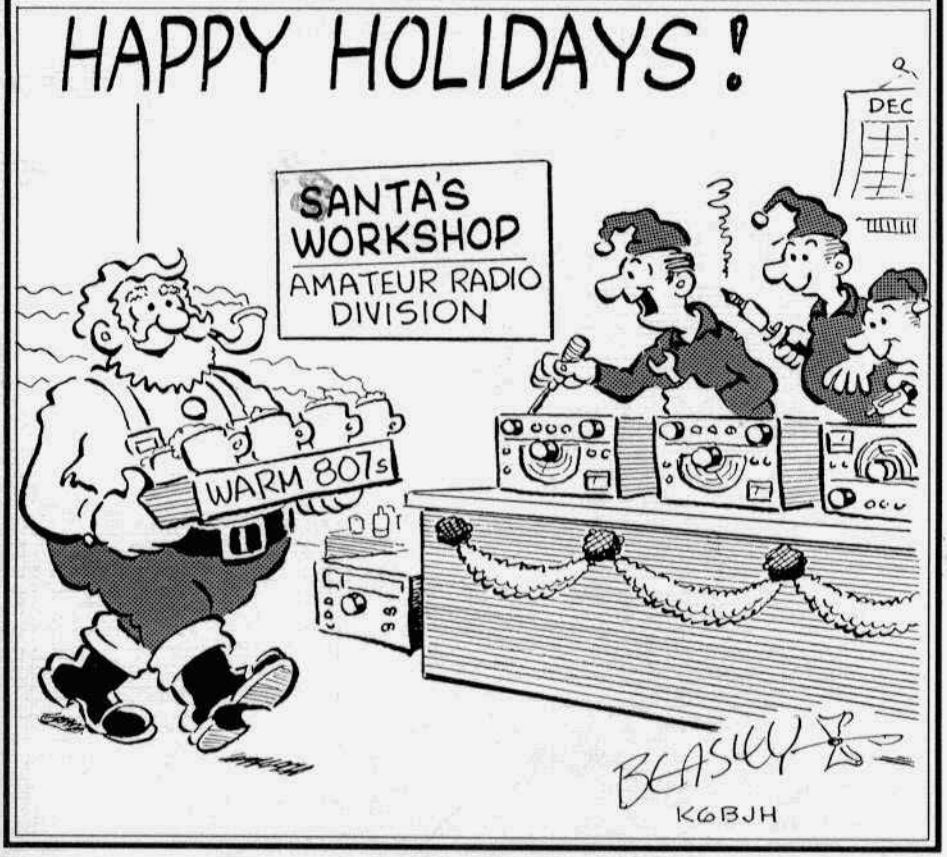
$2.50

# ELECTRIC RADIO

celebrating a bygone era

Number 44 December 1992



# 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

In this issue (on page 3) Dale Gagnon, KW1I, is proposing the reactivation of the old AM organization, AM International. I'm in complete support of Dale's proposal. I think we need an organization to protect and promote AM. And the fact that it will be international is very exciting. We're hearing more and more DX on AM, and their participation with us in an organization should be very beneficial.

All AM'ers are aware that there are some hams out there who would like to see AM outlawed. Just a year or two ago the FCC received a petition for rule-making that would have just done that. Instead of denying it, as they had done almost routinely in the past, they assigned a number to it and solicited comments. It was a scramble to organize a response to that petition. One of the points made in that petition was that there was very little interest in AM anyway. Because of our low profile, that could have been accepted as a fact by the FCC and affected their ruling. Fortunately, AM'ers overwhelmed the FCC with over 800 comments in favor of retaining AM as a legitimate mode on the hambands and the petition was denied. It could have gone the other way.

If we have a strong organization as KW1I envisions it, we will be ready to respond to any rule-making petition that would be detrimental to AM'ers. We would also have a working relationship with ARRL and be in regular contact with the FCC. Please read Dale's proposal and if you have any comments, send them to Dale c/o ER. Next issue we'll print some of the letters.

I wish everyone a merry Christmas and a happy and prosperous New Year. I hope to work many of you during our 160/10-meter contest/jamboree over the Christmas weekend. See page 19 for the details.

# TABLE OF CONTENTS



**Cover:** Another Christmas cover by Bob Beasley, K6BJH. Anyone for a warm 807?

# Reflections Down the Feedline

**by Bill Kleronomos, KDØHG**
**P.O. Box 1456**
**Lyons, CO 80540**

## His Master's Voice

Not very long ago, a friend and I were engaged in one of our discussions of metaphysical electronics when the subject of audio and AM'ers came up. He posed an outwardly simple question that I couldn't readily answer: "What does it take to have truly 'good' sounding audio?" At one time in my life the answer would have been easy-good fidelity, or as some would put it, low distortion and decent audio bandwidth with, perhaps, some pre-emphasis of one sort or another [East or West coast?]. But today I can't easily answer that question, having been exposed over the last year or so to the magazines that cater to the needs of the hollow state audio enthusiast.

By way of introduction, let me say that there's a good reason why many of the old triodes we've historically used in our boat anchor transmitting apparatus have become scarce and expensive. It's not because so many BC-610's are on the air that dealers are asking $20+ for a 2A3! There is a tremendous interest out there in recreating the hollow state audio equipment of yore.

The true audio nut I'm speaking of will consider the sound generated by a conventional amplifier, consisting of a pair of push-pull beam pentodes, to be akin to that of a Black and Decker 6" rotary saw pulling its way though a sheet of knotty plywood. The only true representation of audio fidelity, they insist, comes from that generated by a single-ended class A triode. Circuit embellishments such as the use of inverse feedback are to be strictly avoided, due to the alleged cancellation of the subtelties contained within a piece of music. Modern components such as metal film resistors, plastic film capacitors and even electrolytic capacitors are to be avoided if possible in favor of carbon composition resistors, paper dielectric capacitors and oil-filled power supply filters. Low-mu, physically large triodes, such as types 2A3, 812, 845 and 211, are preferred for output stages along with the hideously expensive [$300 and up!] special output transformers required to handle the steady-state current generated by a class A stage that would saturate an ordinary transformer. A pair of authentic 1930's Western Electric theater amplifiers designed along these lines will cost you more than that Collins KW-1 you've been admiring!

This brings us round the circle to my friend's question. The sound of the audio amplifiers described above does not fit the technical definition of "high fidelity" as previously described. There will most certainly be a predominance of 2nd harmonic distortion over the 3rd, and the noise generated by the vintage components will certainly limit dynamic range-there will always be some residual snaps, crackles and hiss. Yet, many individuals will tell you the sound generated by this type of circuitry, discarded since the '30s, is music as it was meant to be. There is no doubt that the presence of a melodious 2nd harmonic is preferred over the square-wavey, raw sounding, odd order variety. And, yes, this equipment has a unique mellow sound, and even when driven into overload doesn't sound too rotten at all. Could this possibly be 'good' audio?

A recent article in a trade magazine, *Electrical Engineering Times*, confirms this audio 'trend'. Among many guitarists and other musicians there is something to the quality of the sound generated by a genuine hollow-state amplifier such as a Fender that is highly desired over the modern transistorized variety; some musicians


**continued on page 31**

# Proposal For Reactivation of AM International

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

A number of AM enthusiasts have mentioned over the last year the need for a new organization to promote AM and to guard against regulation and policy making from any source that would limit the enjoyment of the mode within Amateur Radio. AM International would be a good name for this new organization because it has historic value to AM enthusiasts and it is also descriptive of the growing interest in AM worldwide. AM International was described briefly by Fred Huntley, W6RNC, in his ER article in August 1991.

AMI was started on the West Coast in 1967. From Fred's article, AMI's purpose was to bring about good fellowship and friendly cooperation, and to maintain the rightful place of AM operation on the amateur bands. As Fred said in the article, "this intent and purpose is equally valid today." The purpose of this article is to test the AM community's receptiveness to a new organization and to get specific feedback on some organizational ideas so that a rebirth of AM International will be a successful one.

## AMI Organization

AMI would be composed of members who qualify for membership solely by their interest in AM. AMI members would elect a President and Vice-President, Secretary-Treasurer and Regional Directors. Five regions, West, North Central, South Central, Southeast, and Northeast are proposed. International regions would be added based on active AM interest. The elected officials would compose the Board of Directors, which would be responsible for policy formulation and planning. A set of bylaws describing AMI's purpose, its structure, and its operating principles will be an essential part of AMI's re-emergence.

## AMI Activities

AMI members will be encouraged to enjoy net operations for the purpose of meeting one another, providing a two-way communications path for AM issues, for setting expectations for the larger amateur community on the use of "AM Window" frequency segments, and to encourage other amateurs and SWLs to consider AM operation. AMI Regional Directors will be involved in coordinating net activity. AMI members will be encouraged to promote AM at amateur conventions and radio club meetings. Regional Directors will have an AMI banner, brochures, a slide show, and a videotape presentation to lend out to AMI members.

AMI will establish appropriate contact with the ARRL and the FCC to ensure the visibility of AM issues to these organizations.

AMI members will, when appropriate, exert influence on the ARRL, the FCC, and elected government officials on behalf of AM.

AMI will be the sponsor of operating events and contests.

AMI news will be published in *Electric Radio* and the *"AM/Press Exchange"*. Emergency information will be broadcast to members on nationally monitored AM net frequencies.

## Financial

AMI's budget will be modest. Membership certificates and mailing costs will be paid for by a nominal charge when requesting membership. Financial records will be published periodically, and will be available to members at any time.

## How To Get Involved

Send letters of comment on this proposal to me via Electric Radio. Barry Wiseman will review and publish selected letters. My information on the old AM International is limited. If you have more background information please contact me. ER

# "The Yaesu FTdx-400 Transceiver"

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

It's not the sort of thing you make a holiday from, but an event of great importance to U.S. hams and to our electronic industry happened twenty-five years ago next month. On page 141 of the January 1968 "*QST*" there appeared an ad for a newly-arrived transceiver made by a company called Yaesu, located in Tokyo, Japan. While the FTdx-400 was far from the first ham electronic import (Lafayette and others had been bringing in ham gear made for their label for years), it was the first Japanese ham transceiver able to go head-to-head against the best of Collins, Hammarlund, and National. It was, in other words, the beginning of the end for the old-line U.S. ham manufacturers.

You don't see many Japanese rigs when vintage ham sets are discussed. 'Import' almost seems a synonym for 'modern and boring'. But a set which was competition for vintage sets, like the NCX-500, KWM-2,or WRL Galaxy V, is certainly as 'vintage' as they are. Moreover, there's something to learn by looking at the winner in any race: just how did the new champ do it? When you look closely, sometimes there are surprises... Is it possible, for example, that the -400 isn't an all-around outstanding radio?

**Overview**

The FTdx-400 is an amateur transceiver covering 500 kc segments of each band from 80 through 15 meters; it covers 10 meters in four segments. By adding crystals you can add three more 500 kc segments, for example, for MARS operation. In addition, two transmit frequencies can be crystal-controlled and an external VFO can be used.

The set measures 6-1/4" by 15-3/4" by 14-1/4" (H x W x D), and weighs 40 pounds including the built-in 100/110/117/230 VAC power supply. It operates on USB/LSB, AM, and CW, and is rated at 560 watts (early models 400 watts) PEP input, equal to about 275 watts PEP output.

The set is designed to match a 50 to 125 ohm unbalanced antenna. There are 15 front panel controls. A built-in crystal calibrator gives marks at intervals of 100 kcs or 25 kcs. A switchable noise limiter is built in. There is no internal loudspeaker (an accessory loudspeaker was available at $14.95). Panel jacks accept a crystal push-to-talk mic and a loudspeaker or phones. There's an S-meter switched on transmit to read PA cathode current, ALC voltage, or relative output (RF antenna voltage).

Controls on the rear of the set adjust PA bias, S-meter zero, ALC meter zero, AM carrier level, and VOX.

The main dial is directly calibrated in units of 100 kcs with intermediate 25 kcs ticks. A black scale reads 0-500 kcs and a red one is marked 500-0, color-keyed to the bandswitch position. The vernier dial is calibrated in 100, 1-kc intervals. The tuning rate is about 15 kcs/revolution.

The FTdx-400 uses 18 tubes and 9 transistors.

**History**

The $600 FTdx-400 was a product of Yaesu Muesen Inc., of Tokyo, Japan and was imported by Spectronics Inc. of Los Alimitos, CA. According to ads in *QST*, other sets in the price range were: the Hammarlund SX-146 and HT-46 combo for a total of $690, the Swan 500 at $590, the WRL Galaxy V 400-watt set at $420, the Drake TR-4 at $600, the National NCX-5 at $685, and the KWM-2 at nearly $1000. None of these equaled the specs of the FTdx-400.


**The FTdx-400. Is this the best looking front panel of the late '60s? It is for sure one of the few ham sets on which the dial and meter are well lighted enough to allow use in a dark room. The knob skirt is backlit, giving it a 'halo' when seen in the dark--a very attractive effect--and when you take hold of the knob, enough light is reflected from your hand to allow reading the numbers on the skirt.**

The set had a relatively long lifespan, being advertised through November, 1969. The replacement was essentially an improved model of the same thing, called the FTdx-560. With even more features and better performance, the '560 carried a price tag of only $460... surely more than the beginning of the end for U.S. competitors.

## Design

This is a good looking radio. The front panel is an aluminum plate having a bright sand finish, framed with a similarly finished aluminum extrusion. Markings are engraved, most are filled in black, but the bandswitch positions for which the red dial scale is used are in red. The bezel around the dial and meter is chrome-plated nylon with the recessed center area finished in dark gray. Knobs are black plastic with turned aluminum centers. It's one of the best looking panels I've seen.

By the late 1960s, five band transceivers were pretty much alike. An RF stage feeds a mixer driven by a crystal-controlled local oscillator usually operating above the band frequency to give a variable IF of a few megacycles. This feeds a second mixer driven by a tunable oscillator operating above the variable IF to give a fixed IF which provides most of the gain and selectivity. Finally, a product detector drives audio and AVC circuits.

The FTdx-400 follows the pattern. A 6BZ6 RF stage feeds a 6CB6 first mixer to give a tunable IF of 5520 to 6020 kcs. A 6BE6 second mixer is driven by an 8700-9200 kcs FET tunable oscillator to give the 3180 kcs second IF and this signal is passed through a 2.7 kcs wide crystal filter, amplified in 6BZ6 and 6BA6 stages and then mixed with either 3178.5 or 3181.5 kcs in a 12AU7 product detector to produce an audio signal. The triode and pentode halves of a 6BM6 are the first and second



**continued next page**

**Yaesu FTdx-400 from previous page**
audio stages. A silicon diode serves as an AVC rectifier and another is used as an AM detector when that mode is selected. Audio is very clean and clear; AVC action is good but not outstanding.

On transmit, a 12AX7 is used as a two-stage mic amp feeding a 7360 beam deflection tube as a balanced modulator. The resulting double-sideband signal, at either 3178.5 or 3081.5 kcs, goes through the crystal filter and the 6BZ6 first fixed IF amplifier to a 6CB6 transmitter first mixer and 6AH6 second mixer which supply the tunable and crystal-controlled frequencies respectively, and then into the 6GK6 driver stage. The final is a pair of 6KD6 sweep tubes in parallel. Final grid current is detected and the resulting negative bias goes back to the fixed IF amplifier as ALC.

Using the same crystal filter for either sideband, as ham sets always do, means that the effective carrier frequency changes by 3 kcs when switching from one to the other. Many sets shift the tunable oscillator by the same amount in the reverse direction to correct this so the dial settings don't change. However, the varactor diode generally used to do the job is another expense and another source of drift and calibration errors--and in ham service sideband changes almost always go with a band change which requires recalibrating anyway. On the FTdx-400, no reverse shift is used; you must recalibrate when changing sidebands.

The -400 dial mechanism is the best I've seen on a ham set. Two sets of anti-backlash spur gears are used to couple the main dial to the vernier dial; this ratio is about 12:1. The crank type knob is coupled to the vernier dial by a ball reduction drive having about a 6:1 ratio. The vernier dial is calibrated by holding the knob and turning the dial, which is held in place by the friction of a felt pad. All the parts are medium priced but the result is smooth and free of backlash; this is one of a very few sets on which it is easy to tune in an SSB signal.

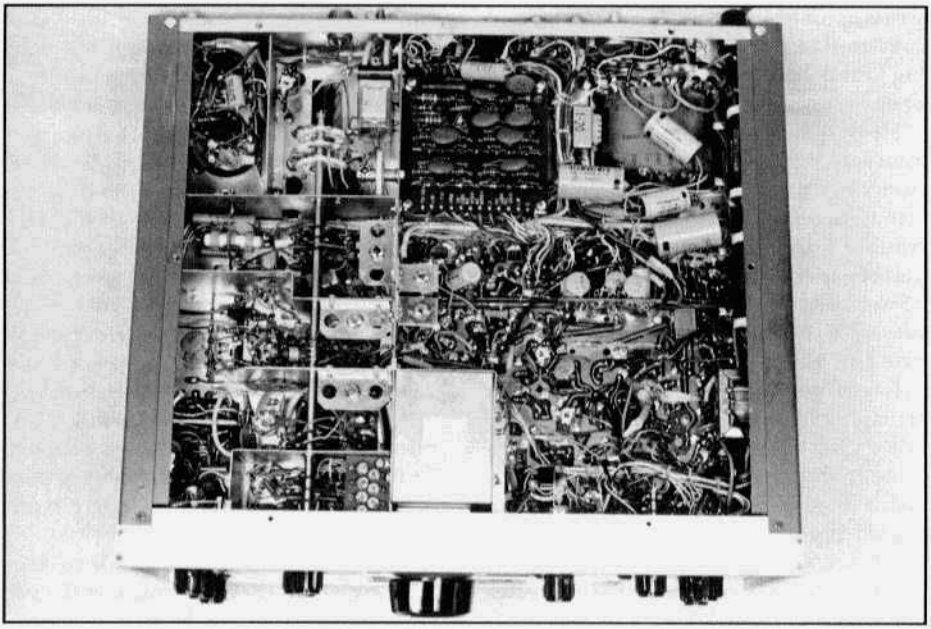
The VFO is a well-designed lower price unit. The Clapp (series tuned) circuit is used with a field effect transistor as the oscillator; FET's were just beginning to appear in hams sets in the late 60's. The coil is wound with #20 wire on a ceramic form with no tuning slug. Adjustment of tracking may be a bit harder without the slug, but leaving it out means one less cause of drift—it is a good choice. The tuning capacitor is of typical aluminum plate 'receiver' design. VFO and first buffer parts are mounted on a fiberglass epoxy circuit board mounted with the tuning cap inside a metal box. This box in turn is inside a second metal housing, this is the only non-Collins set I've seen with a box-in-box VFO construction.

The 100 kcs calibration signal is produced in the usual way by a crystal oscillator, switching to 25 kcs markers turns on a locked multivibrator.

Tuning the transmitter requires presetting controls, dipping the finals in 'TUNE' and then peaking the power output on 'CW'. The three-step procedure is unavoidable in a sweep tube set running at this power level; the PA total dissipation rating of 60 watts is considerably exceeded when running several hundred watts input and 50% efficiency.

Probably the reason that sweep tube finals fell out of favor was the need for such procedures and the failure to understand that the recommended procedure must be followed exactly. For example, the common sense idea of loading the final somewhat below the manufacturer's recommendations will often destroy the tubes by causing excessive screen dissipation.

The mechanical design of the FTdx-400 is unexciting but adequate. The case is folded sheetmetal with a lid removable by taking out two screws and tipping it up. Everything is mounted on a medium-weight steel chassis; the finals, driver, and RF section are wired point-to-point on chassis-mounted sockets while everything else is on a paper-base phenolic



**Underneath the FTdx-400. Could this be the messiest underchassis of the 1960's?**

circuit board. The power transformer is mounted through a cutout in an extra heavy chassis section and runs as cool as any I've seen in a set at this power level.

## On The Air With The FTdx-400

My FTdx-400 came from the 1992 Virginia Beach fleafest where the seller reported that he had tried to put it on the air but ran into problems with the balanced modulator. There was some corrosion on covers and screws inside the set indicating that it had been exposed to condensation, probably in the salt air of the beach area. The asking price was $150.

Sets in this price range and down always have problems, but visible moisture damage can mean serious invisible damage as well--leaky paper caps, rusty bearings in the VFO tuning cap, even a bad power transformer. It was a risk. On the other hand, there was a copy of the manual, the finals and balanced modulator tube were said to be new, and the front panel appeared to have been covered with a sheet of plastic since day one. Late in the day we settled on a price of $110 and, with more than the usual assortment of mixed feelings, I hauled it out to the car.

Back at home a couple of days later I made the usual check for HV shorts, flipped the switch from OFF to CAL 100 kcs, waited a few seconds for the hollow state devices to come to operating temperature, turned the knob, and got a loud beat note. Gosh... the VFO calibration was off by a couple of kcs! But the receiver worked. Connecting it to an antenna showed normal sensitivity.

After a couple of minutes though, I noticed a sudden drop of perhaps 40 dB in sensitivity. $%&! I quickly found that switching the set OFF and back to ON would restore the sensitivity, but in a minute or an hour it would go again. I could produce the problem quickly by tapping around the center of the main circuit board with a fiber rod. A quick check on a dummy load showed good output from the transmitter on 80, though like the receiver it was intermittent. Well, time to check the tubes--an intermittent short in a tube (the 6BE6 mixer is the



continued next page

**Yaesu FTdx-400 from previous page**
worst actor of them all) is a frequent and easy-to-fix source of such troubles. Nothing found, but I replaced a couple of weak ones.

How many times in life one wishes afterwards that one had done the logical thing. In this case to inject signals at different stages in the receiver to localize the trouble. Instead I flipped the chassis over and began resoldering joints on the board. I found a couple that looked suspicious, but after two hours of careful work the problem was still there.

I returned to tapping. No one part seemed much more sensitive than the others, but the trouble definitely seemed to be in the area around the 6BE6 mixer and the adjacent 6BA6 IF. Finally I replaced both tubes. You guessed it--the trouble was the 6BE6 mixer that I had suspected in the first place. The tube tester still didn't see a problem.

Back to the transmitter. Hmmm--now there's no output at all. This time, logic prevailed and I followed the table of transmit signal levels. In about ten minutes I found a tiny solder bridge caused by my 'careful' (unnecessary) resoldering.

The balanced modulator problem turned out to be a stuck balance pot. A bit of carefully applied brute force got it past some mechanical hang-up, allowing perfect nulling of the carrier.

Checking all bands, the top two segments of 10 meters were dead on both receive and transmit and sure enough there was no output from the crystal oscillator on those bands. Crystals do sometimes go bad, but in this case the explanation was simpler--the HC-18/U wire lead crystals for these segments had been removed from their place on the front bandswitch wafers. Ours not to wonder why....

Transmitter drive was somewhat low on 40 meter, so I did a complete alignment of the transmitter and receiver following the instructions in the manual. There was no change in performance. The manual shows a 6BZ6 for the first transmitter (and receiver) IF instead of the 6BA6 which is in my set; the parts values are the same as those in the set so I made the substitution. The 40 meter drive and output was now ample. This was probably not a problem when the set was new, but with the increase in values of many resistors--10% here, 30% there--which generally occurs as a set picks up hours, a design which was barely okay became not good enough. No wonder those composition resistors went out of style, a film resistor won't change value.

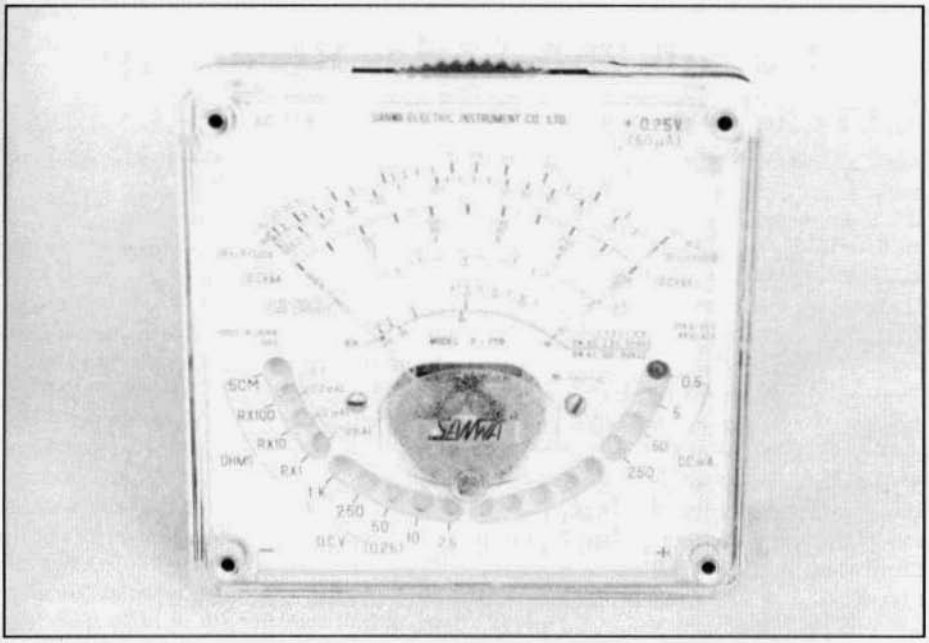
The VFO was off by as much as a kilocycle at some points, it took only a few minutes to bend the capacitor plates to bring the error down to a couple of hundred cps, which is about as closely as one can read the dial.

Warm up drift was a couple of kilocycles in the first two hours--not even close to the spec. The temperature compensation is adjustable by a differential capacitor with one arm hooked to an N750 ceramic and the other to an NPO unit; certainly this would be easy to fix.

Wrong! The adjustment didn't have nearly enough range. Several days of part-time trial and error followed, removing and replacing fixed compensating caps buried inside the VFO box until a combination was found which brought the drift within the range of the adjustment. The end result is 250 cps down in the first 15 minutes, after which it meets the spec. That's the best performance I know of for a set of this period and it is good enough that one is never aware of drift.

The values of the fixed compensating caps in my set were those shown in the diagram as 'nominal', and the differential cap was at its center position: I do not believe any attempt was made to compensate the VFO at the factory.

The RIT control was considerably off calibration, causing a jump of about 3 kcs when it was switched on with the knob at the zero. This, at least, was a simple problem--a 1000 ohm resistor which measured just over 1500 ohms.




**A Japanese electronic product which could have taught Yaesu a thing or two about quality. Bought by a young Ensign in the Akibahara district of Tokyo in 1963 for $17, this 20-range multimeter measures only 3-1/2" x 3-3/4" x 1-7/8" and is even today one of the most accurate at KJ4KV. The range switch surrounds the meter movement inside and points to the range in use with a red glass ball in the semicircle below the scales; it is operated by the ridged ring on top of the unit. I have lost the manual, but the motto of the Sanwa Electric Instrument Co., Ltd. will stick in my mind forever: "What bring comfort and convenience on your life."**

During the first QSO I found that the drive varied from time to time. Back on the dummy load, I discovered that the effect could be produced by tapping on the circuit board near the receiver second mixer and that it also affected the set on receive. I had not noticed that because the 3 dB variation in sensitivity was hidden by the AVC.

I won't list all the blind alleys I explored in finding this problem, but it was more than you find in a medium-size city. Eventually, in desperation, I pulled the mixer output network, which was the last part not already replaced in that corner of the PC board. This unit contains three 1/2" toroids, three ceramic trimmers, and a resistor squeezed onto a pair of 1" square circuit boards in a can about 2" high. One of the wires which supports the upper board projected 1/8" above the board, and one of the toroids was wedged against its sharp end, causing an intermittent short. This unit also had an 'almost short' between a bare wire and the terminal of one of the trimmers a few thousandths of an inch away.

The other vintage SSB sets in use at KJ4KV are a Heathkit HW-100, a National NCX-5, a Sideband Engineers SB-33 and a WRL Duo-Bander II. The FTdx-400 is more stable, more accurately calibrated, more powerful, and more user friendly than any of these--I particularly like the 25 kcs calibration marks, the dial lighting, and the slow, precise tuning.



**continued on page 33**

# The Collins 75A-Series Receivers: A Legacy of High Quality

## Part 4, the 75A-3 and Mechanical Filters

**by Ray Osterwald, NØDMS**
**10679 West Dartmouth Ave.**
**Lakewood, CO 80227**

When the Collins Radio Company announced their new mechanical filter design at the Institute of Radio Engineers convention at New York City in March, 1951, the effect was as if additional radio spectrum had been discovered. Not only was a new high standard of selectivity introduced, but the final link had been forged between an engineering concept and practical, low-cost single-sideband radio equipment.

Collins did not discover the principles of magnetostriction. These had been known well before the radio era. In 1878, Lord Kelvin wrote about the changes which occurred in the field of a magnetized iron wire when he applied controlled mechanical strains to the wire. Magnetostriction, was discovered some time later by an English scientist, Shelford Bidwell. In 1886 he described how iron nickel and colbalt wires changed their length when surrounded by varying magnetic fields. He was able, with a system of levers and mirrors, to measure a total change of one ten-millionth of the length of his sample materials. In our century, oscillators having their frequency controlled by magnetostrictive rods were first described by G.W. Pierce in the Proceedings of the American Academy of the Arts and Sciences for April, 1928. In this paper, Mr. Pierce discussed various types of magnetostrictive metal rods, among them monel, nickel, stainless steel, invar, stoic metal, nichrome, and other nickel alloys. These rods later became an essential component of mechanical filters. (This is the same Mr. Pierce who invented the Pierce crystal oscillator.)

Modern radio handbooks typically have a brief description of mechanical filter design, stating that there is an input transducer, resonant filter disks, and an output transducer. They are actually much more interesting than the space for these brief descriptions allows. When it is mentioned that the filter disks are resonant, it must be remembered that this is mechanical, not electrical resonance. At a typical IF frequency of 455 Kc, a free-space electrical half wavelength is 1,030 feet! The mechanical wavelength for that same frequency is much shorter than its electrical counterpart because mechanical vibrations have a much lower velocity of propagation. Therefore, a compact, high-Q filter may be built with half-wavelength physical dimensions and the same properties as an equivalent half-wave electrically resonant transmission line would have. That's what gives the mechanical filter its extremely narrow passband. The disks are merely mechanically resonant pieces of metal, and the filter bandwidth is set by the accumulated diameter of the disk coupling wires. In Figure 2, short lengths of coupling wire may be seen near each end of the filters. These are actually mechanical impedance transformers.

"Magnetostrictive" materials will expand and contract with changes in a nearby magnetic field. If we connect a signal source to a coil having a magnetostrictive metal core, mechanical oscillations are formed. If we attach that core to a series of resonant disks, a basic lattice filter is built. The more disks in the filter, the higher the loaded Q becomes. Perma-


**Figure 1, the Collins 75A-3 receiver.**

nent magnets are glued onto the transducers. These magnets provide a small magnetic bias which prevents the transducers from producing a second harmonic response. To visualize this action, a similar mechanical bias could be set up in an old style magnetic earphone with a steel diaphragm, if the plate was only allowed to bend in one direction.

The Collins mechanical filter was not developed overnight, but rather was the result of five years of hard work. The project began in Cedar Rapids in 1946, assigned to an engineer named Melvin Doelz. Only the initial research was done in Iowa, however. Early on, the project moved out to the Collins facility at Burbank, California, where most of the final development and all of the production took place. In fact, Rockwell still runs production on the filters out there, annually turning out between 3 and 5 million of them.

Mr. Doelz, who is not a licensed amateur, is a very friendly person who readily agreed to be interviewed for this article. He is still actively employed in engineering, and should be credited with the invention of the first successful mechanical filter. By agreeing to the interview, he has provided ER readers with much valuable background information unavailable from any other source.

I asked Mr. Doelz for not only the technical details of the mechanical filter design, but also for an outline of the steps which lead to a successful product.

As he described it, "Art Collins had been working on the single-sideband project at about this same time, developing the first single-sideband gear. He had a bunch of engineers in Cedar Rapids working nights and everything. He viewed the filter, and I think appropriately, as one of the key moves to making single-sideband practical on a commercial basis. The other filters were too expensive, so it became an integral part of the single sideband project. Bob Olsen, a young engineer who moved out to Cali-



**continued next page**

fornia to join us, worked on it a lot, particularly in the production phase. I did the development work myself, and had patents granted in several areas. I think there were more than two patents, some original ones which described the original configuration, and then there were some others granted for improvements, such as the ferrite transducer and some other things. Collins, at the time, had an in-house patent attorney. He liked to patent everything in sight."

Mr. Doelz said that RCA engineers started working on a post-war design for a mechanical filter before he did. RCA used fragile, thin, flat plates instead of the disks used in the Collins filter, and point-to-point welded wires connecting the centers of these plates. (The "Campbell" mechanical filter was described in the RCA Review for September, 1949, by RCA engineers Roberts and Burns). The RCA filter was a mechanical lattice structure, but was so fragile that Doelz and his associates couldn't use it. Not to be discouraged, he started looking around for a reasonable alternative. One day he came up with the idea of possibly using a disk to replace the thin plates. As he envisioned it, the disk would have a circular vibrational mode similar to a drumhead. The disk coupling wires could then be welded around the edges of the disks instead of to the centers of fragile plates. The entire filter structure would then be much stronger.

He began building the filter with a drill press and hand tools down at the Burbank Plant on Saturdays. He would cut a disk, grind it out to rough dimensions, and finish sizing it with emery paper. This was a slow, laborious process which required measuring the resonant frequency of the disk after every little bit of sanding.

Eventually the resonant disk requirements became known. By mid-to-late 1947, Mr. Doelz had a prototype filter. In the interim RCA gave up, leaving the field wide open for Collins to move ahead.

The mechanical filter turned out as good as Mr. Doelz expected it to be. The disks, due to their circular mode of vibrations, would run at standard IF frequencies much more substantially than in the RCA design.

Mr. Doelz told me a good story about this early period: "We installed one of the first ones into a Collins receiver we'd modified. I forget if it was the amateur or the commercial version. We stuck the filter in one and it worked fine of course. I remember we put a new label on the receiver and called it something else. Mr. Collins happened to stop out there on a trip, and we showed it to him. He thought it was great except he wasn't very fond of the label we'd put on the receiver. We'd just picked some number, and he was a little touchy about the numbers."

Getting a few engineering samples was relatively easy. A far more formidable task, getting efficient production going, lay ahead. They had to find disk materials with a zero temperature coefficient, and a workable magnetostrictive material for the transducers. Production machinery had to be designed from scratch and then tested. Technicians had to be hired and trained. Melvin Doelz's associate, Bob Olsen, was instrumental in getting past these critical phases.

As Mr. Doelz described this early period, "a lot of the development work, actually, the important work was involved in getting it so you could build the things in quantities with good yield. It was relatively easy, and fairly quick, to get some models out that worked. We put a lot of effort into getting the production line going. It was really a question of 'yield'. We started out with maybe 20% yield, and got up to 80 or 90% yield. We developed automatic machinery for measuring the resonant frequency of the disks. The alloy that's used is slightly magnetostrictive, so we could hit them with a magnetic field and they would ring, and we'd measure that frequency. We got a surplus coin sorting machine, the kind that you shake and the coins drop out. We tied it to a channel, and the disks would come

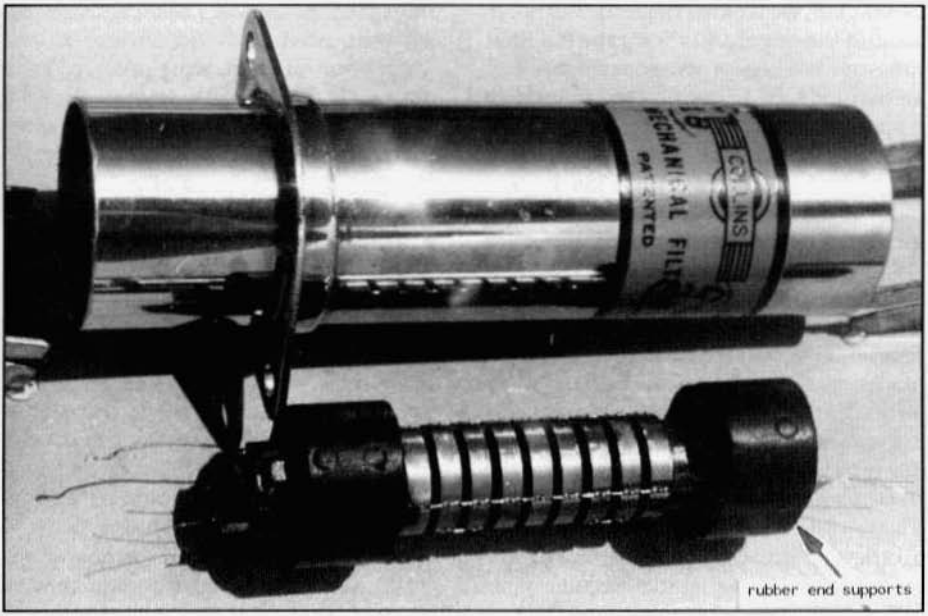



**Figure 2, R-390A mechanical filter.**

rolling out one at a time. There was a pick-up arm for each frequency range, a band of maybe 50 cycles. The disks would come down and the machine would automatically sort them according to frequency.

"The disks were made from Ni-Span C, a special alloy. There's another alloy that's used sometimes, Invar. The Ni-Span C was better for our purposes. We had to get it in batches of one ton, but one batch would last for several years. Ni-Span C was an alloy that had been developed for watch springs, and had a very low temperature coefficient. You need, of course, something that doesn't change its resonant frequency with changes in temperature. I found it when I was at a trade show, talking to some steel specialists from U.S. Steel. They had developed this special metal, and they were the only source and we were their only customer! We would go to them every couple of years or so, and they would stir up a batch of this stuff in one of their furnaces and ship it to us. It came in rod form. The steel company rolled it out to about the right diameter, and then we centerless ground the rod, cut it off, and then surface ground the disks to precise mechanical dimensions. Each batch had a slightly different characteristic. We had to do quite a bit of adjustment of production parameters, as there were spurious resonances showing up outside of the main passband, maybe going out to 40 dB below the passband. Every time we got a new batch we would have to readjust the parameters to fit the new batch.

"The trick to begin with was to get them close to the right frequency. We bought some fairly expensive equipment to do that. We had a big surface grinder that we used, and we got them down probably as close as you could get with ordinary machine methods.

"We also used a spot welder to weld the nickel coupling wires around the edge of the disks. It wasn't a special one, but we did a lot of work getting the right amount of current to get the right heat. That was a somewhat tricky, precise operation because we were welding pure nickel wire to the dissimilar disk material.

"When we had the filter completely



**continued next page**

**Collins 75A-Series from previous page**
assembled, we welded the coupling wires around the edge, and then gave it a final tune-up. We used a swept oscillator and an oscillograph to display the frequency response of the filter. The girls would look at that display, and they used a dentist's drill to make the final adjustment of the disks which needed it. Every girl had a drill at her station.

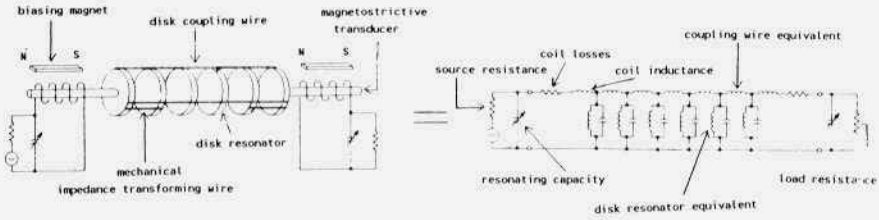
"If you think of the filter disk vibrating as a disk solid, it had a vibration mode where there were two stationary rings. Incidentally, you could see the vibration mode on the disks by sprinkling them with licopodium powder. Even at 455 kilocycles, you'd put the licopodium powder on a disk, and it would gather at the fixed locations on the resonance 'rings'. They would raise the frequency by taking a little off the edge, which reduced the mass that was moving in a circular manner at high speed. They lowered the frequency by drilling out and removing a little at one of the resonance rings, one of the static rings, which is where the material was flexing.

"We were moving in the other direction, increasing the compliance of the metal by drilling out near one of the rings. In an over-simplified fashion, think of a weight on a spring. As they drilled out the material on the ring, it was equivalent to weakening the spring, and as they drilled out the material on the edge it was equivalent to reducing the mass of the weight moving in a circular mode. Metal was removed to either raise or lower the disk's resonant frequency. The disks were pretty good to begin with, but we would trim them up a little bit, get them within the specs if they were out. I think the specs were one and a half dB ripple across the top of the filter passband.

"We used two types of drivers (transducers) for the filters. One of them was just a piece of annealed nickel wire that was butt-welded into the center of each end disk. Nickel is a good magnetostrictive material. There are a couple of coils that slip into a tube that's attached to the filter at the two ends. The nickel wire was self-supporting within these tubes. There's some careful work involved here, obviously. The nickel was very soft. If we bent it much it lost some of its magnetostrictive property, so we had to anneal it and handle it very carefully. That nickel wire was resonant, as I recall, at one and a half wavelengths. There were really two coils in each transducer, it looks like one, but there were two of them producing magnetic fields in different directions at two nodal points on the wire. The trick, of course, was that we had to get the loading on the mechanical ladder filter equivalent to the resistive load at the end of the electrical ladder filter. This magnetostrictive material, this pure nickel, had a very low "Q", about 20 or something, so it provided the necessary loading, in addition to being a transducer to convert electrical energy to mechanical and back again. Those filters had losses of 15 or 20 dB throughout.

"We had another type of transducer, in some of the larger filters, in which we used a ferrite rod that was cemented to a piece of wire that was in turn welded to the end disk. The ferrite rod was a much more efficient transducer, and we got down to losses as low as 3 dB. Both systems worked, and in an IF, a 20 dB loss wasn't too bad, because we had the signal boosted to a fairly high level before it got into the filter. (There is a good photo of a filter with ferrite transducers in the Collins book, *The First Fifty Years*, page 111.)

"There was no bandwidth trade-off between the two types of transducers. The filter bandwidth was determined entirely by the accumulated diameter of the outer coupling wires. The lower the diameter, the narrower the bandwidth, and the higher the diameter the wider the bandwidth. The resonant frequency of the disks alone determines center frequency. If the filter is not loaded down (if a load hasn't been supplied one way or another), what you see is over the bandwidth of the filter, and classic theory will tell you this, is a




**Mechanical Filter** **Electrical Equivalent**

series of sharp peaks, the same number as the number of disks in the filter. A five-disk filter would have five peaks, more or less equally spaced, with great big holes between them, maybe 40, 50, or even 60 dB down. That's a filter without its load. If the load is put in, the valleys fill up and make a nice smooth passband. You don't change center frequencies by anything you do with electrical termination."

In addition to the formal introduction at the above mentioned IRE show, mechanical filters were the subject of a four-page article in the Collins company magazine *Signals*, for Summer, 1952. This article is mostly good company photographs of the filter construction, and photos of installation into a 75A-2A. There is an IF response curve comparing conventional VS mechanical filter response, but not much more text over what is given in typical receiver instruction books.

*QST* ran a three-part article, "Magnetostriction Devices and Mechanical Filters", by Walter Van B. Roberts, W2CHO, of Princeton, New Jersey, June to August, 1953. Mr. Roberts was one of the authors of the original RCA article in 1949. This series is a very detailed description of the basic principles, and of the possible uses of magnetostrictive ferrite devices. It concludes with a construction project, including dimensions, of a filter based on the old RCA design. This is a very impractical article, as most hams are not able to build their own watches, either!

With the introduction of a workable mechanical filter, the picture of a modern receiver was at last complete. When Collins announced the 75A-3 in December, 1951, we entered the modern communications receiver era, having come a long, long way in the 61 years since Sir Oliver Lodge revealed his "coherer" detector in 1890. For the first time a receiver was available that was essentially drift-free, had truly sharp selectivity and super sensitivity, was accurately calibrated, and relatively compact.

Commercial customers had the filters available as add-on kits in the 51J-series receivers, and the military got them in the R-388A with a plug-in IF adapter. Also, for the military efforts, they were designed into the IF subchassis on the new R-390A receiver. They started to show up in new transmitter design as well, and were used to reduce transmit band width, which in turn reduced wide-band noise.

## The 75A-3 Electrical Design

Lou Couillard's 75A-2 was turned over to engineer Gene Senti in mid-1951 for an update incorporating the new mechanical filter. Electrically and mechanically, the 75A-3 is virtually identical to the 75A-2, with the exception of the added filters and IF amplifier. Up to the first IF amplifier, there are no changes. The component numbers and values are all the same.

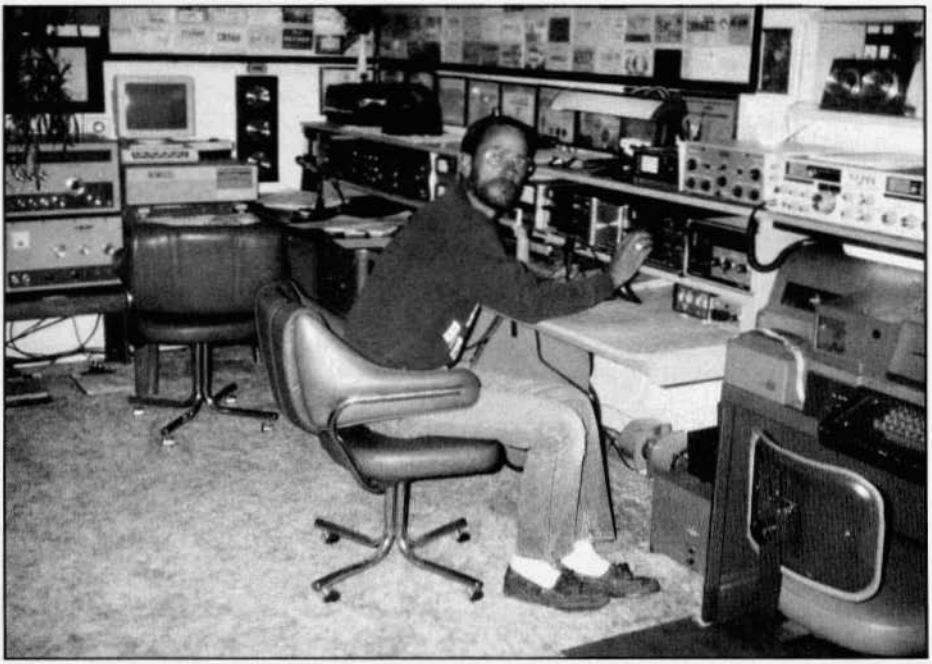
The first IF amplifier, a 6BA6, is used to give the IF strip about 20 dB additional gain to overcome the losses in the mechanical filters. In fact, this stage and its filters are the only significant changes. The next three amplifier stages are entirely conventional, running slightly


**continued on page 34**

AM'ers at the most recent Deerfield, New Hampshire hamfest. Left to right: VE2MUX, K2IJY, WA2PJP, KA2BWH,K1KV, WA3VJB,WA1HLR, K1JJ.


Mack Wilson, NK5T, in his shack, which consists of mostly Collins equipment. Mack says that he and several other AM'ers in the El Paso area get on 29.010 at 8 PM every Wednesday evening.

August Stellwag, a shortwave listener from Orangeburg, New York with some of his vintage receiver collection. He says that he has been an SWL since 1948 and enjoys using the vintage receivers he could not afford as a kid.



Don Zielinski, KØPVI, at one of his several operating positions. Don is the curator of the Colorado Bighorn Amateur Radio Museum, which is located at Watkins, Colo.

# LETTERS

**Dear ER**

Bruce Adland's fine review of the Morrow Company (ER #43, Nov. '92) brought back memories of mobiling in the late '50s. Compact design and top-notch performance were dominant features of the Morrow Twins.

The Salem, Oregon company actually manufactured three of the MB-560 series transmitters:

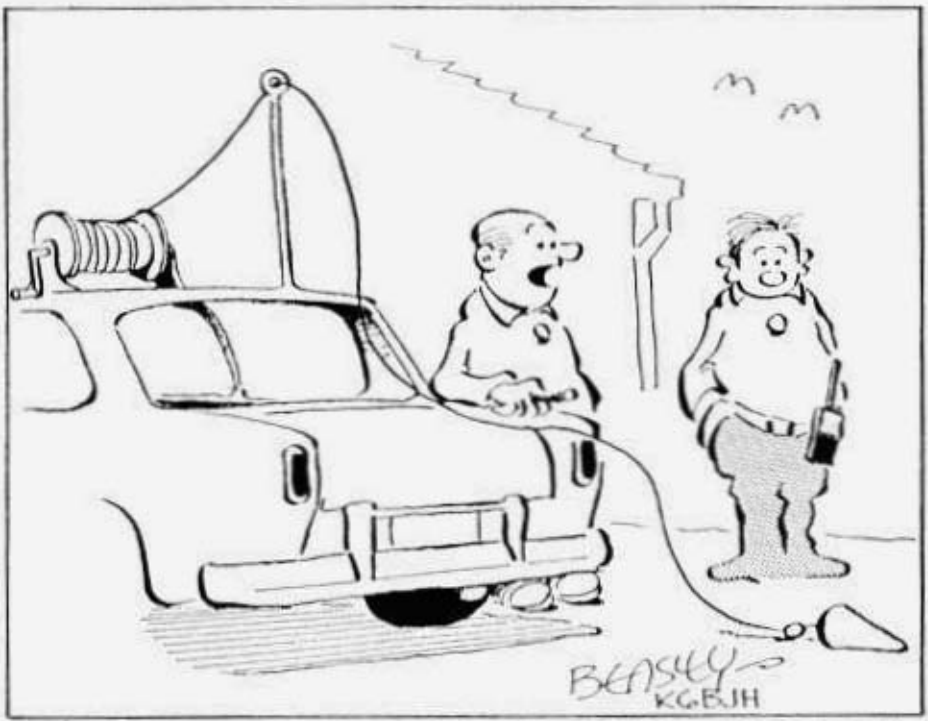
1) The MB-560 was Morrow's first unit, and featured a switch-selectable audio limiter and 300 to 2500 Hz bandpass filter for "communications" audio. The circuit could be switched out for a wider audio response.

2) The MB-560-A was essentially the same as the '560, but with the limiter and bandpass filter eliminated in an attempt to contain production costs.

3) The last unit produced in the late '50s was the MB-565 which was pictured in Bruce's article. This unit featured a rotating drum dial (earlier units had a slide rule dial). Electrical characteristics remained essentially the same as those of the earlier models. The MBR-5 receiver was also updated with the newer dial assembly and became the MBR-6.

The Morrow Company did manufacture at least one additional rig after Ray Morrow left in the early 1960s. The PW-75 transmitter was a 4-tube (including OZ4 rectifier), 8-watt crystal-controlled rig that featured a permanently attached microphone. The matching TC-75 converter was a 3-transistor unit with an IF output of 800

**continued on page 32**




IT'S A TRAILING WIRE ANTENNA FOR 160, BUT I HAVE TO REEL IT IN AT EVERY STOP SIGN OR SOME IDIOT WILL SNAG ONTO IT!

## 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 SPAM net starting at 5:00 CA time; **40 meters** - 7160, 7195, 7290 are the main freqs. Westcoast SPAM net every Sunday afternoon, 4:00 PM on 7160; **80 meters** - 3870, 3880 and 3885 are the main freqs. Westcoast SPAM 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.

## From the Editor:

**160/10-Meter Contest/Jamboree Christmas Weekend, Dec. 25-27**

This year I've decided to combine the 10-meter contest with the annual 160-meter contest. It should be a lot of fun; like work 10 all day and then stay up and work 160 all night. In reality I think there are a lot of 10-meter AM ops that do not work 160 and vice versa. Anyway, we'll see how it works out.

The contest starts on Christmas evening as soon as 160 opens and will end on Sunday night, the 27th, or early on Monday the 28th when 160 closes down. The rules will be the same as in other contests: 1 point per contact, AM station to AM station, and logs must show the standard information.

This year I think we can count on some DX on 10 and to work some long-distance stations on 160. Conditions could be good on both bands.

Speaking of DX, it seems that more and more DX stations are showing up on 10. In a recent conversations I had with 10-meter stalwart, Fred, N8HYR, I was really impressed with the list of DX he's worked this season. Ten has been surprisingly good so far. Let's hope it continues on into the New Year. And if 10 should fold up, let's not forget 15-meters; it's a great alternative to 10. And as I've suggested before, let's operate above 21.400 on 15.

Regarding 15-meter activity, I received an interesting letter from Dennis Petrich, KØEOO, recently. Here's part of what he had to say,"This last Saturday, 11/29/92, Stan Tajima, JA1DNQ/KD2HB and I worked an AM schedule on 21.250 mHz at 0000 UTC. We set up on SSB and quickly went over to AM. Stan was using his Ranger II and 3-element beam and I was using my Valiant and 3-element beam. We were able to carry on for almost an hour before QRM got the better of us. I was coming in an S3 on Stan's 75S-3 and Stan was coming in a solid S9+ on my NC-300. If it hadn't been for the QRM the contact would have been very easy! I must say it was exciting to work AM across the Pacific with such low power. Stan was really thrilled as well. We plan to do more of this in the future with other rigs and on different bands."

On the West Coast, 160-meter activity seems to be taking precedence over 75-meter activity. There seems to be more activity this year than any other in the past. And conditions seem to be incredibily good at times. Barrie, KF7VA, reports that on one evening, recently, there were 7 states represented in 1 roundtable. He asked me if anyone had ever worked all states on 160-meter AM. I told him that I didn't know. Does anyone have any info on this?

Let's all show up for the Christmas week end Contest. It should be fun. **N6CSW/Ø**

# The 1933 Camper's Companion

**by Bob Dennison, W2HBE**
**82 Virginia Ave.**
**Westmont, NJ 08108**

The Camper's Companion is a complete radio receiving set designed to meet the needs of the young camper of 1933. It kept him in touch with the outside world by bringing him weather reports, news, time signals, music, drama, religious programs, and church services. Entirely self-contained, the Companion includes six plug-in coils, headphones, a flashlight and all necessary batteries. A drawer is built-in to hold various accessories such as a callbook, pencils, antenna wire, a jackknife, compass and a pocket watch.

The main door in front swings up to give access to the radio and the drawer. A dial calibration chart is attached to the inside of this door, showing the tuning range of each color-coded coil. The receiver tunes from 540 kc to 19 Mc. Thus it covers the broadcast band, the 160, 80, 40 and 20 meter ham bands, and seven short wave BC bands. These are identified on the tuning chart so that they may be found easily. The plug-in coils are housed in the compartment on the left. When the door is opened, the coils swing into view and become readily accessible. The compartment on the right holds the headphones


**Figure 1. The 'Campers Companion' was exhibited at the 1992 Antique Wireless Conference where it won a 2nd place award in the one- & two-tube receiver category.**

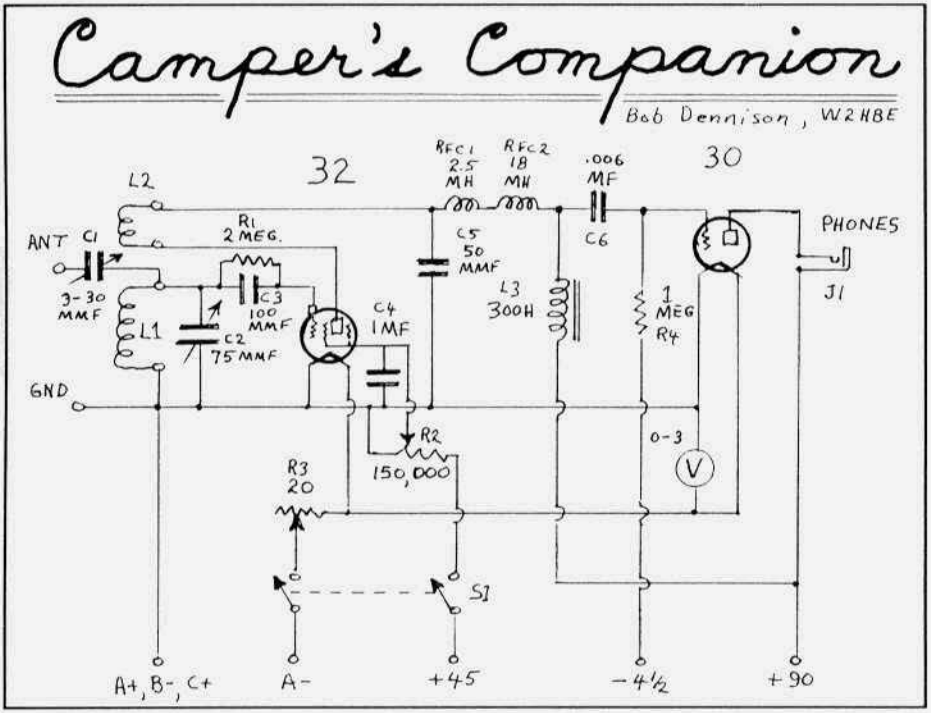



**Figure 2.**

and a Brownie flashlight. The headphones are the 2000-ohm Trim Featherweight type chosen for their compact size and high sensitivity.

At the rear is the battery compartment. The A battery consists of two No. 6 dry cells. A pair of Burgess No. Z30N 22-1/2 /45-volt batteries are used for the B supply. A Burgess No. 5360 battery provides 4-1/2 volts bias for the amplifier tube. Military surplus equivalents to these hard-to-find batteries can be obtained from S & G Electronic, 618 S. 62nd St., Philadelphia, PA 19143.

Tube Choice. Late in 1930, RCA introduced the 30 and 32 tubes. Because of their low filament current (only 60 mA) they became very popular with set builders as attested to by numerous articles in *Short Wave Craft* magazine. The 32 is a screen-grid tetrode which yields high gain as a regenerative detector. Since its plate resistance is very high, transformer coupling is ruled out and either resistance or choke coupling must be used. The latter is usually chosen because it gives higher gain for a given plate supply voltage. The 30 is a triode and, with its much lower plate resistance, is well suited for driving a pair of headphones.

**The Circuit**

The receiver schematic is shown in Fig. 2. It will be recognized as a widely used circuit of the thirties. The only problem encountered was excessive regeneration. This was cured by reducing the value of C5 to 50 mmF. Because of the wide tuning range, two RF chokes are employed. The antenna trimmer, C1,is a mica compression condenser which can be adjusted for best results depending on frequency and the length of the antenna. More C will give louder signals, but at the expense of lower selectivity. Another use of C1 is to eliminate 'dead spots'. When the receiver is tuned to the resonant frequency of the antenna, the antenna will absorb energy from the tuned circuit, lowering its Q and


**continued next page**

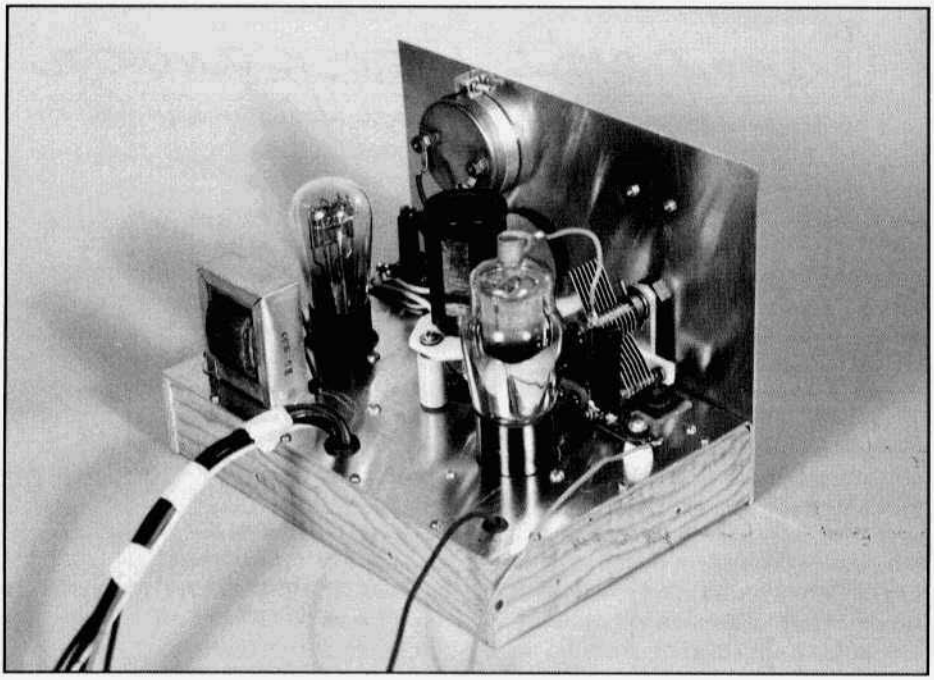


**Figure 3. Rear view of the Camper's Companion radio.**

hence the gain of the detector. Changing the value of C1 will move the dead spot to another frequency. The complete cure is to add an RF amplifier stage ahead of the detector, but that would defeat our goal of low cost and simplicity.

When your campsite is many miles from the nearest radio store, a burned-out tube is very bad news. For this reason a voltmeter is used to monitor the filament voltage. Filament voltage can be reduced when receiving strong signals. This will extend battery life. Figure 3 shows the rear view of the radio.

## Cabinet Details.

The cabinet is made of plywood and pine. The inside of the cabinet is finished with clear polyurethane and the outside finish is polyurethane enamel in nutmeg brown. Corner protectors dress up the cabinet and contribute to its period appearance. All hinges and snap-catches are of antiqued brass. The catches for the side doors are homemade and the knobs are made from old hard-rubber binding posts. Rubber feet are attached to the underside of the base. A 15-page set of drawings is available from the author for $2.25 ppd. Included are coil winding data, tuning ranges, schematic with parts list, chassis and panel drawings, and sketches of cabinet members.


## Acknowledgements

The author would like to thank James C. Newton for permission to use some of his ideas in cabinet design and John Waring, WB2KMW, for fabricating the cabinet. The Camper's Companion was exhibited at the 1992 Antique Wireless Conference where it won a 2nd place award in the one and two tube receiver category. As part of this exhibit, the author's wife painted a backdrop depicting a camp scene showing a wooded area, a lake, a canoe and a tent. A piece of No. 22 hookup wire was strung between two trees in the drawing and then ran down to the antenna terminal of the Companion. This gimmick drew much amused attention to our exhibit. **ER**

# OLD QSL CARDS TELL A TALE

**by Bill Camp, KF2IU (ex- KN3HFU, ex-K3HFU, ex- W2HVV)**
**203 Cayuga Heights Rd.**
**Ithaca, NY 14850**

What do people do with their old QSL cards? Well, if you put them in chronological order, you can trace your movements from band to band, first trying 80 meter CW, then 40 meter for some more distance, then you got your general license and were on 75 meter fone, and then 10 meter fone for some real DX. Or you can see that you really were on the air for bursts of activity: right after getting your first license, of course, at the beginning of summer vacation; and after building a new transmitter with a push-pull 35TG's and 809 modulators. Or you can see how many hams still have their same call signs (Not very many, I'm afraid).

Well, when I started glancing through my stack of 150+ old QSL cards from 1959-1962, I was struck by the wealth of information on them about the equipment of that time. So I decided to compile some statistics about the transmitters and receivers from back then, and see if there was any story that they told. The 4 years covered my 9 months as a novice and the remainder as a general class licensee, with about an equal number of CW and fone contacts. The bands operated were 160 meter fone, 80 meter CW and fone, 40 meter fone, and 10 meter fone. Here is what I found:

First, transmitters. Of 151 different transmitters, there were 34 different models represented. Grouped by manufacturer, the list consisted of:

64 Heathkit
25 Johnson
21 homebrew
14 World Radio Laboratories (Globe)
27 miscellaneous

I had a Heathkit DX-40 myself, but I had not realized, even then, how Heathkits so dominated the transmitter market. Johnson representation is quite decent considering they had fewer kits and were considerably more expensive. But, look how many were homemade! They ranged from low power 807 and 1625 versions to 813's, 812's, or 806's usually modulated by 811's. One boasted of 150-200 watts input to a pair of 1625's! Here is a truncated list of the models:

23 DX-20 (Heathkit)
13 DX-40 (Heathkit)
12 DX-100 (Heathkit)
11 Globe Chief (WRL)
8 DX-35 (Heathkit)
7 Viking Ranger (Johnson)
6 Viking II (Johnson)
6 Eico 720 (Allied Radio)
4 Apache (Heathkit)
4 Viking Adventurer (Johnson)
4 AT-1 (Heathkit)
4 Viking Valiant (Johnson)
3 Globe Scout (WRL)
3 Viking Challenger (Johnson)

As for receivers, variety was much more prevalent, with 69 different models mentioned. And, the dominant force was Hallicrafters. Grouped by manufacturer, there were:

52 Hallicrafters (15 different model numbers)
26 Hammarlund (9 different model numbers)
26 National Radio (14 different model numbers)
12 Heathkit (3 model numbers)
6 Collins
29 Other various brands

In a dramatic difference from the transmitters, only 2 receivers were homebrew! Only 3 regenerative receivers were mentioned (2 Knightkit Ocean Hoppers and 1 homemade with a 1D8GT tube). A short list of the receiver models showed:


**continued on page 34**

# The Heathkit Series of Q-Multipliers

**by Edward Peter Swynar, VE3CUI**
**3773 Concession Rd. 3, R.R. #8**
**Newcastle, Ontario L1B 1L9**
**Canada**

As most any veteran user of modestly-priced 1950s-'60s vintage receivers knows, it's pretty tough to beat a Q-multiplier when it comes to an inexpensive, easy-to-install means of improving the selectivity of "boat anchors". The Heathkit series of Q-multipliers shines as an excellent and readily-available peripheral in this regard.

Making its debut on the amateur scene in 1956 (see the product review in the April 1956 issue of *QST* magazine), the original $9.95 model QF-1 kit, with its effective Q of 4000, would "...provide extra selectivity for separating signals", and, "...reject one signal to eliminate heterodynes". The circuit worked. Indeed, at least one subsequent "homebrew" Q-multiplier design was patterned remarkably close to the original Heathkit standard (see the article "Variable Bandwidth Q Multiplier", by Ronald L. Ives, in the April 1957 issue of *QST*—informative reading for anyone contemplating the use of one of these devices).

The original Heath version suffered only from the lack of an internal power supply; the 1950's ham was expected to tap into the auxiliary power socket of his receiver to provide the 150-250 volts B+ (2 mA.) / 6.3 volts AC (300 mA.) required by the QF-1.

By 1961, Heathkit imparted their Q-multiplier with a fresh "classic Heath green" paint job, a pilot light, and a built-in 150-volt power supply. Even though the model number was changed to HD-11, inside it was still the classic QF-1.

One drawback to both models is the limited frequency excursion available from the L/C tuned network, specifically (as stated in the Heathkit manual), 450- to 460 kHz. If your receiver had an intermediate frequency of 455 kHz—universally-used, for all intents and purposes, in modestly-priced rigs of this era—it is a simple matter to adjust L2 and bring the QF-1/HD-11 into alignment. My RCA AR-88LF, however, has an IF of 735-kHz.

Enter the ARRL "Lightning Calculator". Despite Heath's spec sheet, the absolute upper frequency limit of my QF-1 was just above 500 kHz; well-removed from 460 kHz, but a far cry away from the IF of my receiver. With L2 at minimum inductance (120 uH), my calculator indicated that the capacitive portion of the tuned network was some 830 pF (C6 and C8—3300 pF and 1100 pF, respectively—in parallel). The Lightning Calculator went on to show that this same inductance, in a tuned network with 375 pF of capacitance, would resonate near 735-kHz—just what the doctor ordered (note that any changes in the components of the tuned circuitry should be made in the capacitors, rather than the original, self-shielding, high Q—minimum of 200—variable inductor).

The stock "postage-stamp" micas were replaced with dipped silver micas that I had on hand (1500 pF and 500 pF for C6/C8), and the QF-1 immediately played beautiful music on 735-kHz, as confirmed by my coupling its output to the antenna jack of a general coverage receiver (listen for strong oscillation in either the peak or null setting, with the controls for both set fully clockwise). With preliminary alignment complete, the plate pin of my receiver mixer tube was connected directly to the modified QF-1 by way of a short piece of RG-58 coaxial cable.

Results with my AR-88LF exceeded all expectations tremendously: despite the fact that this vintage receiver incorporates a phased crystal filter to achieve tight selectivity ("world-class" stuff in


**The modified QF-1 on the left and the stock HD-11 on the right.**

1944!), the improvement with the Q-multiplier is dramatic---even with the receiver's selectivity position at the maximum 500-Hz setting. CW signals seem to jump right out of a considerably reduced background noise level, in what is a close approximation of classic single signal selectivity. Indeed, the variable Q of the circuit can be raised so high as to induce a pronounced ringing effect on CW signals...not particularly desirable, maybe, but certainly impressive.

AM phone signals during "prime operating time" benefit, of course, from the null position of the QF-1, but I am more inclined to "peak" these signals when conditions became rough due to QRM. As with CW, background noise tends to become reduced, the signal increases in strength (evidenced both audibly and by the S-meter), and, more often than not, what may have previously been a hopeless situation now becomes Q-5 copy (at the loss of high fidelity in AM, unfortunately---but still a worthwhile sacrifice in otherwise impossible instances).

One very important point: if your receiver is of the AC/DC type (like the Hallicrafters S-77A) DO NOT ground the braid of the coaxial cable lead from the Q-multiplier directly to the receiver chassis (which could be "hot" with 115 VAC!), but rather "ground" the braid through a .01 uFd. disk ceramic capacitator, of the appropriate voltage. Better still, install an outboard isolation transformer (115 volts primary, to 115 volts secondary) whose current capacity comfortably exceeds that drawn by the receiver. "SAFETY FIRST, LAST, AND ALWAYS".

Don't overlook these forgotten gems at your next hamfest. For the investment of a few dollars (my QF-1 cost me $5, the HD-11 was a donation from my friend KA9QLF), you can make even upscale vintage receivers sound like a million bucks—even those that already seem good in "stock" configuration. Best of all, your rig can be returned to its original condition with hardly any effort. If you wish, you can even make a classic '50's 'chicken connection' by accessing the mixer tube through the receiver's lid, and wrapping the output lead around the actual pin of the tube itself before plugging it back in!

**ER**

# Yet Another Valiant Speech Amp Mod

**Rob Brownstein, NS6V**
**3881 Winkle Ave.**
**Santa Cruz, CA 95065**

Does the world really need another modification for the Viking Valiant's speech amplifier section? Probably not. Nevertheless, this modification has produced some very gratifying comments and it eliminates two vacuum tubes from the original circuit.

Like most Valiant owners, I was not pleased with the sound of the stock speech amplifier section. E.F. Johnson had succeeded in giving the Valiant the distinctive, pinched quality of a latter-day SSB signal. This may have been good news for those intent upon intelligibility at all costs, but to new-age AM'ers the stock Valiant audio quality leaves a lot to be desired.

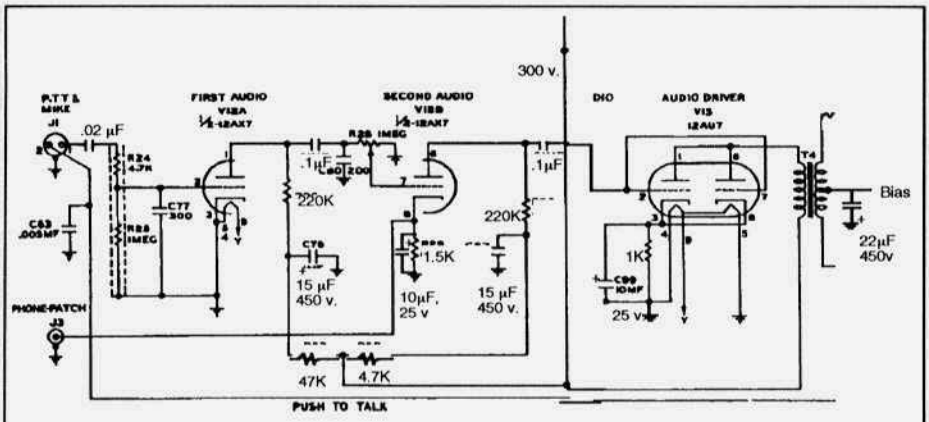
While contemplating making one of the modifications I had come across in *Electric Radio*, I remembered a modulator circuit I had seen the ARRL Handbook, Edition 38, 1961, pp. 276-278. It was a 120-watt modulator featuring a 12AX7, a 6C4 and a pair of 6146s. Sound familiar? The tube lineup was certainly close to that of the Valiant, but missing were the 6AL5, the clipper filter, and the 12AU7. It occurred to me that if this speech amplifier circuit could produce enough drive for the 6146 pair, with only the 12AX7 and 6C4, then I could probably do the same for the Valiant.

The modification I chose to make uses larger value coupling capacitors than the circuit in the Handbook. I also used the 12AU7 instead of the 6C4 because I felt the parallel triodes would make a better impedance match than the sole 6C4. (I did try it both ways, however, and found little difference.)

The diagram included shows the stock speech amplifier after the modification. The input capacitor value to the first stage was increased from .005 uF to .02 uF for a little more low end. The plate resistors (to the plates of the 12AX7) are now both 220 K ohms and 4.7 K ohms (1 watt), respectively. The interstage coupling capacitors are increased to 0.1 uF, and are mylar rather than paper. The cathode resistor on the second 12AX7 triode is now 1.5 K ohms in parallel with a 10 uF (25-V) bypass capacitor. Finally, a 22uF (450-V) capacitor is connected from the interstage tranformer's bias lead to ground.

I made no provisions for introducing negative feedback in the system, having decided to wait until I air-tested the modified Valiant. I am fortunate to live on the West Coast where I am able to gather critical assessments from such august AM'ers as W6BM, W6HDU, K7INK, W9FGJ, W6PSS, KC6VWM and others, on 3870 and 1950, virtually any night of the week. The first night I tried out the modification, the comments were very good. Bill, K7INK, said, "Whatever you did, don't make any more changes, it sounds just great."

I have used it now on 160, 75, 15 and 10 meters, for about a month, and have gotten uniformly positive comments. Therefore, I decided not to add a negative feedback network. The microphone I'm using is a new D-104, with the preamp in the mike stand disabled, and the output coming directly from the crystal cartridge. **ER**




**Modified Valiant Speech Amplifier Section**

**The author in his hamshack. Vintage gear on the top shelf includes a Ranger I, Valiant and National NC-303.**

# A Product Detector for the NC-183D Receiver

**by Hank Scharfe, W6SKC**
**P.O. Box 6160**
**Nogales, AZ 85628**

Rather than build up a plug-in 'kludge' [Webster's Dictionary - "1. (slang) a ridiculous assortment of unmatched and unworkable parts."], I built my kludge into the receiver, and the 6SN7GTB plugs right into what was called "X2 ACCESSORY SOCKET". All the front panel controls work as normal. The CWO switch still turns on the BFO and the CWO control is still the variable (and very stable) VFO. Per the modification, when the PHONO-RADIO switch is in the RADIO position, the BFO (even if ON) does not inject its signal into the AM detector. The AM detector is permitted to operate all the time as far as deriving AVC voltage, S-meter drive, etc. When in PHONO, the BFO must be turned ON. Otherwise the product detector outputs no signal. That is the way it should be.

**Installation**

1) Turn receiver upside down and remove all connections to ACCESSORY SOCKET X2, EXCEPT the three white/brown wires connected to pin 7. These lines are the 6.3 VAC filament line and will be used "as-is" with the 6SN7 product detector.

2) Install a jumper between pin 3 and pin 6. Solder pin 3.

3) Install a 680-ohm resistor between pin 6 and the socket ground lug near pin 8. Solder pin 6. Do not solder the ground lug.

4) Install a jumper between pin 8 and the same ground lug.

5) Parallel a 100-pFd (silver mica) capacitor with a 100K resistor and connect between pin 1 and the same ground lug. Solder the ground lug.

6) Connect a 10-pFd capacitor to pin 1 and solder pin 1.

7) Connect the open end of this 10-pFd capacitor to the white/green (IF input) wire and solder. Shrink tubing may be used to insulate this connection.

8) Connect a 100K resistor between pin 4 and the socket ground lug near pin 4. Do not solder either pin 4 or the ground lug.

9) Connect a 100-pFd capacitor to pin 4 and attach the other end of this capacitor to the junction of C88 (tubular ceramic) and R46 (100K) at the terminal lug located between V8 (6AL5) and V15 (OB2). Solder both pin 4 and the connection at the junction of C88/R46. Disconnect the other end of C88 from pin 2 of V8 and let it 'float'.

10) Install a .01 capacitor between pin 2 and the ground lug near pin 4. Solder the ground lug. Do not solder pin 2.

11) Install a 470-pFd capacitor between pin 5 and the ground lug near pin 5. Solder the ground lug. Do not solder pin 5.

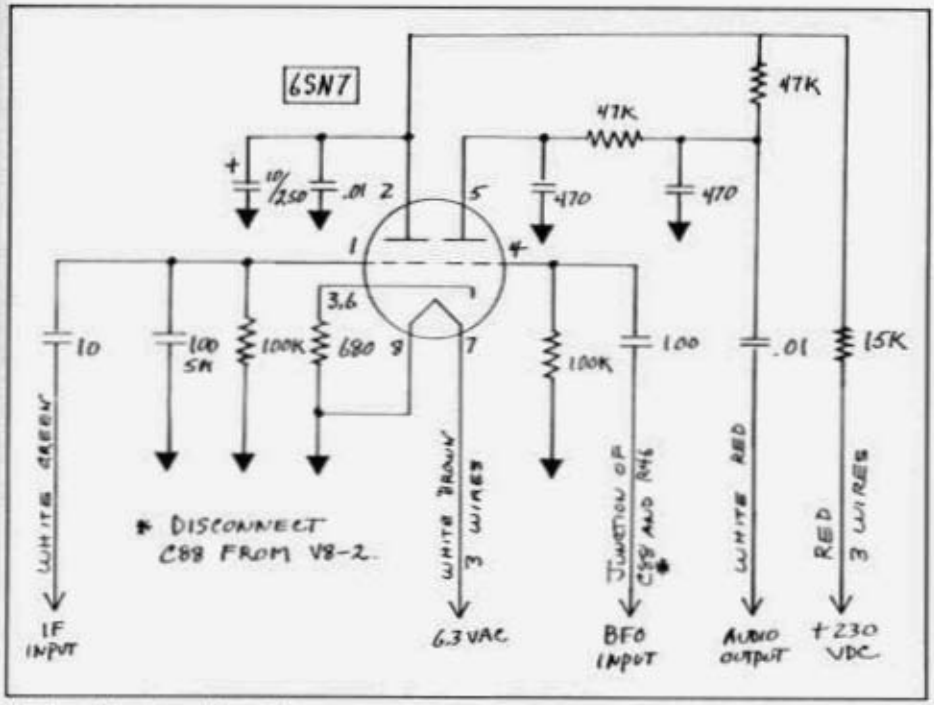
12) Prepare the component-kludge (KC) as shown in Figure 1.

This KC consists of two terminal strips. One strip has one ground lug and two ungrounded lugs. The other strip has a ground lug and three ungrounded lugs. The two terminal strips face each other with their mounting lugs overlapped and lightly soldered together. A common ground busswire should be run between the two ground lugs for rigidity.

Mount the three resistors and the two capacitors as shown in the drawing. Solder a short (2-inch) insulated wire to the upper left (47K) terminal and the lower right (15K/47K) terminal. These wires will be attached to pin 5 and pin 2 after the CK is mounted above the X2 socket.

13) Mount the CK one inch above the chassis and directly over the socket by soldering a short piece of 12 gauge busswire between the ground lugs of the CK and the socket ground lug near pin 8. Resolder pin 8.

14) Connect the two loose wires of the




**Product detector schematic**

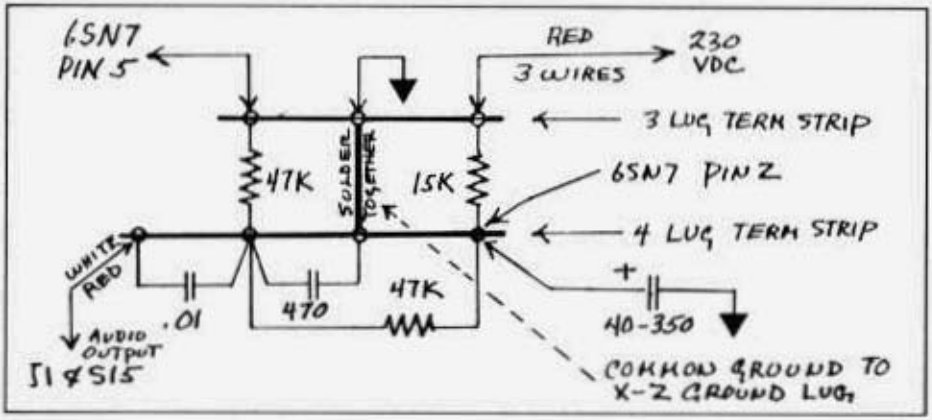



**Figure 1, component 'kludge'.**

CK to pin 5 (47) and pin 2 (15K/47K).

15) Connect the three red wires to the lug that has the "open" end of the 15K resistor attached to it.

16) Connect the white/red wire to the lug that has the "open" end of the .01 capacitor attached to it.

17) The white wire (which was originally attached to pin 5) should be tied back and insulated with tape or tubing. Do not cut it short. It will be used in the AVC-MVC modification.

18) A small 250 VDC electrolytic capacitor should be connected between pin 2 and the open ground lug of the terminal strip directly in front of X2. pin 2 is also



continued next page

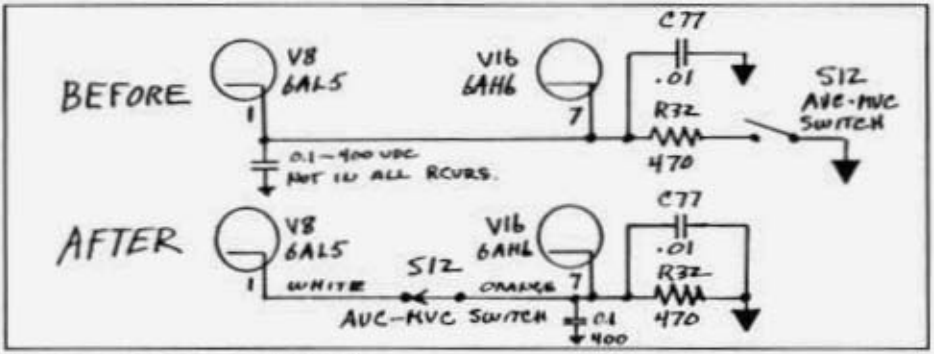



**Figure 2, AVC-MVC modification.**

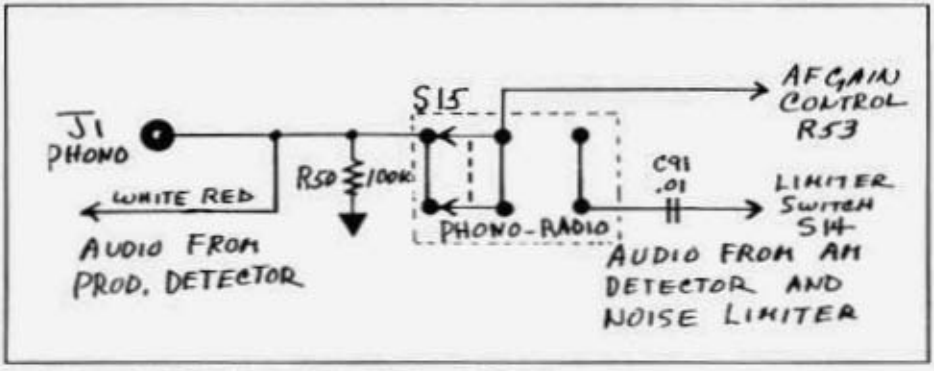



**Figure 3, S15 PHONO-RADIO switch modification.**

available at the junction of the 15K and 47K resistors on the CK and its mounting hole (thru the phenolic) is a convenient location for the positive terminal of the capacitor. Any capacitance between 10 and 50 mFd will be very adequate.

19) Install a 6SN7 tube in X2 and turn the receiver ON. The lighting of the tube's dual filament and the absence of smoke indicates that the modification is probably correct.

**CAUTION:** The outer tin can cover of the large filter capacitor (C64A/B) between the power supply's filter choke and the OB2 voltage regulator is floating +65 volts off of ground. It is "hot" enough to be a nuisance and it might be dangerous. Be Careful!

20) With the receiver in the RADIO mode, all functions should be normal, except the BFO injects no carrier when the CWO switch is ON. AM only.

21) Switch to PHONO, turn ON the CWO (BFO) and tune in a SSB signal. For LSB, set the CWO clockwise from zero to 1.5. For USB, set the CWO counter clockwise from zero to 1.5 (Assuming that the that CWO is "zero beat" at "zero"). Good audio quality with the RF GAIN set at 10 indicates that the product detector is functioning properly.

22) If satisfied that the product detector is working correctly, proceed with the AVC-MVC modification as indicated in Figure 2.

23) Locate the white wire that was "tied back" in Step 17 above, add a few inches of additional wire and attach to pin 1 of V8 (6AL5).

A 0.1-mFd, 400 VDC capacitor may also be attached to pin 1 of V8. More about this later. It is not shown or listed in 1953 manual.

24) Locate R32 (470 ohms), that is con-

nected to pin 7 of V16 (6AH6). Disconnect this resistor from the orange wire on the terminal lug and reconnect to the adjacent ground lug of this terminal strip, which places it in parallel with C77 (.01 disc ceramic), which is also attached to pin 7 of V16.

Rather than move the orange wire on the now open lug (vacated by R32), add a small orange jumper between the lug and pin 7 of V16. We may have a use for this lug in the future. See Step 27-3.

25) Locate the AVC/MVC switch (S12) at the front panel and remove the lead that is tied to the ground lug on the chassis directly below.

26) Locate the white wire that is attached to the PHONO-RADIO Switch (S15), disconnect it, lengthen it and connect it to the now open terminal of the AVC-MVC switch (S12). See Figure 3.

27) Reference Step 23 above, some NC-183Ds may have had a 0.1-mFd, 400 VDC plastic-encapsulated paper capacitor tied between pin 1 of V8 and a ground lug that already has C78 grounded to it.

This 0.1/400 capacitor may not be shown in the photos of the schematic of the receiver's manual, but it may have been added to all receivers before shipped to the customer.

It is easily added to the receiver and definitely improves the AVC action of the receiver.

It can be added to pin 1 of V8 or to pin 7 of V16.

If you select the latter location, it is best connected to the open lug of the terminal strip to which the short jumper was added in Step 24-2 above.

Since this product detector is "identical" to that of the Collins 75A-4, the noise limiter (V12) and the AVC noise clipper (V16) circuits of the 75A-4 can probably be added to the NC-183D also. That would result in a very fine SSB receiver with all-band coverage.

For my own use, I installed a miniature SPDT toggle switch just to the right-rear of V8 (6AL5, 2nd Det. AVC). The loose end of C88 goes to one side of the switch and the other side of the switch goes to pin 2 of V8, permitting CW and AME reception thru the original nonlinear detector. **ER**

---

**Reflections from page 2**

such as Eric Clapton reputedly will not use a solid-state guitar amplifier.

*EE Times* reports the story of a firm by the name of Deja Vu Audio and its founder, Mr. Eric Prichard. Mr. Prichard spent six years of intensive research developing, as the article calls it, "the first successful soild-state emulation of the vacuum tube." To further quote the article,"the dynamics of the grid are crucial and turn out to be governed by nonlinear differential equations that can only be solved by computers, if at all. Since the tube disappeared (sic) from electronics at about the same time the computer was developed, exact models of tube dynamics were never developed." While the *EE Times* article is unclear as to precisely what the Vacuum Tube Emulator consists of, the circuitry was refined with the use of the audio equivalent of wine tasting sessions, with the participants being professional musicians. Deja Vu Audio plans to market this product to those firms wishing to manufacture products that sound precisely like the hollow-state products of yesteryear.

As I said, answering my friend's question was not as easy as it might have been when I was perhaps more blissfully ignorant. And now I have a question of my own-why not just use a real 12AX7? **ER**

Letters from page 18
to 1000 kHz and contained its own 2-penlight battery supply. The units bolted together for under-dash mounting.

When Ray Morrow and I spoke he was rightfully proud of his contribution to ham radio; to this day his equipment continues to be a valuable part of vintage radio.

**Joe Sloss, K7MKS**

**Dear ER**

I wonder if your typesetter made an error. The photo on p. 31 (ER #43) says that Ray Morrow built that receiver in 1932. Some of your readers will probably remind you that RCA introduced the 'magic eye' tuning indicator in the fall of 1935. Also, the string and dial drive with pointer attached to the end of the tuning condenser shaft and the metal cabinet with hinged lid seem to point to a later date.

I wished Ray Morrow lived around here - we would have a lot to talk about. I got my first job in a radio repair shop in the fall of 1936 - the same week I got my ham license, W9YRQ. I worked after school and Saturdays - for $3.50 a week - wow! - but that was a lot of money and it sure beat caddying or cutting grass. In my Jr. and Sr. years I worked at a radio shop on Santa Fe Ave. in Salina, Kansas. I had enough credits at school so I could work all afternoon. Boy, I was in heaven! The boss (Ross was the boss) had a complete file of several radio magazines (*Radio Craft*, etc.) and I spent a lot of my spare time reading them. I discovered a series of articles on math in radio written by J.E. Smith of NRI (correspondence school) which covered algebra, trig and calculus - both differentiation and integration with applications. This got me into trouble when I was a freshman in college. I used some calculus to explain an experiment on the B-H curve - my professor thought I had copied it from a senior's report. After that, I got along swell with all the faculty.

Ray Morrow looks like a very thoughtful man - I'm sure I would like him. With those call letters, W7AWE, he must go way back. I have a callbook for March, 1930 and the last W7 call listed is W7APH so Ray must have got his call in 1930 or '31 - he's an oldtimer. The Spring 1935 call book shows his address as 1870 Cottage St., Salem, Oregon.

**Bob Dennison, W2HBE**

**Dear ER**

An article by Walt Hutchens, KJ4KV, on the ATD brought to mind an interesting experience with that radio. I bought an ATD at the Robbinsdale Hamfest (near Minneapolis) around 1983. I saw it on a table watched over by two elderly hams and marked at $25. Not knowing what it was, I lifted it, groaned, and offered $8. One of the old guys conferred with the other and grumpily accepted the offer with the remark, "ok but you will have to carry it away and take the dynamotor and cables too!" Needless to say I about died since I hadn't even seen the dynamotor and cables. Anyway, I got the rig on the air and have had a great deal of enjoyment running off the dynamotor. Later I got a dynamotor for my ART-13 and was pleased to notice that the 28-volt power plug was the same for both the ATD and ART-13. I thought that made some sense since both rigs were made at the same time and could conceivably be interchanged in some airplanes. However, to my dismay I found that although the primary power plug is the same, the polarity was reversed between the two dynamotors. The ART-13 dynamotor was most unhappy when first run!

Before moving from Iowa to Oregon I put my GRC-9 on the air using the hand crank generator for power. After some careful study of the cranking system I have determined the physique of the Army operators who ran those generators: leg inseam 24 inches, width of buttock 6 inches, trunk length 32 inches, chest 52 inches, biceps 12 inch circumference, arm length 48 inches, tail 32 inches, food-tropical fruit.

**Ken Lakin, KD6B**

Yaesu FTdx-400 from page 9

## Conclusions

This was an interesting radio when I first saw it and the longer I worked on it, the more interesting it became. Looking first at its weaknesses, one finds a number of small usability problems. The set tunes 'wrong', with the knob going counter-clockwise for increasing frequency. The S-and ALC meter has zero at the right and swings left on increasing signal strength or ALC level. The positions of the meter switch are in the order ALC-IC-PO, but they are used in the order IC-PO-ALC. With so many controls on the rear, identifying the one you need is almost impossible unless you look at the label--but you can't turn a 40-pound set 180 degrees on the operating table in order to set the AM carrier level or rezero the S-meter. The stamped sheetmetal levers used on the outer concentric controls tend to drag and leave ugly scars on the panel.

These weaknesses are outweighed by the strong points: high power, good stability specs, calibration accuracy, moderate price, and outstanding styling. Notice that these are what a marketing expert would call 'benefits'--that is, things about the product which do something for the buyer. In fact one sees little sign of what marketing people call 'features' such as 'Famous Collins PTO', 'solid brass gears', 'rugged 6146B tubes in final amplifier'--things about the product which are good but not directly important to the user.

Now take off the covers and flip the set over. Doing that with a National radio always makes me think "boy were these folks professionals". Collins sets bring thoughts like " these guys were brilliant".

But under the chassis of my Yaesu there is a mess--tangles of wire with soldering iron burns, jumpers on the power transformer wired with pieces of the line cord, splattered rosin and solder drops everywhere on the chassis, tacked-on parts and hung-on extra boards--all appearing to be from the factory rather than clumsy repair work. Doing the 'flip test' on my FTdx-400 makes me think"these guys must have built a lot of cheap TV sets". This radio is a consumer product.

Aside from the problems coming from its age, my set's troubles (way out of drift specs, and the short and near-short in the filter can) are quality control issues. The drift problem is particularly interesting because the design and construction are plenty good enough to meet the spec, but the factory people didn't bother to actually do it.

Of course one sample does not prove the point. Mine is an early set; quality control may have been improved later as it was during the late 60s and 70s for Japanese cars and other products. But a company which delivered even one set like this one would have trouble backing up a motto like "the quality goes in before the name goes on" (Zenith) or "ask the man who owns one" (Packard automobiles).

The Yaesu FTdx-400 seems to have come from a company driven not to build fine radios or revolutionize transceiver design, but to succeed--to make lots of money--in the ham transceiver marketplace. The things that are right are 'where the rubber meets the road'; the weaknesses are mostly out of sight. A smart engineer working for one of our major companies in the 1960s might have had a really bad feeling studying the set--something like this thing makes me want to throw up, but we better get going, 'cause it is going to be tough to beat'. If anyone said that, however, he was ignored... and the company dedicated to winning by giving hams what they wanted went on to do so, while those building fine radios and revolutionary designs disappeared. ER

**Collins 75A-Series Receivers from page 15**

higher gain than before. They use grounded cathodes in favor of cathode bias resistors as in the A-2's design. The IF transformer design was changed, due to the newer, sharper IF response, by using simplified coils and coupling networks.

The only other changes were to the muting diode plate load, and the grid bias on the 6AQ5 pentode output stage was adjusted. Mechanically, an A/B switch was added to the front panel, underneath the BFO pitch knob, so an operator could select IF bandwidths. Everything else on the front panel is the same.

No evaluation receiver was available, so no performance measurements were performed. I would expect no real change from the 75A-2, except the radically new shape factor in the IF stage!

The 75A-3's interference fighters, a mechanical filter backed up by a variable crystal notch filter, are superior to any Q-multiplier or T-notch I've ever used. This holds true for any receiver with this dual combination. Interference is not just deeply reduced, but is gone. It is too bad later receivers did not keep this effective weapon available.

The 75A-3 was produced until late 1955, giving it a production run of over four years. This makes it second in A-line longevity only to the 75A-4. The 75A-4 is still the preferred ham receiver of many die-hards the world over, for reasons which will be examined in the next installment of this series. **ER**

---

**QSL Cards Tell a Tale from page 23**

9 SX-99 (Hallicrafters)
9 AR-3 (Heathkit)
7 S-38 (Hallicrafters)
7 NC-98 (National)
6 HQ-129 (Hammarlund)
6 S-85 (Hallicrafters)
5 SX-100 (Hallicrafters)
5 HQ-110 (Hammarlund)
4 S-40 (Hallicrafters)
4 HQ-100 (Hammarlund)
4 NC-183 (National)
4 HQ-140 (Hammarlund)
4 SX-28 (Hallicrafters)
4 S-53 (Hallicrafters)

What was surprising was the Heathkit AR-3 tied for first place! Now, I had one of those and it was barely better than the 5-tube AC-DC broadcast radio in the kitchen. In fact, the only difference was the bandswitching and extra coils and a power transformer for safety. OK, it did have bandspread tuning. It was cheap, however, and I suppose the marketing effect called "drag" where one popular item induces sales of other products from the same manufacturer, must have been at work here, too.

What was totally off the wall was to see that the most popular item mentioned in the receiver blank on the cards was not a receiver at all, but the Heathkit QF-1 Q-multiplier: at least 13 times. It helped increase the selectivity of mediocre receivers and certainly all the AR-3's needed one (plus some of the low-end models from the other manufacturers). I might mention that having only used the AR-3 when I was first a ham, I was completely overwhelmed by the performance of a Drake 2B that I got recently to reenter ham radio after a 30 year hiatus. No Drake equipment was mentioned in any of the cards, although I do recall one friend getting one just as I was going dormant. That was just about the time SSB was becoming popular.

What else? Well, there were 5 YL or XYL hams in the group of 151 cards. Not many, but more than I have heard on the bands since resuming activity. And there were more teenagers then. There were many personalized comments on the cards, too, often about topics from the QSO. And then, some of the cards were handmade or custom printed and just neat to look at. Too bad QSL cards don't seem to be as much a part of ham radio as they used to be. **ER**

# CLASSIFIEDS

## Advertising Information

Subscribers receive 1 free - 25 word- ad per month. **Extra words are .15.** Here's how to count the words in your ad: the heading - For Sale, Wanted, etc count as **1 word**. Your name, call, address and telephone number count as **6 words.** Hyphenated words count as **2 words. Please count the words in your ad and if you're over 25 words send payment for the extra words.**

Non-subscribers: $3 minimum for each ad (up to 20 words). Each additional word is .20. **Please call or write for display rates.**

**VINTAGE EQUIPMENT ONLY**

**ER**
**P.O. Box 57**
**Hesperus, CO 81326** **Phone/FAX 303-247-4935**

## DEADLINE FOR THE JAN. ISSUE: JAN. 3

**FOR SALE:** Repair and restoration on all vintage equipment; 35 years experience. Barney Wooters,W5KSO, 8303 E. Mansfield Ave., Denver, CO 80237. (303) 770-5314

---

**FOR SALE:** Collins 75A-3 rcvr - $275; Zenith Trans-Oceanic Y600 - $75; Millen 90651 grid-dip meter, w/coils - $100; matching spkrs for Hammarlund HQ-170/180 and HQ-100 - $50 ea. Plus shpg. Ron, KC6WTG, POB 783, Santa Rosa, CA 95402. (707) 539-8319, noon - 9 PM PST

---

**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:** NC-400 rcvr, VG - BO; Collins R-389 rcvr, exc. cond. - BO. **WANTED:** Manual or copy for Clegg Thor; Clegg Zeus & Interceptor B in super-clean cond. Mike, KC8CU, (207) 525-4421

---

**FOR SALE:** HD-10 electronic keyer, clean, works, matches Heath SB-line, HW and DX-60 series. **WANTED:** Assembly manuals for Heath HD-20 xtal calibrator and HO-10 monitor scope, copies OK. Marty, WB2FOU/5, (817) 497-6023

---

**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:** 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:** Hallicrafter SR-42A; Conset Tri-Band conv.; 6-meter Communicator; B&W TVL coils; new 450TH. **WANTED:** EC-1 Echophone. Vance Lockenour, W9CNL, RR 15, Box 932, Bedford, IN 47421. (812) 275-4836

---

**FOR SALE:** 1920's Freshman Masterpiece battery radio; old Gould battery eliminator; 1950's Kellogg ITT Stock Market presentation phone; telegraph items. J.H. Jacobs, 60 Seaview Terrace, Northport, NY 11768. (516) 261-1576

---

**WANTED:** I need the coil pack and turret assem. for 6010 Radcom/Westrex radio rcvr. Can anyone help? Edward J. White, WA3BZT, 809 Seymour Rd., Bear, DE 19701-1121. (302) 322-1313

**FOR SALE:** Used technical books - radio, electronics, military, test equipment, catalogs, etc. List- $1 (stamps ok). Softwave, Dept. ER, 1515 Sashabaw, Ortonville, MI 48462

---

**WANTED:** Buy and sell all types of electron tubes. Harold Bramstedt, C&N Electronics, 6104 Egg Lake Rd., Hugo, MN 55038. (800) 421-9397, (612) 429-9397, FAX (612)-429-0292

---

**FOR TRADE:** M-209 cipher machine, OSS/SOE "Spy" radios, and other espionage devises available for trade. Keith Melton, (318) 747-9616

---

**FOR SALE:** Johnson 2-meter vfo; Lafayette TE-50 tube tester, w/book. Gus Enquist, VE3MAL, RR 1, Redbridge, Ont., P0H 2A0, Canada. (705) 663-2387

---

**FOR SALE:** Eico 723, nice - $50 ppd; Eico 723, needs wrk - $25 ppd; (5) FT-243 xtals for 80 and 40 CW - $15 ppd. **WANTED:** HW-16. Dean Hemphill, KC5NG, (817) 497-5365

---

**WANTED:** Collins 32V-3 xmtr. Fenton Wood, KB5VQ, 109 Shoreline Dr., S.H., Malakoff, TX 75148. (903) 489-0204

---

**FOR SALE:** Taylor P850A AM BC xmtr, 60 watts, unused - $60; SX-28, good - $70. Both PU or U-ship. Al, AI4U, 6251 Fox Hunt Trail, Orlando, FL 32808. (407) 222-0007 (d), 298-3493 (n)

---

**WANTED:** Collins mech. filters - 800 Hz & 6 kHz; KWS-1 screen transformer; Collins SM-2 mic. Paul Mezzapelle, WA6NLJ, POB 883, Carmichael, CA 95609. (916) 481-0145

---

**FOR SALE:** Lafayette radio operating and service manuals, schematics etc. If I don't have it,they never printed it. Pete Markavage, WA2CWA, 27 Walling St., Sayreville, NJ 08872. (908) 238-8964

---

**FOR SALE:** U.S. Navy flameproof keys NOS, 1955 sealed packages - $60 shpd. Telegraph items, etc., 7 page illustrated list - $1 plus SASE. J.H. Jacobs, 60 Seaview Terrace, Northport, NY 11768

---

**FOR SALE:** 75S-3 - $300; Scott SLRM - $200; TMC FFR (URR 49V) - $150; Meissner Signal Shifter - $50; RME VHF 152 converter - $25; BC-348, w/ps - $50; A62 Phantom antenna (NIB) - $25; Drake UV-3 remote cable (NIB) - $100; Heath HP-13 pwr sply - $25; Swan mobile sply - $25; R-390A for parts; BC-639 for parts; BC-604 for parts; HW 12A w/AC & DC pwr sply; Drake T4XC, R4C, MS4, AC4 - $350; manuals - SX-28 & S-36 (orig.); tubes - 25AV5, 26A7, 3B28 (NIB). Mel Stoller, K2AOQ, 100 Stockton Ln., Rochester, NY 14625. (716) 671-0776

---

**WANTED:** Knight Kit manuals - Ocean Hopper, Star Roamer, Space Spanner. Top $ for originals. Jim Riff, K9JSC, 81 N. Ela Rd., Barrington, IL 60010. (708) 480-3526

---

**FOR SALE:** New National HRO-500 in factory sealed box, .005 to 30 mHz, AM-SSB-CW - $1100. Brown, POB 3514, Lancaster, CA 93586. (805) 943-2027

---

**WANTED:** Front panel milliammeter for B&W 5100B xmtr. Bob, KL7IDY, 9501 Brien St., Anchorage, AK 99503. (907) 346-1169

**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:** Tektronics type 130 LC meter, VG cond. - $100; Morrow Falcon mobile rcvr, 75 - 10 meters, AM-CW, good cond. - $50; RME-69 rcvr, good cond. - $100. Zeke Adair, W5LUT, 1106 W. 4th St., Roswell, NM 88201. (505) 623-0005

---

**WANTED:** Manuals or copies for the following: Hallicrafters SX-17 and S-36A; National or Wells-Gardner RAO-3; Collins 75A-1. Stan Hojnacki, 103 Wilson Ave., Blackwood, NJ 08012. (609) 435-8975

---

**FOR SALE:** Hewlett-Packard instruments: 330P distortion meter and 206A audio signal generator. Both exc. w/instruction books. Bill Riley, 863 W. 38th Ave., Eugene, OR 97405.

---

**FOR SALE:** CV116A/URR freq. shift converter for R-390A - $75; CV157/URR SSB converter for R-390A - $100. PU only; solid-state plug-in replacements for 872A - $10 ea. P.A. Orobko, VE7FY, 12347 Davison St., Maple Ridge, BC V2X 5N5, Canada. (604) 463-4904

---

**WANTED:** National Radio Institute Communications course books, circa 1958. Nostalgic reasons. VE5JD, Box 306, La Ronge, Sask., S0J 1L0, Canada. phone/FAX (306) 425-2057

---

**WANTED:** Hammarlund xmting condensers, types MTCD-100B and 100C, single and split stators of 100 MMF; B&W coils type 3400. Roland Matson, K1OKO, RR 1, Box 2943, Kennebunk, ME 04043. (207) 985-3751

---

**FOR SALE:** (2) R-390A's, (1) 2-meter xcvr, Swan xcvr, 4-1000A's, 250TH's, 100TH, 20 boxes of cond., tubes, coils, relays, etc. Bring truck and $500 cash. Russ Hunt, (714) 363-8119

---

**WANTED:** Case, clock, xtal calibrator for Hammarlund HQ-145; dynamotor DM28-O for BC-348-O. Robert Bennett, 5675 Shadow Hills, Las Cruces, NM 88001.

---

**FOR SALE:** RAO-2 Navy National rcvr - $75. **WANTED:** Ameco AC-1 xmtr. Cliff Fleury, AI7Y, 64174 Tumalo Rim Dr., Bend, OR 97701. (503) 382-9162

---

**ELECTRON TUBES** FREE 1992 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:** 1930's and '40's radio premiums; RCA 3" camera tube #1847; RCA Dynamic Demonstrator; vintage illuminated signs. Bill Ross, KY9M, 875 Gordon Terrace, Winnetka, IL 60093. (708) 441-6462

---

**FOR SALE:** Xmting tubes from Gray Wireless Museum, send SASE for list; older QST binders - $4 each. Charles Stinger, W8GFA, 404 Ross Ave., Hamilton, OH 45013. (513) 867-0079

---

**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

---

**WANTED:** Information on commercially built and kit transmitters 1930-1980 for new book along lines of "Communications Receivers". Ideas and comments welcome. Ray Moore, c/o RSM Communications, POB 1046, Key Largo, FL 33037-1046. (305) 853-0184

---

**FOR SALE:** Exc. to mint 75S-3B (RE), 32S-3 (WE), 516F2 pwr sply, 3 filters, WARC xtals - $1100. Gary Elliott, NO5H, 808 Clarice St., Delhi, LA 71232. (318) 878-8032

---

**FOR SALE:** Heath Pawnee, 2-meter AM xcvr, good cond. - BO. Jim, K1TMJ, (207) 778-3826 (eves).

---

**WANTED:** Harvey-Wells R9 rcvr; Z-Match; RME-4301, 4302; Eico 722 vfo. Bob Nichels, 1444 S. Rotzler, Freeport, IL 61032. (815) 232-7142

**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:** Millen GDO, tube type, w/coils & manual - $85; Collins mech. filters, 500 cycle and 2.1 kc - $135 each. **TRADE:** SM-3 mic for orig. Collins key pad for KWM-380. Gene Peroni, KA6NNR, POB 58003, Philadelphia, PA 19102. (215) 665-6182 (days)



**FOR SALE:** New list of over 400 vintage radios and accessories, also list of 500 vintage manuals available. SASE please. Mike Horvat, KA7ASF, 112 E. Burnett St., Stayton, OR 97383.

---

**WANTED:** Homebrew rack mounted AM tx; Uniden Tempo 2020; NC-183DTS; broadcast mics; Globe King; vfo for Ameco TX-62; junk box parts; Drake model 4-NB; Harvey UHX-10 xmtr; 1.5 KW ant. tuner, w/SWR bridge. Will swap a Millen type 90061 serial number D002 grid dip meter w/full set of coils for tuner. Please, local only. Donald R. Boland, 28 Faulkner St., Malden, MA 02148. (617) 324-5362

---

**FOR SALE or TRADE:** Drake rcvrs R-7, w/ MS-7, R-4B, filters; R-4B SW xtals. Levy, 8 Waterloo, Morris Plains, NJ 07950. (201) 285-0233

---

**FOR SALE:** 32S-1, 75S-1 and pwr sply - $400; Heath SB-220; HQ-120; RAS-5; Millen xmtr. Joel Levine, WB2BMH, 67 Derby Ave., Greenlawn, NY 11740. (516) 757-7641

---

**WANTED:** Original or photocopy of the construction manual for a Viking Ranger kit. Especially interested in vfo section. Tom Jurgens, KY8I, 3920 Jim Dr., Bridgeport, MI 48722. (517) 777-2257

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

***Leo Meyerson, WØGFQ, (founder of WRL) in concert with QCWA, 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.

---

**WANTED:** RCA AR-88, VLF or ELF rcvr; tube CB's; SB-301; SB-220; SB-110; SB-200; SB-101; SB-310; Harvey-Wells; Davco; Lettine; Drake MS-4; Sonar SRT-120; Gonset; Lampkin; Philco; Arrow; B&W; Bendix; Swan; Hunter; Stancor ST202A. Please, local only. Donald R. Boland, 28 Faulkner St., Malden, MA 02148. (617) 324-5362

---

**FOR SALE:** Reproduction manuals for Eico 950B - $3; SP-400-X - $8; 51J-4, BC-348, BC-375, R-388/URR, ARB - $25; ATB-$28. Postage paid. Robert W. Downs, WA5CAB, 2027 Mapleton Dr., Houston, TX 77043. (713) 467-5614

---

**WANTED:** Converted ART-13 xmtr and SX-88. Both must be in mint/exc. cond. Tom, WB2IIS, 5913 Main St., Williamsville, NY 14221.

---

**FOR SALE:** Swan DD-76 digital display - $75; Swan phonepatch -$25. **WANTED:** Swan 117XC pwr sply/spkr cabinet. Dan, KF9BI', (414) 255-9165

---

**WANTED:** Millen ant. bridge 90672 or its schematic; Heath DX-60 schematic. Seasons greetings. John Oliver, K6UU, 700 Neil Crk. Rd., Ashland, OR 97520. (503) 488-1506

---

**WANTED:** Older HRO for parts, especially cabinet and coils; also need older HRO spkr. Jim Leathem, K7BTB, Box 50355, Parks, AZ 86018. (602) 635-2117

---

**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:** National NC-44, good cond. - $100; NC-88, fair cond. - $80. Buyer pays shpg and handling; Jim Barrows, W7BCT, 15121 41st Ave., S.E., Bothell, WA 98012. (206) 337-4880

---

**FOR SALE:** Reproduction Collins overlays and transparencies for drums, dials, meters. Expanded line. David Knepper, W3BJZ, Box 34, Sidman, PA 15955. (814) 487-7468

---

**FOR SALE or TRADE:** Navy shipboard xmtr AN/SRT-14, 0.3 - 26 Mcs, 4-400 in final, 120 VAC, w/manual and accessories. Ted Bracco, Quincy College, 1800 College Ave., Quincy, IL 62301. (217) 228-5213

---

**FOR SALE:** Field radar set PPS-4, rusty but complete w/tripod - $300. Allan Weiner, 14 Prospect Dr., Yonkers, NY 10705. (914) 423-6638

---

**WANTED:** Shortwave receiver - Patterson, Breting, Howard, Meissner, Pilot, AGS, SW3 or RCA. Cash or trade for AM gear. Bob Mattson, KC2LK, 10 Jane Wood Rd., Highland, NY 12528. (914) 691-6247

---

**WANTED:** Any of the following, complete or parts units - R-390, R-392, Heathkit SB-series, Mohawk, SB-500, SB-310, SB-313, single-banders etc. Byron, WA5TIJJ, 1920 Maxwell, Alvin, TX 77511. (713) 331-2854

**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:** Military favorites: R-390As, R-388s, SP-600s, R-1051s, WRR3s and other HF and LF rcvrs, modules and parts available. LSASE for new list. APS-E, 107 Fayton Ave., Norfolk, VA 23505.

---

**FOR SALE:** Nice Drake C-Line - $425; A-Line - $300; HQ-170A - $150; Central Electronics SSB slicer; S-41C rcvr; Echophone. Don Winfield, K5DUT, 6080 Anahuac, Fort Worth TX 76114. (817) 732-3976

---

**WANTED:** A WRL-70 transmitter. Leo Meyerson, WØGFQ, 69911 Via Del Sur, Cathedral City, CA 92234. (619) 321-1138

---

**FOR SALE or TRADE:** Knight R-100A rcvr, good cond.; Collins 51J-4, good cond. **WANTED:** Manuals/copy for Heathkit HX 1680/HR1680 combo. Joe Perratto, K2QPR, 1341 SW Evergreen Ln., Palm City, FL 34990. (407) 220-2189

---

**WANTED:** Heath VF-1 vfo; WRL SM-90 screen modulator; Hammarlund HQ-180. Greg Lewis, WØBTW, 11415 33rd St., SE, Valley City, ND 58072. (701) 845-3441

---

**FOR SALE:** New Collins parts: 30L-1 blower motors - $35; 51S-1 PTO osc., 70K-7, P/N 522-2918-000 - $200; silver plated 30S-1 tank coils - $7. Dennis Brothers, WAØCBK, HC 84, Box 1, Potter, NE 69156. (308) 879-4552

---

**FOR SALE:** BC-610, w/speech amp, xtra finals, reduced to - $375; SX-101 - $150; SX-99 - $85; Dentron MT-3000A antenna tuner - $100. Will trade the SX-101 or SX-99 or the tuner for a Ranger II. Chuck, KØRFQ. (417) 863-7415

---

**FOR SALE:** Mint/VG 75A-2, w/cabinet - $275 PU only. **WANTED:** Knight Kit Ocean Hopper and coils, any cond., working or not; mint/VG S-19R Sky Buddy main tuning dial; Millen 34300 100 uH RFC; mint/VG SX-100, AT-1; info on R-388 built in 1963 on contract 3700B-PC-62. Dave Ishmael, WA6VVL, 1118 Paularino Ave., Costa Mesa, CA 92626. (714) 979-5858

---

**WANTED:** FT-243 xtals for 80 and 40 meters; ARC-5 xmtr & rcvr for 40 meters; manual for Knight T-150 xmtr. Bob Braeger, WA6KER, 6634 Navel Ct., Riverside, CA 92506. (714/909) 682-5084

---

**FOR SALE:** Radio Marine Corp. RAZ-1 rcvr, w/pwr sply, preselector and manual, VG cond. - $300 plus UPS. Details SASE. Paul Gregg, W9POC, 725 College Way, Carmel, IN 46032. (317) 846-3094

## 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:** SX-101 manual - $15; National 2"scope (xtra tube), desk or 19" rack mount (with adapter for rack) - $35; regulated pwr sply for BC-221, RA 133A, 1952, NOS by Hallicrafters - $25; pwr sply dynamotor, Navy model CC-1-219-84, NOS - $40; rectifier reg. pwr unit PP 94 CRM-3, 12 V, w/diagram - $35; Westinghouse type 550 (15A SP) 250 VAC breaker - $10; Westinghouse type 550 (5A SP) 250 VAC, NOS - $5; Thordarson xfmr T-45943, 115/230 VAC, 60 cycle, (190V, 115 mA) (980V, 480 mA) (760 V, 160 mA), NOS - $40; many other hard to find items. Joe, W6CAS, (916) 731-8261

---

**WANTED:** TMs 11-227, 11-235, 11-265, 11-266, 11-288, 11-638, 11-859, 11-866*, 11-867, 11-868, 11-873, 11-874, 11-875, 11-876, 11-877, 11-878, 11-880, 11-882, others ok, too. (*especially needed) Gene, (800) 872-9680

---

**FOR SALE:** New 1993 catalog now ready. Send $2 for the Add-A-Page, color, plastic protected, illustrated catalog. Laboratory and Hobby test equipment, tubes, plug-in coil forms, reprint books and literature. Antique Radio Labs., R 1, Cutler, IN 46920.

---

**WANTED:** BC-455 type radios, racks, dynamotors; clean BC-345 and BC-306A (BC-375 antenna tuner 150/800 kHz); would like to correspond with WW II B-17 radio ops. Neidich, 145 E. 15 St., -6A, New York, NY 10023. (212) 777-1332

**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

---

**FOR SALE:** Thirty-six page catalog of WW II military radio equip. - $1 or postage stamps. Sam Hevener, W8KBF, "The Signal Corps", 3583 Everett Rd., Richfield, OH 44286.

---

**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:** AN/PDR-27F geiger counter, w/ all accessories, manual, case - $45; equipment, parts, books, magazines, manuals, long list $1. Joe Orgnero, VE6RST, Box 32, Site 7, SS 1, Calgary, AB T2M 4N3, Canada. (403) 239-0489

---

**WANTED:** 100 K wirewound potentiometer, hopefully with switch. R. Haworth, W2PUA, 112 Tilford Rd., Somerdale, NJ 08083. (609) 783-4175

---

**FOR SALE:** Gonset G-50, 6-meter AM - $115; HQ-140X - $125; National HFS - $125; Globe Chief 90A - $50. Clem, W8VO, (313) 268-2467

---

**WANTED:** Original TM 11-6625-274-35 maintenance manual for TV-7D/U tube tester. Jay Mathisrud, 4553 - 32nd Ave., So., Minneapolis, MN 55406. (612) 724-0322

---

**WANTED:** Pwr xfmr for NC-270; band switch for Harvey-Wells TBS-50; bandspread dial for SW-54. Charles J. Graham, K6KDZ, 20335 Casa Loma Rd., Grass Valley, CA 95945. (916) 273-6847

## 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!**

**WANTED:** Machine shop work. Knobs shafts bushings, etc. made to your sample or drawing. Reasonable. Jim Dill, Box 5044, Greeley, CO 80631. (303) 353-8561 evenings.

---

**FOR SALE or TRADE:** NCX-5, w/ps & vfo; Galaxy GT-550A; Swan 250; TV2B & ps; Drake R4B; T4XB; MS4; C4; W4; MN200. All exc., w/manuals. **WANTED:** Mohawk; B&W 5100; HT-33A; SW-54; RME 4350; G-43; S-38D; DX-20. Colorado Bighorn Museum, (303) 344-4630

---

**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:** Working antique Hickok RF-AF generator - $65. **WANTED:** Sylvania 6JB6 tubes and working Ranger, preferably Ranger II. Rick, K8MLV/Ø, 1802 W. 17th St., Pueblo, CO 81003. (719) 543-2459

---

**FOR SALE:** Lafayette HA-225 rcvr, w/matching spkr, exc. - $150. John File, POB 566, Tolono, IL 61880.

---

**WANTED:** HRO coils - F, G, H; dials - 14.0 - 30.0 Mcs & 7.0 - 14.4 Mcs; SX-96 pitch control knob. Joe, WA9LAE, (708) 795-6761, FAX 795-6764

---

**FOR SALE:** RAL 6 rcvr, works - $35; Rycom R-1307A/GR LWR - $150 OBO; Hallicrafters twins, HT-46/SX-146 - $150. PU only. Joe, NM1V, (508) 658-6186

---

**WANTED:** Need more room in your home? Cramped? Crowded? I will clean out your attic or basement or whatever of all unwanted radio parts, old projects, dead gear, etc free of charge. Will travel reasonable distances. I have my own truck. If you need more room, please call. Donald R. Boland, N1FYX, 28 Faulkner St., Malden, MA 02148. (617) 324-5362

---

**WANTED:** Hallicrafters SX-101 or SX-101A. Must be clean and in working condition. John B. Keil, 4618 Norwalk St., Union City, CA 94587. (510) 471-4838

---

**FOR SALE:** Johnson Signal Sentry - $40; 180S-1 cabinet cover - $5. **WANTED:** AC supply for Harvey-Wells T-90; Eico 722 vfo. Bill, KE7KK, 6712 Lake Dr., Grand Forks, ND 58201. (701) 772-6531

---

**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 or TRADE:** Viking Valiant - $225; URM-25F sig. gen., w/acc. - $70; depot fresh GRC-9, w/ass.; BC-603 - $30; used 4-400A - $20; RBL-5. **WANTED:** BC-314/344; MN-28 control box for MN-26 radio compass; RBB rcvr. Tom Brent, Box 1552, Sumas, WA 98295. (604) 826-4051

---

**WANTED:** Manuals for HP 606A, Hallicrafters HT-32A, Heathkit DX-60B and HR10B. Complete originals preferred. Bob Smith, KC4WJO, 14779 Kogan Dr., Woodbridge, VA 22193-3314

---

**WANTED:** Allied Radio catalogs, 1959, '50-'56, '40's. Top $! Jim Riff, 81 N. Ela Rd., Barrington, IL 60010. (708) 480-3526

---

**FOR SALE:** Mint condition Heathkit IM-2215 digital multimeter, w/manual - $25 postpaid. Ken Greenberg, 4858 Lee, Skokie, IL 60077. (708) 679-8641

---

**WANTED:** Collins 75A-1, exc./mint. Will pickup within 200 miles of Joplin, MO. Don Hilliard, WØPW, Rt 5, Box 219, Neosho, MO 64850. (417) 451-5892

---

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

---

**FOR SALE or TRADE:** National 110, w/coils, paper, pwr sply. Joe, K5VDD, 2151 FM740N, Forney, TX 75126. (214) 722-3551

---

**WANTED:** 211, 203A, 801A tubes. Joe, N4WQC, 6323 Beryl Rd., Alexandria, VA 22312. (703) 256-2468 phone/FAX

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

**FOR SALE:** SAMS for hams. Photofacts of vintage ham gear. We also buy used SAMS. A.G. Tannenbaum, WA2BTB, POB 110, East Rockaway, NY 11518. (516) 887-0057

---

**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

---

**WANTED:** Home video of your station. Write for details of upcoming promotional tape for broadcast and amateur distribution. Paul Courson, WA3VJB, Box 73, W. Friendship, MD 21794-0073. Many thanks!

---

**FOR SALE:** Cabinet for RAO-7 rcvr; power xfmr fits all RAO/NC-120 types; chokes for above; slide bars for band change; (2) coils D-1 type for band D, NIB. Mike Tara, 4657 Eastview, Stockton, CA 95212. (209) 931-6059

---

**WANTED:** Manuals/operating instructions, schematics for following Seco equipment: Tube Tester model 88 (less tube index); Crystalign Meter model 500; Transmitter Tester model 510. Copies OK. Will pay copying & shipping charges. AJ Kyle, KC4YME, 7428 Brad St., Falls Church, VA 22042. (703) 573-5739

---

**WANTED:** G-28 for 10 meter AM. Must be in good cond. Bill Bruno, WB3IZN, 205 North Wayne Ave., Wayne, PA 19087-3530. (215) 687-5232

---

**MESSAGE:** "The Vail Correspondent" is the quarterly journal for key collectors. Sample issue $2. TVC, Box 88-E, Maynard, MA 01754.

---

**FOR SALE:** Two Viking II's, one with vfo; Ranger and Apache, VGC, working, w/ manuals, PU only; Bretting 14 rcvr; S-22R rcvr and S-36 rcvr. Dusty Rhodes, W8MOW, 1324 N. Dorset Rd., Troy, OH 45373. (513) 339-1546

---

**FOR SALE:** New Electro-Voice speech clipper - $25; National 697 pwr sply - $45; RME-4350 - $80; SSB adapter - $55; speaker - $30; PMR-8 - $30; AF-67 - $35; Elmac #1071 AC/DC pwr sply - $45; Racal model 6217E GC rcvr - BO. **WANTED:** SM-40 & Morrow AC pwr sply. Joe Sloss, K7MKS, (206) 747-5349

---

**WANTED:** Good cond. Collins 516F-1 (pay $100-$150); 516F-2 (pay $100-$120); SM-3 mic (up to $150) and 515-1. Mimi, 2212 Rockefeller Ln., Redondo Beach, CA 90278. (310) 379-6052 or FAX 379-5543

---

**WANTED:** Manuals for Clegg FM27B and Specific Products WWVC freq. standard rcvr. Geoff Fors, WB6NVH, POB 342, Monterey, CA 93942. (408) 373-7636

**FOR SALE:** Thousands of vintage radio parts, catalog #0692, 40 pages - $2. Gary B. Schneider, Play Things Of Past, 9511-23 Sunrise Blvd., North Royalton, OH 44133.

---

**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

---

**WANTED:** URM 26 series sig. gen.; TV 10 tube tester; 51J-4 ID plate; 51J-4 for parts. Ward Rehkopf, K8FD, 116 Fairway Dr., Belmond, IA 50421. (515) 444-4396

---

**WANTED:** Collins speaker for my 75A-3. Mike Student, KB7TH, 6585 Canoe Hill Rd., Sparks, NV 89436. (702) 322-5104 (d) 673-2046 (n)

---

**FOR SALE:** Collins KW-1 w/extra parts and manual, good cond. All offers considered. SASE for info and photos. Greg Kordes, WA6EEB, 17220 Newhope, #201, Fountain Valley, CA 92708. (714) 921-7222

---

**FOR SALE:** RT-671/PRC-47 radios, complete, unchecked, w/top cover, great for parts, as-is, shipped unboxed, 44 lbs - $45 each, 2 or more - $40 each. Quantity limited. Include shpg. Tartan Electronics, Inc., POB 36841, Tucson, AZ 85740. (602) 577-1022, FAX 888-5330

---

**FOR SALE:** Hallicrafters SX-24, nice - $100; HRO-50-1, w/4 coils - $275. **WANTED:** Pre-war and WW II HRO's, any cond.; also racks, spkrs, coils, etc. John Orahood, N5SPQ, 5819 Miller Valley, Houston, TX 77066. (713) 440-5598

---

**WANTED:** Clean parts for 51J/R-388: Top and bottom covers; original mil tz-scale drum & right-side bracket for same. Fredrick Sequin, 28 Commonwealth Ave., Boston, MA 02116. (617) 267-7887

---

**WANTED:** 75A-2 and 75A-3. Have clean 51S1 to trade. Robin Liu, AH6CP, (808) 488-7214

---

**FOR SALE:** BC-191, w/manual and 40/160-M tuning units; NIB 1942 USCG 30-40 Mcs xmtr and rcvr, complete w/cables, control head, handset and spkr. Best offers by 1 Jan. '93. **WANTED:** Collins 32V-3, spkr, SM3 mic, spline wrench set; E.F. Johnson milliammeter. Brian Roberts, K9VKY, 3068 Evergreen Rd., Pittsburgh, PA 15237.

---

**FOR SALE:** Nice Globe Chief 90 xmtr - $75; Hallicrafters S-38A - $45; Knight RF gen. - $35. **WANTED:** Junker Ranger or Ranger mod xfmr. Bernie Doermann, WA6HDY, 300 James Way, Arroyo Grande, CA 93420. (805) 481-6558

---

**WANTED:** RCA AR/CR88; SX-28; SX-115; SX-88; National NC-400; early HRO's; Viking II; Viking 500; R-390A manual. Any help appreciated. Gary, KE6MS, (310) 696-0177

---

**FOR SALE:** Drake TR-4C - $175; HQ-110 - $50; Heathkit HP-10 DC sply - $24; HO-10 monitor scope - $40; 51J-4/R388 parts - send want list; Radiotron Designers Handbook 4th ed. - $20; ARRL Handbooks - 1943, '44 - $16; 1950, '52, '56 - $12; BC-603/BC-604 - $50. Mark Hovda, NØJWI, POB 10091, Cedar Rapids, IA 52410. (319) 364-4048, 7-9 PM

---

**FOR SALE:** First user friendly circuit on early BC-348's. Most needed comp. values on 2 sheets 8 x 14. Reads left to right. Send $2 + (2) 29 cent stamps. Ray Larson, 12241 1/2 Gorham Ave., W. Los Angeles, CA 90049-5214.


* - Actual Ad from 1927

**FOR SALE:** Tube close out, all new in original boxes. GE (5) 4-250A/5D22 - $90 ea; GE (4) 710/6011 - $45 ea; GE (2) 4-125A/4D21 - $60 ea; GE (6), CBS (3) 4X150A/7034 - $35 ea; Eimac (2) 4CX250K/8245 - $100 ea; Penta (3), Amperex (2) 4-65A - $45 ea; Corvair (11) 866 Jr. - $6 ea; 836 $10 ea; RCA (4) 3B28 - $18 ea; WE (12) 705A - $4 ea; WE (12) 388A - $5 ea; GE (10) 2C44 - $15 ea. Also large inventory of 12BH7A, 12BY7A, 6AZ8, 6DC6. Electron Tube Enterprises, Box 8311, Essex, VT 05451. (802) 879-0611

---

**FOR SALE:** (2) Eimac 100THs, used - $30 for both, shipped; (6) B&W tank coils w/internal link and (1) ceramic female mount - $30 for all, shipped. Richard Lucchesi, WA2RQY, 941 N. Park Ave., N. Massapequa, NY 11758. (516) 798-1230

---

**WANTED:** Ham Key paddle; anything Brown Brothers; WRL SS-3 Q Multiplier (1965); Hammarlund HK-1 keyer. Gary, K3OMI, 11124 Oak Hollow Rd., Knoxville, TN 37932. (615) 690-4217, M-F days

---

**FOR SALE:** 12 inch 1949 Motorola B&W TV for parts; parting out Johnson Ranger and Galaxy III or $200 for all three. Please, local only. Donald R. Boland, 28 Faulkner St., Malden, MA 02148. (617) 324-5362

---

**FOR SALE:** (1) TRP Tunaverter, a converter that converts a standard car radio to cover the 3.8-4.0 mHz phone band for AM, CW, and SSB reception. Solid state, new - $20 ppd. Bill Riley, 863 W. 38th Ave., Eugene, OR 97405.

---

**WANTED:** HT-33 linear in good or mint cond.; spinner knob and reduction gear for 75A-4; mech. filter for 51J-4. Tom White, WA4FJQ, 406 Cascade Ct., High Point, NC 27265. (919) 887-0705

---

**FREE:** Teletype Model 28, PU only. **WANTED:** Copy of Johnson SSB adapter manual. Mike, W1JZ, (508) 529-4427

---

**WANTED:** Spkrs - Hammarlund, Hallicrafters, National, etc. Also need 4-125A's. Bill Gode, KB9IY, 1540 Kaywood, Glenview, IL 60025. (708) 998-0974

---

**FOR SALE:** B&W 850 inductor plate circuit. **WANTED:** Manual or copy for R-388 and R-389; 6082 tubes; Millen vfo; RCA mikes. Andy Howard, WA4KCY, 105 Sweet Bay Lane, Carrollton, GA 30117. (404) 832-0202

---

**WANTED:** Manual/copy for Heathkit SB-300 rcvr. Vern Snyder, 3712 Amber Trail, Duluth, GA 30136. (404) 381-6636

**FOR SALE:** Collins 312B-4 station control - $165, mobile pwr sply - $50, 351D-2 mobile mount - $35; (2) Triax 500-W xmtr, CW-AM-SSB - $750; Harris model RF-103A linear amp, w/remote ant. tuner - $3500; Conset Twins, G-77/G-66, complete mobile station, exc. cond. - $400, Super/ceiver & vfo mobile unit plus misc - $35; TMC AN/URA-28 modulator and matching; pwr sply - $285; Globe Sidebander, as is - $35, Scout Deluxe, as is - $35; Star, as is - $25, HG-303, 80-10-M mobile xmtr - $25; Hunter Station Control & phone patch for parts - $15; Hallicrafters Loudenboomer linear amp, exc., w/160-M mod. - $475, S40-B rcvr, as is - $35; Hammarlund HQ-170 rcvr, good cond. - $125, HQ-110A/VHF rcvr, good cond. - $100; Heath Warrior amp, w/160-M mod, exc. cond. - $350, HD-19 hybrid phone patch - $10; EK-2 rcvr, as is - $25, QF-1 Q/Multiplier - $15, HM-11 SWR bridge - $10; (2) Ameco 6&2-M xmtrs - $35 ea; Hygain 2-M vert. - $35; Stancor ST-203A 10-M mobile, a collectible, exc. cond. - $85; Drake TR4-C/MS4 spkr/AC-3 pwr sply, good cond. - $375; Tpe/Tone TC-10B preamp converter, as is - $20, XC-144B 2-M converter, as is - $20; B & W L-1000A linear amp, 2 813 finals, exc. cond. - $475; Antron 99, 11-M vertical %40; Bud code practice oscillator - $15; 3 boxes of assorted radio xtals - $50; BC-659 rcvr, new - $85; BC-454 80-M xmtr - $25; Tektronix 531 scope - $85; marker scope - $30; Precision tube tester - $100; Westinghouse Signal Corp. RF sig. gen. #1-106A - $25; General Radio admittance bridge - $85; Do All TV gen. - $15; Eico Model 666 tube and transistor tester - $10, model 955 in circuit cap. tester; RCA test oscillator - $35; (2) HP 412AR VTVM - $45 ea., 525B freq. converter unit - $15, audio gen. - $35; General Radio comparison oscillator - $25; Welex reference gen. - $15; Dovetron MPC-1000CR RTTY TU - $150, MPC-1000R TU - $150; BC-221 freq. meter - $25; homebrew electronic keyer - $15; Premier large amplifier construction cabinet - $35; Mariner marine monitor & rcvr - $15. Skypoint Ham Shack, 11561 Southington Ln., Herndon, VA 22070. (703) 787-5750, 437-1559

---

**WANTED:** Electrovoice model 606 microphone. Search your junkbox. They haven't been made for years. Bill, W4CC, 149 Elizabeth St., Eufaula, AL 36027. (205) 616-0468

---

**WANTED:** WW II airborne TV equipment - ATK, ATJ, etc.; also early radar equipment units or complete systems. Allan Weiner, 14 Prospect Dr., Yonkers, NY 10705. (914) 423-6638

---

**WANTED:** Non working Collins equipment !!! Also other makes. Write with model and make.. Dan Rupe, W7HBF, 1302 S. Uplands Dr., Camano, WA 98292.

---

**FOR SALE:** From the estate of Frank Wilson, final listing. Globe Chief Deluxe; (2) Johnson Viking II xmtrs, Mobile VFO, 122 VFO, Viking Mobile, Invader 2000, w/pwr sply; Hickock model 533 tube tester; Precision VTVM; Paco C-20 cap/res. bridge; Swan Model 175, w/117X pwr sply, (2) Model 350, w/117X pwr sply, Model 500, no pwr sply, Model 700CX, w/spkr, no pwr sply; Hallicrafters SX-122, w/manual, mint, Super Skyrider (for parts), S-47, S-40 (for parts), Heath model HW-32 (20 meters) w/pwr sply, model 717 rcvr; Drake 2C rcvr, TR4C xcvr, needs work; Harvey-Wells TBS-50C Bandmaster Sr., xmtr; Pal 11-meter vfo; National NC-173 rcvr; (2) R-388 rcvrs (for parts) Galaxy V MK2, w/remote vfo and pwr sply; R-390A rcvr, good cond; plus all types of TV and radio tubes NIB, too numerous to list. Please enclose SASE for reply. Russ Smith, W6ONK/Ø, POB 1954, Montrose, CO 81402-1954. (303) 249-5881

---

**WANTED:** National pwr sply 5897 AB; spkr for HRO FB-7; XCU-300 xtal calibrator. F.W. Nicholas, W7RBF, (602) 944-7026

---

**WANTED:** E.H. Scott Special Communications Receiver in any condition. Also looking for any radio manufactured by Lincoln, McMurdo Silver, E.H. Scott, Leutz, Norden Hauck, Mathews and Breting. Michael Feldt, 12035 Somerset Way E., Carmel, IN 46033. (317) 844-0635

---

**FOR SALE:** BC-348-R, VGC, no motor - $50 shpd. **FOR TRADE:** old 73 & CQ mags. M. Oxenreider, WB3CTC, 63 Hellens Church Rd., Leola, PA 17540. (717) 656-8746

---

**FOR SALE:** Real audio for your R-390A. Send me your audio chassis (no junkers please) and I'll ship you a ready-to-play chassis. If you're not happy (for any reason) return the chassis (within 30 days) for a full refund. Specs will equal or exceed those specified in ER #42 article - $119 shpg prepaid. Allow 30 days for delivery. Bill Kleronomos, KDØHG, DBA Longmont Labs, 224 Main St., POB 1456, Lyons, CO 80540. (303) 823-6438

**FOR SALE:** (8) 577W tubes (HV rectifiers). What do these fit? Alan Douglas, Box 225, Pocasset, MA 02559.

---

**FOR SALE:** National NC-33 - $75, I-10 - $50; Hallicrafters S-38D - $50; Multi-Elmac PMR-7 - $25. Shpg xtra. Charles Lukas, W1DOH, (508) 263-3743

---

**WANTED:** Globe RME-602 (6&2-M) xmtr; DSB-100 and WRL FCL-1 speech booster. Al Bernard, NI4Q, POB 690098, Orlando, FL 32869-0098. (407) 351-5536

---

**FOR SALE:** Drake C-Line, loaded - $450; R-390A - $350; S-53A - $75; NCX-3 - $125; 75A-3 3.1 kHz filter - $50; McMurdo Silver wavemeter - $20; HQ-129 manual - $10. Carter Elliott, WD4AYS, 1460 Pinedale Rd., Charlottesville, VA 22901. (804) 979-7383

---

**WANTED:** Heathkit AT-1, DX-20 xmtrs; AR1, AR2 rcvrs; HW17,I HW18, Sixer, Tener, Shawnee xcvrs; Chippewa linear; SB-300-4, SC6 converters; AK5 spkr; HD19; VX1; any unassembled kits; catalogs from '50's and '60's; Knight Span Master, Ocean Hopper, Space Spanner; also Halli-kit SX140K. Nick, KD4CPL, 811 Kenmore Rd., Chapel Hill, NC 27514. (919) 929-4342

---

**WANTED:** SX-115 rcvr; RME 6902 rcvr; RME-6901 companion spkr for 6900 rcvr; books by Bill Orr, esp. late '30's, '40's & '50's handbooks. Happy Holidays to all & thanks for supporting my addiction throughout 1992. Larry Howe, KBØHIB, 1333 S. Airwood, Springfield, MO 65804. (417) 882-1682

---

**FOR SALE:** Drake collector thinning out shack. R-4B plus second unit for parts, T-4XB, AC-4, MS-4 - $400; MN-2000 - $175; W-4 - $75. Michael, WAØEPW/6, 5601 W. 79th St., Los Angeles, CA 90045. (310) 645-5511 after 6 PM PST

**WANTED:** Bandspread dial, drive mechanism w/knob for NC-190 and schematic. E. Renstrom, RR 1, 1598 Maple St., Crete, IL 60417.

---

**WANTED:** Globe King 400 or 500, parts or all. Jim Roseman, W9UD, 2716 West 3rd St., Coal Valley, IL 61240.

---

**WANTED:** NC-109 rcvr, any condition - poor, medium or good. George, (405) 341-6419

---

**TRADE:** DX-40, w/manual copy for AT-1 and VF-1; Eimac 4-400A, NIB, for decent Ranger, KW-1 or your offer. Jim Hanlon, W8KGI, POB 581, Sandia Park, NM 87047. (505) 281-0814

---

**WANTED:** Ranger I; National NC-183; HRO-50. Original, exc. cond., w/paperwork. NY and NJ area for PU. David Morris, (718) 698-9877

---

**WANTED:** Manuals for BC-348; BC-610; AN/URC11; AN/ARC2; SCR245. Glanzmann, 22bis avenue, Gros-Malhon, 35000 France.

---

**FOR SALE:** Collins 32V-1, no cabinet - $100; R-388/51J-3 rack mounted - $175; 75A-2 - $175; Heath Apache, very clean - $80; Allied A-2516 rcvr - $40; Hallicrafters Skyrider 5-10, no cabinet - $20; General Electric H-51-C 1929 console, wrking - $100. No shpg beyond 70# UPS limit. WANTED: Lafayette HE-10 (KT-200) rcvr, Johnson 122 VFO. Jim Jorgensen, K9RJ, 1709 Oxnard, Downers Grove, IL 60516. (708) 852-4704

---

**WANTED:** Johnson 500 must be in excellent cond. Tom, WB2IIS, 5913 Main St., Williamsville, NY 14221. (716) 634-2545 (d)

---

**WANTED:** You won't believe what I'll pay or trade for a Skyrider S1, 2, or 3 and a National SW-4. Robert Enemark, Box 1607, Duxbury, MA 02331. (617) 934-5043

**FROM: KBØHIB - LARRY**
**SPRINGFIELD, MO**

MERRY CHRISTMAS & HAPPY NEW YEAR

**HAPPY HOLIDAYS TO ALL & THANKS FOR SUPPORTING MY ADDICTION THROUGHOUT 1992**

# Service You Expect, Quality You Can Count On!

TUCKER 25 Anniversary 1967-1992

## HP 606A
### Signal Generator

The Hewlett-Packard Model 606A Signal Generator will provide precise test levels from 50 kHz to 65 MHz. Reading the output frequency is easy on the 606A's direct reading frequency dial, which is over 95 inches long. An internal crystal calibrator provides check points at 100 kHz and 1 MHz across the 606A's frequency band. Headphones with a standard RCA jack may be used for calibration signal monitoring.

A built in 140 dB output attenuator allows metered output set levels from +23 to -120 dBm or 0.1 µV to 3 V into 50 Ω. Front panel metering of output modulation is also provided. A highly refined internal 400 Hz or 1 kHz amplitude modulation system provides AM up to 90% with low distortion and incidental FM. This feature allows precision distortion checks of receivers from antenna to output. The 606A will even accept external modulation with complex waveforms, square waves or DC voltages for the test and evaluation of filters, networks, amplifiers, and receivers.

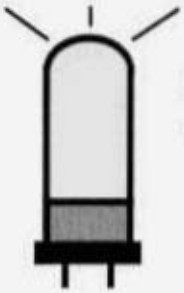
Your operational Hewlett-Packard 606A HF Signal Generator will be fitted with a full "HP"-classic bench-style case while their quantities last.

## Tucker Bargain Price..... $249

Price is FOB Garland, TX • To Order Call, Write or Fax:
National: 800-527-4642 • In Texas: 800-749-4642
Local: 214-348-8800 • Fax: 214-348-0367
1717 Reserve St. • Garland, TX 75042

# TUCKER
ELECTRONICS & COMPUTERS

**CALL, WRITE OR FAX A REQUEST FOR OUR ALL NEW**
**BARGAIN HUNTERS DISCOUNT & CLOSEOUT CATALOG**



SECOND
CLASS

ELECTRIC RADIO
145 CR 123
Hesperus, CO 81326

TO: