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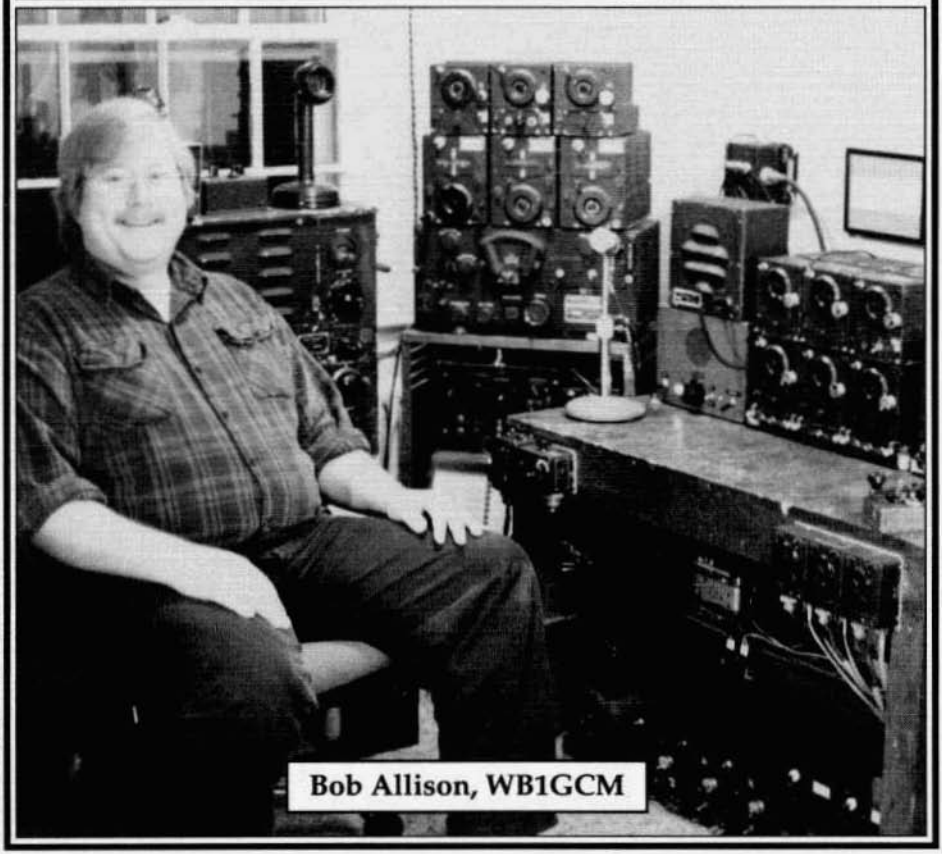
ELECTRIC RADIO

celebrating a bygone era

Number 57 January 1994



Bob Allison, WB1GCM

ELECTRIC RADIO

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Electric Radio is published primarily for those who appreciate vintage gear and those who are interested in the 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/operating with an emphasis on AM, but articles on CW and SSB are also needed. Photos of hams in their hamshacks are always appreciated. We invite those interested in writing for ER to write or call.

Regular contributors include:

Walt Hutchens, KJ4KV; Bill Kleronomos, KDØHG; Ray Osterwald, NØDMS; John Staples, W6BM; Dave Ishmael, WA6VVL; Jim Hanlon, W8KGI; Chuck Penson, WA7ZZE; Jim Musgrove, K5BZH; Dennis Petrich, KØEOO; Bob Dennison, W2HBE; Dale Gagnon, KW1I; Rob Brownstein, NS6V; Dick Houston, WØPK; Andy Howard, WA4KCY; Skip Green, K7YOO; George Maier, KU1R; Albert Roehm, W2OBJ; Mike O'Brien, NØNLQ, Bob Sitterley, K7POF (photos) and others.

EDITOR'S COMMENTS Barry Wiseman, N6CSW/Ø

A prediction for 1994: We're going to see a revival in homebrewing. And ER is going to do everything it can to support it.

NBFM is going to play a part in this revival. Dennis, KØEOO, and the rest of us involved in experimenting with this mode have concluded that the hardware available now might not be as good as we'd like it to be. Someone is going to have to design new discriminators and reactance modulators and until someone starts a cottage industry building them, we're going to have to build them ourselves.

Another thing that's going to get the soldering irons warm is the declining availability of good AM transmitters (and the high cost). Considering the price and availability of something like a Desk KW, a Globe King or even a BC-610 it's rapidly becoming a better idea to 'roll your own'. I have talked to a couple of AM'ers presently involved in HB transmitter projects and several others who are considering it. The interest is growing.

ER encourages all HB'ers to send in articles on their projects. And for those that don't have the time or inclination to produce an article, we're going to have a page or two each month devoted to pictures and short descriptions of HB projects. The articles or photos with short descriptions don't have to be on something you've just built; they could be on something you did years ago.

New books in the ER Bookstore :

Communications Receivers, 3rd Edition by Raymond Moore. This edition is much improved over the previous ones; better photos and a new military section.

McElroy, World's Champion Radio Telegrapher by Tom French. Theodore Roosevelt McElroy was more than a world's champion radio telegrapher; he was a REAL character. Tom French is an excellent writer and this book is a classic. I recommend it to all ER readers. I guarantee you'll enjoy it.

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Cover: Bob Allison, WB1GCM, with his vintage military gear. See his letter on page 15.

NBFM Update

by Dennis Petrich, KØEOO
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Well it's been a month now since my first article in ER#56. I wonder how much experimentation has been going on since then. I'd enjoy hearing from others who are interested in NFM.

I have had several Q5O's myself and am looking for more. Barry, N6CSW/Ø, John, W6BM, and Jim, N6PIQ have all been in there trying. Jim, N6PIQ is adding NFM to his DX-100B. A couple of weeks ago John, W6BM, drove his homebrew KW rig with an HT-18 Hallicrafters NFM exciter/VFO. It sounded quite good on my HRO-50T with the NFM-83-50 NFM adapter. The HT-18 generates FM so it doesn't have the tinny sound of PM. John experimented with various deviation and mic gain settings while I monitored his bandwidth with the SB-620 Scanalyzer. The tests were very informative and a lot of fun to conduct. During one test I ran my output power from 100 watts to 300 watts with no change at the receive end. (I was already doing well at 100 watts.)

John reported poor results with the NFM-83-50 NFM adapter after tuning it up the way National instructions dictate. It measured only +/- 2KHz of linear bandwidth before the discriminator became nonlinear. Subsequent retuning of the IF's and discriminator using his sweep generator and scope improved its performance but he still reports poor performance in the way of distortion, response to amplitude variations, etc. . .

I have noticed the distortion myself using this adapter and I believe more work is necessary to improve its linearity and reduce its susceptibility to amplitude variations, etc. . . In fact, a completely different design may be the ultimate solution to these problems. Technology is available today that wasn't available 40 years ago. More work will have to be done with the receiver's performance before NFM will sound as consistently good as AM does.

Barry built the NFM detector described in the June '60, *QST* article and both of us found the circuit to be susceptible to amplitude variations and distortion on NFM. Hank Scharfe, W6SKC, also built the circuit and said it worked good on his NC-300 monitoring wider 2 meter FM signals using a converter. At this writing the circuit seems to be giving mixed results.

John told me he was working on adding an NFM modulator to his Johnson Valiant. The modification would be FM as opposed to PM and correct for deviation variations when the VFO frequency is multiplied. Valiants are plentiful so this modification should be popular. I'm looking forward to the results of his efforts.

On the subject of receiver distortion, on 2 meter FM I have noticed audio distortion if you are not exactly on the transmit frequency. The distortion is caused by the transmitted signal deviating into the nonlinear regions at the edge of the receiver IF/discriminator bandpass. Older FM receivers provided a tuning indicator to solve the issue of centering the transmitted signal into the receive bandpass. This technique worked very well. Today you don't see these tuning meters much because the phase-locked receivers/transmitters don't need such an indicator.

As luck would have it, the NFM-83-50 adapter has a test point for a VTVM that can be used as just such a tuning indicator. I have tried it and found it to be very sensitive to frequency variations, making it useful for centering NFM signals. I adjusted the VTVM for zero at center scale so when the needle

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AMI Update

by Dale Gagnon, KW1I, President

AMI at the 500 Mark!

Memberships have been coming in steadily the last few weeks. Some of this is due to continuing coverage in *Electric Radio* and *The AM Press Exchange*, some is due to the AM operating events concentrated around the holiday weekends and some is due to recent mention of AMI in *QST* with the photo of WB3HUZ's September island portable operation. It is very gratifying to read the notes that accompany many of the memberships. These are not certificate hunters, but for the most part are amateurs who are excited about AM, who want to do what they can to promote and preserve this great mode.

AMI Finances

Year-end balances were not available from AMI Treasurer, Warren, NY2H, at press time, but for the first time AMI finances are in the black. All of the start-up printing and material expenses have been covered. Several have questioned whether the $2 membership fee is a one- time or annual fee. It is a one-time charge. This should be enough to cover certificate and brochure production and postage, with a little accumulation in case we need an emergency mailing.

AMI Officer Election

As reported last month the response to the election process was 'underwhelming'. I trust the lack of participation reflects satisfaction with the individuals currently serving, yet there were members who have expressed disappointment that the democratic process was not fully played out. If you have recommendations how this process can be improved, drop a line to AMI Headquarters.

The Great Lakes Region Director position is open. If you are in one of the states of Ill., Ind., Ky., Mich., Ohio, Wis., W.Va. or bordering Canadian provinces and you know someone who would do a great job organizing and encouraging the local AM activity, please send me their name.

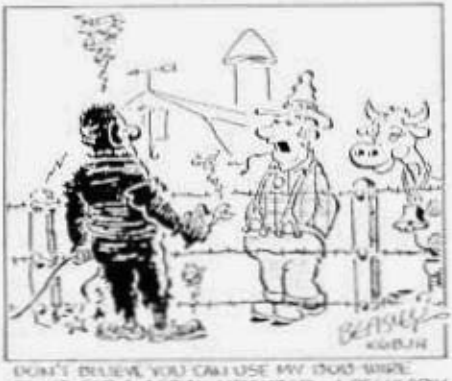
Thanksgiving Weekend AM Jamboree

Thanks to those who sent in copies of their Jamboree QSOs. It was encouraging to see the 15 meter activity. Eddy Swynar, VE3CUI, made 8 of his 25 contacts near 21.420 MHz. Al Siebel, WØDYI, made six of his 14 contacts on 15 meters near 29.4 MHz. Paul Maikranz, KB2MUQ, is anxious to see more AMI membership participation in these operating events. His log showed ten of his 23 contacts on 160 meters were with AMI members.

Dayton HamVention

AMI will sponsor the Fifth Annual AM Forum in Dayton the last weekend of April. The HamVention, its flea market and the AM Forum are great gathering spots for AM enthusiasts. Hope you can make it. ER

To join AMI send $2 to Box 1500, Merrimack, NH 03304-1500.



DON'T BELIEVE YOU CAN USE MY DOG WIRE FENCE FOR A AERIAL, NEIGHBOR—I REGULARLY RUN ABOUT 20,000 VOLTS ON IT.

My National FB-7A

Jim Hanlon, W8KGI
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Sandia Park, NM 87047

If you ever get to Kansas City, you simply must visit Associated Radio. You've seen their ad in *QST*, the one with the pictures of shelves full of Collins classics. They're in Overland Park, in the Southwest part of town. Go west on 80th from Metcalf. Cross Santa Fe at the first light, take a hard left onto Conser, and there they are on the right.

Associated Radio's pictures are a little out of date. They haven't had shelves groaning with S-line gear for several years now, since some Japanese fellow came and cleaned them out I understand. But you'll still find some Collins gear, Drake four-line equipment of all kinds, and rigs by Heath and Swan. What keeps me going back to visit the merchandise, however, is the back shelf. It sports receivers, transmitters and speakers by Hallicrafters, Hammarlund, National and such. I recall seeing on a recent visit an HQ-129x, HQ-170 and HX-500, several S-40's, an SX-101, an HT-37, an NC-125 and an NC-300 and a Harvey-Wells Bandmaster complete with VFO. There was even a genuine Cosmophone Transceiver and an NC-200 marked, "Lights, no smoke $85."

Associated Radio is really worth a visit for any afficianado of Electric Radios. Things are generally pretty pricey by my calibration, although Barry keeps reminding me that I'm still looking for antiques at 1970's flea market rates. But it's fun in any event, even if you just stop by to touch, feel and admire.

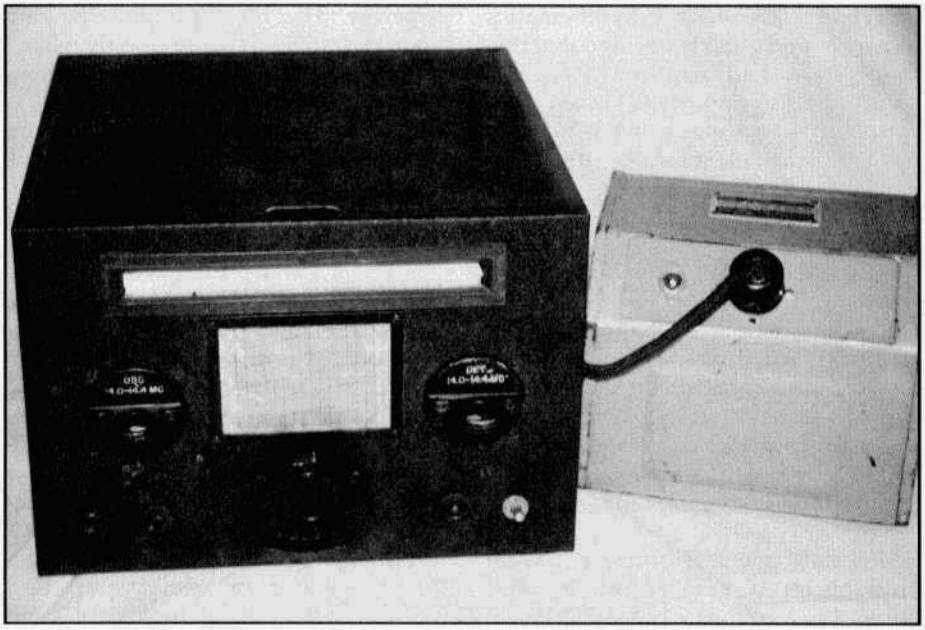
It was mid-April this year when I visited KC on a business trip. I was feeling a little sorry for myself since I hadn't been to the Dayton HamVention now for four years. So I stopped by Associated Radio with a friend after our meeting on the way to the airport. They had a few "make us an offer" items on a shelf, and the counter man remarked that he was "feeling very generous that day." My friend made a successful $5 bid on a B&W TR switch. I caught the spirit and picked up the crystal calibrator for my NC-303 for $10.

Then I decided to ask what had ever happened to the National FB7 they used to have up on the back shelf. It didn't seem to register with the counter man. "You know," I said, "it's kind of a square little black crackle box with some funny looking plug-in coils in front."

"Wait a minute," he said and disappeared behind the partition back of the counter. I heard some bumping and shifting going on, and shortly he reappeared with the object of my curiosity. "I don't know what kind of condition it's in," He said, "but I'd be willing to let it go for about a hundred dollars."

An immediate conference started inside my head. My fleamarket child-self screamed, "What a STEAL! Does he realize what he has?" My adult advised, "Keep your cool. Look it over to make sure there's actually something inside the box. Don't seem too interested, or he'll up the price." My Scottish ancestry chimed in, "You have enough mad money in your checking account to do it."

It looked pretty good from the outside, a full set of knobs and switches were there along with a matched set of 20 meter coils. The cotton braid on the power cord was clean and not frayed. Under the lid, things continued to look



The 1933, National FB-7A with power supply.

good. No dirt to speak of. There were tubes in all the sockets, complete with multi-piece aluminum shields. All the IF cans were there. The tuning capacitor was OK and even the dial drive was working. My trusty Swiss Army Knife didn't have a quarter inch nut driver for the bottom cover screws, so it was DECISION TIME! I wanted it, but I would have to haul it back from KC to Albuquerque via Detroit and Flint, Michigan, which was the next stop on my itinerary. Was I crazy enough to do it? Of course I was!

"A hundred dollars, you say? Well it looks like it's mostly all there. Would you have a box to put it in?" A few minutes later, and much to my friend's amusement, I walked out of the store with a genuine, 1933 vintage National FB-7A somewhat uncomfortably tucked under my arm.

It wasn't easy hauling through the Detroit airport. Naturally I checked my suitcases and carried the FB7 myself. It just fit under the seat in front of me - who cares about foot room. My arm felt like it was going to fall off by the time I got it to the rental car. But that was the worst of the trip. I stopped in Flint and got some clothesline which I made into a handle, and carrying was easier after that. The airport X-ray machine people didn't even bother to ask what was in the box! I was a little disappointed. It can't be every day that they X-ray a 60 year old communications receiver!

Home at last with the FB7 set down in a clear spot on my garage work bench, I began to take a more serious look at what I had acquired. Underneath the bottom cover things looked remarkably clean. When was the last time you saw resistors that were white ceramic tubes with lead end-bells and with the value written on them by hand in black ink? It was pretty apparent that a previous owner had made an "improvement" - there was wire and several color banded resistors and wax coated paper capacitors of a later vintage, and an extra switch and pot had been added to the front panel. I compared what I had to my copy of the FB7 manual - doesn't

continued next page

everybody have one in their schematics drawer? - and quickly decided that this little fellow had acquired a typical, double diode/triode detector, avc, first audio circuit in place of the original triode "plate detector." A little more looking showed that the "new" audio gain control had a frozen shaft and needed to be replaced, and the wires from the 59 audio output tube to the speaker pin jacks in back were missing. Other than that, all of the tubes tested OK, none of the wound paper bypass caps was leaky, and the resistors were close to their assigned values. It was beginning to look like I might have a real, live receiver on my hands!

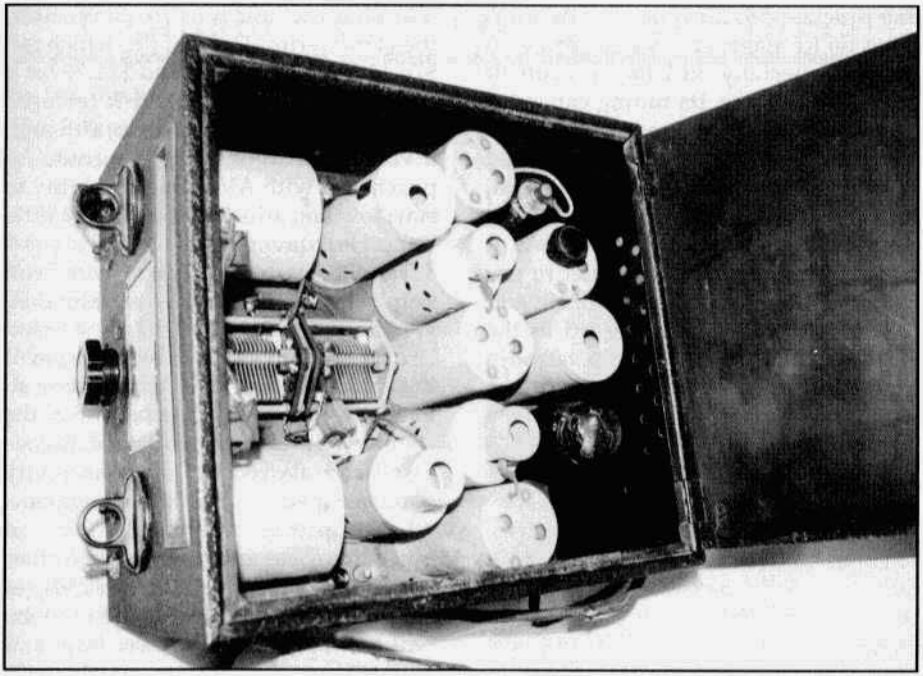
Now for a power supply. The FB7 was designed with 2 1/2 volt tubes back in the days when 6 volt tubes were unusable on AC because of hum. It requires 2 1/2 volts at 9 1/2 amps, and it prefers B+ between 180 volts at 40 mA and 250 volts at somewhat more current. These were originally supplied by National 5887-AB, 180 volt, or 5897-AB 240 volt "doghouse" power supplies. I had picked up a National 697 doghouse at the Albuquerque hamfest, designed to power an HRO with 6.2 V, 3.5 amps and 230 volts, 75 mA. I checked its B+ output at no load, what the FB7 would see with its B+ switch off, and found it to be more than 300 volts. National did not include a bleeder resistor in these supplies for some strange reason. Anyway, 300 volts was more than I cared to subject 60 year old bypass caps to, even in a transient situation, so I replaced the 5Y3 with two silicon diodes (Sorry about that) and switched the supply to its 220 volt configuration so that the B+ dropped to a more acceptable 160 volts. For filament power, I found a 2 1/2 volt, 10 amp transformer that once lit up a pair of 866A's. Because of some drop in the connector and power cord, I added one more turn to the transformer secondary to bring the voltage up to 2 1/2 at the tube sockets in the receiver. The filaments and the dial lights winked on encouragingly when I plugged in the filament transformer. Now it was time to apply some B+.

Do you pray before you power up an old radio for the first time? I do. With a quick invocation to The Old Man to make my fingers quick on the switch if smoke should start to rise, I began to inch up a Variac in the primary of the HV doghouse. All was well for a moment, and then just as my trusty, 41 year old Simpson was topping 50 volts - a grinding snarl leapt from the speaker. "No problem," I told myself after I had dumped the B+ and verified that nothing in the FB7 smelled like smoke. "It's probably just the power supply filter capacitor."

Sure enough, the old triple eight had waited till just then to give up. So I patched in a couple of modern 30's and was ready for another go. This time I inched the Variac all the way up with no apparent problems. There was even some perfectly respectable noise coming out of the speaker. Then to my utter amazement, the old fellow was able to tune in my modulated signal generator on 20 meters. It was alive! It really worked! !

But the BFO was not responding. Lifting the lid, I saw that the 24A BFO tube was dark. It should be OK, it was good in the tube tester. I put my finger on the grid cap and rocked the tube in its socket. A moment later it blushed to life, and the BFO began to whistle a somewhat hummy tune.

Next I touched up the IF alignment, being careful to wrap a turn of plastic tape around my spintight as the trimmer caps were hot. It didn't take much tweaking, the old radio was already pretty well aligned to start with at the BFO frequency of about 495 kHz. Looked like its previous owner had taken pretty decent care of this old fellow. After adjusting the trimmer on the local oscillator coil a little to bring 14,000



Inside the FB-7A

in at the right place on the dial, I clipped the antenna terminal to an extension cord strung out across the garage. Voila - there was the 20 meter CW band, alive, well and copyable. The old guy even made the 20 meter SSB signals understandable. Amazing! Outstanding!

Beyond the above repairs and tweaking, the only fixing I found to be necessary was to supplement a couple of original electrolytic caps used as cathode bypasses with new ones, discretely tucked away where they wouldn't show. The old ones had dried out to where they were ineffective, but they hadn't shorted.

Now that the first thrill of bringing a 60 year old amateur superhet back to life has subsided to a warm glow, I can be a little more objective about my find. The FB7 is a lot of fun, but it is far from the ultimate superhet.

The FB7 was the second superhet put on the market by Jim Millen and Company at National. Their first was the AGS, the "Aircraft Ground Superhet" designed as a ground link receiver for the Airways Division of the U.S. Department of Commerce and introduced in 1932. The AGS was a beautiful job, featuring 1 RF, 2 IF's, avc, a crystal filter in some models, a three-gang tracked tuning condenser, and plug-in coils that were adjusted by hand by National engineers for proper coverage and alignment. It also sold for $265 list, a small fortune in those dark depression days, and as a result precious few hams could even dream of having one.

The "Fone Band 7" made its debut in March of 1933. It's AGS lineage is definitely visible. It uses the AGS plug-in coils in its local oscillator and mixer front end, and it retains the AGS's two IF amplifiers and its round, deep drawn aluminum canned IF transformers - to be passed on in turn to the early versions of the fabulous HRO in 1934. But the FB7 is greatly simplified and cost reduced, or as the National ads of the

continued next page

National FB-7A from previous page
day proclaimed, "Stripped for Action." It has no RF stage, and is quite prone to images especially on 20 as a result. It came without avc. Its tuning capacitor is taken from the SW3 regen as is its RF gain control, right down to the signal strength "S unit" calibration on its rim. Its cabinet and chassis are the same, simple sheet steel found in the SW3. It was the first National superhet to use 57 and 58 pentodes in the mixer and IF's, also destined to show up in the HRO, instead of the type 36 tetrodes found in the AGS. Best of all, it was wonderfully affordable. A ham in 1933 or 34 could buy an FB-7A for only $34.20 and add bandspread coils for his favorite band, 160 through 10 for $6. The FBXA introduced in April added a crystal filter and sold for only $42.93. A National 5897-AB power supply could be added for $15.90 more, but I suspect many FB7's were powered from borrowed broadcast TRF power packs or from filament transformers and B+ batteries. And additional general coverage coils for the 1.5 to 20 MHz range were available for $6 per set. There were apparently also straight FB7 and FBX (no "A") models offered initially that used compression trimmers in the IF cans rather than the air variables found in the "A" models. These are listed in Raymond S. Moore's "Communications Receivers" as selling for $4.70 less than the A prices quoted above, but in my oldest *QST*, December 1933, only the A's are offered for sale. Perhaps the compression trimmers were too unstable. Does anyone reading this "who was there" remember why they went out of favor?

At any rate, the FB-7A and FBXA were the most affordable superhets available in 1933 and 34, and judging from the pictures and station write-ups in *QST* and the handbooks of that era, they were highly popular. A fully equipped FB7 with doghouse power supply and coils for all the ham bands cost about as much as its competitor, the Hammarlund Comet Pro which ran $76.44 for the receiver and $11.70 for a complete set of coils. And it featured roughly the same stage lineup, although a version of the Comet Pro could be purchased with AVC. But the ability to start low and add extras made the little FB7 a clear favorite.

The FB7's shortcomings were well known even when it was on the market. With its 495 kHz IF and only one tuned circuit on the signal frequency ahead of the mixer, WWV at 15MHz comes in like 'Gangbusters' on the bottom of the 20 meter CW band, and the SW broadcast band above WWV makes pretty good competition for 20 meter phone. As early as that December 1933 *QST* of mine, there was an article by none other than James J. Lamb and F. E. Handy (of Handy's handy Handbook fame) on how to modify the FB7. Wave traps and an outboard preselector which looks exactly like one introduced by National in early 1934 were suggested. The same article also directs that the 57 mixer be replaced with a 58 to lower susceptibility to cross modulation. In the June 1934 *QST*, Wolcott M. Smith outlines the replacement of the 56 triode "plate" detector with a 2B7 double diode, triode to provide a detector, avc and a first audio stage. This is the mod that I found installed in my FB7.

But images aside, it's not all that bad a receiver on 20 CW. The coils are wound on heavy "R39" forms and they mount inside of deep drawn aluminum cans that open to the front panel, so thermal drift is not a major problem. Selectivity is not great on my non-crystal model, about the same as my Hallicrafters "Sky Champion" S20R. National included a low pass audio filter between the detector and first audio, and I have plans to add a Heath Q-muliplier to the first IF to help out selectivity a bit. The BFO injection is relatively low, perhaps a function of the change from a plate de-

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Evaluation of Toko Ceramic Filters

by Ray Osterwald, NØDMS
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A few issues back, in ER #52, Pat Keogh, WB9GKZ, wrote up his experiences using the Toko ceramic filters in a 75A-4 as an economic alternative to mega-buck original Collins filters for AM service. I had been interested in these filters myself for similar applications, and when Pat mentioned that he wished someone would evaluate them, I decided to get my project going.

In general, I like the smooth response of these filters. As expected, the ultimate attenuation is not so great, but the overall smooth response curve contributes greatly to the excellent audio quality which can be achieved when they are used in an IF amplifier strip with proper filter terminations.

The equipment used in my testing was a General Radio type 1025A sweep generator and a Tektronix 549 storage oscilloscope -- state of the art stuff back in '65! The camera was a tripod mounted 35mm, ASA 200 film exposed for 1 second at f:2.8.

The vertical display range in all of these photos is 50 dB. Be aware that I only tested the few filters that I ordered, and manufacturing tolerances will dictate variations from the results I have obtained. Also the shape factor quoted in my measurements is not the typical 6:60 dB figure as found in most filter specifications, but was measured from -6 to -50 dB.

Figure 1 is the schematic of the test set-up for the 4 kc filter. As called out in the Toko documentation, resistive terminations were used.

Figure 2 is a photograph of the result of the frequency sweep. The marker (the center "pip") was adjusted to be 3 dB down from the peak filter response

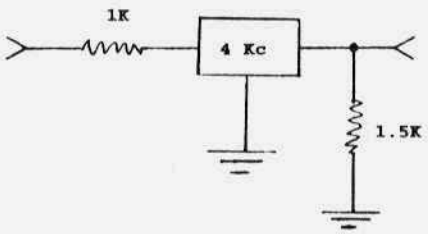

Figure 1

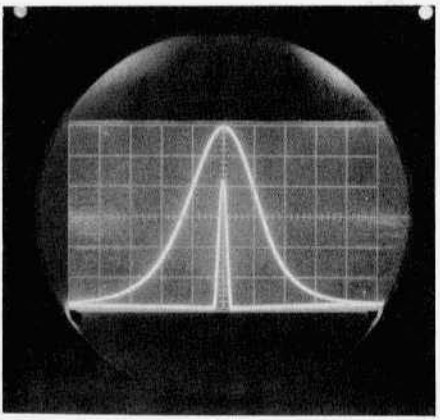

Figure 2

at center frequency. Notice the nice, smooth, symmetrical response curve, and the peaked noise response which is typical of ceramic filters. The response is only slightly wider on the lower side than it is on the higher side, which is noticeable on the first large division up from the baseline. This filter is a heck of a good value for $3.64! The filter center frequency measured 455.62 kc, or 620 cycles higher than specified. The -50 dB bandwidth was 20.94 kc, or a shape factor of 1:5.8. Insertion loss measured 7.6 dB, or 1.6 dB higher than specified.

Figure 3 is the setup for the 8 kc filter, and figure 4 is a photo of the frequency sweep. Notice here that the skirt response is slightly more symmetrical, but the noise response has shifted. The

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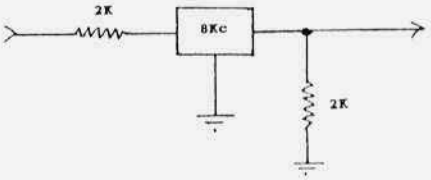


Figure 3

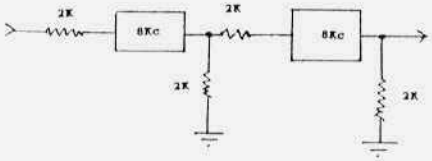


Figure 5

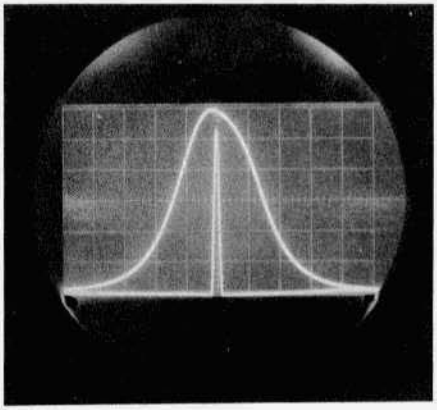


Figure 4

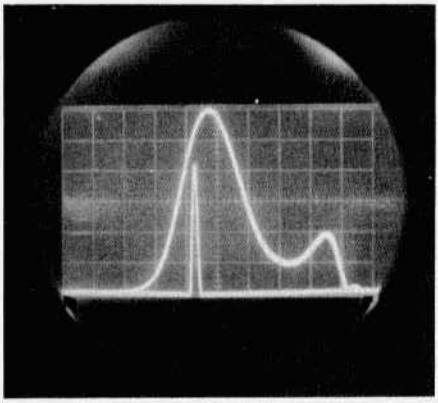


Figure 6

marker is 1 dB down from the geometrical center of the filter at 455.83 kc, but the peak response is a little lower at 455.36 kc. This is a 470 cycle difference. The -6 dB bandwidth measured 9.06 kc, and the -50 dB bandwidth was 42.23 kc for an overall shape factor of 1:4.6. Insertion loss was 6.6 dB, this time only .6 dB greater than the specification. The Toko specifications call out a 9 kc bandwidth at 18 dB down. I measured a 12.93 kc bandwidth at -12 dB. Not astounding selectivity, but at the price, certainly usable.

At this point, I got curious. Could two of these filters be cascaded to improve the overall skirt response? Figure 5 is a schematic of my trial, and figure 6 is the frequency sweep. One of the filters used was the same filter as in the first 8 kc test, and the second was another which was ordered at the same time. As is obvious, the results are less than "optimum"! The marker is centered at 455.000 kc, 3 dB down from the peak response. The photo shows an overall double-hump response, with the largest peak at 456.160 kc (+1.15 kc) and the second is even higher, at 466.560 kc (+11.56 kc.) This combination wouldn't make much of an IF filter.

In an effort to improve the response, I experimented with various terminations. The Toko data sheet calls out a 2000 ohm termination for the 8 kc filter. 2000 ohms works out to about 100 pF at 455 kc, so I tried terminating both filters with this value of capacitance (see schematic in figure 7). This produced the response shown in figure 8, which is slightly improved. The noise response is smoother and sharper, but is centered at 456.150 kc. The second peak, while greatly reduced, is still evident. The 6 dB bandwidth measured 2.72 kc, and the -50 dB figure was 14.11 kc. This is a much lower shape factor of 1:3.7. While this has not been tried in an actual receiver, this might be too narrow for AM. Also, the IF would have to be

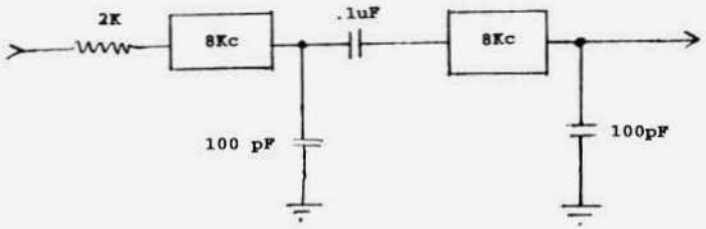


Figure 7

aligned for 456.150 kc. Higher values of terminating capacitance made no improvement, and neither did lower values. Inductive terminations were not tried, although some of the Toko interstage IF transformers might prove to be an ideal solution to the coupling problem.

To use these filters in the 75A-4, be sure that no B+ voltage is across the filter terminals. Only the early models of the 'A-4 have this voltage present. Any of them built in 1956 or later have the changes already installed. If yours is one of the early ones, consult any of the later instruction book schematics and wire in the modification. This was never the subject of a service bulletin, but is simply shown on the schematic revisions for later production runs.

It's really easy to use the Toko filters in a 75A-4. Mechanical filters have input and output impedances of about 2000 ohms, very close to the value specified for the ceramic filters. As Pat mentioned, one can simply "plug it in" and try them out, as the receiver filter section is already designed for an input and output impedance close to 1000-2000 ohms. Closer matching might be done with some form of an L network, but the only difference would be 1 or 2 dB additional gain. The March 1993 issue of *RF Design* carried an excellent article by Bill Sabin on the use of mechanical filters in HF receivers, including equations for calculating suitable matching network values. A deluxe installation might include additional impedance matching, and some shielding between the filter terminals so that signal leakage does not degrade its performance.

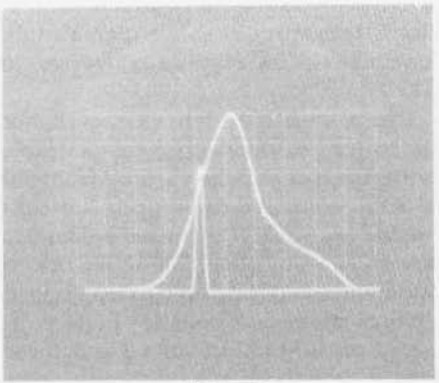


Figure 8

The super low price, small size, and reasonable performance offered by these ceramic filters make them ideal for use in a wide variety of radio projects. They are readily available from Digi-Key, whose service is so fast that it seems like they arrive as soon as you hang up the phone! Readers will surely find the time spent installing them well worth it. **ER**

Editor's Note: Digi-Key can be contacted at 800-344-4539 (until 7 PM CT) or by FAX (24 hours) at 218-681-3380.

813 Triodes as Modulators

by John Staples, W6BM
732 Cragmont
Berkeley, CA 94708

Triode-connected 813's (813-T's) offer a low-cost, high-quality alternative to 810's and similar tubes as modulators in kilowatt-class AM transmitters. They work well in zero-bias class-B service with plate voltages in the range of 2 to 3 kilovolts. With simple modifications, transmitters using increasingly expensive 810's may be converted to 813-T's.

I measured the plate characteristics up to four kilovolts and one ampere, with the grid voltage varying from -10 to +100 volts. All three grids are connected together at the socket. The figure shows the plate characteristics in solid lines, and the grid current vs. grid voltage in dashed lines for plate voltages from 0.5 to 2 kilovolts. I took these measurements with a short pulse technique. The curves are for the best 813 of about 10 measured: a few had slightly lower emission, but this represents a typical new, out-of-the-box tube.

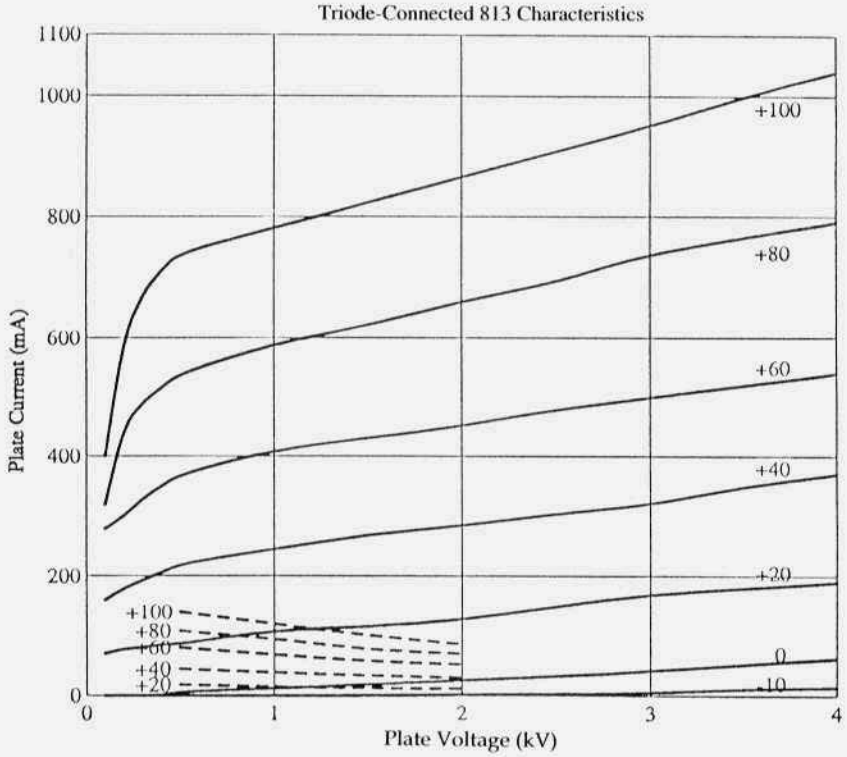
The 125 watt plate dissipation is not exceeded at zero bias at plate voltages below 3 kV. Operation above that requires a volt or two of bias. A little bias may be used at lower plate voltages to reduce power supply drain and to provide some plate dissipation margin.

Zero bias operation presents a more uniform load on the driver in push-pull operation as one grid is always drawing current, and, depending on the output impedance of the driver, may actually lower the distortion over high-bias tubes such as the 810. My audio driver, a Viking Ranger, uses inverse feedback to lower the output impedance, and I swamp the secondary of the driver transformer with a 1.6k ohm resistor from each side to the center tap to provide additional load stabilization.

Additional characteristics calculated from the plot show that the 813-T plate resistance is fairly high, 20 to 25k ohm at +40 to +60 volts of positive bias, decreasing to 7.6k ohm at +80 volts. This is a little higher than the 810, but at negative modulation peaks where the secondary of the modulation transformer becomes unloaded, this should present sufficient back load to prevent voltage soaring. The transconductance at 2.5 kV plate voltage and +50 volts bias is about 8800 micromhos.

The plate-to-plate load impedance is not critical. The choice of load impedance is a compromise among gain, peak power output and distortion. A lower load impedance usually results in lower distortion but higher driving power requirement, which may in turn result in higher distortion in the driver. Usually the user has little choice in the matter, as the modulation transformer is already at hand, so try what you've got. If the transformer is tapped, try all combinations for the best overall operation. The optimum plate-to-plate load impedance for the 813-T is in the range of 15k ohms.

The grid voltage swing requirement depends on the plate-to-plate load impedance, but will probably be in the range of 150 to 200 volts peak-to-peak, requiring less than 20 watts peak or 10 watts rms to drive a pair of 813-T's to full output. Drivers designed for 810's can easily provide this. Bias, if used, should come from a source variable from 0 to perhaps -5 volts. A 1.5 volt



flashlight battery could be used, and it would be charged in this configuration. Alternatively, one or two forward-biased silicon power diodes could be placed in the cathode return circuit. Too much bias would result in excessive crossover distortion.

You may wonder, as I did, why transmitters of the Collins KW-1 or Johnson Desk vintage didn't use 813-T's to begin with. When the KW-1 appeared in 1951, and four years later when the Johnson Desk appeared, the 810 was the only popular tube with sufficient capability to modulate a one kilowatt rig. In 1949, 810's retailed for $14.50 while 813's cost $16.00. The transmitters had to provide grid bias circuitry for the final anyway, so biasing the modulators probably didn't add much additional cost. There was also probably a bias (pun intended) against triode-connecting a perfectly good pentode. Other tubes, such as the 805 or the 811A didn't have the power capability. Large triodes such as the 833A or various radar modulator types were available, but would have been overkill. However, the nearly zero-bias 811A was the most popular modulator tube for transmitters in the 500-watt class of the day. Unfortunately, the 811-A had no kilowatt counterpart.

Later on, in 1961, a tube did appear on the market that would have served well: the 572. This would have been a fine zero-bias class-B modulator providing over 500 watts of audio power with only 2000 volts on the plate. By this time, AM was no longer of interest to new ham equipment manufacturers, and the 572 evolved into the 572B, used in many class-B linear amplifiers. But it was too late to see application as a modulator tube.

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LETTERS

Dear ER

A letter from Pete Brown, KH6IRT, in December's issue about "Mint" radios voices a real problem with sellers of radio equipment.

Perhaps a guideline of radio cosmetic rating needs to be established & published in Electric Radio. I think most honest sellers just don't know how to rate or describe a radio because there is no standard to do it with. The 1 to 10 rating system is sometimes used and misused. Words like "Mint" "Average" "Excellent" "Collector Quality" "Nice" "little scratch", etc mean different things to different people.

Something I do when a buyer is interested in detailed cosmetic condition is to take the time to go to the radio in question and describe its defects in detail with an on-the-spot inspection. It takes just a few minutes and is well worth it. Sometimes the potential buyer/collector does not purchase the item but I usually do sell the item and the new owner is happy with his purchase. Perhaps a poll of readers for suggestions as to a standard of rating for radios could be made and the results published in Electric Radio. It would be a great help to all of us that buy and sell vintage gear sight unseen.
Don Winfield, K5DUT

Dear ER,

It was a splendid idea to let Bill, KDØHG, write something about the handling of precious old 'hollowconductors'. I think there still must be some of the old experts with the appropriate know-how hanging around somewhere. It would be very interesting to have more articles on tube handling. Some of the questions to be answered could, e.g. be:

- is it OK to run finals in cutoff for a long time?
- is it ok to have diodes in the power supply, or should the supply come up slowly or delayed, after all cathodes are sufficiently heated?
- what about over- and under-heating? E.g. why is there a 8BN8 running on 6 v in my Drake 2-A?

I am sorry, but I am not a tube expert with enough experience to write such wonderful articles like Bill, but if I happen to run into something useful in older German literature, I promise I will try to send you a translation.
Ernst, DJ7HS

Bill's response:

I have found the Radiotron Designer's Handbook to be the best single reference work on vacuum tubes with a practical tilt; try to obtain a copy to answer your hollow state questions! As best I can, here's my response to your questions.

The question of using instant warm-up silicon diodes in a power supply was addressed in ER #3. In general, it is always preferable to allow tubes to reach their correct cathode operating temperature prior to application of B+. There are exceptions to this rule; for example, tubes rated for a high plate voltage (more than 500V) reportedly are more immune to the negative effects of cathode stripping.

With regard to heater voltage tolerance, I have never seen any receiving tube data sheet that characterizes tubes at out-of tolerance heater voltages. Running a tube at reduced heater potentials can cause seriously shortened life when rated plate current is drawn. However, many thoriated tungsten transmitting tubes may be run in such a manner to extend heater life if run at reduced ratings. I suspect that the same may be true in the case of some receiving tubes. In the example you cite, of the 8BN8 run on 6.3 volts, it may be possible that the equipment designers desired to minimize heater-caused tube heating for the

sake of stability and chose to run the tube at reduced plate current as well.

I cannot easily answer your question regarding the cut-off finals without further information such as the type of tube and the length of time being biased off. In general, thoriated tungsten tubes should show little if any deleterious effects from such a practice. On the other hand, coated cathodes may develop odd effects such as high internal resistance between the base metal and coating. Please refer to the recent article by Ray Osterwald, NØDMS, on the subject. Again, in very general terms, it is sound practice to remove all electrode voltages if a tube is to be idle for any extended time.

Bill, KDØHG

Dear ER

I've always enjoyed AM. I built my first rig twenty years ago; a Heath DX-60B. But my interest in AM took an interesting twist in March of '81. I found my first command set receiver (an ARA type, 3-6 Mc.). It was only six dollars and seemed almost new. A little probing and a dynamotor from Fair Radio got it running. I got hooked and soon afterwards I had my first complete command set station running. It was fun raising the eyebrows of old timers who hadn't heard an ARC-5 in thirty years. It seemed as though no one else in this part of the country was using them in their original form.

After a few years of running them and other vintage gear out of a barn in Glastonbury, CT, I ran into Walt Hutchens, KJ4KV. With Walt I made my first 2-way command set QSO, something I doubted would ever happen. Each time I worked Walt late at night, (around 3 AM on 75M) he was running some different piece of military gear. This inspired me to collect other old military sets and improve my command set collection. Later on Walt's articles in ER helped me tremendously.

I also enjoy operating other fine AM gear. My favorite TX/RX pair is my Viking I and HRO-M. The Gonset G-28 also gets plenty of use. Six meter AM is very active here in Connecticut and there is an excellent AM repeater now on the air; K1JCL - 50.4 in, 50.5 out. With cable TV and better shielding on TVs and VCRs these days, why not try six AM?

Bob Allison, WB1GCM

Dear ER

I enjoy reading Electric Radio and commend you for helping promote AM and vintage radio. It is good to see a renewed interest in AM and to notice that many new operators are discovering the fun of this mode.

Sadly, I also notice that AM operators are still considered to be a low form of animal life by some of the diehard SSB operators who have only had the pleasure of using a Japanese made transceiver.

I also fear that some of our AM operators are helping to reinforce that low opinion of us. Possibly some of us are getting careless and maybe some have not considered how their operating practice could influence the opinions of us by other hams in general. Perhaps it is time that someone reminds us that we should not let up in our efforts to enhance our best image and to keep AM operating enjoyable.

Here are a few things I have observed while monitoring AM on 75 and 40 meters lately:

Frequent use of socially unacceptable language. Even words such as "hell" and "damn" have no place in normal speech.

Long monologues, with no apparent consideration as to whether the other members of a round-table discussion are interested. Transmissions should be kept short enough that all have a chance to be heard.

Many operators evidently have not

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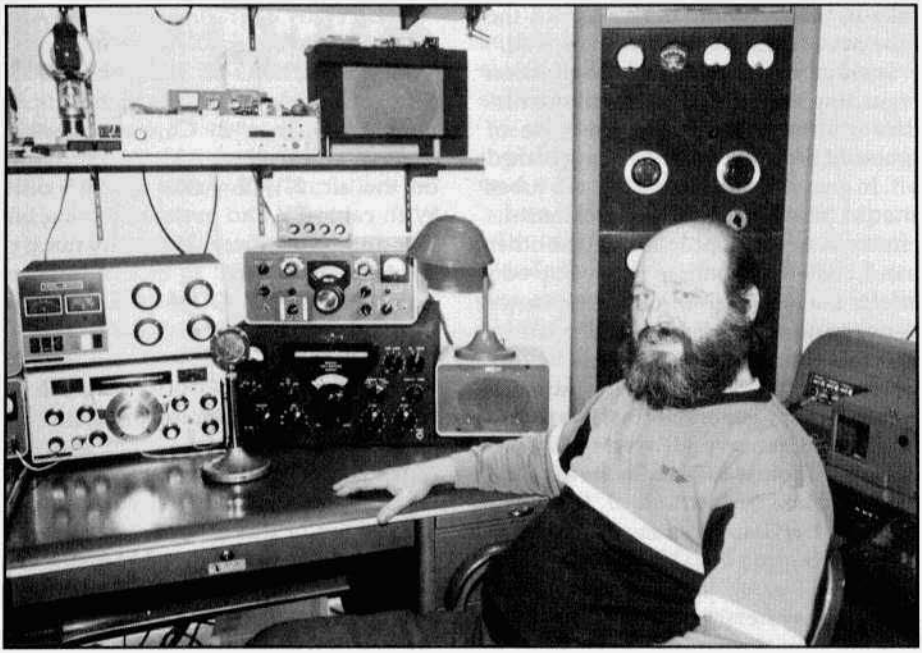
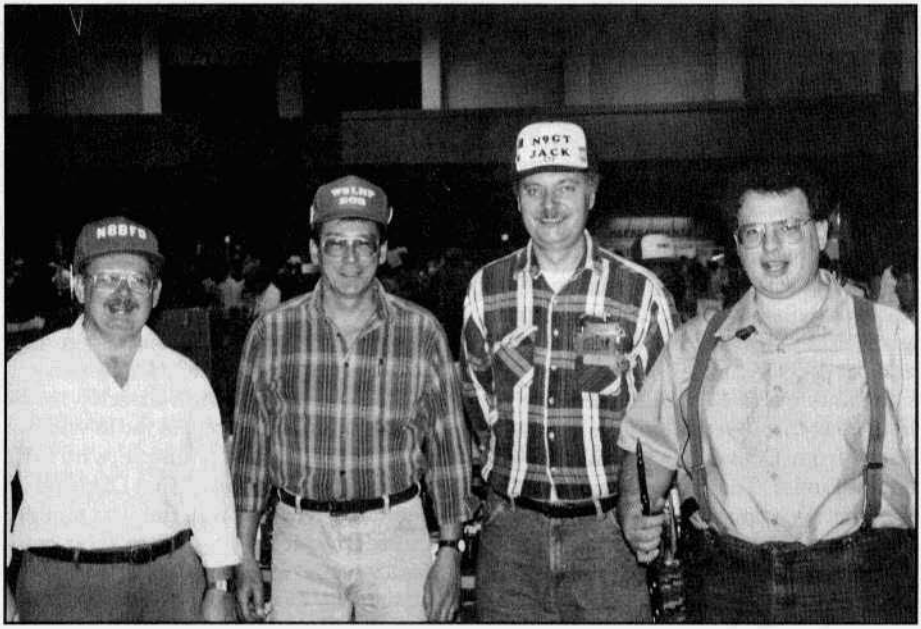


Bob Zarkovich, KL7HDY, in his Anchorage, Alaska hamshack. He's active on 15 and 20 meters with 4-element mono-banders. Some of the gear shown includes a Johnson Desk KW, a Collins 75A-4, an HRO-500 and an NCL-2000. The HB rig in the corner has a 304TH final modulated by 810's.

Calif. AM'ers at a TRW swapmeet. From L to R: Dave, AJ7O; Steve, K6PFW; John, KU6X; Jim, NU6H; ?; Ron, W6HFZ; Dave, WA6VVL and Larry, ex-K6LXT.



AM'ers at the Fort Wayne hamfest in November. L to R: Milt, N8BFD; Bob, W8LHP; Jack, N9GT and (?) WD8AZD.

Art Rideout, WA6IPD, with his vintage gear. The transmitter on the right is a BC-610.

A Boatanchor Calibrator That Works

by Walt Novinger
431 Norfolk Dr.
Pacifica, CA 94044

I use my boatanchors for listening to major SW broadcasters as well as to ham nets (the West Coast AM Net is my favorite) on a daily basis. I am currently using an SP-600-JX17, an RME-84, an HQ-180 and an R-390A, all of which share the same antenna (a 40' random feeding 50-ohm coax through a Magnetic Longwire Balun from Doeven Elektronika in The Netherlands). The radios are hooked to the antenna using a B&W Model 595 6-to-1 switch. One of the characteristics shared by the SP-600, the RME-84, and several other old radios I hook-up from time to time is the lack of a crystal calibrator that will put out a marker every 100 KHz to aid in figuring out where the radio is tuned or to adjust the bandspread (when available) to be "right on the nose." This article describes my solution to this problem and should be of interest to others who miss the handy calibrator on some of their radios.

A small company in Pawling, NY, Two Fox Electrix, runs an ad in *ER* (e.g., #57, p.48) for their Tri-Mark crystal calibrator. The unit runs on a 9-volt battery (or rectified filament voltage) and costs only $17.95 as a kit. After talking to the owner for a few minutes, I placed my order and received the kit six days later via first-class mail. The kit uses quality parts, and is built on a high-quality drilled and tinned PC board; total assembly time was less than 45 minutes from opening the package to hooking it to the antenna input of the RME-84 to test it. As advertised, the Tri-Mark places strong markers at every 100 KHz, 1 MHz, or 5 MHz, selectable using a three-position slide switch. The unit has a power switch that controls the input voltage (regulated by a 78M05 5-volt regulator). Calibration is accomplished by zero-beating against a known frequency like WWV (I used my NRD-535D for this to assure the highest accuracy possible).

Now that I had the calibrator working, it was time to figure out how to enclose it and make it most useful. Two Fox Electrix purposely limits the output to a low enough level that the calibrator can be attached directly to the antenna terminals of the radio without overloading it. So, a simple wire with an alligator clip was all that I figured I'd need. Indeed, this was the first method I used and, for those radios whose antenna terminals I could get to conveniently, it worked quite well. Simply clip the clip onto the antenna terminal, turn the power on, and calibrate away. Unfortunately, some of the radios are mounted in a 19" rack cabinet, and others are just too heavy to move to attach the calibrator regularly. Besides, I'm inherently lazy. . . who wants to fiddle with alligator clips, anyway?

Finally, I hit on the right idea. . . build the calibrator into the antenna switch so that it's available to any radio instantly. By luck, the calibrator fit very nicely into one end of the B&W switch (the PC board is only about 2.5" by 3.5") and mounted on .25" standoffs with 4-40 screws. This left plenty of room for a 9-volt transistor battery which I wrapped with black electrical tape to avoid shorting the antenna wires. I set the marker switch to 100 KHz, and wired s SPST toggle switch across the on-off switch (left open); the toggle switch is mounted to the face of the antenna switch where it's just a handy flip away when I want to use the calibrator. The calibrator's output is wired to the common lug of the B&W's rotary switch; whichever radio is selected therefore gets the calibrator's output.

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VINTAGE NETS

Westcoast AM Net: Meets informally, nightly on 3870 at 9:30 PT. Wednesday at 9:00 PM PT they have their formal AM net which includes a swap session. Net control rotates.
California Early Bird Net: Wednesday nights at 8 PM PT on 3835.
Southeast Swap Net: Tuesday nights at 7:30 ET on 3885. Net control is Andy, WA4KCY. This same group also has a Sunday afternoon net on 3885 at 2 PM ET.
Eastern AM Swap Net: Thursday evenings on 3885 at 7:30 ET. This net is for the exchange of AM related equipment only.
Northwest AM Net: Recently started by Pat, K7YIR, this net is on 3875, Mondays and Fridays at 9:30 PT. This same group meets on 6 meters (50.4) Sundays and Wednesdays at 8:00 PT and on 2 meters (144.4) Tuesdays and Thursdays at 8:00 PT.
Twenty Meter AM Net: This net on 14.286 has been in continuous operation for at least the last 20 years. It starts at 4:00 PM PT, 7 days a week and usually goes for about 2 hours. Net control is Les, K6HQI.
Arizona AM Net: Meets Sundays at 3 PM MT on 3860. On 6 meters (50.4) this group meets at 8 PM MT Saturdays.
Colorado Morning Net: An informal group of AM'ers get together on 3875 Monday, Wednesday and Friday mornings at 7AM MT.
DX-60 Net: This net meets on 7290 at 2 PM ET. Net control is Jim, N8LUV. This net is all about entry-level AM rigs like the Heath DX-60.
Military Net: It isn't necessary to check in with military gear but that is what this net is all about. Net control is usually Walt, KJ4KV, but sometimes it rotates to other ops. It starts at 5 AM ET Saturday mornings on 3885.
Grey Hair Net: The oldest (or one of the oldest) 160-meter AM nets. It meets on Tuesday nights on 1945 at 8 PM in the winter and 9 PM ET in the summer.
Vintage CW Net: For CW ops who enjoy using vintage equipment.This is not a traffic net; speed is not important. The net meets on 14.062, Saturdays at 3 PM PT. Net control is Tracy, WB6TMY.
Vintage SSB Net: Net control is Chuck, N5SWO. The group meets on 14.293 at 1 PM CT, Sunday afternoons.
Collins Users Net: The oldest of the 'users nets'. It meets on 14.263 Sunday afternoons at 2 PM CT. The net control revolves. This group also gets together for an informal ragchew on 3805 Tuesday evenings at 7 PM CT.
Drake Users Net: Another relatively new net. This group gets together on 3865 Saturday nights at 8 PM ET. Net controls are Criss, KB8IZX; Don, WZ8O; Rob, KE3EE and Huey, KD3UI.
Heath Users Net: A new net started by Marty, WB2FOU/5. Net control is shared by Fred, AA5LW. It meets on 14.275 at 4 PM CT Sundays. Check in on either AM or SSB.
Swan Users Net: This group meets on 14.250 Sunday afternoons at 4 PM CT. The net control is usually Dean, WA9AZK.
Nostalgia/Hi-Fi Net: Meets on Fridays at 7 PM PT on 1930. This net has been meeting since 1978.
K1JCL 6-Meter AM Repeater: Located in Connecticut it operates on 50.4 in and 50.5 out.

1994 Classic Radio Exchange QSO Party

The 1994 Classic Radio Exchange QSO Party will take place between February 6-7 from 2000 UTC to 0400 UTC.

Suggested frequencies: CW up 60 kHz from low band edges; phone 3880, 7290, 14.280, 21.380 and/or AM frequencies. Novice/Tech: 20 kHz up from low band edges. 7060 and 3560 CW tend to be the most popular CX frequencies. Send logs, etc. to Jim Hanlon, W8KGI/5, P.O. Box 581, Sandia Park, NM 87047 or Marty Reynolds, AA4RM, P.O. Box 13354, Atlanta, GA 30324. Include an SASE for a copy of next "CX" newsletter.

The SW3 and I... and Other Stories

Part 2

by Roger Faulstick, KD4AS
210 Mariah Ct.
Merritt Island, FL 32953

The only factory modified SW3 that I presently own is one with a B+ switch. I have seen others that had National modifications that included special name plates, heater and B+ toggle switches and one that had a two position rotary switch that appeared to select a DF loop or single ended antenna. As usual, their were no panel markings.

I remember in 1965 going aboard a 1930's bulk cargo ship that was way past its useful life. It was getting ready to go to the wrecking hammer. In addition to rust, fatique cracks and a hundred shipyard patches, the ship had obviously seen some heavy war action. I could see, even under layers of paint, the pattern of shell hits and splinter damage and signs that it may have been modified for cold weather operations.

No one at the yard knew where it came from. All I knew was that it was carrying a foreign flag, (which wasn't surprising.) It had been towed in from somewhere and was a sad, old rust bucket, looking like it had been tied up in some harbor backwater for years. I went aboard to work up a bid on buying the ship's electrical switch gear and generators. Out of curiosity, I checked out the radio room. As I remember, it was complete, with a odd assortment of gear, a Russian style gray colored HRO, some old Mackay transmitters, down to the Radio Officers mill, covered with dust and a straight key still bolted to the operating desk. My eyes scoped a strange piece of equipment attached to the bulkhead. It was very unusual looking, but unmistakably a SW3, with shock mounts, handles, toggle switches and a reinforced case.

The top cover had a typical National style nameplate partly written in what appeared to be Cyrillic. The words National Co. were clearly visible. It was a old Model I with globe style tubes. To this day it is an enigma; I have only found one other person who has seen a similar SW3. Some years later, I was talking sea stories with a old RM/3 China hand, who had sailed on one of the Asiatic gunboats back in the early thirties. I asked him what kind of gear he used back then. He remembered every piece of gear, including a shock mounted SW3 with handles sticking out the sides installed in the radio room. His comment was "Usually the damn thing worked better than the main eighty pound Federal Electric TRF receiver, but it was really a pain in the butt when the input voltage varied, the signals would go swoosh and be gone forever." (It had to have been an SW3.)

Getting back to my derelict ship. The modifications to the SW3 didn't look like any typical ship yard job. The work was too neat, even all the bolts and fittings were black wrinkle. With it was a beautiful teak coil rack, that looked as if it had been someone's spare time labor of love. It enclosed a complete set of low frequency coils and a leather bound instruction manual hand dated and accepted for installation in 1933. The receiver was wired directly into the ship's 110 volt DC main batteries. It apparently was a backup or emergency receiver. Unfortunately, I didn't have any

tools with me and had to leave the SW3. I did a lot business with the yard, and could have had it for the taking. Probably for 20 bucks and a sixpack. The yard boss would have had one of his coolies cut the whole damn radio compartment out of the ship for me. It was going to end up as smashed scrap metal anyway. I often thought, what stories that SW3 could tell. A Murmansk run survivor; probably, a hundred times around the world; easily.

I will elaborate somewhat on the information that Jim Hanlon presented in his article. When I first started fooling around with SW3's, I had trouble telling one model from the other, because to the uninformed, they essentially all looked alike. Even the SW3 instruction books were sketchy and typical 1930 style with a schematic(s), a brief description of how the controls work, a reprint of a pamphlet that discusses the original engineering effort and some catalog sheets that covered several different models.

The National Model I was the original SW3, introduced in 1931. It was available in three versions depending on the tubes that were used. It was available for 6.3 volt heater, 2.5 volt heater and 1.4 volt DC filament type tubes. The 6.3 and 2.5 volt tubes had five-pin bases, and the 1.4 volt DC tubes had four pin bases. This is a quick way to check if you have a Model I. Also check the top cover; as I remember, the cover did not have the turned up lip on the front edge for easy opening. A few had the Jackson Labs label but are very rare, most turned to ozone after a few years. . .Looking underneath, all the micas were the old style open eyelet construction. The resistors were dog bones except for the ever-present multitap wirewound. The correct coils are the series 10-20 for all three versions.

Jackson Labs was a clever maneuver by National to get around the ubiquitous and oppressive RCA licensing agreements. Attila the Hun was a nice guy compared to the top management of RCA. Jackson Labs was not always a dummy company or shell. It was a small legitimate company that had a facility and people assembling kits supplied by National. Considering how petty RCA was, the upper management must have had their noses tweaked by little National.

The National Model II was the most popular SW3. It used tubes with either 6.3 volt or 2.5 volt heaters with six-pin bases. It's the most common model. To identify this model, look underneath the chassis for brown phenolic molded mica capacitors. The correct coils are the series 60-70. Sometimes called series 60.

The universal model III, which I have only seen one of, used the popular octal based 1.2 volt DC or 6.3 volt AC tubes. They were sometimes supplied more often with toggle switches installed than the earlier series. This receiver uses the series 30-40 coils.

There was sometimes an overlapping between models, a late model I might look like a early model II, being a mixture of components. This was a necessity of life for a small company during the tough times prior to WW II to survive. From what I have heard, the so-called Great Depression didn't end until 1939 or so.

The SW3 used an odd color code for the power cable. Black and red was used for the heaters, yellow or white was ground (or negative) blue was B+. Sometimes one side of the heaters was grounded, sometimes not. It's best to check this before you fire up a strange SW3. If you happen to have a grounded center tap on the filament transformer in your power supply, and one side of the heater is grounded in the radio, you just might have to find a use for a 3.15 volt filament transformer. . . . . Hey, Jose, are you smoking those strange

continued next page

SW3 and I from previous page
cigarettes again, or is that my power supply burning? Always check under the chassis before you ever apply power to a strange SW3. I have run into some very unusual modifications.

I remember one SW3 that had all the components removed from under the chassis and all four wires from the power cable soldered together with one big blob of solder and grounded to the chassis. Another had the B+ on one of the heater pins. It would have been very thrilling to witness the effects on my unfused power supply.

SW3's have been around so long and usually passed through so many hands, it's rare to find one that doesn't have at least one Ding Dong modification. Some of the more common problems that I have found are gassy tubes (Sorry Red Rider. . . . those aren't VR tubes with grid caps), open sections in the wire wound voltage dropping resistor, occasionally leaky or open .5 mF bypass caps (I repair these by stuffing five .1 mF ceramic disc caps in the little metal boxes, or, you might try a wrap and fill mylar capacitor).

I had a quirky problem with one set of coils. The 100pF grid leak bypass inside the detector coil had become a perfect one meg resistor. It had corroded plug pins, sockets and switches. Verdigris was causing leakage from a brass capacitor contact to ground.

This type of failure is usually caused by exposure to humidity and some type of acidic salt, e.g. impure types of soldering flux. Another failure mode is brittle copper wire. If a copper or brass alloy goes through a fast drawing process during manufacture, as it ages, it progressively gets harder, and just moving a wire can cause a break. Remember, some SW3's are over sixty years old.

I remember having a difficult time trying to repair an old WW II I-177 tube tester. I would break one or two wires every time I moved a component to get further into its rat's nest wiring. I finally decided to end my misery and gave it a happy joyful send off to I-177 heaven. I have had a similar problem with some Model I SW3's, trying to modify a coil to a different frequency range. The wire just fell apart in my fingers. The chassis wiring in an SW3 is rather "robust" as the English would say, however I still have found a occasional broken connection.

In audio transformers, hardening of the copper combined with corrosion of the very fine gauge wire at solder connections can easily cause a catastrophic failure. Shorted turns, shorts between primary and secondary windings in old National power transformers are also not unusual. This is caused by normal aging of the natural enamel on the wire and breaking down of the insulation paper between windings, which is usually caused by a very small residual amount of sulfurous acid in the paper, which after many years may cause the paper to revert back to wood pulp.

Some SW3's can be very finicky regarding the characteristics of the power supply you hang on them. If you don't have a 5880AB, and are going to build your own, I would suggest (if I may be so presumptuous) that you pay attention to the following.It may save you considerable time and annoyance.

It really is a personal choice regarding the use of solid state or thermionic components. You can use a 6X5 or a 80 with a VR150 if you are somewhat of a purist, or silicon diodes and a high voltage Zener, or a string of Zeners for voltage regulation, if you are more progressive. The SW3 usually won't care. However, there are certain additional things that the power supply must have for good SW3 performance.

1) Use a good quality low-leakage transformer, with a Faraday shield between primary and secondary and a copper hum strap around the core. Most steel-cased military transformers are also excellent choices.

2) Plan on using a double filter network, with two chokes and three capacitors. Even with being in a steel cabinet, SW'3 are very prone to hum problems both induced and conducted.

3) Use some type of voltage regulation. I have found that you might have to adjust the voltage to get optimum performance out of your particular receiver. I have one SW3 that just purrs at 150 volts: my other one likes something lower like 90 to 105 volts. So, it's no big deal to pick VR tubes or diodes to get the correct voltage. You can use an unregulated supply, but any line voltage variation will affect the regeneration point and may cause you to go back to listening to your Japanese rig.

4) Be wary of using electronic regulated supplies. I have tried to use my HP electronic regulated lab supply with mediocre results. It seems to offer the SW3 a higher impedance than it likes and caused the whole SW3 to become hot and have hand capacity problems. Simple bypassing and a low-pass networks didn't seem to really cure the problem.

5) Make sure you bypass all diode junctions and from both plates to cathode if you are using tubes. Any type of .001 to .005 mF high voltage mica or ceramic discs should work. This will prevent untold problems with what the old timers called "tuneable hum". Tuneable hum is a phenomenon that shows up as hum that modulates the received signal. CW sounds like everybody has filter problems, kind of like the whole world is T-6. It also makes receiving SSB almost impossible. When first hearing it, you may think that you need additional filtering in your B+. But those of you that have worked with direct conversion receivers know it may take heroic efforts to cure this problem. However,sometimes just an RF choke from the cathodes of the rectifiers to the input filter or a toriod wound choke in the receiver heater leads will cure the problem.What you are trying to do is keep RF out of any rectifier junctions that could act like a radiating harmonic generator.

6) Make sure that you twist the heater leads and if the filament transformer secondary has a center tap by all means, ground it. If the transformer does not have a center tap ground one side or the another. However, make sure that the other side is not already grounded.

One of the most confusing aspects of the SW3 is coil identification. . . .AH,. . I couldn't quite hear what you said there Jose, you say not true. . . . just turn up my hearing aid, plug in the coils and any lid can find the ham bands. It's amazing how gauche and unsophisticated some young hams are today. With the calliope of Megawatt commercial and propaganda signals clogging the HF bands and with the broad band and so called bandspread characteristics of the SW3, good luck. Doing a quick count of the available coil sets for the SW3, I came up with eighteen different frequency ranges for each of the three different models of receivers.

How did National identify the different coils? Well, they had three methods. The model 1 originally used a colored dot centered between the pins. At some time in their production run they switched to a small quantity of paint in a small groove molded into the top rim. At a later date, they started hot stamping the bases. So, with this model you could have three different marking systems for the same coil and radio. Do you kind of feel like we are in the SW3 Twilight Zone OM? **ER**

Next month part three, the conclusion.

The HQ-110, A Vintage Receiver Bargain

by Rob Brownstein, NS6V
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Let's face it, the days of discovering a 75A-4 for $150, a Viking 500 for $300, or a Johnson Desk for $500 are probably all over -- at least for now. We rummage through swap meets and find ratty-looking vintage gear for clean-gear prices, and the rare clean gear for ridiculous prices. The equipment advertised in this magazine is usually more realistically priced, but the superstars of vintage gear are simply getting harder, if not impossible, to find. It's no wonder, then, that you've probably skipped over ads for HQ-110s looking for that elusive AR-88, NC-183D, NC-303, HRO-60 with all the coils, or the like. But if you did, you overlooked an underrated and often bargain-priced receiver.

The HQ-110, introduced by Hammarlund in 1957, is a double-conversion, ham-bands-only receiver that covers 160 through 6 meters. You can receive AM, CW and SSB. The receiver sold originally for $229 plus $10 for matching speaker but I have seen the matching speakers recently listed for about the same price as some HQ-110s!

Hammarlund introduced the HQ-110 to compete with Hallicrafters and National receivers in the $195 to $295 price class. This included the NC-125, SX-96 and SX-11. None of the competition were ham-bands-only, single-knob-tuned receivers. They were general coverage, main tuning/bandspread receivers. None had bandspread calibration for 160 meters, either. That may not have been a detriment in 1957, but with today's popularity of the "top band," it gives the -110 a leg up on its contemporary competition.

I would not claim the HQ-110 is the equal of an NC-300 or -303. It isn't. It has no triple conversion for greater selectivity and image rejection, nor any crystal filtering. Then again, it didn't cost as much as these receivers then, nor does it now. In its favor, though, the HQ-110 has no exotic, hard-to-find tubes, and is easy to repair, align and calibrate. And, for a receiver with an IF bandwidth of about 3 KHz, it sounds surprising good on AM, and has a warm, pleasant CW note.

The Design

There's nothing extraordinary about the HQ-110's design. Nor is there anything "gimmicky." It is a straightforward, double-conversion, superheterodyne receiver. The first IF frequency is 3035 KHz and the second is 455 KHz. The receiver front end uses a 6BZ6 RF amplifier with tuned grid and plate circuits switched by the multi-wafer band switch. A variable capacitor serves as an antenna trimmer for matching impedances of about 50 to 500 ohms.

A 6BE6 mixer mixes the RF stage output with an HF oscillator signal to produce a 3035 KHz RF signal on 40 through 6 meters, or a 455 KHz IF signal on 160 and 80. A second 6BE6 converts the 3035 KHz first IF to a 455 KHz second IF by beating it against a crystal frequency of 2580 KHz. The output of this converter stage drives the first IF amplifier (a 6BA6). A Q-multiplier consisting of 1/2 of a 12AX7 sits on this input line and provides a continuously variable band-pass and peaking function. The passband can be narrowed to about 100 Hz prior to breaking into oscillation, and the peak frequency can be moved around within the pass band.

The first IF amplifier drives the pentode portion of a 6AZ8 which acts as a second IF amplifier and linear detector. The triode portion of the 6AZ8 is used for the BFO section. A 6BJ7 triple-diode tube follows the 2nd IF and pro-

Front view of the Hammarlund HQ-110.

vides AM detection, AVC and series diode noise-limiter functions. The other half of the 12AX7 is the first AF amplifier which drives the AF output amplifier (a 6AQ5) to about 1 watt of audio power. This AF section will not blow the doors off your shack but it is consistent with the audio stages of late 1950s and early 1960s receivers.

The HF oscillator section uses a 6C4 triode mounted in a ceramic socket. It doesn't have a special constant-current ballast tube in its filament circuit, like the NC-300's 4H4-C, but it does provide reasonable stability after reaching thermal equilibrium, and the warm-up drift is less than that of a lot of higher-priced receivers.

Shortcomings

So, what are the HQ-110's shortcomings, you ask? First of all, it has no SO-239 coax connector on the rear, nor a chassis cut-out for mounting one (like the NC-303 has). Therefore, your first order of business is to drill or punch a hole for the SO-239 in the clear area between the antenna screw terminal strip and the S-meter zero adjust pot. Just jumper the center contact to the appropriate antenna screw's solder lug. My other gripe about the HQ-110 is the headphone socket is located on the rear. You have to live with that one!

The HQ-110 has no S-meter function when in CW/SSB mode. If you want to get an S-meter reading, you have to switch on the AVC (AVC/MAN switch), put the mode switch in receive (AM) mode, turn the sensitivity (RF gain) control to maximum, then read the meter. This is obviously more work than most of us want to do. The noise limiter only functions when the receiver is in AM modes, and even then it is not adjustable. Presumably it limits pulse-type interference like the stuff you used to hear when your next door neighbor started up his 1955 Dodge, which had no radio-suppression spark plug cables. At my QTH, ambient noise is usually very low, thus I've never seen the noise limiter do anything of consequence. There is no external input to the AVC line for break-in CW muting. There is, however, a female socket (110 v type) on the rear chassis. An antenna changeover relay's contacts can be connected to provide muting during transmitter operation. I use this for AM push-to-talk muting.

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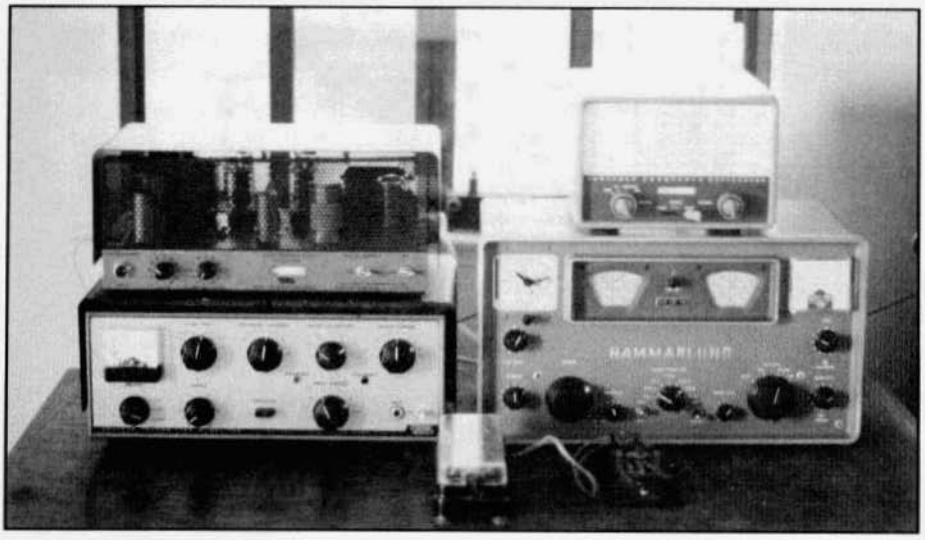

The HQ-110 set up with the Eico 720 xmtr, 730 modulator and 722 VFO.

Using It

The HQ-110 was acquired to complete my third vintage station position. It was to be paired with an Eico 720/730/722 combination. This would be a close approximation to my original 1958 through 1970 station (a Viking Adventurer, homebrew plate modulator, 122 VFO and HQ-110). I was a little apprehensive about buying the -110 because I had had nearly a year's worth of operation using my NC-303 and HQ-180. I wondered if the -110 would still seem as good as I remembered it.

I found my HQ-110 in the classified section of Electric Radio. An East Coast ham had listed it for $65. I called, he said it worked, I sent him a check for $80 to cover receiver and shipping. A week or so later, it arrived. Cosmetically, the only missing item was the plastic bezel over the clock. Operationally, it was seriously misaligned and had two marginal tubes. I drilled a hole and installed an SO-239. Then I replaced the tubes and gave it a thorough IF and RF alignment. I was now ready for the big moment.

The HQ-110 was placed on its operating desk and connected to the antenna relay and muting line. It was about 8 PM, so I decided to try 80 meter CW first, then drop in on the 3.870 net later that night. As the receiver warmed up, a few CW signals went whizzing by, but after a minute or so, the drift settled down. I started tuning. The distinctive sound of the -110's CW transported me back. The 47 year old veteran ham became the 13 year old rookie, again. I tuned up the Eico, and began sending CQ with my J-38 handkey (which I've owned since age 11). The hour and a half seemed to roll by quickly. I had good reports on the Eico's CW note and stable operation by the HQ-110.

Around 2130 local time, I tuned up the band to 3.870, and switched from CW/SSB to AM mode. The first AM arrivals were beginning to queue up. This would not only be the maiden AM voyage for the HQ-110, but the first AM operation with the Eico 720/730 combination. I was hoping to run into Bill Neely, K7INK, because he so kindly donated the Eico 730 modulator to my cause. And there he was. Bill said the Eico combo sounded good, and others were equally complimentary. What they couldn't hear was how good they all

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HF BALUNS

by Al Roehm, W2OBJ
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Balum, Balun, Voltage type, current or choke type, air core, toroidal core, rod core, coiled coax, transmission line transformer, 1 to 1, step up and step down ratios—do I need one? Yes, you do. . . .No, you don't. Who cares? Wow, will someone please set me straight.

Is it any wonder that next to the so-called G5RV miracle antenna the subject of baluns is so confusing and controversial? Let's try to clear the air a bit. First, the word itself is a contraction of balanced to unbalanced--BALUN and not balum. Secondly, amateurs should strive to understand why, when and where a balun is desirable. Lastly, I will make some suggestions regarding the type of balun to use and its construction.

Why, When And Where a Balun

Prior to World War Two, ham HF antennas were either connected directly (with a capacitor) to the transmitter's tank circuit or fed by open-wire line. While the concept of standing waves was known, the majority of operators preferred to rely on an RF ammeter or lamp in the line for tuning purposes. And, as far as I know, the word "balun" had not yet been coined.

Construction practices changed in the late Forties due to the emergence of TV with its inevitable interference problems and the availability of military surplus coaxial cable at low cost. Transmitters could no longer be breadboarded using open and unshielded layouts. On the contrary, complete shielding was the order of the day. This led to the universal use of unbalanced RF output ports. Generally, a phono jack or surplus SO-239 UHF coaxial connector was employed to connect the transmitter to the shielded (and grounded) coaxial feedline. Literally tens of thousands of dipoles and beams were wired this way, and they worked fine without a balun. So, as a famous TV commercial once asked--"where's the beef?".

Perhaps the best justification for using a balun is to locate it at the feedpoint of a directional antenna, such as, a Yagi type beam or multi-element quad. These antennas produce gain through directional characteristics. Their driven elements also represent balanced loads and should not be fed by unbalanced lines which might result in skewed radiation patterns. Hence the need to employ a balun.

Another situation where a balun might be called for is at the feedpoint of a resonant dipole or inverted vee. But, maybe not. The antenna is balanced and if fed with coax some RF current will probably be present on the outside of the shield. Figure 1 shows this condition. You might say--"So what!". The RF on the outside of the coaxial feeder will radiate and, most likely, will be predominantly vertically polarized. The energy leaving the feedline may even improve your DX operation due to the lower angle of radiation or fill in the antennas nulls. Of course, some of that RF will also find its way to ground through the shack and could affect microphones, accessories and nearby TV or audio equipment. So, if you are experiencing RF feedback in your audio or have TVI, then using a balun at the antenna feedpoint may be needed to reduce or eliminate feedline radiation.

There is another important point that most readers of our amateur handbooks generally overlook. When using a broadband balun containing powdered

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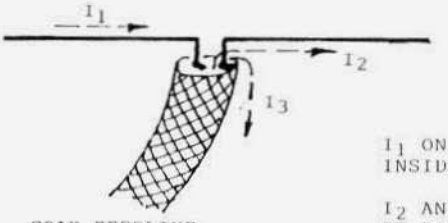

COAX FEEDLINE

I_1 ON CENTER CONDUCTOR = I_2 + I_3 ON INSIDE OF SHIELD.

I_2 AND I_3 ARE IN PARALLEL ON ONE SIDE OF DIPOLE. SINCE $I_1 \neq I_2$, DIPOLE'S RADIATION PATTERN IS SKEWED. I_3 GOES TO GROUND ON OUTSIDE OF SHIELD.

FIGURE 1

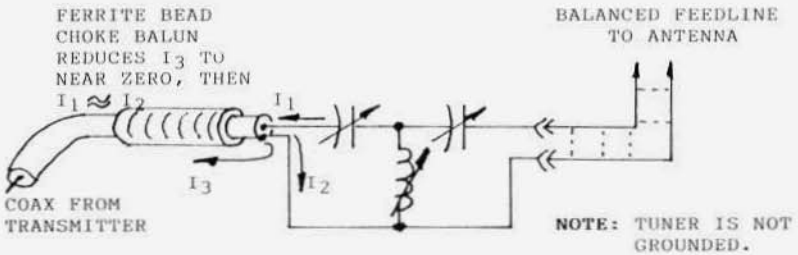

FIGURE 2

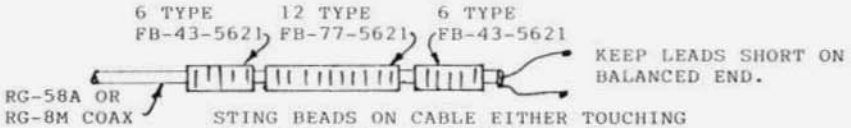

FIGURE 3

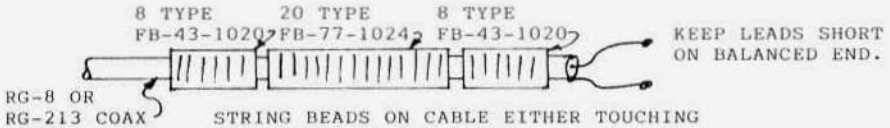

FIGURE 4

iron or ferrite cores the load impedance should not exceed 300 ohms or so during high power operation. This precaution reduces the possibility of saturating the core and producing TVI, harmonics, or excessive heating of the core material which might damage the balun. Excessive heating can even occur at a lower power setting when one of these baluns is located at a high impedance point as a result of multiband operation (G5RV antenna users please take note). So, what is the bottom line? Here are some guidelines for HF operation:

o For directional antennas, such as beams and quads, use a balun at the feedpoint. Keep the balun away from the beam's grounded boom.

o For center-fed (balanced) antennas, such as single-band 1/2-wave dipoles, multiband trapped dipoles or multiple dipoles fed from a single coaxial line, use a balun at the feedpoint if RF feedback or line radiation is a problem. For other types of antennas, always place the balun at a low-impedance point.

o For multiband operation of a dipole (such as 80 through 10 meter operation with an 80 meter dipole) or a random length antenna, DO NOT use a balun at the feedpoint. Instead, replace the coax with a balanced feeder, a suitable tuner, and if necessary, a balun on the input (low-impedance) side of the tuner. More on this topic later.

o A true G5RV antenna is designed for operation on a single band, for example 20 meters. If multiband operation is desired, replace the coax by extending the section of balanced feedline all the way to the tuner. Instead of the G5RV, you can improve your thinking about a simple multiband antenna by using approximately 3/8-wave length on the lowest frequency of operation. If you need a formula, use 351/fMHz to obtain the overall length. An easier method is to simply use about 100 feet of wire for 80 through 10 meter operation and double that length for 160 through 10 meters. The actual dimensions are not critical. Anything from 90 to 100 feet or 180 to 200 feet is a desirable length, but not mandatory. In other words, run the wire from "here" to "there" and let the open-wire feedline and tuner do the resonating. Why 3/8 wavelength instead of the time honored 1/2 wavelength? Let's say you're using an 80 meter 1/2 wavelength antenna on 40 meters. Then, you're voltage feeding the antenna and the feedpoint impedance is very high, perhaps over 5,000 ohms. Of course, on 80 meters the impedance is low, something around 50 to 70 ohms. That's quite a difference and depending on how long the feedline is, the tuner could be trying to match a very wide range of impedances. Now, suppose we go about midway between these extremes. That's what the 3/8 wavelength antenna does for us. The feedpoint impedance is moderately high, say 2,000 to 2,500 ohms, on all bands and the tuner doesn't work so hard.

I hope the above comments have convinced you that the balun, if used, should always be placed at a low-impedance point of the antenna system. For resonant antennas, this means the balun should be located at the feedpoint. The feedline can be coax even if you use a tuner to cover the entire phone and cw portions of a band. And, contrary to popular belief, if a tuner is used with a nonresonant type antenna for multiband operation, the balun should be located on the input side of the tuner. However, this doesn't mean that a balanced tuner is required (1). The typical, and popular, unbalanced tee circuit tuner works fine (as do other circuits) with a choke type balun on its input as long as the tuner is isolated from ground. See Figure 2.

Tips On Balun Selection and Construction

There are several categories of HF

continued next page

Baluns from previous page
baluns and methods of construction. Let me comment on a few of them:

o Voltage type - typically bifilar or trifilar wound with or without an iron or ferrite core, to provide 1 to 1 or 1 to 4 impedance ratios although other ratios are possible. This type of balun produces equal amplitude, opposite phase output voltages to drive RF current to the antenna. Note that according to Ohm's law both halves of the antenna must have equal impedances in order to have equal antenna currents. Any imbalance in the currents results in a skewed antenna pattern. In addition, if the balun is located at the shack end of the antenna system, then radiation from the feedline can also occur due to the imbalanced currents. Generally speaking, the difference in load impedances is small and the voltage balun will perform safely and satisfactorily into loads up to 300 ohms.

As mentioned earlier, multiband operation with a 1/2-wave dipole, 3/8-wave dipole, or a random length antenna results in load impedances of several thousand ohms. Therefore, the voltage type balun should not be used with these antenna designs.

o Choke or current type - a simple choke-type balun for 20 through 10 meters can be formed by randomly coiling up a section of coaxial line. Some manufacturers of beams suggest 8 to 10 turns wound into a 10-inch diameter loop.

While this configuration presents an adequate X_L (of perhaps 2,500 ohms on 20 meters) its effectiveness is reduced by leakage due to interwinding capacitance. This type of balun is not recommended on the lower frequencies because the value of X_L becomes too small to be effective (about 330 ohms on 160 meters).

A far superior choke-type balun can be constructed by slipping a number of ferrite beads onto coaxial cable. Although I described several designs in a previous article (1), the baluns shown here in Figures 3 and 4 are recommended. Either of these baluns can be installed at the feedpoint of a resonant antenna or on the input side of a balanced or unbalanced tuner. Please note that the recommended baluns use a mixture of ferrite materials. Baluns using only one kind of ferrite (such as type 73 or 77) usually fail due to excessive heating in several of the end beads. This phenomenon is especially noticeable below 3.7MHz and over 100 watts of power. Conversely, the baluns recommended here have been field tested under actual RF conditions and not merely evaluated on an RF bridge. The total impedance measured by the bridge method ignores the fact that the individual beads do not quench the electromagnetic field in equal amounts. In the real world of magnetics, high permeability (mu = 2,000) end beads try to do the whole job, become saturated, and then overheat. The easiest solution to the heating problem is to use ferrite beads made of type 43 (or similar) material. This mixture exhibits a much lower permeability factor (mu = 850) and stays cooler because of its reduced effectiveness as a magnetic choke at HF. I have used the choke balun shown in Figure 3 ahead of my unbalanced tuner since August, 1988. To date, it has performed superbly on all bands. At the 100-watt level of power, all of the beads remain at the ambient temperature, perhaps 5 to 10 degrees F higher. And, this heating only occurs below 3.7MHz.

Correspondence relating to the baluns in Reference 1 indicates that many of the recommended baluns have already been installed and are working satisfactorily. I have never received a report of a failure. So, if you would like to use a state-of-the-art balun try the designs shown in Figures 3 and 4. **ER**

Ref. 1- "Some Additional Aspects of the Balun Problem", ARRL Antenna Compendium, Volume 2, 1989, page 172.

The Copy Cat

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This transmitter "The Copy Cat" was inspired by the W8DFV/W4PNM Antiquer (ER #16). I have seen this rig and marveled at all of the antique IRC metalized resistors, Sangano condensers, and open frame transformers. What immediately caught my eye was the old Western Electric 212D tube with its 275 watt plate dissipation and 14 volt filament in a split Heising modulating configuration. Seeing this rig, I just knew that at some time I would have to build a similar rig.

While at the Asheville, NC, hamfest with my very good friend and hamfest buddy, Bill Ray, W4CUP, he found, purchased and presented to me a Westinghouse 861. It had been manufactured for the US Navy and accepted by the Navy in June of 1943.

As soon as I returned to the car with my new treasure, I quickly checked the filaments and found them to be intact according to the ohmmeter. There were no indications of shorts between any of the elements. Now the only problem was, had any air leaked into the envelope over the last fifty years? After arriving home from the hamfest, I produced an 11-volt 15-amp filament transformer that was then connected to a variac. The filaments were connected to the transformer and voltage was applied starting at 2 volts and ever so slowly raised to the operating voltage of 11 volts. Glory be! No smoke appeared in the envelope, so maybe the 861 tube could be used in an ol' time rig.

The next step was to look up the specifications in the RCA TT-3 transmitting tube manual. The spec sheet showed that the 861 could be operated at 2000 volts and loaded to 250 mA in the class-C plate modulated configuration with only 40 watts of driving power required (500 DC watts input). A full test on the 861 could be made using a Viking Ranger and an outboard clip-leaded power supply.

A table was then constructed similar to the W8DFV/W4PNM antiquer. After completion, the 861 was mounted on the new table along with the associated grid and plate circuitry. After this was all wired up, a Viking Ranger was placed to the left of the vertical meter panel. The Ranger was then tuned up on 1990 kcs. The Ranger was coupled to the grid circuit of the 861 and when it was keyed the required 65 mA grid current was indicated on the grid meter. High voltage was then applied to the plate circuit through a variac controlled power supply starting at 800 volts for tuning purposes and slowly raised to the full 2000 volts and loaded to 250 mA plate current. With the 861 running at these parameters it was putting 300 watts into the Bird/dummy load. All the meter readings were as outlined in the RCA transmitting tube manual of 1938. So far, so good!

The next question, what would be an appropriate oscillator and buffer combination to replace the Ranger? I immediately thought of the ol' Jones regenerative crystal oscillator of the 1937 era using a type 42 pentode to drive parallel 807's. As it turned out the 42 had more than adequate output to drive the parallel connected 807's and they did provide the required 65 mA (and more) to the grid of the 861.

Three old-style rotary switches of the '20s were then mounted on the face board to turn on and off the filaments, low voltage and high voltage power supplies. These switches were found, new in the box, at last year's Dayton Hamvention.

On the shelf below are the three power supplies, 2000 volts for the final amplifier, 1250 for the modulators and 600

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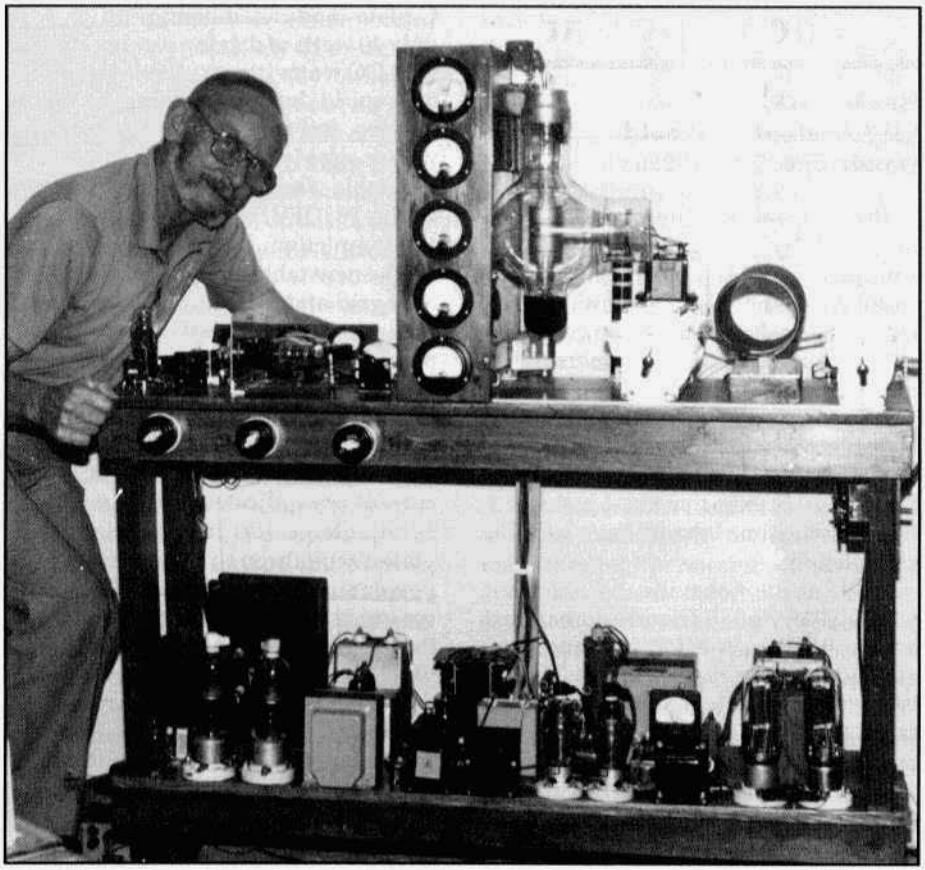

The author with his "Copy Cat" transmitter.

for the exciter. The oscillator runs at 300 volts, draws 27 mA plate current and delivers 7 mA grid current to the 807 grids. The plates are loaded to 90 mA and supply 65 mA grid current to the 861. The 838 modulator tubes are to the far right with their associated filament transformer. The modulation transformer is behind the tubes.

The Jim Taylor, W4PNM, designed speech amplifier (6SL7-6SN7 to PP 2A3's) was then connected to the 838 modulator grids. More than enough drive was available with the gain control at less than the half-way mark.

The transmitter was then run into the dummy load and all seemed to be ready for action. It looked good on the scope so it was then haphazardly connected to the aerial and all circuits resonated to 1990 kcs. A short CQ was put out on the airwaves around midnight and Don Chester, K4KYV responded to our call. This was the first QSO with the Copy-Cat and I was pleased to receive a report of good audio and a very strong carrier.

During the next few days the Copy-Cat was properly connected to the aerial. Since then many very fine QSO's have been had on the high end of the 160 meter band, 1990--+kcs. This rig, from its inception to completion was a lot of fun to plan and build, yet more fun to operate. **ER**

The 'Copy Cat' with some of W2IQ's other transmitters. From L to R: the Copy Cat, Collins KW-1, HB and Collins 20V2 broadcast transmitter.

Hank seated at his modern operating position. This gear is mostly Ten-Tec.

National FB7A from page 9

tector to a diode detector. So I have to run the audio gain wide open and ride the RF gain on CW to avoid blocking on strong signals - no great problem. And when I go on transmit and short the antenna input with a relay, I can turn the RF gain down to the point where I can comfortably monitor my own transmitter. I worked Redmond WA, Calgary Alberta, and Vancouver BC the first evening I had it on the air, and I heard Russia. And as a final bonus, the FB7 also has a distinct, smile-face personality as you can see from its picture.

I know that at least two other *ER* readers out there have FBX's, Marty Reynolds, AA4RM and John Kelley, so I'll upgrade the miniscule technical content of this article by offering to send to anyone who sends me an SASE a table of original National coil information for the FB7 and AGS, kindly furnished by Wes Chatellier, W5PDM, in response to my ad in the *ER* classifieds. These coils can be wound on the same forms used for the SW3, available from James Fred at Antique Electronics Laboratory.

So, let me close with several pieces of advice. First, when in Kansas City, Do Not Pass Go until you've visited Associated Radio. Second, should you ever find an FB7 smiling at you, smile back and then take it home. Third, should you ever find any FB7 coils or coil parts, save them and pass them along to someone who will put them to good use. . . Marty or John or even me. **ER**

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813 Triodes from page 13

Two transmitters using 813-T's have been reported in *Electric Radio*: the WA4KCY rig in *ER* #5 and the W6BM rig in *ER* #15. I have not yet heard of anybody converting a rig from 810's to 813-T's yet, but with the increasing scarcity of 810's, the 813-T may be a less-expensive alternative. The conversion would involve replacing the tube sockets, changing the bias and possibly adding swamping resistors across each half of the secondary of the driver transformer. The 813-T's would require a little less drive than the 810's.

I have been using 813-T's in my rig as modulators (and 813-pentodes in the r.f.) for several years now without a failure. Whether designing a new rig, or modifying an old one, you may want to consider them. **ER**

HQ-110 Receiver from page 26

sounded on my HQ-110. No noticeable hum and very little audio distortion.

Since then, I've used the Eico and HQ-110 station on 10 AM with good results to the mid-West and East Coast, and on 20 CW for many VK/ZL CW QSOs. This station is one of four operating positions connected to a common multiband antenna system through a rotary coax switch. On any night, now, I might be operating this station, or the Ranger/HQ-180, or the Valiant/NC-303. Rarely, though, is the switch turned to fourth position, the one that connects the ICOM 761 and QSK linear amp to the antenna system. That station has now become relegated to contests only, and, of late, it collects far more dust than it does contest multipliers. **ER**

ER Parts Directory Needs Parts Units

If you have a junker or parts unit please consider putting it in the parts directory. Your dead rig can brings others to life and you can make money doing it. Please write, call or FAX your information in.

Letters from page 15
learned to zero-beat and stay on frequency. I have monitored stations in a QSO as much as 3 to 5 kilocycles apart. (I never have gotten used to kilohertz).

Long test transmissions. These should be conducted on a dummy load.

I suspect there are some stations not aware that we can no longer run 1 kw input on AM. I do not believe it is a wise idea to try to outdo the SSB stations running 4 to 6 kw. Many stations are trying to squeeze all the power they can from their rigs, and sometimes they do not have enough audio to fully modulate. I believe a 100 watt rig fully modulated is more effective than a 500 watt rig modulated only thirty percent. And, conversely, overmodulation is another big no-no.

Have noticed some stations calling CQ on top of an existing QSO. This is a real neat way to alienate a whole bunch of operators. This could easily be the result of not having a good receiver, and unintentional on the part of the offender, but this is how wars can get started.

The list could go on and on, but the above are the most recently observed. In defense of AM operators, I must say that there are some SSB operators whose misconduct far exceeds any I have noticed on AM. Let's all put our best foot forward and continue to improve the reputation of AM operating.

If possible, I believe we should all be prepared to copy SSB while we are operating AM. I have had several SSB stations answer my AM CQ, and this gives us a chance to further explain what is happening with amplitude modulation. Some of them did not realize they could even copy AM on their SSB transceivers, and were surprised that they had connected with an AM station.

Gene Tincher, K5NYT (AMI #160)

Dear ER

The article, "Packaging Gear to Survive UPS" (ER #56) was very good. I have a couple suggestions to add.

1. When you receive an item, save for reuse the peanuts, foam and bubble wrap. These do not break down well in a landfill.

2. Instead of using peanuts, I have seen popped popcorn used. To dispose of the popcorn, simply feed it to the birds. Birds love it.

Steve, N8ZR

Dear ER,

Thanks to AMI's AM Jamboree Thanksgiving weekend, I experienced what I thought possible but unlikely: QRP AM contacts on 160. Friday afternoon, almost as a lark I occasionally called "CQ AM Jamboree" on 1900 (only rock I have) on my homebrew 5 watt rig.

Around sunset I became aware of two 9-area fellows talking to each other. After two calls I heard, "I think someone is calling us." Another fellow joined in and we talked for 30 minutes until QRM made it impossible to continue.

N9HNI, KF9DU and KE9VA are all in the Minomonie, WI, area about 200 miles north. This was skywave! I shut the rig down; my middle-aged heart couldn't take anymore.

I thank these gentlemen and AMI for what has to be a high point in my hobby.

'Twas a different story for the ER 160M contest. Sidebanders held forth on 1900 all evening and my few CQs were met with silence.

But the band was alive with AMers. I heard AMI numbers by the score: I also heard two fellows apologize for not having one. KB8QF (not sure of the call) learned his new AMI number on the air from Dale, KW1I, then mentioned that he was now worth 5 points instead of one. Everyone seemed to be having a good time.

By the next contest, I expect to have the Valiant on the air.

Doug Beard, KFØVF

A Boatanchor Calibrator from page 18

While not every antenna switch has room inside for the calibrator; the principle should work for any switch. If you don't mind doing a bit of surgery on your switch (I'd mount an RCA jack on the switch), the calibrator could be housed in a small aluminum hobby box and connected to the antenna switch with a bit of coax.

Alternatively, if you have only a single radio to use the calibrator with, you can find a handy source of 9-12 VDC (the filament supply, perhaps, run through a rectifier) and tuck the PC board into a handy corner, running a shielded wire to the antenna input. Here, too, it might be handiest if you mount a toggle switch inconspicuously somewhere on the radio to control the power.

No matter how you mount it and connect it to your radio(s), the Tri-Mark calibrator is a very worthwhile addition to the SWL's listening shack. You can contact Two Fox Electrix at (914) 757-5800. **ER**

NBFM Update from page 2

is centered so is the signal. This type of tuning indicator is much more accurate than an S-Meter for zeroing the received signal. In fact, when the HRO-50 or 60 is in the AM mode the NFM adapter is still connected to the IF's so, consequently, the tuning indicator works for AM signals as well.

On another note, Brian Harris, WA5UEK, a friend of mine for many years, is an applications engineer for Phillips. Brian recently sent me sample IC's that perform the functions of limiters, PLL's and discriminators. As soon as I get some time I plan to see if these devices can help solve the receive problems. They are currently used in today's state of the art commercial FM gear. Their characteristics are adjustable so they should accommodate the narrower NFM signals.

On the subject of transmitting NFM, I have come across several good vintage articles (see references) on reactance modulators using clipping or compression to increase the NFM signal presence. In one of the referenced articles (Nov,48) Ed Harrington of National Radio (designer of the NC-300/-303) shared the circuits and results of his experiments using clipping in conjuction with NFM. The results of his experiments would seem to indicate a definite advantage to using processing of this type. Ed must have been in charge of NFM applications for National Radio for a time because he also published a nice article on a discriminator for the NC-173 receiver (*QST*,Nov.,'47).

Just a reminder about using any of the late model HF transceivers on FM below 29 MHz. Make sure the transmit deviation is set below +/- 2KHz and that the bandwidth is less than or equal to that of an AM signal. Also, the receiver discriminator is not adjustable so NFM signals will sound a bit anemic but don't let that stop you from getting on and experimenting with your other gear. The NFM net is still on Thursdays at 8:30 PM on 3855 KHz. Check in and maybe I can lend a hand setting your deviation using my HRO-50T & SB-620. **ER**

Additional References:

QST, March, 1941,Crosby article on NFM; QST, Jan., 1946; QST, Feb., 1947; QST, Nov., 1948.

Editor's Note:

We'er interested in your ideas and input on NBFM. If you're on the air experimenting with this mode we'd like to hear from you.

We'd particularly like to know how your vintage NFM equipment is performing. If you've built discriminators or reactance modulators we'd like to hear about that too.

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FOR SALE: National HRO rack, w/pwr sply, rcvr, coil box and spkr - $350, PU only. Roland Matson, RFD #1, Box 2943, Kennebunk, ME 04043. (207) 985-3751

FOR SALE: New list of 1000's of tubes! Includes new, used, antique, collectible, Majestic and Western Electric types. Send SASE to Jim Cross, 2817 Parklawn Dr., Dayton, OH 45440-1538. (513) 298-5827

FOR SALE: Drake 1A, exc. - $319; Johnson Invader 200, exc, orig. manual - $319; another Invader 200, good but paint chipped & manual copy - $219. Projects - Hallicrafters S-40 - $29; S-38C - $13; RCA ACR-136 - $139; National RCP WW II airport version of NC-100 - $149; Hammarlund SP-400 - $95. Test gear - B&W 600 GDO, as-new, w/coils - $79; Boonton 79B pulse gen. - $29; RCA Chanalyst, 4 tuning eyes - $49; Tektronix plug-ins - 1A1, w/manual - $45; 81, w/manual - $19; TU-7 test fixture - $39; General Radio 1001A sig. gen., 5 kHz - 50 MHz, manual, attenuators - $99. Don, (412) 234-8819 (weekdays, EST).

FOR SALE: HQ-170 - $150; 100TH - $30; 250TL - $75; Ranger, real clean - $190; GSB-100, ext. clean - $150; Millen GDO, missing some coils - $40; Clegg 22 - $50. All FOB. Jon, KA4RLV, (615) 337-9317 after 6 EST

FOR SALE: Collins S-Line aluminum knob inlays: small (exciter/PA tuning) - $1; 30L-1 - $2; spinner/plain (main tuning) - $3. Charlie, K3ICH, 13192 Pinnacle Lane, Leesburg, VA 22075. (703) 822-5643

FOR SALE: ART-13 parts & other interesting stuff. SASE for "The Bone Yard List." eLKay electronics, 231 Shenandoah Trail, Warner Robins, GA 31088-6289.

TRADE: Atwater Kent model 10 for SX-88, NC-400 or PRO-310. Tom Rousseau, K7PJF, 23995 SW Drake Lane, Hillsboro, OR 97123. (503) 642-3679

WANTED: FB7 coils, one or a bunch. Help me restore a grand old rcvr. Thanks! Jim Hanlon, W8KGI, POB 581, Sandia Park, NM 87047. (505) 281-0814

TRADE: Tube Bank Exchange. Swap your new-in-box tubes for our NIB tubes. SASE for info. TBE, POB 806, Lake City, MI 49651.

FOR SALE: Used technical books - radio, electronics, math, military, magazines, etc. $1 for large list. (stamps ok). Softwave, Dept. ER, 1515 Sashabaw, Ortonville, MI 48462

WANTED: Millen coils, all the 43xxx numbers; Hallicrafters coils for HT-17; military TBY-x accessories; TBX radio. Don, (412) 234-8819 (weekdays).

FOR SALE: Collins parts and manuals, misc equipment, parts, magazines, books, manuals, data books, radioastronomy books and magazines, lists - $1. Joe Orgnero, VE6RST, Box 32, Site 7, SS 1, Calgary, AB, T2M 4N3, Canada. Phone/FAX (403) 239-0489

FOR SALE: Collins 51J4 - $400, PU only. **WANTED:** Drake TR-6; Hallicrafters SX-115. Steve Barnes, K6PFW, 848 N. Silverwood, Upland, CA 91786. (909) 985-1062

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WANTED: NCX-5 for parts, cash. Write to Neal, 26 Laver Circle, Little Rock, AR 72209.

FOR SALE: National SW-54, Knight Spanmaster, both mint; RME 84, very nice; clean Ecophone, average. All working. Dusty Rhodes, W8MOW, 1324 N. Dorset Rd., Troy, OH 45373. (513) 339-1546

TRADE: My SX-115 for clean R-390A, w/cabinet. Steve Moore, WB7BNZ, POB 589, Roslyn, WA 98941. (509) 649-2913

WANTED: DY88/GRC-9 pwr sply; manual for TMC GPR-90 RXD; RBU or RBV panadaptor; AN/SRR-12 or AN/FRR-22. Tom Brent, Box 1552, Sumas, WA 98295. (604) 826-4051

FOR SALE: T-60 - $50; HX-20 & HR-20 - $200; HX-30 - $100; Alpha 6 - $30; Challenger - $100; National 62 VFO - $60. Don, K5DUT, 6080 Anahuac Ave., Fort Worth, TX 76114. (817) 732-3976

FOR SALE: Collins mech. filter adapter 353A-12, w/filter - $125; Millen GDO, w/coils and case - $65; Boonton 260 Q-meter, w/12 standards - $150. Ron, KC6WTG, POB 783, Santa Rosa, CA 95402. (707) 539-8319, noon-9 PM PT

Lafayette Radio and Vintage Manuals Available. Over 2000 manuals in stock. Satisfaction Guaranteed. List, low price quote, write or call, Pete Markavage, WA2CWA, 27 Walling St., Sayreville, NJ 08872. (908) 238-8964

WANTED: SC-101; SC-301; KW-1; 30K-1 thru 5; 302C1; 75A thru 75A-4 rcvrs and spkrs, any condx. Purchase entire estates, pick up 48 states and top $ paid. Rick, (800) 462-2972

WANTED: Walter Ashe novice xmtr; Globe Scout 680; mint D-104, w/G stand; 1950's ARRL Handbooks. Tony Stalls, K4KYO, 917 N. Lexington St., Arlington, VA 22205. (703) 522-1568

FOR SALE: SP-600JX Hammarlund; Gonset 6-Meter xcvr; S53A rcvr. **WANTED:** Cabinet for SP-600JX. F.W. Nicholas, (602) 864-9987

WANTED: Viking Navigator; Challenger; 'E' coil for HRO-50T1; Harvey-Wells TBS-50, w/VFO. KØAL, (319) 377-4367

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TRADE: Have Rider's Volume 6, will trade for Rider's Volume 15 or 17. Itsuo Yano, 80 Lehua St., Kahului, HI 96732.

WANTED: Collins 32V-3 xmtr, showroom condx not necessary but prefer working unit. Doug McArtin, N2QPX, 4 Portland Pl., Yonkers, NY 10703. (914) 968-3560

WANTED: Case for Collins R-388 rcvr. Don Loomis, NØPYX, 4341 S. Pennsylvania St., Englewood, CO 80110. (303) 789-3803

FOR SALE: Monitoradio, 152 - 174 MHz FM, nice nostalgia for hamshack, exc. condx - $50. **WANTED:** Hammarlund HQ-180 in VG condx. Jim Benedict, POB 806, Lake City, MI 49651.

FOR SALE: TMC GPR-90 rcvr, pristine condx, from orig. owner, w/orig. manual, recent alignment, fantastic rcvr - $250/offer; Johnson Viking II, works good, w/orig. manual - $75; Heath HW-202, w/manual - $40/offer; Lafayette Explor-Air regen rcvr - $40; Hallicrafters SR-46A 6-M xcvr - $35. WANTED: Motorola Mocom 35 without xtals in working condx. Ed, WA7DAX, 1649 East Stratford Ave., Salt Lake City, UT 84106. (801) 484-5853

FOR SALE: R-390A service: Module repair and alignment to complete remanufacture, new front panels, knob sets, VFO calibration,expert service, reasonable, any condition accepted. Rick Mish, (419) 726-2249

WANTED: Collins 75S3C/32S3A and 75S3A. Mike Palmer, K5FZ, 16707 Creeksouth, Houston, TX 77068. (713) 444-7737

TRADE: My RCA RBC, w/manual for your Hallicrafters SX-28A. Dave Sampson, (315) 446-1258

FOR SALE: NC-57, w/S-meter - $75; S-38 - $50; Clegg 99'er, cherry - $100; SP-600, good shape, works - $150. Ron Herrold, K6LLQ, Box 21608, Concord, CA 94521. (510) 685-7989

FOR SALE: Electronics suite from U.S. aircraft carrier. MF-UHF rcvrs, xmtrs, radars, PPI displays, RTTY cnvters, terminals. Much more.Bob Mantell, W6VQT, 3135 N. Ellington Dr., Los Angeles, CA 90068. (213) 851-2786

FOR SALE: T-368D xmtr, slightly modified to allow use of D-104 mic which is included. Also included is spare 4-400 and 4-125 tubes and manual, works very good - $600; T-195 xmtr, R-392 setup, includes mounting base, cables and connectors, mic and spkr, works very good - $400. Terms - cash, you PU. Located near St. Louis. Ron Reu, WB0LXV, (314) 668-6518 before noon.

WANTED: Heath DX-100B manual and a DX-100, w/manual. L. Heaton, K7BIN, 1915 W. 15th Ln., Apache Junction, AZ 85220. (602) 982-1856

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FOR SALE: Electron tube tester TV-7D/U, w/manual - $150; standing wave indicator HP415B - $50; peak power calibrator HP8900B - $400. Mary Simpkins, 2030 Oak Grove Rd., Carrollton, GA 30117. (404) 854-8628

WANTED: Knight T-60 xmtr; Drake MS-4 spkr; coils for Central Electronics 10B exciter; Hallicrafters Continental table radio parts sets; factory AC pwr sply for Gonset G-76. Also, the following books and manuals are needed - any books written by John T. Frye, W9EGV; information and manuals about Hallicrafters Continental table radios; "How to be a Radio Amateur" published by the ARRL 1950; Editors and Engineers Radio Manual 1948; operator's manual for the Hallicrafters S-120; manual for Eico #460 oscilloscope. All postage that you use to write will be refunded. Please let me know what you have. Dave Mantor, W9OCM, 2308 So. Fairlawn Way, Anderson, IN 46011.

WANTED: Navy ARB WW II rcvr, unmodified, w/dynamotor preferred. Pete Hamersma, WB2JWU, 87 Philip Ave., Elmwood Park, NJ 07407.

WANTED: Very early Hallicrafters and Hallicrafters/Silver Marshall equipment including Skyriders with entire front panel dull aluminum color, S-30 radio compass, S-33 Skytrainer, S-35 panadaptor, wood console speakers - R-8 & R-12, HT-2, HT-3, BC-939 antenna tuner, parts, advertising signs, paper memorabilia of Hallicrafters. Also want RCA model AVR-11 airport tower receiver. Chuck Dachis, WD5EOG, "The Hallicrafters Collector", 4500 Russell Dr., Austin, TX 78745. (512) 443-5027

FOR SALE or TRADE: Collins KWM-2A, RE, (1971), new (unused) condx. Trade for Collins 75S3B,C/32S-3 or 62S-1 in new condx or best cash offer. Inspection/PU only northern Virginia to central Pennsylvania area. Details - R.L. Cramer, POB 53, Lorton, VA 22199.

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FOR SALE: Very good photo copies of manual and schematics for AT-1, VF1, DX-60A, Navigator, Viking II, CE 20A, BC-458, 1A, R4B, Nat. 270, BC-348Q - $10 each. HQ-170 - $15. Write Craig, KB6XV, 14 Governors Ct., Sacramento, CA 95817. (916) 736-1133 between 6 & 9 PM PT

WANTED: 51J4 nameplate; 51S1 knobs and xtals; R-390A junker and parts; 516F2 xfmr. Greg Johnson, K3EWZ, 31 Monument Ave., Malvern, PA 19355. (610) 296-2483

FOR SALE: Micro-wave freq. meter, military TS-127U (range 375-725 Mc) - $40; US Army freq. meter TS-69AF - $40; Instructograph "Code Instructor", w/tape (used for code practice) - $40. All items in good condx. Plus UPS. Stephen L. Bonino, 107 Georgetown Rd., Glassboro, NJ 08028. (609) 881-0244

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FOR SALE: Tektronix Parts instruments. I am starting a parts instrument list with 29 of my own instruments. Send $1 & an SASE for my list. If you have Tektronix parts instruments of your own, send me your list and I will include it with mine, no charge to you. Stan griffiths, 18955 SW Blanton, Aloha, OR 97007. (503) 649-0837

WANTED: Valiant II; D-104 mic; T/R switch for Valiant II in working order. Michael Pinto, 47 Harding Dr., Rye, NY 10580. (914) 835-4634 lve message

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FOR SALE: R109 rcvr, boxed - $45; Collins CP1 xtal packs - $125; TA312 field phones - $50; Collins 18051 tuner - $165. SASE for list. U-ship. Bob, 129 Marly Dr., Syracuse, NY 13219. (315) 468-2691

FOR SALE: Johnson Thunderbolt amp. Run legal limit without high level modulation xfmr worries, built for AM service. Good condx. Jim, (616) 229-4318

FOR SALE: We rebuild twist-loc, wet style, rectangular, can capacitors. Mail your can to us, typical in shop time is 10 days. We custom build tubular & can capacitors & rebuild your capacitor. Inquire. Frontier Electronics/Everett Hoard, NØNVQ, Lehr, ND 58460. (701) 378-2341

WANTED: Manuals, info, schematics for Heath WA4M amp, WAP2 preamp, FM3A tuner, copies fine. Some Dynaco products, info wanted. Ward Shrake, POB 4699, Covina, CA 91723-4699. (818) 919-0499

FOR SALE: NC-300; NCX-3; DX-60 parts; SX-28; SBE-34; SP-600J; HW-17; Triplett RF gen.; Heath 0-12 scope; Aerovox LC checker; Superpro. N5SWO, (915) 837-5249 nites

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WANTED: Hallicrafters SX-28 or SX-28A; PM-23 spkrs; also HT-9 (grey panel), VG to excellent only, premium paid for clean units. Buying '46 to '51 Hallicrafters junkers for "original" correct knobs. Dick Igou, WA5OXR, 8435 Twisted Oaks, Garden Ridge, TX 78266. (210) 651-9049, phone or FAX

WANTED: Intelligence museum wants German, Japanese, Italian, Russian and Chinese communication equipment and any British or U.S. spy radios. LTC William Howard, 219 Harborview Lane, Largo, FL 34640. (813) 585-7756

FOR SALE: 1951 National NC-57M AC/DC rcvr, mint condx, w/manual - $150 shpd. Doug, N8NHG, 1539 North Rd., Troy, OH 45373-1101. (513) 335-1300

WANTED: McIntosh and Thordarson amplifiers; poor to junk Collins 75A-2, 3 and 51J series rcvrs; poor to junk Hallicrafters louvered spkr. Serious sellers only! Marcus Frisch, WA9IXP, Box 28803, Greenfield, WI 53228-0803. (414) 545-5237 (24 hrs) collect.

FOR SALE: Heath - variable HV sply - $25; GD-1B GDO - $50; 0-15V sply - $15; VTVM - $25; IM-25 VOM - $25; IT-18 transistor tester - $20; HD1422 noise bridge - $25; HM-15 VSWR meter - $20. All for $125. Lane, KM3G, (505) 526-0910

WANTED: WW II radar equip., units and complete systems. Also collecting early electron microscopes made by RCA, wireless equip. and pre-1900 motors and generators. Allan H. Weiner, 14 Prospect Dr., Yonkers, NY 10705. (914) 423-6638

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Electrolytics, high voltage capacitors, power resistors, plugs, switches and more. Free catalog. **A.G. Tannenbaum, WA2BTB, P.O.Box 110, East Rockaway, NY 11518. (516) 887-0057, FAX 599-6523**

FOR SALE: Collins 75A-4, near mint; Gonset G-506-M Communicator, VG; Heath AR-3 rcvr, exc.; Johnson Sideband adaptor, exc.; Viking II, VG; 275-W Matchbox, w/meter and coupler, exc.; AX-9909, AX4-125A tubes, appear to be new. **WANTED:** Cetron 572-B tubes. Steve, WB4IJN, (803) 873-7847 X 200 (d), 821-6931 (n)

WANTED: To borrow or rent to Xerox pages 1 thru 1000 of MIL-HDBK - 161 of 1959- will put up deposit and return promptly. Walter Chambers, K5OP, POB 241371, Memphis, TN 38124-1371. (901) 761-9381

NOTICE: I'm back from my trip to sea with the merchant marine, and will shortly have a new list of WW II equip. and manuals. Henry Engstrom, KD6KWH, POB 5846, Santa Rosa, CA 95402. (707) 523-9268

WANTED: Johnson 500 in VG to mint condx; SX-115 and HRO-500. Top $ paid. Tom, (716) 634-2545 between 10 AM and 4 PM EST, 741-9574 (n)

WANTED

Collins promotional literature, catalogs and manuals for the period 1933-1983. Jim Stitzinger, WA3CEX, 23800 Via Irana, Valencia, CA 91355. (805) 259-2011. FAX (805) 259-3830

FOR SALE: Collins 75A-4 filters: 6 pole ceramic for high quality AM. 3 bandwidths available: 4, 6, or 9 Khz - $83.50 ea.; single pole CW crystal filters - $88 ea. 10% discount for two filters. Money back guarantee. Calif. residents please add sales tax. Vector Control Systems, 1655 No. Mountain, Ste. 104-45, Upland, CA 91786. (714) 985-6250

FOR SALE: Collins KWM-2, WE, Samsonite case, PM-2, MP-1, 302C3, tubes - $875; R-392 - $250; RCA VTVM - $35. Lane, KM3G, (505) 526-0910

FOR SALE: Vintage parts. Send stamp and request "Vintage Flyer". USA only. 40 years of mail order electronics. Bigelow Electronics, P.O. Box 125, Bluffton, OH 45817.

TRADE: Heath Comanche, Cheyenne, AC pwr sply, xtal calib., mic, all exc. **WANTED:** Same condx Heath SB-200. **FOR SALE:** 4E27's, 803's. Neil Berg, WØMXX, 2219 Ridgewood Dr., NW, Alexandria, MN 56308. (612) 763-4857

WANTED: Hallicrafter S-38 & S-38C, prefer in good shape but will take junkers for parts. John Henderson, NM3M, 524 Mill Rd., Goldsboro, NC 27534. (919) 751-0067

WANTED: Manuals and info for CEI/ Watkins-Johnson radios - 501, 605, 960, S302, SM9310, SM8512; Nems-Clarke 1906. Terry, WB9GVB, 306 Van Deusen St., Madison, WI 53715. (608) 258-1810

FOR SALE: Gonset G-63 rcvr - $125; Gonset GSB-100 xmtr - $200; Hallicrafters SX-101 MK III - $125; Heath DX-60B, w/HG-10 VFO, orig. manual & mic - $125. John, KG7RS, (602) 926-6478

WANTED: Books! Tommy Rockford hardcovers (good dustjackets); similar ham adventures; also Rick Brant #s 18-24, Tom Swift Jr. #s 30-33. Morris Hornik, WB9JHW, 4850 Connecticut, NW #1006W, Washington, DC 20008. messages (202) 363-9719

FOR SALE: Transmitting/Receiving tubes, new and used. LSASE for list. I collect old and 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., 16112 W. 125th St., Olathe, KS 66062. (913) 782-6455

FOR SALE or TRADE: SX-25; HA-230; DX-150. **WANTED:** Tuning eye rcvrs - SX-11, NC-100X, others. Jim Dillon, 201 Seward St., Juneau, AK 99801. (907) 586-3223, 10-6 PST

WANTED: Johnson gear, all models, any condition. Also parts and literature. Please state condition and shipped price. Wen Turner, AD7Z, Box 451ER, Cal-Nev-Ari, NV 89039.

FOR SALE: Collins meatball lapel pin - $5.95 + $.75 S & H. George Pugsley, W6ZZ, 1362 Via Rancho Prky, Escondido, CA 92029.

WANTED: Old telegraph items, quack medical, mechanical, scientific and "what in heaven is this?" J.H. Jacobs, 60 Seaview Terr., Northport, NY 11768. (516) 261-1576

FOR SALE: Mfg. conv. 154-158 + 160-164 MHz, Leeds & Northrup equip. AC-DC pwr sply, 5V 25A, 12 + 15V; OS8 C/U scope + more for list. SASE to Buddy Herring, 1310 Andover Rd., Charlotte, NC 29211. (704) 366-6600

WANTED: Stromberg-Carlson radios and paper. Also looking for desk top or shorty roll-around rack cabinet for R-390A. John England, POB 59136, Schaumburg, IL 60159. (708) 823-5287

FOR SALE or TRADE: National HRO single -signal rcvr, pwr sply and coils. Make offer. VE3VIK, (705) 327-7825

ELECTRIC RADIO PARTS UNIT DIRECTORY

If you need a part for a vintage restoration send $2 and an SASE (.52 postage) for a 6 page list of parts units. If you have a parts unit, consider putting it on the list. Your dead unit can help bring others to life!

Repair & refurbishment of older tube-type amateur equipment. Fully FCC licensed; 35 years experience. Chuck Banta, N6FX, Claremont, Calif. (LA area) (909) 593-1861

WANTED: Condenser, carbon and other early broadcast microphones; cash or trade. James Steele, Box 620, Kingsland, GA 31548. (912) 729-2242

FOR SALE: Clegg 22'er, w/manual, no mic, clean - $50; Johnson Thunderbolt amp. - $475, PU only Detroit area. Clem, W8VO, (810) 795-4670

WANTED: Conversion kit for KWM-2 to KWM-2A, there must be some lying around. Ernst Schroeder, DJ7HS, Pinkenburger, Str., 25 D, D30655 Hannover, Germany.

WANTED: Schematics/plug-ins for rcvr R-5007A/FRR-502; schematic, scope AM-USM398. Mike, WA1MTZ, 605 Loomis St., Westfield, MA 01085.

FOR SALE: Collins 51S-1, RE - $900; Drake R4C, w/MS4, NB, all 3 filters - $275. WANTED: Collins 32V-3/75A-4. Will consider trading 51S-1. Bill, N2WXJ, (914) 356-6553

WANTED: For Globe King 400: V-70D final tube, 160-M coils and padder. Charles Graham, K6KDZ, 20335 Casa Loma Rd., Grass Valley, CA 95945. (916) 273-6847

WANTED: Millen 90810 VHF xmtr. Cash, or trade Millen items such as 90800 xmtr, 90700 VFO, 90651 GDM, 90721 Hetrofil. John Kelly, N3GVF, 17510 Sir Galahad Way, Ashton, MD 20861. (301) 774-8186

FOR SALE: Hallicrafters SX-28, Heath DX-100, both working and in good condx - $135 each. PU only. Jim Roseman, W9UD, 2716 - W. 3rd St., Coal Valley, IL 61240. (309) 799-7447

WANTED: Tubes: 26A6, 26C6, 26D6, 6AJ5. Ken Dounar, N9IPQ, 3841 E. Holmes Ave., Cudahy, WI 53110. (414) 481-5104

WANTED: Pwr xfmr for the National NC-100A or 101XA rcvr. James T. Schliestett, W4IMQ, POB 93, Cedartown, GA 30125. Phone/FAX (404) 748-5968

WANTED: All types of military electronics, especially RDF and radar items, manuals too. Also need URD2 antenna. William Van Lennep, POB 211 Pepperell, MA 01463. (508) 433-6031

FOR SALE: Roll charts for Hickok tube testers models 6000 - 6000A and 6005, March 1959 thru spring 1972 - $8 each ppd (no copies). John Snow, 4539 N. Bartlett Ave., Shorewood, WI 53211. (414) 964-0194

WANTED: Tubes for Tube exchange bank. Receiving tubes, all American, new-in-box. Help us make this zero tube cost system work. SASE for info. Tube Exchange Bank, POB 806, Lake City, MI 49651.

WANTED: Single lever Bencher with oval (not triangular) paddles, in exc. to mint condx. State base finish and price. Tom French, W1IMQ, 120 Great Rd., Maynard, MA 01754. (508) 897-2226

WANTED: BC-348R part needed. I ship. Tom N5OFF, 111 Destiny Dr., Lafayette, LA 70506. (318) 989-3430

FOR SALE: Drake R4A/T4X/AC-3/MS-4 - $325; Collins 32S-3, WE, w/516F2 - $350. U-ship. Gary Elliott, NO5H, 808 Clarice St., Delhi, LA 71232. (318) 878-8032

WANTED: HT-9 final tank coils and doubler coils. Dale, KB5IKH, (817) 666-3787

FOR SALE: TBX (junker) - $25; APN-1 altimeter, w/dynamotor - $25; No. 19 Mk II - $45; BC-655 target xmtr - $25. Plus UPS. Ted Bracco, WØNZW, Quincy University, 1800 College Ave., Quincy, IL 62301. (217) 228-5213

WANTED: WW II Japanese military radio equipment, US Marine Corps TBY portable xcvr, w/accessories. Takashi doi 1-21-4 Minamidai Seyaku, Yokohama, Japan.

WANTED: 01A's and other early tubes to complete several radios. Need good, weak or duds. Will pay AES prices. Bob Bakinowski, 1524 Saint Tropaz, Tucson, AZ 85713. (602) 624-8029

FOR SALE: Repair & restoration of all classic & vintage radio equipment, reasonable rates, prompt turn around, 25 yrs experience. Mike McKean, N3HJQ, 726 McClellan St., Philadelphia, PA 19148. (215) 336-6111

WANTED: Visitors and tubes by museum. Old and odd amateur or commercial tubes, foreign and domestic purchased, traded or donations welcome. All correspondence answered. K6DIA, Ye Olde Transmitting Tube Museum, POB 97, Crescent City, CA 95531. (707) 464-6470

FOR SALE: RIT for KWM-2 and S-Line. No modifications for KWM-2. $59.95 tested/42.95 for kit. SASE for details and order info. John Webb, W1ETC, Box 747, Amherst, NH 03031.

FOR SALE: SX-24, works - $75 OBO; TCS parts rcvr - $20; Measurements 560FM sig. gen. - $25; TRA-4 rotor and control - $15; LM-18, LM-21 - $10 each; LP-5 w/ps - $20; Swan 500, w/117X sply, clean - $175 OBO; parting out Heath HA-10 amp. Trade for IC-22A, TCS or ?? U-ship. WA7HDL, (208) 756-4147

WANTED: Radiation Detection instruments and sales & service info; Geiger & Scintillation units, esp. model 111, 115, and 117 by Precision Radiation Instruments Inc. Buddy Herring, 1310 Andover Rd., Charlotte, NC 28211. (704) 366-6600

FOR SALE: Hammarlund HQ-110C, emaculate - $150; HQ-105TR - $125; RME 4350A, w/spkr - $125; Hallicrafters SX-130, w/R51 spkr - $135. Doug Deweese, 502 East 80th St., Tacoma, WA 98404-1014. (206) 472-3478

WANTED: National optional wood cabinet for NCX-A; meter housing or complete meter for Gonset GSB-201. Geoff Fors, WB6NVH, POB 342, Monterey, CA 93942. (408) 373-7636, FAX 373-2345

FOR SALE: Military surplus: R1051, RT618, T827, AM3007 partials, AN/WRT1, AN/WRT2, AN/URR13A, R1230/FLR, AN/SRR11, AN/SRR21, WRR3B, T336D, TED3, URC7 2 Mc RX/TX, Canadian Marcona AN/SRC502A amp, Bendix RDF's, various antenna tuners, PSK converters, amplifiers. SASE for list. Dave Morgan, WO4S, 117 West City Hall Ave., Ste. 701, Norfolk, VA 23510. (804) 552-8626

Please remember to count the words in your ad. If you are over 25 words, please send 15 cents for each extra word.

WANTED: Collecting early Heathkit gear, accessories and literature. Any condx or parts units. Thanks. Byron Tatum, WA5THJ, 1920 Maxwell, Alvin, TX 77511. (713) 331-2854

FOR SALE: Subscribe to "The Amateur Market Place". A Canadian newsletter, listing new/wanted Amateur/Computer equipment. 10 issues per year $16.50 US. Benefit from $ exchange. P.O. Box 8180, Ottawa, Canada K1G 3H7

FOR SALE: 6-tube Crosley radio, paper, spkr - $75; blue Arcturus #127 - $17; Morrow 5BR-2 amateur band auto converter - $40; 6L6G - $10; 1625 - $3; WD-11 duds - $2; 807 - $5; Sparton C-104 duds - $2; HQ-129X - $85; #45 tubes - $20. **WANTED:** Will pay for copy of Harvey-Wells TBS-50C schematic, also need schematic for Swan 117XC pwr sply. Mel, WØMLT, 67750 Ridge View Dr., Montrose, CO 81401. (303) 249-1544

WANTED: Antenna tuning cap for an HQ-180A or the capacity of same; retrofit mech. filter kit for a 51J-3, filters optional; manual for an RME 150A converter; RBA long wave rcvr, working. Call collect after 6:00 PM (609) 393-4122

FOR SALE: Knight SWR meter - $15; Knight VFO - $35; PMR-7 - $20; AF-67 w/AC pwr sply - $110; 275W Matchbox, no SWR - $70; DXI-100 - $125; NC-173, w/spkr, fair - $25; Supreme #333 tester - $35; Sprague TO-5 cap analyzer - $25; parting HRO-60 (no coils) and Viking II. **WANTED:** Dial parts for SB-101; any SB-100, 300 or 400 series will work. Joe Sloss, K7MKS, (206) 747-5349

WANTED: Hallicrafters S-38 or S-38A in good condx; also HA-5 VFO. Dick Lucas, WD4PMT, 400 Devonshire Way, #318, Palm Beach Gardens, FL 33418. (407) 626-0136

WANTED: Cabinet for Hammarlund model SP-600 face plate measures 10-1/2 by 19 inches. Lee Shumway, WB8ZEY, 2820 Yankee Springs Rd., Middleville, MI 49333. (616) 795-3255

FOR SALE: Restoration of vintage radios; 25 years experience. Phil Goodman, K4FXB, 217 Millbrook Farm Rd., Marietta, GA 30068. (404) 509-9493

WANTED: All items found in WW II Martin B-26 radio compartment, BC-461 antenna reel control box, clock, lamps, oxygen hardware, chair, boxes, etc. Greg Greenwood, WB6FZH, Box 1325, Weaverville, CA 96093. Msg. # (707) 523-9122

FOR SALE: Collins 32V? PTO w/front gears and dial assembly - $25. John H. Walker, Jr., 16112 W. 125th St., Olathe, KS 66062. (913) 782-6455

WANTED: Collins 32V-3 xmtr; also spkr for A-3/A-4 rcvrs. John, WB2SMA, 423 Line Rd., Aberdeen, NJ 07747. (908) 566-1312

WANTED: Any type Heath, Eico, Knight, Swan manuals to buy, swap or loan. Pete Markavage, WA2CWA, 27 Walling St., Sayreville, NJ 08872. (908) 238-8964

FOR SALE: Johnson Viking I, w/122 VFO - $165; Hallicrafters SX-101A, HT-37 and HT-41 1 KW linear - $475 for all 3 pieces; Globe Chief model 90 - $85; Gonset Commander, w/VFO - $75. John F. Dubino, KA1SBN, 73 Devens St., Greenfield, MA 01301. (413) 774-5826

WANTED: Sprague TO-6 cap analyzer; Radio Eng. Handbooks, esp. mid to late '50's. Barrie Smith, KF7VA, 125 Ben Hogan Dr., Missoula, MT 59803. (406) 728-7637 (d), 549-1921 (n)

WANTED: Pre WW II radio magazines, books, photos of stations, QSL cards, broadcast and ham collections bought. C. MacNeill Book Dealer, WA8ZNX, 3165 12 Mile, Berkley, MI 48072. (313) 543-1177 days

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FOR SALE: Riders complete index (copy) for Vols. 16 thru 22 (no 23) - $10 ppd. John Snow, 4539 N. Bartlett Ave., Shorewood, WI 53211.

FOR SALE: Military tech manual listings, largest stock in the world, over 50K - $5 refundable with first order. SASE for inquiries. Lee Frank, POB 60011, Harrisburg, PA 17106-0011.

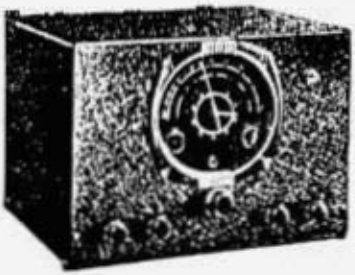
FOR SALE: 4-1000A, 4PR1000A, socket, chimney, plate caps, all unused - $475; 4CX1500 - $200; 4CX1000 - $200; (2) 8122's - $150. Lane, KM3G, (505) 526-0910

WANTED: DX-35 pwr xfmr; Ameco TX-86; "junker" Globe Chief Deluxe for parts. Al Bernard, POB 690098, Orlando, FL 32869-0098. (407) 351-5536

WANTED: Hallicrafters R47 or R48 spkr; calibrator and NBFM adapter for HRO-60. Ward Remkopf, K8FD, 116 Fairway Dr., Belmond, IA 50421. (515) 444-4396

WANTED: Manual & schematic for Hammarlund HQ-140X; 4 MHz xtal for T19 ARC-5. Steve Gajkowski, KD3HT, RR #2, Box 2712, Saylorsburg, PA 18353. (717) 992-6768

WANTED: WRL-70 xmtr; HB xmtrs for display, must be museum quality; thousands of QSL cards to paper walls of Amateur display. Call Leo, (402) 392-1708, Western Heritage Museum, Omaha.



WANTED: Any condition, Hallicrafters Sky Master and EP-132 as shown. Also want SX-46, S-48 and S-49. Chuck Dachis, 'The Hallicrafter Collector', 4500 Russell Dr., Austin, Texas 78745. (512) 443-5027

FOR SALE: Bird wattmeter, 4 slugs - $275; Yaesu FV-101B VFO - $125; SX-110 - $165; HAM-44 rotor - $100; (3) Johnson Directional Couplers - $30. Lane, KM3G, (505) 526-0910

FOR SALE: Navy type CJB-26003A "flameproof" keys. New in orig. boxes - $47 CONUS shpg included. Trade for working IC-22A, TCS or ?? WA7HDL, (208) 756-4147

FOR SALE: Tecraft xmtr, w/2,6 and 1-1/4 converters; Gonset preamp; 5 Millen wavemeters; Silver wavemeter; Radio Eng. Lab. wavemeter. Collins 7000C-5. **FOR TRADE:** HRO-50 coils. **WANTED:** NC-101X manual, spkr; SW-3 coils, manual, pwr sply; SP-44 manual. Carter Elliott, WD4AYS, 1460 Pinedale Rd., Charlottesville, VA 22901. (804) 979-7383

WANTED: SB-620 spectrum display; rcvr multicoupler; PRC-74 modules; SX-100 knobs. Joseph Pinner, 201 Ruthwood Dr., Lafayette, LA 70503. (318) 981-7766

WANTED: Manual or copy for Central Electronics sideband slicer model B; Heath HD-11 Q-multiplier; RME DP-22 or 22A preselector. Bill, (304) 842-4635

FOR SALE: RCA 931A - $18; 6AF6G - $9; UG 212A/U angle - $4.50; new 10-500 ohm NI glass res., 1.2 KW - $50; new 3/8 to 1/4 inch clutch, 1-3/4" dia. I- $10. Joe, W6CAS, (916) 731-8261

FOR SALE: KWM-2, RE; KWM-2, WE; 516F2, RE; 516F2, WE; PM-2; 516E1. All very good-exc. Dana, K7OBB, (602) 742-3676

WANTED: Hallicrafters DD1 Skyrider Diversity, only in VG condx. Jose Cangas, EA4JL. Contact in the States Kurt Keller, (203) 431-6850

WANTED: Western Electric tubes - 101D/F, 102D/F/G, 205B/D/E/F, 262A/B, 252A, 274A/B, 275, 300A/B, 350B, 212/E. Ed Billeci, 2310 SE 113th, Portland, OR 97216. (503) 281-4734

FOR SALE: Drake TR4C, MS-4, AC-4, exc. - $275; Heath HR-10 - $30; DX-60B - $40; HB-10B - $40; Hallicrafters SX-99 - $100; S-120 - $30. Richard Lucchesi, WA2RQY, 941 N. Park Ave., N. Massapequa, NY 11758. (516) 798-1230

WANTED: Loop antenna; radio mounting racks for German JU-88 bomber and any other parts. Bob Graham, 2105 NW 30th, Oklahoma City, OK 73112. (405) 525-3376

WANTED: Schematic or manual copy for Collins 718F-2 R-T group case and 313V-1 control head. I need to make cables. Will pay top $. John H. Jones, P.O. Box 2058, Davenport, IA 52809-2058

FREE: Starting my own newsletter for anyone interested in buying, selling and trading panel meters. Free dislay and classified ads. Free subscription. **WANTED:** Your ads and letters to put in my newsletter. Interesting in true stories from "Good Ole Days" of railroading, flying, ham radio, etc. Chris Cross, POB 94, McConnell, IL 61050.

WANTED: Galaxy gear - bandswitch or parts unit GT-550, spkrs, pwr splys, accessories, xcvrs, wkg or parts units. Byron Tatum, WA5THJ, 1920 Maxwell, Alvin, TX 77511. (713) 331-2854

FOR SALE: Collins 302C3 - $135; MP-1 - $75; SX-110 - $165; FV-101B VFO - $125. Lane, KM3C, (505) 526-0910

WANTED: Early radio parts - variometers, variocouplers, tap switches, bayonet tube sockets, coupling xfmrs, etc. Stan Hojnacki, WA2NPL, 103 Wilson Ave., Blackwood, NJ 08012. (609) 435-8975

FOR SALE: HF/KWM-380 digital keypads that are electrically and functionally identical to the original model AC 3805A keypad. These are newly manufactured units, packaged in a colormatched and weighted low profile enclosure. A small quantity will be built and I'm taking orders for these units. Price is $99.95, plus $5 S/H with a 30 day moneyback guarantee. Specs available with a SASE. Jerry Brouwer, AB8U, 3041 Rising Springs Ct., Bellbrook, OH 45305.

Message: "The Vail Correspondent" quarterly journal for key collectors. Sample $2. TVC, Box 88-E, Maynard, MA 01754.

WANTED: Manual or schematic and front panel for Hammarlund HQ-120X; also top cover for mouse key. Marvin, WA4TOJ, 2957 Gaffney Rd., Richmond, VA 23237-3551. (804) 275-1252

FOR SALE: Mason A-38 surveilance rcvr in attache case, w/spectrum display, 2 kHz - 1.6 Ghz, solid state, manual - $4000. S.T. Carter II, W4NHC, POB 033177, Indialantic, FL 32903-0177. (407) 727-3015

FOR SALE: Dial calibration is easy with our Tri-Mark crystal calibrator. Uses 9-V battery or rectified filament voltage. Three outputs provide rock steady signals from broadcast to UHF. Great pocket signal source. Kit $17.95; assembled $24.95. $4 S&H, Visa/MC. We have a large selection of HV capacitors for tube circuits. $1 brings catalog and coupon. USA/Canada only. Two Fox Electrix Co. POB 235, Tivoli, NY 12583. (914) 757-5800

WANTED: HRO-7, w/pwr sply, matching spkr and coils; power xfmr for HT-32. Clark, WØBT, 2546 SE Peck Rd., Topeka, KS 66605. (913) 235-2721

WANTED: Eldico S-line clone pwr sply and any orig. manuals or information on Eldico equipment. Thanks! Tom Smith, N5AMA, 13034 Elmington Dr., Cypress, TX 77429-2062. (713) 376-3436 (h)

FOR SALE: Schematic diagrams for Knight-Kit 50-W CW xmtr, Ocean Hopper and Spacespanner rcvrs. Write for info. Paul Vaughn, 2317 Williamson Rd., Williamson, GA 30292-9613

WANTED: Vitamin Q caps, all values; 304TL sockets; 20-30 Henry @ 300 mA choke; ceramic standoffs; ceramic feed-thru's; SX-88 tuning knob; 592/3-200 tubes; 810 sockets; all sizes of finned aluminum plate and grid connectors. Barrie Smith, KF7VA, 125 Ben Hogan Dr., Missoula, MT 59803. (406) 728-7637 (d), 549-1921 (n)

FOR SALE: Receiving tubes, new and used; multi-section twistlock electrolytic caps to 500-VDC; SAMS photofacts. Send stamp for lists. Turner Electronics, 16701 Main St., Ste. 121, Hesperia, CA 92345.

FOR SALE: Limited quantity of new blue with white stitching handles for Tektronix 545A etc. scopes, complete with new chrome mounting hardware - $7.50; also replacement rolls of special silver bearing solder (3 feet) for Tek scopes - $.50 each. Add $5 S&H. Stan Griffiths, W7NI, 18955 S.W. Blanton, Aloha, OR 97007. (503) 649-0837

WANTED: SX-101 w/160; Radio Shack DX-400; Uniden CR 2021; Heath HG-10(B) VFO; RCA model CRM R6A; Heath SB-610 monitor scope; 3 RP1 CRTs. Rick, K8MLV/Ø, 1802 W. 17th St., Pueblo, CO 81003. (719) 543-2459

FOR SALE: Speed-X #500 bug (scarce) - $90; Hammarlund HQ-110 (clean) - $85; Eimac 304TL (u) - $35; WE 715T (u) - $25. Plus shpg. Franklin Albanese, 1610 Prince St., #7, Berkeley, CA 94703. (510) 845-2625

FOR SALE/TRADE/WANTED: Vintage tube CB's: list - LSASE. **WANTED:** Fisher tube rcvrs, Fisher K-10 Spacexpander, electric guitar tube amplifiers. Charles Zafonte, RFD 1, Box 75, Fort Kent, ME 04743. (207) 834-6273 (eves)

HEATHKIT FANS: Don't mourn their passing; enjoy learning more about their past in historic pictures and personal insights from many company oldtimers in 124 page book - $9.95 pp. Heath Nostalgia, 4320 196th S.W., Suite B-111, Lynnwood, WA 98036-6754

FOR SALE: Manual copies: HRO-50T1, HRO-60 - $16; SX-100 Mark II - $11; NC-98 - $6. Postpaid USA. **WANTED:** HRO-60 dial scales AC, AD. Richard Prester, 131 Ridge Rd., West Milford, NJ 07480. (201) 728-2454

WANTED: 15 Hy choke, 5 KV 400 mA, not swinging. Will trade an MC-60 amp and C-8 audio compensator by McIntosh. Amp has bad output xfmr. Fred, KC4MOP, 6922 Furness Ave., Oxon Hill, MD 20745. (301) 567-2012

WANTED: Collins 32V-3/2, 75A-3/2; Collins mech. filters; 51J meter; McElroy bug. TRADE: Amperite RBM mic. Brian Roberts, K9VKY, 3068 Evergreen Rd., Pittsburgh, PA 15237. (412) 931-4646

WANTED: Hammarlund clock w/cover & S-meter. **FOR SALE:** Johnson directional coupler w/meter; Signal Sentry - $45; Viking II and Ranger I parts; S-38B - $40; National 183D rack mount - $200. W7FG, (918) 333-7893

FOR SALE: Exchange or donate hard to get xmtr parts, tubes, tech info or anything pertaining to radio. SASE. Cmd. Glenn W. Ritchey, USN Ret., W7SAB, 219 Naval Ave., Bremerton, WA 98310. (206) 373-9631

FOR SALE: Repair! All makes and models, homebrew, maximum labor per unit - $96. Dan Rupe, W7HBF, Telo Technology, 1302 S. Uplands, Camano, WA 98292. (206) 387-3558

FOR SALE: Volume controls - 100 plus new in orig. boxes. Centralab, Philco, IRC, RCA, plus 2 boxes of kits, plus replacement manual - $100 plus shpg. John Snow, 4539 Bartlett, Shorewood, WI 53211. (414) 964-0194

WANTED: Eldico SSB-100F, SSB-100MIL, SAB-1 and any manuals or information on Eldico equipment. Thanks! Tom Smith, N5AMA, 13034 Elmington Dr., Cypress, TX 77429-2062. (713) 376-3436 (h)

TRADE: RME 152A for RME DM 36 to match my RME 69. Bill, WC7O, 12405 Ranchette, Tucson, AZ 85743. (602) 682-7285

WANTED: KWM-1 pwr connector, would consider AC or DC sply; also want Regency ATC-1 converter; manual copies for Logimetrics 921 generator and Eico sweep generator. Colin Lamb, K7FM, 29830 NE Mt. Top Rd., Newberg, OR 97132. (503) 538-4301

FOR SALE or TRADE: Drake TR-3; RV-3; SW4A; MS-4; B&W Unbal/Bal #701, 15-M balun; Stier's tuning coil; Litz wire. Ray, (314) 428-1963

WANTED: Any documentation on Navy xmtr TCM, need manual, schematic, and any other info. Will trade, buy, travel to get information needed to get mine on the air. Thanks. Andy Miller, KD6TKX, (408) 484-2389

WANTED: Tubes, new or used 8005 or 6550. George Schwarz, 18504 Arrowhead, Cleveland, OH 44119. (216) 486-6489

FOR SALE: Heath DX-60 xmtr, HR-10 rcvr, HG-10 VFO, manuals - $125 package; Hammarlund HQ-110, manual - $100. Dave, W1DWZ, (508) 378-3619

WANTED: Dead or alive: Heathkit SB-220, SB-221, HL-2200. Lane, KM3C, (505) 526-0910

TRADE: Collins ARC-52X NIB radio. Trade for complete TBX or other WW II equip. Steve Bartkowski, 4923 W. 28 St., Cicero, IL 60650. (708) 863-3090

FOR SALE: Hallicrafters SX-42, SX-43, SX-25, SX-62A, R-50, SX-140; Philco model 38 cathedral; Rider manuals; Colt tube CB set. Gerald E. Perkins, RFD #2, Box 34, Milo, ME 04463. (207) 943-5204

WANTED: Help me complete my National collection - pay well for SW-4, SW-34, SW-58 & LC-3. Robert Enemark, W1EC, Box 1607, Duxbury, MA 02331. (617) 934-5043

FOR SALE: 1926 Premier Ensemble (kit home assembled), 5 01A's, 3 big dials, 3 small. Very nicely built - $100 shpd. John Snow, 4539 N. Bartlett Ave., Shorewood, WI 53211. (414) 964-0194

WANTED: WW II & Korean mititary sets, xmtrs, rcvrs & test equipment. Send list of equipment along with price. Richard Mollberg, K6PWF, 2340 Almond Ave., Concord, CA 94520. (510) 283-6786 eves

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WANTED: Manual copy for Eddystone model 770 MK II rcvr. Jeff Garrett, KEØMT, (303) 455-5658

FOR SALE: New tubes - 866A - $8; 3B28/866 solid state - $8; 80, 82, 83, 83V, 5Z3 solid state - $8; 6LQ6/6MJ6 match pair + 6GK6 driver, rare - $45; 6JB6 match pair - $35. Receiving tubes - missing box, pulls, etc, check as new, sell as used - $1 each or 10 for $7. SASE for list,(from Tube Bank Exchange). Collins F500 F(B)-14 - $25; new pwr sply for pair of 811A's, 3 HV taps and filament, compact - $35; transformers - 115 VAC to 870, 965, 1000-V (no CT) - $5. Write J. Benedict, 7113 N. 9 Mile, Lake City, MI 49651.

WANTED: Bud or similar type cabinet, desk top type, must be 32" minimum height, 48" maximum, for 19" rackmount equipment. Don, KØPVI, (303) 822-9868

WANTED: Heath VF-1 in VG condx. Bill, KO4XF, 7270 Collins Point Rd., Cumming, GA 30131. (404) 887-7567

FOR SALE: Tube tester, military TV-7. Works beautifully, includes photo copy of setup manual -$90. Dick Bergeron, Box 8311, Essex, VT 05451. (802) 879-1844

WANTED: Manual or copy for HRO-60T rcvr; meter for Viking Valiant, RME rcvr. **FOR SALE:** 4-65 tubes NIB; ARC-12 rx/tx; VHF Command sets. Larry, (602) 892-4618

WANTED: Call sign license plates from all states for W.A.S. display. Will reinburse the postage if you wish. Bighorn Museum of Amateur Radio, POB 229, Byers, CO 80103. (303) 822-9868

WANTED: Collins 75A-1 or 75A-3, working or not; need knobs for NC-303. Bob Kemp, POB 470, Lake City, MN 55041. (612) 345-5345 (days)

FOR SALE: Rare orig. military cabinet for single R-390/R-390A rcvr - $165. Sam Hevener, W8KBF, "The Signal Corps" 3583 Everett Rd., Richfield, OH 44286-9723. (216) 659-3244

WANTED: BC-611, case etc. **FOR SALE:** RME 4350; R-390A; R55; MRU35; NC-98; NC-183D; Transocean 6040; AF-67; PMR-7; Starroamer; SBE-33; SBE-34; Collins MR201. Dave Wilson, AB6DV, 9361 Valleyview St., Alta Loma, CA 91701. (909) 945-5431

FOR SALE: Illustrated catalog of WW II military radio sets - $2 US, $5 foreign, also buying WW II sets. Sam Hevener, W8KBF, "The Signal Corps" 3583 Everett Rd., Richfield, OH 44286-9723. (216) 659-3244

WANTED: Speaker for Collins 75A-4. David A. Clark, K5PHF, 9225 Lait Dr., El Paso, TX 79925. (915) 591-4184

WANTED: WW II Signal Corps BD-72 12 line switchboard. Ed Hammond, WN1I, 1322 SW 21 Way, Delray Beach, FL 33445.

FOR SALE: Nostalgia boat anchors. Two pristine, brand new, PE-103A dynamotors complete w/cables, U-ship - $15 each. Pete Ohlson, W5LVM, 8928 Hackney Ln., Dallas, TX 75238. (214) 348-1823

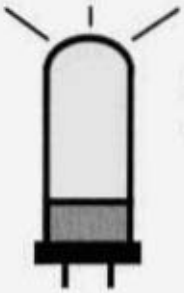
WANTED: Book "History of Communications: Electronics in the U.S. Navy" published by U.S. Government Printing Office, 1963. K.A. Norvell, W5KN, 6015 Norway Rd., Dallas, TX 75230. (214) 373-3973

WANTED: Spkr for HRO-60/NC-183D; V-70D tubes; plate rings for 4X250B and panel meter for Johnson Navigator. Howard Edson, 1505 No. "M" St., Tulare, CA 93474. (209) 688-8506

WANTED: SX-115 or HRO-60. K8FD, 116 Fairway Dr., Belmond, IA 50421. (515) 444-4396

WANTED: Ranger II, Valiant, SX-115, in nice working condx. Consider Globe Champion or 51J4, need 2 AM setups. San, K5YY, POB 763, Springdale, AR 72765. (501) 756-5010

WANTED: Manuals for a Gonset Communicator IV, 2-M xcvr and a Knight TR-108 2-M xcvr. Jerry Kethcart, 16620 Robinhood Lane, Orlando Park, IL 60462.



SECOND
CLASS

ELECTRIC RADIO
145 CR 123
Hesperus, CO 81326

TO: