BY MARC ELLIS

The Model 70 Comes to Life

LAST MONTH, WE CONCLUDED A VISUAL INSPECTION OF THE PHILCO MODEL 70 CATHEDRAL THAT HAS BEEN UNDER RESTORATION FOR THE PAST FEW ISSUES. A COUPLE OF AREAS WHERE THE ORIGINAL CIRCUIT HAD BEEN MODIFIED WERE discovered. All six of the set's bakelite block capacitors and both of the metal-can capacitors were removed for rebuilding. Finally, all blocks and cans were "unpotted" and their original components removed. A set of replacement caps (and in one case a resistor), previously mail-ordered, had arrived in time for this month's session and were waiting to be installed in the vacated enclosures.

Rebuilding and Reinstallation

I must say that, even with the additional complication of having to remove, research and unpot the contents of the Bakelite blocks and cans, this was probably the easiest recapping job I've ever done. Removal of the blocks was a snap compared to removal of the individual caps in a conventionally-built radio. The terminal lugs atop the blocks are raised well above the other wiring in the set and are easily accessible. Anyone who has tried to desolder a component from a tube-socket lug buried in a tangle of leads knows the frustration of trying to complete the operation without scorching surrounding wiring or parts.

Not only that, but each lug had only a few leads attached to it compared with the four or six per lug one often encounters when removing individual caps. As an added bonus, taking out the bakelite blocks left at least one end of most resistors in the set disconnected, greatly facilitating the checking of these parts for out-of-spec values.

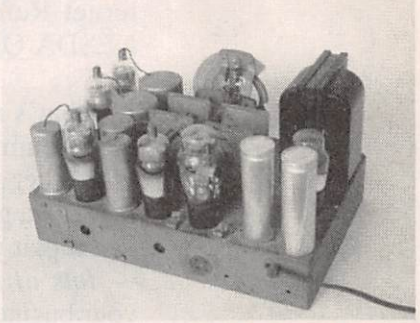
Thanks to their diminutive size, the modern caps fit easily into the bakelite enclosures. Slipping them in with their wires passing through the terminal eyelets, wrapping the leads around the external terminals, and soldering them in place was an easy and pleasant job. Even the large (0.5-μF) cap required for one of the metal-can enclosures made it inside the relatively skinny space without causing hardly any bulge. Reinstallation of the rebuilt blocks on the chassis was also quite a simple matter thanks to the careful notes I'd forced myself to make on connections and lead dress.

Untangling the Wiring

In a previous column, I'd mentioned a few spots where the original circuit had been rewired or compromised. One problem was that each of the set's two 240,000-ohm resistors had roughly doubled in value. I replaced them with modern composition resistors of the proper value. This may have been a problem even when the set was current. One of the service notes in the *Rider Manual* listing for the radio indicated that those particular resistors had been changed from the old fashioned metal end-cap version (which were originally in my set) to what was called the "Continental Carbon type. This is the resistor without the metal ends."

Another problem area was the volume control pot—a 2-section unit controlling (a) cathode bias of the RF and IF amplifiers and (b) RF input to the antenna coil. The antenna connection had been removed from the wiper of the RF section of the pot and connected directly to the antenna coil. I wondered if the pot had been bypassed because it had opened up.

An ohmmeter check suggested otherwise, though the resistance changed quite erratically as the pot was run through its range. Luckily, it was a simple matter to push the metal cover off the back of the pot—providing access to both sections. A puff or two of contact cleaner sprayed inside, followed by a vigorous working of the control, smoothed out the action quite nicely. Satisfied that the pot was OK, I returned the antenna connections to their normal configuration.



TO MAINTAIN PROPER APPEARANCE, the recapping project included the installation of two dud replacement screw-mount electrolytics (lower-right corner of chassis) in the mounting holes for the original Philco units.

The other questionable area involved the filter caps. At some time in the past, the two individual 6-μF, 450-volt units had been replaced with a multi-section can (of war-surplus origin, judging from its markings). The wiring had looked quite suspicious at first glance, including

as it did a 750-ohm power resistor that had no place in the original circuit. The specs etched on the can looked suspicious, too, though it was hard to read them while the unit was still installed on the chassis.

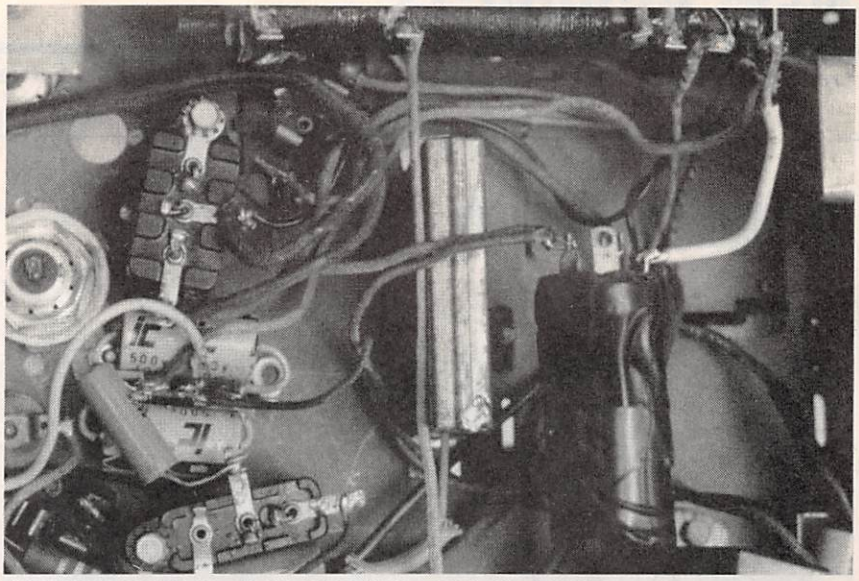
I didn't want to disconnect this cap until all of the bakelite block units were reconnected. I confuse easily and there were already entirely too many free leads floating around on the chassis! However, now I was able to look into the problem, so I quickly removed the wiring from the capacitor—noting the point where each lead had been connected.

With the cap removed from the set, I made an interesting observation. Though "+" terminals had been provided for three separate sections, the can contained only a single 10-μF at 450-volt unit. The codes for the two unused terminals were marked "0 μF—0 volts!" Yet the capacitor had been wired as if not one but two of the terminals were in use. The mysterious power resistor was connected between what was supposed to have been "B+" to the third dummy terminal. God knows how the radio sounded, or performed, with this strange lash-up.

My parts purchase for this set included two individual 10-μF at 500-volt tubular electrolytics. These tiny units are hardly larger than, say, the 0.01-μF bypass capacitors of 50's or 60's vintage. I mounted them on a small 3-terminal strip to facilitate wiring and found a spot under the chassis where I could tuck them in between other components using an existing mounting hole. Then I completed the wiring according to the Rider schematic.

For appearance's sake, I was interested in installing a pair of dud screw-mount can-type electrolytics above the chassis in the original mounting holes. My own junkbox was no help, but my friend Chuck Schwark, proprietor of the well-known "Philco Repair Bench" Web site (check it out at members.aol.com/caschwark/index.htm) came up with a couple of NOS (new old stock) screw-mount 10-μF Aerovox cans of the type that would have been used as replacements for the original Philco units.

They had dried out to the point where they couldn't be reformed, but were visually great! After I removed the rather garish Aerovox labels (the ossified glue made this one of the more difficult jobs, so far, in the restoration), the cans looked quite convincing, and almost like the originals.



THE TEMPORARY 10-μF ELECTROLYTIC CAN CAPACITOR can be seen wrapped in electrical tape at right. The two new electrolytics (one of which arrived defective) are at left, center. Above and below these caps are two of the rebuilt bakelite block units. The large nut that is just above left center retains one of the dud screw-base electrolytics.

Incidentally, Chuck also responded to the question I posed last time about the possible toxicity of the black waxy potting compound used in the Bakelite block caps. It's not dangerous at all, he says—just wax!

The Smoke Test

At this point, I couldn't see any reason why the set shouldn't be powered for its initial test. I facetiously call this stage "the smoke test," although, since my policy is to completely recap any set before initial start-up, the test is usually quite uneventful. Not so this time, however!

After flipping on the power switch, the voltmeter I had connected to monitor B+ quickly climbed to about 30 volts and stopped. At the same time, the surface of my workbench began to reflect a series of erratic blue flashes worthy of a pyrotechnics display! I hurriedly cut the power after tracing the source of the fireworks to the 80 rectifier tube.

I really couldn't believe there was a short in the wiring, and an ohmmeter connected across B+ read over 7K. Taking a look at the 80, I saw that its filament support structure had failed and pieces of the metal were floating around inside and resting on the plates of the tube. Most of the rectifier failures I've observed were signalled by a red glow coming from the overheated plates, not complete meltdown! So I began to think that maybe this problem was nothing more than a tube that had been seriously shaken up and damaged when the set was shipped to me.

After testing all tubes to make sure there were no other such problems (something I probably should have done earlier in the game), I decided to risk another 80. This time the ominous warning glow coming from its plates allowed me to shut off the power before the tube was destroyed.

I hoped I hadn't miswired one of the Bakelite block units or installed a faulty cap in one of them. That might have been a tough problem to trace! However, by isolating the power supply wiring from the set proper, I was able to determine that the fault was in the supply and not in the other circuits. It turned out that one of the new 10-μF electrolytics was leaky!!! Doesn't seem fair, does it?

Eureka!

Searching through my junk box, I found an old 10-μF, 450-volt unit in a fairly small can. Putting it through a "reforming" process (done by slowly upping the voltage while keeping the current under a milliampere or so, using the leakage test function of my cap tester), I finally deemed it usable at full working voltage. Wiring it into the set temporarily in place of the bad unit, I was now rewarded by seeing plate voltage rise to 350 or so and hearing an

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encouraging hum from the speaker.

With an antenna of perhaps six feet laid on the floor of my office and no ground, I was able to pick up a number of stations all over the tuning dial. Volume control was smooth and noiseless, indicating no problems caused by my having restored the original wiring. However, the sound seemed a bit sharp, even considering the ancient technology used to produce it. When I cut in the "bass" capacitor using the two-position tone control, the sound obediently dropped several octaves in pitch. However, it became so muddy as to be virtually unintelligible.

We'll have to check on the sound problem next. I want to take a look at the grid bias on the 47 output tube, and I'd also like to have the speaker reconed. The present cone is perfectly intact, but has been treated with so many coats of speaker cement that it is very stiff. Also on the docket for the next couple of columns is cosmetic cleaning of the chassis top, realignment, and (definitely my least favorite activity) cabinet refinishing.

In the meantime, your comments and queries are always welcome. Write me c/o **Electronics Now**, 500 Bi-County Blvd., Farmingdale, NY 11735 or e-mail me at mfellis@enteract.com.