# ANTIQUE RADIOS

## Ancient transformers, tubes, and speakers

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ALTHOUGH THERE'S BEEN TREMENDOUS developments in electronics technology during the past 100 years, fortunately for those of us into antique radios, we don't have to concern ourselves with either the pioneering days or the high-tech '80s. Our interest is primarily the era of the vacuum tube: from the 1920's through the 1940's.

Tube radios have five basic components: 1) Transformers and coils; 2) Resistors; 3) Capacitors (which used to be called "condensers"); 4) Tubes; 5) Speakers. This time out, we'll discuss the different types of transformers, resistors, and speakers, and how they're used.

Transformers and coils are related because they are essentially inductors. Power, IF, and audio-output transformers are the types most commonly used in radios. Components considered to be coils—even though they might actually be transformers—are those in the antenna and RF-amplifier circuits, a speaker field, and the speaker's voice-coil.

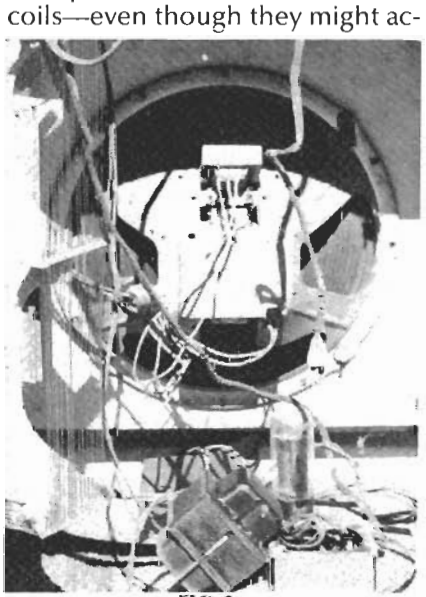

FIG. 1

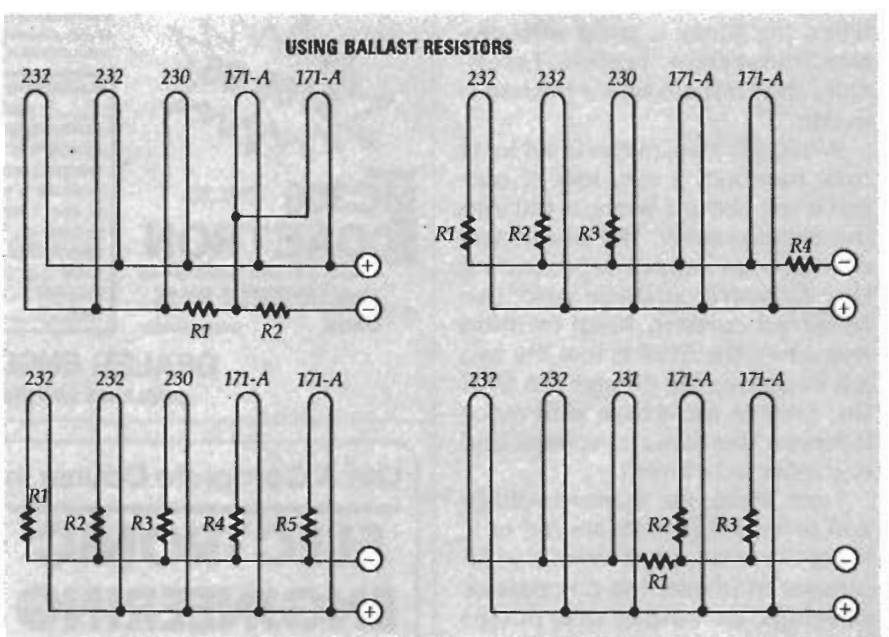


FIG. 2

How is a transformer a coil? Simple! That's what we choose to call it. For example, an antenna input "coil" usually has primary and secondary windings, and that's a transformer in anyone's engineering textbook. Same thing with an RF amplifier's output circuit. While it might use a single inductor (a coil) as a load, more often than not the *plate coil* has primary and secondary windings; and once again, that's a transformer in an engineering textbook. However, in early radio service manuals, and even in modern manuals, both transformer types are usually called coils. It's sort of like calling cycles-per-second Hertz. Hertz is a term created from what alchemists used to call the *ether*—air. Since we all breathe the same air we know what Hertz really is—it just takes a textbook two pages to explain what used to be obvious.

Although many antique radios had more transformers and coils than tubes, it's the tubes that collectors expect to be burned out; few expect transformers and coils to go bad. Unfortunately, power transformers in antique radios have often burned out many years earlier, and it's something you might not be able to check at the time you're purchasing the radio. But it's been my experience that radios with a defective transformer have been worked on at some time or other, so be wary of a

set where the transformer's mounting screws are missing or disturbed. Whoever worked on the set shown in Fig. 1 left the power transformer a wreck.

Besides total burn-out, open and shorted windings are also common to old radio transformers. While it's easy to use an ohmmeter to determine whether a winding is open, troubleshooting shorted windings with a conventional instrument is usually impossible.

**The nose knows**

Antique radio collectors soon learn to recognize the odor of an overheated or burning power transformer. If you fire up an antique radio and the transformer smells or overheats, turn the power off *fast* before a handful of other expensive parts go up in smoke. But keep in mind that a hot power transformer doesn't necessarily mean that the transformer is at fault: make certain that you at least check the rectifier and the filter capacitors before deep-sixing the power transformer.

Removing the rectifier tube or the selenium rectifier (if used instead of a rectifier tube) can help determine if the power transformer is shorted, or if a short in the B+ supply is drawing excessive current. That's because removing the rectifier usually disconnects the transformer from the rest of the circuit. (However, take care that there isn't a second rectifier—perhaps used for grid bias—separately connected to the power transformer.) In all likelihood, the transformer is probably OK if it doesn't overheat when the rectifier is removed.

A superheterodyne radio's IF transformer is another troublesome device. While it can have any of the usual transformer troubles such as shorts, opens, and poorly-soldered terminals, more frequently you'll find that the problem is man-made—or more accurately, tinkerer-made. An old radio that has lain around for many years could have been "repaired" by persons trying to make it play by tightening "the loose screws"—the IF transformer's adjustments.

Moving on to the output transformer, the device that matches

the high impedance of the output tubes to the low impedance of the speaker, the most common problem is an open primary winding, which is easily confirmed by using an ohmmeter. Since there are still plenty of universal replacement output transformers available, it shouldn't be too difficult to locate a substitute.

Although it's possible, I don't recall coming across an electrodynamic speaker having an open field coil. As a general rule, a defective antique radio's speaker usually has a damaged or distorted cone that can't be repaired because few technicians have the knowledge, ability, tools, or even the material to re-cone a speaker. So if you must remove what is an otherwise a good speaker from its mounting, be careful not to touch the cone because it's probably so brittle from old-age.

### Voice-coil testing

The voice coil is sturdy and rarely opens or shorts; but a problem in early radios known as an

*continued on page 108*

## ANTIQUE RADIO

*continued from page 85*

"off-center voice coil" can occur. When the voice coil is uncentered it rubs against the speaker's magnet, producing a thin, tinny, distorted sound. Although the speakers used in modern radios make no provisions to recenter the voice coil, many of the speakers used in antique radios had some form of adjustment that allowed a voice coil to be recentered.

The voice-coil test is made with the set off and unplugged. Put the speaker on the workbench with its cone facing up. Lightly touch the cone at various places with the tips of your fingers. If you hear a mechanical scratching noise you know that the voice-coil is off-center because the scratching sound is caused by the voice coil rubbing against its magnet. If you have a steady hand and nerves of steel, you can try whatever steps are necessary to recenter the voice coil. But remember, if the cone is brittle just one "whoops!" can permanently damage the cone.

When we get together next time we will finish up with the voice coil before moving on. **R-E**