Art of Electronics*, by Paul Horowitz and Winfield Hill, Chapter 5 (more information on that book can be found in the box titled "How to Get Information on Electronics").

Finding Discontinued ICs

Q *I have a Heathkit digital multimeter that has served me well. The problem is finding replacement RTL logic chips to replace the original ones. Do you know of any vendor who deals in discontinued RTL ICs? — E. H. S., Clarendon Hills, IL*

A Discontinued ICs are the specialty of Rochester Electronics, 10 Malcolm Hoyt Dr., Newburyport, MA 01950 (Tel: 508-462-9332; email sales@rocelec.com). But it may be easier to find a used multimeter like yours at a hamfest or by advertising on rec.radio.swap, and salvage it for parts.

Add A Volume Control

Q *I recently acquired several Dynaco power amplifiers for almost nothing at a yard sale. How do I go about installing a volume control on these things? I've thought about putting a dual-ganged potentiometer in series with the input jacks—is this the proper way to do it? — J. R., Middletown, RI*

A Not quite; you'd probably get some hum, and the volume wouldn't go all the way down to zero because even a large series resistance can't block all of the signal. Instead, a volume control should be connected as a voltage divider in front of the amplifier input, as shown in Fig. 4. One channel is shown; you can use a dual-gang potentiometer and wire both channels the same way.

For best control at low volumes, use an audio-taper potentiometer. "Audio taper" means that when the potentiometer is set to half-scale, you'll get considerably less than half of the full signal; that's desirable because most audio systems operate far below maximum volume most of the time, and because the ear perceives loudness logarithmically.

Build An Ohmmeter

Q *The surplus dealers are offering beautiful 50-mA meters with ready-made ohms scales (full scale = zero ohms). What battery and resistance do I put with the meter in order to make an ohmmeter? — J. K., Clackamas, OR*

A Regardless of the meter characteristics, zero ohms will be full scale and infinity will be the other end of the scale. What you need to know is that the meter reads at half scale. That will tell you what resistance to put in series with it (see Fig. 5). Then you have to find a battery voltage that will make it read correctly. That's easy; you already know that it takes 50 microamperes to deflect it to full scale, so the battery voltage will be 0.00005 × R. It will probably turn out to be a standard battery voltage, per-

continued on page 16