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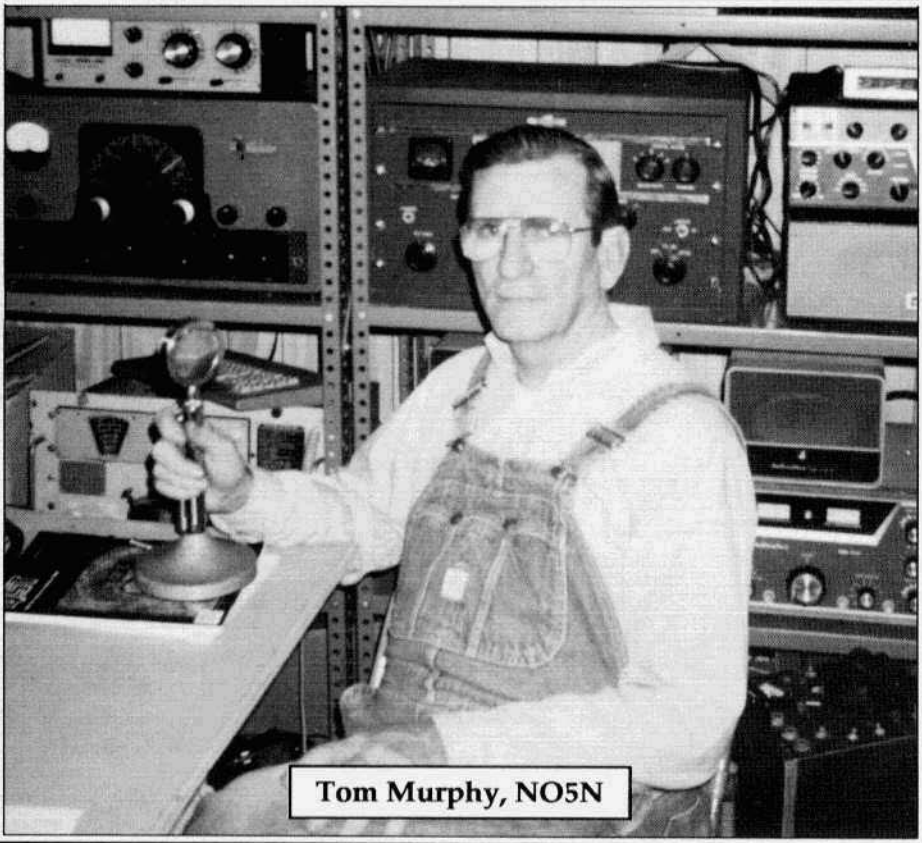
ELECTRIC RADIO

celebrating a bygone era

Number 49 May 1993



Tom Murphy, NO5N

ELECTRIC RADIO

published monthly by Barry R. Wiseman, N6CSW/Ø

at 4 Aspen Place, Durango, CO 81301

Second Class postage paid at Durango, CO. and additional offices

Authorization no. 004611

ISSN 1048-3020

Postmaster send address changes to: Electric Radio
Box 57
Hesperus, CO 81326

REGULAR CONTRIBUTORS

WALT HUTCHENS,KJ4KV.....ELECTRIC RADIO IN UNIFORM
FRED HUNTLEY,W6RNC.....REFLECTIONS DOWN THE FEED-LINE
BILL KLERONOMOS, KDØHG.....VINTAGE PRODUCT REVIEWS
DALE GAGNON, KW1I..... AM REGULATION UPDATES

Electric Radio is published for amateur radio operators and others who appreciate the older tube type equipment. It is hoped that the magazine will stimulate the collecting of, and interest in, this type of equipment.The magazine will provide information regarding the modification,repair and building of equipment. We will also work to-wards a greater understanding of amplitude modulation and the problems this mode faces.

Electric Radio Solicits Material

We are constantly searching for good material for the magazine. We want articles on almost anything that pertains to the older amateur equipment or AM operation. From time to time we will also have articles and stories relevant to the CW operator and the SWL. Good photo's of ham shacks, home-brew equipment and AM operators (preferably in front of their equipment) are always needed. We also welcome suggestions for stories or information on unusual equipment. For additional information please write us or give us a call.

EDITOR'S COMMENTS Barry Wiseman, N6CSW/Ø

This is from a letter I received recently:

"I am MAD. Before I subscribed to ER a year ago, you sent me a sample copy in a nice envelope. So when I sent in my subscription (First Class) I had expected to receive my issues in an envelope the same as the sample issue!!

"To my surprise, that wasn't the case, and throughout the year I have received my issues bent and ripped. I am more than willing to pay to receive your great magazine in an envelope, First or Second class.

"For now, I am renewing in Second class, because I figure as long as we have to put up with the post office's incompetence, it might as well be as inexpensive as possible.

"P.S. Not really mad, just upset. You have a great magazine, keep up the good work".

It never occurred to me that I was being somewhat less than honest by sending samples in envelopes, giving the impression that all the regular magazines were sent this way. I now see that doing this without making it clear that regular issues come without envelopes isn't right. I apologize to all the subscribers whom I may have misled. And I thank the writer of this letter for bringing this to my attention.

At the moment I'm exploring the possibility of sending out all the magazines - or possibly just the First class- in envelopes. The cost- and I think at this time it would be about two dollars a year- would have to borne by subscribers.

I'd like some input on this. Please drop me a card or call and tell me how you feel about the idea and let me know how your magazine arrives. And if you have any other comments pertinent to improving the magazine please let me know about those as well. ER has always been nothing more than the input from it's subscribers. With this issue we move into our 5th year. Its a good time to be making changes.

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Reflections Down the Feedline

by Barry Wiseman, N6CSW/Ø

Fred Huntley, W6RNC, SK

Fred Huntley, W6RNC, who filled this page under this title for almost four years passed away February 8 in Nevada City, Calif. He was 75 years old. As far as I know, he had never married. For most of his life he was a marine radio operator.

Most ER readers need no introduction to Fred. He started his "Reflections Down the Feedline" column with issue #1 and continued almost monthly until he became ill. His last column appeared in issue #44, September, 1992.

I learned of Fred's passing about mid-April when a SWL called and said he had just heard that news on the evening 3870 Westcoast AM net. I called Bill Neeley, K7INK, who was acting as net control that evening, and he confirmed the news. The SWL had also told me that K7INK had asked for a minute of silence in memory of Fred. I told Bill, K7INK that I thought that was a wonderful gesture as Fred had been a very dear friend.

Apparently Fred left his equipment to his church and they have since disposed of all of it. Someone told me that Fred's 'Kelvinator Killowatt' (a 250TH KW built into a refrigerator cabinet,ER #6) was parted out. I hope that information is not true as I feel that that rig should have been saved intact for posterity as it was a one of a kind.

I got to know Fred shortly after I announced that I was starting ER. He called and offered to do a monthly piece and he thought "Reflections Down the Feedline" might work as a title for the column. When I received his copy for that first issue I couldn't have been happier. I thought Fred was a wonderful writer.

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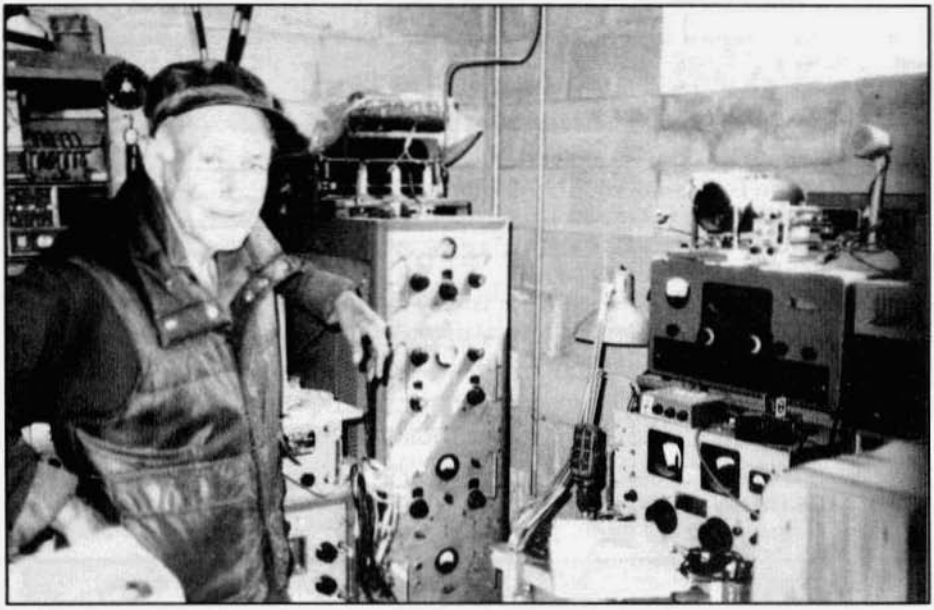

Dayton HAMvention 1993 AM Forum Report

Dale Gagnon, KW1I
9 Dean Ave.
Bow, NH 03304

The AM Forum was a standing room only affair again in '93. Seventy-five amateurs signed the attendance list. The HAMvention Forum Coordinator noted on his form that we need a larger room! Happily cool weather on Saturday, April 24 kept the crowded room comfortable.

The principal business of the Forum was the formal announcement of AM International. We briefly reviewed the purpose, structure, activities and membership procedure. Regional directors were announced. New AMI brochures were handed out and a sample of the new AMI membership certificate was passed around. Membership mail had already started to arrive at AMI Headquarters before the HAMvention as a result of the announcement of AMI in the April issue of *Electric Radio*.

The second segment of the AM Forum was a slide show, "Amateurs and Their Broadcast Transmitters". As always, pictures of equipment and amateurs are well received. Special thanks to John, AB9G, who sent beautiful pictures of his RCA BTA 250M and who was there at the Forum to describe it! Special thanks to Martin, K7BDY, for having such a beautiful station set up in Showlow, AZ and for supplying over a dozen pictures of his two broadcast transmitters, towers and operating positions. Special thanks as well to Hank, W2IQ, who was also there to describe his pictured multi-band broadcast transmitter set up.

Following the slides we played two video segments, one from Paul, WA3VJB and one from Gary, N2INR. Paul, who attended the Forum, described these segments as the beginnings of material that will be ultimately crafted into an AM promotional video. The segments show Paul at his impressive, studio-like operating position making a transmission to N2INR and Gary's segment shows his equally impressive operating position as he answers WA3VJB's transmission. Since I live in the Northeast, I know that both of them sound as good as their stations look!

The last section of the Forum was a panel moderated by Don, K4KYV. I sat on the panel with Andy, WA4KCY and Paul, WA3VJB. Andy, who is AMI's Southeast Regional Director, discussed his thoughts about AMI in the Southeast. He reported on the already active Tuesday night AM International AM Swap Net that he coordinates. Paul spoke about the concept of the "AM Radio Network" which was referenced in the article he co-authored with Steve, WA3HUZ, in *QST* recently. Paul read a note from Steve, who is the AMI's Northeast Regional Director. One of the things Steve is concerned about is the concentration of AM operations around such a small number of frequencies in the Northeast. He would like to use AMI to open up some other frequencies. Pete, WA2CWA, from the audience, reminded everyone about the additional possibilities of AM using VHF frequencies.

A number of AM'ers got together for our annual informal pizza dinner. We were joined by a number of the Collins User Group. This Saturday night meal was for all practical purposes the end of the HAMvention for many of us. Sunday turned out to be a day of heavy rain starting in mid-morning.

I think the AM Forum got AM International off to a good start and I'm pretty sure the AM Forum will be invited back to HAMvention '94. Thanks to everyone who attended. **ER**

Editor's Note: I'd like to remind all the AM'ers to send in their $2 for AMI membership. The address is:

AM International
Box 1500
Merrimack, NH 03054-1500

ELECTRIC RADIO IN UNIFORM

by Walt Hutchens, KJ4KV
3123 N. Military Rd.
Arlington, VA 22207

"The TBX Transceiver"

Among the smaller nasty surprises of WW II was the fact that a radio which was okay under peacetime maneuver conditions could be almost useless for the real thing. When we looked at the USN/USMC's TBY portable transceiver we noted that the wet leaves and deep canyons of the Pacific island war made its effective range almost zero even before the continuous 100% humidity caused a thick layer of green fungus to grow over the wiring. This month we'll look at the set which took over the TBY's job when that set was given an early discharge "for the convenience of the government".

Overview

The TBX is a portable transmitter/receiver designed and built by GE about 1937 and bought by the U.S. Navy mainly for USMC use. The transmitter covers 2 to 5.8 Mcs in two bands with a rated power output of 9 watts on CW and 3 watts on voice or MCW. It has a continuously tuned master oscillator (the old name for a VFO) and can also operate on either of two crystal controlled frequencies. The receiver is a five-tube superhetrodyne and covers 2 to 8 Mcs in three bands, continuous tuning only.

The set measures 8" x 16" x 10" (HxWxD with the front panel cover) and weighs about 32 pounds. It is housed in a thin stamped steel case having a stamped cover held down by screw clamps and sealed with a rubber gasket. With the cover on the set it's watertight (and will float) if the case and cover aren't bent; without the cover it is splash proof.

The set was made in two major versions and a total of nine models. The 'early' TBX is the TBX and TBX-1 through TBX-7, all with minor variations. This version has an 837 oscillator for a transmitter. The 'late' TBX is the TBX-8; this design has a 3A4-2E22 transmitter and other improvements. The models through the TBX-3 were built by GE. The TBX-4 was built by Hazeltine, the TBX-5 by Garod Radio, the TBX-6 and -7 by GE, and the redesigned TBX-8 by Garod.

The transmitter and receiver are separately powered with the transmitter requiring 425-550 plate volts and about 12 volts for filaments and the receiver needing +135, +90, -15, -6, and +3 volts.

Transmitter and receiver controls are independent, for example the receiver has a 'CW-MCW' switch and the transmitter has one for 'CW-Voice'. The separate transmitter and receiver tuning controls are not directly calibrated in frequency; a set of hand-made laminated calibration curves is in the cover of the set. The TBX-8 has push-to-talk; the early version has a transmit/receive switch on the front panel.

There are many possible power supplies, some of them usable only with one or a few of the sets. The receiver can be powered from a set of dry cell batteries or from power supplies running from 6, 12, 24, 32 or 110 VDC or 110 VAC. Transmitter power supplies include a gasoline driven generator, a hand crank generator, a 12 VDC vibrator pack which can also power the receiver, and a 110 VAC supply. Since the transmitter filament is hot only when the transmitter supply is ON, using the hand generator means you can't start talking until the guy on the cranks has been turning for a while; the

The front of the TBX-8 transceiver. The watertight key mounted on top can be removed. The set was normally equipped with the 'pillbox' style crystals shown (the frequencies in this set are 2716 kcs and 2844 kcs) but the Navy type 40125 (FT-243) crystals can also be used.

delay is about 2 seconds for the TBX-8 and perhaps 15 seconds for earlier models.

There are more accessories than could be carried by a Marine rifle squad. These include whip (called 'flagelliform' in one early manual -- in those days a Marine radioman needed a real education!) and wire antennas, a remote control box, a key, headphones and mic, a crystal calibrator, a plastic rain shield for the front of the set, a battery/accessory box, canvas carrying cases, storage chests... I guarantee that's not all. The simplest configuration is the one using the hand crank generator and dry batteries; you'll need at least three good men to carry that. And your corpsman better have packed plenty of APC tablets, 'cause the design of the carrying bags distributes the load badly and even though they are padded, your back will be worked over by every bump and ridge on the equipment.

History

From the types of tubes used, the TBX design must have been started about 1937; the nomenclature was probably assigned in 1939. It replaced an earlier USMC portable HF set, the TBO, about which I have no information. (Can any reader help?)

Some time ago we visited the U.S. Marine Corps' first backpack transceiver -- the TBY of the early WW II period. The TBY had been intended as a highly portable short range teammate to the TBX but when it was found about late 1942 that the TBY was useless in the real world of Pacific combat the TBX took both jobs. At that time the basic transmitter design and many details were improved to produce the TBX-8. Probably around the start of 1944, the U.S. Army's excellent SCR-300 backpack set became available and took over the short range USMC communications job, hampered only by the fact that neither the Navy nor the Marines

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had anything else which could talk to this 40-48 Mcs FM set.

The final TBX contract was dated March 1945. With only three samples of the nine TBX models the total number of sets built can only be guessed but 5000 seems reasonable. The TBX retired from service by 1950, being replaced by the U.S. Army's GRC-9 and in a few cases by the RCA-built GRC-13 portable sets.

Design

The TBX is of aluminum frame and chassis construction; the style will look familiar to users of the BC-191/375, which was also designed by GE. Electrically the receiver uses a pentagrid converter, a single IF stage operating at 1515 kcs, a grid leak detector and a pentode audio stage. There's a separate BFO. There is only one tuned circuit at the signal frequency and only three on the IF. The early version sets uses a 1C6 and four type 34's; the TBX-8 has octal tubes – a 1A7, two 1N5's and 1A5.

The gain control (called 'SENSITIVITY' on the panel) operates by adjusting the negative bias on the converter and IF stage control grids. There is no AVC but considering that the set was intended for fixed station use at ground-wave ranges there would have been little fading and adding AVC might have required another tube, leading to shorter battery life.

The early transmitter consists of an 837 pentode in an ECO (electron coupled oscillator) circuit in which the screen serves as the plate for what is effectively a triode oscillator. 'Electron coupled' means that output is coupled from the oscillator by the bursts of electrons which miss the screen grid and pass on to the plate of the tube. This arrangement gives much of the isolating effect of a separate amplifier stage without an extra tube.

On 'MO' (tunable) operation the circuit is a Hartley; the two crystal ('CO') positions rearrange it to a tuned plate oscillator. The plate circuit is an 'L' network; taps on the coil allow adjusting the antenna loading. The antenna must be resistive or capacitive – that is, resonant or short.

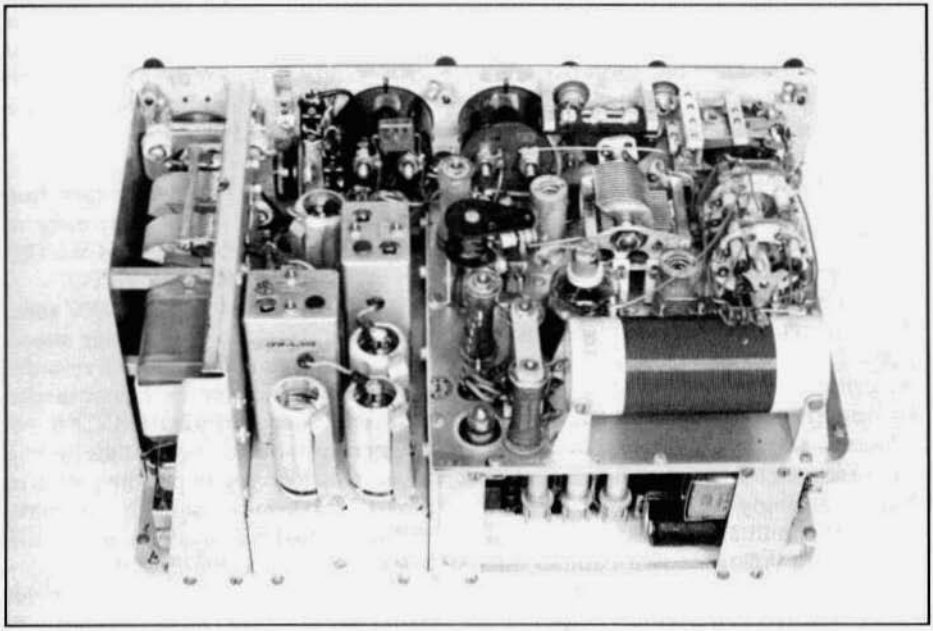
In the TBX-8, the transmitter uses a triode-connected 3A4 as a separate master oscillator and a 2E22 as a power amplifier. This is the tube lineup of the BC-1306 and its much improved GRC-9 son but those sets use more advanced circuits.

Both TBX versions use suppressor grid modulation; the early one takes the voltage directly from the carbon mic transformer while the late one adds a 3A4 amplifier.

There are some surprising control arrangements on the TBX series. On the very early sets, connections to the JK-26 mic jack are reversed. The mic button goes to the tip and the switch to the ring; these sets can be identified by a white cover on the mic jack. Beginning at least with the TBX-4, the jack cover is red and the connections are the modern ones. This change was probably made to bring USMC sets in line with the rest of the Navy. Did you ever wonder why the ART-13 has a red washer around the mic jack or many RS-38 carbon mics have a red band on the plug?

'NET' functions as you might expect, turning on the transmitter oscillator to allow zero beating a station being received. This feature showed up on the TBX-3 or -4 and was added by field change to at least some earlier models. The surprise is that even on the TBX-8 (with a two-stage transmitter), 'NET' turns on the transmitter and radiates a signal – it is just like closing the key except that the receiver stays on.

Transmit/receive switching on the early sets is about as simple as it gets: a rotary switch on the panel transfers the antenna from the receiver input to the transmitter output, applies high voltage to the 837 and mutes the receiver by removing its high voltage. TBX-8 switching is the same but uses a relay. TBX-8 transmit audio is coupled from the modulator tube to the receiver audio output transformer so the operator hears his own



Inside top view of the TBX-8. The receiver section is on the left; the transmitter is at right. The top of the 2E22 is just above the left end of the final tank coil. The antenna relay is at the upper right; just to its left a sliding link allows use of either the transmitting antenna or an auxiliary antenna for receiving.

voice when talking; this 'sidetone' feature isn't provided on the early version sets.

Another new feature on the TBX-8 is remote operation over a twisted pair. When the two-wire remote line circuit is 'closed' for DC by pushing the switch on the mic at the remote station, the current operates a relay in the set which closes the PTT circuit and connects the line through a blocking cap to the mic input. When the remote mic switch is released, the relay releases PTT and connects the line to the receiver audio output.

Remote operation is a good idea for even a small front line radio because an antenna is a flashing neon 'SHOOT HERE' sign for any alert enemy gunner. Though you still need an operator for tune up and someone to crank that darn generator, they, the set, and that dangerous antenna can be out of sight below the crest of the ridge or behind a clump of trees. Even if your steel 'pot' is spotted occasionally, it doesn't announce that you're controlling the naval gunfire in this sector as an antenna does. "Up 200, Right 100, Fire for effect!"

There are many other small improvements and simplifications in the TBX-8 by comparison to the earlier versions. Among them are fewer voltages needed by the receiver, elimination of the filament rheostat, simpler shielding, provision for the use of FT-243 style crystals as well as the bulky and expensive 'pillbox' types, and a jack for PL-55 phone plug as well as phone tip terminals.

Workmanship in the TBX is first rate. Attention paid to moisture resistance goes well beyond the effort to seal the radio against the entry of water. Failures of wirewound resistors caused by moisture (usually by corrosion where the element is connected to the terminals) were largely eliminated in the TBX-2 by the use of sealed-in-glass wirewounds. Most insu-

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lation is glazed ceramic – the best there was in 1937 for moisture resistance. These are some of the most beautiful parts I've seen. To this, the TBX-4 adds a container of silica gel inside the case to gobble up any moisture which does get in.

Also noteworthy is the attention to practicality. The hand generator, for example, does not have the usual easy to lose or break legs and seat. Instead a chain and clamp are used to secure the unit to a standing or fallen tree, post, pipe or other object. The hand generator and the gasoline driven one are interchangeable.

Radioactive Materials on the TBX

The transmitter and receiver frequency dials of some models of the TBX are among the most strongly radioactive of any to be found on a military set. My TBX-4 and TBX-8 (with yellow-brown painted dial markings) have the problem; the TBX-2 (raised aluminum markings) does not.

The dials, stationary and index mark plates for both the main and vernier dials should be wiped with a damp paper towel and sprayed with clear acrylic lacquer to seal the radioactive paint in place. Wear disposable rubber gloves and seal up the gloves and paper towel in a plastic bag before disposing of them; never burn such materials. Finally, wash your hands carefully.

These precautions may be excessive but they are not pointless: my PDR-27 geiger counter measured the sealed bag at about twice the level of local 'background' radiation, showing that the towel and/or gloves had picked up some loose particles.

The vernier dials themselves also have radioactive paint but their construction makes them hard to remove and unlikely to be rubbed against and the factory lacquer on mine looked sound. Some models have radioactive plastic buttons on the ends of the toggle switch handles. These are a hazard only if loose; if they are a drop of Krazy Glue should keep them in place.

On the TBX as on other military radios, meters with a black face having tan or dirty yellow paint on the pointer or calibration marks are radioactive and must never be opened.

On the Air With the TBX

My first TBX was a -2 which came from a hamfest several years past; more recently I was the lucky recipient of a TBX-4 from 'Uncle Joe' Saah, WB5ZPQ.

I got the TBX-8 and CRF-20337 transmitter/receiver vibrator power supply long enough ago that I have no record of where they came from. Both were in near-new condition, a rarity at KJ4KV. An even bigger rarity was that not a single internal repair was required to put the combo on the air. I had to make one of the two cables and fix a broken connection in the other but when I connected a 12-volt supply, away it went. Several dirty toggle switches required the 'switch the switch 100 times' technique and a dirty receiver tuning cap wiper contact needed the equivalent but that was it.

I've said many times that no WW II vibrator works unless you open it up and clean the contacts but on this set I have to eat my burnishing tool – it was just 'CLICK' (the switch going on) and 'mmMMMMMMHUMMMM' (from the vibrators). Users of the BC-654 (which can require weeks of replacing parts and cleaning vibrators) can read and weep; I am one so I'll be right there with you. The TBX-8 is one fine piece of radio construction.

It isn't, however outstandingly stable. During 30 minutes of four minutes receive/one minute transmit operation at 3885 kcs it drifted up about 120 cps during each transmission and down 1.8 kcs overall. During a following ten minutes continuous key down, drift was another 400 cps down. Detuning the PA by enough to reduce power output by half changed the frequency by about 1 kc. This is one of the worst performances among WW II sets but on a set which can also be crystal

The crystal calibrator/monitor furnished with the TBX-8. The unit has a triode-connected 3A4 crystal oscillator operating at 7.5 plate volts; the switch selects any one of ten internal Navy type 40125 crystals. The collapsible antenna allows radiating a signal to set the TBX receiver; with headphones plugged into the jack the circuit becomes an oscillating detector to allow adjusting the transmitter to the crystal frequency. These were furnished only with the TBX-8 and perhaps only on the last contract; this one is s/n 23 and the only other one I've seen was in the '60's. At right front is the 'Powerful Pete' four bladed screwdriver which stows inside the bottom of the TBX-8.

controlled (and with the latest models including a ten-frequency crystal calibrator) that isn't as serious as on an MO-only design.

On the air, the TBX is a low power set - with three to five watts of AM carrier you don't fight and win against thunderstorms or SSB channel sharers. As with grid modulated sets you can't get the linearity you would from plate modulation and like other military grid modulated sets the adjustments you'd need to make to get the best possible linearity are fixed by the design at average values. A sine wave input on my set gives a distinctly square topped modulation envelope. But the resulting voice is easy to copy -- in effect it is built in speech clipping.

The receiver 6 db bandwidth is about 9 kcs – too broad for the crowded band conditions typical of 75 meters during peak hours but okay for use late at night -- about the only time this amount of power will be heard. The MO tuning rate is quick enough to make zero beating a real trick but crystal control is a better idea anyway. When copying skywave signals the lack of AVC is a problem; you have to ride the gain control constantly and even then you get blasted sometimes and lose words at others.

The TBX makes a good set for the vintage military radio enthusiast who can enjoy it for what it is -- an example of the best in late 1930's portable set design. And we shouldn't say 'obsolete' too loudly -- my 1962 Radio Amateur's Handbook has almost the identical receiver circuit under the title 'The 2x4+1 Super'. Because of its instant heating transmitter tubes and MOPA rather than modulated oscillator design the TBX-8 is much more usable than the earlier models.

There's a surprising amount of this gear still around. I see one or two TBX's a year at hamfests and odd accessories turn up

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Good Audio

Part One
by John Staples, W6BM
732 Cragmont
Berkeley, CA 94708

Do you want to improve the sound of your transmitted audio, but don't quite know how to go about it? Have you heard really fine audio, and you would like to duplicate it? Are your contacts having trouble even understanding what you are saying? Stay tuned, and in this article, I will discuss what makes good audio and how to improve your transmitter. Fundamentals will be mixed in with some good, practical advice.

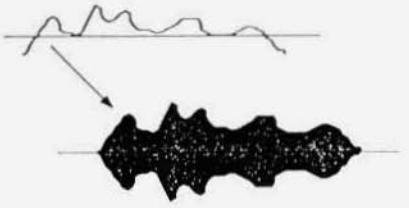

Fig 1

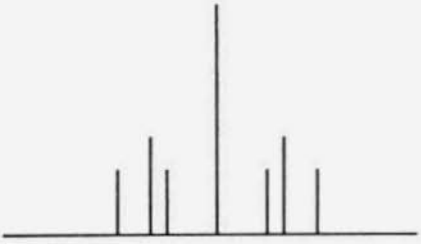

Fig 2

First, let's cover some basics. In AM, the transmitted peak carrier voltage mirrors the voice waveform, varying from zero up to approximately twice the unmodulated carrier voltage. This variation of carrier voltage causes sidebands to be generated, and the bandwidth of the signal is twice the highest modulation

The author at his operating position showing some of his audio processing equipment.

frequency. Figure 1 shows the modulation of a carrier in the time domain, where the horizontal axis represents time, moving left to right, and the vertical axis represents the carrier voltage. The second figure shows the spectral distribution in the frequency domain, where here the horizontal axis represents frequency. The sidebands surround the carrier, and reproduce the spectral distribution of the audio signal. It will help to visualize the signal in either the time or frequency domain to understand why some improvement techniques work, and why some don't. We will return to these two representations often.

Next, let's clear up some misconceptions. Good hamband AM audio is not the same as hi-fi audio. A broadcast-quality transmitter fed with a broadcast-quality mike would sound flabby and undermodulated. The highs would be lost in the narrow bandwidth of the receiver. The low-frequency components would dominate the modulation power, but would be lost to the low-frequency roll-

off in the receiver. What's left of the midrange would sound weak, and the signal would lack punch. Proper response shaping results in audio that sounds powerful, natural and undistorted.

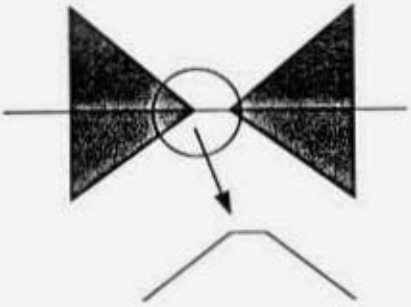

fig 3

Overmodulation is not the only cause of splatter. Figure 3 shows a detail of the carrier amplitude crashing to zero on a negative overmodulation peak. The waveform represented by this severe clipping has a sharp kink (time domain), which requires a wide set of frequencies to represent it (frequency domain). This wide frequency spectrum creates sidebands far away from the carrier, producing splatter and buckshot. Clipping or parasitics in the transmitter can also produce splatter.

Low-level modulation found in single-sideband transmitters operated in the AM mode can be quite acceptable, if adjusted correctly. Many older broadcast transmitters used low-level modulation followed by several stages of linear amplification. When they are correctly tuned, the results can be completely satisfactory. In fact, if a balanced modulator is used, overmodulation will not cause splatter – it will just result in audio distortion if an envelope (diode) detector is used (frequency domain: two sidebands, reduced carrier), but can be demodulated without distortion with a synchronous detector (Staples, ER #30,34). The most common problem with low-level modulation schemes is that the amplifiers following the modulated stage are not operated in their linear range and flat-topping or crossover distortion usually occurs.

I now will discuss each component of the audio chain from the microphone to the receiver, along with some commercial AM broadcasting practice.

Microphones

Your audio really starts with your own voice, which I can't do much about, so we'll begin with the microphone. I have heard wonderful audio from $1.50 Radio Shack electret mikes, and lousy audio from improperly equalized $1000 RCA 44-DX velocity mikes.

It is important to emphasize the middle range of the voice without overdriving with the bass components. Without a roll-off of the bass register below about 200 Hz or so, the lows in the voice will determine the modulation level. The remaining middle register will be weak in comparison and the signal will sound undermodulated and bassy. In addition, many transmitters can't handle the lower frequencies without distortion.

The high frequency response of some microphones may have sharp resonances or holes. A resonance produces a ringing sound frequently heard on older telephone equipment. Missing spectral bands can also sound like ringing. Audio physiologists know that if an audio source is missing spectral segments, the ear-brain system will attempt to fill that section in. This process results in listener fatigue, which can result in a ringing sensation in the ear. (This is a common effect produced by cheap hi-fi's). A sharp cut-off in the audio frequency spectrum will produce the same effect. A smooth roll-off of the lows and the highs with no sharp peaks in the midrange spectrum avoids listener fatigue.

Some microphones, such as ribbon velocity mikes, become bassy when close-talked. These mikes may have a variable low-frequency roll-off selector switch (voice-music1-music2) incorporated in the microphone itself to shape the bass response.

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Good Audio from previous page

The directional characteristics of a microphone may be important. If you prefer to talk far from the mike, you may want to consider a directional mike which will not pick up wall echo. If you close-talk the mike, then any pressure-sensitive microphone should work fine.

Most ham mikes are crystal, dynamic, or electret (a convenient form of capacitor mike). The crystal mike requires a high-impedance load to preserve the low-frequency response. The crystal mike equivalent circuit is a voltage source in series with a few hundred picofarad capacitor. This forms a high-pass filter with the grid resistor of the first amplifier stage. The resistor must be large enough, a few megohms, to preserve the bass response, but not too large, otherwise the grid will float negative, changing the bias of the first stage. Good mike cord shielding is essential, and the cord should be as short as possible.

Some crystal mikes such as the amplified D-104 have a preamp in the stand providing a higher signal level at a low source impedance. However, unless the audio output level is correctly adjusted, the audio amplifier stages in the transmitter before the gain control may be overdriven by the high output. Another potential problem with the amplified D-104 is the presence of a strong voltage transient when the talk bar is pressed or released, which may ride through the modulator and stress the modulation transformer. In higher power transmitters, place a spark gap across the modulation transformer secondary to protect it against transients (Dennison, ER #25). Some transmitters, like the Johnson Ranger, have no d.c. blocking capacitor between the mike connector and the grid of the first audio stage. A leaky electrolytic coupling capacitor at the D-104 amplifier output may upset the first audio stage bias. Include a d.c. blocking capacitor of at least 0.01 microfarad before the grid resistor to prevent any d.c. from the mike from upsetting the bias on the first amplifier stage. Don't replace the electrolytic in the D-104 with a smaller capacitor, as the mike won't then drive low-impedance loads.

The D-104 mike seems to have an almost ideal frequency response and relatively high output, and doesn't need any more response shaping. Its popularity attests to this, with many hams having collected several of them. The crystal cartridge does eventually degrade, however, but is easily replaced at modest expense.

The small electret microphones sound just fine, and their built-in amplifier provides a low-impedance output. They tend to have a fairly flat response, with a bit of bass fall-off, and work fine without equalization. I have not heard enough dynamic mikes on the bands to have an opinion about their suitability for AM work.

Broadcast-type mikes are fun to use on an AM transmitter, but need to be equalized, knocking down the bass response, to render their frequency response more suitable. You must speak a foot or two away from ribbon mikes, but they have directional characteristics that allow you to put echoes or noisy transmitters in the directional nulls.

Mike Mixers

A multi-input mike mixer may be a valuable addition to your station. It allows you to test several microphones in quick succession, and to include other audio sources such as tape recorders.

Mixers come in a wide range of capabilities, from small units with two high-impedance mike inputs to full studio consoles. The more elaborate mixers usually have low-impedance microphone inputs, with separate preamps for each mike. The preamps may be modular plug-in units low-level inputs, which can be removed for high-level inputs. Amplified D-104's can drive the 600-ohm high level inputs nicely.

These mixers frequently support monitoring functions, such as a VU meter, or a headphone output. The mixer output level is fairly high, which is not suitable for

feeding into the transmitter mike input, but is well adapted to feed other audio processing equipment. The mixers usually have no provision for push-to-talk circuits. New connectors and push-to-talk wiring may be added to the mixer. Below, I will discuss how to feed high-level signals into amateur transmitters.

Phasing

The human voice has an asymmetric waveform, and to increase the average modulation percentage, it helps to establish the phase of the audio chain so that the higher polarity peaks in the acoustical waveform produce upward modulation of over 100% while maintaining the peak negative modulation level below 100%. Commercial AM broadcasters use equipment which constantly monitors the symmetry of the audio feed to the transmitter and automatically switches the phase to favor the positive modulation peaks, which are allowed to reach 125%.

One way to estabiish the phase of the audio is to observe the modulated signal on an oscilloscope and observe whether the upward peaks exceed the downward. If they don't, invert the phase somewhere in the system.

The phase can be conveniently inverted at two points: the microphone and the modulation transformer secondary. The wires to the microphone element can usually be interchanged, as long as neither side of the element itself is ungrounded, such as in the D-104. The secondary leads of the modulation transformer can also be interchanged. If negative feedback from the modulation transformer is not used (the Viking Ranger is an exception), primary leads can also be interchanged, usually by switching the plate caps.

If equalizers, limiters or other audio processors are in the audio chain, they should maintain the phase when switched in or out. These units usually have balanced 600-ohm inputs and outputs, and reversing the leads inverts the phase.

Equalizers

Equalizers might improve your audio quality. A good amplified D-104 with a modified Valiant transmitter (Staples, ER #24) doesn't need any equalization at all. An equalizer won't help a rotten mike, with lots of sharp peaks in its response. Bassy or tinny audio without high-frequency resonances may be helped by an equalizer. The sort of equalizer you might try is the 10-band octave-type used in hi-fi systems and available at electronics flea markets. The 10-band variety usually allows each octave to be boosted or attenuated by about 10 or 15 dB. Connecting the two stereo channels in tandem will achieve up to a 30 db boost or cut.

One way to tune an equalizer is to rely on a listener using his normal station receiver to talk you into the best response adjustments. By including the receiver in the loop, the receiver audio response is taken into account.

If the transmitter has distortion at the extreme ends of the spectrum, cut them off. Many transmitters cannot modulate below 200 Hz without considerable distortion. There is no point in extending the audio range above 8 kHz.

Articulation tests show that if frequencies below 570 Hz are eliminated from speech, 96% of random syllables can be interpreted correctly, and 90% with frequencies below 960 Hz eliminated. The corresponding high frequency cutoffs for the same syllabic identification accuracy are 5000 and 3100 Hz (Radiotron Designer's Handbook, and Kleronomos, ER #11). It is clear than a limited frequency range does not affect accurate understanding, but it does affect the naturalness of the sound. For heavy QRM situations, you may want to emphasize only the middle of the spectrum with your equalizer settings.

The audio response of various transmitters varies widely. The Collins 32V series has a rather narrow response, and the Johnson Ranger is somewhat wider. The modified Valiant is excellent, (+ dB from 70 Hz to 15 kHz), with low distortion. An equalizer can correct some of the

continued on page 33

A Calibrator for the NC-183D

(Model XCU-83-50?)

by Dennis Petrich KØEOO
6419 Berwickshire Way
San Jose, CA 95120

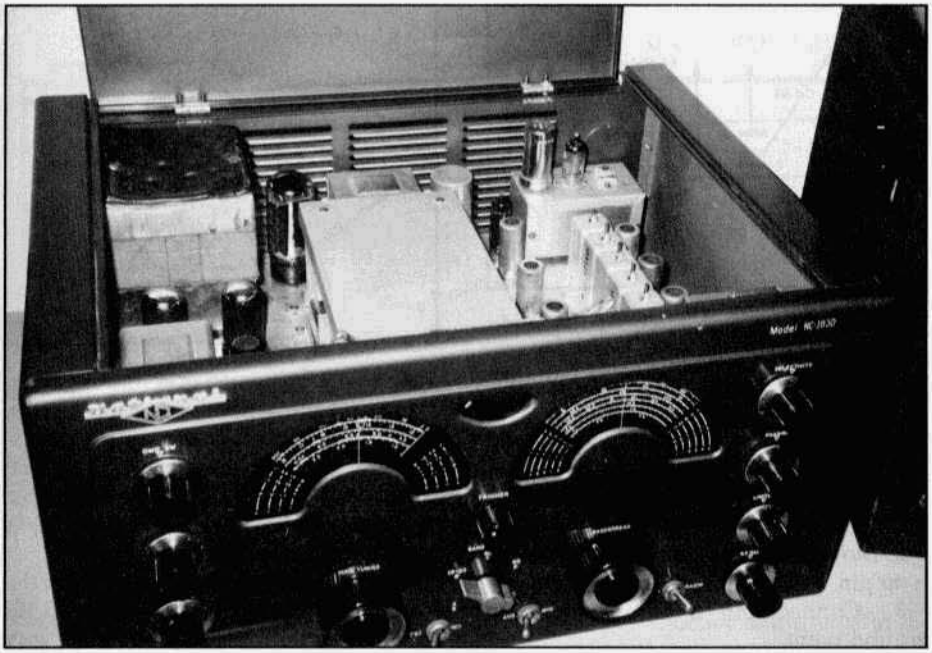
I was at a local swap meet the other day when I ran across a National NC-183D with speaker and original manual, from the original owner, no less. The radio was in excellent condition with only a few nicks and scratches to mar the beauty of this classic.

I couldn't wait to get it home and put it on the bench so I could evaluate the condition of my find. Well, a close look at the under side revealed only a few cobwebs and years of dust on the bottom plate. The set must have been stored in a warm, dry place for it to be in such good condition. A few hours of dusting, cleaning and waxing revealed a real gem of a find. I have always loved the beauty of National's cabinet work; the rounded corners and the smooth gray tone finish. I also pulled the knobs and scrubbed the dirt from the ribbed plastic with a tooth brush and mild detergent. This revealed knobs that now look like new.

With the cleanup out of the way I started looking at and measuring the condition of the various components in the set. I found a handful of resistors out of spec by a wide margin and all of the paper, .1uf, capacitors were leaky. I especially want to mention R-36 and R-37. If you have a NC-183D, check the condition of these two resistors. THEY ARE SUPPOSED TO BE 1K by 2 watts each and in parallel to form a 500-ohm 4-watt to ground return for the center tap of the power transformer. Across these resistors a negative bias is developed for various functions within the '183D. An unusual design for a receiver but a good one if the resistors don't change value or open up.

Well, the combination in my set were at 748 ohms, which gave me over 60 volts to ground! You can easily check the condition of yours by measuring from the 'can' of the electrolytic capacitor, C-64, to ground. This can be done from the top of the chassis and should be around -40 to -45 volts if the resistor values are correct and if the power supply current in your set is around 80 mA like mine. I replaced the incumbent components with a hefty 20 watt, 500 ohm wire wound resistor. The voltage at C-64 has been stable for weeks now. If this voltage gets too high C-65 will be pushed past its rating of 50 volts. I had to replace mine for this reason.

I'll skip over the details of checking all of the voltages and pots and doing the alignment. Needless to say this all took several days but isn't important for this article. So, lets skip ahead in the story to the point where I'm tuning around the band wondering where in frequency I should set the two dials so I can be calibrated?? Well, the "bandspread" dial has a nice "SET" mark on it when you want to use the "main" tuning dial for general coverage. The calibration is good enough in this mode for Short Wave Listening. A log scale is provided if you want to find a specific frequency again. But, your problems begin when you want to use the "bandspread" dial for the ham bands. Setting the main tuning knob accurately is impossible without a reference signal, accurate transmitter or a calibrator. I looked in the manual for "where the calibrator goes" and found that none had been designed for this set!! It took me a few minutes to get over my astonishment before I decided I would try and add one to the radio myself. Trying to use this receiver with one of the vintage transmitters with VFO's of the time would be tough anywhere near the band edges. With the addition of a simple 100 Kc or 1 Mc calibrator this receiver could be a real performer!



NC-183 with crystal calibrator installed in upper right hand corner of chassis.

So... a quick check of the schematic revealed an easy method of installation for a 100 Kc or 1 Mc calibrator depending on what the user needed. There was room in the corner in the "Accessory Connector Socket, X-2". And the "Radio-Phono" switch could be used to turn the calibrator ON and OFF. Socket X-2 and the switch were designed to be used with the NFM-83-50 F.M. adapter and the SOJ-3 "Select-O-Ject". If you use any of these adapters then this calibrator will not fit in your 183D. Both adapters use the "Radio-Phono" switch to place the set in the proper mode. In fact, this is what gave me the idea of using the switch to turn ON the calibrator. Even so, Figure 2 of the calibrator includes an auxiliary switch, S-1, to turn the unit ON and OFF without having to modify the "Radio-Phono" switch S-15 if desired. The lid on the '183D will have to be opened to use the auxiliary switch and the calibrator can be unplugged and the other National adapters used as well.

According to the schematics for both National adapters, the calibrator modification designed here will not affect the electrical characteristics of socket X-2, but the modification to the Radio-Phono switch will. So, for those of you who have those other adapters I have included a way to have the best of all the worlds. In any event, the changes to the NC-183D only took about 30 minutes and can easily be changed back to their original state in even less time.

The changes are as follows:

For the socket X-2, cut the ground wire from pin 2 and connect a 7" piece of small dia. coax such as RG-174 from pin 2 to the input antenna connector "E-1". Connect the center conductor of the coax to the antenna input and the shield to the ground point on E-1. Do not connect the shield at the other end of the coax to ground. According to the schematics provided by National pin 2 is not used by either of their adapters, so if you ever want to return this mod back to its original state,

continued next page

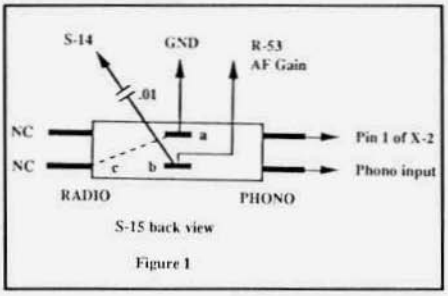


Figure 1

you can leave this one in. This is all you do for X-2.

If you want to use the "Radio-Phono" switch, S-15, to turn the calibrator ON and OFF refer to figure 1 and do the following:

1. Disconnect the jumper from pin 'c' to pin 'a'.
2. Move .01 uF capacitor C-91 from pin 'a' to pin 'b'.
3. Connect pin 'a' to a convenient ground point.

This completes the modifications required to S-15.

Refer to figure 2 for the calibrator schematic I used. I picked up an NC-300 a while back that included a homebrew calibrator. Since then I found an XCU-300 calibrator to replace it. So, the homebrew one was just sitting around looking for a home. It was the same design as the XCU-300 circuit but unfortunately the XCU-300 is mechanically too tall to fit into the '183D. Building one from scratch should be simple. Hopefully, most of the parts for this design will come from your junk boxes, friends or swap meets. The 100Kc or 1Mc crystal can be purchased from Surplus Sales or directly from a crystal house.

I modified the calibrator I had to ground the cathode instead of applying B+ to turn it ON. This simplifies the changes to the '183D quite a bit. I also added a return resistor to keep the bias at about -24 volts with respect to the grid of the 6AK6 when OFF. If you use S-1 to turn the calibrator ON, it isn't necessary to connect pin 7 of the 6AK6 to pin 1 of the X-2 socket. Also,

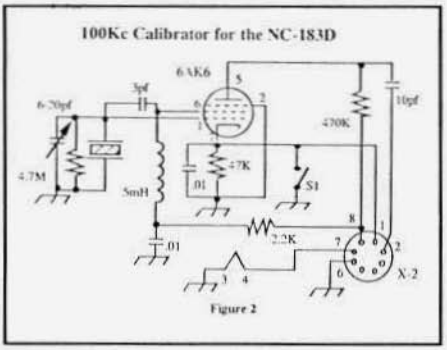


Figure 2

I added a 2.2 K screen grid limiting resistor in case the oscillator doesn't start up. The 6AK6's screen grid can draw excessive current if this happens. The 6-20 pF trimmer is used to zero the calibrator against WWV, a task easily done in a general coverage receiver.

Figure 3 shows where to position the hole on the bottom of a 2.23" X 4.0" X 2.25" minibox for the octal socket to mate with "X-2" in the 183D. Any box that will fit into that corner will work so be as creative as you want with your production XCU-83-50. Mount the crystal, 6AK6, trimmer and switch on the other half of the box on the top. Fabrication of the calibrator is quite simple so I won't go into any more detail.

Summary

I originally intended to build a 1Mc. calibrator because the '183D is a general coverage receiver. I didn't think a 100 Kc. calibrator would get me close enough to the correct frequency dial mark; you could be off +/-100 Kcs I thought. Instead, I have been impressed with the calibration of the '183D even in the general coverage section. It has been great! It has been easy for me to find the correct 100 Kc mark even up on 10 meters. Also, the signal strength up on 10 has been S9+ so it's easy to find even with the antenna hooked up. For those of you who want to use the calibrator on 6 meters a 1Mc crystal might be better.

By the way, the first production run of '183D's had a nifty amplified AVC S-meter

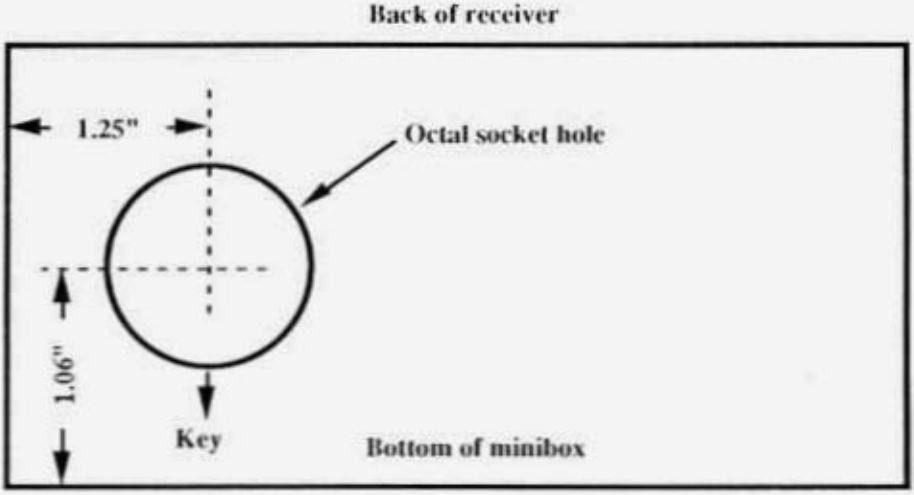


Figure 3.

circuit that auto zeroes the S-meter. The S-meter adjustment on the back of the receiver adjusts the full scale calibration of the meter instead of zeroing it. A great circuit. I would like to know why they later changed over to a circuit similar to the one used in the HRO-60 that requires zeroing?? If your NC-183D has a 6J5 in it, than you have the earlier version, like mine. Later versions use a 6SN7.

Of all of the receivers I own the NC-183D seems to me to have the best sounding audio even compared to my HRO-60. Fuller, richer, more robust are words that come to mind and I have noticed that the AVC action is quick enough to keep up with the worst QSB conditions, eliminating that "funny fading sound" from the audio in most cases. The audio quality of this '183D reminded me of the audio in those old wood short wave radio consoles from the 30's and 40's. To date this is my best receiver for listening to the audio quality conscious group at 3870.

Also, the sensitivity, frequency stability and selectivity are excellent and what you would expect of a quality AM/CW receiver of the day. Dial calibration is generally good but with this calibrator it's right on frequency and usable in the amateur bands even with an uncalibrated transmitter. So, have fun with your NC-183D and let me know how your XCU-83-50 turns out! **ER**

E.F. Johnson Celebrates 70th Anniversary

June 1993 will mark the 70th year that the E.F. Johnson Company has been in the business of manufacturing radio equipment and electronic components. In celebration of this historic event the Viking ARS (long-standing company ham club), will be operating a special event station from one of the original E.F. Johnson buildings located in Waseca, MN. The specific dates will include June 18-20, and Field Day week-end June 25-27. Much of the radio equipment to be operated will be vintage E.F. Johnson. Many of the radios to be used will be on loan from area hams who have long been loyal to the Johnson mystique.

At this time it is hoped that Edgar Johnson's original callsign "9ALD" will be in use. In the event that this call is unobtainable the callsign "WAØCJU" (club call of the Viking ARS) will be used for the duration of the event. Operations will take place on all non-WARC bands from 160-10 meters using a mixture of AM, SSB, and CW. The club plans to have available both a QSL and certificate (8 x 11 SASE required for certificate, letter size SASE for the QSL only) commemorating the 70th Anniversary event. In addition there will also be a certificate offered for guest operators at the station. (Guest operators are welcome...please bring a current copy of your valid amateur license if you wish to operate.) All requests for QSL's and Certificates must be accompanied by an SASE of appropriate size. Send requests to:

E.F. Johnson Co.
ATTN: 70th Anniversary Special Event Station
P.O. Box 1249
Waseca, MN 56093

In addition to this there is a telephone information line in operation 24 hours a day. Anyone wishing more information on the upcoming event may call **(507) 835-6612.** This number will contain a recorded message detailing the operation and anyone wishing more information may leave a short message at the end of the recording.

Blind Ham Needs Help

I am totally blind, and a friend has been helping me restore a Viking Ranger. We are looking for a safe way to gain access to the meter readings. I have a tuning aid which emits a tone. The tone changes as the current flowing through the meter changes.

The problem is that the Ranger's meter is in the high voltage circuit. A rather unpleasant experience with a similar circuit about 20 years ago tells me that connecting my tuning aid to such a meter is not wise. I am seeking a circuit which will allow me independent access to the meter functions at a safe voltage level. Can anyone offer me any soution other than trading my Ranger for a solid-state rig?

I may be contacted at the above address, or at my Callbook QTH.

I will appreciate any assistance that your readers can offer me.

Mike Duke, WB5ADC
5880 Ridgewood Rd., Apt U175
Jackson, MS 39211

NOW THAT I THINK OF IT, THE GUY THAT SOLD ME THOSE 4-FOOT SAID HIS OTHER HOBBY IS TROPICAL FISH

AM FREQUENCIES

2 Meters - 144.4, calling freq., activity in most cities; **6 meters** - 50.4 calling freq. **10 meters** - 29.0-29.2 operating window; **12 meters** - 24.985 calling freq.; **15 meters** - 21.400 - 21.450; **17 meters** - 18.150 calling freq.; **20 meters** - 14.286 for the nightly net starting at 5:00 CA time; **40 meters** - 7160, 7195, 7290 are the main freqs. Westcoast AM'ers net every Sunday afternoon, 4:00 PM on 7160; **80 meters** - 3870, 3880 and 3885 are the main freqs. Westcoast swap net Wednesdays nights, 9:00 PM on 3870. AM Swap net Thursday nights, 7:30 PM on 3885; **160 meters** - Gray Hair net every Tuesday at 8:00 PM EST on 1945. Mostly sporadic summertime activity, but during the winter signals can be heard anywhere on this band.

SWAN USERS NET

Pictured below is Dean Lang, WA9AZK, the founder of the Swan Net, that meets every Sunday on 14.250 MHz at 2200 Z. Dean founded the net in April of 1990 and publishes a newsletter which includes a membership list, a resource list and other items of interest to Swan collectors. The newsletter is supported by donations and can be acquired by contacting WA9AZK at 3256 E. Bell Oaks Circle, Sandy, UT 84092.

The primary purpose of the net is to promote the use and preservation of Swan radio equipment. Dean says everyone is welcome to checkin and that the net is quite informal.

Dean Lang, WA9AZK, founder of the Swan net.

Can Do! The Heathkit Cantenna

by Chuck Penson, WA7ZZE
Box 2414
St. Paul, MN 55102

Consider the Cantenna. Undeniably the longest running, most successful product Heath ever made. Selling for 30 years and spanning more than three quarters of Heath's amateur radio life, it is impossible to say how may zillions of Cantennas were put together. Other products came and went, but the Cantenna remained. It is difficult not to wax nostalgic over this humble Heathkit.

The Cantenna was invented one day late in 1960, almost by accident, when Heath engineers Joe Schaffer and Al Robertson decided--for some reason now forgotten--that they had to have a dummy load. Wanting to keep it as simple as possible, and working with materials close at hand, they decided to use a whole bunch of cheap and plentiful two-watt resistors and run them in parallel by sandwiching them between two metal plates. Realizing that the resistors would need to be kept cool in an oil bath lead to a little head scratching. A paint can, they concluded after some thought, would be perfect! What a great idea for a kit! Management, believing that absolutely no one would pay for something as simple as a paint can full of resistors, was a bit less enthusiastic. Undaunted and confident they had a winner, Robertson and Schaffer managed to persuade Heath that because the dummy load was cheap enough, if it didn't sell, Heath wouldn't really be out anything. And so, taking its name from the standard one gallon paint can in which it was built, the Cantenna was introduced in January 1961, and sold for $9.95.

Can you say "I'll take one"?

I'm sure Schaffer and Robertson had to smile a little when it became clear that

Heath was unable to keep up with orders. Indeed, Cantennas flew out the door so fast they had smoke behind them.

The original Cantenna, given model number HN-31, was rather unassuming--just a plain black can topped off by a small aluminum mini-box with an SO-239 and a phono jack. The phono jack was a DC pick-off for relative power measurements. Some time prior to 1965, Heath replaced the fistful of two watters with a single, large, solid carbon resistive element, just to make things a little simpler. Curiously, Heath didn't change the model number.

Throughout its 30 year life, the Cantenna's basic design never changed. There were, however, a few cosmetic changes. By 1969 Heath had purchased so many paint cans, the supplier practically volunteered to screen the can with the Heath logo. In addition to the logo, Heath added a schematic diagram and power de rating curve. Again, the model number stayed the same. They must have been very happy with this little gem because it was another 14 years before Heath pulled out the files to have another look. In 1983, facing rising costs, Heath removed the mini-box and the phono jack from the top of the can and mounted the SO-239 directly to the lid. At this same time, Heath removed the printing from the can and replaced it with a flashy three-color stick-on label. While these changes were largely a matter of cost cutting (the $9.95 price tag had by now risen to $24.95), Heath figured a little tune-up was in order. In 1969 no one gave it a second thought, but because VHF and UHF operations were now booming, Heath took the opportunity to fix a pesky SWR spike just above 220 MHz and lower the overall SWR above 400 MHz to less than 1.5:1. Heath noted these changes by adding an "A" to the HN-31's model number. These were the last tweaks made to the Cantenna. It remained unchanged to the very end in 1991--when Heath "pulled the big switch".

The HN-31A provides a 50-ohm non-inductive load with an SWR of 1.5:1 from 1.5 to 450 MHz. The original "31" provided 1.5:1 SWR to about 300 MHz, and 2:1 above. When used with transformer oil, the Cantenna will handle 1000 watts key down for ten minutes. **CAUTION**: Some transformer oils contain PCBs--a suspected carcinogen. If you're not sure what's in your Cantenna, handle with care. Heath did not supply the oil.

Consider the humble Cantenna. Sitting on the floor out of sight under your bench, quietly doing its job without complaint. Not a glamorous product, but one with character. Indeed, there is more than a resistor and a gallon of who-knows-what inside that can--there are 30 years of history, and many tales to tell. **ER**

A Letter From Jack

by Jack Strayer, WB7EOB
17234 NE 16th Pl.
Bellevue, WA 98008

Editor's Note: What follows is a letter I received from Jack a while back that I found extremely interesting. I think ER readers will too.

First, we had a few shots left from one of the Grandvarmint's birthday party, so I thought I'd use the film up and get some pictures. Sorry about the messy scribbling on the back, the paper didn't like the ink I guess.

The Western Electric console (circa 1940's) has all of its original "innards" but the microphone preamps have been bypassed so that the mic channels are all 600 ohm line level.

It is a full two-channel board, (WE saw AM/FM simulcast coming) and I use the channels separately for diversity reception (SW broadcast) up to the recorder. A summing amp is used for combination of both channels for transfer purposes. For ham use, CH 1 is the outgoing buss for microphone, tape playback and phone patch, and its 600-ohm +4 dBm output is switched by relays to fixed and variable attenuators to adjust to mic level inputs on the six transmitters. The same 3PDT relays also operate the transmitter PTT loop.

CH2 is used as the receive buss. The ham receiver speaker output is stepped up to 600-ohms by transformer, fed into the 30 into 10 de-essing limiter and then into MC CH1, and then on to the monitor speaker system. In ham use both channels can be recorded separately, or they can be combined on one track and WWV put on the second track for a time reference.

The transmitter select group is the lower right hand black panel on the console, with the twist keys and pilot lights on it. Even though this was an addition to the board, Pacific Northwest Bell let me scrounge all of the WE parts from old switchroom gear that they were scrapping, so at least all of the added parts match what was already there.

An outboard relay switching system is the "memory" for all functions, so I don't have to remember which switch goes where, in other words it's 'idiot proof'. For instance, operating the transmit key will mute all 14 receivers BEFORE the mic channel is opened. The 12 and 24 volt relays and all of the newer 12-volt solid-state rigs run on "well regulated" 1100 amp power supplies located in the garage on the other side of the south wall. (Actually they are two 160-amp hour deep cycle marine batteries that will deliver 1100 cranking amps, hooked in series, with two 12-volt chargers on a clock. (Turning on the DC mains also activates the chargers, which will more than carry any normal load.)

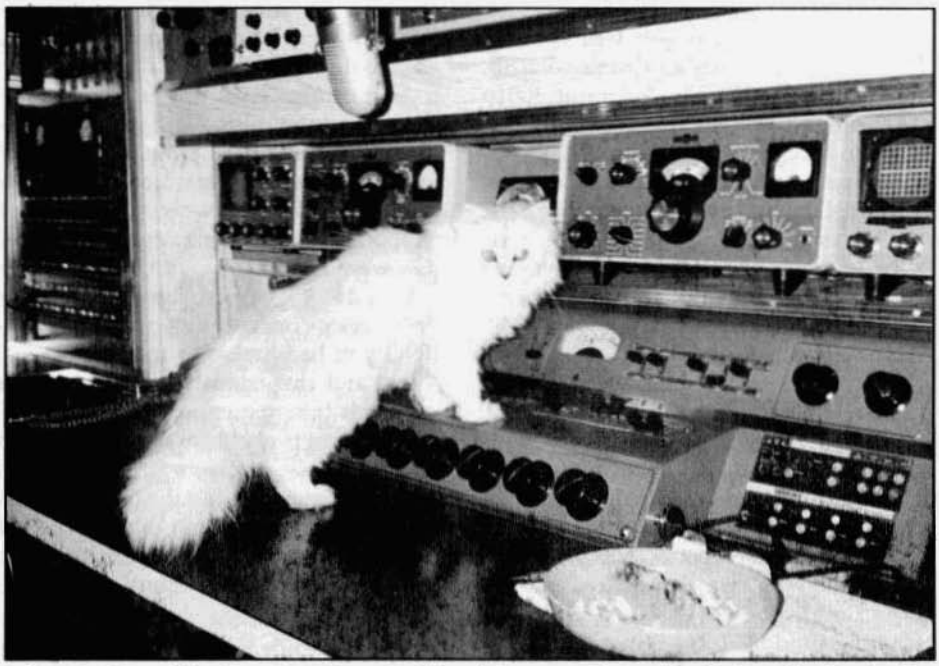
I'm just in the process of re-doing the antenna system and adding about 200 feet of 25-conductor wiring to complete the switching system, so there's a lot to be done yet. There is already over 2500 feet of shielded pair and multiconductor wire hanging in the cable ways behind the equipment in this 10 by 12 room.

So much for the shack, now to the receivers:

In the late '30's RCA was contracted by the Navy Bureau of Ships to build a "No Compromise" set of radio receivers for naval ship and shore use. The main high level radios then in use were the RAK (15 to 600 Kc) and RAL (300 Kc to 23.0 Mc) units. These were both TRF radios, which did not have direct frequency "reading" dials, but worse yet they were very "leaky". The super regenerative detectors reradi-

continued on page 24

The author at his operating position.



A better view of Jack's operating position. The gear shown is all described in Jack's letter. The mic is a RCA 77DX velocity.

A Letter From Jack from page 22
ated back into the antennas,and it was well known that German direction finders on U boats were very good at "transmitter hunting."

By mutual consent, RCA "borrowed" the top radio design engineers from seventeen companies. They all worked together, completely turned loose to design the ultimate, and cost was no factor. A design engineer's dream come true. It was less than a year when the primary design was completed.

After the dust had settled, the configuration was as follows:

Model RBA: Super gain TRF radio, with antenna isolation stages,tuning 14.5 to 600 Kc. Primary contract to RCA, later manufactured by Federal Telegraph and Radio Corp. Cost to Navy (1940): $3,000. each.

Model RBB: Single Conversion Superhet. Local oscillator down 95 db or better at antenna. Range 500 Kc to 4.0 Mc. Antenna input: 300 to 1500 ohms (antenna wire) 70-ohm (transmission line). Cost to Navy (1940): $2700 each.

Model RBC: Single Conversion Superhet. Local oscillator same as RBB. Range 4.0 Mc to 27.0 Mc. Ant input: 300 to 2300 ohms (antenna wire) 70-ohm line .Cost to Navy (1940) $2,400. each.

The per unit price based on quantities, with RBC as highest, RBB next and RBA the lowest.

Now when you consider the average costs of the "ham band" and general coverage receivers at the same time slot, 1940, it is obvious that something "special" was "living" in those ugly black boxes.

The Hallicrafter SX-28 was around $200. The HQ-129 was at $129. (I always wondered about that.) and the "high level" Hammerlunds were also in the '300 something range.

Even later, the cost of Navy "off the shelf receivers" was more "reasonable. "The Collins R-388 (1952) was $755.The Hammerlund SCR-244-Super Pro (1952) was $828. The Hammerlund SP-600J-. The other Superpro (1950) was $590.The Collins 51J-4 (1955) came up to $1,307. None of the "commercial receivers" on the Navy list, with the exception of the huge shore-based diversity receivers, came close to the same price range.

From what I've been able to learn from people close to the project, the engineering costs were definitely a factor, but equally expensive was the pains taken in producing the absolute best components possible for their assembly.

For instance: the five-gang precision variable capacitor, and its associated anti-backlash gear drive are the most accurate tuning assembly that I've ever found on any receiver. The 1000 division logging dial is so accurate that tuning to 1/4 division is accurate in repeatability, tuning either direction. The bandswitch sections, each stage, associated coils and ceramic/silver switch, are individually housed in separate steel boxes for isolation. The first RF stage is also completely shielded in a steel box. All tube sockets are ceramic silver, all capacitors are oil bathtubs or sealed silver mica. All of the special components were made just to do one thing, and to do it here.

In the fifties, RCA produced the "compact/modular" SRR-13s, 14s and 15s, utilizing the miniature "pencil tubes." Two of these receivers were about the same size as one RBC, however I saw several shipboard installations where the B's and C's were used along with the SRRs, for CW and RTTY service. The modular "plug in" service concept was great, PROVIDING you had access to the module test "jigs" and the extensive service routine manuals (not to mention the tubes).

The most probable explanation for the lack of these receivers on the surplus market centers around the fact that most of them were sealed up in the mothball fleet, and in many cases were re-sealed up after the Korean War until up into the 1970s.

The first RBC that I found "intact" was in 1955. There was only one, marked "Long Beach Naval Radio Station", with no

This is what Jack describes as the "west and north wall". The gear consists of (upper level from the left) a freq. meter (.15-60,000 kcs), w/counter; PBC rcvr panadaptor; RBM (LF as Q'5r; power control and pwr sply). Lower level from left: RBC-1 'spotter' rcvr; RBC-6 'vertical' rcvr; polar diversity audio panel. Left rack: two audio limiters (diversity system); receive antenna patch bays.

power cable or power supply. It was pretty rough looking, paint was peeling and scratched and one meter had water in it but nothing major was broken or bent.

I did notice the large, strange and very unfamiliar nine-pin power connector, the huge RF connector, the twin-ax coaxial connector and the Astatic 3-pin mic connector, on the back, but I figured that I could figure it out, so I bought it for $20.

I thought that there would be spare pins on the power connector but when I opened it up, all pins were used. The neatly formed cable nicely hid the final destination of each wire. The filament, plate, ground and power switch loop were all easy to identify, and after a time the E pin, connected to the local oscillator plate, suggested a separate regulated voltage, but what were the other two pins for? (A & B that is.) Finally, I found that one of the pins connected to a funny little octal tube that looked like a miniature heater inside.

A well meaning but ill informed ham buddy told me that these little heaters were used to temperature stabilize the oscillator, so just ignore it. So figuring I had just learned something, I did ignore it. I applied 6.3-V to the filaments and 225-V to the plates, with 105-V to the 6AB7 oscillator (that I did get right) and absolutely nothing happened.... DEAD; dead.

After ignoring the blankety blank thing for a few days, I got out the meter and started measuring voltages. During this process I found that the local oscillator had its 105 plate voltage but no 6.3 on the filament. A little more tracing revealed that pins A & B fed the oscillator filament and the little unidentifiable heater was in series with one wire. The heater just became a regulator, but what voltage goes into this Christmas tree bulb string? I just jumped the filaments on the oscillator to 6.3-volts, and the darn thing came alive.

Since I couldn't find any books anywhere, I just tweaked and twiddled, very

continued next page

A Letter From Jack from previous page
carefully, until the receiver functioned the best I could get it, and its performance in all respects was outstanding compared to other surplus receivers that I had worked on.

The RBC sat on the shelf above the workbench in the garage, hooked to a piece of wire through the rafters, and was my main SW broadcast receiver while I was working there. (It was too big and ugly to take into the radio room in the house.)

About 1963, when I was still living in Los Angeles, a friend of mine who loved to collect nautical items told me about a "warehouse store" that he had found on Terminal Island, San Pedro, California. He said that this outfit scrapped ships and sold some items to the public. He also mentioned that they had several "black and grey radios with U.S. Navy plates on them."

Two days later I made my first visit to National Metal and Steel Corp. This was a HUGE operation. It covered several acres, and they had six 50-ton cranes on two wrecking docks, with a third 600-foot long dock just to "park" ships that were waiting to be scrapped. . . . and best of all there were about ten Navy ships moored there, with the largest being a light cruiser. (U.S.S. Amsterdam I would find out later.)

I ran through the two block square warehouse, full of winches, superheaters, condensers (water type) etc., etc., etc., and finally found the "Radio Department." I almost cried!

Here were RBBs, RBCs, SRRs, R-390s (with two TMC SSB converters) RBOs, RBLs, brand new Model 28 teletypes, all types of SRT and FRT gear, and they were all T-R-A-S-H-E-D! NMS was in the business of ship breaking, and the way you destroy something made of steel, up to 40 inches thick, is by cutting it with super torches. LIKEWISE, anything you remove from the ship piecemeal is by the same method. . . . BURN, BURN, BURN.

All of this beautiful equipment had been just fried. Then when their crews off loaded the gear it was thrown around and piled so that glass was broken and shafts were bent and connectors mangled just enough to completely destroy the gear thoroughly.

I talked to the manager of the warehouse and explained that there was a good market for this equipment, because outside of the damage done by NMS, it was in new condition. He said that I should talk to the management of the company and see if we could work something out. I won't go into detail about all of the negotiations, but after getting special accident insurance on myself and signing off any liability toward NMS, I got permission to be the only non-NMS employee to go aboard vessels, remove anything I wanted, and pay only ten cents a pound for it. I also agreed to assist their crew in removing electronic equipment which they were authorized to sell to allied Navies for spares. THE INMATES JUST TOOK OVER THE ASYLUM!

The first vessel I was turned loose on, because nothing had been touched on it, was the cruiser Amsterdam. When I found Radio Room 1, there were rows of As, Bs and Cs, all with their power supplies and armored power cables. All of the accessory items were there too, including a half dozen panadapters. The communications office was the real treasure house, because all of the manuals for all of the radio equipment on board was neatly filed here.

I won't go through the whole inventory, but in total I removed 22,000 pounds of electronic equipment, including manuals, from the Amsterdam, and that was at about 3500 pounds per trip, the capacity of my one ton van.

From 1963 until 1976, when I moved back to Washington, according to my invoices, I "scrounged" about 250 tons of electronics, and believe me that's a lot of radios; and sore back muscles.

On that first day, I got ahold of the first documentation that I'd ever seen on the RBB and RBC. I read the whole manual

The east wall from the left: Collins 30L-1 sitting on the Navy WRR-2 rcvr (all 375 lbs of it); Altec audition amp; power panel (240 and 120); audio distribution control (output of consoles to any 1 of 6 xmtrs); Teac recorder (not used here). Upper level: RCA de-essing wide band limiter (all rcvrs); Navy Vox unit; BC-614 amp (remote telephone input); Heath Seneca 6 & 2-M AM rig (modified for full plate modulation). A nice feature few of us have is the toilet and sink in the lower right.

that night and it was the first realization of just what had gone into this ugly "boat anchor".

The next day I fired up a RBB and RBC, fully expecting problems since the ship had been mothballed for sixteen years. Not so, both receivers came up dead on frequency, and BOY! were they sensitive. My poor old garage RBC wasn't even close. Equally interesting, I lived in North Hollywood at this time, and I was about six blocks from KMPC's transmitter site. This AM station operated a three-tower antenna system with 50 KW omnidirectional pattern during daylight hours and 10 KW at night with an east/west pattern, which put the center of their night lobes right through my house. The RBB would copy them "against the pin" at 710 Kc, with just a whisper at 1420, but there was no intermod anywhere else on the .500 to 4,000 Kc range. This kind of selectivity is MANDATORY aboard ship where antennas are actually intermingled and thirty or forty channels, from VLF to VHF are all being used simultaneously, and this one special requirement has resulted in the above-average performance of primary shipboard communications receivers.

I sold lots of the gear to a friend of mine, who co-incidentally owned an electronic surplus store, and the B's and C's were gobbled up quickly by ex-navy types, and knowledgeable engineer types who worked CW, because they knew the history of these radios, which they were good enough to pass on to me.

continued on page 32

LETTERS

Dear ER

I was an avid reader while I was growing up, with particular interest in science. In the course of time, I came across several books on radio communications, with such things as instructions on how to build simple receivers. My first receiver was for the broadcast band using a crystal detector. I was able to order parts from Burnstein-Appleby and Allied Radio. As my interest expanded, I wanted a store-bought radio, and it was a Knight-Kit Ocean Hopper. What an experience, being able to tune in to short wave broadcasting and amateur radio stations. The code that I heard was a great mystery, but I learned it in a short time. I then found a piece of an ARRL book on becoming as amateur radio operator. I constructed a 6V6 oscillator for 40 meters, put up a dipole, and purchased a Hallicrafters SX-99 receiver from after-school earnings. I received my novice license in November of 1958, call KN5UKH. I worked quite a few states, often getting up after midnight when the band was quiet. Many stations would tell me I was their first Mississippi contact. I upgraded in the summer of 1959 and was on the air with a Heath AT-1 and VF-1, and my SX-99. I added a homebrew pair of 811A's modulated by a pair of 812A's, which I drove with my AT-1. In 1962, I got into SSB with a Hallicrafters SX-111, and HT-37. Over the tears I have enjoyed many different rigs, and many different modes, but I have missed the "good ole days"! Last year I discovered Electric Radio Magazine, and that was the beginning of a renewed interest in amateur radio. My log is filled with contacts on 10 meters AM, where things are relaxed and easy going. I have started to collect and restore "hollow state" radios, most of which were only "dreams" to a youngster growing up on a farm in Kosciusko, Mississippi.

I now live about 7 miles from that farm, out in the country about 2 miles from Ethel, Mississippi. I began a career in electronics because of my early interest in radio. I worked at a TV and radio repair shop during high school, as well as a local commerical radio station. I went into engineering work after high school and was the Chief Engineer for several FM and AM stations. I also went into TV broadcasting, and I am now the Network Chief Engineer with the Mississippi Educational Radio and Television Network, consisting of 8 TV stations, 8 FM stations, and over 534 miles of microwave circuits. I upgraded in 1984 to Extra Class, call NO5N.

AM operation (and CW, using the old rigs) is great fun, and that is what ham Radio is all about.

Tom Murphy

Dear ER

A little over a year ago I sailed aboard the Pacific Princess between Tahiti and Hawaii. At that time I reported only weak AM stations being monitored on 10 meters and the strongest AM signals were heard on 27mc. I just finished two weeks aboard the Royal Princess sailing between Mexico and New York with better results. I monitored the AM frequencies with a Panasonic RF-B65. I could monitor only one hour a day because of my other shipboard responsibilities, like eating. On the Pacific side of the canal monitoring was similar to the Tahiti trip but after passing the canal AM frequencies came alive. On the morning of April 17th just north of South America I was hearing stations on 3875, 3880, 3885 and 3890. The very strongest station came that afternoon on 15 meters, I heard K1GUP from Carmel, Maine calling CQ numerous times he finally landed two stations but I was surprised he had to call CQ so often because he was just blasting South America. On the 22nd just off Bermuda I monitored KD4ULC talking with AJ1G and KW1I. I did not hear KW1I. He was mobile in Illinois headed for Dayton. Sometimes it was difficult to copy

callsigns because of static, QRM etc. I also monitored the "Old Military Radio Net" on 3880, Walt Hutchens, KJ4KV was loud and clear, other callsigns came so fast that it was impossible to copy them all. Here are the other callsigns that I think I monitored: KA5ZML, WØNY, K2EM, N2GBY, WB3CTK, WA4OID, NO2N, N3IQE, WA1SOZ, W3PWW, WA2EJT, W1DCT, KJ4KV, WB3CTC and W1DCD. For any cruise ship junkies who might wish to know the "PIG cruise rating" it's a 10, (PIG=pounds I gained).

Art Rideout, WA6IPD

Dear ER

First of all I want to thank you for the fine magazine and many interesting articles you publish in "Electric Radio". I have always found them to be good reading if not always accurate.

Case in point. Electric Radio number 41, September 1992, page 25. The aircraft in the photo and referenced in the article is not a "Navion", but an Ercoupe, model 415-C, Serial number:3201. NC2576H was manufactured by Engineering and Research Corp. in May of 1946.

Engineering and Research Corporation was established in 1930. It was one of the first subcontractors in the airframe parts business, manufacturing parts for Douglas and Lockheed in California.

Fred E. Weick was E&R's chief engineer who designed the novel Ercoupe monoplane. It was first flown in October, 1937. The type was notable for its advanced control system design, which eliminated the rudder pedals. The aircraft was first marketed in 1940. Production ceased at S/N:2641 with the entry of the United States into WWII. During the war years the company was fully engaged in combat aircraft parts production. In 1946 civil Ercoupe production was resumed.

The James Knights Co. bought Ercoupe S/N:3201 in September of 1946 from Parks Aircraft Sales and Service, Inc. based at the Pal-Waukee airport in Wheeling Illinois. James Knights Co. resold the aircraft to Howard Aviation, Inc. of Peoria Illinois on May 13th, 1948. Since then it has changed owners many times, being last sold to a couple from Scottsdale, Arizona, in January 1991, and kept at the local airport not to far from W7EH's QTH. 'Tis a small world indeed.

I have enclosed a few photocopies of old CAA records from the Federal Aviation archives. I hope you find them of interest. As for myself I am currently working on a book about the early history of printing telegraph systems, from the 1870's and Charles Krumm and his first tape printer in England to Klienschmidt/Teletype.

Richard J. Puzin, PhD.
Industrial Historian

Editor's Note:
Attached to Mr. Puzin's letter were photocopies of all the transactions - Bills of Sale, Applications For Registrations, etc. I was impressed. I called Lee, W7EH, and read him the letter. His comment,"Isn't that something". He said all the information was accurate.

Oops, I goofed!

As you may have heard by now, I erred in reporting that McMurdo Sound in the Antarctic was named after McMurdo Silver. Several correspondents were kind enough to point that out, gently, to me. Alan Douglas of Pocasset, Mass, supplied information that came to him from H.L. Chadbourne of La Jolla, Ca, pointing out that McMurdo Sound was so named around 1840 by Ross, an early Antarctic explorer, after one of his captains. But I guess I'm not in too bad company in my mistake. Ray Moore made the same error in his first edition of Communications Receivers.

So, I hope that you and your readers will all forgive me. I'll try to be more accurate in the future.

Jim Hanlon, W8KGI

DX-100 Audio Mod Update

by Bill Beatty, K7CMS
4721 N. Bamboo Cir.
Tuscon, AZ 85749

The DX-100 audio modifications published and known to me are: Bob Bealmear, WØCAB, *Press Exchange* #24, 12-81, Bill Beatty, K7CMS, Press Exchange #35, 11-82, and Don Chester, K4KYV, *AM Press Exchange*, 8-85. In addition, in the late 70's a lot of information was exchanged on the air, and Bob, W5PYT (or was it W5KDI?) and Tom, WB8NER come to mind.

A composite analysis of these sources results in some interesting patterns, which are not exclusive to the DX-100. Since the Heath schematic does not designate component by symbol (C1,R1, etc.), I have redrawn the stock schematic with newly assigned symbols.

Starting at the mike and working toward the modulator, R1 (RF stopping resistor): 4.7 k to 47 k ('CAB and 'CMS).

R2 (mic load): 470 k to 4.7 Meg ('CAB and 'KYV), to 1Meg ('CMS).

C1 (1st audio cathode): 2 mFd to .25mFd ('CAB), to ,.2mFd ('CMS).

C3 (1st to 2nd audio coupling): 510 pF to .05 mFd ('CAB), to .033 mFd ('KYV), to .01 mFd ('CMS).

C4 (B+ decoupling): .1 mFd to 20 mFd 450-V ('CAB and 'CMS).

C5 (2nd audio cathode): 2 mFd to non-inverse feedback ('CAB), to 10 mFd ('CMS).

C7 (B+ decoupling): same as C4.

C6 (2nd audio to driver coupling): same as C3.

C8 (driver cathode): 2 mFd to 100 mFd ('CAB), to 60 mFd 50-V ('CMS).

Add .005 mFd across primary of driver transformer ('CAB)

Add 39-V1-W zener diode from c.t. of driver transformer secondary to ground ('CAB and 'CMS): add 100 mFd 150-V in parallel ('CMS).

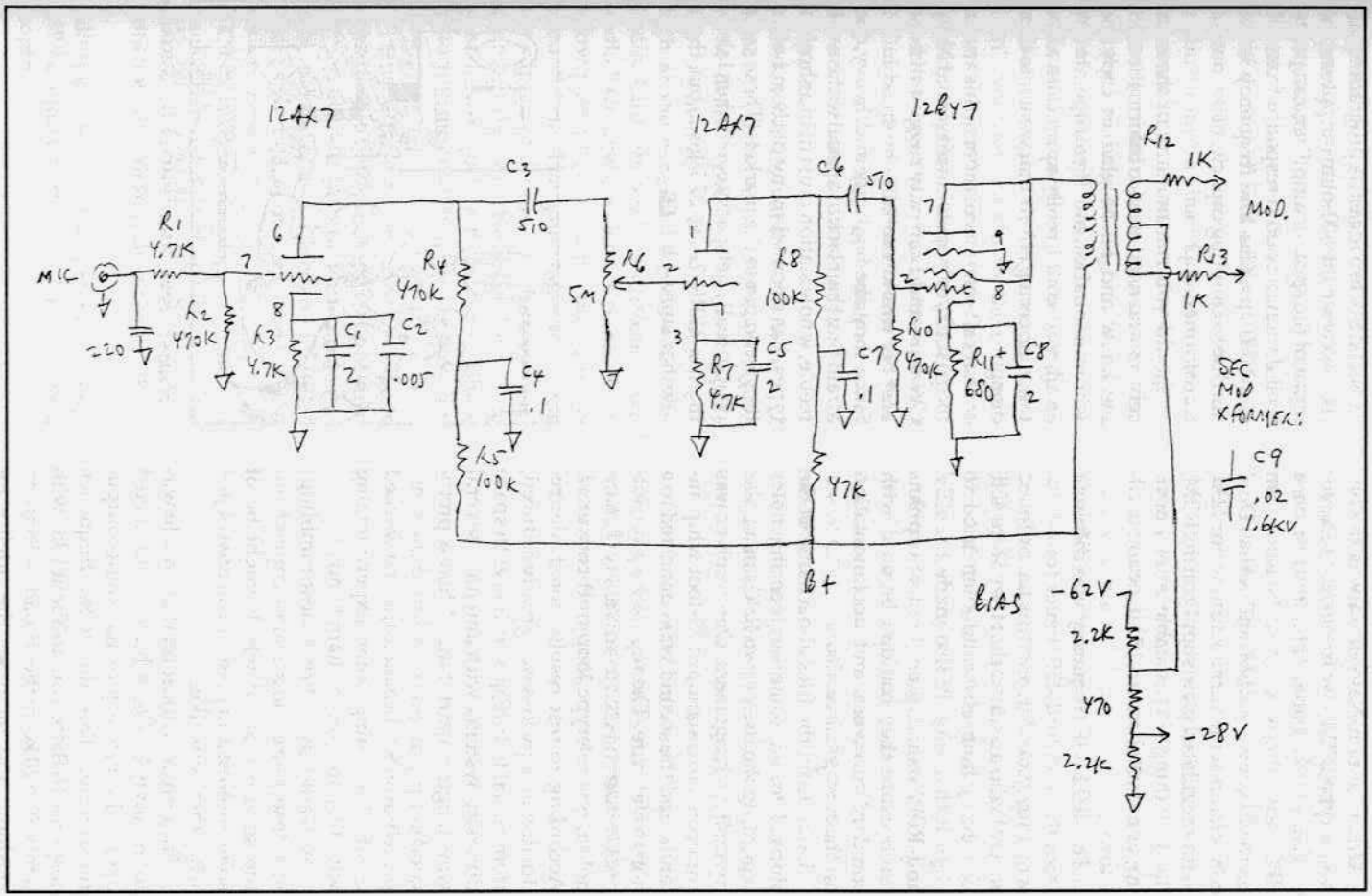
Replace R12 and R13 each with a piece of wire ('KYV and 'CMS).

Add 100-ohm 2-watt at plate of each 1625 modulator ('KYV).

Regulate the modulator screen voltage with 2 OA2's ('KYV).

C9 (across modulation transformer secondary): .02 mFd 1.6 kv to delete ('KYV), to .0068 mFd 1.6 kv ('CMS).

The above variations have nothing to do with being right or wrong, but rather with applying sound techniques to accomplish the desired goal. The other extreme to a DX-100 audio modification is historically correct (stock), which is telephone-like and somewhat distorted. With very little modification it can sound like an undistorted, punchy telephone or a broadcast transmitter, whatever is your pleasure. ER


12AX7
12AX7
12BY7
MIC
.220
R1 4.7K
R2 470K
R3 4.7K
C1 2
C2 .005
C3 510
R4 470K
R5 100K
C4 .1
R6 5M
C5 2
R7 4.7K
R8 100K
C6 510
C7 .1
R9 470K
R10 470K
R11 680
C8 2
R12 1K
R13 1K
MOD.
SEC MOD XFORMER:
C9 .02 1.6KV
B+
BIAS -62V
2.2K
470
-28V
2.2K

A Letter from Jack from page 27

One nice non-Navy mod was to connect a type RBM low frequency receiver to the 400 Kc panadapter output on a RBC, leave the AVC on in the RBC, turn on the BFO on the RBM, and walla ! Dual conversion with vernier tuning for SSB. With a regulated plate supply on the RBM, the dern thing was as stable, after warm-up, as a crystal controlled injection oscillator.

The 400 Kc IF frequency was different from the standard 455, never found out why they picked it, and this factor foiled several who assumed that they were 455, like everything else, and then tried to align it that way. It also made the RBV and RBW panadapters kind of orphans too because they couldn't be used with standard receivers, and documentation on them was scarce also.

Later, from the files aboard one of the ships, I found some engineering notes regarding the use of two RBCs in a polar diversity arrangement. One receiver was connected to a standard 35-foot whip antenna, and the second was connected to a horizontal wire. The separate audio outputs were connected to a diversity (2 channel in, one teletype loop out) converter. According to test results noted, the reduction in copy loss was greatly reduced, from signal fading, just as it is with space diversity systems with antennas several wavelengths apart. Since I had a pretty good supply of receivers, I tried the same principle on SW broadcast, and it worked great. (I'm doing some experimenting with this now on the ham bands.)

Well anyway, to bring these ramblings to a close, I've enclosed some copies from the service manual which might be of some interest and give you an idea of just what they look like.

The only modification that I made was to remove C-376, which is connected across the primary of the audio output transformer. This allows the frequency response to flatten out to about 6 kc, with a rolloff to 10 kc, in the "Broad" selectivity position, and increases the fidelity for music on SW broadcast. A program equalizer, between the 600-ohm output and the input of the speaker amplifier, can pretty well flatten the audio response from 150 to 10,000 cps. (the low frequency losses are due to coupling capacitor size, output transformer, etc.)

Should you run into any of these receivers and need service information, let me know and I'll be glad to copy the whole manual for you. If you operate CW at all, you could really appreciate all of the engineering efforts that went into their design.

I haven't seen any of them in this area in the past 15 years, outside of two old Navy CW nuts, and I can only suggest that the best bet would probably be an ad in ER. Since they are big, ugly and heavy, I'm afraid that their lack of appeal to the weak feeble, whole station must fit in a shoebox types, has doomed many of them before they even got to the market. (These same people really get glassy eyed when I show them a WRR-2A at 375 lbs.....but that's another story. HI ! **ER**

OH, ALL RIGHT -- GO AHEAD AND ORDER ONE OF THOSE METAL REPLACEMENT TUNING KNOBS

Good Audio from page 13

deficiencies of a transmitter with limited frequency range, and problems with bassy microphones. Transmitter problems such as narrow bandwidth or distortion are better dealt with by modifying the transmitter itself, as forcing preemphasized audio through an inadequate transmitter can make matters worse. Correct the response problems in the transmitter first, and then consider adding an equalizer if you think it's still needed.

A word of caution on frequency response testing of the transmitter itself. Don't sine-wave modulate the transmitter at high level when measuring its frequency response: keep the modulation level low. Most ham transmitters are not built to endure 100% sine-wave modulation, which stresses the modulator tubes, transformer and power supply.

Clippers

Back when the bands were full of AM signals, one had to punch through QRM to be heard. Low-level audio clipping kept the average modulation percentage high at the expense of good-sounding audio. Clippers produce distortion and audio harmonics, which are removed by a low-pass filter, usually cutting off at about 3 kHz. The gain stages following the clipper still must be of exceptional quality, otherwise baseline shifts from poor low-frequency response or phase distortion may nullify the benefits of clipping.

Transmitters such as the KW-1 include a splatter filter after the modulation transformer, cutting off at approximately 3 kHz, and include a clipper and low-pass filter as well. Most owners have now removed these items.

Clippers have no place in ham AM transmitters today. With suitable response shaping, the audio can have sufficient punch while still sounding clean. **ER**

Editor's Note: This is the first part of what will be a three part series. Part Two next month.

Reflections from page 2

Over the months and years ahead, that he wrote for ER, he was always genuine and interesting. I was told by someone who knew Fred well that he was very proud of his 'Reflections' column and was very happy doing it. As far as I know, this was the first writing for publication that Fred had ever done.

I never met Fred face to face. I regret this very much. If I had ever made a trip to California I would have made Nevada City one of my first stops. I've been told by other hams, who had visited Fred at his QTH in Nevada City, CA, that he lived alone and that he was totally devoted to vintage/AM radio.

Fred was one of the hams who stayed with AM through the lean years when SSB was taking over. He was also a devotee of CW, a carryover from his years at sea as a radioop.

There's not a whole lot more I can say about Fred other than he was a good friend and I miss him. **N6CSW/Ø**

The issues that Fred's 'Reflections' column appeared in are as follows: #1-#7; #9-#14; #16-#17; #19-#22; #24-##41. His last column was #44.

ER in Uniform from page 9

even more often. I foolishly passed up a set of brand new headphones for the 'early' sets (canvas straps rather than a spring head band and phone tips rather than a PL-55) offered at the Vienna, VA hamfest this year; the Timonium, MD show had a gasoline generator and new (just out of government surplus) hand crank generator. The key shown in the photo came from the Virginia Beach hamfest in early April.

Conclusions

It is tempting to call any set with a modulated oscillator 'primitive'. But before we do, let's peek at the U.S. Army's short range HF gear. Skipping over the SCR-179, with its wooden cases and 'portable on a pack horse' design, we find the BC-223 transmitter weighing 60 pounds and requiring the 50 pound BC-342 receiver, based on the type 10 triode, and drip proof at best. This set would only begin to trickle into the field in 1942 by which time it would be obsolete. Then there's the BC-654 transmitter/receiver with splash-proof and true portable design but with MO-only operation and the first sets not to be available until the Fall of 1942. The stopgap BC-474 was in production (by RCA) only because it had been ordered by the Swedish Army and the contract was taken over for our forces. The troops landing in North Africa in September, 1942 trained with the BC-474 and got brand new BC-654's just in time to embark.

Had we been forced into ground battle any more quickly – for example to repel the much feared Japanese landing on Hawaii -- the Army would have been communicating with a few 1930-vintage radios, runners and whatever was left of the civil telephone system. Even in mid- 1942 only obsolete radios were actually in production and those only in small numbers.

Now back to the TBX. It will float, it can be carried by three men, it can use either crystals or a tunable master oscillator. And it was in production in 1941.

Sure you can find fault with it -- shouldn't someone have thought of combining the two CW-VOICE switches or at least giving them similar labeling? The meter switching arrangements have to be used to be believed. Was 'WOBBLER' really the up-to-the minute name for the BFO frequency knob in 1937? Surely the Marines had discovered packboards by 1937; why are the arrangements for carrying the set so miserable?

But overall, for 1937, the TBX is a fine piece of work. And the fact that it was only modestly improved when the design was updated in 1943 takes nothing from that – the improved version was needed in a heckofa hurry and much better gear was already under design so doing more than a minor update would have made no sense.

Looking at the TBX it isn't surprising that General Electric is today a profitable company while the Signal Corps Radio Laboratories at Ft. Monmouth, New Jersey, (responsible for the BC-223 and BC-654) survive only in the roles of military radio research and contract supervision -- they no longer design radios.

Afterthoughts

As we near the 50th anniversary of the midpoint of WW II perhaps we should stop a moment to remember what the equipment discussed in this series was for. The users of these radios didn't pick the one they liked best with a 30-day money-back guarantee; they took what they were issued (often, as we have seen, a lot less than the technology allowed) and they went and did the job. The world is hardly a nice place today but can we even imagine the scale of the evil had they not? The next time you flip a switch on a TBX, command set, BC-348, BC-610, or other military radio, how 'bout a word of thanks to the GI who was its first user?

(The following sets mentioned in this column have been covered in previous issues: the TBY, November 1989; the BC-474, June 1991 and the GRC-9, October, 1989). **ER**

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FOR SALE: Connectors: UG-21 B/U "N" male or UG-23 B/U "N" female connector for RG-8 or RG-213 - $1.65; "N" double female barrel - $1.65; "N" male to SO-239 adaptor - $1.75; SO-239 to BNC male (great for handi-talkies) - $1.75; PL-259 nickel, bakelite, gold pin - $85; standard mic plugs or chassis mount receptacle: 8-pin - $2, 6-pin - $1.95, 4-pin - $1.45. These are a sample of the hundreds of connectors we carry. Send $1 (refundable) for a price list. $15 minimum, add $4 S & H. Good personal checks OK. Mike Currie Connectors, POB 940375, Plano, TX 75094. (214) 423-9625

FOR TRADE: National FB-7 rcvr, w/5897 AB pwr sply, all coils, wrkg condx. Bob Sloan, KK4GO, 2340 S. Pucketts Mill Rd., Dacula, GA 30211. (404) 945-8642

FOR SALE: Hichock automatic tube tester - $50 each, limited sply; model 924 FM WW II tank xmtr, w/dynamotor - $50; T.S. 174 freq. meter - $40; Galaxy GT 550, w/sply, mint - $230. Levy, W5QJT, 115 N.W. Loop 410, Apt. 24B, San Antonio, TX 78216. (210) 366-3290

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

WANTED: I'll pay $50 for an ART-13 aluminum shock mount. Also need the dynamotor mount. Pete Patton, WØEWQ, (215) 898-1787

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: BC-348L, internal pwr sply - $100; FT-154 mount, new - $40; C-82/ART-13 control box, new - $20; more, long list - $1. Joe Orgnero, VE6RST, Box 32, Site 7, SS 1, Calgary, AB T2M 4N3, Canada. (403) 239-0489

FOR SALE: Heathkit DX-60 in very good condx - $60; D-104 mic - $45. Charlie, KD4AJ, (404) 396-0276

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

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: Quality audio recordings of AM QSOs. Trade Eastern U.S. activity for elsewhere. Open reel, cassette, DAT. WA3VJB, Box 73, W. Friendship, MD 21794.

WANTED: Top and bottom covers and original cabinet for R-390A; data on Cetron UXCVII triodes; manual for HP 606B. Clark Hatch, WØBT, 2546 SE Peck Rd., Topeka, KS 66605. (913) 235-2721

FOR SALE: Hammarlund SP200/BC-779 rcvr, w/pwr sply, works fine - $90; (4) 866A tubes, w/sockets & filament xfmrs - $25; (4) NIB 809 tubes (U.S.) - $45. Jack C. Shutt, N9GT, 1820 Dawn Ave., Ft. Wayne, IN 46815. (219) 493-3901

WANTED: Power cable (AN3106A-16S plug) and test cable assembly (CG-1101/SRR) for SRR-13A rcvr. Tim Rosaire, POB 1513, Sausalito, CA 94966. (415) 332-5652

FOR SALE: Johnson Ranger - $170 plus shpg; several antenna relays, Dow or Signal, 115-V, with or without contacts - $25 to $35; one B&W RF sensing ant. relay - $45. Bob Schafer, WA7IHN, POB 442, Aumsville, OR 97325. (503) 749-1149

WANTED: Winchester Electronics or equivalent connectors - MRE26P, MRE26S, MRE18P. Geoff Fors, WB6NVH, POB 342, Monterey, CA 93942-0342

WANTED: Manuals for vintage amateur radio equipment, buy or swap. Pete Markavage, WA2CWA, 27 Walling St., Sayreville, NJ 08872. (908) 238-8964

WANTED: Unbuilt kits by Heath, Johnson and Knight. Gene Peroni, POB 58003, Philadelphia, PA 19102. (215) 665-6182 days

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FOR SALE: $125 each - Viking Ranger, Harvey-Wells T-90 (w/AC), Multi-Elmac AF-67 (w/AC), Heath SB-400 and Multi-Elmac A-54. Cliff Fleury, 64174 Tumalo Rim Dr., Bend, OR 97701. (503) 382-9162

WANTED: Audio output xfmr PP output from 6F6 for Hammarlund Super Pro (BC-779A etc.) and pwr sply for above rcvr. Roger, KA9ANN, POB 605, Francesville, IN 47946. (219) 567-9641

FOR SALE: Hammarlund HQ-180, exc. - $185; Drake SPR-4, near mint - $275. U-ship. Jerry Andrews, WB3BDM, 1813 Rocky Glen Dr., Frederick, MD 21702. (301) 696-1934

WANTED: Clegg Thor 6; Sideband Engineers SBE Sideband Sixer. Chris, K2PCB, 46 Columbia Ave., Hopewell, NJ 08525.

WANTED: Heath AT-1 & DX-20 xmtrs; AR1, AR2, GR54, GR78 rcvrs; HW17, HW18, Sixer, Tener xcvrs; XC6 converter; AK5 spkr; VX1 VOX. Also want Hallicrafters SX-140K and Knight T-400 & R195; Heath, Allied catalogs from '50's and '60's; any unassembled kits from Heath, Knight, etc. Nick England, KD4CPL, 811 Kenmore Rd., Chapel Hill, NC 27514. (919) 929-4342

FOR SALE: R-390A service, module repair to complete remanufacture, cosmetic restoration, 20 years experience, expert service, 1 week turnaround, very reasonable, any cond. accepted. Rick Mish, (419) 726-2249

FOR SALE: New RCA 802 tubes - $3; type 1616 - $2; type 2E26 - $1.50; type 675 (same as 575A except base) - $10. Write for special pricing on other tube types. Antique Electronic Supply. See ad inside back cover.

WANTED: Heath SB-620 pan adaptor; SB-200 linear; T-368 or BC-610 xmtr; plate & mod. xfmr for HB KW AM xmtr. Scott Johnson, 11027 S. Bannock, Phoenix, AZ 85044. (602) 496-0763

FOR SALE: 810 HB KW, 80-40 meters, w/ coils for 40 meters - $325, PU only; Hallicrafters HT-37, w/HT-32 parts unit - $100 for all, PU only; CE 20A - $60. **WANTED:** BC-375 shock mount. Steve Davis, KD2NX, 705 13th Ave., Belmar, NJ 07719. (908) 280-9760

WANTED: Component parts for FRR59B rcvrs. Looking for both cosmetic and electrical items. Wayne, N8MS, Rt 2, Box 1500, Fairmont, WV 26554.

FOR SALE: Millen 90651 grid dipper - $75; Collins 1051B HF rcvr - $450. All plus UPS. Wally Chambers, K5OP, POB 241371, Memphis, TN 38124-1371. (901) 761-9381

FOR SALE: CQ magazines 1945-75, including the first issue January 1945, approx. 325 issues - $125. Charles Stinger, W8GFH, 404 Ross Ave., Hamilton, OH 45013. (513) 867-0079

FOR SALE: New reprint "Tubes and Circuits" by Wholesale Radio Laboratories, circa 1942-43 - $8 ppd. James Fred, R1, Cutler, IN 46920. (317) 268-2214

FOR SALE: Utica 6-meter xcvr, w/ext. vfo - $50; Heath DX-60 - $45; Heath SB-401, SB-303, SB-600, manuals - $200. Plus shpg. Richard Lucchesi, WA2RQY, 941 N. Park Ave., N. Massapequa, NY 11758. (516) 798-1230

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

ELECTRON TUBES FREE 1993 Catalog, over 2,000 types in stock. **Electron Tube Enterprises,** Box 311, Essex, VT 05451. (802) 879-0611, FAX (802) 879-7764

FOR SALE: Radio tubes; repair and restoration of all vintage amateur and commercial radios, 25 years experience. Herbert Stark, 321 N. Thompson St., Hemet, CA 92543. (714) 658-3444

WANTED: Collins literature, manuals, catalogs, SM2, SM3, MM2 mic's, TD1, 647T dipole ant, 35C low pass filter, 55G1. Rick Coyne, KD6CPE, POB 2000-200, Mission Viejo, CA 92692. (714) 855-4689

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: Atwater Kent model 'G' horn spkr, green, works, looks good - $125 OBO; Hallicrafters SX-24, works - $95 OBO; CDE TRA-4 rotor, w/control, cable - $20; Palomar IC keyer, matches Collins - $25; Swan 500, w/ 177XC sply, cables, book, clean vintage SSB - $225 OBO; Hygain 12AVQ, 10/15/20-meter vertical, w/book - $35 OBO. U-ship. WA7HDL, (208) 756-4147

WANTED: Globe King 500 or Johnson 500/ KW; Collins 6 kc filters F455J-60 & F455B-60; Collins 270G-1 spkr. Howard Edson, KK6OB, 1505 North "M" St., Tulare, CA 93274. (209) 688-8506

FOR SALE: Manuals, manuals, manuals for WW II radio equipment. Korean era radios & misc. Henry, KD6KWH, POB 5846, Santa Rosa, CA 95402. (707) 584-8624 message phone (707) 523-9268

WANTED: Crescent shaped dial plates with or without handles or knobs. Fan shaped and other protruding meters in early transmitting style. Roland Matson, K1OKO, RFD #1, Box 2943, Kennebunk, ME 04043. (207) 985-3751

FOR SALE: Parting out Hallicrafters SX-42. What do you need? WANTED: R-44 or R-44A spkr. R.D. Chenez, RFD2, Box 437-J, Plymouth, NH 03264

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: Military monitoring antennas: broadband VHF/UHF discones, biconical types, 30 - 1000 Mcs, shipboard construction, 'N' connectors, preamps, antenna multi-couplers, cables and accessories. Rick Mish, (419) 726-2249

FOR SALE: Exc.- mint 75S3B RE, 32S3 WE, 516F-2 - $1000. U-ship. Gary Elliott, NO5H, 808 Clarice St., Delhi, LA 71232. (318) 878-8032

WANTED: Johnson accessories, code keys, SWR bridge, station monitor, etc. Even good clean rigs. Bob Kemp, POB 470, Lake City, MN 55041. (612) 345-5345 days

FOR SALE: Barker & Williamson balun, 50-300 ohms - $15; Triplett 0-100mA meter, 3-inch - $10. Bill Riley, W7EXB, 863 W. 38th Ave., Eugene, OR 97405.

FOR SALE: Johnson T/R switch - $40; RME HF 10.20 converter (exceptional) - $50; Gonset G-63 rcvr - $100; (2) Gonset GSB-100 xmtrs - $150 each; Heath DX-100 - $100; Tektronix 547 scope, w/cart - $225. All above exc. to mint, w/ manuals, retubed, etc. Derry scope - $25; converted ARR-15 rcvr (wrks), w/spare parts unit, manual - $75; 3-1/4 and 4-3/4, 115-V muffin fans - $5. Parts trades considered. David Bertman, AB7B, 1314 SW Hall, #E, Portland, OR 97201. (503) 223-5295

WANTED: Any Multi-Elmac xmtr, w/AC pwr sply. Willing to pick up within 250 miles. Ron Mayer, W8KYD, 5410 Alder, Cleveland, OH 44129. (216) 888-1904

Western Heritage Museum Omaha, Nebraska
"a magnificent home for your equipment"

Leo Meyerson, WØGFQ, (founder of WRL) needs donations of gear and related materials for the amateur radio exhibit at Western Heritage Museum in Omaha, Nebr.

This permanent display is the only one of its kind in the country and is something that all hams can be proud of. We expect 50,000 visitors annually.

Your tax deductible donation will be permanently noted on a plaque that will be prominently displayed.

For more information contact Leo at (402) 392-1708, May-Nov.; 619) 321-1138, Nov.-May.

FOR SALE: Heath Nostalgia - 124 page paperback covers Heath history in pictures and stories. $9.95 postpaid (plus tax in WA). Heath Nostalgia, 4320 - 196th SW., Suite B-111, Lynnwood, WA 98036.

FOR SALE: Collins kHz dials for 75A-1, 75A-2, 75A-3, 32V-1, 32V-2, 32V-3, KW-1, KWS-1 - $30 per dial or $35 exchange. Butch, KØBS, (507) 288-0044

WANTED: Hammarlund HX-50 xmtr. Must be in good, clean condx. Lance Wilken, KNØUSQ, 545 Woodland Ave., Fairmont, MN 56031. (507) 235-9195

FOR SALE: Hammarlund SP-600, w/factory cabinet, needs minor repairs - $100 plus UPS; FAA " Voice/Code Reproducer", w/control tower traffic magnetic tape recorder, w/audio amplifier for 19" rack mounting - $50 plus UPS. Pete Patton, WØEWQ, (215) 898-1787

WANTED: Hallicrafters S-38D, S-41, S53A, S107; National NC-33, NC-57, NC-60, NC-105 wrkg or repairable. Benigno Fernandez, KP4DN, 1674 Atlas St., Summit Hills, PR 00920.

FOR SALE: Sams Photofacts bound volumes #50 - #84 (1957-62) plus misc. folders. Each volume weighs 10 lbs. U-ship. Heinz P. Gronemeier, WD8QVD, 9950 Ellis Rd., Clarkston, MI 48348. (313) 625-2805

TRADE: My Eimac 3CX3000A1 (pull) for your RME-69 or NC-240D including spkr. A. Bruno, 24 Butternut Dr., New City, NY 10956. (914) 354-8899

WANTED: Espionage equipment. Historian purchases spy radios, code and cipher machines and any equipment, devises or manuals pertaining to the world's intelligence organizations. Keith Melton, Box 5755, Bossier City, LA 71171. (318) 747-9616

FOR SALE: Vintage parts. Send stamp and request "Vintage Flyer". USA only. Copies of some obsolete Readrite/Triplett equipment manuals. Bigelow Electronics, P.O. Box 125, Bluffton, OH 45817.

FOR SALE/TRADE/WANTED: Vintage tube CB's, all makes/models available; old radio books. LSASE for lists (specify). Charles Zafonte, RFD #1, Box 75, Fort Kent, ME 04743. (207) 834-6273 eves.

FOR SALE: Viking Valiant cabinet - $20; Viking II cabinet - $20; R-392 PTO - $10; Heath Warrier HA-10, rough - $85 OBO; Westinghouse tubes - 860 - $12, 861 - $25; TBX for parts - $20; big roller inductor 25 uh, w/counter - $35; WW II radio filter FL-8B, w/cords - $15 OBO; Collins 32MS-1 remote control, w/handset - $15; 15 mA meter, switch, shunts, for T-368 - $15. **WANTED:** Working IC-22A. U-ship. WA7HDL, (208) 756-4147

WANTED: The 10-meter output tank coil or whole tank assembly for CE600L amplifier; Waters Q-multiplier for 75S-1 (377-7551); passband tuning knob for 75A-4; spkr for NC-303. I have stuff to trade or I will pay cash. Thanks in advance. Dennis Petrich, KØEOO, 6419 Berwickshire Way, San Jose, CA 95120. (408) 997-9835

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: BC-610F - $300; SX-101A - $85; Sancor scope - $25; home brew 6146 all-band xmtr w/separate pwr sply - $50; book of radio diagrams 1924-'26, good condx. **TRADE:** Mint 75A-4 for a mint NC-303. Chuck, (417) 863-7415

WANTED: Radio tube 112 or 112A (used or new). Stephen Kalista, 9 Maple Dr., Jim Thorpe, PA 18229. (717) 325-4120

FOR SALE: Hi-V pwr sply items - xfmrs, chokes, rectifiers, resistors; HP 200CD; timers, Bud rack; more. Yours to get. Tom Waters, 3703 Bonview Ave., Baltimore, MD 21213. (410) 488-5356

FOR SALE: Heath SB-650 freq. readout. **WANTED:** Face plate for Heath CG-1 RF gen. Must be mint. Marty, (817) 497-6023

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

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TRADE: 1938 Hallicrafters "Skyrider 5-10". Completely original, no rust. Trade for HF communications receiver of same era, in similar condx. SASE to John Moriarity, K6QQ, POB 88, Palomar Mountain, CA 92060. (619) 742-8778, 9 to 11 AM PDT

FOR SALE: NC-183D, w/manual, VGC - $200; Uniden Tempo 2020, w/owner and shop manuals, VGC - $250. Plus shpg. Burt Ostby, 2424 F-30, Mikado, MI 48745. (517) 736-8020 after 5 PM EDT

WANTED: I need the following items to complete a vintage station: Johnson Matchbox, Viking II manual, aluminum shock mount base for ART-13, any HRO coils and accessories. Pete Patton, WØEWQ, 6908 Clearview St., Philadelphia, PA 19119-1927. (215) 849-5830 (h), (215) 898-1787 (w)

FOR SALE: Philco 37-620 Tombstone - $110; Strom. Carlson 325H - $95; Zenith 4K035 farm radio - $60; Sparton 141XX - $75; Watterson 527 - $50; SX-71 - $125; Mitchell bed lamp radio - $50; Philco 46-250 - $40; Philco 46-200 - $35; Motorola 5X11U - $50; Emerson big portable - $50. All plus UPS. Bud Santoro, 3715 Bower Rd., Roanoke, VA 24018. (703) 774-9153

FOR SALE: Collins mech. filter F250 24 - $35; (6) solid-state plug-in rectifiers for 872A tubes - $50. P.A. Orobko, VE7FY, 12347 Davison St., Maple Ridge, BC Canada. (604) 463-4904

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: R-390A squelch modication: small external add-on module, super sensitive, works great on AM and SSB, 15 minute installation, instructions included - $25. Rick Mish, (419) 726-2249

FOR SALE: Replacement B&W 5100/5100B VFO dials. Replace your faded and aged one with an exactly styled snow white plastic version. Your transmitter will look like it just left Upper Darby! Idiot-proof instructions included. $10 postage paid. Marcus Frisch, WA9IXP, Box 28803, Greenfield, WI 53228-0803

WANTED: Winding information for National FB7 40, 80 and 160-meter bandspread coils, coil parts or complete coils. Jim Hanlon, W8KGI, POB 581, Sandia Park, NM 87047. (505) 281-0814

WANTED: Lysco 40 meter mobile xmtr using 3-6AQ5s; need schematic for creative electronics "Transcon 10" xmtr/converter. Steve Miller, WA3JJT, 909 Walnut St., Erie, PA 16502. (814) 454-8990

FOR SALE: Collins 30L-1 (winged), exc., w/ manual - $600; Collins 75A-4, SN 4,000+, w/2 filters and spkr - BO; sell or trade rare Collins KWS-1K, RF unit restored, immaculate, pwr sply needs wrk - BO. Joel Thurtell, 11803 Priscilla, Plymouth, MI 48170. (313) 453-8303

WANTED: Broadcast equipment catalogs and transmitter brochures from 1930-1955. Magazines wanted: "Broadcast News" (RCA), "Pickups" and "Oscillator" (Western Electric). Sam, W6HDU, 1031 San Antonio Ave., Alameda, CA 94501. (510) 521-1429

FOR SALE: Transmitting/Receiving tubes, new and used. LSASE for list. I also collect old and unique tubes of any type. Looking for Taylor and Heintz-Kaufman types and large tubes and sockets from the old Eimac line; 250T through 2000T for display. Maybe you have something to trade? John H. Walker Jr., 16112 W. 125th St., Olathe, KS 66062. (913) 782-6455

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: Several ARRL Handbooks - LSASE for list; Hallicrafters S-38abcd's - $55 includes shpg; parting Johnson Viking I, S-40, S-38's, NC-33. No Hallicrafter knobs. **WANTED:** ARRL Handbooks - 1st, 5th and 16th editions. Bob Schafer, WA7IHN, POB 442, Aumsville, OR 97325. (503) 749-1149

WANTED: Modulation xfmr 250W-500W or complete modulator deck; RME-69 rcvr; spkr for NC-183; Globe screen modulator; front panel and meter for Globe Chief 90. Jack C. Shutt, N9GT, 1820 Dawn Ave., Ft. Wayne, IN 46815. (219) 493-3901

FOR SALE: Collins 75A-4 S/N 4396, w/vernier knob, 2.1 kc filter, spkr, book (copy). Clean, very nice condx, no scratches, no corrosion. New tubes, completely aligned - $650 plus shpg. Ray, NØDMS (303) 987-3836

WANTED: Drake R-7/R-8; Collins 75S3C, 51J4, 51S1; Hammarlund HQ-180, HQ-120. Levy, 8 Waterloo, Morris Plains, NJ 07950. (201) 285-0233

WANTED: NCX-5 w/AC pwr sply, mic & manual. State price and condx. Russ Hunt, W9HZD, 14 Siros, Laguna Nigel, CA 92677. (714) 363-8119

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!

FOR SALE: Repair & refurbishment of older tube-type amateur equipment. Fully FCC licensed; 35 years experience. Chuck Banta, N6FX, Claremont, Calif. (LA area) (714) 593-1861

FOR SALE: Heathkit amateur radio repair by RTO Electronics, 4166 Maple St., Berrien Springs, MI 49103. (616) 473-3201

FOR SALE: SAMS Photofacts and parts for collectors. Electrolytics, high voltage capacitors, power resistors, plugs, switches and more. Free catalog. A.G. Tannenbaum, WA2BTB, POB 110, East Rockaway, NY 11518. (516) 887-0057, FAX 599-6523

FOR SALE: Narrow bandwidth (600 Hz) mech. filters for CW reception with Collins 51J-type rcvrs - $45 each. Limited supply. Joel Thurtell, 11803 Priscilla, Plymouth, MI 48170. (313) 453-8303

WANTED: Control knobs for R-274 (Hallicrafters); mount for ARR-15; manuals for RBA, DAE and ARB. Tom Brent, Box 1552, Sumas, WA 98295. (604) 826-4051

FOR SALE: Military complete RC-58-B tape facsimile, TM11-374, amplifier BC-908-B, Recscanner BC-918-B, cables, bag, extra vibrator, spools, writing stands; BC-604 xmtr, superb condx. Victor, (503) 289-6373

WANTED: Plug-in speech/amp/modulator #250-40 for Johnson Viking Adventurer. Gil Parsons, WA8JIW, POB 192, Ross, OH 45061. (513) 867-8380

WANTED: Collins catalogs, promotional items, Signals. Richard, KD6CPE, 25108 Marguerite #B-200, Mission Viejo, CA 92692. (714) 855-4689

FOR SALE: Heath Q-Mult - $15; Drake 2A - $80; S40B - $65; MD-7 - $25; DM-35's - $12; DM-32 - $12; DY-2/ARR-2 - $12; Bud "Gimix" - $5; G-50, mint - $65; Morrow 5BRF & FTR - $25; parting SX-25; SX-25 spkr, poor - $15. **WANTED:** SM-40. Joe Sloss, K7MKS, (206) 747-5349

FOR SALE: Heath HD-1 distortion bridge, vgc - $35; Heath AV-2 ACVTVM, vgc - $15; shpg & manuals included. Bill McCombs, WBØWNQ, 10532 Bartlett Ct., Wichita, KA 67212-1212. (316) 722-7669

FOR SALE: RIT for KWM-2 and S-Line. No modifications for KWM-2; 75S needs one wire - $59.95. SASE for info. John Webb, W1ETC, Box 747, Amherst, NH 03031.

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: Racal RA17C, complete w/ longwave converter and manual - $100; BC-779, w/pwr sply - $50; BC-221, w/pwr sply and orig. calibration book - $50. James G. Herkimer, WB2ANO, 338 Village Blvd., S, Baldwinsville, NY 13027. (315) 635-8016

WANTED: 51J4 top dust cover, filter choke 678-0432-00, mech. filters F500B-14, F500B-31; R390A Stewart Warner (1960) RF deck, EAC (1967) IF deck; old Western Electric, RCA, Gates broadcast equipment catalogs, General Radio Co. catalogs and Experimenter magazines. John Tiedeck, WA2SDE, 212 Grandview Rd., Media, PA 19063. (215) 566-8049

WANTED: For Stoddart NM-40A rcvr: pwr sply, manual or schematic (copy OK) and antennas. Marty Sagendorf, K1CVF, Box 21, Hat Shop Hill, Bridgewater, CT 06752. (203) 354-9035

WANTED: Help: check you junkbox, need a J-41A key and manual or info on the military TG-5B telegraph set. Thanks. Marvin, WA4TOJ, 2957 Gaffney Rd., Richmond, VA 23237. (804) 275-1252

FOR SALE: Tektronix scopes for restoration, some wrkg, all repairable; various plug-ins available 531, 531A, 535, 535A, RM35A, 541, 541A, 545A, 585, 585A, 575. Pick up only. Norm Roscoe, W1CIX, POB 402, West Bridgewater, MA 02379. (508) 583-8349

WANTED: Switchcraft type S-230 phone plug for Drake TR-4; Drake MS-4; Knight T-60 xmtr; National NC-57C rcvr. Thank You. Dave Mantor, W9OCM, c/o Med., POB 2106, Anderson, IN 46018-2106. (317) 642-1103

WANTED: Collins 500 cycle mech. filter for 75A-3; Collins 32V-3; 75A-3 and 270G3 spkr; meter for Collins 51J3/51J4. Brian Roberts, K9VKY, 3068 Evergreen Rd., Pittsburgh, PA 15237. (412) 931-4646

WANTED: US Navy bugs made by McElroy, Bunnell, etc. for personal collection. Tom French, W1IMQ, "the McElroy collector", 120 Great Road, Maynard, MA 01754. (508) 897-2226

FOR SALE: Millen 90651 grid dip meter - $75; Collins R 1051 solid-state 2-30 mHz - $450. All plus UPS. Walter M. Chambers, K5OP, POB 241371, Memphis, TN 38124-1371. (901) 761-9381

WANTED: Rcvr portion of AN/GRC-9 (2-12 mHz). Also manual for Harvey-Wells R-9 rcvr. Al Bernard, NI4Q, POB 690098, Orlando, FL 32869-0098. (407) 351-5536

WANTED: Panel frame for Johnson KW; National NC-400 rcvr. Al Santangelo, VE3AJM, 252 Arnold Ave., Thornhill, Ont., L4J 1C2

FOR SALE: Small quantity of Bud 5-pin and B&W BVL, 1500 series and 3400 series coils and bases; also some B&W coils from 10 KW amplifier AN/MRC-2 (look like giant BC-610 coils) and extra BC-610 coils and tuning units (none for 160 meters). LSASE for list. Robert W. Downs, WA5CAB, 2027 Mapleton Dr., Houston, TX 77043-2410.

WANTED: Hammarlund HC-10 or SPC-10SSB converter; Central Electronics Sideband Slicer; Collins 353B-31 or -12 plug in; Technical Material Corp. model SBC-1 sideband converter, antenna coupler modul CU-872. Please state condx and asking price. Shaun P. Merrigan, 14203-72 St., Edmonton, AB Canada T5C OR4

FOR SALE: All Collins R-392, near mint, low serial and mfg. no., operational - $300; HP 606A HF lab quality, exc. generator - $200; URM-25F HF generator - $89; HP 100 E frequency standard, mint - $100; large military weather balloons - $10; USM-207 freq. counter, 500 mHz - $150; L.T.V. G-175C VHF rcvr - $200; LTV G-186B 455-500 kc IF spectrum display unit - $150. Same but 21.4 mHz IF - $125; HP 5255A 12.4 Gig converter plug-in - $135; HP 5245M Hi-stab. counter mainframe - $175; HP 5243L - $75. U-ship. Joe Bunyard, 1601 Lexington, Waco, TX 76711-1701. (817) 753-1605

WANTED: W-4 wattmeter and FS-4 freq. synthesizer. Howard Albers, WA7PDN, 3306 Horton Smith Ln., Billings, MT 59106. (406) 656-4855

FOR SALE: Older 23-channel CB radios, some tube types, as is - $25 ea. + shpg. SASE for list. James Fred, R1, Cutler, IN 46920.

WANTED: Hammarlund HQ-215 operating manual, especially a schematic and alignment instructions. Photocopy is fine. Skipp Tullen, K2PXQ, 26 Altamount Ct., Morristown, NJ 07960. (201) 539-8120, FAX (201) 539-5615

FOR SALE: Moving from my big house to tiny New York apartment. Virtually everything must go by June 15: ARC-5; ART-13s; BC-348s; BC-611s; RAX; TCS; ARB, very good, most with racks, plugs, shock mounts, etc; Navy rcvrs (the big heavy ones), GRC-9; model 15, mint, w/TD and reperf; DX-40; Millen's 3" scope; BC-221; TS-174; mod xfmrs - Merit 4007 (300+ watt), Thordarson 21M65 (500 watt); 75A-4 (2039); Millen and National dials; Bud 40-watt multiband tuner; Measurements Corp. 65A sig. gen.; G-R counter. Incomplete list available, but not much time left. I'm in northern NJ, more stuff, come visit. Ken, WB9OZR, 362 Echo Valley Lane, Kinnelon, NJ 07405. (212) 512-1866 (d), (201) 492-9319 (n), FAX (201) 492-8958

FOR SALE: Hammarlund HQ-100, no clock, exc. condx - $85; Hallicrafters SX-110, w/orig. Hallicrafters tubes, very good condx - $110. Prefer to meet for pick up. Mike KC4SLK, RR #8, Box 140, Danville, PA 17821. (717) 437-3210

FOR SALE: Restoration of vintage radios; 25 years experience. Phil Goodman, K4FXB, 4112 Commodore Dr., Atlanta, GA 30341. (404) 457-4195

WANTED: Collins 51J4 rcvr, w/case, spkr and manual. Barry Nadel, Box 29303, San Francisco, CA 94129. (415) 346-3825

FOR SALE: Meters - 0-30 mA, 0-300 mA, 0-15 mA, 200 micro amp, 0-10 ACV, 0-20 mA, 0-500 mA (3 scales 0-10, 0-5, without shunt); 1/4-inch angle drive - $15; SBE cartridge (only), 300-5000 Hz - $7; UTC xfmr 0-6 - $5; Daven attenuator VAR, 2 sections 80Ω 18 dB step, new - $20; Eimac vac fixed VC6-32, new - $8; (2) SX-101 knobs - $5; 1 "H" logo - $2; door knob cap 500 mmF, 20 KV - $4; wave meter dial drive, complete, new - $20; Joe, W6CAS, (916) 731-8261

FOR SALE: Collins RE 312B-4, SN 59917, EC, - $175; WE 312B-4, SN 52034, EC, - $150; 516E-1 12 VDC pwr sply, NIB w/tags - $150. Shpg xtra. All w/money back guarantee. Jerry, AB8U, (513) 429-5457

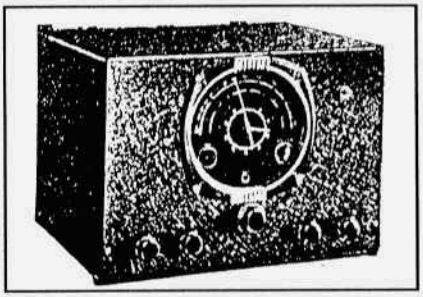
FOR SALE: RBB, RBC rcvrs, w/pwr sply and cables - $300. Pick up only in Klamath Falls, OR. Ken, KD6B, Redmond, OR (503) 923-0804

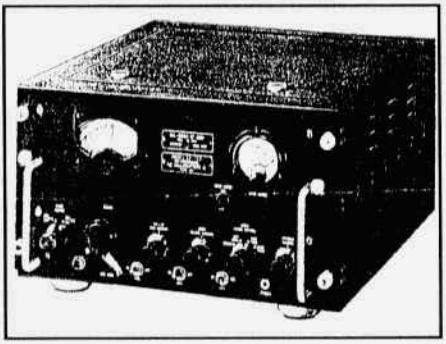
WANTED: Main tuning knob and 100 khz xtal for SX-101A. FOR SALE: Parting out Viking II, HQ-129X. Tom Marcellino, 13806 Parkland Dr., Rockville, MD 20853. (301) 871-7463

WANTED: Manuals for the following Nems Clark DCA-5100A, R-1071A-1, RFT-109A, RFT-101D, PSD-104E, PSD-105E, 1432, and 1673. Ed White, WA3BZT, 809 Seymour Rd., Bear, DE 19701-1121 (302) 322-1313

WANTED: TM 11-856, w/schematic packet for R390/URR; also pwr sply module, PP-660/URR for R220/URR. Bob Bakinowski, 1524 Saint Tropaz, Tucson, AZ 85713. (602) 624-8029

FOR SALE: Put a class knob on your classic Collins 75A-4. 'Jupiter Superknobs' are solid brass, six times heavier than fragile plastic original vernier knob - $149 + $5 shpg 48. Joel Thurtell, 11803 Priscilla, Plymouth, MI 48170. (313) 453-8303





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

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WANTED: 75A-4; junk HRO-60, DX-35, DX-40. W2YJ, 12072 Valley LA E., Aurora, NY 14052. (716) 655-3562

FOR SALE: Tempo One AM/SSB/CW xcvr; Yeasu FL101 xmtr, FR101 rcvr. John L. File, POB 566, Tolono, IL 61880. (217) 485-3439

FOR SALE: Harvey-Wells T-90; R9A, APS90 pwr sply. **WANTED:** HQ-180A, B or C; Swan 500C & pwr sply. Gene, W7WXM, (208) 522-5854

WANTED: I need the following to complete the GRC-109 set: maint. tool set/hand crank gen./xtal set/complete manual/updates/ headset/burst keyer AN/GRA71; Gen. Rad. imp. bridge GR1606A or B. John Reimertz, LA9VI, Vangsvn 9, 1470 Lorenskog, Norway. phone 47 67905880 or FAX 47 22320990 or Jan Bjerke, Hollis N.H. phone 603 4652048/FAX 603 4652680

WANTED: R-390 or R390A; Sprague capacitor analyzer. Bob, NØNFI, (719) 846-6265

FOR SALE: Limited quantity of orig. manufacturer new knobs for Collins 75A, 32V and KWS-1 series, 1:1 main tuning - $25; large pointer (1.75" skirt) - $12; medium pointer (1.5" skirt) - $10; small non-skirted pointer - $5. Shpg included. Money back guarantee. Jerry, AI8U, (513) 429-5457

FOR TRADE: 6251. **WANTED:** AT-1; HRO-60; SW-3; SX-88; S-35; SC101; 55G1; 270G; RME-69; 312A-1. Michael, WM1O, (914) 834-7678

WANTED: Cabinet for CE 20A xmtr. Dale, KB5IKH, 424 Spring Valley Rd., Hewitt, TX 76643. (817) 666-3787

FOR SALE: Heathkit SB-10 - $80; parting out aViking II and a Ranger I. Need manuals for S-40A, SX-115, Heath HR-10. Manuals for vintage equipment - see our ad at the top of this page. Gary, W7FG, (918) 333-7893

WANTED: Collins 270G-3 or 312A-1 spkr & escutcheon for 75A-4. David A. Clark, K5PHF, 9225 Lait Dr., El Paso, TX 79925. (915) 591-4184

FOR SALE: Heath HA-10 linear, w/new Peter Dahl xfmr and comm'l plug-in 866A replacements; Butternut HF-5V, w/30-M and 160-M, exc. condx, outside only a year. Both UPS shippable. Ken, WB9OZR, 362 Echo Valley, Kinnelon, NJ 07405. (212) 512-1866 (d), (201) 492-9319

Manual, repro, TO 16-55-109, Nov. 1944, spare parts list SCR-274-N. A must for the serious collector. Parts list of all SCR-274 units, symbols, quantity, part descriptions, contractor part no's. Covers rcvrs, modulators, dynamotors, mounts, etc. $10 plus postage. Lee Frank, P.O. Box 60011, Harrisburg, PA 17106-0011

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WANTED: LG13 legs for BC-654; RBA rcvr. Bill Strangfeld, WB8YUW, 254 Elm Ave., Cincinnati, OH 45215. (513) 948-1071

WANTED: Collins 75A-2 or 3 in good condx, w/op manual. Bud Santoro, 3715 Bower Rd., Roanoke, VA 24018. (703) 774-9153

FOR SALE: National NBS 1 rcvr; Swan 700CX, w/117XC; Boonton 250A RX mtr; General Microwave pwr head; N420-B-2, elements, Avantek Mu amp. Bruce E. Walther, W9QAH, (715) 344-9099

FOR TRADE: (7) 872A rectifiers, (2) GL 5550 ignitions; all NIB for older rcvr/xmtr/acc. or sell - offers. Richard Prester, WA2IFS, 131 Ridge Rd., West Milford, NJ 07480

FOR SALE: Matched set 2" sq. illuminated meters, 20-V, 5-A, 10-A, 20A available - $15/pr.L. Gardner 458 Two Mile Creek Rd., Tonowanda, NY 14150. (716) 873-0447

WANTED: Rcvrs - Radio Shack DX-400; Uniden CR 2021; RME 4350; TMC GPR-92 or GPR-90 w/xtal cal.; RCA model CRM R6A. With manuals prefered. Rick, K8MLV/Ø, 1802 W. 17th St., Pueblo, CO 81003. (719) 543-2459

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: Hallicrafter SX-88 - $900; SX-62A - $375; Johnson Courier - $325; SSB adaptor - $175; tuner, w/meter - $85; Pacemaker - $225; GPR-90 - $425; 651S1 - $985; HRO-500 - $700; LF10 - $400; HB AM KW - $500; 312B4, RE - $185; Hammarlund HXL1 - $425; 75A-4 prototype - $700; 600R/600T - $450. All VG to excellent. Jim, KE8AP, (313) 784-9860

FOR SALE: (6) Eimac 4E27As, (5) 125B, NIB - $50 each, U-ship. Jack Dubbs, 44 Monk, Security, CO 80911. (719) 392-2043

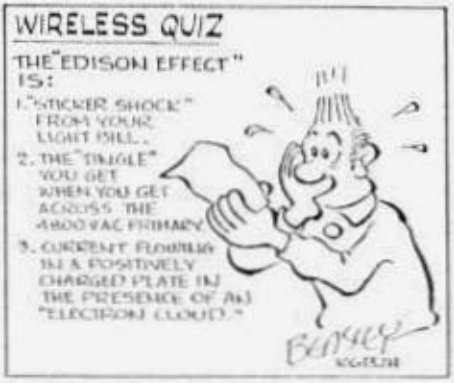
FOR SALE: Collins 51S1 - $900; Trans-Oceanic L600L leather - $300; McMurdo Silver sig. gen.; assorted command rcvrs; BC-453 - 455. All exc. condx, plus shpg. Michael Neidich, K2ENN, 145 E. 15th St., -6A, NYC 10003. (212) 777-1332

WANTED: Stromberg Carlson 22-24/52-54, 69, 83-84, 72-74, 130L/H, 160-180, 370M/470M, 430H, lit; etc; Stancor PC8412/8413, A3801/A8053; circa 1941 Thordarson CHT & Tru Fidelity; Gernsback vol 8, 1941. Russell Worthy, 389 West Main St., North Adams, MA 01247. (413) 664-6442

FOR TRADE: CE 200V for military rcvr. John Richardson, 1163 Highland Pl., Dubuque, IA 52001. (319) 556-5504

WANTED: BC-348 (Q or similar): RF/Osc. coils 200-500 kc and nameplate; QST magazine May 1959; receiver Echophone EC-1-A (in any condx). HB9AQS, Hans Zimmerman, POB 209, CH-3780 Gstaad/Switzerland.

WANTED: Vairiac, metered preferred; Regulated bench supply 3-30 volts, 300 mA; CATV signal level meter; GE/RCA tube caddy; 51S1 manual; panadaptor SP-44 or PCA2 or other 500 kHz; command xmtr BC-458A; BC-454; BC-455; BC-348Q; racks; exc. only; Zenith Trans-O 7000-1 Taiwan. Michael Neidich, K2ENN, 145 E. 15th St., -6A, NYC 10003. (212) 777-1332



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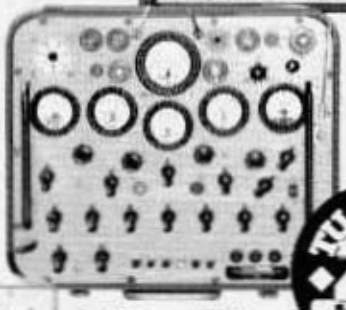

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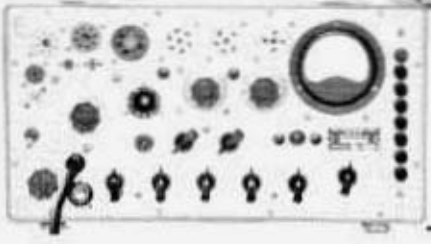

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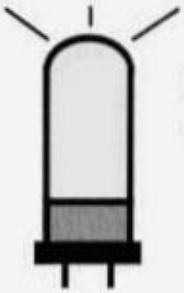

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