Second Guessing the Experts

Modifications to the Collins 75A-1 Receiver

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"If I'd been designing it, I'd have done it a bit differently . . ."

DURING THE PAST DECADE there have been a few receivers that have been milestones in amateur history. In the early 30's the three tube SW-3 was developed and was an instant hit. It is still a popular receiver in lands where there are no kilowatt rigs just around the corner. The writer had excellent luck with one at FP8AC during the summer of 1950.

A little later the RME-69 was marketed. There was a time, on 14 mc fone, when "if one didn't own an RME-69, he just wasn't one of the boys". The HRO, the PR-10, the SX-28 and a very few others have proven to be outstanding performers, while many other models have simply faded away.

With the introduction of the new Collins 75A-2, tre 75A-1 has finally been outmoded and joins the parade of old favorites. Many hundreds of them are now in use, and their popularity is apparent when one notices the extremely short interval that they stay on the shelf at a second-hand radio store.

Once a receiver reaches this venerable stage, a rash of articles appear in amateur magazines telling how the particular receiver can be "hopped up" or otherwise improved over the basic design into which the manufacturer undoubtedly poured thousands of dollars and many man-hours of engineering time.

This article, therefore, is a short story of how to "improve" the "now obsolete" 75A-1. It is a remarkable receiver, and a few moments spent roaming thru its innards will produce welcome results.

The Audio

1. The most commonly known modification to the 75A-1 is a slight operation upon its rather mediocre audio system. The boomy quality can be improved by placing a 10 μf 50 volt electrolytic condenser across the cathode bias resistor (R-51) of the 6V6 audio tube. Caution! On some models of the 75A-1 the standby switch is connected in series with R-51, thus breaking the cathode return of the 6V6. On these models the 10 μf condenser must go directly across the cathode resistor. If it is placed from cathode to ground and the standby switch is opened——po-o-oof! Better hook it up as in Figure 1.

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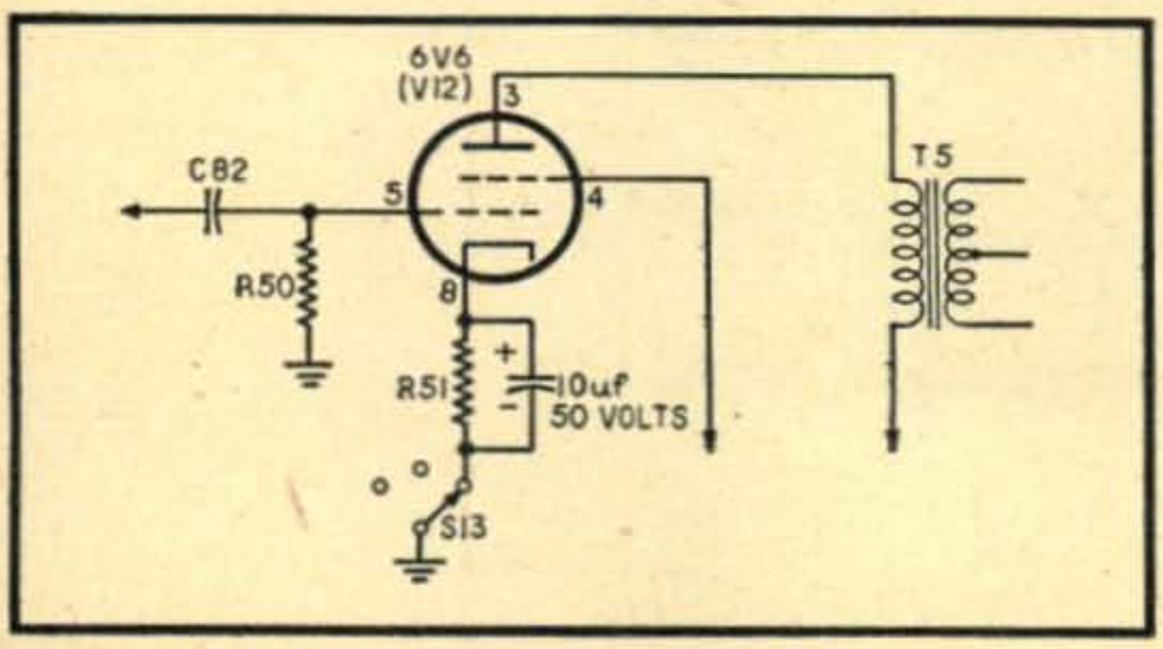

Fig. 1. Audio stage modification.

2. A second modification is to replace the second detector i.f. filter condenser (C-83), a .002 μf job, with a .0005 μf condenser. The .002 μf condenser is mounted on the back of the audio volume control and contributes mightily to the "Empty Barrel" effect so noticeable in the receiver. Reducing the value of this condenser restores a correct balance between low and high audio frequencies and makes voices sound much more life-like.

Fig. 2. The hopped-up 1st I.F. stage.

The I. F. Amplifier

1. This is an easy modification for you! Merely replace the 6SK7 tube (V3) in the tunable i.f. stage with a 6SG7 tube. You must re-set the zero adjustment potentiometer in the "S" meter circuit. You will immediately notice increased gain of the receiver and greater sensitivity of the "S" meter. No wiring changes are necessary.

2. If additional i.f. gain is desired, the second 500 kc i.f. stage may be opened up a bit. It is biased back rather heavily. On socket V7 replace R-30 (the 560 ohm cathode resistor) with a 330 ohm resistor of the same wattage. Replace R-32 (120,000 ohm plate resistor) with a 10,000 ohm resistor of the same wattage. Also, replace R-31 (screen resistor) with a 110,000 ohm resistor. These changes will give an appreciable increase in receiver gain with no danger of oscillation in the i.f. amplifier. See Fig. 2.

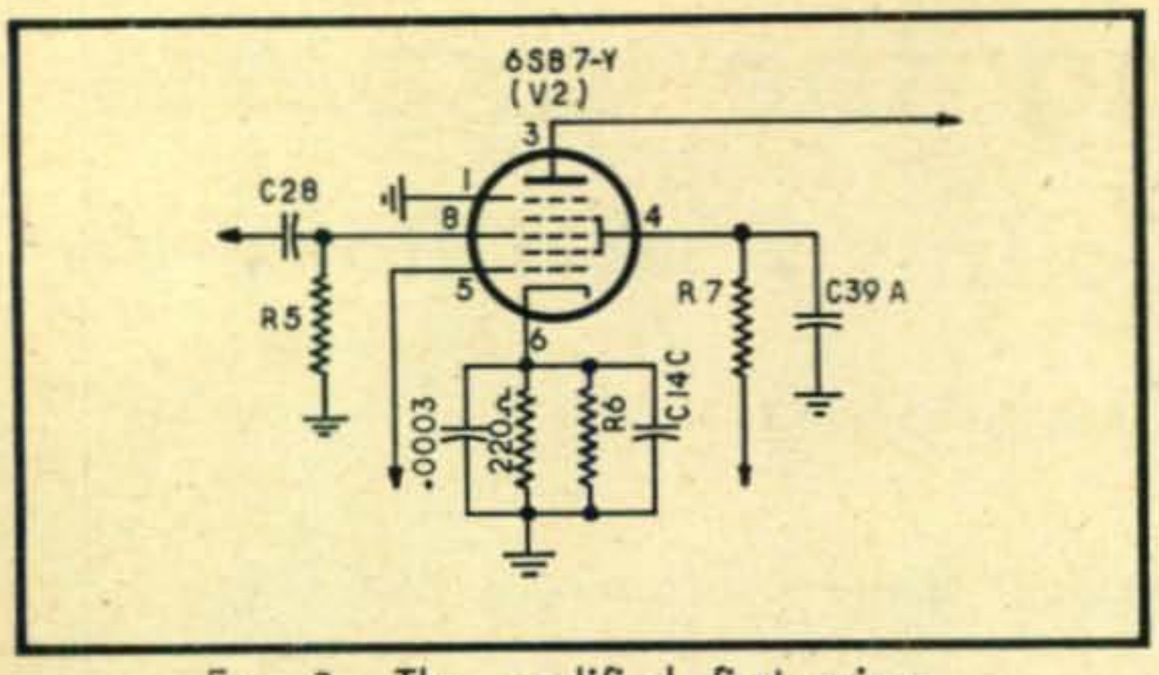

Fig. 3. The modified first mixer.

The First Mixer

A worthwhile betterment of the signal-to-noise ratio of the receiver may be had by substituting a 6SB7-Y for the 6SA7 (V2) mixer tube. To make this change efficiently the cathode resistor (R6) of the converter tube should be shunted with a 220 ohm, ½ watt resistor, and the cathode pin of the 6SB7-Y (pin 6) should be bypassed to ground with a midget .0003 μf mica condenser. This is in addition to the cathode bypass condenser that is already in the circuit. Keep the leads to this new condenser short! See Figure 3.

The R. F. Stage

Ah, here is where we really have ourselves a time!

I have noticed in months past that my 75A-1 had a very inferior signal-to-noise ratio on 28 mc. The results were far worse that the instruction manual would lead one to expect. As a last resort a 6J6 grounded-grid preselector was added to the 75A-1. This did the trick, but it looked like a wart on a dill-pickle. The receiver, by itself, was far better at receiving hiss than it was at receiving signals. Information was received from the factory that the input impedance of the 75A-1 on 28 mc was disgustingly high—something over 1500 ohms. Pity the poor man feeding this receiver with a coaxial line!

A long series of experiments was started and the combination of a new antenna coil and a 6AG5 r.f. amplifier tube turned the trick, making the 75A-1 into a superb 28 mc receiver. Here's how:

The Antenna Coil

The r.f. input circuit of the 75A-1 is unorthodox in that a common antenna and tunable grid coil (L6) is used on all bands. The input impedance of the receiver starts at a modest value of about 200 ohms on 80 meters and progressively grows with each flip of the bandswitch, reaching an unusuable value on the 11 and 10 meter bands. The solution is a new antenna coil of correct proportions.

Remove the bottom plate from the coil catacomb and examine the grid coil of the 6AK5 r.f. stage. (L6). It is a slug tuned coil. At the free end is a close wound coil of a dozen or so turns. This is the antenna coil, and it is connected to the antenna terminals of the set by two pieces of twisted hook-up wire. The grid coil is a spaced wound coil directly below the antenna coil, and separated by about ¼". Remove the two twisted leads that go from the antenna coil to the antenna terminals. The antenna coil is now left floating and a new antenna coil is wound, consisting of three turns of high-grade hook-up wire directly around the A.V.C. end of the spaced grid coil. These three turns are close wound directly over the last few turns of the grid coil. A long nose pliers will come in handy to pull the wire around the terminal stud on the coil form and the various other obstacles that prevent you from doing it easily with two hands. If you were smart you left enough wire on both ends of the new coil, to be twisted and to reach to the antenna terminals.

The input impedance will now be close to 300 ohms on 28 mc, 150 ohms on 14 mc, 75 ohms on 7 mc and 35 ohms on 3.5 mc. These are very handy values. 300 ohm line may be used on 28 mc and 14 mc, and 50 ohm coaxial line on 7 mc and 3.5 mc. I would still, however, frown upon the idea of feeding the receiver with coaxial line at 28 mc. Better use an impedance matching device between the coaxial line and the receiver.

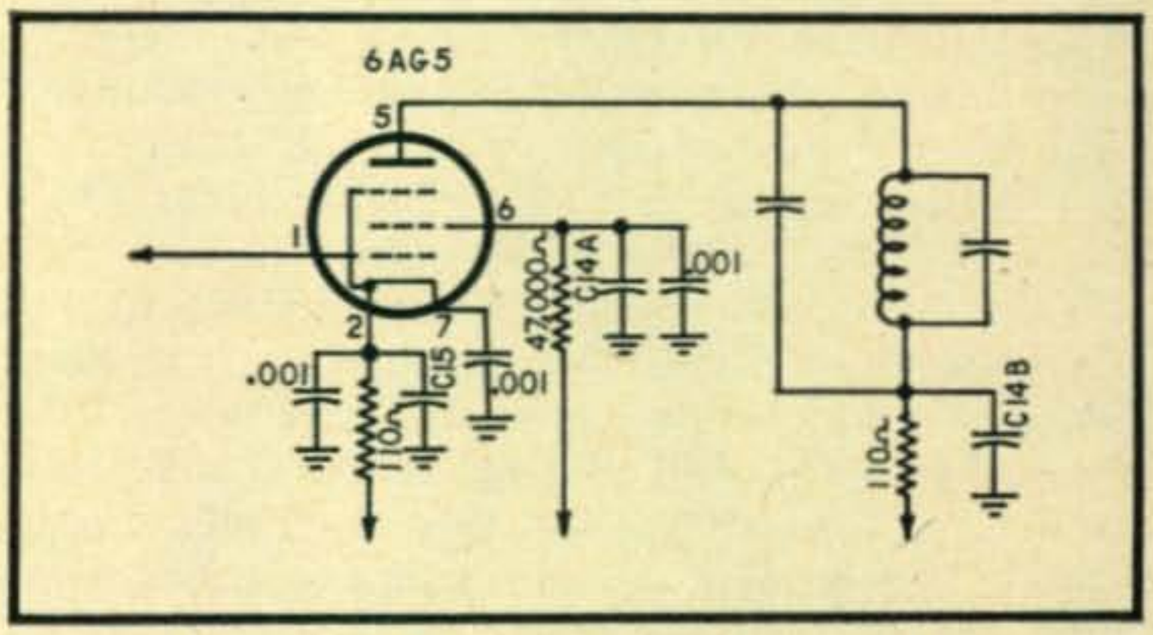

Fig. 4. The reworked r-f amplifier.

The R. F. Tube

Let us examine the 6AK5 tube. My experience with the garden variety or 69¢ surplus 6AK5 (now $1.89-Ed.) is that such an animal is good for about three or four months use, after which it starts to go soft. Experiment has proven that a 6AG5 tube is an excellent substitute for the 'AK5, giving longer life and a decidedly better signal-to-noise ratio. This change may be accomplished as follows; see Fig. 4.

1. By-pass pins 2, 6 and 7 of socket V1 (r.f. tube socket) directly to the socket shield with .001 μf "oyster shell" ceramic condensers, or very small .0003 μμf silver mica condensers. Either type is satisfactory. There is very little room atop the socket and care must be taken to place the condensers correctly to obtain short leads and to keep them from occupying the same space simultaneously! These condensers are actually in parallel with the condensers C15 and C14A that are already in the set. However these condensers in the set are oil units and are connected to their circuits with rather long leads, and their bypassing efficiency at 28 mc is somewhat open to question. The extra bypass condensers are needed with the 6AG5 to prevent oscillation.

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2. Replace cathode resistor R2 with a 110 ohm resistor. Replace screen resistor R3 with a 47,000 ohm resistor. Replace plate resistor R4 with a 110 ohm resistor. These resistors are all mounted on the fibre terminal strip next to the 6AK5 socket.

3. Replace the 6AK5 tube shield with the next larger size, as the 6AG5 is a taller tube than the 6AK5. You may also replace the 6AK5 crystal oscillator tube with a 6AG5 for uniformity. Either type works equally well here.

Alignment

The receiver should now be completely and carefully aligned according to the procedure outlined in the instruction manual. For most effective alignment a noise generator should be employed.[1]

Summary

The net result of all these changes is a receiver with excellent sensitivity and superior signal-to-noise ratio on all bands. It is now much more tolerant of various types of antennas, and weak signals stand out sharply above the background noise of the set. Each modification, in itself, may make only a slight improvement in the set, but taken as a whole, the series of changes produce an amazing improvement. The useable sensitivity on 28 mc is such that a preselector does no good, and my dill-pickle 6J6 preselector now rests in the junk box.

Here are some handy hints, as a closing shot, for 75A-1 owners:

1. Has your 75A-1 ever broken into wild oscillations at the high frequency end of the tuning dial? This is a puzzling phenomenon but very easy to cure. Loosen all the self-tapping screws on the bottom plate of the coil catacomb and retighten them. There is a chemical reaction that takes place between the steel bolts and the aluminum coverplate, and after a period of time the screws provide only a high resistance ground for the plate. Loosening and retightening the screws will clean the oxide and eliminate the trouble.

2. A 100,000 ohm potentiometer connected between pin 6 of the b.f.o. tube (V10) and ground is a very handy device for varying the b.f.o. injection. This is a nice touch when you are chasing the "weak ones" on c.w. The correct amount of injection is very important for weak signal reception.

3. When the time comes to replace the 6SJ7 in the variable oscillator, put in a 5693 "red" long life tube. It will last a good deal longer than a 6SJ7 and is a much more stable oscillator.

4. If you are not overly impressed with the noise limiter, remove the 6H6 detector/noise limiter tube and substitute a pair of 1N34 crystals mounted on an octal adapter socket. This provides much cleaner clipping on ignition noise.

5. You might try a Jensen "Speechmaster" speaker on the receiver. It sounds pretty nice.

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1 A Practical Crystal Noise Generator, By W. I. Orr, Radio & Television News, June, 1951.

LETTERS

(from page 6)

New Lenox, Ill.

Editor, CQ:

I was glad to read in the August issue of CQ that you are starting a Novice section. This interest is further strengthened by the fact that my son and I have just received our Novice licenses.

I was always interested in Amateur radio since high school but never took the steps necessary to become an operator, lack of funds being the primary reason.

Some months ago my boy became interested so we have been working together, with the most helpful assistance of the Joliet Amateur Radio Society. We took our examination in Chicago the morning of July 2nd (we were the first to arrive at the FCC offices), our licenses are dated July 17th, and you can imagine how we felt when the licenses arrived. My boy, Ronald, is WN9OGC, he is 16 years of age and will be a junior at the Joliet Township High School. My call is WN9-OFR.

It is needless to say that we are both diligently working on that code speed and studying theory with the Club in Joliet, hoping to take that next examination at the earliest possible time.

Thanks a lot for a fine magazine; it has been a great help to us. We will be looking forward to this Novice section.

R. Melvin Whitaker, WN9OFR

Help Wanted

Bridgeville, Del.

Editor, CQ:

Can any of my fellow readers of CQ help me on the following? I have an Electronic Labs "Master Utiliphone," Model 2660B, which has become inoperative. The original manufacturer is no longer in business, so I am unable to get a schematic or suggested service procedure for this unit.

Geo. V. Ruos