The Communications Receiver
A Depression-Era Receiver For The Beginning Amateur

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*T*he Great Depression, which began in 1929, was the worst business crash in United States history. While the entire industrialized world was affected, the U.S., with its modern economy, was hit especially hard. Business activ

In spite of this gloomy situation, some of the companies in the emerging technologies of aviation and radio managed to survive. But the average citizen had a very hard time of it. With little or no spare cash, Joe Ham had to resort to the simplest equipment for his radio amateur activity. Fortunately he had the *ARRL Handbook* to guide him, and one example of amateur receiver simplicity appeared in the editions of the mid-1930s.

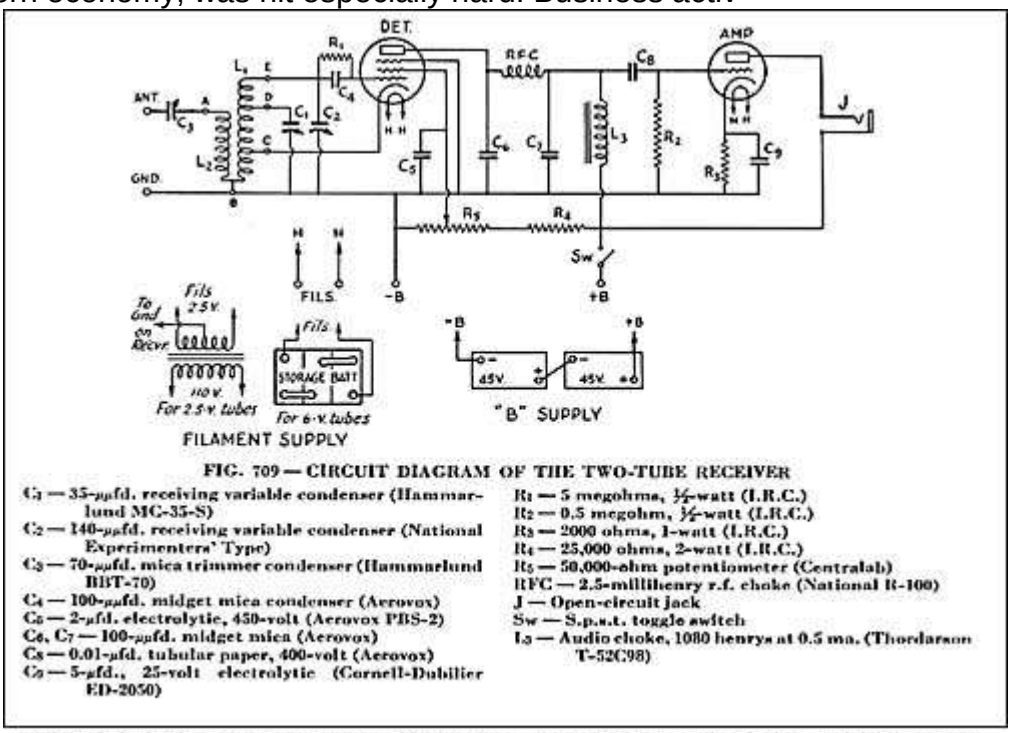


FIG. 709 — CIRCUIT DIAGRAM OF THE TWO-TUBE RECEIVER

C_1 — 35-μμfd. receiving variable condenser (Hammarlund MG-35-S)
C_2 — 140-μμfd. receiving variable condenser (National Experimenters' Type)
C_3 — 70-μμfd. mica trimmer condenser (Hammarlund BBT-70)
C_4 — 100-μμfd. midget mica condenser (Aerovox)
C_5 — 2-μfd. electrolytic, 450-volt (Aerovox PBS-2)
C_6, C_7 — 100-μμfd. midget mica (Aerovox)
C_8 — 0.01-μfd. tubular paper, 400-volt (Aerovox)
C_9 — 5-μfd., 25-volt electrolytic (Cornell-Dubilier ED-2050)
R_1 — 5 megohms, ½-watt (I.R.C.)
R_2 — 0.5 megohm, ½-watt (I.R.C.)
R_3 — 2000 ohms, 1-watt (I.R.C.)
R_4 — 25,000 ohms, 2-watt (I.R.C.)
R_5 — 50,000-ohm potentiometer (Centralab)
RFC — 2.5-millihenry r.f. choke (National R-100)
J — Open-circuit jack
Sw — S.p.s.t. toggle switch
L_3 — Audio choke, 1080 henrys at 0.5 ma. (Thordarson T-52C98)

Original schematic and parts list from 1938 ARRL Handbook construction article.

It is interesting to follow the evolution of this little set, which initially reflected the close working relationship between James Millen of the National Company, and the ARRL. (The writer was told by Millen, for example, that layout work on *QST* often was done on the large ping-pong table in his outside radio building.)

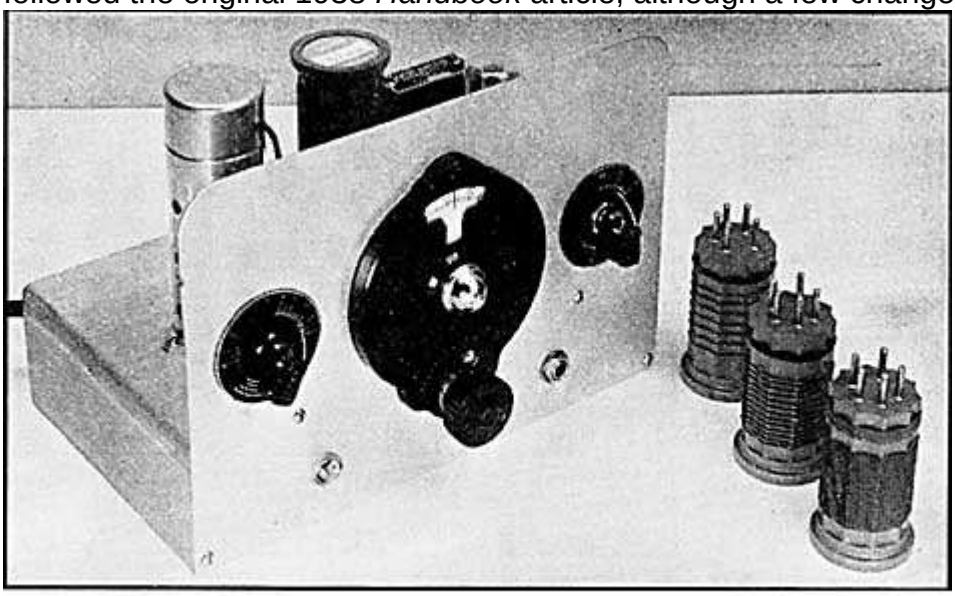
In the 1935 *Handbook* version the extensive use of National parts is obvious. By 1938, however, with essentially the same circuit, construction was considerably simplified. The only National parts used were a dial and capacitor. The expensive National S-101 audio coupler was replaced by discrete components of similar value

and the complicated National cabinet by a simple aluminum panel and a wood chassis.

The basic circuit is a pentode regenerative detector, with a triode audio amplifier providing useable headphone volume. Depending on the tubes, the filaments could be powered by either batteries or an AC supply, while a 90-volt B battery supply was recommended. One departure from the 1935 circuit was that a primary antenna winding was added to the coil.

This circuit was hardly new in 1935. The National SW-3 receiver, similar except for its R.F. stage, was already well established in the market. With an added R.F. stage, the little *Handbook* radio could rival the SW3's excellent performance and, with an added audio stage to drive a speaker, might even outdo it.

This particular receiver was purchased by the writer at the AWA Conference flea market a number of years ago. It had been built recently by an AWA member, and I was immediately impressed by the beautiful workmanship. Last month I studied the set with the idea of presenting it in this column. I found that construction generally followed the original 1938 *Handbook* article, although a few changes were noted



The finished receiver as shown in the 1938 Handbook.

An aluminum chassis had been used instead of the depression-era 1/2" wood platform originally called for. Also, the tube and coil sockets were mounted above the chassis on 1" standoffs, wiring from them passing below the chassis through 1" holes (I surmised that the constructor didn't have a large enough socket punch.).

The 70uuF. antenna compression trimmer had been replaced with an APC variable for better stability. The Thordarson 1080 henry audio choke apparently was not available. He had replaced it with a look-alike audio transformer, using one winding as the choke. While the inductance was much less than called for, it did seem to work.

While the coil could remain as mounted, I preferred to have the tube socket connection lugs below the chassis in the usual manner. Since I had the correct chassis punch this change was made. The two electrolytic capacitors and the audio-coupling capacitor were bad, and were replaced. The 5uF. audio cathode electrolytic was replaced with a 10uF. unit, since that was what I had available. Not

having the 2uF. cap for the detector screen circuit and questioning the need for that value, I researched other, similar designs. I ended up using a 1uF. capacitor, which seemed adequate to protect the screen from audio modulation. The coil connections were checked and all were in order. The tubes used to match my six-volt power source were a 6C6 and a 76.

The set was powered up using my Heath AC bench power supply, an IP-32 with a variable B+ control. The B+ was set at 100 volts, and surprisingly the set worked on the first try. The coil was marked 5-15 mc, but actually tuned from 5.5 to 14.5 mc. Numerous strong stations came in around 9.5 mc, using just a 15-foot antenna strung across the basement ceiling. There was some tunable hum from the power supply. With a pure DC supply as originally called for, performance might be better.

Author's flea market find is very similar in appearance to the Handbook version.

This particular radio could use some more work to optimize the components to get the sensitivity and reliability that is needed in even a simple communications receiver. Not only the values, but the various grounds need to be examined. One technique is to use a common ground bus, and not rely solely on the chassis. Most important, high-impedance headphones are necessary. If these oldies are not available, the modern low-impedance types should work if fed through a standard audio output transformer.

Look back to the depression years of the 1930s and imagine that you are a teen-ager with few or no financial resources. But you are enamored of radio and you want to build this receiver, especially since the Handbook article promises that it will be entirely satisfactory to receive the amateur and other short-wave bands.

A friendly radio repairman has given you some hints on winding coils, arranging shielding, etc. You have wood from apple crates, some pieces of tin, and a few

battery sets to scrounge parts from. The audio choke is replaced with an old audio transformer, with the windings series-connected. The dial is a challenge, but you get a vernier movement somewhere. There is no aluminum for the front panel, but a piece of 1/4" wood backed by tin should work. Surprisingly, with a bit of help from your "Elmer," the thing gets built, it brings in signals, and the world opens to you.

The next two years are full of discovery of the wonders of amateur radio. When World War II begins, you enlist in the Marines and are immediately made a sergeant because men with radio experience are in short supply. (This anecdote is factual; it actually happened to a friend of the writer.)

Modern writers often revisit the fascinating subject of simple regenerative receiver circuits. For example, read the series of articles by Bruce Vaughn, NR5Q in Electric Radio. He is one of the experts on the subject, having built so many over the years that he has probably lost count. One good reference is his excellent paper on debugging of homebrew regenerative receivers (ER No. 134, June, 2000). After reading this, one wonders how 1930s constructors were able to get the darned things working at all!

Another excellent source of information is author Bob Dennison, W2HBE (for example, see ER No. 137, October, 2000) who has written extensively on the subject of regenerative receivers.

Finally, a question: Has anyone else out there built this little receiver? If so, I would be very interested in hearing of your experiences. I can be reached via Email at w2dgb@ptd.net.