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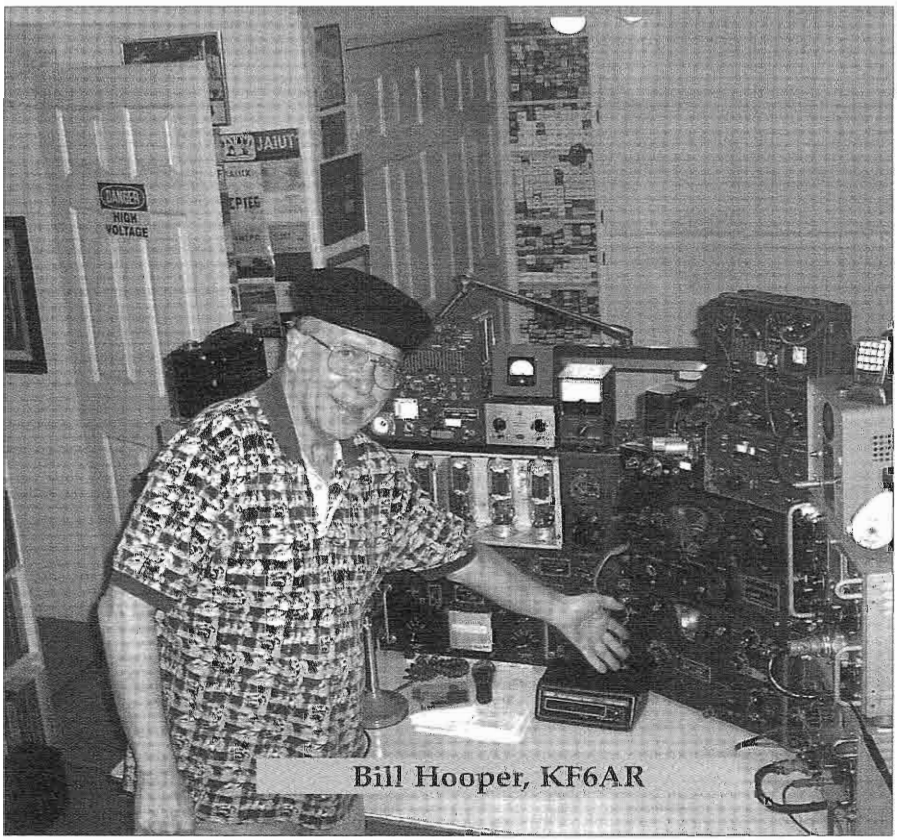
ELECTRIC RADIO

celebrating a bygone era

Number 180 May 2004



Bill Hooper, KF6AR

ELECTRIC RADIO

published monthly by Symbolic Publishing Company
PO Box 242, Bailey, Colorado 80421-0242
Periodicals postage paid at Cortez, CO
Printed by Southwest Printing, Cortez, CO
USPS no. 004-611
ISSN 1048-3020

Postmaster send address changes to:
Electric Radio
PO Box 242
Bailey, CO 80421-0242

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Electric Radio is dedicated to the generations of radio amateurs, experimenters, and engineers who have preceeded us, without whom many features of life, now taken for granted, would not be possible. Founded in May of 1989 by Barry Wiseman (N6CSW), the magazine continues publication for those who appreciate the intrinsic value of operating vintage equipment and the rich history of radio. It is hoped that the magazine will provide inspiration and encouragement to collectors, restorers and builders.

We depend on our readers to supply material for ER. Our primary interest is in articles that pertain to vintage equipment and operating with a primary emphasis on AM, but articles on CW, SSB, and shortwave listening are also needed. Photos of Hams in their radio shacks are always appreciated. We invite those interested in writing for ER to write, email, or call.

Regular contributors include:
Bob Dennison (W2HBE), Dale Gagnon (KW1I), Chuck Teeters (W4MEW), Bruce Vaughan (NR5Q), Bob Grinder (K7AK), Jim Hanlon (W8KGI), Brian Harris (WA5UEK), Tom Marcellino (W3BYM), John Hruza (KBØOKU), Bill Feldman (N6PY), Hal Guretzky (K6DPZ)

Editor's Comments

Vintage Field Day

The annual Electric Radio Vintage Field Day will be held the first weekend in June, the 5th and 6th. I've heard from many operators who are planning on setting up for the event, and it should be fun for everyone who is able to participate. Listen for Bill Feldmann (N6PY) who is planning to operate his ART-13 from a 9000 ft. location near his home. I am planning to set up a vintage station at a high location in Central Colorado, and I hope the weather cooperates this year. We will operate on the traditional AM frequencies, which are listed on page 45 of this issue. Vintage Field Day will begin at 8:00 AM Pacific Time, or 1400Z, and run until Sunday noon, 1800Z.

EF Johnson Closing

From Bill Knish (W9ALD) comes word of the end of an era in Waseca, Minnesota, with the closing of the EF Johnson manufacturing facility. The announcement has come just six months after the company's big 80th anniversary celebration in October, 2003. The effective closing date will be March 31, 2005, and layoffs of 139 long-time employees will begin in June, 2004. The new management of the EF Johnson Company plans to move to its new Irving, Texas, facility and turn EF Johnson into a software and marketing company. This is a major economic blow to the community of Waseca, and to the State of Minnesota. Apparently there are no current plans to outsource manufacturing to China, although offshore manufacturing is still under consideration.

Edgar Johnson founded the company in 1923 when he began to sell radio receiver kits from his father's woodworking store in downtown Waseca. The business was slow but successful, and by 1936 Edgar and his wife Ethel had opened a downtown factory and office building with 17 full-time employees. E.F. Johnson was critical to the manufacturing effort during World War II, and had expanded to over 500 employees during the period. I don't know what our

[Continued on page 13...]

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Cover: Bill Hooper (KF6AR) is proudly pointing out the vintage military station he uses on 1945 kc. The equipment is a BC-375E and two receivers, the BC-342 and BC-348. Designed in the 1930's and still in use in the 21st Century!

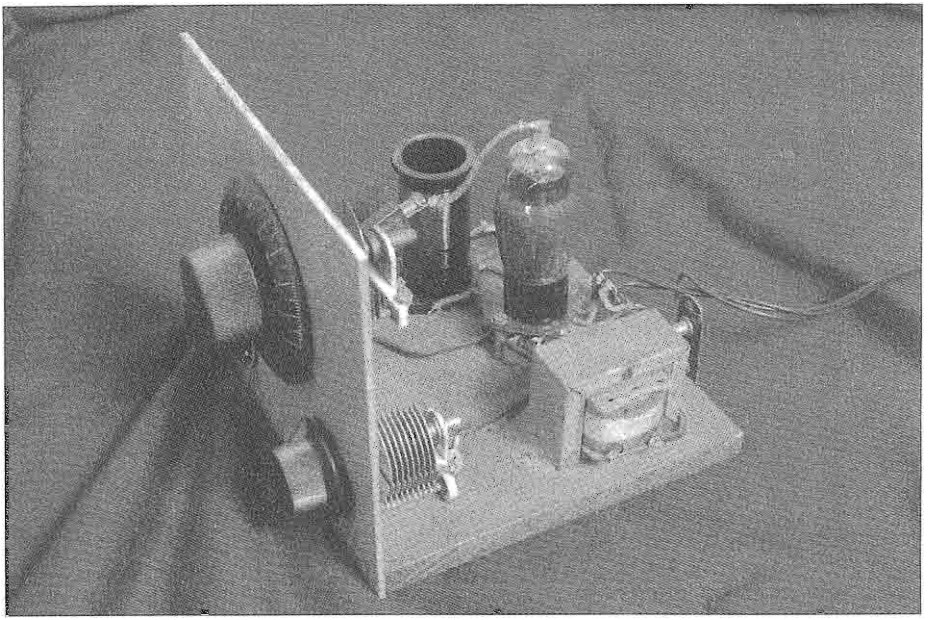
A 1938 One Tuber Remembered

By Chuck Teeters, W4MEW
110 Red Bud Lane
Martinez, GA 30907
Photography by Reggie Frazier, KG4HAD

Did you ever run across something that triggered your memory but you couldn't come up with what that something was? In my most recent senior moment, the something was at the Shelby, NC, hamfest. Sitting on the ground in the boneyard was a 7" by 7" breadboard with an aluminum panel. It had three variable caps, an empty octal socket, a plug in coil, a transformer, a bit of wiring and a cut off cable with years of dust on the whole works. I was positive I recognized that breadboard as something I had seen lots of times before, but it was going to take a while for my memory to clear up. In the meantime, I asked the seller what it was, and how much did he want for it. He didn't have the slightest idea what it was, as he had picked it up with a bunch of stuff at auction. Apparently in a good mood from previous sales and ready to depart, he added if I wanted it I was welcome to it.

By the time I got home to Augusta, I was chomping at the bit to look through my old Ham shack photos, but nothing in the pictures of my Ham stuff through the years provided any clues. With the breadboard on the shelf in the shack, I spent several days looking at it and thinking about it, but the memories would not come into focus. I knew I had seen it lots of times years ago, but couldn't remember when or where. The third day I put it on the workbench, cleaned it up, and checked out the wiring. I was sure it was a regenerative receiver and that's what it checked out to be. A band set variable cap in parallel with a three plate band spread variable on the front panel were connected across the coil and they grid dipped between 1.5 MHz and 2.8 MHz, the top end of the BC band and 160 meters. The third variable on the front panel was obviously the regeneration control as it connected to the tube socket but something was cut out and missing. By checking the connections to the empty octal socket, I could positively identify the filament, cathode, grid and plate connections but still had three connections left over.

Time to get out a tube manual; so keeping with my estimate of the mid thirties as the age of the regen, I pulled my 1938 ARRL handbook off the shelf. Looking over the octal socket connections I found two tubes that fell in line with what I had identified, with the three extra pins turning out to being a second triode in the same envelope. The two possible tubes were a 6C8G and a 6F8G, both twin triodes. The 6C8G was familiar, as I had used one back in the thirties. I had used it as an electronic mixer in an audio amplifier I built, and then in a regenerative receiver. The receiving tube charts in the old handbooks were at the front of the Receiver Construction Chapter, and when I flipped over a few pages there it was, "A ONE TUBE REGENERATIVE RECEIVER". There were two pictures of my hamfest find, with a neater wiring job and with a National BM vernier dial but almost a dead ringer for my hamfest find. No wonder I remembered it so well, as the one tube regenerative receiver in the ARRL handbook was a reprint of the June, 1938,



The 1938 one-tube regen receiver from QST was found at the Shelby, NC, Hamfest last year and restored as described in the text.

QST with the same pictures and text, and that QST was what I used to build my 6C8G one tube regen. I must have looked at those pictures and text a hundred times in 1938 when I built my first Ham receiver. I built mine on an old Spartan BC set chassis I had cannibalized for parts so mine didn't look anything like the QST model, but it worked, and the Spartan dial drive provided a great tuning dial.

I used the regen receiver for code practice until I bought a used Hallicrafters S-14 Sky Chief later that year. I remember the one tuber as working well on 160 meter CW, however when I got the S-14 I was in hog heaven, with a calibrated and illuminated dial, volume control, magic eye, or cats eye as some called them, tuning indicator, and a loud speaker. The regen receiver was relegated to the junk box and forgotten for 66 years. But here was my chance to rebuild this one to look like the one Tom Ferrill had built in the ARRL lab for the 1938 QST article and find to out how useable it really was. Ferrill worked for the ARRL in West Hartford as a technical assistant but was not licensed when he built the receiver. I guess he built the one tuber to practice copying code and that's what I used it for.

A trip to the attic and I had my June, '38, QST in hand, complete with a picture of Tom Ferrill on the cover. He was working on a transmitter so he must have gotten his ticket. On the other hand he was now identified as being in the Editorial Department at QST so it makes you wonder. A check of my tube stock turned up a 6F8G, a medium MU twin triode, which was what Ferrill recommended for his receiver. The 6C8 that I used in 1938 is also a medium MU twin triode. The only significant difference is the filament current of the 6F8 is 6/10 of an amp, twice that-of the 6C8. However, Ferrell's article in the June, '38, QST recommended running the 6F8 filament at half voltage, so the filament differ-

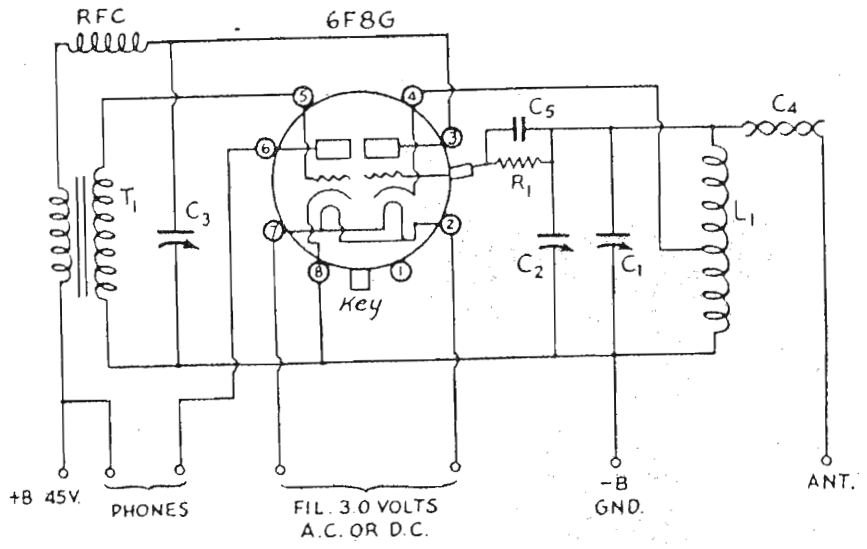


FIG. 1—CIRCUIT DIAGRAM OF THE ONE-TUBE RECEIVER

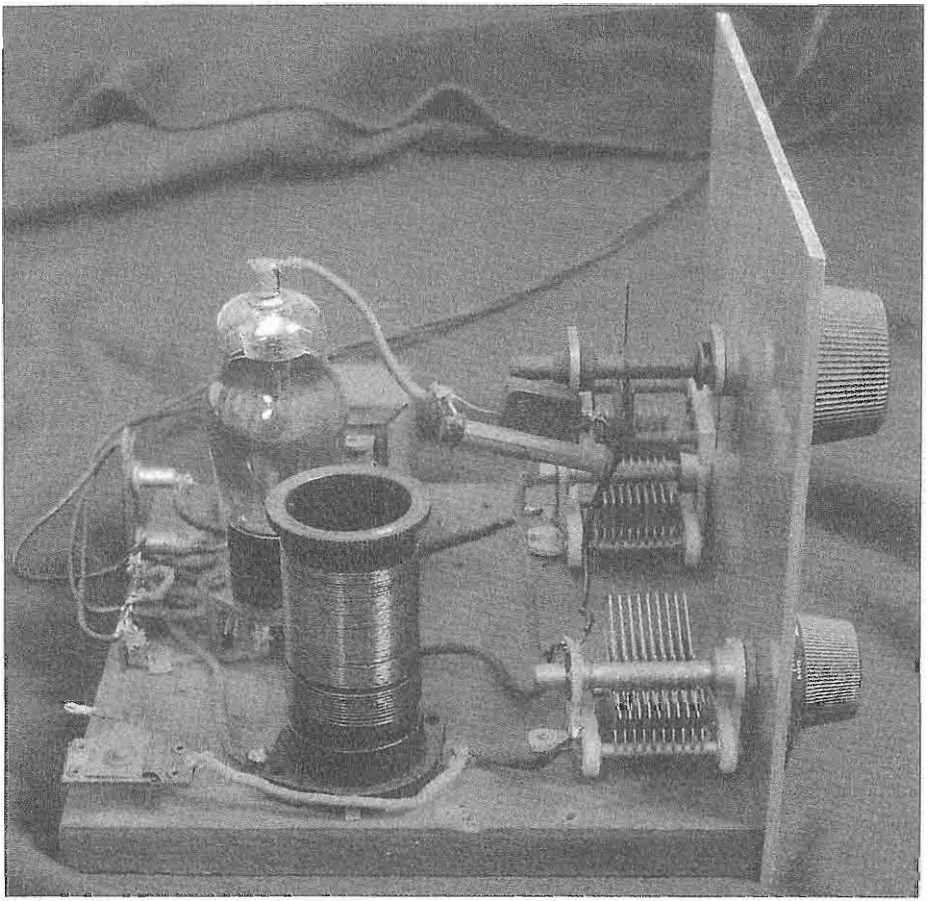
C_1—*75-μμfd. band-setting midget condenser (Cardwell ZU75AS).*
C_2—*10-μμfd. band-spread midget tuning condenser (Cardwell ZR10AS).*
C_3—*75-μμfd. midget regeneration control condenser (Cardwell ZU75AS).*
C_4—*Insulated wire-ends, twisted (see text).*
C_5—*0.0001-μfd. fixed mica condenser (Aerovox).*
R_1—*2-megohm, ½-watt resistor (IRC).*
RFC—2.5-millihenry choke (National R-100).
T_1—*3:1 audio transformer (Thordarson T13A34).*

June, 1938

The circuit diagram of my receiver from June, 1938, QST.

ence is nullified, and running the receiver from commercial power who cares, you are not going to kill any batteries. A check of the breadboard showed only one missing component. The 2-½ mH radio frequency choke was gone. Ferrill called for a National R-100, so since I happened to have one in the junk box, in it went.

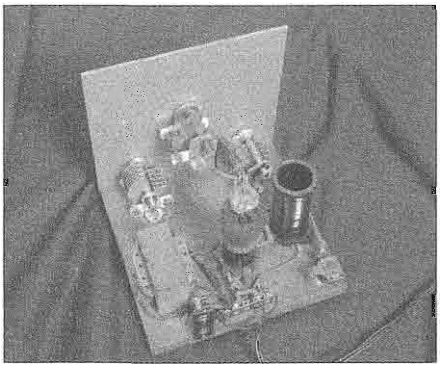
The builder of my one tuber didn't copy the mechanical details of the 1938 article exactly. Ferrill had used angle brackets to hold the front panel in place. Mine had the band set and regen caps lowered to sit on the breadboard and provided the support for the panel. It had a knob on the bandspread tuning, not a vernier like the QST one, so I



This view of the left side of the 1938 QST receiver project shows elegant simplicity and a classic design.

mounted a Pilot 10-to-1 vernier, which was similar to the national BM. The builder of mine had installed a compression trimmer for the antenna coupling instead of using a twisted wire capacitor. Also, several insulated staples were used to hold wires in place. The cut off power cord was replaced and mated to an old power supply I had. My supply was 6 VAC and 105 DC, and I left it that way for the initial tests. Ferrill had recommended using 45 volts on the plate, but I would try this out the way the power supply was set up.

I have a high impedance Brandes headset with pin jacks, so they were plugged in, a long wire was connected to the antenna terminal, and we were off. Some hum in the headset was heard, but nothing more. Touching the grid of the audio amplifier side of the 6F8 gave me a lot more hum so the audio amplifier was working. Some checks of the continuity of the regenerative side showed no continuity between the coil tap and the cathode: Bad solder connection on the coil tap at the coil socket. A repair job and I had regeneration with the regen cap about ¾ open. Setting the tuning cap closed put me in the broadcast band and I heard several lo-



This top view of the receiver may be used as a parts placement guide.

cal stations. In typical regen fashion, running the detector up close to oscillation but not quite into oscillation there was plenty of gain on the AM stations. Putting the detector into oscillation, there was a strong beat note the way it should be. It was not smooth going in and out of regeneration however. It was like a grinding noise when shifting a manual transmission without the clutch. I dropped the plate voltage down almost to 20 volts before it started going in and out with a single plop. Of course the gain dropped also, so I cut the filament voltage to 3 volts. Now I could bring the plate voltage back up to 45 volts and keep a smooth change going in and out of detector oscillation. Adjusting the antenna coupling to a minimum let me bring the voltage up to 65 volts. I now had some real gain with nice control of the regeneration.

If I had followed Farrell's original 1938 instructions, I would have used half voltage on the filament in the first place. Also, if it were not so much trouble, I would have moved the coil tap down a few turns. This might keep the regeneration nice and smooth with a higher filament and plate voltage and even more gain. As it is, however, there is plenty of headphone volume on 160 meters and the broadcast band. If I wind some other coils I might make the change.

Some day I will wind a 20-meter coil to compare the one tuber to my SW-3. The National does a good job on 20 SSB, but I doubt if the one tuber could. It does OK on 160 SSB, but likes to lock on the strongest parts of a S9 signal. It takes very careful tuning with decreased sensitivity by running the regen control past the optimum point to copy SSB. There is no problem with CW however, but again if there is a strong CW signal it will lock in almost to zero beat. The National's RF stage with its gain control takes care of these problems, thanks to the great engineering of James Millen. Using the one tube regen sure reminds you in a hurry of the difficulties of operating a regen. You use one hand to tune and the other to adjust the regeneration, since it changes as you tune. A strong signal and you have to decrease the antenna coupling to get it in and out of regeneration, and any movement of the antenna and you start all over.

Aggravating as the receiver is, using it has been the most fun I've had in years. The receiver has dusted off lots of forgotten memories about my younger days in my attic shack in Buffalo, New York. The one tuber was at the start of my route to getting W8JWK. I wonder how Tom Ferrill made out. I don't remember seeing his name in QST with a call sign attached, nor do I remember him showing up after the war, but if you are still around Tom, thanks for the nice start you provided a young Ham hopeful.

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Restoring A Pair Of Hallicrafers SX-62's

By Larry H. Will, P.E., W3LW
1055 Powderhorn Dr.
Glen Mills, PA 19342

Introduction

The Hallicrafters SX-62 and SX-62A were, at least in my opinion, built as "parlor" radios designed for casual listening. They date from the late 1940's and feature wide frequency coverage continuous from 0.54 to 108 Mcs, variable bandwidth, and actually have a BFO. They have no bandspread function for ease of tuning in crowed bands. They do tune both AM and FM. The set uses a 10.7 Mcs IF on bands 5 and 6 (28 to 108 Mcs) and can tune either AM or FM in this region.

I received the SX-62A receiver from my good friend Lew, W1LI. That receiver was stored in his barn in Maine for most of the last 30 years. It is the "universal" model with a 115-240 V switch selectable power transformer. The second one, the older SX-62, I found along a road on trash day, but that's another story. Both radios have push-pull 6V6 audio output stages with negative feedback. There will be more on that subject later. The SX-62 series does not have an S-Meter or a discriminator meter for FM. The band-select knob style varied over the production cycle. Earlier radios had a bar type knob and the bands were labeled on the front panel. Both of my radios do not have the bands labeled on the front panel

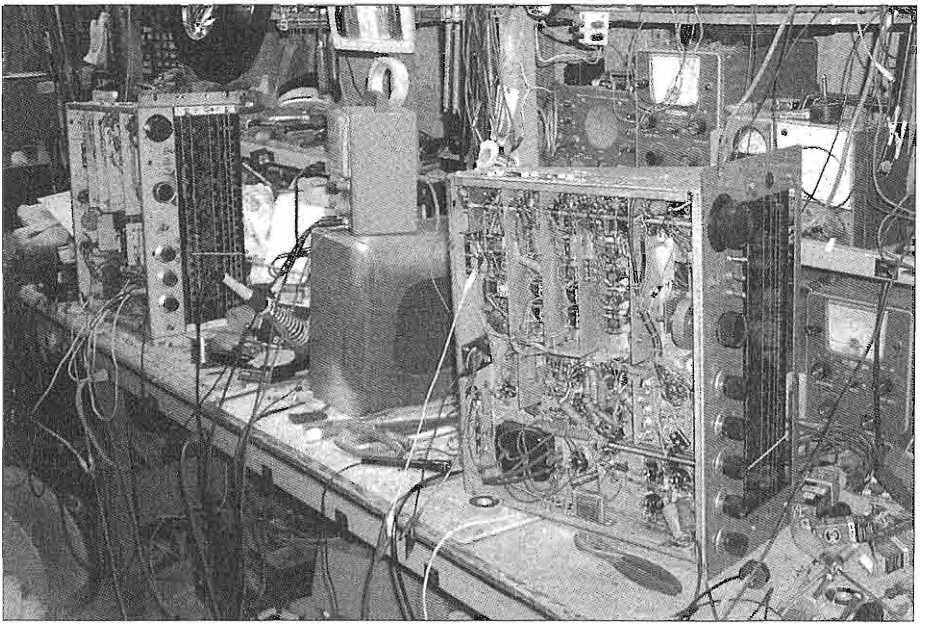

Figure 1: This is a picture of both receivers taken just as testing began.

and they use a round knob identical to the main tuning knob. Only the SX-62A had the correct band select knob as received. However, the metal insert ring was not present on two of the three larger knobs on hand.

Both radios sat in my basement for the last year or year and a half or so. Having two to work on at once, as it turned out, made the job easier.

Initial Testing

As shown in **Figure 1**, both radios were put on the bench, and much to my surprise, both of them worked after a fashion, at least on the lower bands. Both radios had missing front dial glass and the SX-62 from Maine had noticeable cracking of the black paint on the back of the glass tuning dial itself. The long dial pointer was also missing on this radio and was replaced with a new piece of 0.047 wire soldered to the pointer guide and painted gloss white with enamel. Initially, the older SX-62 appeared to work somewhat better than the SX-62A. Both receiver cabinets need a complete restoration and painting and this cabinet restoration is not completed as of this writing.

As in other recent receiver restorations, I decided to replace only those parts that were actually failed or out of tolerance. I think that one can do more damage replacing everything whether it needs it or not. For example, miniature tube socket pins with 3 or more wires properly crimped and attached make for a challenge for "safe" parts removal without breaking the tube socket pin. The 12-wafer bandswitch and associated wiring in the SX-62 makes servicing the RF, mixer, and oscillator sections very difficult at best. A complete disassembly is almost impossible in this area.

To make the job easier, I had several versions of the manual. I had the SAMS Photofact® for the SX-62, the Rider SX-62 diagrams, and I had downloaded both the SX-62 and SX-62A manuals from the BAMA internet site and I had made extra copies of the schematics to make troubleshooting easier. I spent some time reading all of the manuals; familiarizing myself with the differences between the models before I started on the restoration. I decided that the initial restoration would be to original factory specifications.

Restoration

Both radios were worked on simultaneously. What I found was that, especially with the SX-62, the real problem was many out of tolerance (over 20% high) resistors rather than very many bad capacitors. Only a few of the brown Aerovox waxed paper capacitors in the older unit were leaky and needed replacing. The trusty old Heathkit® C-3 capacitor checker or the RCA Senior Voltohmyst® on the Rx1 Megohm scale come in handy here. Most of these questionable capacitors were in circuits were HV was present or in the high impedance AGC circuit and had enough leakage to cause problems. This condition was most noticeable in the IF tube screens. Because of the leakage causing excessive current in the screen dropping resistor, some of the IF tube screen dropping resistors were quite high in value and were replaced. A new old stock "FP" can electrolytic main filter capacitor was installed in the SX-62. All the bad capacitors in the receivers that were leaky were replaced with new 630-volt axial lead units and spaghetti sleeving.

The newer radio had what looked like "Black Beauty" caps but they actually were the later "CUB" units manufactured by Dubilier. I found none of those to be bad even though some of them looked kind of awful.

The front panels were removed completely and the entire mechanical system for the band select and tuning was disassembled and cleaned and lubricated with WD-40 type light oil. De-Oxit® was used on all the switches and

some tube sockets. After cleaning, the main tuning dials on both receivers "spun" and tuned like one would expect.

On the older radio in initial testing, it appeared that the 8 gang main tuning capacitor was erratic, especially on the higher bands. I carefully removed the main tuning capacitor and completely cleaned and re-lubricated the unit. My old time American Beauty soldering iron made ground strap removal from the chassis easy. As a result of taking out the capacitor, the spring loaded gear drive had to be re-loaded upon re-installation. Patience and a small C-clamp to hold the pre-load setting are the words here but it can be done. The dial cords, there are two, had to be re-strung as discussed below.

Audio Circuits

The SX-62 and SX-62A use a pair of 6V6's resistance coupled from a 6SL7 for the audio stages. The 6V6's take an audio feedback signal from the SECONDARY of the audio output transformer to apply both inverse (negative) feedback and variable, switch-selected tone control to the 6SL7. This circuit depends upon the relatively high audio voltage derived from the 500-ohm output tap from the audio output transformer for proper operation. The SX-62 used an output transformer with a 5000 and 500-ohm secondary typical of early Hallicrafters. The SX-62A normally uses a transformer with 500-ohm and 8 and 3.2-ohm outputs.

Many times these transformers have failed and have been replaced, as was the case with my SX-62A. In order to get correct operation of the feedback and tone controls, the replacement transformer must have a 500-ohm (or thereabouts) output. The SX-62A replacement transformer only had a single 8-ohm secondary and neither the tone control nor the feedback was correct. The lack of proper feedback caused higher than normal gain and distortion and no bass boost in that tone control position. To solve this I ordered a Hammond general-purpose universal P-P audio output transformer, which can match up to 16 ohms for the speaker, and a second speaker-to-line transformer just to make the 500-ohm level needed for the feedback. These two transformers together restored the audio stages to correct operation and give me the option of using either a 500-ohm or low-z speaker on that receiver. The other receiver with 500 and 5000-ohm outputs uses an external line-to-speaker transformer for proper operation.

Based on measurements on the SX-62 with the correct audio output transformer, the approximate proper audio feedback occurs when, with a moderate volume setting, audio at about 50 V peak-to-peak appears on the feedback line to the tone control switch. Low audio at this point results in excessive gain and distortion in the audio amplifier and too much audio at this point results in a muddy sound and excessive bass boost. A squeal indicates the feedback is positive and the leads from the two 6V6 plates should be reversed. A noticeable but not excessive increase in bass response should occur when the tone switch is set to the "bass" position.

The coupling capacitors from the 6SL7 plates to the grids of the 6V6's should be checked very carefully for leakage. Any leakage will cause a reduction in bias on the 6V6 grids, which will cause them to run hot and operate with increased distortion. A good rule of thumb is if the 6V6 grids read positive to ground with a VTVM (at least 11 megs input R), the capacitors should be replaced. In the older SX-62, almost every resistor around the 6V6's was out of tolerance (high by 20-100%) and had to be replaced. Some of the resistors around the 6SL7 were also high in value and these too were replaced.

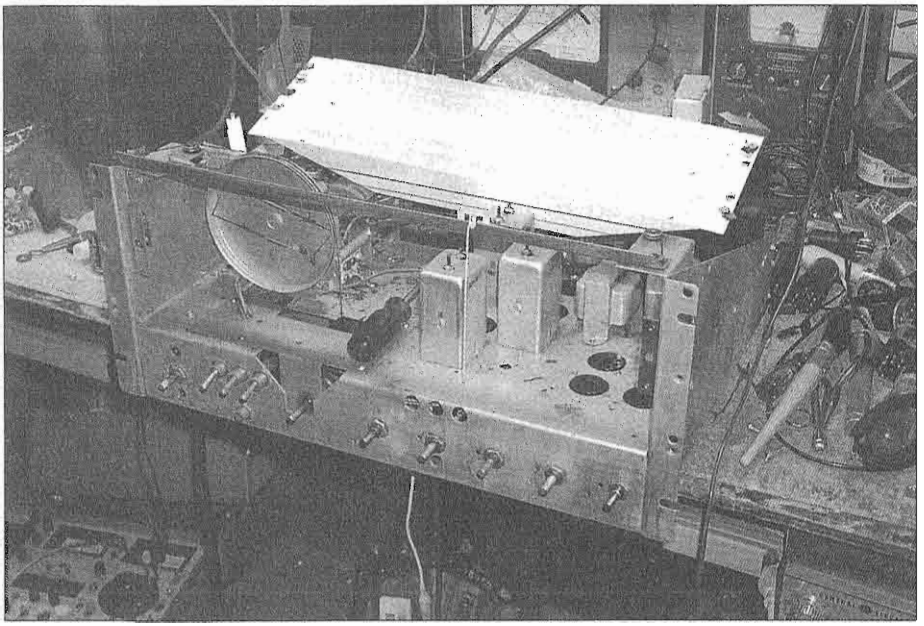

Figure 2: This is a view of the receiver with the front panel removed and the dial lamp shroud taken out.

IF Alignment

I completed the 455 kcs low and the 10.7 Mcs high IF alignments exactly as outlined in the SX-62 manuals. The IFR FM/AM 1000 service monitor generated the 455 kcs low IF and 10.7 Mcs high IF signals exactly on frequency. Because the radio has a 10.7 Mcs AM detector for 28-108 Mcs, the hard part of the 10.7 Mcs alignment can be accomplished without a sweep generator. If you follow the Hallicrafters alignment procedure, the rig tunes up as it should. Except as noted next, the bandwidth checks were as "advertised".

After completing the 10.7 Mcs alignment, the FM bandwidth appeared too narrow. That is, the FM tuning on FM broadcast stations was quite critical. The Hallicrafters alignment procedure tells you how to carefully offset the signal generator IF frequency and adjust the IF cans for equal peaks. I did the adjustment by offsetting the IF signal generator by first + and then -50 kcs and checking for minimal distortion in each case using a 1000 cps FM modulated signal from the IFR. Carefully "rocking" the slugs on each 10.7 IF can have revealed those that were too "tight" on one side. When the radio decoded a 50 kcs deviated FM single tone signal 50 kcs on either side of 10.7 Mcs, giving equal output into the speaker, the 10.7 Mcs alignment was done. During this process DO NOT make any adjustments to the primary or secondary of the discriminator can.

The SX-62 and SX-62A use a 500 kcs crystal calibrator. There is no trimmer adjustment present on that crystal and both receivers were off about 1 kc at 15 Mcs. No attempt has been made so far to trim this crystal.

Dial Cords, Dial Pointer Correction, and Tuning Dial Glass

One dial cord runs the main tuning capacitor by means of a very large wheel and a two-gear drive directly from the tuning knob and a second cord from the wheel drives the dial pointer. One dial cord on one receiver was frayed so

it was replaced with new cord of the proper diameter obtained from Antique Radio. Again, the Hallicrafters or SAMS manual shows the process. I used a piece of about #18 solid wire with a "U" bent in one end to act as a third hand in restringing these two cords. I also used some masking tape to "hold" the cords on the main tuning capacitor during stringing. While this was a bit of trial and error, and the procedure was helped by the use of some weights to keep tension on the lines where needed, I was able to restring both the band change and the main tuning dial cords OK. If you remove the tuning capacitor, prior to stringing the dial cords, remember to "load" the spring loaded gears as you re-assemble the drive mechanism.

The band changing system activates a series of #44 incandescent lamps behind each appropriate band so no other dial cord is needed. As shown in **Figure 2**, the shroud that holds these pilot lights was removed from each radio and thoroughly cleaned to remove the nicotine from the interior white surfaces. Also visible in **Figure 2** is the large wheel that couples to the main tuning capacitor and holds the two separate dial cords. After the dial glass is removed, the pilot light shroud assembly comes off the radio by removing four 6-32 hex head self-tapping screws.

Each radio had some portion of the mechanism used to "tweak" the dial pointer for calibration errors missing. I obtained some of the needed parts from another Ham that was parting out an SX-62. The correct small Hallicrafters knob was missing from both receivers. To make the actual adjusting shaft, I used a 2" long brass 10-32 screw with the head removed and attached a new small substitute knob with an 1/8" shaft hole drilled out with a #13 drill bit to accept the 10-32 bolt. In one receiver the small bracket that accepts this shaft had a loose pressed nut, which I re-staked to provide proper operation. A light drop of oil and all motion points and adjustment of spring tension insured easy motion of the calibration assembly.

After inspecting the backing on the tuning dial glasses, I decided to use some gloss black enamel paint to fill in the areas where the opaque black was cracking. On one of the dials these areas did not include the actual frequency

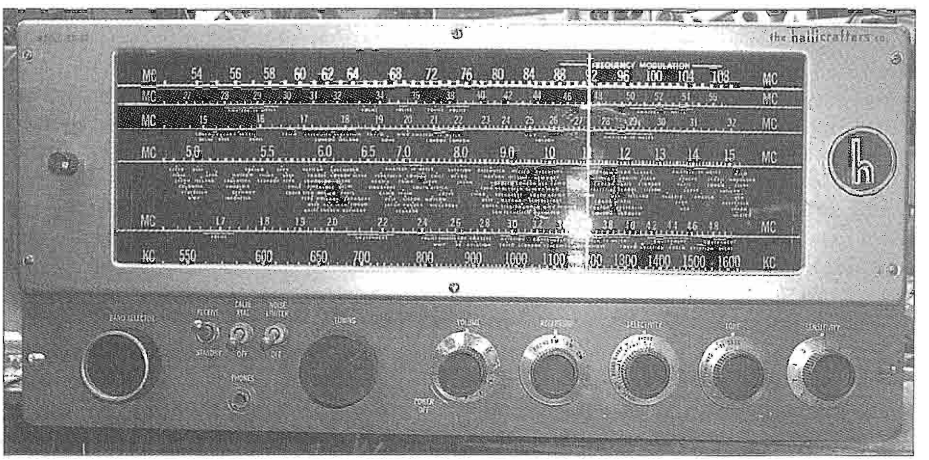

Figure 3: The SX-62 in test.

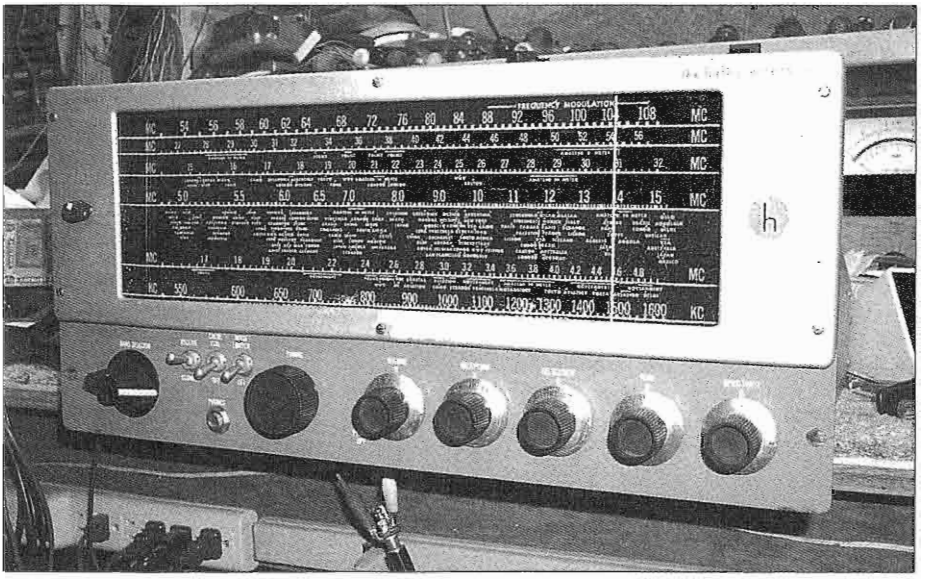

Figure 4: Here is the SX-62A in test.

and station listing areas so the black enamel applied with a very small brush effectively filled in the cracks and make the dial look much better with the real back lighting scheme. On the other dial, the opaque backing is extensively cracked and was also repaired as much as possible. I scanned the good dial on my flatbed scanner for hopefully later making a new opaque insert.

HF Alignment

The SX-62 and SX-62A each use a single 6AG5 RF stage on bands 1 and 2 and both RF stages on the higher bands. Care was taken to be sure these tubes were up to standards. The 6AG5 is not a particularly "hot" tube and more than likely a better replacement could be used especially if weak signal FM reception is desired. The mixer/oscillator is a 7F8 Loctal® dual triode which is one of the first tubes used in FM tuners of this era.

The HF/VHF alignment was a bit of a chore. Take particular note to the coil and capacitor locations for each band, they are not quite obvious. On the older receiver, I found an open plate winding on the RF stage coil on Band 1 (AM Broadcast) causing very low receiver gain. Also on that receiver, the top two bands would not tune the entire range. That is, they would go dead about 1/3 of the way from the lower end and about 1/5 of the way from the upper end as the dial was rotated. Lots of checking and trial and error found most of the trouble. Someone had changed the oscillator trim capacitor on Band 5 (28-56 Mcs band) to a larger value so the 7F8 HF oscillator was running at ½ frequency! Putting in the correct capacitor solved that problem. For Band 6, 56-108 Mcs, after checking each and every component, I found that lead dress around the oscillator restored correct operation at least up to 106 Mcs. Above that frequency, the oscillator stops and as of this writing, I have not solved that yet. The second newer receiver had no significant alignment problems.

These radios do not have any sort of antenna peaking so you get what you get in alignment. The oscillator tracks reasonably over the limits of alignment

as called for in the manual but not very well beyond. The RF/mixer tracking is fair, but not perfect, and judging by the frequencies used on each band to peak the RF and mixer stages it appears to me it never was. Remember this is a post WW2 parlor radio and it can't be expected to work like a modern scanner on VHF.

After warming up, the stability is surprisingly good on FM. The oscillators are fed from regulated 150 volts from a 0D3 and in monitoring the 6H6 discriminator, FM tuning holds for several hours. The radio does not have any automatic frequency control (AFC). Since the published manuals do not list any sensitivity data, no attempt has been made yet to confirm sensitivity on either receiver but MF and HF sensitivity appears adequate with a good antenna and FM band sensitivity is good enough for local low band TV and FM stations with a 3-foot wire attached to the antenna terminals. Audio volume on FM varies a lot with signal strength suggesting not enough IF and limiter gain.

On Air Tests

All during the restoration process, I had an antenna connected to each receiver to do some casual listening and evaluation. Casual listening on standard broadcast, 75 and 40 meters, shortwave, AM, and the FM broadcast band showed that the receiver performed quite well as a casual receiver. I plan to use one of the receivers with my 1947 vintage RCA "Furnace" 15-0inch speaker and cabinet which I am also restoring. **Figures 3 and 4** show the nearly completed and working SX-62 and SX-62A respectively, without cabinets.

Good luck on your SX-62 restoration.

ER

[...Comments, from page 1]

Country would do should this manufacturing capability become necessary again. As late as 1997 there were 550 employees in all of the organizations related to EF Johnson, who were producing successful land mobile radio equipment for federal, state, and local governments. The recent downturn in the telecommunications industry has reduced the recent staffing at Johnson to less than 200.

There is a large collection of historic material in the EF Johnson museum in Waseca. Management's intention at this time is to divide it between the City of Waseca and the new plant in Irving, Texas. I hope that the collection does not end up in a landfill, as has similar material from other American radio manufacturers who closed down. This would be a tragic loss.

The Restoration Corner

The column "Restoration Corner" I have been running has turned out to be very popular. I would like to run it as long as there is material to print, so I am asking and encouraging everyone to send in restoration tips and hints so all the readership can use them. These do not have to be formal articles, and handwritten notes will be fine. Photos, if available, would add a lot to the column. Many restoration tips have been printed in years past in Electric Radio, but many newer readers and restorers do no have access to the older issues.

Late-Breaking Important BPL News

Just as issue #180 of Electric Radio was due to go to press, we received important news about the BPL situation. On Tuesday, 27 April, the Na-

[Continued on page 45...]

Restoration of a Collins 30-FX

By Don Benecchi, K1DC
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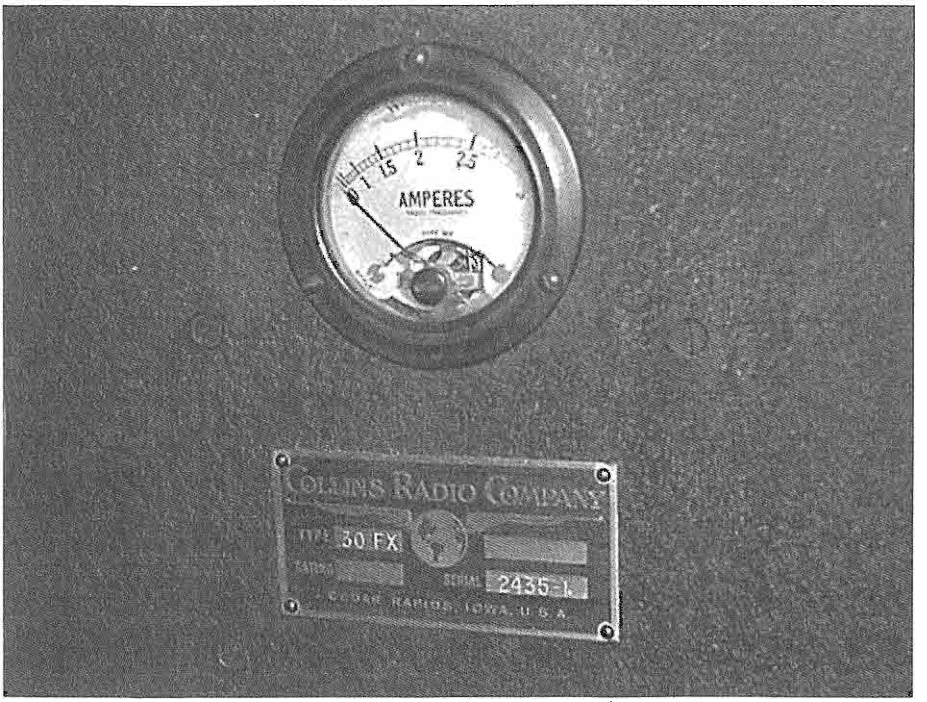
K1DC@comcast.net

It's not often that one has the opportunity to obtain a piece of pre-WW II radio antiquity, but one came into my possession last fall. Among an assortment of old parts and equipment I purchased from the estate of a deceased local Ham was a very dingy and dirty Collins model 30-FX transmitter.

As there was no documentation to be found, I had no idea of what I had uncovered except that it was unbelievably heavy (110 lbs) for it's 28" height. A search on the Collins Collector's web site showed the 30-FX to be a 100-watt CW, 40-watt grid-modulated AM phone transmitter that was introduced in December, 1934. The RF tube lineup consists of two type 47's in parallel as a crystal oscillator, two 46's in parallel as buffer/doubler and a single 211 triode final. The power supply tubes are a 5Z3 low voltage rectifier, a 45 (triode) wired as a rectifier for the bias, and a pair of 866's for the high voltage.

All tubes except the 211 final were missing, as well as all the coils. Timing was perfect for parts shopping because the fall installment of Hoss Traders



The front panel label of my Collins 30 FX shows a serial number of 2435-1.

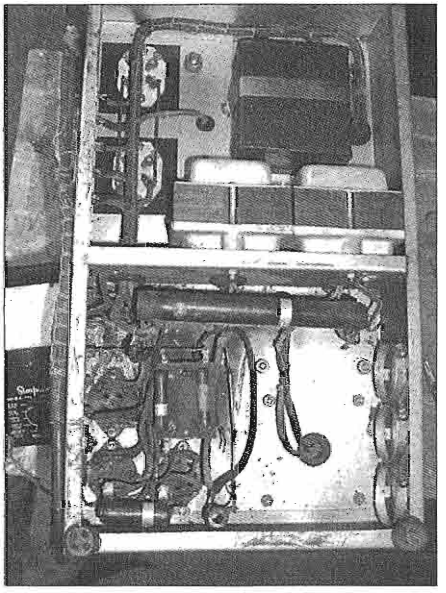
Flea Market at Hopkinton, N.H. was coming, and I was able to purchase or scrounge a complete complement of tubes and an assortment of coil forms. Also purchased were the 12 issues of 1935 QST's where Collins advertised the 30-FX.

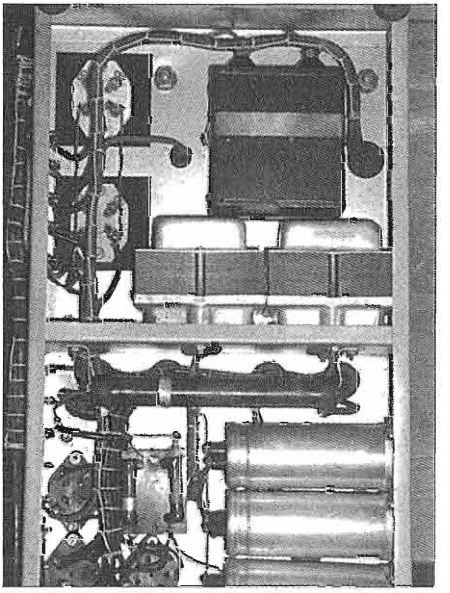
Despite the dirt and grime, the front panels and cabinet were in surprisingly good condition with very few scratches and no chipped paint. The power supply chassis, however, was a different story. Pitted and rusted, it would require a major restoration and was the starting point of the project.

Initially, the transformers were removed and each lead labeled. At the same time, a schematic was drawn as the disassembly progressed and photos were taken with a digital camera to use as reference during re-assembly. Each transformer was bench tested after removal, likely the first time in many years that voltage had been applied. Insulation on several of the transformers leads was scorched and burned and I was relieved when the power and filament transformers check OK. Filtering for the low voltage supply consisted of three oil filled capacitors (2ufd/2kv), and all appeared to have a small amount of oil leaking from them. Not being able to find equivalent replacements, I planned to open them and recap them with newer electrolytics as a means to maintain the original appearance of the power supply.

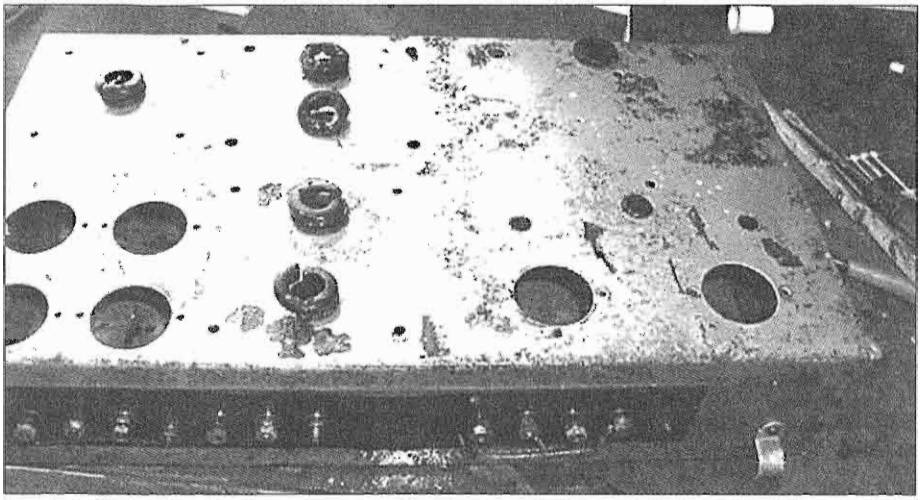
With everything removed from the chassis the outside was sanded with an electric palm sander until all the rust and pitting was removed. The inside was cleaned to remove the stains from scorched insulation.

The top and sides were primed and painted with Rust-Oleum fine textured silver spray paint to match the original chassis color. The end result was a textured finish similar to sand blasted metal. In order to maintain good electrical contact for all the ground connections the inside was not painted. The end covers of all the transformers and





The photo to the left shows the under-chassis view of my 30-FX as I received it, and on the left is the same chassis after restoration was completed.



The power supply chassis was very rusty and corroded, so it was stripped and restored by the method explained in the text.

chokes were refinished with the silver paint and the laminations were painted black.

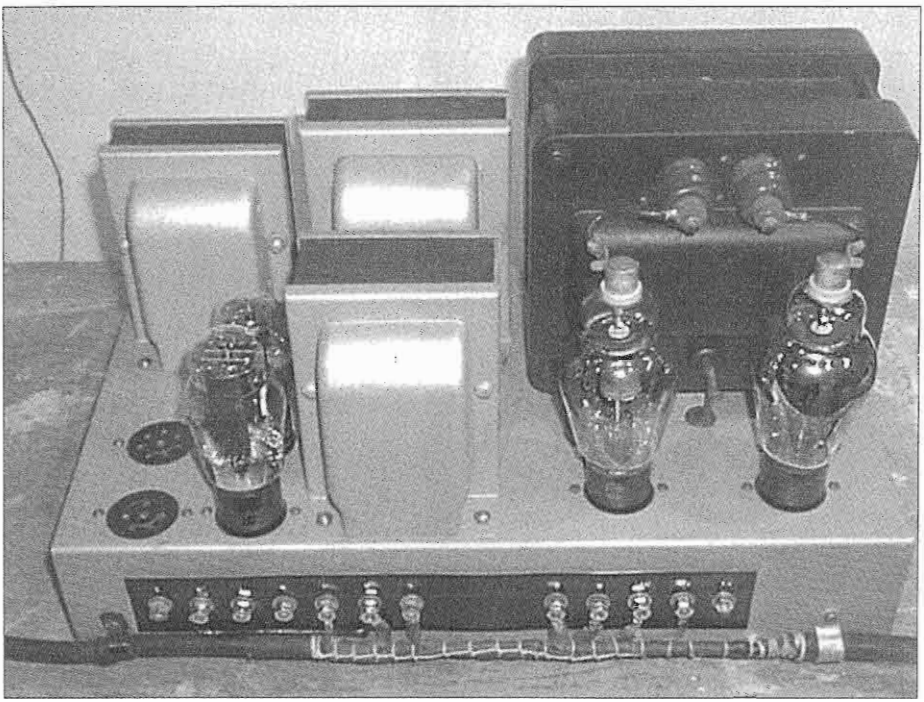
The supply was re-assembling and resistance checks made to assure there were no shorts, and with breath held, 110VAC was applied. Luckily, no smoke appeared and no fuses blew and both the low voltage and bias voltages came to life. Much to my surprise, the ac ripple content of the low voltage supply was very low and for the time being I have no immediate plan to replace or rebuild the three oil filled capacitors.

After waiting for 30 minutes for the mercury in the 866's to vaporize, again I held my breath and turned the high voltage switch. What a relief when the familiar blue mercury vapor glow appeared and the Simpson 260 read 1400 VDC. A check of all the filament voltages was made and the supply was left on for several hours with no load and everything appeared to be working fine.

Next step was to get the RF deck working and with no coil winding information, I reasoned it would be the most difficult part. At the suggestion of one of my 75-meter cronies, I made contact with W5EU, J.B. Jenkins, who used to work at Collins and has a 30-FX transmitter. While JB did not have Collins documentation he provided photos and a hand drawn sketch of his 160-meter coils. At least now I had a starting point for 80-meter coils.

Using a 2" diameter ceramic form a final tank coil was wound. With the help of a grid dip meter, the right combination was made to make the coil resonant at the 50% setting of the tank tuning capacitor. Next, an oscillator coil was wound, and after making several winding and tap adjustments I began to hear it's output on a receiver. The buffer coil, according to JB, has a lower winding of scrambled Litz wire, which I scavenged from an old RF choke. After several attempts of various patterns of scrambled windings, the buffer/driver began to work and the 211 started to put out power.

Although the top panel of the 30-FX transmitter consists of a very versatile Collins Type 2C tuner designed to tune balanced open wire feeders, I elected to use a 4 turn link on a 1 ½" PVC tube inserted inside the ceramic tank coil. This made it easy to feed my coax fed



This is the same chassis as in the picture on page 16, and it looks like it comes from a brand new 30-FX chassis.

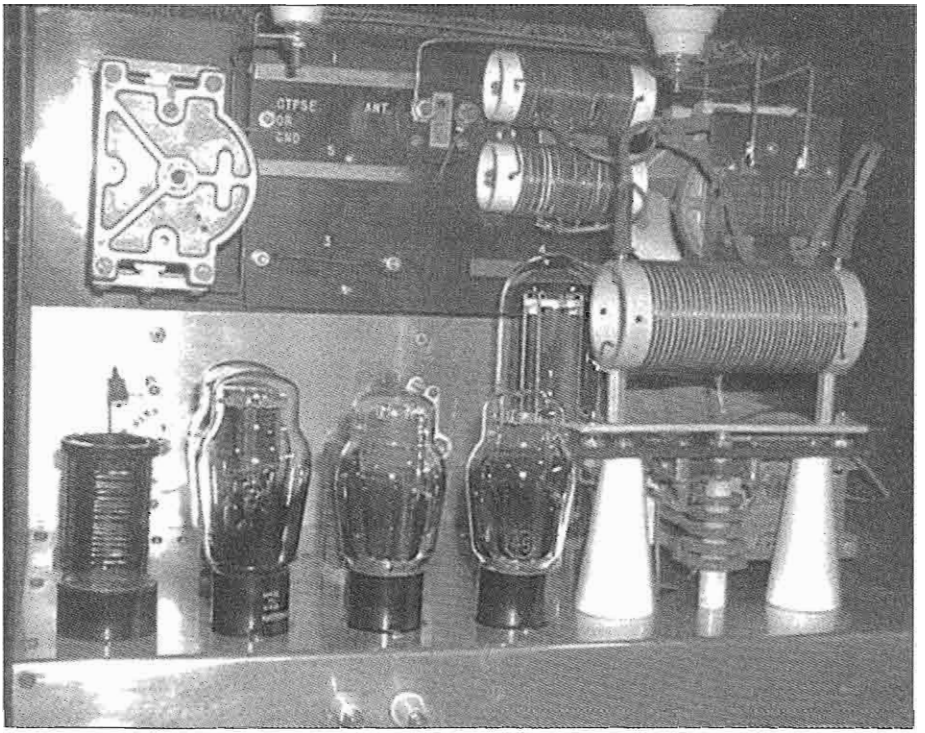
resonant antennas. With the RF deck now operational with up to 150 watts output into a dummy load, I was ready to put this relic on the air.

Initial operation was with a crystal on the low end of 80 where several East coast stations and a G station were worked with excellent reports. As there is an ECO input on this transmitter wired to drive the buffer stage, I was able to use an ARC-5 as an exciter for VFO operation on 80.

Having succeeded in getting everything working on CW I now felt comfortable to complete the restoration of the aluminum RF chassis. I began by removing the three "bread slicer" variable capacitors and placing them in the dishwasher. After going through the complete wash and drying cycle they came out squeaky clean and looked just like new. As the tube sockets were screwed in from the bottom of the chassis it was easy to remove them along with most of the wiring harnesses making it a lot easier to clean. The aluminum cleaned up great using "Mothers" brand Pre-Wax Cleaner (a liquid) purchased at a local auto parts emporium.

During 1935, Collins ran photo ads of the 30-FX in QST. Shown in the ad was their model 7X speech amplifier/grid modulator. Having no schematics, and using the photo as a guideline, a reproduction was built using the same tube lineup (57, 56 and 45 or 2A3) with circuits derived from several old handbooks. The end result was a unit that closely resembled the Collins 7X in appearance.

My first AM phone contact was with the well-known AM aficionado," Tim", WA1HLR. Tim's report of the excellent audio the modulator produced made my day. During the SKN (Straight Key Night), December 2003, 20 contacts on



The restored RF deck looks just as nice as the other chassis.

CW were made between 80 and 40 meters. Also, the transmitter was a welcomed call-in on the January Collins Radio Association AM net on 75 meters where I received many reports of the excellent audio quality.

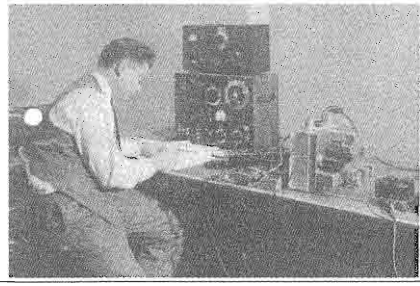
I've concluded that a realistic restoration of a pre WW II vintage boat anchor is quite difficult due to the scarcity of the older components. Component technology changed quite a bit during and after the War and the older, larger components have become scarce. Also difficult to obtain was the cloth covered wire and old insulating spaghetti to match that used in the power supply. I found myself scavenging wire from other old equipment found at flea markets. The old type waxed twine used in the thirties for lacing cables was scarce too. The restoration of my antique transmitter came out quite close to its original appearance even down to the speech amplifier/modulator.

During the restoration I received help from a number of friends who provided parts and information. Thanks to: W5EU (J.B. Jenkins), W6CC (Norm), W1UX (Al), KM1A (John), W1JZ (Mike), W3BV (Alan) and W1HIQ (John).

Should there be someone out there that has an original Collins manual and schematics of the 30-FX transmitter and speech amplifier I would appreciate hearing from them. I'd like to determine how close I came to second-guessing what Collins produced almost 70 years ago.

ER

The Restoration Corner



Transmitter Service and Maintenance Hints, Part 1

This material is taken from a booklet originally published by Heathkit in 1956, and is from the collection of Clark Hatch, WØBT.

Arcing Within The Power Supply

In the field, little or no trouble has been experienced through defective electrolytic condensers. However, they may be damaged if they are incorrectly installed or if the bleeder resistor should be open or otherwise defective. If arcing occurs in the condensers, inspect first the bleeder resistor. Look for a loose or broken connection and check the high voltage potential.

An open bleeder resistor or a defective high voltage filter capacitor may show up by other indications than an audible sound. Distorted audio, downward or inadequate modulation, or hum on the carrier may result as well as extremely low plate voltage.

Noise In The Transformers

When operating a transmitter under full load, there will be some sound in the high voltage power transformer and choke. This of course is normal provided the sound remains at a low level and cannot be heard at distances greater than eight or ten feet from the transmitter. When operating phone, the modulation transformer will "talk back" at a low level. This should not be sufficiently high to cause feedback if the microphone is located near the transmitter.

Downward Modulation And Splatter

Splatter may be detected by extreme distortion in the audio. It is generally caused by over modulation, that is, greater than 100%.

An indication of downward modulation may be detected through use of a dummy antenna such as a light bulb or "on the air" checks. This condition can also be traced to defective components or possibly a gassy modulator tube as well as a defective bleeder resistor or a leaky electrolytic condenser. A shorted winding within the modulation transformer is another source of downward modulation.

The possibility of weak rectifiers must be taken into consideration if quality of modulation or CW signal is not up to standard. For good audio quality, the importance of a satisfactory microphone cannot be stressed too strongly. Modern transmitters will op-

erate satisfactorily with most high output, high impedance microphones. These include ribbon, dynamic, crystal or cardioid.

Excitation

Insufficient excitation, gradual drop-off of available grid drive during prolonged phone or CW operation, superfluous oscillation and minor key chirp may be classed among the most difficult problems to solve. Should any of the above symptoms be experienced, the following service procedure is suggested.

The oscillator, buffer, and VFO tubes should be checked if possible by direct substitution. Should you be using crystal excitation, eliminate the VFO as a source of trouble. "Cold", loose, or unsoldered connections, can and do cause lack of excitation, spurious oscillation, and TVI. Should your transmitter use cathode bypass condensers in the oscillator and buffer stage, they should be checked for a possible short circuit. A condition of this type would result in little or absolutely no excitation. If crystals are used, be sure they are in satisfactory operating condition. The contacts of the crystal selector switch, and/or VFO selector switch, must at all times be clean and secure. After making a general inspection of the VFO, oscillator and buffer circuits, it may be well to determine whether or not the VFO or crystals as the case may be, are oscillating. Simply measuring the negative voltage between the grid and ground of the oscillator tube can check this. The negative potential will vary but should fall somewhere between -8 and -14 volts. No voltage at this point of course indicates no oscillation which then can be traced to one of the above mentioned symptoms as well as an open or possibly shorted coupling condenser between the crystal circuit or VFO circuit and the grid of the oscillator tube.

Incorrect adjustment of the oscillator peaking coils is often the cause of inadequate excitation especially on the higher bands, that is, 10, 11, or possibly 15 meters. You may find it necessary to broaden out the peak adjustment of these coils in order to reach a "happy medium" so that adequate excitation may be obtained on all bands.

Lead dress and parts placement throughout the VFO, buffer, and multiplier circuits cannot be emphasized too strongly.

Should difficulty be encountered in making correct alignment adjustments to the VFO, whether it is a built-in VFO or an external unit, refer to the instruction manual and reverse the alignment procedure as directed. This is in reference to adjustments of the slugs within the VFO coils and the trimmer capacitors. In other words, should correct tracking be difficult to obtain, following the directions in the construction manual, and then go through the alignment procedure once again. However, when adjustment of the slug is called for, use the trimmer condenser and in a like manner, when it is time to adjust the trimmer, use the slug. Often this reversal of alignment procedure will prove entirely satisfactory. Should tracking be considerably out of tolerance, you might then suspect the coil that is in the circuit for those particular frequencies, also, the frequency determining condensers. If alignment or tracking is off on all bands, then the defect would lie within a component common to all frequencies. This then would indicate a tube or possibly the tuning condenser of the VFO bandswitch.

Severe keying chirp or frequency shift may be traced once again to a defective VFO tuning capacitor, VFO tube, or oscillator tube as well as inadequate voltage regulation or extremely high voltage. Should chirp or frequency shift take place when operating the transmitter crystal controlled, once again change the oscillator and possibly the buffer tubes, but above all, make cer-

tain the crystals are not dirty or otherwise defective. Here again, poor voltage regulation could cause a frequency shift. Dirty key contacts are also a high offender of chirp.

It may be noted on some transmitters especially on the fundamental frequency of crystal or VFO operation, that the excitation current (grid drive) cannot be reduced to a satisfactory value, even with the grid drive control at minimum. *As* an example, let us assume that the available excitation cannot be reduced to the prescribed value on 80 meters. Check then the oscillator coil for 80 meters looking for a resistor directly in parallel with the coil. If such is found (it may be approximately 15 k in value) reduce the value of this resistor as much as is necessary to bring the grid drive within the specified limits for that particular transmitter. The same procedure would hold true on any band if excitation should be excessive. Remember that in multiband transmitters, the excitation will normally drop off on the higher frequencies, in the vicinity of 10 meters, or possibly even in the 15 meter band. This may be considered normal and the final amplifier may be operated with approximately two-thirds the excitation recommended in the manual without adverse effects. Therefore do not be concerned if excitation is noticeably lower on the high frequencies.

During prolonged operation should a noticeable drop-off of excitation occur requiring constant adjustment of the grid drive control, one may usually suspect a defective tube within the oscillator, buffer, or VFO circuit. A resistor that is heating due to excessive current will thus rise in value and result in loss of excitation. Once again the standard troubleshooting procedure will apply resulting in replacement of any components such as tubes, condensers, controls or resistors that look doubtful or definitely show a discrepancy. It is not uncommon to notice a slight drop-off in excitation shortly after the plate switch has been turned on and the transmitter is in operation. A minor adjustment of the grid drive control should rectify this condition. Do not exceed the specified excitation limits with the plate switch in the "ON" position.

Excessive Plate Current

Occasionally it may be noted that the final amplifier will tend to draw excessive current and no adjustment of the final amplifier tuning condenser will bring the dip indication down to a reasonable level. Should this condition be experienced, it can generally be traced namely to unsatisfactory antenna requirements, thereby constituting a high standing wave ratio (SWR). If such should be the case and there is an intolerable SWR, the pi-network output circuit cannot effectively match the impedance of the transmitter to the impedance of the antenna. Bear in mind that a pi-network is not an all-purpose loading circuit but is a device used to match impedance. If your antenna is not satisfactory for certain frequencies, then the impedance mismatch might rise to several thousand ohms. Should this happen, a high voltage will develop across one or several of the components in the pi-network. Subsequent failure of the capacitor may result, reflecting back to the final amplifier and plate tank coil. This condition also promotes excessive heating of the tank coil due to the higher than normal circulating current that would develop. Therefore, should the final plate coil be come sufficiently hot to melt the coil form and distort the physical appearance of the coil, it is then necessary to replace not only the coil but possibly the loading capacitor as well (this would be true if fixed mica capacitors are used in the pi-network). In general, poor loading characteristics may be attributed to (1) inadequate antenna facilities; (2) the possibility that a defective loading capacitor was included with the kit or

that it has been damaged while in operation and, (3) parasitic oscillation within the final amplifier.

Although a pi-network tank circuit can and will abolish the necessities of a separate antenna coupler, and even aid in the suppression of harmonics, it is not a "cure all" for antenna matching and never will be. It has definite limitations regarding both the impedance and the reactance that it can handle. In general, the pi-network used in our transmitters will match antenna impedances from a low of 50 ohms to a high of 600 ohms, provided there is no capacitive or inductive reactance to tune out. Inasmuch as there is no way of anticipating the type of antenna match which will be required in conjunction with a transmitter in the field, or even the individual characteristics of each type, the following few paragraphs will be strictly a general description of the "do's" and "do nots" as is applicable to antennas in general. Any transmitter regardless of power, is of course no better than its radiator. Thus it is far more practical to increase antenna efficiency than to increase power output from 100 to 1000 watts, not to mention the cost of a ten to one power increase. One major step towards effective radiation is to present a load to the transmitter that is within its matching range. This means an antenna tuned to resonance and exhibiting neither high capacitance nor inductive reactance. As a rule, high reactance results in high SWR and may cause extreme voltages (as high as 4000), to appear at the transmitter antenna terminal. This as you can see will immediately damage the loading capacitors, loading switch, or plate tank coil, due to high circulating currents. These currents are sufficiently heavy (possibly 30 amperes in some cases) to heat the tank coil to destruction. In a transmitter rated at approximately 100 watts, the tank coil could normally carry 300 watts, but on many occasions has been completely destroyed by heavy currents resulting purely from improper matching. In a transmitter of this type, the loading capacitors will normally operate at approximately 250 volts, that is, at an impedance of 600 ohms. The capacitors used in many pi-networks carry an AC test of 1200 volts, but have been shorted by the high voltages developed through mismatch. There are no set rules for determining what type or size of antennas that should be used. The physical and geographical location of the transmitter is an important factor in antenna design. Most any single wire antenna that is end-fed will result in a high impedance and indeterminate reactance at the transmitter. This, as you can see, often results in very high voltages. If a long wire antenna is used, a separate external coupler must be incorporated to bring the impedance down to a range the pi-network in the transmitter will accept. If a balanced antenna such as a dipole is used, once again a coupler completely external from the transmitter must be employed to change the 50-600 ohm output of your transmitter to a balanced output and of the correct impedance for the type of antenna employed. Simply because a transmitter seems to load in accordance with the information given in the instruction manual does not necessarily indicate you are getting full power out to the antenna unless a coupler or other matching device is placed between the antenna lead-in and the transmitter output.

There are a few occasions when no additional coupler is needed. If you are using a half wave dipole fed with coaxial cable on a specific frequency, no additional coupling is needed.

By the same token, a rotary beam cut for a specific frequency fed with coaxial cable (RG-8U) needs only the matching facilities afforded by the pi-network. The Windom type of antenna seems to be quite popular, however, from past experience in the field, we

find that this type of antenna definitely should not be used. Of course, balun coils are generally incorporated between the Windom antenna and the transmitter. Normally, one would then assume this is a balanced antenna, however a simple test made with a neon bulb will prove a condition of unbalance due to the fact that when in operation with a Windom antenna through balun coils, the neon bulb will light at one end and the top of one coil but at the same end and same side of the other coil, it will not light. This is a condition of unbalance. However it may be possible to load a Windom antenna with a tuned type of antenna coupler, which will compensate for the inherent unbalance.

The design center of any antenna should be based on a minimum SWR. Of course the optimum would represent a ratio of 1 to 1. This means that all of the energy reaching the antenna is being radiated with no energy reflected back to the transmitter.

Whatever the antenna type or design, a little research on the results to be expected from it and some experimentation at low power levels may prevent serious damage to your new transmitter. There is also the increased enjoyment and pride gained from good coverage and good reports.

We fully realize that the owner of a new transmitter will be anxious to get on the air and therefore possibly not too careful in his choice of antennas. However, it is hardly worth risking serious damage to your transmitter to get on the air a few hours sooner. Use of any transmitter with an improperly selected antenna, may result in serious damage which could show up immediately or create a severe weakening of components which will cause continuous trouble and breakdown of other components before the original source of difficulty has been located. Many fine articles have been written on antenna design and the various amateur handbooks and magazines contain much information that would be useful in the design and installation of a suitable RF radiator for your locality. Stay off the air until a good antenna has been installed. This will save considerable grief and expense in the future.

Parasitic Or Self-oscillation

Assuming that all requirements so far discussed have been met but the final amplifier will not dip, as it should, it will then be necessary to look for parasitic oscillation within the vicinity of the final amplifier. This condition might result if the screen bypass condensers in the final amplifier were defective or incorrectly installed, i. e., loose connections, a gassy or "soft" tube or tubes in the final amplifier circuit, incorrect adjustment of the clamp circuit, a defective clamp tube, if such is used, as well as a defective R F choke are other possibilities. Parasitic or self-oscillation will show up in one of two common characteristics, either inability to obtain a satisfactory final amplifier dip indication or strong harmonic output, as well as a poor CW note. Generally however, harmonic output within modern transmitters (which is the exception rather than the rule) is through incorrect loading of the final amplifier, unsatisfactory adjustment of the oscillator stage, incorrect choice of crystals, or improper calibration of the VFO. If the final tank circuit was tuned to a harmonic or should the antenna favor a harmonic frequency, the above conditions may show up. Once again, lead dress and parts placement throughout the entire circuitry of any transmitter, is of the utmost importance. In the case of self-oscillation, a careful scrutiny of all wiring and soldered connections is extremely important.

[Next Month, Part 2--Ed.]

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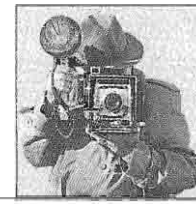
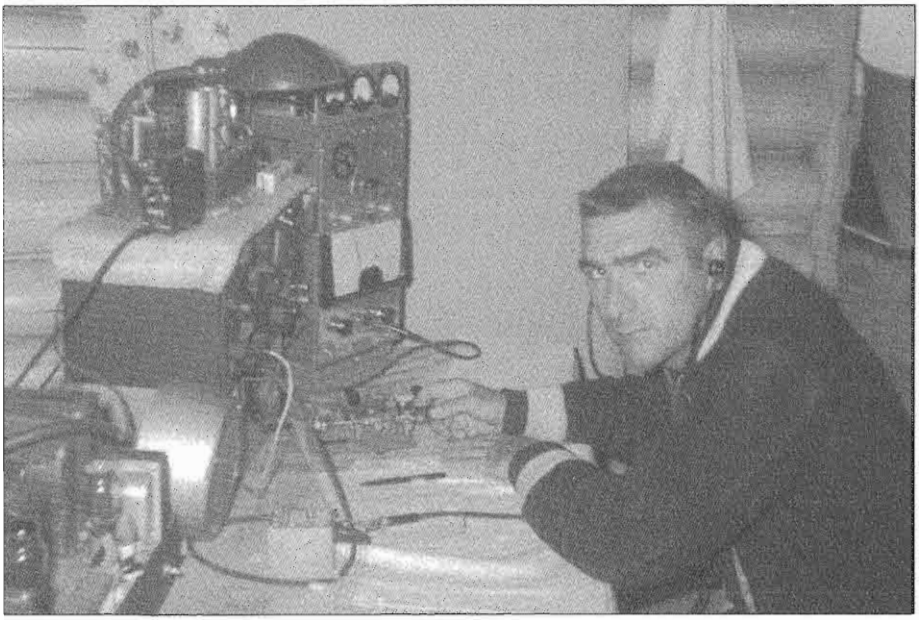


PH

HOTOS

Phil LaMarche (W9DVM) was the manager at the Amateur Electronic Supply store in Tampa, Florida during 1961, the date of this photograph.



Bruno DeLuca (VE3AFD) operated Field Day in 1956 from a cabin in Minnesota with homebrew transmitting equipment and a surplus BC-348 receiver.

Long-time ER contributor Brian Harris (WA5UEK) has 10 operating positions set up in the room he designates "Studio C". This position has some homebrew equipment, along with some mid-1950's Collins AM and SSB equipment.

AMI Update, May 2004

By Dale Gagnon, KW1I

Dayton Hamvention – The AM Forum will be held on Friday, May 14, 2004, at 3:15 pm in Meeting Room #2 at the Hara Arena in Dayton, Ohio. The program will feature three segments. An update on the AM International organization and operating events, a segment on the people, rigs, events and issues of the AM community in the Great Lakes area presented by Steve, W8TOW, and a pictorial presentation by Don, K1DC, on the restoration of his Collins 30-FX transmitter. The annual Hamvention gathering of AM ops for pizza at Marion's Restaurant in Dayton will be, as usual, on Saturday at 7:00 pm. For information during the Hamvention find Dale, KW1I, Dean, KK1K, and Brown, W1NZR, at outdoor exhibit spaces 2925 and 2926.

AMI North Central Region News

Skip, K7YOO, reports construction projects have been proliferating with many guys putting together some fine "scratch built" rigs, Mike, KØMAZ, John, W9TFC, are just a few of the notables. The "King of Construction" though, would be Robert, WØVMC. One of his finer efforts ended up at Jeff's QTH (WØXV) in Mississippi. Robert has been rattling the paint cans and spewing solder fumes to make up for the loss. Judging by his frequent visits and subsequent wounding of the K7YOO parts depository, you can count on even more serious RF burns coming from his Wisconsin QTH. Skip has been traveling, rebuilding the Bat Cave (K7YOO QTH) and assembling more big iron. A recent project is an old Heintz & Kaufman 500 watt CW transmitter from the late 20's. It turns out that this rig was the same as the ARRL used at that time and is shown in the late 20's and early 30's handbooks. This particular unit was central in the litigation between RCA and H & K/Dollar Steamship line and came out of station KUP.

AMI North Central Region News

Dennis, W7QHO, reports on preparation for the Military Radio Collectors Group (MRCG) 2004 meeting at Camp San Louis Obispo, CA, to be held on 30 April and 1 May. Highlights include hidden transmitter hunts, technical forums, equipment exhibits and judging, and a flea market Saturday morning. West Coast operating activities recently have been challenged by unsettled propagation conditions on the lower bands. Seventy-five meters has frequently gone "long" as early as 1900 PT and both the AMI Net (Wednesday on 3870 kHz) and the West Coast Military net (Saturday, 3983 +/- kHz) have temporarily shifted starting times to 2000 hours. Recent nets have had 40 check-ins. Bill, N6PY, has been helping with NCS. Bill is currently in the process of restoring his second BC-610.

MRCG members in the Los Angeles area held a mini-field day exercise at Ft. MacArthur in San Pedro, CA, last November. A message passing exercise was organized involving four GRC-9 field stations set up in city parks, parking lots and driveway in a 10 mile radius of the Fort, and one operator on foot with a Hughes PRC-104 manpack. Great fun. More activities of this type are planned for the future.

ER

Installment 11

W. J. Halligan
Newspaper Reporter and the State of Radio 1923-1924, Part 4
Broadcast Listeners (BCLs)

By Robert E. Grinder, K7AK
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Full Outline of Part 4:
Broadcast Listeners

A. Citizens Who Mainly Listen
   Listening Styles
   DX Hounds
   Night Owls
   DX Records
   Proselytizing Converts
   Crystal Sets VS. Vacuum Tube Receivers
B. Listeners Who Tinker
   Obstacles
   Bill Halligan's Advice
   Radio Builders—Wizards
   Radio Builders—Technicians
C. Epilogue
   How Far Have You Heard?
   The Art of Soldering
   Headsets and Loud Speakers

C. Epilogue
The Art of Soldering
Headsets and Loudspeakers

A sizable proportion of the contestants who entered the three Radio Broadcast listening contests wired their receivers with unsoldered connections. As novice experimenters rushed to build receivers during the heady, early years of broadcasting, they regarded the art of soldering as largely a highly specialized, mysterious technique. They knew, too, that clumsy, dangerous equipment challenged dauntingly their limited skills. Consequently, the benefits of soldering were initially unappreciated.

A contestant who had done well in the second contest, however, strongly advised in his remarks that his less successful compatriots consider making soldered connections. He granted that some receivers function fine when no solder has been used, but success is short-lived, for the "joints will oxidize or pull apart and are bound to weaken signal strength, cause disturbing noises, and make increasing annoyance" (April, 1923a). Too often, he maintained, listeners have been bothered by "cracking noise", which was unrelated to static, and have had had to stop and readjust a poor contact in the middle of attempting to copy a distant station. He contended that "a very slight resistance in the [receiver] circuit very materially decreases the amount of current. So the first consideration is electrically perfect joints."

Eric Shalkhauser was aware of the importance of soldered joints, and after a personal catastrophe, he recommended passionately rosin (non-corrosive) flux instead of acid flux for radio work. He confessed to readers of Radio Broadcast that he had used acid (corrosive) flux the first time he assembled his prize-winning portable. The ruinous acid penetrated several components, including particularly bypass condensers and jacks. The receiver functioned at about 15% efficiency until he replaced the affected parts and re-soldered connections with rosin core flux (Shalkhauser, 1923, p. 419).

Electric soldering irons appeared in hardware and radio-component stores sometime in late 1923 or early 1924. The laboratory staff of Radio Broadcast

suggested, April 1924, a month before Bill Halligan ceased reporting for the Boston Telegram, that every person committed to "fine radio-craftsmanship" should acquire an electric soldering iron. A relatively good, small iron could be purchased for about $4.00. Cheaper irons should be avoided, because they were prone to slow heating, over-heating, short-circuiting, and burnout. A good electric soldering iron, on the other hand, provided relatively constant heat, correct soldering temperature, and ensured "a perfect flow of metal and weld at every joint." The staff thus argued that "only the owner of an electric iron can truly appreciate the actual handicap under which he labored with the old style, inefficient and sooty tool," which required racing back and forth between work bench and gas stove ("Editors," 1924a).

The advantages of an electric soldering iron over one externally heated became apparent when the former became available. The transition of experimenters to the new iron began about half way through Bill Halligan's career as a reporter. Most of his vignettes, therefore, dealt with home-construction projects that featured electrical connections that were soldered—if they were soldered at all—with irons heated externally. Individuals who built radio equipment prior to 1923 thus acquired the skill of soldering with irons heated in fireplaces or on gas or coal stoves by following a dangerous, difficult process. Soldering was fraught with precarious circumstances difficult to control, and results were often uncertain. Nonetheless, soldered connections were recognized as crucial determinants influencing both the effectiveness and reliability of radio equipment.

How early radio experimenters struggled to produce soldered connections with irons heated externally is, surprisingly, seldom discussed in the historical literature. Therefore, given the integral role of these early irons in the construction of radio equipment, the steps that an experimenter had to take in using one are described below:

According to Standiford (1923), the irons, or "coppers," as experimenters often called them, ranged in weight from a few ounces to several pounds. Lighter ones, of course, were easier to handle than heavier ones. An iron, weighing slightly less than a pound (shank and handle excluded), he believed, was about right for radio work (see **Figure 1**). A soldering iron was

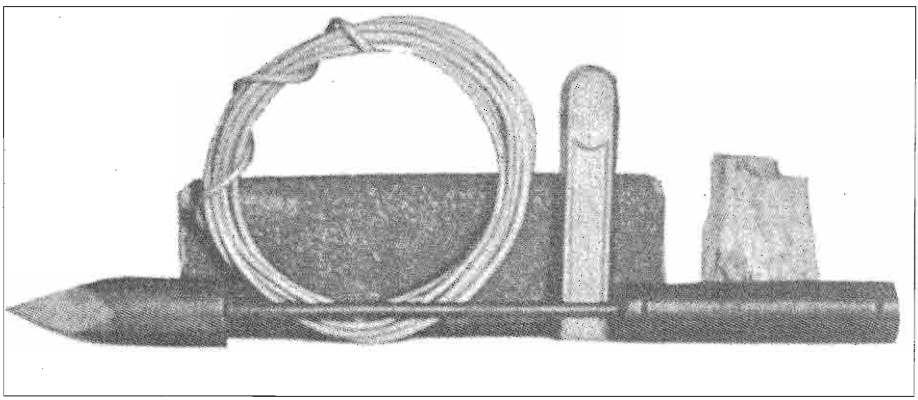

Figure 1: A "Tinned" Soldering Iron and Accessories. Behind the iron are a coil of wire solder, a bar of "half-and-half solder" (composed of tin and lead), a strip of emery paper tacked on a wooden block, and a lump of sal ammoniac. From W.S. Standiford (1923, June). Radio Broadcast, 3, p 161.

constructed easily from a one-inch copper bar for its nose, a fire poker for its shank, and a portion of a broomstick for its handle.

Standiford (1923) described also how the nose must be tinned on all four sides before the iron is ready for use. The process started by putting the iron in a heat source akin to a red coal fire, free of smoke. When the nose attained the "right" degree of heat, the solder would melt instantly when it was applied to the iron. If the nose got too hot, that is, red hot, the nose would not "tin". Standiford (1923) observed that experienced builders adopted a practice of holding the iron about 3 inches from the palm of one of their hands; the palm sensed the radiated heat from the hot metal, and in turn, served as a better guide for proper heating than touching solder to the iron.

The nose of the iron was ready for tinning when it was at the "right" temperature. Each of the four faces of the nose was then brightened with a file or a piece of sandpaper tacked on a block of wood. Each face was rubbed rapidly, one after the other, with a rosin and solder mixture. If the process went astray, as when the nose might cool too rapidly, the tinning steps were repeated. The copper nose was re-heated, each face filed again and stroked with a lump of sal-ammoniac to remove accumulated grease, and finally, the rosin and solder mixture was applied again.

Once the task of tinning was accomplished, the technique of soldering connections was relatively easy. Connections were coated with rosin flux to dissolve oxide film that might impede the solder from sticking to them. Next, the iron was heated in a gas or coal fire until it acquired the proper temperature to melt solder on its tinned surface. As the nose was lifted from the fire, it was rubbed quickly with a piece of old carpet or heavy rag in order to wipe foreign particles from its surface. The nose was now touched to a bar of solder to pick up a drop of the latter, which the nose then conveyed to the connection. If the preceding steps went well, the hot copper would heat the connection and the drop of melted solder would flow smoothly over it. The final step was to remove the nose from the connection before its hot surface burned the wires (Standiford, 1923).

When a normal-sized soldering iron was too large and bulky for a tiny connection, a modification in the technique was necessary. Highstone (1924) recommended a multi-step process: tinning one end of a short piece of # 14 bare copper wire, about six inches in length, leaving a drop solder on its tip, applying a small amount of rosin to the connection, grasping the improvised soldering iron with a pair of pliers, touching the end of the wire with the solder to the connection, and finally, playing a flame from a hand-held blowtorch upon the central portion of the wire while heat traveled along it to fuse the drop of solder to the connection.

Headsets and Loud Speakers

Inexpensive crystal sets predominated among BCLs at the outset of broadcasting. These primitive receivers were incapable of amplifying audio impulses; consequently, listeners necessarily had to clamp a headset over one or both ears to hear programs. Cheaper headsets lacked both sensitivity and fidelity, which led to enormous variations in the quality of those available to BCLs. Furthermore, most early BCLs, whatever their involvement in listening eagerly for DX, were also enthusiastic about sharing concerts, educational programs, and speeches with family members and friends. A clamor thus arose among them for sound amplification sufficient to fill a room, and thereby, to eliminate the inconveniences associated with headsets.

Radio engineers addressed appeals for loud speakers in the early 1920s, at first, by attaching a headset "receiver-

unit" to the tone arm of a household phonograph; subsequently, they attached the receiver-unit to megaphones and other sundry forms of horns. They aimed to make the sound emanating from the receiver-unit grow in volume as it traveled through the expanding neck of the horn. The creation of loud speakers for sound distribution occurred after BCLs began to take advantage of vacuum-tube broadcast receivers. The relatively strong audio output of these receivers enabled radio engineers to use headset receiver-units as "drivers" for primitive loud speakers. One ecstatic engineer declared that the confluence of circumstances signified "the emancipation of broadcast reception" (Allen, 1923).

Broadcast listeners and amateurs worked diligently to improve the effectiveness of their antennas and receivers, and to some extent, their contributions helped advance radio technology. The complexities associated with converting electrical impulses to mechanical motion, and in turn, sound, however, forced them to defer to commercial manufacturers. They were thus generally disinterested in research associated with either the development of headsets or the vexing problems early horn speakers presented. Nonetheless, given the significance, respectively, of the two sources of sound to successful DX hunting and general listening pleasure in 1923-24, the development of both early headsets and loud speakers is briefly discussed below:

A headset in the 1920s was comprised of at least one receiver-unit; it was similar in both appearance and construction to an ordinary, wire telephone receiver, which wireless operators at the turn-of-the-century appropriated for their receiving equipment. Early receiver-units, designed specifically for radio work, were named occasionally "watchcase" receivers; eventually a metallic "headband" was used to attach two "watchcase" units and to cover both ears (Signal Corps, 1922). Secor, Gernsback, and Lescarboura (1921) described the "headband" as forming "a pair of head receivers". However, as double receiver-units grew in popularity, such descriptive terms as "headphone" or "headset" gained credence and widespread usage.

Each receiver-unit of a conventional headset in the 1920s consisted of four basic components: a metal case, a hard-rubber earpiece that screwed into threads on the case, an electromagnet, and a diaphragm. Two major factors determined the overall quality of a receiver-unit: (1) the sensitivity of the electromagnet to audio-frequency current, and (2) the capability of the diaphragm to produce undistorted sound waves.

The electromagnet of a receiver-unit was constructed usually with a strong, permanent magnet made of high-grade steel shaped into a horseshoe with two poles. The sensitivity of the electromagnet depended on the number of turns of copper wire wound around each of the poles. The higher the resistance relative to the number of turns of wire, the greater the sensitivity of the receiver-unit. For radio work, thousands of turns of very fine, insulated wire would be wound around each pole; then, the two windings would be connected in series. Whereas the windings on an ordinary wire telephone receiver probably represented less than a thousand turns and a total resistance of about 500 ohms, a serviceable BCL headset, with the two receiver-units also in series, might have had several thousand turns of wire and a resistance ranging from 1,500 to 4,000 ohms.

Manufacturers preferred to define their receiver-units on the basis of impedance, which provided a reference standard by which prospective purchasers could evaluate the sensitivity of different headsets. Since the resistance of the windings was affected by

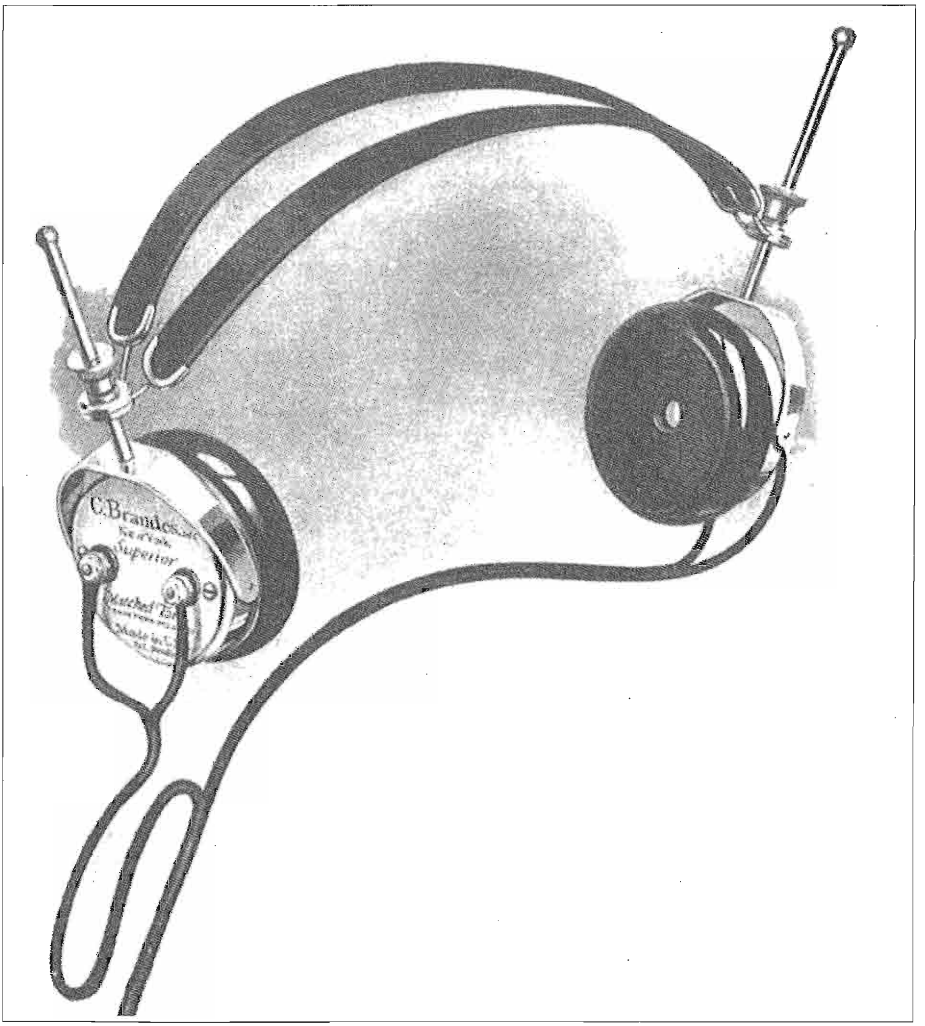

Figure 2: The 1922 version of the Brandes Superior Matched Tone Double Headset, complete with Featherweight Headband. From Robertson—Cataract Electric Company Catalogue, #22. 1922-1923, p. 72.

the frequency of applied currents, they used the AC resistance of the windings to express ohms of impedance. Common reference standards included AC resistance at 800 cycles or 1,000 cycles.

The diaphragm was conventionally a thin, circular, soft-iron disk, situated a few thousandths of an inch above the magnetic poles, and held in place by the earpiece. The minute air gap between the ends of the poles and the surface of the diaphragm allowed it to move proportionately relative to the strength of audio currents flowing through the magnet windings. The movement produced sound waves. A diaphragm functioned at audio frequencies, and it had to follow the low-frequency variations that occurred in ordinary speech as well as the high-frequency variations of oboes, flutes, and piccolos. Noises produced by tubes

and static discharges often triggered diaphragm ringing in poor quality headsets, which sometimes obliterated desirable signals. Furthermore, the diaphragm may have had an obnoxious resonant frequency at which it vibrated at greater intensity than at any other frequency. Considerable energy was thus consumed at the resonant frequency in producing louder sounds than at other frequencies, which resulted in distortion. Elimination of this objectionable characteristic required careful attention to acoustic, electromagnetic, and mechanical design (Crouse, 1923).

The "Brandes Superior Matched Tone" headset, shown in **Figure 2**, was arguably the most popular headset available to BCLs and amateurs in the early 1920s. C. Brandes, Inc., New York City, introduced the "Superior" headset in 1911. The Company provided shortly thereafter two receiver-units so well matched that sound was heard in both ears with equal intensity. "The popularity and superiority has been so steadily maintained that the Superior of today is the standard in radio broadcast reception" (Robertson-Cataract, (1922, p. 72). At 800 cycles the receiver had an impedance of approximately 20,000 ohms. The headset, including a "featherweight" headband and a "nonoise" conducting cord, six feet in length, sold for about $10.00 in 1922.

Reginald Fessenden designed in 1906 a headset for the U.S. Navy that was still unsurpassed in the 1920s. C. Brandes, Inc. manufactured the headset during most of the early twentieth-century. It soon accrued several records for long distance reception. C. Brandes found that by "matching the two receivers of the set, far weaker signals could be more easily read than with any other existing type, even through static disturbances." In 1922, the "Brandes Navy Type Matched Tone double headset, complete with 'Featherweight' headband and special radio-frequency cord" [the cord was designed specifically for vacuum tube sets] sold for $15.00. The Brandes Navy type headset was "unequalled for both lightness and efficiency; its wonderfully pure and mellow tone is especially adapted for the reception of speech and music either as a simple headset or as the receiver element of a loud speaker" (Robertson—Cataract, 1922-1923, p. 73).

Attempts to create loud speakers in 1922-24 began with phonograph sound chambers; the reproducers on tone arms were disconnected and replaced with headset receiver-units. Not everyone possessed a phonograph, so attention turned to affixing receiver-units to the orifices of horns of various configurations. Unfortunately, acoustic engineers found that distortion emanated inevitably from the "cut and try" variety of loud speakers, which resulted in sound quality less satisfactory than that from high-quality headsets.

The material and design of a horn markedly affected the quality of "amplified", or more precisely, "concentrated sound-expansion"; metal horns were best manufactured with such "dead" metals as zinc, lead, or cast aluminum. Horns constructed of wood, wood fiber, celluloid, and hard rubber were slightly more satisfactory than metal horns (Allen, 1923). A good headset, like one manufactured by C. Brandes, covered with minimal distortion a wide range of the fundamental tones and overtones within reach of the human ear. Sometimes, to mitigate the distortion introduced by a single horn, as many as three horns, each with its own driver, were used. For example, one very long horn, perhaps coiled to save space, might be used for responding to low-frequency tones, a second medium length horn, perhaps with a neck of 12-18 inches, might be employed for middle-range tones, and a small-neck horn might included for reaction to high-pitched notes. The

three types of horn, all working at once, combined to provide agreeably uniform responses over the audible range ("Laboratory Information Sheets," 1928, p. 16).

Radio engineers of 1923 hypothesized that a correctly designed single horn would radiate sound uniformly over a wide range of audio frequencies. They reasoned mathematically that an "exponentially" shaped horn would realize their acoustic criteria. They specified that the cross-section area of an "exponential horn" should double at equal intervals along it length. For example, an exponential horn might start from an orifice of ¼ square inches, and increase in area ½ square inches, one square inch, and 2 square inches, at distances of one, two, and three feet, respectively, from the orifice. The rate of expansion determined the lowest frequency at which the horn would effectively amplify sound. For example, a horn which doubled in area every foot would amplify frequencies as low as 60 cycles.

Exponential horns are always fairly long, for short exponential horns will radiate only the higher audio frequencies. Figure 3 illustrates an exponential horn manufactured by the Racon Electric Company of New York and England. "Racon exponential air column horns are designed with bell-openings and expansion factors as advocated by recognized authorities on acoustics" (see **Figure 3**). The air column of the loud speaker is 84 inches, the bell is 14 inches round, with a depth of 9 inches and a total weight 3 ½ pounds. The Racon was promoted as covering a wide range of audio frequencies "with absolute freedom from distortion of any kind."

A receiver-unit of a headset, in use as a driver for a horn loud speaker, was usually connected in 1922-24 directly in the plate circuit of the last tube of a two-stage amplifier of a battery-powered receiver. This circuit resulted in

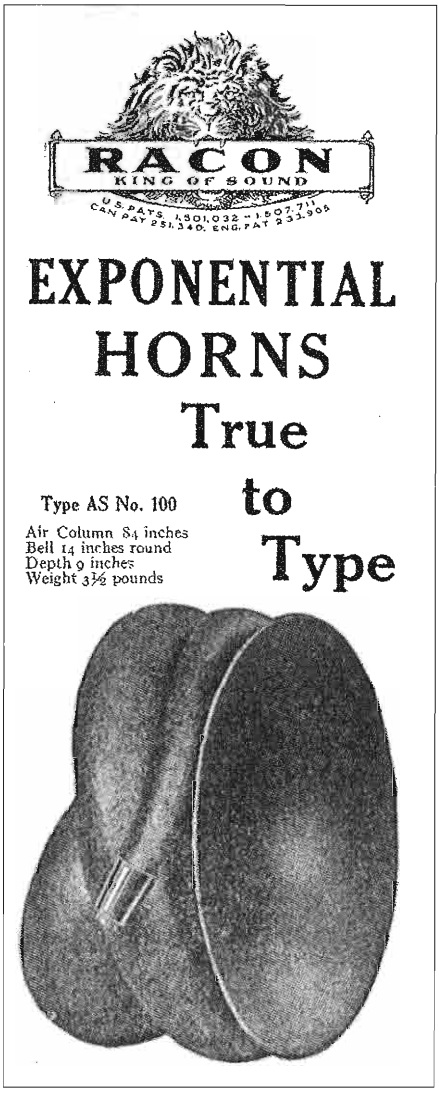

Figure 3: An example of a Racon Exponetial Horn, of "non-porus, vibrationless, one piece construction". From Radio Broadcast's Data Sheets, 1928. N.Y.: Doubleday, Doran & Co., p. 64.

volume sufficient to fill a small room. However, as Bill Halligan indicates in several vignettes, a popular BCL pastime was that of making speech and music audible to crowds of people as-

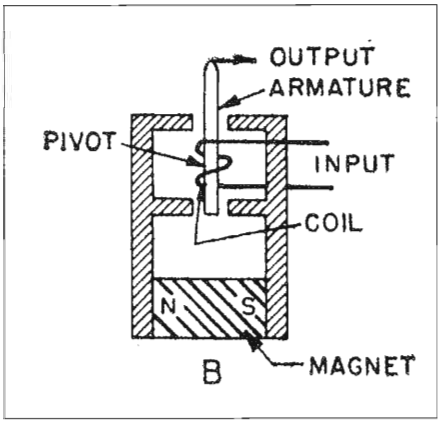

Figure 4: A depiction of an electromagnetic driving system for a cone speaker. From H. F. Olson, Proceedings of the IRE. May, 1962, Vol. 50, p. 731.

sembled on sidewalks, congregated in auditoriums, and massed at house parties. The task of obtaining adequate amplitude for large volume settings necessitated a different type of loud speaker and a more powerful amplifier, which utilized one or more tubes of relative high plate voltage, and heavy consumption of B battery energy.

In early 1924 the cone reproducer entered the consumer marketplace (Chidester and Chidester, 2001). The diaphragm of the new loud speaker was a circular cone, constructed of light, stiff paper. Cone sizes ranged from 4 to 36 inches in diameter, and the large ones, especially, radiated a broad range of audible frequencies. They reproduced sound with less distortion and much greater volume than a horn speaker. **Figure 4** shows a balanced armature, electromagnetic driving system that was widely used with cone speakers, and Figure 5 depicts a typical cone speaker. The Crosley Musicone advertisement (**Figure 5**), which first appears in late 1925 issues of Radio, suggests that cone speakers were slow to replace horn speakers. Perhaps BCLs, who collectively in 1923-24 had been purchasing horn speakers in carload quantities, were reluctant to abandon them so soon after acquiring them.

Radio engineers recommended in 1924 that an output transformer be used to match amplifier tube and cone loud speaker impedances. Matched impedances via a transformer maximized the efficiency by which amplifier power was delivered to the loud speaker, and importantly, the transformer isolated DC plate current from the coil windings around the balanced armature. Allen (1923) declared that "speech and music have been made easily audible

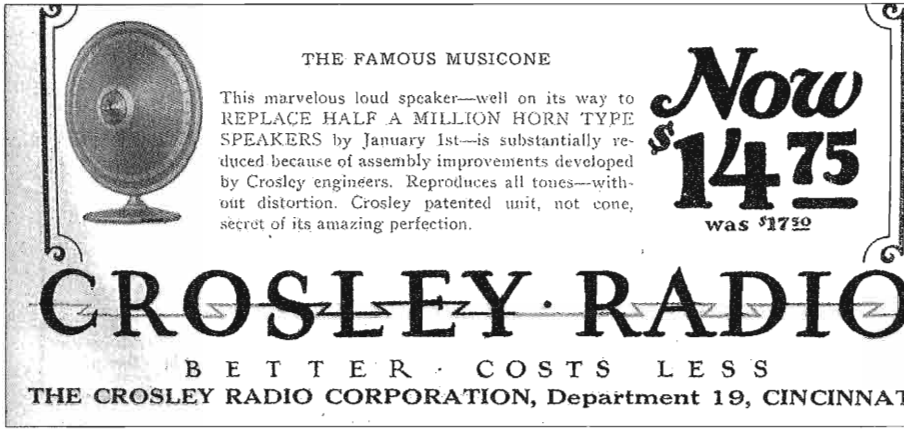

Figure 5: An early advertisement for the Crosley Musicone. From Radio, December, 1925, Vol. 7, p. 7.

over distances of more than one mile" when tubes capable of delivering considerable power have been connected so that the loud speaker is supplied by the sum of their outputs, that is, when a transformer having a split primary was used in the plate circuit of a two-tube (push-pull) final amplifier stage. The secondary of the transformer was connected to the loud speaker. Allen (1923) concluded his commentary with the statement: "the manufacturers of loud-speaking devices have accomplished wonderful results when the time they [acoustic engineers] have been working on them is taken into consideration." Neither Bill Halligan nor the BCLs of 1923-24 would have disagreed with him, partly because they had no standard against which to compare the loud speakers available to them.

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[Part 5 will begin next month--Ed.]

ER

Electric Radio Yearly Index
May 2003 – April 2004
(Issues 168-179)

Compiled by Don Buska, N9OO

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ER

Taken about 1939, Captain Olson of the Wisconsin Highway Police is proud of his new Motorola T19-32H 31-Megacycle radio system. Vintage Motorola remotes for the T19 system are in the picture, as is a rack-mounted S-20R.

Electric Radio Parts Unit Directory For 2004

[Editor's Note: Beginning with this issue of Electric Radio, I am going to publish the ER Parts Unit Directory at six month intervals, depending on available space. As Barry Wiseman used to say, your dead unit can bring another one to life! If everyone will join the effort and send in new parts units for the list as they become available, and also let me know about units which are no longer available, we can make this a valuable tool for ER readers.]

Ameco TX-62: George Silva, WA6HCX, 27 La Flecha Ln., Santa Barbara, CA 93105. (805) 682-3094

ARB: Robert Martin, 111 Bancroft Dr., Rochester, NY 14616-2904. (716) 663-4182

ARC-5 rcvrs & xmtrs: Jim Miccolis, N2EY, 126 Summit Ave., Upper Darby, PA 19082. (610) 352-5247

B&W 5100B: Ed Clink, WA9PFB, 1285 New Salem Church Rd., New Berlin, IL 62670

BC-191/375 tuning units: Jim Miccolis, N2EY, 126 Summit Ave., Upper Darby, PA 19082. (610) 352-5247

BC-221: Tom Brent Box 1552, Sumas, WA 98295. (604) 826-4051

BC-312: Tom Brent Box 1552, Sumas, WA 98295. (604) 826-4051

BC-348: Tom Brent Box 1552, Sumas, WA 98295. (604) 826-4051

BC-453: Ken Kolthoff, K8AXH, 8967 Scott Dr., De Soto, KS 66018-9432. (913) 585-1196

Central Electronics 10A. Cliff Peterson, WA9SUE, 608-625-4527

COL-46159, p/o TCS-9: Dan Buck, 5877 Embee Dr., San Jose, CA 95123. (408) 224-9163

Collins 51J4: Rich Dixon, W7QZO, 16032 Lost Coyote Ln, Mitchell, OR 97750

Collins 75A-2: Abe Levy, W3DA, RFD 2 Box 230, Greenwood, DE 19950. (302) 349-5389

Collins KWS-1: Butch Schartau, KØBS, 5361 St. Mary Dr., Rochester, MN 55901. (507) 282-2141

Drake AC4: Dale Mecomber, N2DM, POB 87, Skaneateles Falls, NY 13153.

Drake R-4B: Bill Rovas, WA1APX/8, 7002 Rickett Dr., Washington, MI 48094. (810) 781-9717

Drake SPR-4: Bill Rovas, WA1APX/8, 7002 Rickett Dr., Washington, MI 48094. (810) 781-9717

Drake T4XC: Bill Rovas, WA1APX/8, 7002 Rickett Dr., Washington, MI 48094. (810) 781-9717

Drake TR-4: Bill Rovas, WA1APX/8, 7002 Rickett Dr., Washington, MI 48094. (810) 781-9717

Drake TR3: Bruce Manser, POB 271, Cleveland, WI 53015. (414) 693-3247

Drake TR4: Dale Mecomber, N2DM, POB 87, Skaneateles Falls, NY 13153.

Drake: T4-XB: John Poland, AE4EN, 2859 Scotts Hill Loop Rd., Wilmington, NC 28411. (910) 686-4236

EICO 720: John Vercellino, WB9OVV, 6921 Springside Ave., Downers Grove, IL 60516. (708) 964-3020

Gonset G-50: Walt Hutchens, KJ4KV, 3123 N. Military Rd., Arlington, VA 22207. (703) 524-9794

Gonset GSB-100: Abe Levy, W3DA, RFD 2 Box 230, Greenwood, DE 19950. (302) 349-5389

Gonset GSB-100: Dick Dixon, W7QZO, 16032 Lost Coyote Ln., Mitchell, OR 97750. (541) 462-3078

Hallicrafters 8R40: William Swiger, Rt 1, Box 142A, Bridgeport, WV 26330. (304) 842-4635

Hallicrafters HT-32A: John Poland, AE4EN, 2859 Scotts Hill Loop Rd., Wilmington, NC 28411. (910) 686-4236

Hallicrafters HT-32A: Jonathan Weiner, 113 Valley Oak Dr., Greenville, SC 29617-6159

Hallicrafters HT-37: Bill Rovas, WA1APX/8, 7002 Rickett Dr., Washington, MI 48094. (810) 781-9717

Hallicrafters HT-37: John Adams, 908 E. Southmore, #130, Pasadena, TX 77502. (713) 477-2048

Hallicrafters HT-40: John Adams, 908 E. Southmore, #130, Pasadena, TX 77502. (713) 477-2048

Hallicrafters HT-9: George Silva, WA6HCX, 27 La Flecha Ln., Santa Barbara, CA 93105. (805) 682-3094

Hallicrafters S-118: John Poland, AE4EN, 2859 Scotts Hill Loop Rd., Wilmington, NC 28411. (910) 686-4236

Hallicrafters S-19: JIm Musgrove, K5BZH, 4217 Buckeye St., Fort Worth, TX 76137. (817) 232-9438

Hallicrafters S-38: John Adams, 908 E. Southmore, #130, Pasadena, TX 77502. (713) 477-2048

Hallicrafters S-38C: John Adams, 908 E. Southmore, #130, Pasadena, TX 77502. (713) 477-2048

Hallicrafters S-39: Dick Dixon, W7QZO, 16032 Lost Coyote Ln., Mitchell, OR 97750. (541) 462-3078

Hallicrafters S-40A: William Swiger, Rt 1, Box 142A, Bridgeport, WV 26330. (304) 842-4635

Hallicrafters S-85: John Poland, AE4EN, 2859 Scotts Hill Loop Rd., Wilmington, NC 28411. (910) 686-4236

Hallicrafters S20R: John Adams, 908 E. Southmore, #130, Pasadena, TX 77502. (713) 477-2048

Hallicrafters S22R: Chuck Graham, K6KDZ, 20335 Casa Loma Dr., Grass Valley, CA 95945.

Hallicrafters S38: Chuck Graham, K6KDZ, 20335 Casa Loma Dr., Grass Valley, CA 95945.

Hallicrafters SR-160: H.I.Stark, K9UBL, 3215 S Meridian St., Indianapolis, IN 46217. (317) 788-1210

Hallicrafters SR-2000: Bruce Manser, POB 271, Cleveland, WI 53015. (414) 693-3247

Hallicrafters SX-100: Tom Clark, K5CGC, 2402 Kings Lodge Dr., Kingwood, TX 77345. (713) 360-5513

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Hallicrafters SX-101A: Jonathan Weiner, 113 Valley Oak Dr., Greenville, SC 29617-6159

Hallicrafters SX-107: William Swiger, 1 Casey Ln., Bridgeport, WV, 26330. (304) 842-4635

Hallicrafters SX-24: Bob Rose, K6GKU, 15514 E Richwood Ave., Fountain Hills, AZ 85268-1436. (602) 770-7829

Hallicrafters SX-24: Dick Dixon, W7QZO, 16032 Lost Coyote Ln., Mitchell, OR 97750. (541) 462-3078

Hallicrafters SX-25: Bob Rose, K6GKU, 15514 E Richwood Ave., Fountain Hills, AZ 85268-1436. (602) 770-7829

Hallicrafters SX-25: Mark Shoup, 27 Dogwood Dr., Newton, NJ 07860. (201) 383-6417

Hallicrafters SX-28: Tony Schroeder, N8SNC, 165 S. Main Glandorf, Ottawa, OH 45875

Hallicrafters SX-36: John Adams, 908 E. Southmore, #130, Pasadena, TX 77502. (713) 477-2048

Hallicrafters SX-43: John Adams, 908 E. Southmore, #130, Pasadena, TX 77502. (713) 477-2048

Hallicrafters SX-62: William Swiger, Rt 1, Box 142A, Bridgeport, WV 26330. (304) 842-4635

Hallicrafters SX-71: Ed Clink, WA9PFB, 1285 New Salem Church Rd., New Berlin, IL 62670

Hallicrafters SX-71: Jim Larson, KF7M, 2245 Ross Ave., Idaho Falls, ID 83406. (208) 528-7869

Hammarlund HQ-110: William Swiger, Rt 1, Box 142A, Bridgeport, WV 26330. (304) 842-4635

Hammarlund HQ-120X: Bob Rose, K6GKU, 15514 E Richwood Ave., Fountain Hills, AZ 85268-1436. (602) 770-7829

Hammarlund HQ-129X: George Silva, WA6HCX, 27 La Flecha Ln., Santa Barbara, CA 93105. (805) 682-3094

Hammarlund HQ-140X: Abe Levy, W3DA, RFD 2 Box 230, Greenwood, DE 19950. (302) 349-5389

Hammarlund HQ-170: Bill Rovas, WA1APX/8, 7002 Rickett Dr., Washington, MI 48094. (810) 781-9717

Hammarlund HQ-170A: William Swiger, 1 Casey Ln., Bridgeport, WV, 26330. (304) 842-4635

Hammarlund HQ-170A: Abe Levy, W3DA, RFD 2 Box 230, Greenwood, DE 19950. (302) 349-5389

Hammarlund HQ-180A: Tom Clark, K5CGC, 2402 Kings Lodge Dr., Kingwood, TX 77345. (713) 360-5513

Hammarlund SP-600: Jeffrey Hopkins, WA2DPK, 1360 Jean Ave., Redlands, CA 92374-2749. (909) 798-7914

Hammarlund SP-600JX-17: Les Locklear, 1122 36th St., Gulfport, MS 39501-7116. (228) 864-8384

Harvey Wells TBS-50: Drew Kelley, W8GFG, 9010 Marquette St., St. John, IN 46373. (219) 365-4730

Heath DX-100: Dennis Murphy, KØGRM, PO Box 7162, Bismark ND 58507-7162

Heath DX-100: Abe Levy, W3DA, RFD 2 Box 230, Greenwood, DE 19950. (302) 349-5389

Heath DX-100: Darryl Dippel, WA5AAO, POB 335, La Grange, TX 78945-0335

Heath DX-100: Tony Schroeder, N8SNC, 165 S. Main Glandorf, Ottawa, OH 45875

Heath DX-100: William Swiger, Rt 1, Box 142A, Bridgeport, WV 26330. (304) 842-4635

Heath DX-40: William Swiger, Rt 1, Box 142A, Bridgeport, WV 26330. (304) 842-4635

Heath DX-60: Brian Roberts, K9VKY, 3068 Evergreen Rd., Pittsburgh, PA 15237. (412) 931-4646

Heath DX-60A: Jerry Kethcart, WB9YMT, 16620 Robinhood Dr., Orland Park, IL 60462. (708) 532-9245

Heath HR-10: Dale Mecomber, N2DM, POB 87, Skaneateles Falls, NY 13153.

Heath HW-101: Abe Levy, W3DA, RFD 2 Box 230, Greenwood, DE 19950. (302) 349-5389

Heath HW-101: Brian Roberts, K9VKY, 3068 Evergreen Rd., Pittsburgh, PA 15237

Heath HW-12: Fred, WØBMT, NE, (402) 887-5201

Heath HW-16: Ed Clink, WA9PFB, 1285 New Salem Church Rd., New Berlin, IL 62670

Heath MT-1: Collin Collier, N4TUA, 3400 Hwy 341, S., Hawkinsville, GA 31036. (912) 988-1276

Heath SB-101: Bruce Manser, POB 271, Cleveland, WI 53015. (414) 693-3247

Heath SB-102: Bruce Manser, POB 271, Cleveland, WI 53015. (414) 693-3247

Heath SB-401: Brian Roberts, K9VKY, 3068 Evergreen Rd., Pittsburgh, PA 15237

Heath Seneca: Jerry Kethcart, WB9YMT, 16620 Robinhood Dr., Orland Park, IL 60462. (708) 532-9245

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Heath V-7: Collin Collier, N4TUA, 3400 Hwy 341, S., Hawkinsville, GA 31036. (912) 988-1276

Heathkit SB-401: Abe Levy, W3DA, RFD 2 Box 230, Greenwood, DE 19950. (302) 349-5389

HG-10 chassis only Bob Meyers, KA7UMR, 18811 Cathy Adams Dr., Oregon City OR 97045, 503-722-8558

Hunter Bandit 2000: Bruce Manser, POB 271, Cleveland, WI 53015. (414) 693-3247

Johnson 122 VFO: Abe Levy, W3DA, RFD 2 Box 230, Greenwood, DE 19950. (302) 349-5389

Johnson Viking I: Abe Levy, W3DA, 13111 Blanchard Rd., Greenwood, DE 19950. (302) 349-5389

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Johnson Viking II: Keith Ericson, KØKE, 11090 N. Forest Hills, Parker, CO 80138. (303) 841-9582

Johnson Viking II: Tom Jurgens, KY8I, 216 Nickless, Apt 4A, Frankenmuth, MI 48734. (517) 652-3474

Lafayette HE-45A: John Poland, AE4EN, 2859 Scotts Hill Loop Rd., Wilmington, NC 28411. (910) 686-4236

Multi-Elmac PMR-6A: Geoff Fors, WB6NVH, P.O. Box 342, Monterey, CA 93942. (408) 373-7636

National NC-100 Richard Petersen, 1940 Grand Ave. Marion IA 52302, 319-377-9126

National HRO-50T-1: Tom Clark, K5CGC, 2402 Kings Lodge Dr., Kingwood, TX 77345. (713) 360-5513

National NC-100XA: Ed Sauer, KC9SP, 787 N Peterman Rd., Greenwood, IN 46142. (317) 881-1483

National NC-173: Jim Miccolis, N2EY, 126 Summit Ave., Upper Darby, PA 19082. (610) 352-5247

National NC-183: Abe Levy, W3DA, 13111 Blanchard Rd., Greenwood, DE 19950. (302) 349-5389

National NC-183: Abe Levy, W3DA, RFD 2 Box 230, Greenwood, DE 19950. (302) 349-5389

National NC-183D: Abe Levy, W3DA, 13111 Blanchard Rd., Greenwood, DE 19950. (302) 349-5389

National NC-200: Paul Gregg, W9POC, 725 College Way, Carmel, IN 46032. (317) 846-3094

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National NC-300: Abe Levy, W3DA, RFD 2 Box 230, Greenwood, DE 19950. (302) 349-5389

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National NCX3: Chuck Graham, K6KDZ, 20335 Casa Loma Dr., Grass Valley, CA 95945.

National NCX1000: Jim Buliszak, W1DU, 3 Sarah Ln., Chelmsford MA, 01824

National SW-54: Jim Larson, KF7M, 2245 Ross Ave., Idaho Falls, ID 83406. (208) 528-7869

R-1051B: Geoff Fors, WB6NVH, P.O. Box 342, Monterey, CA 93942. (408) 373-7636

R-266A/URR-13: David M. Sundheimer, 13020 Lakeview Dr., Burnsville, MN 55337. (612) 890-1844

R-274: Tom Brent Box 1552, Sumas, WA 98295. (604) 826-4051

R-390/390A: Earl Harris, K5FTE, 1009 Stanley St., El Paso, TX 79907. (915) 592-9185

R-390: Rich Dixon, W7QZO, 16032 Lost Coyote Ln, Mitchell, OR 97750

R-390: Tom Brent Box 1552, Sumas, WA 98295. (604) 826-4051

R-390A: Tom Clark, K5CGC, 2402 Kings Lodge Dr., Kingwood, TX 77345. (713) 360-5513

R-392: Tom Clark, K5CGC, 2402 Kings Lodge Dr., Kingwood, TX 77345. (713) 360-5513

RAK: Tom Brent Box 1552, Sumas, WA 98295. (604) 826-4051

RAL: Tom Brent Box 1552, Sumas, WA 98295. (604) 826-4051

RAO-3: Adam McLaughlin, KD6POC, 323 Asuelo way, Santa Rosa, CA 95401. kd6poc@jps.net

RCA AR-88: Jacob McClure, KB4AI, 2531 Garrisonville Rd., Stafford, VA 22554. (540) 752-0760

RME 45: Jonathan Weiner, 113 Valley Oak Dr., Greenville, SC 29617-6159

RME-4350: Cal Eustaquio, N6KYR, 1964 11th St., Los Osos, CA 93402. catman351@digitalputty.com

Robin/SBE-36: Bruce Manser, POB 271, Cleveland, WI 53015. (414) 693-3247

RS-6: Gary Cain, 850 Marschall Rd., Shakopee, MN 55379. (952) 496-3794

RU-17: Robert Hall, 643 Highway BB, Dunnegan, MO 65640-9718

SBE SB-33: Walt Hutchens, KJ4KV, 3123 N. Military Rd., Arlington, VA

22207. (703) 524-9794

SBE SB-34: Rich Wurtz, K9RLF, 1140 S. Taylor Ave., Oak Park, IL 60304. (708) 383-4579

SBE SB-34: Walt Hutchens, KJ4KV, 3123 N. Military Rd., Arlington, VA 22207. (703) 524-9794

Stancor 202A: Carl Lavnikevich, K1EYY, 259 Walker Rd., Cabot, VT 05647

Tempo-One: John Vercellino, WB9OVV, 6921 Springside Ave., Downers Grove, IL 60516. (708) 964-3020

URM-25:Jonathan Weiner, 113 Valley Oak Dr., Greenville, SC 29617-6159

USM-3: Walt Hutchens, KJ4KV, 3123 N. Military Rd., Arlington, VA 22207. (703) 524-9794

VHF FAA transmitter 6146 driver, 4CX150 PA 2 ea. Chuck Felton, 307-322-5858

Wireless Set, No 19, MK II: Ed Field, Rt 2 Box 825, Palmyra, VA 22983

WRL Duobander: Drew Kelley, W8GFG, 9010 Marquette St., St. John, IN 46373. (219) 365-4730

WRL Galaxy III: Drew Kelley, W8GFG, 9010 Marquette St., St. John, IN 46373. (219) 365-4730

WRL Galaxy V: Drew Kelley, W8GFG, 9010 Marquette St., St. John, IN 46373. (219) 365-4730

WRL Globe Champ 300: John Poland, AE4EN, 2859 Scotts Hill Loop Rd., Wilmington, NC 28411. (910) 686-4236, ae4en@aol.com

WRL Globe Champion 300: John Poland, AE4EN, 2859 Scotts Hill Loop Rd., Wilmington, NC 28405. (910) 686-4236

WRL Globe Chief 90: George Silva, WA6HCX, 27 La Flecha Ln., Santa Barbara, CA 93105. (805) 682-3094

WRL GT-550: Drew Kelley, W8GFG, 9010 Marquette St., St. John, IN 46373. (219) 365-4730

ER

AM Calling Frequencies

160 meter band: 1885, 1945 kc
80 meter band: 3870, 3880, 3885 kc
40 meter band: 7200, 7290 kc
20 meter band: 14.286 Mc
15 meter band: 21.400 to 21.450 Mc
10 meter band: 29.0 to 29.1 Mc
6 meter band: 50.58 Mc
2 meter band: 144.450 Mc

[Editor's note: Please send in your updates and corrections to the calling frequency list. I'd like to keep the frequencies as accurate as possible. Many newer AM'ers are not familiar with the traditional gathering spots.]

[...Comments from page 13]

tional Telecommunications and Information Administration (NTIA) released its study on the interference potential of broadband over power line (BPL) system operations to *federal government communications in the high frequency (HF) bands.* The NTIA recognizes that President Bush has "established the bold goal of universal and affordable broadband access for every American by 2007," and has called for "technical standards that make possible new broadband technologies, such as the use of high-speed communications directly over powerlines." The NTIA study also indicated agreement with the FCC that BPL can be deployed using the *existing emission limits*. But, it states that existing Part 15 measurement guidelines "significantly underestimate peak field strength," and the study does "not recommend that the FCC relax the Part 15 field strength limits for BPL systems."

Instead, NTIA recommended several new measurement guidelines:

1) measure emissions at power line height;

2) measure at a uniform distance of 10 meters from the BPL device and power lines,

[Continued on page 57...]

VINTAGE NETS

Arizona AM Nets: Sat & Sun: 160M 1885 kc at sunrise. 75M 3855 kc at 6 AM MST. 40M 7293 kc 10 AM MST. 6M 50.4 mc Sat 8PM MST. Tuesday: 2M 144.45 7:30 PM MST.

Boatanchors CW Group: QNI "CQ BA or CQ GB" 3546.5, 7050, 7147, 10120, 14050 kc. Check 80M winter nights, 40 summer nights, 20 and 30 meters day. Informal nightly net about 0200-0400Z.

California Early Bird Net: Saturday mornings at 8 AM PST on 3870 kc.

California Vintage SSB Net: Sunday mornings at 8AM PST on 3860 +/-

Colorado Morning Net: An informal group of AM'ers get together on 3875 kc Monday, Wednesday, Friday, Saturday, and Sunday at 7 AM MT.

Canadian Boatanchor Net: Meets daily on 3725 kc (+/-) at 8:00 PM ET. Hosts are AL (VE3AJM) and Ken (VE3MAW)

Collins Collectors Association Nets: Technical/swap sessions meet every Sunday on 14.263 mc at 2000Z. Informal ragchew nets meet Tuesday evening on 3805 kc at 2100 Eastern time, and Thursday on 3875 kc. West Coast 75M net is on 3895 kc 2000 Pacific time. **10M AM net starts 1800Z on 29.05 mc Sundays, QSX 1700Z.**

Collins Collector Association Monthly AM Night: Meets the first Wednesday of each month on 3880 kc starting at 2000 CST, or 0200 UTC. All AM stations are welcome.

Collins Radio Association nets: Mon. & Wed. 0100Z on 3805 kc., also Sat 1700Z on 14.250 mc.

Drake Technical Net: Meets Sundays on 7238 kc, 2000Z. Hosted by John (KB9AT), Jeff (WA8SAJ), and Mark (WBØIQK).

Drake Users Net: This group gets together on 3865 kc, Tuesday nights at 8 PM Eastern Time. Net controls are Gary (KG4D), Don (W8NS), and Dan (WA4SDE)

DX-60 Net: This net meets on 3880 Kc at 0800 AM, Eastern Time on Sundays. Net control is Mike (N8ECR), with alternates. The net is all about classic entry-level AM rigs like the Heath DX-60.

Eastern AM Swap Net: Thursday evenings on 3885 kc at 7:30 PM Eastern Time. Net is for exchange of AM related equipment only.

Eastcoast Military Net: Check Saturday mornings on 3885 kc +/- QRM. Net control station is W3PWW, Ted. It isn't necessary to check in with military gear, but that is what this net is all about.

Fort Wayne Area 6-Meter AM net: Meets nightly at 7 PM Eastern Time on 50.58 mc. This is another long-time net, meeting since the late '50s. Most members use vintage or homebrew gear.

Gray Hair Net: The oldest (or at least one of the oldest at 44+ years) 160 meter AM nets. Net time is Tuesday evening on 1945 kc at 8:00 PM EST and 8:30 EDT. Also check www.hamelectronics.com/ghn

Hallicrafters Collectors Association Net: Sunday on 14.293 mc, 1730-1845 UTC. Control op varies. Midwest net Sat. 7280 kc 1700Z. Control op Jim (WB8DML). Pacific Northwest net Sunday 7220 kc at 2200Z. Control op Dennis (VE7DH).

Heathkit Net: Sunday on 14.293 mc 2030Z right after the Vintage SSB net. Listen for W6LRG, Don.

K1JCL 6-meter AM repeater: Operates 50.4 mc in, 50.4 mc out. Repeater QTH is Connecticut.

K6HQI Memorial Twenty Meter Net: This flagship 20 meter net on 14.286 mc has been in continuous operation for at least 20 years. It starts at 5:00 PM Pacific Time and goes for about 2 hours.

Midwest Classic Radio Net: Meeting Saturday morning on 3885 kc at 7:30 AM, Central Time. Only AM checkins are allowed. Swap and sale, hamfest info, and technical help are frequent topics. Control op is Rob (WA9ZTY).

MOKAM AM'ers: 1500Z Mon. thru Fri. on 3885 kc. A ragchew net open to all interested in old equipment.

Northwest AM Net: AM activity is daily 3 PM to 5 PM on 3875 kc. The same group meets on 6 meters at 50.4 mc. Times are Sundays and Wednesdays at 8:00 PM. 2 Meters Tues. and Thurs. at 8:00 PM on 144.4 mc. The formal AM net and swap session is on 3875 kc, Sundays at 3 PM.

Nostalgia/Hi-Fi Net: Started in 1978, this net meets Friday at 7 PM Pacific Time on 1930 kc.

Old Buzzards Net: Daily at 10 AM local time on 3945 kc in the New England area. Listen for net hosts George (W1GAC) and Paul (W1ECO).

Southeast Swap Net: Tuesday at 7:30 PM Eastern Time on 3885 kc. Net controls are Andy (WA4KCY) and Sam (KF4TXQ). Group also meets Sunday on 3885 kc at 2 PM Eastern Time.

Southern Calif. Sunday Morning 6 Meter AM Net: 10 AM on 50.4 mc. Net control op is Will (AA6DD).

Swan Nets: User's Group meets Sunday at 4 PM Central Time on 14.250 mc. Net control op is usually Dean (WA9AZK). Technical Net is Sat, 7235 kc, 1900Z. Net control is Stu (K4BOV)

Vintage SSB Net: Sunday 1900Z-2030Z 14.293 & 0300Z Wednesday. Net control Lynn (K5LYN) and Andy (WBØSNF)

West Coast AMI Net: 3870 kc, Wed. 8PM Pacific Time (winter). Net control rotates between Brian (NI6Q), Skip (K6LGL), Don (W6BCN), Bill (N6PY) & Vic (KF6RIP)

Westcoast Military Radio Collectors Net: Meets Saturday at 2130 Pacific Time on 3980 kc +/- QRM. Net control op is Dennis (W7QHO).

Wireless Set No. 19 Net: Meets the second Sunday of every month on 7270 kc (+/- 25 Kc) at 1800Z. Alternate frequency is 3760 kc, +/- 25 kc. Net control op is Dave (VA3ORP).

CLASSIFIEDS

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Subscribers receive 1 free 20-word ad per month. **Extra words are 20 cents.** Here is how to count the words in your ad: "For Sale" or "Wanted" and your contact information counts as 7 words. Hyphenated words count as 2 words. **Please count the words in your ad as described above, and if you are over 20 words, send payment for the extra words at .20 each.** Note: Not all readers use email, so it is a good idea to include phone numbers.

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FAX (call first): 303-838-3665
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Deadline for the June 2004 issue: Friday, May 28

FOR SALE: Repair and restoration on all vintage equipment; 45 years experience. Barney Wooters, W5KSO, 8303 E. Mansfield Ave., Denver, CO 80237. 303-770-5314

FOR SALE: Military Radio manuals, orig. & reprints. List for address label & $1. For specific requests, feel free to write or (best) email. Robert Downs, 2027 Mapleton Dr., Houston, TX 77043, wa5cab@cs.com

FOR SALE: All unused AB-15/GR mast base, MP-50 mound bracket, SC-C-28591 angle bracket for MP-50. All for M38 & M38A1 jeep. $60 plus shipping for all. M. Forgensi, 916-630-0932

FOR SALE: Clegg 66'er with mic. 21939 Sky Buddy, with book, $100. Fred Clinger, 417 Beechwood Drive, Galion, OH 44833, 419-468-6117 After 6 PM.

FOR SALE: Hallicrafters, Heathkit & Drake equipment. Making room in the shack - reasonable prices on all items. Bob, W1RMB 508-222-5553.

FOR SALE: Hickok model 820 tube tester, $25. Heath vector scope w/manual, free, send $20 for shipping. Bruce Beckeney, 5472 Timberway Dr., Presque Isle, MI. 49777, 989-595-6483

FOR SALE: National NC-183D, $200. NC173 $100, 57B $50, 121W $80. Pick up only. Doug, WAØCGN, 6 Sutherland Ct., Highlands Ranch, CO 80130, 303-791-3559

FOR SALE: HT32B, KWM2, SR150, SP-210, T4XB, R4B, TR4, SX117, HT-44, more. Bob Ryals, KIØGF, 719-265-9950, joebob1@adelphia.net

FOR SALE: General Radio lab equipment, over 250 pieces, manuals, write wants, SASE. Stuart T. Carter II, W4NHC, 680 Fernwood Dr., Melbourne, FL 32904, 321-727-3015

FOR SALE: Lots of old radio & related books. Eugene Rippen, WB6SZS, www.muchstuff.com

FOR SALE OR TRADE: Gates / Harris Broadcast BC1H, 833s mod by 833s, Peter Dahl plate transformer, tuned to 1550 Khz, FB shape, Pick up in Denver CO, $650. Jeff, KEØMT, 303-967-2752 9-5 MST or KE0MT@aol.com

FOR SALE: QST magazines. Thirties through Century. Three to seven bucks. Request free contents pages. Charles Graham, 4 Fieldwood Dr. Bedford, NY 10507, 914-666-4523

FOR SALE: FT243 crystals (plenty) 3510, 3520, 3579, 3880, 3885, 7044, 7050, 7143, 7290, 7295, 8400, 10106, 14286 kcs. ONLY. $9.00 each plus $3.00 S/H. Details at: HTTP://AF4K.COM/CRYSTALS.HTM 407-323-4178 Brian Carling, AF4K

FOR SALE: Old CW transmitter. Tubes 6AC7, 6V6, 814, 6Y6 clamp. Needs refurbrishing, $20 + shipping. Fenton Wood, W5AIR 4716 Stonebriar Cir, College Station, TX 77845. 979-690-9824 milordwood@verizon.net.

FOR SALE: Heathkits: HD-1418 Audio Filter, $65; HD-1410 Iambic Keyer, $50; HD-20 Crystal Calibrator, $35. Richard Prester, 131 Ridge Road, West Millford, NJ 07480. 973-728-2454. rprester@warwick.net

FOR SALE: National HRO-60, collectors excellent, NBFM adaptor, xtal calibrator, speaker, 10 coils. $800 pickup. Tom Raymond, W5JM, 2320 South "O" St., Fort Smith, AR 72901, 479-783-8848, tomrw4jm@sbcglobal.net

FOR SALE: Heath HR-1680 Receiver & matching HS-1661 Speaker, excellent condition, w/manual, $200. Richard Prester, 131 Ridge Road, West Milford, NJ 07480. 973-728-2454. rprester@warwick.net

FOR SALE/TRADE: UT2000 Universal Transmatch $225. RT66/GRC $100. SR7R/WWV rcvr $100. HRO50T $400. **WANTED:** RCA/Radiomarine T408/

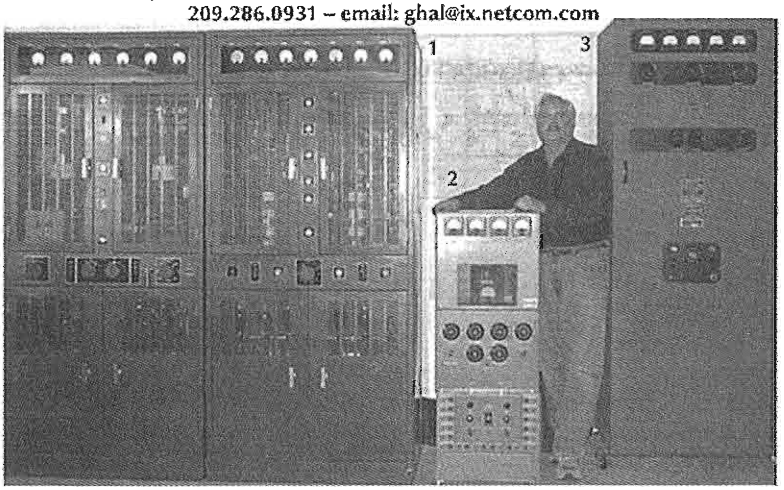
Magnificent Heavy Metal Sale

1. **1937 Western Electric 353-E1 1KW AM Transmitter.** On 160 meters. With original manuals, schematics, and spare tubes. Excellent condition: $8K. See ER #64, page 23 for details.
2. **Collins 507A-1 RF deck.** Removed from an FRT-24. 2-30 MHz, 4-1000 final. Vacuum tuning with gorgeous RF components. Includes homebrewed HV supply: $700.
3. **Collins TDO Transmitter.** WWII, 2-18MHz, 250W AM, 400W CW. Near mint condition. Includes two remote controls, original manual, extender cables and spares kit: $5K.

Buyer ships. Will consider trades. Located 50 miles East of Stockton CA.

WA9MZU, Gary Halverson **Mokelumne Hill, CA**

209.286.0931 – email: ghal@ix.netcom.com



URT12 xmtr/info. Sam, KF4TXQ, PO Box 161 Dadeville, AL 36853-0161 stimber@lakemartin.net 256-825-7305 "Life is another radio."

FOR SALE: Heathkit transceiver HW100, $150. Hallicrafters SX-24, $110. Grundig YB400, $90. Microphones: EV664, $65. Shure Boom 535, $85. D104, $45. Icom R71A $350. Realistic PRO2006, $400. Collector quality SP-600 inquire. Ron, MI, 517-374-1107

FOR SALE: DX-35, DX-40 reproduction crystal doors. $11.50 shipped. Texans add 8.25% sales tax. Glen Zook, 410 Lawndale Dr., Richardson, TX 75080

FOR SALE: Request free vintage flyer. USA only. 50 years of mail order electronics. Bigelow Electronics, POB 125, Bluffton, OH 45817-0125

ESTATE SALE: SX-115; HRO-60; RARE SX-73; 75A4 plus many more. Condition of most is excellent. Pick up in Parker, CO only. Call for details. Bill Leahy, KØMP 303-841-6146

FOR SALE: Viking Valiant $350. Hammarlund HQ-110 $150. Must pick up. Chuck, WB9FHU, Beaver, WI 715-854-7339

FOR SALE: Valiant II, factory wired, VG condx, $1000. Collins KWS-1 good condx, operational, not mint. Hal Guretzky, K6DPZ, 718-847-3090

FOR SALE: Countermeasures receiving set AN/WLR-1D, 50-10750 MHz, 9 bands, simultaneous display of frequency, spectrum, and modulation info on dual displays, manual, 1200 lbs., $4,500. Carl Bloom, 714-639-1679, carl.bloom@prodigy.net

FOR SALE: Galena crystal radios and parts to make your own. Also radio parts and tubes. Len Gardener, 458 Two Mile Crek Rd., Tonawanda, NY, 14150. email: radiolen@att.net

FOR SALE: Naval Receivers RAK, RAL, RAO, RBA, RBB, RBC, RBL, RBM. Some checked, pwr splys available. $75-$450 depending on condx. Many other types. Carl Bloom, 714-639-1679. carl.bloom@prodigy.net

The Collins Radio Association

Supporting the restoration and preservation of Collins Radio, now the world's largest Collins organization. Join today and receive the *Collins Journal*, bimonthly for only $20.00, now in its 11th year of publication. Help Support the CRA.

The No. 1 Collins website is still at www.collinsra.com

FOR SALE OR TRADE: QST, full years, excellent condition. 1950 thru 1960, plus 1944 missing September. $10 per year plus shipping from 10021. Or trade for CQ 1950 thru 1969. Ken, W2EWL, 212-288-1310, ken44@nyc.rr.com

FOR SALE: Tested good globe 201A $14, 226 $15, 227 $10 and others. Slightly weak tubes guaranteed to work in early radios ½ price shown. Write or e-mail: tubes@qwest.net for a new price list or see www.fathauer.com. George H. Fathauer & Assoc., 688 W. First St. Ste 4, Tempe, AZ 85281, 480-968-7686. Toll Free 877-307-1414

FOR SALE: Authorized repairs and sales of all types of amateur radio and communications equipment, and also test equipment. Please call us at LAND AIR COMMUNICATIONS, 718-847-3090 and visit our web site: www.landaircom.com. We have over 3,000 items in inventory and carry all types of communications parts.

FOR SALE: Vintage Radio Service. We repair radios, record changers, radios home, auto, tube & transistors. 1930-1980. Ken Hubbard, KA9WRN, POB 792, Beloit, WI 53512. 608-362-1896

FOR SALE: Your old QSL card? Search by call free, buy find at $3.50 ppd. Chuck, NZ5M, NZ5M@arrl.net

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Radio Auction

"The Howard Granoff Collection"
Saturday, May 22, 2004 at 10 am EDST
at the "Seville Antique Auction Barn"
8240 Wooster Pike Rd., Seville, Ohio

(Exit #2 off I-76, north one mile on SR #3)

Estes Auctions will be selling the inventory of the late Howard Granoff. Howard was the owner of "Olde Tyme Radio Company" in Silver Spring, MD. Howard did mail orders through his catalogs, and was well known by radio collectors. We will offer the inventory of that business.

Included are hundreds of Tubes, NOS Capacitors, Resistors, Radio Dials, Wire, Head Phones, Tube Testers, Transformers, Battery Set Parts, Books, Manuals.

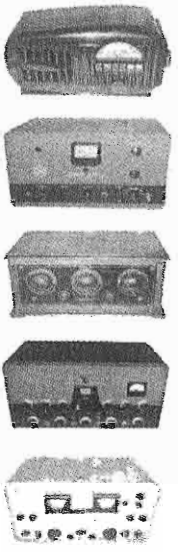
We will also offer a collection of Radios from Illinois, including Amateur Radio Receivers and Transmitters. Lots of ca. 20s Battery Sets, Horn Speakers, Cathedral and Tombstone Style Radios, several Crystal Sets, Test Equipment, Radio Magazines, Dumont and Crosley TV Sets, Console Radios, Rider Manuals, Edison Standard Phonograph.

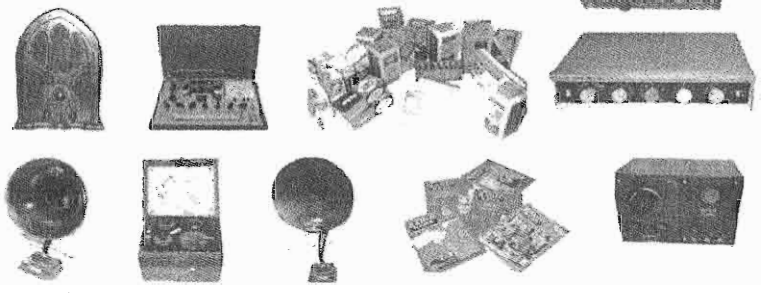
Lots of parts and part sets to be sold prior to the main auction.

Another Nice Radio Sale.

Hope to See You at the Sale!

Terms: Cash/Check/Visa/MasterCard; 5% Gallery Fee





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Richard Estes, Auctioneer -- Radio Call Sign K8LRY
Bob Dobush - Tube Consultant Kim Graca - Tech Support & Historical Alan Ferris - Set Up Mark DeLauter - Set Up

Call Us to Sell One Radio or Your Entire Collection!

No collection is too large for us, regardless of the location.

★ ***We will be able to pickup items at the Michigan and the Rochester AWA Meet for Consignment in our Auctions*** ★

FOR SALE: Radio books, magazines, catalogs, manuals (copies), radios, hi-fi, parts. Send 2 stamp, LSASE. David Crowell, KA1EDP, 40 Briarwood Rd., North Scituate, RI 02857. ka1edp@juno.com

FOR YOUR MUSEUM. For your rare tube collection. Uranium glass Jennings "Peanut" fixed capacitor. Still in original 1944 box. Unused "mint" condx. Glows bright green under your UV blacklight. $20 postpaid, free info. Bob Ryan, 1000 S. Gilbert St., Apt 132, Hemet CA 92543-7065

FOR SALE: Collins Radio stock certificates, 33 avail, 10-share (green) or 100-share (blue), issued to various companies. $20.00 each, limit one per customer. Check or MO. No choice on color. William O. Dean, KC7ICH, PO Box 3105, Tonopah, NV, 89049

FOR SALE: Repair, Restore, Sales of antique, vintage tube radios. John Hartman, NM1H, www.radioattic.com/nm1h

FOR SALE: New Ranger 1, Valiant 1, & Navigator plastic dials, freq numbers in green, with all the holes just like orig. - $17.50 ppd. Bruce Kryder, W4LWW, 277 Mallory Station Dr., Ste. 109, Franklin, TN 37067. bak@provisiontools.com

FOR SALE: KWM2/S-line metal logo pins. Meatball or winged. Excellent replica of the original. Put one on your hat, badge, or replace a missing logo on your panel. $6.25 shipped. W6ZZ, 1362 Via Rancho Prky, Escondido, CA 92029. 760-747-8710, w6zz@cox.net

FOR SALE: Used technical books: radio, electronics, math, military, magazines, etc. List: $1 (stamps OK). Softwave, 2 Dept. ER, 1515 Sashabaw, Ortonville, MI 48462

FOR SALE: R.L. Drake repair and reconditioning, most models including TR-7's, 35 years experience. Jeff Covelli, WA8SAJ, 440-951-6406 **AFTER 4 PM**, wa8saj@ncweb.com

NOTICE: Visit Radioing.com, dedicated to traditional ham radio & vintage radio resources. Let's Radio! Charlie, W5AM. http: / /www.radioing.com.

FOR SALE: Heath Nostalgia, 124 PG book contains history, pictures, many stories by longtime Heath employees. (See BOOKS inside back cover.) Terry Perdue, 18617 65th Ct., NE, Kenmore, WA 98028

FOR SALE/TRADE: Transmitting/Receiving tubes, new & used. $0.55 & LSASE for list. I collect old & unique tubes of any type. **WANTED:** Taylor and Heintz-Kaufman types and large tubes from the old Eimac line; 152T through 2000T for display. John H. Walker Jr., 13406 W. l28th Terr. Overland Park, KS 66213. PH: 913-782-6455, Email: jhwalker@prodigy.net

FOR SALE: Treasurers from the closet! Go to www.cjpworld.com/micromart to find some unique items many hams would lust for! Gus, WA, 360-699-0038 gus@wa-net.com

FOR SALE: Vintage equipment at the K8CX Ham Gallery Classified Ads section. Visit the largest Antique QSL Card Gallery http:/ /hamgallery.com

FOR SALE: Strong steatite antenna insulators. Lengths from two to fifteen inches. SASE for list. John Etter, W2ER, 16 Fairline Dr., East Quogue, NY 11942. 631-653-5350

FOR SALE: Please visit RadioWorld-Online.Come to see our ham gear, parts, and more. Carl Blomstran PO Box 890473 Houston Tx. 281-660-4571.

FOR SALE: Spun Aluminum Knob Inlays for most Boatanchors. Collins Dial Drum Overlays. Dakaware Knobs. Charlie Talbott, 13192 Pinnacle Lane, Leesburg VA 20176-6146. 540-822-5643, k3ich@arrl.net

FOR SALE: Build your own "Midget" bug replication by KØYQX, ca 1918, featured by K4TWJ in CQ Magazine, May '98. 10 detailed blueprints. FAX: 507-345-8626 or e-mail bugs@mnic.net

FOR SALE: Parts, tubes, books, ECT. Send two stamp SASE or email for list. Wayne LeTourneau, POB 62, Wannaska, MN 56761 letourneau@wiktel.com

FOR SALE: Collins restoration. Everything inside & out to make it as Art Collins built it. 50 yrs experience. W9OJI/N4FZ, IL, 815-734-4255 or N4PZ@aol.com

FOR SALE: Military and commercial communications items. Murphy's Surplus, 401 N. Johnson Ave., El Cajon, CA 92020. 619-444-7717 www.Murphyjunk.com

FOR SALE: New Release. For details send 2-stamp LSASE to: Olde Tyme Radio Co, 2445 Lyttonsville Rd. Ste 317, Silver Spring, MD 20910

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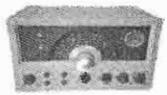
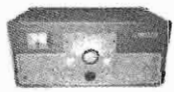
Radio Auction

The Michael Brown Collection
Saturday, June 26, 2004 at 10 am
at the Expo Auction Center
8157 Garman Rd., Burbank, Ohio

(Exit #204 off I-71)





Estes Auctions will offer the Collection of the late Michael Brown "Brownie" W8DJY from Middletown, Ohio. Michael was very active as an amateur radio operator and had amassed a large selection of items, all to be sold at our auction. Some of the items are:

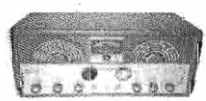
Collins 32S-3 Transmitter, Collins 75S3B Receiver, Collins P/S, Drake Transmitter, Drake L-4B Linear, Drake Model TC2, Drake TC6, Drake Watt Meter, Drake AC4 P/S, Dentron Transceiver Model 160XV, Drake TR4 Transceiver, Heathkit DX-40, AT-1, Hallicrafters SX-28 Super Sky Rider, SX-43, SX-130, S38-B, S53A, SX-101A, SX-42, SX-71, S-36, Hallicrafters HT-40 Transmitter, Hallicrafters Speakers R-46, R-42, PM-100, Receiver SX-25, S-120, Hallicrafters SX-99, SX-140, Hammerlund HQ-110A, Hammerlund H2-105TR, National Model NC-173, NC-300, NC-188, NC-57, Hammerlund H2-129X, Knight T-60 Transmitter, Heathkit DX-100, Johnson Viking Ranger, Globe High Bander VHF-62, Globe Scout Transmitter, RME Model 45 Receiver, RME 4300 Receiver, Bird Watt Meters, Drake T-4BX Transmitter, Viking Challenger Transceiver, Drake Remote RV-4, Kenwood TX-5115 Transceiver, Echo 432MHZ, Transceiver, Mirage B2516R Amp, Vibroplex Bug, Hand-Keys, Power Supplies, Coax, Coax Fittings, Crystals, QSL Cards, all the items that go with a Ham Shack.

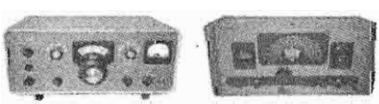
In addition to this collection, we will offer a collection of radios from Eastern Pennsylvania which will include Zenith Consoles, Zenith Chairsides, Tombstone and Cathedral Radios, Early Radios and a large collection of Tubes.

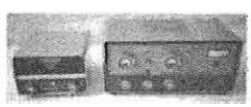
Check out the June issue of ARC for our ad.

Hope to See You at the Sale!

Terms: Cash/Check/Visa/MasterCard; 5% Gallery Fee







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FOR SALE: Convert any wattmeter to read PEP! Perfect for AM/SSB-$24.95 ppd for complete kit! HI-RES, 8232 Woodview, Clarkston MI 48348, 248-391-6660, info@hi-rescom.com

FOR SALE: Complete hardware set to connect Collins PM2 to KWM2 -$19.95 ppd. Warren Hall, KØZQD, POB 282, Ash Grove, MO 65604-0282.

FOR SALE: Repair, upgrade, performance modification of tube communications & test equip. Accepting most military, all Collins & Drake designs, & the better efforts from others. Laboratory performance documentation on request. Work guaranteed. Chuck Felton, KDØZS, Felton Electronic Design, Box 187, Wheatland, WY 82201. 307-322-5858 feltondesign@yahoo.com

FOR SALE: Tube list, new & used, wide variety audio, and ham. Recently expanded. SASE 52c. Bill McCombs, WBØWNQ, 10532 Bartlett Ct., Wichita, KS 67212-1212

FOR SALE: PANEL AND CABINET REFINISHING; Johnson, Hammarlund 180(a), R390(A), & others total restoration & sales; My updated web site: http://w4pnt.8k.com Patty & Dee's Marina; Dee Almquist, 534W. Main St., Waynesboro, VA 22980. 540-249-3161 Cell: 540-480-7179, FAX 540-249-5064

FOR SALE: RIT for Collins KWM-2/2A; No modifications needed. $79.95 SASE for details. John Webb, W1ETC, Box 747, Amherst NH 03031 bigspndr@bit-net.com

FOR SALE: Aluminum heat dissipating plate and grid connectors for all 3, 4 and T series Eimac tubes including 3-500Z, 4-1000, 304T's and others. Alan Price fixr7526@cs.com

FOR SALE: Ships radio room clock repros, boatanchor mugs and t-shirts, more. http://www.cafeshops.com/amradio.amradio2

FOR SALE: I built hot-rod receivers; R390A, SP-600, R-388/51J. NC-183D...and transmitters: Valiant, DX-100, T-4X-A-B, HT-32. 51J-4 filter replacements, R390A Hi-fi AM $245.00 ea. Chuck Felton, KDØZS, Wyoming, 307-322-5858, feltondesign@yahoo.com

FOR SALE: Collins reproduction items available through the CRA on www.collinsra.com. Join the CRA and subscribe to the Collins Journal. Dave, W3ST

FOR TRADE: Two good RCA 833A's for one Taylor 833A. Also looking for Taylor 204A, 813, TR40M. John H. Walker Jr., 13406W. 128th Terr., Overland Park, KS 66213. PH: 913-782-6455, Email: jhwalker@prodigy.net

FOR SALE: Two R-390A receivers, one R-389 receiver. Call for details 845-223-8392. Charles Croatman, WB2ZKS, 55 Lake Walton Rd, Wappingers Falls, NY 12590

WANTED: Collins R-389 LF receivers, parts, documentation, anecdotes, antidotes. W5OR Don Reaves, PO Box 241455, Little Rock AR, 72223 501-868-1287, w5or@militaryradio.com, www.r-389.com

WANTED: An R-390 "Non A Version" in VG or better condx for my SWL shack. Also R-389, R-391. Dan Gutowski, 9753 Easton Rd, Dexter MI, 48130. 734-718-7450, dg16ms26@msn.com

WANTED: July 1941 QST to complete QST, thanks! Carl. KN6AL, 3290 6th Ave 1E, San Diego, CA 92103 kn6al@earthlink.net phone 619-997-6146.

WANTED: RCA communications receivers, AR-60, ACR-111, CR-88, AR-8516, CRM-R6A, SRR-13. Dan Gutowski, 9753 Easton Rd, Dexter MI, 48130. 734-718-7450, dg16ms26@msn.com

WANTED: 250-watt multi-match modulation transformer. Owens, NWØO, Boulder, CO 303-673-9019, owensj@atd.ucar.edu

WANTED: For SCR-178: Generator GN-37, Insulator IN-85, lamp LM-18, Insulator mounts, leg supports, other parts. Robert Forte, 518-696-2400, ruforte@frontiernet.net

WANTED: Knight Span Master regens. Hajime Suzuki, Nishikuniyoshi 1644-24, Ichihara-Shi, Chiba-Ken, 290-0231 Japan.

WANTED: Good condition Heath AT1, VF1, AC1, Hallicrafters S38D, Tom Root, wb8uuj@arrl.net 810-659-5404.

WANTED: Still need #33A and #35 coils for Universal SW-3 for cash or trade. Hank Bredehorst, 2440 Adrian St Newbury Park CA 91320. 805-498-8907 quailhill@earthlink.net

WANTED: Hallicrafters SR-2000 Hurricane XCVR. Contact me if you OR a friend has a SR-2000. Mark, WB9QZB@AOL.COM, 847-774-2937.

WANTED: Hallicrafters external S-meter for S-20R. Joe Whisnant, 1233 Newcastle Way, Maryville, TN 37803, 865-977-9024

WANTED: references to articles written by Gordon Eliot White on ARC-5 receivers and Transmitters. Louis L. D'Antuono, 8802-Ridge Blvd., Bklyn, NY 11209. 718-748-9612 AFTER 6 PM Eastern Time.

WANTED: Fully functional with manuals: Johnson AN/FRT505 transmitter, Swan F51 and FC76. Contact Ric at C6ANI@arrl.net

WANTED: International Crystal T-12 Transmitter or just a schematic if you have that - any condition. Please contact me via license address or via http://AF4K.COM - thanks, Brian AF4K

WANTED: Plugin coils for 80 meter band. Made by Insuline Corp. of America. Variable capactor inside the coil which measures 3"/1.5", 5 pin. Bob WBØDMC 507-331-5103. rspeck@hickorytech.net

WANTED: For ART-13: DY-12, DY-17, or DY-17A, K-101. Bill McCaa, KØRZ, 303-499-1936, billk0rz@aol.com

WANTED: Top dollar paid for WWII radios, PRC-1, PRC-5, AR-11, SSTR-1, SSTR-5, British B2, need pts for PRS-1 mine detector. Steve Bartowski, 708-863-3090

***WANTED:** Please, help me in my NC-183D restoration. Need: S-meter, knobs, toggle switches, bottom covers, L40, T12. If needed, have contact in USA for shipping purposes. NC183D Winter Project: http://jvgavila.com/nc183d.htm. Thanks! JOSE eb5agv@ctv.es

WANTED: Scott Special Communications rcvr. EA4JL, please call Kurt Keller, CT, 203-431-9740, k2112@earthlink.net

WANTED: Technical Materials Corp. model DCU combiner, DVM monitor, LPP patch panel, LSP speaker, DCP power panel VOX V.F.O., CFA converter, and PSP-1 power supply. K8CCV, Box 210, Leetonia, OH 44431-0231, 330-427-2303.

WANTED: ANY Harvey-Wells speaker, aircraft unit, or military surplus component. Will answer all. Kelley, W8GFG, 9010 Marquette St., St. John IN, 46373, 219-365-4730

WANTED: SCR-602 components, BC-1083, BC-1084 displays, and APS-4 components. Carl Bloom, 714-639-1679

WANTED: WW2 Navy MBF transceiver, hopefully unmodified. John Svoboda, W6MIT 530-672-0903 or svoboda@directcon.net

WANTED: Collins 310B-3, basket case OK, 70E-8A PTO per 1948. Chicago CMS-2, pair of Taylor T-21. Jerry, W8GED, CO, 303-979-2323.

WANTED: James Millen coils 42080, 42040, 42015, 43015. Navy SE2511/ SE2512 receiver, SE2513 coil set. Gary Carter, WA4IAM, 1405 Sherwood Drive, Reidsville, NC 27320. Phone: 336-349-1991. Email: gcarter01@triad.rr.com.

WANTED: Correspondence with others (am incarcerated) on Military (especially R-390's & backpacks) and tube rigs. Also looking for copies of old surplus catalogs postwar thru 90's. W.K. Smith, 44684-083, FCI Cumberland Unit A-1, POB 1000, Cumberland, MD 21501.

WANTED: 23 channel tube-type CB radios for 10-meter conversions. Also tube-type 10-meter linear amplifiers. Ed, WA7DAX, 1649 East Stratford Ave., Salt Lake City, UT., 84106. 801-484-5853

WANTED: Looking for the emblem of National "NC". Katsu JO1GEG/ ex.N8EYH, khirai@ieee.org

WANTED: Audio transformers, with good windings, for Westinghouse RADA and Aeriola SR. amplifier. Paying $40.00 each plus shipping. Roland V. Matson, POB 956, Lake Panasoffkee FL

WANTED: Any TMC Equipment or Manuals, what have you? Will buy or trade. Brent Bailey, 109 Belcourt Dr.,Greenwood, S.C. 29649 864-227-6292 brentw@emeraldis.com

WANTED: National NTE CW xmtr in working Condx. I love National. Sylvia Thompson, 33 Lawton Foster Rd., Hopkinton, RI 02833. 401-377-4912. n1vj@arrl.net

WANTED: Old military radar displays, scopes, antennae, receivers, manuals, etc. Even half ton items! William Donzelli, 15 MacArthur Dr., Carmel, NY 10512. 847-225-2547, aw288@osfn.org

[...Comments, from page 45]

3) measure using a calibrated rod antenna or a loop antenna in connection with appropriate factors relating magnetic and electric field strength levels. [In other words, standard radio engineering practice--Ed]

In addition, the NTIA wants "exceptional protection" (e.g. notching) for 41 frequencies (4.2 MHz of spectrum total) amounting to 5.4% of the 1.7-80 MHz frequency range in which BPL operates.

Finally, the report recommended that BPL interference can be prevented or eliminated by mandatory registration of certain parameters of planned or deployed BPL systems; and by routine use of minimum output power, using filters and terminations to extinguish BPL signals on power lines where they are not needed, and judicious choice of BPL signal frequencies to reduce radiation.

73, Keep Those Filaments Lit!
Ray, NØDMS

WANTED: QSL card from my Grandfather, W9QLY, from before 1957. Also seeking original National Company logos from Ham or military equipment. Don Barsema, KC8WBN, 1458 Byron SE, Grand Rapids, MI 46606. 616-451-9874. dbarsema@prodigy.net

WANTED: ARC-5 rcvrs, racks, dynamotors. Jim Hebert, 1572 Newman

Ave. Lakewood, 0H 44107.

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WANTED: I wish to correspond with owners of National FB7/FBXA/AGS coil sets. Jim, KE4DSP, 108 Bayfield Dr., Brandon, FL 33511 j.c.clifford@Juno.com

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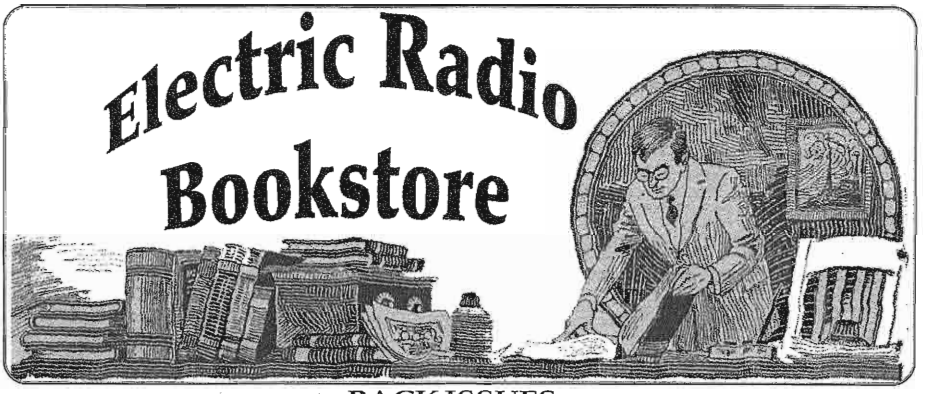

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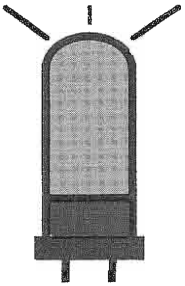

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