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ELECTRIC RADIO

celebrating a bygone era

Number 58 February 1994

Kathleen Smith, VE3WKW

ELECTRIC RADIO

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Electric Radio is published primarily for those who appreciate vintage gear and those who are interested in the history of radio. It is hoped that the magazine will provide inspiration and encouragement to collectors, restorers and builders.

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

Regular contributors include:

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

EDITOR'S COMMENTS Barry Wiseman, N6CSW/Ø

Homebrewers tell me that the most difficult part of any construction project is finding the parts. Although there are a number of catalog parts houses that have a lot of the stuff builders need, they don't have everything and sometimes their parts are prohibitively expensive. I have a suggestion that may help alleviate the problem.

In the classifieds we see a lot of ads every month. Most of these ads describe rigs for sale; not many of them list parts for sale. I'd like to encourage those people who are clearing out their hamshacks to make a list of the parts they have available and to advertise the list in the classifieds. I think that they'd be very surprised with the response they'd receive. And they'd have the satisfaction of helping the homebrewers.

The parts that are needed most are transformers (of all sorts, but particularly mod xfmrs), variable caps (particularly the big ones with good spacing and of course vacuum caps), inductors (particularly variables), high-wattage pots, tube sockets (ones for the final tubes), meters, switches (big band switches are hard to find), relays, NOS rack panels (these are very, very, expensive today), oil capacitors (high voltage), rack cabinets and so on.

I think that a lot of people are not aware of the demand for vintage parts. I hope that those who have parts will consider following my suggestion; I'm sure they will find that an ad in the ER classifieds will produce a good response. I think that it would be acceptable to ask those sending for the list to include an SASE. If the list is long (several pages) it might also be OK to ask for a dollar or two that would be refundable on the first order.

I know that there's a lot of parts out there languishing in garages and basements; let's get them into circulation again.

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Cover: Kathleen Smith, VE3WKW. Elmer'd by her friends Harry MacLean, VE3GRO and Bill Skidmore, VE3AUI, she has become a very competent vintage/AM operator. She does all her own restoration and repairs and is currently planning a HB transmitter.

LETTERS

Dear ER,

NBFM was quite popular in the mid-fifties and I have used it on and off since 1957. The lack of good FM receivers however has limited the use of this mode in the shortwave spectrum. This has been due to the predatory practices of certain manufacturers in the matter of patent licensing. Hallicrafters and National Company are, of course, excepted, but even they offered FM only in their top of the line models. Uniquely, only Hallicrafters made a true FM exciter/VFO, the HT-18. I used mine with my HT-20, which is at least as good a transmitter as the 32V-2 and much better looking. It is also very, very reliable, having 2 807's modulating the RK 4D32 tetrode with lots of buffering from crystal or VFO (HT-18!) input to the 4D32 final amplifier.

The usual Japanese appliance is capable only of anemic performance on FM and the audio ain't great on any of their products. Nothing, but nothing, beats push-pull audio in the SX-42 (15-15 kcs FLAT) or the SX-88 (20-20 kcs FLAT) both at 10 watts! Push-pull 6V6's in both receivers beats anything else that I have seen (except inadvertently overlooking the Hallicrafters SX-62).

Incidentally, this writer had the pleasure of asking Arthur Collins why Collins audio wasn't great (1964). His reply was that neither high fidelity nor power audio (10 watts) is necessary for good single sideband receivers. He was, of course, correct as far as he went.

Roy Luxemburg, N5QQM

Dear ER,

I want to begin by strongly endorsing the letter from Gene, K5NYT, in the January, 1994 *ER*. As AM'ers we all need to extend our efforts toward preserving the high quality operating practices that led many of us to our initial interest in the mode. Top band has long been called the gentleman's band. I like to think of AM as the gentleman's mode.

Unfortunately a recent experience brought home one of the reasons some hams view AM'ers with scorn.

Like many active hams I enjoy operating many modes, SSB and CW in addition to AM. I also love 160 meters and have recently been working toward my 160 WAS, a really interesting challenge.

Since I only need HI and AK to complete the WAS, I've been listening to the Century Club SSB Net on 1892.5, a worked all states net that has been established for years.

Several weekends ago, long after the net had begun, a loud het suddenly appeared that virtually wiped out many of the net participants. The offending signal was from two AM operators holding a QSO on 1.891, only 1500 cycles from a net with signals big enough to be heard on any receiver if only they had listened first. Obviously they either didn't listen or didn't care.

When it appeared that the net could not continue, the control operator moved to 1.891 and VERY courteously asked them to please move down a bit. The band was clear below them all the way to 1.880. Their response? Nothing. This polite request was simply ignored. A few minutes later the request to QSY was made again with great courtesy. They were even invited to join the net. There was no response and their QSO continued.

The control operator finally decided to move up the band to get away from the QRM but it was so loud that many net participants either gave up by that time or weren't able to hear the information that the net was moving.

All AM operators lost valuable points that night, all due to the poor practices and attitudes of these two LIDS. I would have been very ashamed to admit to being an AM'er that evening.

A little common courtesy will go a long way toward getting AM'ers the respect

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AMI Update

Southwest Region Report

by Director, Bill Neeley, K7INK

AM activity in the Southwest Region is steady and seems to be growing on a daily basis. Hardly a week passes when there aren't several new calls showing up on the West Coast AM Net (Wednesday, 3870 at 9 PM PST). About 10% of those who show up out of curiosity become regulars or semi-regulars. An interesting dilemma is posed by the arrival of newcomers. One question is how to be encouraging and helpful without conveying the impression that a SSB transceiver does not sound good enough to use forever on AM.

Another issue we have been kicking around is how to handle the "too much of a good thing" factor when the 75-meter round table on 3870 grows to unmanageable numbers. Some of the Southwest AM'ers have been establishing a second round table when the group grows too large. Other are operating on 160 meters or going into the proverbial "listening mode".

A problem has surfaced recently out here and has brought forth considerable discussion. Some AM'ers are interfering with AM operations by using SSB within the AM window (3865-3890 kHz). We have long had groups of SSB operators who operate within this window and a kind of mutual tolerance has grown between a group that operates on 3872 and the AM'ers. We move down to 3868 if they are still on; they usually call it an evening about the time AM activity commences. But, the new issue has to do with a few operators who are regular AM operators, who for their own reasons decide to fire up on SSB within the window. My own point of view is to keep the window as "clean" as possible. I and a number of others have made New Year's resolutions to restrict our SSB activities to other frequencies. We are going to take a positive, by example approach instead of acting as frequency cops. We'll see if taking the high road works,

There are several new transmitters either on the air or about to emerge. Mike, W6THW, just put his refurbished Collins 300G on 160 meters. It sounds good now and will sound great as soon as he gets the equalization set up. Mike, WA6KKM, just put a new homebrew 4-400 rig on 75 meters. The venerable 4-400 RF, 810 audio combination seems to work great. John, W6BM, is about to put a broadcast transmitter on 160. Mike, K6ZSR, rebuilt a Johnson KW. Jim, NU6H, in addition to operating his Johnson KW recently, rebuilt a Globe King 500 and is having a lot of fun bringing it back to life. My Globe King 500B is back on the air with a Peter Dahl HV transformer. Tom, WB6VVX, is about to put a KW-1 on the air that started out almost as a basket case. Doug, KM6OR, has built a beautiful 813 rig. Doug likes to build so much it is hard to get him to operate. Doc, K6HLO, is taking a hiatus while he re-roofs his house, builds a tower and roots for the 49'ers. Sam, W6HDU, has several broadcast transmitter projects underway and is regularly on with his RCA and his KW-1. **K7INK**

Announcement - Armed Forces Day Operating Event

AMI is sponsoring the second annual Armed Forces Day Operating Event on May 21. To expand participation over last year, the event will not be a contest just for stations running military radios. This year the goal will be for all participants to work as many stations running military radios as possible. This early notice of the operating event is to encourage individuals and groups of military radio users to plan to operate all or part of Saturday, May 21 to give out contacts with your military radio

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Panel and Cabinet Restoration

by Ron Eisenbrey, KC5DFX
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Now that you have that old rig electrically and electronically perfect, it's time to think about the cosmetic restoration process. Nothing will add more value to your equipment than a new set of skins properly restored. I might also add that poorly done cosmetic restorations will significantly detract from the value of your equipment. This article will explain to you how to get a professional finish to your front panels and cabinets, a finish more often than not better than the original equipment manufacturer's finish. So for those of you who need new panels and cabinets please read on and we will walk through the steps on how to do it right the first time.

The Front Panel

Silk screening of communications equipment panels is still a widely used process in modern manufacturing. There are other methods of getting "information" onto the panel surface other than silk screening. Engraving is still sometimes used and other more high-tech photographic processes are becoming popular. However, for the vast majority of the equipment silk screens are still the most economical and of the most interest in our hobby.

Photo 1 is the subject of our panel restoration. This is a Hammarlund HQ-129X and typical of many panels of the era, it is beginning to show its age. Note that large sections of the paint and markings are completely gone around the bandspread and audio controls. This wear is not so much from friction, but from oils from the hands of past operators. Note also that paint around the panel perimeter mounting holes has also been worn away by the panel mounting screws.

To start any panel restoration, get the panel flat, as in our example. Remove all bushings, escutcheons, edge extrusions, etc. (Removing the aluminum edge extrusions from the newer Hammarlund panels is a real fun job, but you gotta do it). For silk screening to be successful we need to be concerned with two dimensions only. Metal that is bowed, warped or twisted is also going to cause problems—get it FLAT.

Once we have the panel flat, take a good look at the panel to see if all of the information we will need is still readable. In our example we have lost considerable information around several of the controls, but it was not too difficult to interpret what was missing. With your panel you may not be so lucky. If in doubt about missing information find someone who has a similar rig and photograph it for reference, or research old trade literature for pictures.

The Basic Four Steps in Silk Screening

The four steps in silk screening consist of generating the art work, creating a photo positive, creating the silk screen and silk screening the object. The actual screening of the panel will end up taking about 15 seconds. It's all of the hours, days, and headaches ahead of that 15 seconds where all of the fun is! Before we begin this process let's first assemble some tools. You will need a good metal straight edge with at least 1/32" calibration and some inside calipers to measure hole diameters. Drill bits work great for measuring the hole diameters too, provided you can read the size on the bit or have a calibrated drill bit holder.

Generating The Art Work

This is an artistic process and the methodology you use to do this is your choice. Typical methods are professional typesetting, light boards and rub on letters, or CAD (Computer Aided Design). I use and recommend the latter as it is faster, easier, more accurate and you have better control of input (the nut behind the keyboard)

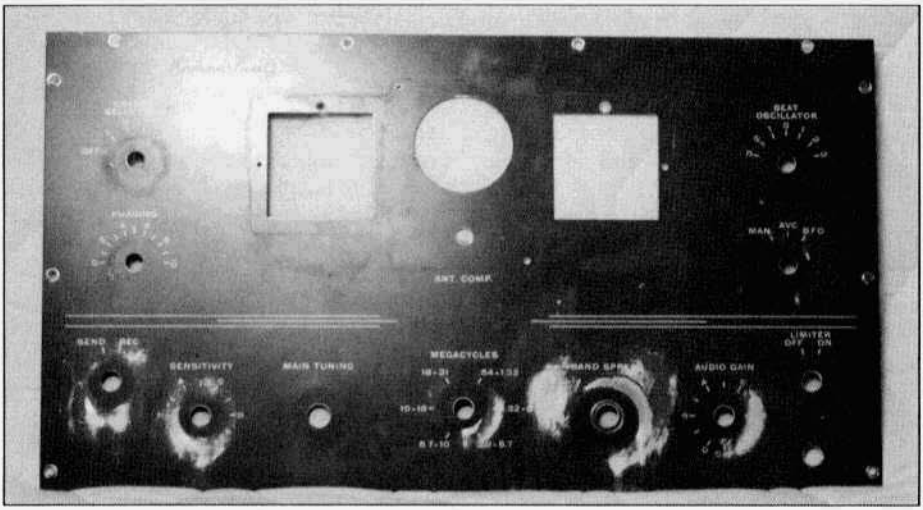

Photo 1, the Hammarlund HQ-129X front panel before restoration

and of the output (plotters, printers). Regardless of the methodology the output is an exact pictorial reproduction of the information (letters, numbers, logos, circles, tic marks, lines, etc.) on the panel.

Photo 2 illustrates a CAD session in process for this panel. We are working on the area near the Crystal Selectivity control in the upper left portion of the panel. The CAD session illustrated is Auto CAD for Windows. To start this process first determine a vertical and horizontal reference axis from which to place objects on the drawing. You will need to use these same reference points for all measurements when locating holes and information on the drawing. I typically use the left vertical edge of the panel and the bottom edge. First locate all holes around which we will need to place information. In our example we do not need to "draw" hole locations for the S meter, mounting holes on the panel perimeter or the square tuning dial holes. Draw the hole size so that it is on the inside of the panel hole. Once located, plot the holes on some transparent paper such as velum and lay the plot on the panel and check alignment. Light boards work great for this. If you do not have one, tape the plot to the panel and hold it up to the window for the alignment check. Holes must be EXACTLY in the same place on paper as on the actual panel. If things are off as much as 1/64", knobs are not going to line up properly and you are not going to be happy. Plot, align, plot, align as many times as it takes to get it perfect.

Font selection is the next step. Electronically match the font style and size to the original panel. As words are placed on the drawing, stretch the word or object in both dimensions until it matches the same location and space as on the original panel. Again, several iterations of plotting and aligning will be needed to get the text to match exactly as on the panel. Other objects such as special logos may need to be scanned and reproduced with other software and brought into the CAD session and placed on the object. You will need to create a different set of artwork for each color of the information we will be screening onto the panel and we will need to make a separate screen for each color. Photo 3 illustrates a portion of the artwork plot for this panel. Photo 4 illustrates how the Hammarlund name and model information would need to be created on a separate "layer" should they need to be different colors. For the actual generation of the final artwork for this restoration the

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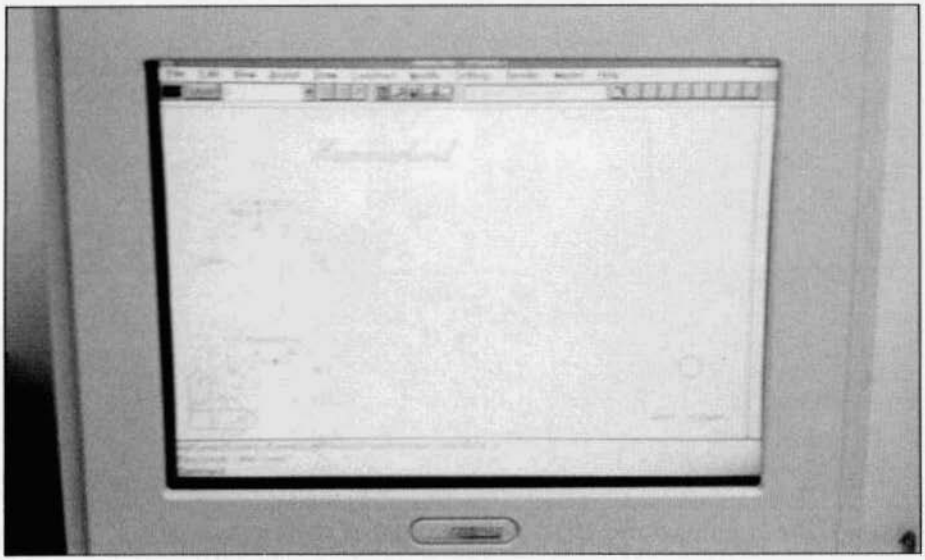

Photo 2, a CAD session in process for the HQ-129X front panel.

CAD layers were merged onto one composite layer since we are going to screen in white ink only.

Almost done now. Remember all that time you spent correctly locating holes and measuring hole diameters? Well, now it is time to erase all those holes from the drawing. We don't need them any longer, unless you want holes screened onto your panel. Actually, we do need to leave about 3 holes to be chosen for the index registration or alignment of the finished screen and the panel. In our illustration the Ant. Comp., Main Tuning and Band Spread control holes are left to allow for screen registration in a later step.

A word on CAD output before we proceed to creating the photo positive. The letters or objects must have clear, sharp edges. No "fill" can be tolerated with closed letters or numbers. A good letter to check would be the upper portion of an "e" or an "8". Check for sharp vertical edges on the numbers and the letter "1". Use a magnifying glass for this. What may appear to be nice artwork to the naked eye will more than likely not stand up under magnification. Fuzzy edges create very poor silkscreens--you will get fuzzy letters, numbers and objects on your panel. Never use a dot matrix printer to create artwork. A 400 dpi laser is barely acceptable, but best results are obtained by a pen plotter with a clean fine pen.

Creating The Photo Positive

This is a photographic process and not something I would recommend you try unless you are a professional photographer. Your silk screen shop can do this or will know where to direct you to get it done. Many engineering reprographic companies provide this service. A photo positive is the inverse of negative. The artwork is photographed in exact scale and reproduced on a transparent film. Information on the artwork will appear as black on a transparent film. The positive is used in the next step in the creation of the actual silk screen.

Creating The Silk Screen

This is another process I would recommend you leave to the professionals. Typically a wooden frame is constructed of strong hardwood. Frame size is selected to be larger than the artwork so we will have "operating room" during the actual screen process. Silk cloth which has been photochemically treated is stretched very

tightly across the frame and anchored securely. It is important the screen material be tight and have no wrinkles. The screen is then "burned" with the photo positive and then washed with filtered water. The end result is a pattern of minute holes in the screen which exactly match your original artwork. Where there are holes ink will pass through onto the panel surface.

Before we actually begin step four--screening the panel--we will have to back up a moment. The panel surface has to be ready first, so now let's discuss metal preparation and painting.

Panel Preparation

The first step in panel preparation is to have the original color matched. Computers are used for this, but paint samples oftentimes work just as well. We not only want to match color but also texture and gloss. We also need to match the screen ink color at this time.

Now that we have our screen created and our color matched we can take that front panel down to bare metal. Get all of the old paint off. New paint will not stick very well to old paint. The best method I have found for doing this is the old vibrator hand sander. Don't use coarse sandpaper--the metal will scratch and no amount of priming and painting will ever get the streaks out. For the same reason, belt sanders are not recommended as they tend to gouge the metal at the beginning of the sanding stroke. Take your time and use "fine" sandpaper. You want a nice brushed finish on the bare metal when you are finished, and a nice even surface texture to the entire panel.

If you have some deep gouges fill them with metal epoxy and sand them smooth. After the panel is smooth, clean the surface to get it free from dirt, grease, fingerprints and other foreign materials. Prime it immediately. Nice shiny metal will start oxidizing quickly. The primer to use will depend upon the panel material and the type of paint you are going to use. Our sample panel is aluminum and we are going to be painting with Sherman Williams Polane T enamel, so that means we need to prime with industrial P60 G2.

No, I am not a salesman for Sherman Williams, but I have been using Polane T paint for years and in my opinion it is just about the finest industrial paint on the market. It is a two part (has to be mixed) polyurethane enamel, extremely tough and scratch resistant and is impervious to most liquids--including body oils. For those needing more information on this paint contact your local Sherman Williams technical representative and ask for product data sheet CC-D5. Many electronic manufacturers specify this paint system for their cabinets and panels.

Once the panel is painted, allow to dry overnight in a dust free environment. Now we are almost ready for step four of the silk screening process.

Screening The Panel

The painted panel is securely fastened to the screening table work surface. No movement is allowed in either dimension. Even a few thousandths of an inch of movement on the panel will create severe problems as ink is applied to the panel. The silk screen itself is aligned with the panel in a hinged adjustable mounting jig. The registration holes are used for this alignment. Once aligned the screen is secured in the hinged jig and again no movement can be tolerated. Commercial screen shops frequently use pneumatic fixtures for this process. The properly aligned screen is suspended approximately 1/32" above the surface of the panel. Ink is poured onto the screen at one end and the ink wave is squeegeed across the screen. As the ink wave passes the minute holes in the screen it is forced through the screen by the squeegee and transfers to the panel. One pass of the squeegee is all that is needed. The screen is then lifted and the panel surface inspected. If OK, it is removed from the fixture and allowed to air dry overnight. If things do not go right on the first pass with the squeegee, the ink is wiped from the panel surface with a proper solvent and the process is started again.

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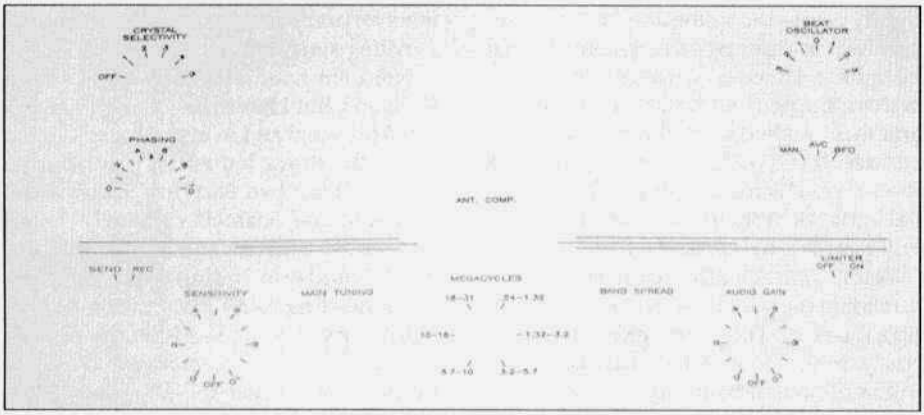

Photo 3, illustration of partially completed artwork. Note the registration holes on the Main Tuning, Band Spread and Ant. Comp. controls.

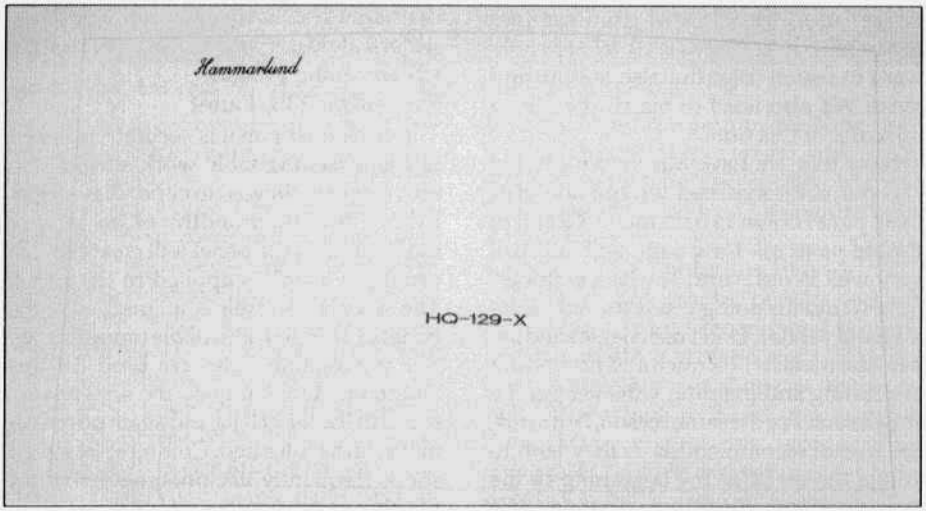

Photo 4, illustrates a layer of artwork that will be merged into the final composite.

Once finished, the screen must be cleaned with proper solvents and dried with compressed air if it is to be used again. Once the screen is dry it must be stored in a controlled environment and protected from dust.

The type of ink you specify is just as important as the type of paint on your panel. I use quick drying epoxy inks. They have a rather short working life (minutes) but they dry quickly and do not require additional clear coating of the panel surface to protect them. Our finished product is shown in Photo 5.

Finishing The Cabinets

Cabinet finishing requires the same attention to detail as the panel. Cabinets are more difficult to "prep" for painting than panels. Cabinets take a lot of physical abuse over the years and most dings and scratches go through the paint and into the metal. They also seem to accumulate more rust, particularly on internal welded seams.

The recommended method to strip off the rust and old paint is with some type of media blasting. Water blasting is not recommended because oxidation starts too

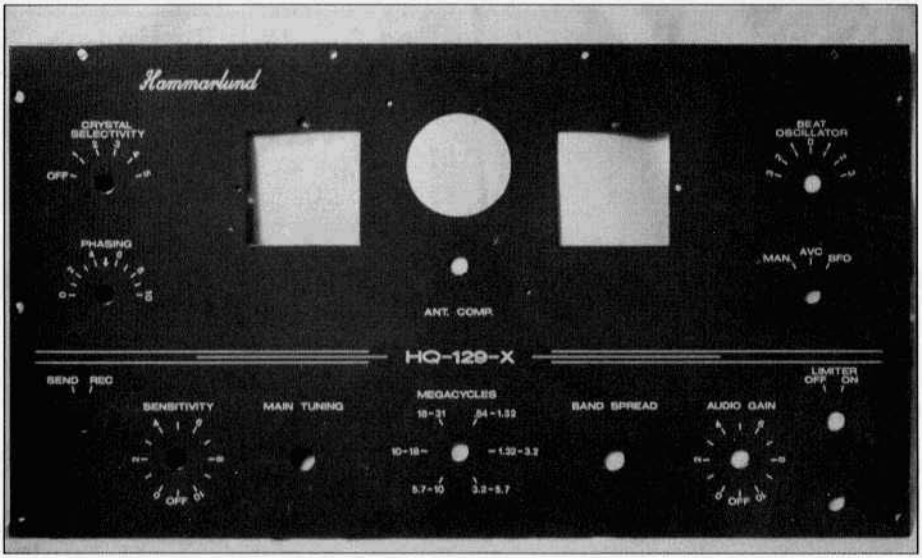

Photo 5, the Hammarlund HQ-129-X front panel after restoration.

quickly on the wet surface. Sand or shot blasting works well. You can easily direct the blasting stream into corners and get to the surfaces that are impossible to reach with sandpaper.

Once you have everything stripped down to bright bare metal, prime and painting procedures are the same as in the panel preparation. Be sure to color match the paint on the cabinet before you blast it away!

It is not always necessary to completely strip all of the old paint from the cabinet. If the exterior and interior surfaces are in fair shape and have little rust, often they can be hand sanded to remove most of the scratches and to roughen up the surface for new primer and paint. Hand sanding is also a good time to get a feel for how well the old paint is sticking to the metal. If the old paint comes off easily with hand sanding, you are going to be better off stripping the entire cabinet down to the metal and starting over.

Finishing Touches

Nothing looks worse on a new panel and cabinet restoration than reusing the old nuts, washers and screws. The plating on old hardware was just not up to today's standards or has long since eroded away. Put all of that exterior hardware in a bag and carry it down to your local industrial fastener shop. Have them match the hardware for you with stainless steel. If you don't want stainless, get nickel plated steel. This new hardware may cost you $5-10, but it is well worth the investment. For this HQ-129X restoration we would reassemble with nylon washers under the heads of the panel mounting screws on the panel perimeter to further protect the panel surface.

Shine up those control knobs too. Put the buffing wheel on the bench grinder or use a Dremel tool with a buffing head. On black knobs I polish with a black "color match" automotive polish. After a few minutes on the buffing wheel the luster will return to those knobs. For those knobs having white engraving, refill with white lacquer stick after polishing. Let dry overnight before putting them back on the shafts.

Cost Estimates

Cost is one of those things that if you have to ask about, you can't afford it. However, there is good news and bad news about cost. Let's examine the cost

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Mechanical Design Of Collins Amateur Equipment

by Fred Johnson
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Part 1

Previous articles in *ER* have described functional characteristics, design features, history, and development accounts of Collins amateur equipments. Ray Osterwald's, NØDMS, articles are a great contribution! My earlier article discussed Collins equipment reliability. There seems no end to what could be written.

Collins' influential role in amateur radio's history accounts for continuing interest in these subjects. Because authors of previous articles are mostly electrical engineers, it occurred to me that there is further information of possible interest. That is, the design of Collins equipment as seen from an involved Mechanical Engineer's point of view.

Bear in mind that some of the following recollections are about 40 years old. A little slack must be allowed for minor lapses in memory of details. And, of course, things always look better through hindsight. There will be some inevitable redundancy. I'll try to keep it to a minimum.

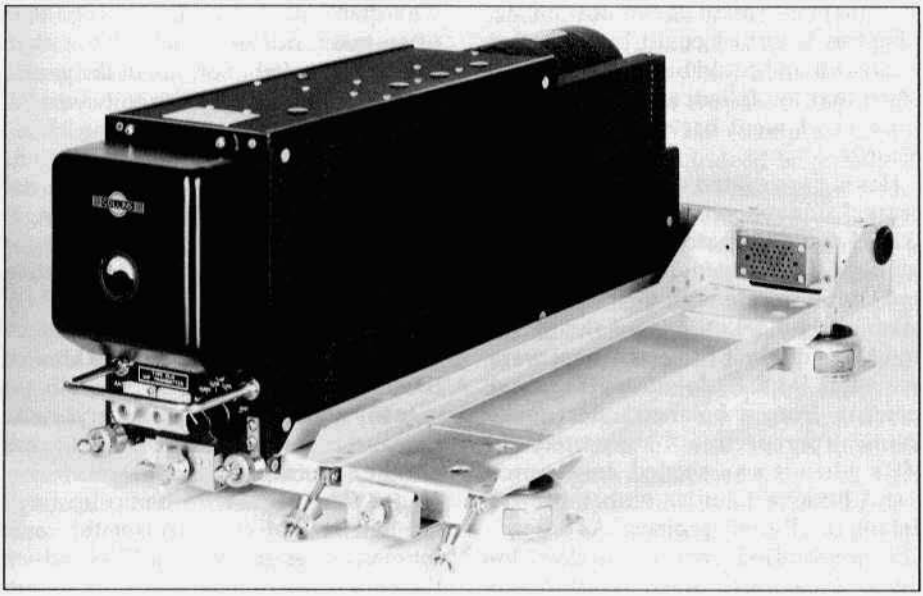
To understand the context of what follows, here is a view of situational details during a major era of Collins amateur equipment development. That is, the very late '40's to mid '60's.

During a substantial portion of the period I'll discuss, my boss was Ernie Pappenfus, K6EZ. Ernie was the E.E. department head for about half of Collins development programs under the chief engineer. Ernie had several E.E. groups. They included one responsible for amateur equipment. Ernie was a quick study. He was action oriented. I think it was Ernie whom I first heard say to a procrastinating engineer: "What are you going to know next week that makes it better to wait than to make the decision right now?". This has proven to be a timeless thought. A lot of Collins amateur equipment bears the imprint of Ernie's decisions.

Under Ernie, I headed a group of mechanical engineers. Engineers from my group were assigned to equipment development programs in the E.E. groups, the amateur line included. Usually, one M.E. was assigned per program. For his day-to-day instructions, an M.E. would report functionally to the equipment Project Engineer – who was almost always an E.E.. However, the M.E. reported organizationally to my mechanical engineering group for coordination and administrative purposes.

This matrix organizational scheme helped avoid the reinvention of wheels. It also provided technical backing to each engineer when tough problems came up. Much of the technology of then-concurrent avionics and military development programs was available to amateur equipment engineers via this method of organization. Collins had a powerhouse of available capability. This concept of organization is still being employed by progressive design organizations.

Virtually all E.E.'s working on amateur equipment developments at Collins Radio were hams. Most of the M.E.'s and I were not. However, I had electronics background from a lifelong interest in "Radio". I built receivers starting with UV-99's. Also, I had taught electronic and radio fundamentals in



17L-2 VHF airborne voice transmitter designed in 1948/'49. Art Wulfsberg, EE; Fred Johnson, ME.

the service. My heavy interest in high quality audio originated with the design and construction of pre-war amplifiers for sound reinforcement. Some were used for what would today be called "disco" applications. Later, I built post-war Williamsons, and Ultra-linears, as soon as they were known.

After the war, I was infected with an intense interest in design and construction of FM receivers, for their FI and noise-free promise. I liberated some acorn tubes when they were first available. They were "romantic". They worked well in the 50 MHz range. Remember, FM was still on the low band. That was before the shift to 88-108 MHz -- megacycles then!

This latter effort, into FM RF/IF/Limiter/Discriminator design and construction, continued at moderate level until about '60. It then became a full scale push. I had a serious case of the hots to receive "Good Music" station WFMT from Chicago. At Collins, I was of course in Cedar Rapids, Iowa, 200 miles distant. This quest lead to , in addition to the construction of an advanced receiver itself, the construction of a 72-ft. tilt-over tower, twin stacked 10-element center-band-tuned Yagis, specially constructed air-spaced 3/4" copper tube rigid 75-ohm coax down-lead, with stretched-to-diameter inner conductor, 300-ohm-to-75-ohm balun design (with E.E. help), and, purchasing a lot and building a house on the second-highest hill in town. The house location was arranged on the lot so the tower base was within a 12 foot flex coax run of the receiver input connector. Hams have no corner on fanaticism! I still have that receiver. I couldn't bear to discard it. But this is a continuing story.

The quest to receive WFMT was an illuminating lesson in real statistics! With this rig, my reception from Chicago was in the high 90% range. On that basis, the project could probably be judged a success. BUT, and this is a very big but, there is no innovative way in the world to inject a couple percent of fade noise, airplane flutter, or muting -- no matter how it is distributed -- and

continued next page

maintain enjoyment of classical music. I kept at it until I could buy a better receiver than I could build. Eventually, when that too failed, and the romance wore off, I went back to listening to records.

Having associated with EE's over the years, I understood what part of their skills I couldn't match. With a few exceptions, I could generally understand and communicate with them. So, I was often a technical arbiter for the M.E.'s and E.E.'s on their projects. There were many E.E./M.E. trade-offs that required steering from a balanced electromechanical perspective. I supported the ME's when it was needed. In the process I became familiar with technical details of all their projects. As a practice, we studied our own earlier designs. Also those of competitors, to guide our design decisions. The best that was possible was always the objective.

With that having been said, what follows is a few selected M.E.-oriented topics that come to mind. They are arranged in no particular order. Others are welcome to improve on the chronology before everyone has forgotten.

Arthur Collins, WØCXX, and his high-level engineering managers, were noted for pulling together "Tiger Teams", or task forces. Selected individuals would be picked to become a team to work with high intensity on very focussed subject areas. The entire SSB program is a good example. It has been cited before, and will be mentioned again. This kind of operation became legend. It was effective. In some quarters it was not liked. But, it prevailed.

In one such setting I heard Arthur Collins admonish an engineer with: "Look, we want to adapt and apply, not innovate or invent". It was a perfect choice of words for that one very specific circumstance. Arthur was really skilled at precision expression. But, like so many other times, this kind of quote was often repeated, and, unfortunately, often taken out of context. I saw that happen too often. For one of the greatest innovators of his time to have said it, it was an unlikely-sounding statement. Yet, to fully appreciate its wisdom, one must understand the background in which it was said. Some engineers picked up on these concepts readily. Others couldn't. They didn't stay on his programs long.

A beautiful example of Arthur's precision expression will be quoted later in this article.

In my view, Arthur Collins' style was the purest form of LEADERSHIP. He got the best from his engineers. He did it not by "managing", rather by leading! His intellectual curiosity set the tone for many an engineer to build a productive and rewarding career. This is part of a story that's too large for here. It comes through little by little in other articles on Collins equipment, and the man, wherever they appear.

Well, as it happened one time, two ham engineers under Ernie Pappenfus had come up with a clever RF linear amplifier concept. They had done it more of less on their own time -- in typical ham fashion. One of the pair was Gene Senti, WØROW. Gene is an E.E., and has contributed to earlier articles in *ER* relating to Amateur products for which he was responsible. The other engineer was Arlo Meyer, WØLBK. Arlo is that rare ham who is an M.E. Although Arlo wasn't directly responsible for amateur equipment design at that time, he was always watching over the shoulders of those who were. Being the quick study, Ernie learned of this linear amplifier that was gestating in the basements of his employees. The whole concept was slick. Ernie grasped its potential and wanted to add the amplifier to the S-Line as a fully developed Collins product.

What Ernie saw had come about something like this. Arlo helpfully re-

freshed me on these details. Gene had mounted the four 811A's with their output network on a nondescript chassis. When Arlo saw it, he thought, "Holy Cow, I could put that in an S-Line case and have an amplifier that I really want". He got together with Gene. The two of them worked out a general layout, tubeless power supply, etc. They bought the power transformers, tubes, SCR's and got two cases from the Collins salvage store. Arlo made sketches of necessary chassis and mechanical parts and personally punched and formed two sets of metal parts in the lab shops. He got the metal parts finished in production, with the help of manufacturing contacts with whom he worked day-to-day. He and Gene then assembled and wired the units. Gene's unit was apparently the first one that caught Ernie's attention. Arlo had no idea that this would be considered for production, since he knew the construction standards that would apply.

My recollection is that at the start of the 30-L development, from these humble beginnings, Bob Cox, Collins Chief Engineer, and Ernie's boss, had no funding for such a program. Not to be deterred, Ernie called together a half dozen engineers and literally locked the group in a vacant room previously used for a classified project. Ernie had food brought in for lunch and dinner every day. The goal was to do nothing but to make Gene's and Arlo's linear amplifier into a full-blown Collins "product" ASAP.

The kick-off for this exercise was a Wednesday (Tues.?) morning at about 9 AM. Ignoring for a moment the frantic efforts meanwhile, the first operational 30L-1 was functional and being tested at 6:00 PM on the following Saturday. Back then, we didn't count days very much. Arlo reminds me, nights either!! When completed, that first operational model had been built completely from a mechanical design layout, and its subsequent detail manufacturing drawings. Gene and Arlo had already made many design decisions. They had the operational proofs that are part of any product development. For example, that the four 811A's could indeed be packaged this way and work. That design effort didn't have to be redone. What remained to be done in the "lockup", and on a compressed schedule, was largely the design "packaging" and proof of performance testing. A few special components had to be found. New specifications for them were prepared. Suffice it to say, it was a very busy few days. With little additional design touchup the design was released for production in what amounted to a KWM-2 case.

Because it took just a few days, development cost for the 30L-1 was small. I've never been privy to any information indicating this smuggled project caused anyone gas pains. It was an example of what competent people can do when the objective is clear, and the boss is looking over your shoulder -- and carrying in food.

During those frantic few days, when anyone asked what had happened to the "missing" engineers, the secretaries would respond: "They are in the green room". The walls of that particular room were indeed green. That color was notable because the entire remainder of the building was a more or less industrial drab color -- beige, maybe.

As the years have gone on, and there have been other panic jobs, many have adopted the name "Green Room". The name stuck throughout the company. It is still used today to describe heroic efforts. A few of us remember the origin. **ER**

Part two next month.

The Hallicrafters SX-100 - Restoring A Classic

by Dave Ishmael, WA6VVL
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Costa Mesa, CA

Dave Mills, AJ7O, has rebuilt, cleaned up/repainted, and restored, lots of vintage equipment. Since he used to live only 7 miles from my QTH, I had many opportunities "to look over his shoulder" at his handiwork. It was while he was going through the Hallicrafters S-85, SX-96, and finally an SX-100, that I developed an interest in the SX-100. The more I played with his SX-96, and later his SX-100, the better I liked them. It wasn't that I had a bad opinion of the SX-96/SX-100 - I had NO opinion - I didn't know anything about them! But I was learning fast!

I visited with John Hurst, KU6X, in November '92 and he showed me his primo SX-100. I was now "hooked" and started advertising for one. I physically looked at about seven or eight and called on about six more before Dave Kamlin, AB6XK, found a nice one at the July '93 Flagstaff swapmeet. He gave me the option of buying it and I did.

My SX-100 is a Mark-2 model. Based on the date codes on the original Hallicrafters tubes (60-41, 60-49, . . .) and crystals (10/61 & 11/61), I think this receiver was originally sold as early as '62. The knobs are the latest "SX-111 type" as pictured in the '63 ARRL Handbook, the last year the SX-100 was advertised in the Handbook. The chassis is corroded but is still one of the better ones that I have seen.

I brought the SX-100 up on a variac and to my surprise, everything worked! The dial calibration was way off but "came back" after using it for a couple of weeks. I checked all tubes and all were OK. After two weeks of use, I used an HP 606B to align it. The IF's were really off, especially the 50.75 KHz IFs. It took a couple of evenings to get it right but the difference in performance was worth the extra time.

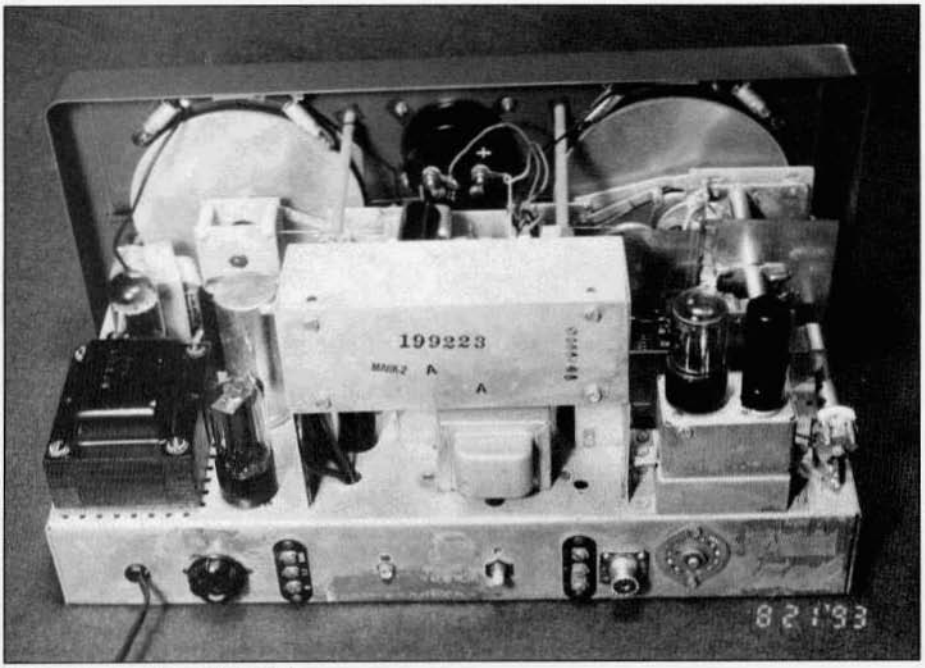
Dave Mills lent me his 2nd SX-100 "parts unit" to upgrade some of the parts. The corroded tube shields were sanded and painted black and the chassis cleaned.

At this point, I decided that the SX-100 would be a "keeper". The front cowling and cabinet were badly scratched and I decided to have them professionally repainted. I have repainted a lot of my gear but one thing that I have noticed is that the finishes have been relatively soft - they're not very tough/durable and will easily scratch. I removed the cowling, hinged top cover, and cabinet and lightly wet sanded the surfaces, feathering the edges of the scratches. I masked the tube location chart on the inside of the cabinet and then let a local firm, Custom Enamelers, paint it. It cost $100 to paint the three pieces with two colors. Custom Enamelers did a very good job matching the finish and color of the original cabinet. I waited a few days for the paint to "cure" and then very carefully put everything back together.

Was it worth it? I think so. The SX-100 works very well and I really enjoy using it with my DX-20/DX-40/Challenger on CW QSOs. I use it on the weekends to listen to the 40-M SSB swapnets and while not as stable as my 75A-4, it's "good enough".

For additional reading, try the SX-100 review in the December, 1955 *QST*, pgs. 52-53, 180. ER

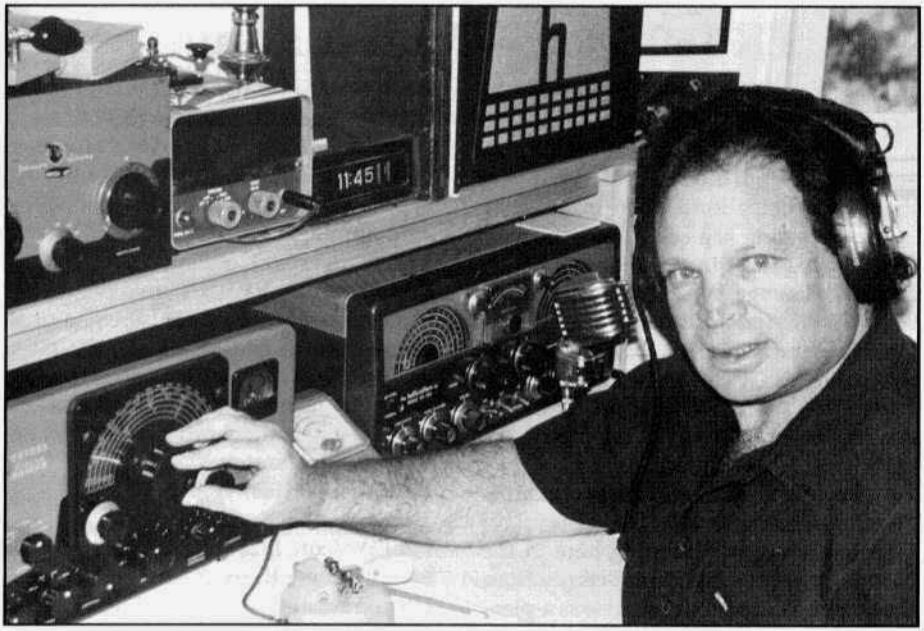
The restored Hallicrafters SX-100. This general coverage, 14 tube receiver sold for $295 during the years it was manufactured - 1955-1961.



Rear view of the SX-100.

Ed Fluehe, WA7DAX, with just some of the vintage gear in his Salt Lake City, Utah, hamshack. He is one of the late-night AM'ers out here in the west.

John Naumann, W9CN, in his hamshack. Readers might remember that we used a picture of John when he was 13 years old on cover of ER #30.



Harvey Laidman, N6HL, at his operating position. The vintage gear shown includes a Johnson Ranger I transmitter, Hallicrafters SX-100 receiver, Johnson Matchbox and Hallicrafters TO keyer.

Gerry Higgins, W9INP, President of the Barry Goldwater Chapter of the QCWA. The receiver on the back shelf under the hat is an HRB-16 that Gerry built recently. We'll have more on that in an upcoming issue.

ER 160-Meter Contest Results

The Fifth Annual ER 160-Meter AM Contest held on Sunday, December 26 was a big success. Curiously all of the logs sent in were from the east coast. Why was there no participation out here in the west?

The following is a complete summary of all the logs sent in as of February 3.

Peter Markavage, WA2CWA, total points 99.

Dale Gagnon, KW1I, total points 93. Dale was using his GE XT-1A broadcast transmitter (833's x 833's) and an SX-88 receiver. His antenna was an inverted L (65' vertical, 120' horizontal).

Paul Beckwith, K2LMQ, total points 105. His comments regarding the contest:

"The top band was hopping here in the Northeast, with continuous activity from the outset. Believe it or not, it was a pleasure to hear the heterodynes!!

"Many interesting rigs were worked, including **W2ZM's** Heising modulated 203A (1925 vintage). **KC2LK** was using a Lafayette Explor-air regenerative receiver."

Larry Szendrei, NE1S, total points 93.

Bill Bogart, KA9CWK, total points 72. He used a DX-100B, an NC-183D and a 125' sloper.

Paul Fritsch, W3HHC, total points 36. He used a Ranger, a Hammarlund HQ-129X and a G5RV with counterpoise.

Butch Schartau, KØBS, total points 74. He used a Viking Desk KW, an SP-600 and a dipole.

Vance Gildersleeve, K5CF, total points 14. He used a Ranger II, a 75A-2 and a 1/4 wave end fed Hertz. His comments, "Not a big score but had fun. Wish the SSB boys would let us have the upper end of the band 1940-2000."

Bill Bolton, WBØBBM, total points 73.

Bruce Burgess, WX1O, total points 89. He used a DX-100, an R-390A and a 1/2 wave dipole.

Steve Gajkowski, KD3HT, total points 49. He used a Valiant II, a 75A-3 and a 160-M umbrella antenna.

Paul Maikranz, KB2MUQ, total points 126. He used a DX-100, an HQ-180 and a center fed dipole.

Jack Shutt, N9GT, total points 100. He used a Globe Scout 40A into a homebrew amp running a pair of 3-500Z's, an NC-183 and an inverted L antenna.

Eddy Swynar, VE3CUI, total points 100. His comments, " I worked the gamut all the way from AMI #1 **(Dale, KW1I)** to AMI #470 **(Bill, W8VYZ)**. Rigs I heard were the 'latest' to replica rigs from the 1920's... what other on-the-air activity can boast of such variety?"

Bert Schrevelius, WA3JYU, total points 50.

Paul Wolcott, N2JTD, total points 39. He used a Ranger II, an NC-303 and a dipole. His comments, " I had a blast working 160 AM in the contest."

Dennis DuVall, WA3YXN, total points 145. His comments, " FB evening. I work 160 AM here on the east coast a lot but three quarters of the stations I worked in the contest were new to me. It certainly brought out a lot of new activity. Looking forward to next year. "

Jerry Burns, K1GUP, total points 64. He used a Viking II and a 75A-2. His comments,"During the peak activity (mid-evening) there were few places between 1870 and 1950 where no AM signals were to be found. For a while it sounded like the 10 meter window three or four years ago!

And the winner is..... **Dennis DuVall, WA3YXN**, with 145 points. Congratulations Dennis.

Some of the entrants will notice that their scores I've indicated are higher than the totals they calculated. This is because as I went through the logs I noticed some people took 5 points for an AMI contact while others took 6. I changed the totals to give everyone 6 points per AMI contact. Mark your calendars for this years contest, Friday, December 30; same times and same scoring. **N6CSW/Ø**

VINTAGE NETS

Westcoast AM Net: Meets informally, nightly on 3870 at 9:30 PT. Wednesday at 9:00 PM PT they have their formal AM net which includes a swap session. Net control rotates.
California Early Bird Net: Wednesday nights at 8 PM PT on 3835.
Southeast Swap Net: Tuesday nights at 7:30 ET on 3885. Net control is Andy, WA4KCY. This same group also has a Sunday afternoon net on 3885 at 2 PM ET.
Eastern AM Swap Net: Thursday evenings on 3885 at 7:30 ET. This net is for the exchange of AM related equipment only.
Northwest AM Net: Recently started by Pat, K7YIR, this net is on 3875, Mondays and Fridays at 9:30 PT. This same group meets on 6 meters (50.4) Sundays and Wednesdays at 8:00 PT and on 2 meters (144.4) Tuesdays and Thursdays at 8:00 PT.
Twenty Meter AM Net: This net on 14.286 has been in continuous operation for at least the last 20 years. It starts at 4:00 PM PT, 7 days a week and usually goes for about 2 hours. Net control is Les, K6HQI.
Arizona AM Net: Meets Sundays at 3 PM MT on 3860. On 6 meters (50.4) this group meets at 8 PM MT Saturdays.
Colorado Morning Net: An informal group of AM'ers get together on 3875 Monday, Wednesday and Friday mornings at 7AM MT.
DX-60 Net: This net meets on 7290 at 2 PM ET. Net control is Jim, N8LUV. This net is all about entry-level AM rigs like the Heath DX-60.
Military Net: It isn't necessary to check in with military gear but that is what this net is all about. Net control is usually Walt, KJ4KV, but sometimes it rotates to other ops. It starts at 5 AM ET Saturday mornings on 3885.
Military Radio Collectors Net: Meets Sundays at 4 PT on 3905. Net control is Tom, WA6OPE. It is not necessary to check in with military gear.
Grey Hair Net: The oldest (or one of the oldest) 160-meter AM nets. It meets on Tuesday nights on 1945 at 8 PM in the winter and 9 PM ET in the summer.
Vintage CW Net: For CW ops who enjoy using vintage equipment.This is not a traffic net; speed is not important. The net meets on 14.062, Saturdays at 3 PM PT. Net control is Tracy, WB6TMY.
Vintage SSB Net: Net control is Chuck, N5SWO. The group meets on 14.293 at 1 PM CT, Sunday afternoons.
Collins Users Net: The oldest of the 'users nets'. It meets on 14.263 Sunday afternoons at 2 PM CT. The net control revolves. This group also gets together for an informal ragchew on 3805 Tuesday evenings at 7 PM CT.
Drake Users Net: Another relatively new net. This group gets together on 3865 Saturday nights at 8 PM ET. Net controls are Criss, KB8IZX; Don, WZ8O; Rob, KE3EE and Huey, KD3UI.
Heath Users Net: A new net started by Marty, WB2FOU/5. Net control is shared by Fred, AA5LW. It meets on 14.275 at 4 PM CT Sundays. Check in on either AM or SSB.
Swan Users Net: This group meets on 14.250 Sunday afternoons at 4 PM CT. The net control is usually Dean, WA9AZK.
Nostalgia/Hi-Fi Net: Meets on Fridays at 7 PM PT on 1930. This net has been meeting since 1978.
K1JCL 6-Meter AM Repeater: Located in Connecticut it operates on 50.4 in and 50.5 out.
Internet "Boatanchors" discussion group. Daily discussions on all manner of hollow state ham gear... technical topics, swap info, and restoration techniques are all fair game. Send an e-mail to: owner-boatanchors@gnu.ai.mit.edu to join.

Congratulations to QST for including AM operation in their "Considerate Operator's Frequency Guide". See page 101 of the January, '94 issue.

The SW3 and I... and Other Stories

Part 2

by Roger Faulstick, KD4AS
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Most of the later models (II & III) had the coil number hot stamped into the base centered between the pins. However, I have seen several sets of coils that had no sign of paint or coil number on either the coil or the coil boxes. I guess you could say that National was inconsistent in their inconsistency. What makes the picture even more confusing, is that the color markings most often have faded and it's sometimes impossible to tell a pink dot from a brown dot. The final coup de grace is that all this is probably academic, since if the coils have been handled or left out of their boxes, most of the damn paint usually will have flaked off anyway.

However, don't despair Jose, you say you got a big box of coils you don't know what model they are for or frequency range they cover, help is on the way, and I don't mean a via a GDO.

There has been various amounts of information available on how to wind SW3 coils. Usually this information has been incomplete, covering a single series. Jose, I have for you a complete series of winding charts for all standard band spread and general coverage coils for all three models of SW3's. The information is accurate, I acquired the original National factory manufacturing sheets and a copy of a personal letter from Jim Millen discussing additional coil data. By comparing your unknown coils with the winding data sheets, most coils can be readily identified.

The low frequency coils (from 90 to 390 kc) are best identified by listening for loran down at 100 kcs, and marine and aircraft beacons in the 200 to 400 kcs range.

If you have coils from 200 meters and up in frequency, it is relatively easy to count the number of turns in either the primary or secondary winding. Then, look up the number of turns on the winding charts. This will give you the coil tuning range.

To determine the series number of the coil and the model radio, with a magnifying glass or a young pair of eyes, count the number of turns in the tickler winding in the small groove at the bottom of the coil. Remember, you may be looking for a one to one half turn difference. Considering that most ticklers only have 3 to 4 turns it's not too big of a deal, just look for the fine green wire. National coils are very consistent and accurately wound.

There is a quick way that may help you identify the bandspread coils. In comparing different series of detector bandspread coils it appears that band spread detector coils designed for the model I (10-20 series) all have phenolic based mica trimmers. Band spread detector coils designed for the model II (series 60) all have a larger ceramic trimmer similar to the style used in the FB7.

I am a bit suspicious regarding the necessity for all the different series of coils, might this be another National marketing stratagem. It's hard for me to accept a technical argument that a fraction of a turn will make a lot of difference in a tickler winding, and/or the interstage coupling, considering the

amount of regeneration adjustment range that is available in the SW3, and the wide range of tubes and operating voltages that were recommended. Possibly it was Jim Millen's passion for excellence or maybe it was just doing business the good old Yankee way.

I have used SW3 model I coils in a model II receiver and SW5 coils in several different model SW3's with good performance. However, I have not tried all the different coils in all the SW3 models. I believe they will all work with some adjustment of plate voltage.

When the emotional subject of SW3 coils comes up, it usually works into a discussion about the very odd pattern six-pin coils. Why didn't they use a standard six-pin tube base (Was this really a devious plan by National to corner the coil business for all of their early receivers as many think?) Well, Jungle Jim if you can keep a secret, let me whisper something in your shell like ear that is known to few mortals. When National designed the special six-pin coil form in the early 1930's, there were no six-pin tubes, so there were no six-pin standard tube bases.

National made reference to the "independence of windings" in their description of the special six-pin pattern design. Don't ask me Jungle Jim, I'm not sure I understand what it means either. I said I was only going to tell you something. I didn't say I was tuned into the National engineers' celestial brain wave circuit in 1930. Of course, JJ there had to have been a little input from the slick dudes in the National sales department.

After finally acquiring a very nice, almost new SW3 with a complete set of coils, I decided to really give it a test under modern ham band conditions. I frankly had forgotten what a old regenerative Blooper sounded like and wasn't particularly optimistic about how well it would work. My first project was to build a well regulated power supply with the special accouterments that (as I remembered) SW3's required. I hauled out my favorite Greenlee punches (remember them?) and attacked a virgin aluminum chassis and started sorting through two tons of parts in my BIG BIG junk box.

I have been told my garage looks like a small version of Fair Radio. After two weeks, I found enough parts (that I didn't even remember I had) to build twenty power supplies. I seem to suffer from a hamfest animal syndrome called ratpacking. You know, "I think I will buy that four KW modulation transformer. It's just what I need for that new rig I will be building one of these days."

I was talking about the power supply design with Jose, another local terminal technician. I ignored his suggestion of plugging the SW3 into my HRO power supply, and started and finished building the PS project in two nights. My wife thought I had left her and she was talking to her girl friends about finding a good lawyer - if there is such a thing these days!

What a pleasant surprise, the power supply and SW3 made beautiful music together. I tweaked the knobs and suddenly there was the sweet adagio of forty meter CW. I started tuning the lower part of the band for DX. CW sounds absolutely great on the SW3 and even with my old beat up ears I had no trouble separating out signals. I did some comparison with my 75S3 and even with a short fifteen foot antenna on the SW3 the apparent sensitivity was as good or better than that of the 'S3. It's hard to explain, the noise level is just a soft rushing sound in the background and the signals seem to jump right out. I was able to read several European stations that were really down in the mud that were almost unreadable on the S3??

Although some of my comments may have sounded somewhat like disparagement, regarding the SW3 and National, not true. I give National a lot of

continued on page 34

A Product Detector For The R-390A

by Bob MacDonald, N2NIR
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Soon after I received my R-390A I decided that the SSB reception left something to be desired. The main problem is that the existing detector is easily overloaded with a strong SSB signal. This can be compensated for by reducing the RF gain, but it makes tuning across the bands a many knobbed complex operation.

My objectives for the design were to fix the strong signal overload problem, and also keep the disturbance to the existing chassis and front panel to a minimum.

Circuit Description

I researched a number of circuits but finally selected the one shown in Figure 1.

I decided to use the BFO off/on switch to select either the AM or the CW/SSB detectors. A relay (K1) powered from the BFO switched B+ line through a dropping resistor performs that function.

The 6BA6 BFO V505 is replaced by a 6BE6 pentagrid mixer. The mixer grid (pin 7) is connected to the 455 kHz signal at the grid of the AM detector. The audio output from the plate (pin 5) is filtered for RF before going to the audio system. Since the mixer is essentially a plate detector it is not significantly affected by strong signals.

The BFO pitch control is used as a sideband tuning control and clarifier. A setting of +1.5 kHz tunes the lower sideband, and -1.5 kHz tunes the upper sideband.

To summarize:

1 tube is replaced.
4 components are removed.
10 components are added.

Chassis Rework

1. Remove the IF chassis from the receiver.
2. Remove V505.
3. Remove the BFO pitch control shaft and the alignment coupler. (Be sure to scribe the current positions of the chassis shaft, the alignment coupler, and the BFO inductor shaft so they can be put back in their correct positions.)
4. Remove the following components; R529, R530, R531, & C534, and the solder post at the junction of these components.
5. Remove the ground wire from pin 2 of V505.
6. Move the L508 tap from pin 7 to pin 2 of V505. (This connects the inductor tap to the cathode of the new mixer.)

At this point your circuit implementation may have to be different from mine. My R-390A does not have the RT510 current regulator installed. Instead V505 and V701 are 12-V equivalent tubes. The wire from J512 is connected to V505 pin 4, bypassing the RT510 9-pin tube socket. I removed this socket to make room above the chassis for the relay and other components. See figure 2.

Note: In the following steps be sure to keep the new components low and close to the chassis to allow ample room for reinstalling the BFO pitch shaft and coupler.

7. Add a 120K 1/2-W resistor from V505 pin 5 to the existing B+ standoff.
8. Add a 82K 1/2-W resistor from V505 pin 6 to the existing B+ standoff.
9. Add a .01mFd 450-V cap from V505 pin 5 out the socket hole in the chassis.
10. Remove the wire from the output side of L502 and run it thru the chassis socket hole. (May need to be spliced.)
11. Add a new wire from the output side of L502 and run it thru the chassis socket hole.

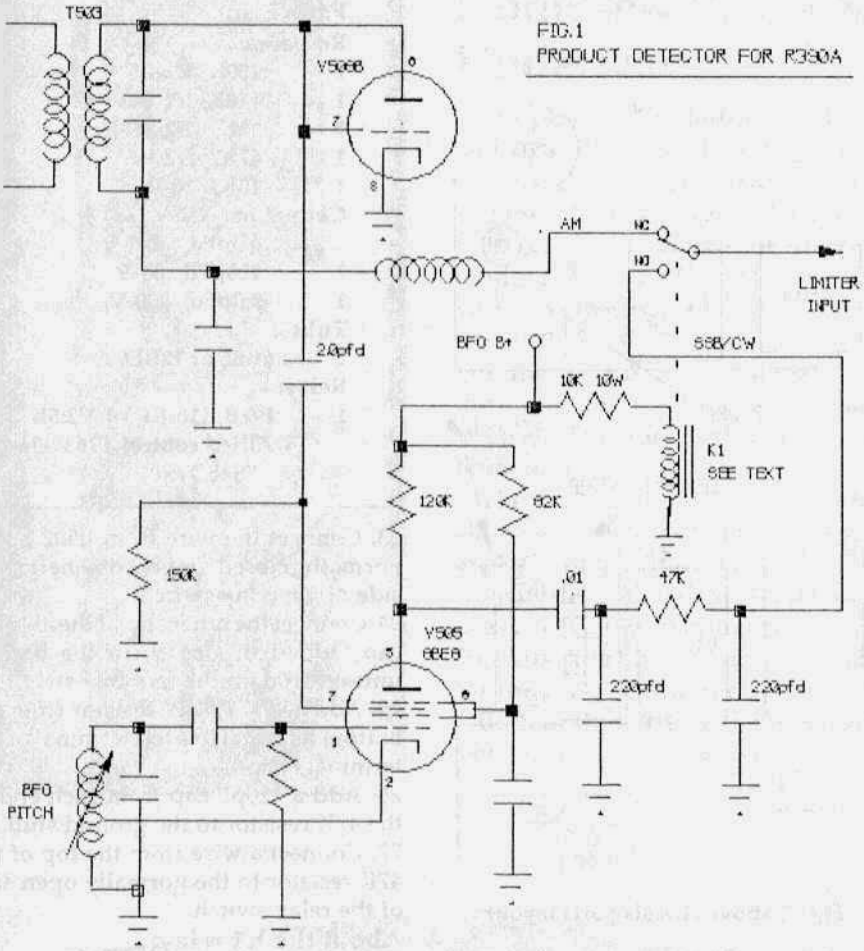

FIG.1
PRODUCT DETECTOR FOR R390A

12. Add a wire from the BFO B+ standoff and run it thru the chassis socket hole.
13. Add a 150K 1/4-W resistor from T503 pin 1 to a convenient ground.
14. Add a 100K 1/4-W resistor from V505 pin 7 to ground.
15. Mount the standoff removed earlier in a convenient place near V506B. (I installed it on the tube base bolt near the center of the chassis). Add a wire from this standoff to V505 pin 7.
16. Connect a 2.0mFd capacitor from the above standoff to pin 7 of V506B.
17. At this point double check all of the changes you have made so far and then reassemble the BFO pitch control shaft and coupler. (Make sure the scribe points all line up, and that none of the added components shorts out to the shafts or coupler.)
18. Attach the 10K 10-W resistor to the top of the chassis using a long #6 bolt into the empty hole next to the chassis side wall. (Use fiber washers to isolate the resistor from ground.) Attach the wire from step 12 (BFO B+) to the connection nearest the chassis.

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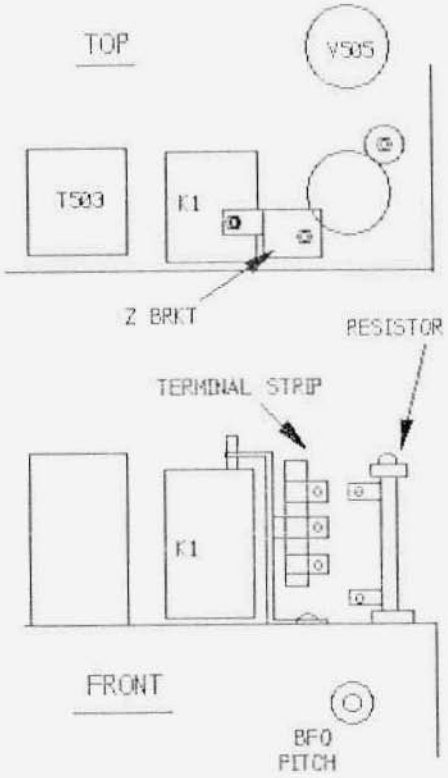


Fig. 2, above chassis parts layout

19. Make a "Z" bracket out of aluminum. One end bolts to the chassis in front empty tube chassis hole. The other end will have the relay mounting stud bolted to it. Drill a hole in the center of the bracket and mount a 2-position terminal strip with a ground on the opposite side of the bracket from the relay.
20. Connect a wire from the terminal strip ground to one side of the relay coil.
21. Connect a wire from the top of the 10K 10-W resistor to the other side of the relay coil.
22. Connect the wire removed from L502 in step 10 to a switch common.

Parts List:

Resistors:

1	150K, 1/2-W
1	120K, 1/2-W
1	82K, 1/2-W
1	47K, 1/2-W
1	10K, 10-W

Capacitors:

1	.01mFd, 450-V
2	220pFd, 50-V
1	2.0pFd, 50-V

Tubes:

1 6BE6 or 12BE6

Relay:

1 P&B R10-E1-Y4-V2.5K
Allied control T163x-34
"See Text"

23. Connect the wire from L502 to the normally closed (when de-energized) side of the relay switch.
24. Connect the other end of the .01 mFd cap (added in step 9) to the bottom unused stud on the terminal strip.
25. Add a 47K 1/4-W resistor from the bottom terminal to a top terminal of the terminal strip.
26. Add a 220pF cap from each end of the 47K resistor to the ground stud.
27. Connect a wire from the top of the 47K resistor to the normally open side of the relay switch.

About the K1 relay:

I used a P&B SPDT multipole plug-in type with a 48VDC 2500-ohm coil, because that's what I had in my junk box. Just about any SPDT DC relay would work, but try to keep the coil current in the 20mA range. Since the 6BE6 draws less current from the B+ supply than the old BFO circuit the net increase will be in the 15mA range.

This completes the physical modifications. Double check all of your wiring before reinstalling the IF chassis. A tube extender in the V505 socket will allow checking resistances before applying power and making voltage checks after power is turned on.

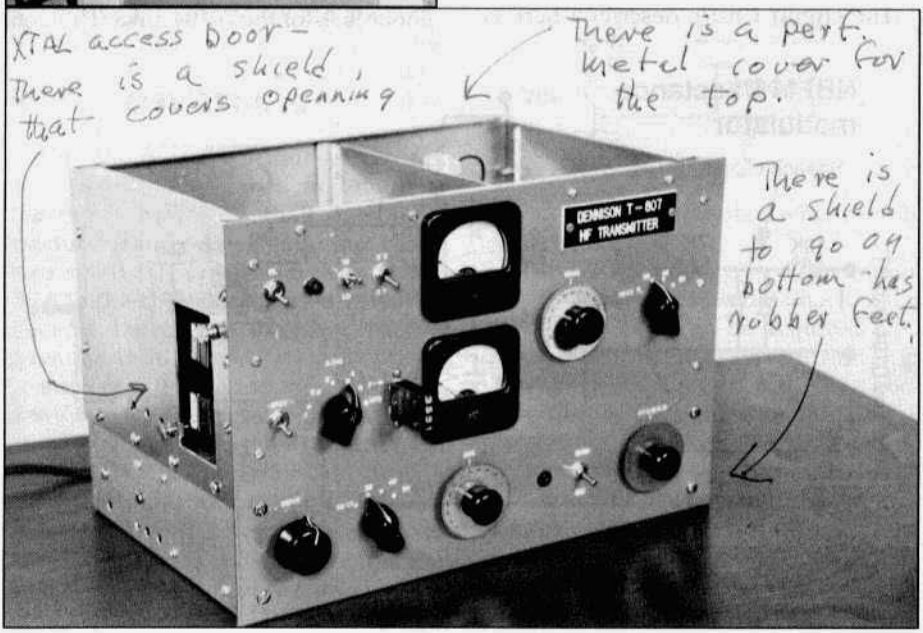
continued on page 34

Hombrew Projects Underway

The photo on the left shows Barrie Smith, KF7VA, inside his transmitter under-construction. This 'behomoth' (it's in a 7' rack cabinet) will consist of a pair of 450TH's modulated by 304TL's. The mercury vapor rectifiers are 673's (575A's). Above the rectifiers are two Variac's; one for the final plate supply and the other for the modulator plate supply. The rack cabinet is also homebrew.

The bottom picture shows Bob Dennison's (W2HBE) latest project, an 807 transmitter. This is a CW transmitter for 80 thru 10 meters. It uses a 6AG7 oscillator and puts out 50 watts. Bob built this rig primarily for the AWA Oldtimer's contest.

Both of these rigs will be the subjects of future ER articles.



NBFM for the EFJ 122 VFO

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

One of the first requirements for NBFM is getting on the air! So, some form of modulation that varies the frequency or the phase of the transmitted signal is required. There are several vintage transmitters that are capable of FM or PM but most are not. So, here is a simple modification one can add to any of the thousands of remote VFO's out there to easily get on the air with NBFM.

The EFJ 122 is a typical and popular VFO that can be used with virtually any transmitter of the time. That includes most of the older non-heterodyning rigs such as, Harvey-Wells, EF Johnson, B&W, Collins, MultiEimac, Gonset, etc.

This reactance modulator is not restricted to the 122. Any similar VFO circuit such as those made by Heathkit, Knight Kit, National, Hallicrafters and others are perfect for this application.

The circuit I have described here is quite easy to build and adjust. I started out with an amplified D-104 of any vintage. The amplified version puts out over a volts rms and will drive a diode clipper quite easily. If you don't have an amplified D-104 or equivalent the alternative is to build the circuit in figure 3 to drive your reactance modulator.

The clipper was added to increase the talk power in the sidebands without overdeviating. I chose to vary the frequency of the VFO instead of the phase because I wanted to increase the low frequency response of the modulator without having to add additional roll-off to a PM circuit. The circuit shown in figure 1 works very well and displays no measurable distortion. I used a diode clipper with a simple RC filter to minimize size and cost. The audio response is down about 20dB at 4 kcs.

I replaced the key jack on the back of the 122 VFO cabinet with a 1/4" stereo phone jack for the D-104 mike/PTT con-

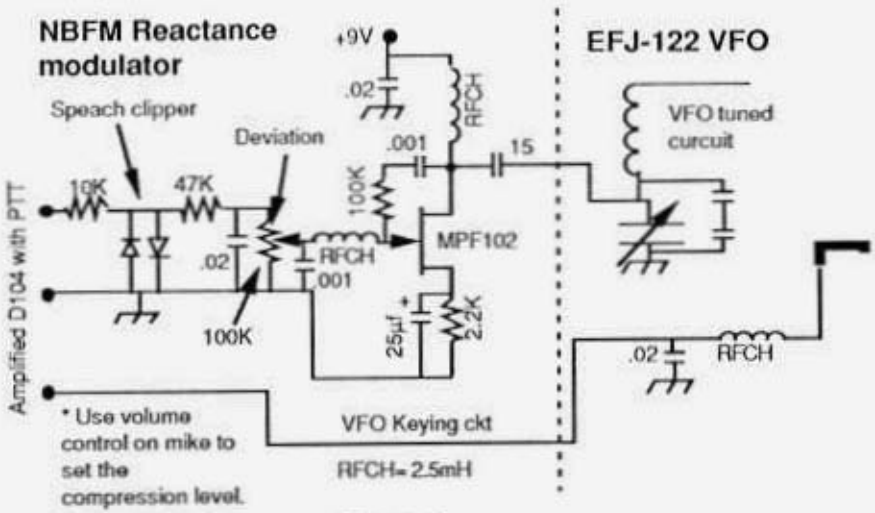
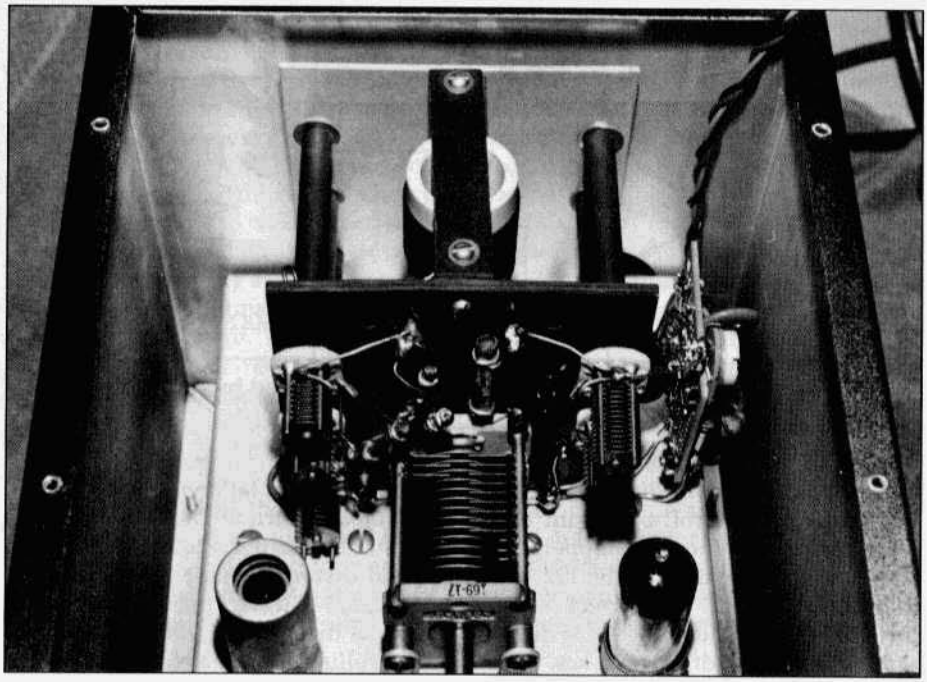


Figure 1



Inside the 122 VFO with the reactance modulator on the right.

nection. The mike PTT keys up the VFO instead of the transmitter PTT. I also ran the deviation control out of the cabinet through the top cover and down the back a few inches. I plan to mount the control permanently when I know whether I want it on the front or back of the VFO.

The photo of the inside of the 122 VFO, with the reactance modulator to the right, shows the small size of the modulator and ease of mounting. I used two small "L" brackets to mount the PCB to the chassis and ran a stiff wire over to the tuning trimmer capacitor from the 15pF cap.

Power for the modulator can be from a 9-V battery or from the 6.3-VAC filament power going to the VFO tubes, see figure 2. I did the latter and built a supply into the bottom of the 122 case; there was plenty of room. As you can see from figure 1, when you push the PTT switch on the mike the VFO is keyed on. The modulator only draws

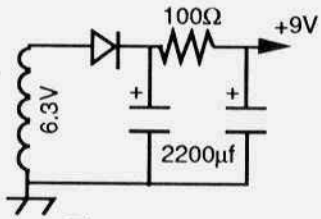


Figure 2

about 1mA so I leave it on whenever the VFO is on.

The JFET used here is very common and available from Radio Shack. All of the other parts can be acquired from swap meets, the junk box or from Digi-Key. Digi-key, I might add, has a good selection of RF chokes in the 2.5 mH range.

More about the operation of this reactance modulator. I have been running the mike gain at full and have been varying the deviation control to set the deviation. The clipper sets the audio level to about 0.5-volts peak-to-peak.

continued next page

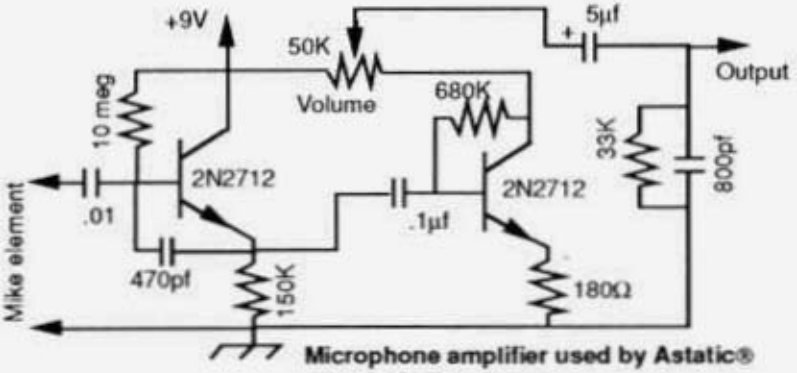


Figure 3.

That keeps a constant level going into the deviation control. Spectrum analyzer displays of the unit in operation show its ability to deviate the 122 VFO to beyond ±5.0 kcs. The correct setting for NBFM is around ±1.8 kcs. of deviation or a bandwidth of ±3 kcs. That point came for this circuit at about half throttle.

The 15pF silver mica capacitor coupling the modulator to the VFO tuned circuit is quite critical. Its value, along with the deviation control, determines the amount of deviation. In most cases any good cap between 10pF and 15pF should give you adequate deviation control range. Also, I had to reduce C64 from 91pF to about 80pF so I could recalibrate the VFO with the NBFM modulator installed. I have noticed no frequency drift from the VFO to date.

I installed the reactance modulator to the 160 meter coil in the 122 VFO. That gives you NBFM on 160, 80 and 40 meters. If you want the higher frequencies connect the modulator to the other coil.

Adjusting the deviation of these NBFM reactance modulators can be difficult. I have found though that a very good approximation is to start with the deviation control set low. Then, while listening to yourself on a receiver with a NBFM discriminator and a 6 kcs IF bandpass, start talking at your normal volume and turn up the deviation until the audio from the receiver just starts to sound distorted. As it turns out, your FM signal will start phase distorting as soon as the sides of your IF bandpass start rolling off. I have correlated this observation with my scanalyzer. So, if you start noticing distortion on anyone's NBFM signal, the first thing to do is suggest that they turn down the deviation! Oh, make sure you are tuned to the center of the stations signal before you request the reduction in deviation.

Also, if you do the initial deviation adjustment on 160 meters, when you switch to 80 and 40 meters the deviation will double each doubling of the fundamental frequency. That means you will have to make an adjustment for each band. The HT-18 VFO from Hallicrafters had a novel way to correct for that effect. They would increase or decrease the audio to the reactance modulator tube as you changed bands, always maintaining the correct deviation of about ±1.8kcs.

I have been using this modified 122 to drive my Valiant. I use the C1 crystal plug in the front of the transmitter as the auxiliary VFO input. I put the Valiant in the CW mode and close the KEY. When I want to transmit, I turn on the plate power and use the PTT on the D-104 to key up

the VFO. I have been running a cool 170 watts out with no problems.

On the subject of the Thursday night NBFM net at 8:30 on 3855. This time and frequency has been very poor. The frequency has many SSB QSO's going on at this time of the evening. I have heard many of you trying to check in but little has been accomplished in the way of NBFM experimenting as was originally intended. Allan Bergman, WØPUF, has proposed 1900 kcs on 160 meters and others have suggested later in the evening on 75 meters at around 3885 or so. These are all good ideas and I plan to try each of them in the up and coming weeks.

I also want to thank those of you who have been supporting the NBFM experimentation. I have received many positive comments and letters these last few weeks. Dick, WD4PMT, wrote and proposed using the Motorola MC3335 receiver IC chip. Larry McClelland wrote and told me of this experimentation in serial FM data communications and that using single sideband NBFM would increase the deviation while staying within the AM bandpass. Fred, KC4MOP, on the east coast, has been staying up late to try and check into the NBFM net with no luck so far. Fred, I will be letting you know of the new time and frequency. For those on the east coast I might like to try 40 meters in the evenings.

I must say for myself the research and attempts at QSO's to date have been a lot of fun and the results with this reactance modulator have been encouraging. I'm looking for better conditions at another frequency in the future. Now we need an article on a NBFM detector for our vintage receivers. ER

Johnson Viking 122 VFO modified for NBFM connected to a Valiant transmitter.

813 Transmitter for 160 Meters

By Bill Allen, W7US
11720 E. Twin Hills Tr.
Tucson, AZ 85748

I've been on the air since 1938 and back in the '40's and '50's I built many AM rigs. I left AM when SSB came into popularity and just returned to the mode in the last couple of years, sparked by some local AM operators and Electric Radio. At the time I decided to build this 813 rig, I was looking for a Globe King 500 or equivalent. Having no luck, I decided to build my own.

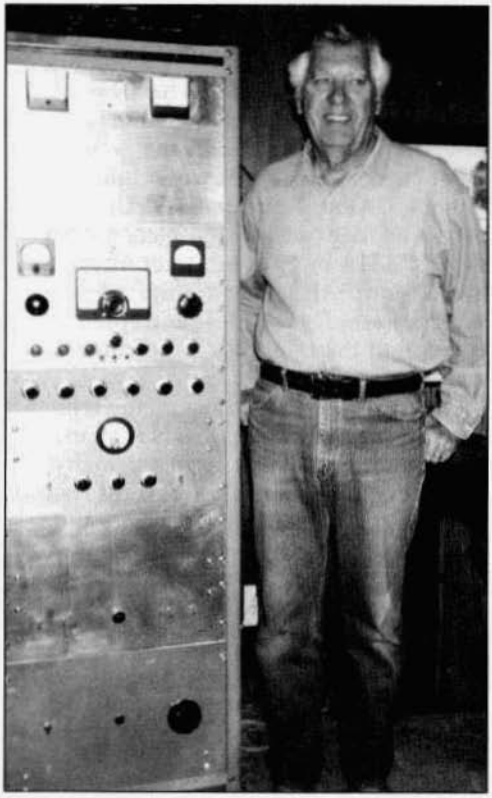
The bottom panel contains the high voltage supply for the 813 final which consists of a 3 KV transformer, bridge rectifier, a string of electrolytics, a soft start circuit and a variac for voltage control.

The next panel up contains two power supplies. One furnishes 1200 volts for the 811 modulators, the other is 350 volts for the speech amp and exciter. The modulator supply uses 866's as rectifiers and the 350-volt supply has a 5Z3 rectifier.

The third panel up from the bottom contains the modulator. The transformer I use is a 300-watt Thordarson multimatch. The 811 grids are driven by a 6SN7GT phase inverter with a 500-ohm line input from the speech amplifier. Two balancing pots on the front panel permit adjust the idling current for each of the 811's.

The panel above the modulator is the speech amplifier. This unit is conventional with the exception that it has a speech clipper/audio filter circuit plus a compression feedback circuit to hold the output somewhat nearly constant.

Above the speech amp is the exciter/final RF section. A 5763 is used for the VFO, which is a standard run-of-the-mill Colpitts oscillator. The inductor along with the variable capacitor is mounted in a small aluminum box. The 5763 is mounted outside the box. An OA2 regulator keeps the screen voltage happy. The VFO output frequency is on 160 meters and its untuned output is capacity coupled to a 5763 driver. The output of the driver is likewise capacity coupled to the grid circuit of the 813 final. The 5763 is shunt fed and a pot is used in the screen supply to regulate its output. The 813 grid circuit is a tuned input with 125 volts of negative fixed bias plus a series grid resistor which gives a nominal negative 165 volts bias on the 813 with 15 mA grid drive. The plate circuit of the 813 is shunt fed with a pi-net output.



The author with his HB 813 rig. Photo courtesy of his daughter, KB7ZKS.

continued on page 32

Review: 'Bible' for Receiver Buffs Updated

by Mike O'Brien, NØNLQ
1031 E. University St.
Springfield, MO 65807

The new third edition of "Communications Receivers -- The Vacuum Tube Era: 1932-1981," a compendium of data on more than 700 vintage shortwave radios, is the product of author Raymond S. Moore's half-century hunt for the elusive "ultimate receiver."

The quest began in boyhood for Moore, now 69, and continued throughout a career as an electronics engineer and industry executive that culminated in a vice president's post with Teledyne. Along the way, Moore amassed what he describes as "probably the most extensive library on communications receivers in the world." In 1987, he generously began sharing his files in the first edition of his book.

To meet Moore's definition of a "communications receiver" and thereby qualify for inclusion in the book, it must be a superhet, have a BFO, cover a substantial portion of the HF spectrum, have been marketed to amateurs and/or SWLs -- and, of course, feature vacuum tubes circuitry.

Moore traces the history of such receivers back to the eight-tube Hammarlund Comet, which was developed in 1931. He considers the shutdown of production of Drake's hybrid R4C in 1980 the end of the glorious era.

In between those two milestones, Moore spotlights offerings of almost 70 manufacturers, from Allied to Western Electric. Interspersed among familiar names like Collins, Hallicrafters and National are lesser-known but noteworthy firms such as Breting, Howard and Guthman.

The book's format is straightforward, emphasizing authoritative content rather than snazzy graphic design. Receiver listings include years of manufacture; original selling price; frequency coverage; IF(s); filters; number, type and purpose of tubes; and notes about special features, lineage accessories, etc. Most descriptions are illustrated by photographs.

Moore also offers a fascinating and insightful 10-page narrative overview of the vacuum-tube heyday, plus brief histories of major manufacturing firms and illuminating sketches of innovative engineers (James Lamb, James Millen, etc.) and dynamic personalities (Bill Halligan, Art Collins, etc.) who spearheaded development of the fledgling American electronics industry.

The book's 125 large (8 1/2 by 11 inch) pages are jam-packed with fact and lore, ranging from highlights of the zig-zag career of zany McMurdo Silver to documentation of more than 40 variations of the classic National HRO. Moore is particularly proud of his painstakingly researched history of The Hallicrafters Co.

This new version offers notable refinements and additions:

"I spent thousands of extra dollars to improve the quality of the photographs from the previous editions," says Moore, who paid his printer to screen each photo individually, resulting in optimum reproduction quality from old, often faded images.

And he tacked on 10 supplementary pages, acknowledging more than a dozen recently rediscovered commercial models and adding an all-new section on military receivers such as the BC-348 and BC-454 that proved popular among amateurs and SWLs when they became available on the surplus market.

Will there be a fourth edition in the future? Moore says no -- but that's what he swore after the second edition was published in 1991. "Remember, this is a closed-end subject," Moore says. "They're not making vacuum-tube re-

continued next page

Review from previous page

ceivers anymore. All I can do is find out more about the ones they made years ago. And I think I've found out and already published most everything worth knowing about them."

Besides, Moore is busy preparing a companion book about tube-type ham transmitters. He's behind schedule; it'll be another year before the book is available. "We got distracted a bit by designing a loop antenna and some other accessory equipment that we hope to market on a modest scale," he apologizes.

There are other distractions, too. The Atlantic Ocean beach is a mere 100 feet from the front door of Moore's home in Key Largo, Florida. The Gulf of Mexico is only 600 feet beyond his backyard. And a tennis court is an easy stroll away. A typical day, he admits, is "work on the book in the mornings and play around in the afternoons."

Truth to tell, Moore plays first thing in the mornings, too. He arises around 6 a.m. to indulge in his passion for SWLing. (He was a licensed ham, K1DBR, but let his ticket lapse years ago during his busy business career. He says he might take the exams to get back on the air now that it appears possible to regain his old callsign through the FCC's new "vanity call" program).

Moore enjoys chasing broadcast band DX, "especially stations in Australia and the South Pacific, which is my real forte," he says.

And what radio does he use?

His long-sought "ultimate receiver," of course.

A couple of major surprises:

One, it's NOT a receiver documented in his book. After buying and trying many of the fancy factory-built radios, Moore decided to construct his own in the late 1960s, using the Collins R-390A as his model. Because his main interest is BCB DXing, he optimized the circuitry for 500-1800 MHz and eliminated conversion stages.

Two, it employs NO vacuum tubes. When he first designed the receiver, it boasted 16 tubes. "But over the years I've gradually revamped each stage and replaced all the tubes with solid-state devices," Moore confesses.

"I love vacuum tubes," he assures. "There is nothing more beautiful to me than a fine old vacuum-tube receiver. But in all honesty I must say there's nothing that those tubes can do that can't be done at least as well, usually better, in solid-state."

Don't let that last bit of seeming "heresy" dissuade you from purchasing Moore's book. At $19.95, it is a genuine bargain that easily can pay for itself by pointing you toward flea market treasures, winning bets with your buddies ("What are the differences between the NC-300 and NC-303?"), or just warming your heart on a cold winter night. **ER**

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813 Transmitter from page 30

The final tuning capacitor is rather unique. It is patterned after a very fine article by Al Roehm, W2OBJ, that appeared in the November, '93 issue of ER (#55). The article appeared in print at a time when I was searching for a variable capacitor with the required voltage spacing. It looked like a unique project that would fit my purpose and I am happy to report that it worked out like a charm.

The 813 in my particular construction required just a hint of neutralization, so a homemade neutralizing capacitor was made that consists of a 3-1/2" high by 1-1/2" wide piece of aluminum mounted on a chassis feed-thru insulator next to the 813 glass envelope. The other end of the feed-thru below the chassis is connected to the cold side of the 813 grid coil. This provided the right amount of capacity to make the 813 rock solid.

The final result is that the 813 runs at 2000 volts @ 200 mA with 15 mA of grid current and has an output power of 300 watts on 160 meters. After many years of not building anything major, it was a great satisfaction to complete this rig. **ER**

Panel and Cabinet Restoration from page 9
elements first, and I think the bad news will become evident. These prices are general estimates and will vary with geographical location.

1) Custom Mix Paint--$45-$50 per gallon, one gallon minimum.
2) Artwork Generation--$22-$40 per hour.
3) Custom Mixed Screening Inks--$30-$35 per batch.
4) Photo Positives--$18-$22 each.
5) Silk Screen Manufacture--$45-$50 each.
6) Silk Screen Labor--$20-$25 each.
7) Panel Prep and Painting--$35-$55 each.

For a very simple panel of one color and a single color of ink you can very easily have $200-$225 invested by the time you finish. The more complex artwork arrangements with multicolored panels can easily add another $100. For the serious collector this may not be a problem, especially if the set is a rare one. However, for most of us, this could be more than we have invested in the set.

There are usually only three costs associated with cabinet refinishing.

1) Custom Mix Paint--$40-45 per gallon, one gallon minimum.
2) Metal Prep and Cleaning--$20-$25 per hour.
3) Paint Labor--$20-$25 per hour.

Single color cabinet painting will usually price out $60-$85. If multiple colors are involved and painting masks are needed, prices will average $125-$200.

Now for the good news. These costs can be controlled and they are volume sensitive. For example, that gallon of paint will paint a lot of panels. Artwork costs and silk screen costs can also be amortized across many panels. Labor costs tend to get more economical with more units per batch because equipment cleanup and set-up costs can now also be amortized across multiple units. Some things you can do yourself, like maybe the artwork or certainly some of the metal prep work. Economies of scale apply to the silk screen process and this why it is a preferred method in manufacturing. Costs can come down exponentially in quantity.

So, unless you absolutely have to do just one, collect a batch of them and do them together in one production run. Most screening shops like to run batches of 8-12 units per production run. This winter I plan to do some panel and cabinet restorations on Heathkit S-line classics, the SB-301 and the SB-401 and the Johnson Viking I. Those of you who have similar sets needing panel and cabinet restoration are encouraged to write the author for more detailed information. **ER**

Acknowledgements

Polane T and P60 G2 are products of the Sherman Williams Paint Company.
AutoCAD is a software product of Autodesk Inc.
Windows is a software product of Microsoft Corp.
Dremel is a registered trade name of Dremel Inc.
A special thanks to Lon Cottingham, K5JV, for allowing us to use his HQ-129X panel for these illustrations.

AMI Update from page 3
equipment. Ideally, groups will plan a field day activity at sites of military significance, take plenty of pictures, offer a special event QSL or certificate and promote their operation beforehand on the air and in amateur radio publications. Please send details of your planned operation and, if possible, including frequencies and times to AMI Headquarters by March 25 to get your special Armed Forces Day Operating Event promoted in this column in April.

AM Forum at the Dayton Hamvention

Plan to attend the AM Forum on Saturday, April 30, at the Dayton Hamvention. Plenty of AM'ers will be on hand at the Forum and in the flea market. Don't forget to save time in your schedule for the annual Saturday evening AM pizza gathering. Be sure to bring pictures of your station to pass around your table. **KW1I**

R-390A Product Detector from page 24

Alignment:

No special alignment is necessary. This change will work fine as is. However, I do recommend that the AGC and IF modifications from part III "The Competition-Grade R390A" by Ray W. Osterwald, NØDMS from ER #26 be installed.

I know there are many possible solutions to adding a product detector to this receiver. I had originally thought of an outboard, solid state, all mode, detection system. One that not only had AM, CW, and SSB but NBFM as well. There have been many good circuits published that would work, but this was such a simple solution to the SSB problem that I believe it's well worth the effort. ER

The SW-3 and I from page 21

credit for surviving the terribly difficult times that faced many of the budding radio manufacturers of the 1930's. The National management staff were not only great engineers, but a rare combination of astute business people and marketers par excellence. They designed and built well engineered, quality products that have stood the test of time. For over fifteen years the SW3 filled a need for an inexpensive, high performance, regenative receiver. Its design was based on solid engineering principals, instead of hokum and radio hype that was so common in the 1930's. Hats off to Jim Millen and the National crew for designing and producing an outstanding receiver that has carved itself a permanent place in radio history. ER

Are you a member of AMI? If not send $2 to AMI, Box 1500, Merrimack, NH 03054-1500. AMI promotes and protects AM; we should all be members.

Letters from page 2

we deserve. Please check the adjacent frequencies before you start operating and remember AM is unique in that it causes not just intermittent splatter but CONTINUOUS QRM from a carrier-produced heterodyne if you operate too close to an SSB QSO. Let's be good neighbors on the band.

James Viele, N8IRL

Dear ER

I've been following the NBFM articles with interest. A suggestion for those looking for a commercial transmitter with NBFM capabilities, look for a Hammarlund HX-500. It features a reactance tube FM modulator section (as well as SSB, DSB, CW and PSK modes). The manual specs claim the FM bandwidth to be the same as the DSB carrier with no audio. The deviation is said to be "limited to less than 3 kcs". Tests here support these specifications. RF out on FM is approximately 90 watts and is adjustable to 0. Looking forward to joining in on NBFM.

Bill Kipping, KE7KK

Dear ER

While monitoring the 75-meter AM window on Saturday, January 29, 1994, at 1425 EST, I observed an AM QSO in progress between WA2VMO, WB3FJJ and W1AW (that correct, W1AW).....welcome aboard, ARRL!

Ted Young, W3PWW

NO, WE DON'T HAVE ANY STOCK YET -- WE'RE WAITING BECAUSE BARRY SAID VACUUM-TUBE RADIOS ARE COMING BACK

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DEADLINE FOR THE MARCH ISSUE: MARCH 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: Martin twin lever Vibroplex, w/ case - $300; Lightning bug - $60. U-ship. Peter Harbrand, AA6ZE, 5140 Gates Rd., Santa Rosa, CA 95404. (707) 537-1120

WANTED: Good antique tubes, even common ones such as 226's and 227's. Please send your list for my offer to Jim Cross, 2817 Parklawn Dr., Dayton, OH 45440-1538. (513) 298-5827

TRADE: I still have two unchecked Collins 618S-1/4s (AN/ARC-88 forerunner) for trade. I am always looking for military goodies. William Donzelli, 304 South Chester, Park Ridge, IL 60068. (708) 825-2630

FOR SALE: NC-173; Collins 75S3 and R-392, w/new PS and manual. Richard, (919) 637-6724

FOR SALE: HQ-180AC, exc. - $290; Drake TR4, AC4, exc. - $180. **WANTED:** McMurdo Silver 701, 702, 801 and 802. John Hurst, KU6X, 2512 Euclid Cres., East, Upland, CA 91784. (909) 981-6759

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

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

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

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

FOR SALE: Vintage WW II airborne electronics new in orig. boxes - BC-375E, w/plugs, mount, TU-10-B tuning unit, TU-26-B and PE-73 dynamotor - BO. John Snow, 4539 Bartlett, Shorewood, WI 53211. (414) 964-0194

WANTED: FB7 National detector and oscillator coils (front panel mount with pull grips). Claude Pennington, POB 1916, Macon, GA 31202. (912) 746-1231

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

FOR SALE: Manuals: Babcock D-X Mitter, model MT-5A - $2; BC-375E xmtr; Tech Order No. 08-10-139 - $4; Collins KWS-1 xmtr (S/N 114), w/6 service bulletins - $6. All 3 - $10. Ed Cartotto, 641 W. Hillsdale Blvd., San Mateo, CA 94403. (415) 345-4334

WANTED: Pwr xfmr for Heath DX-20 xmtr. Frank Hill, WA6SYI, 1313 Milton Ave., Walnut Creek, CA 94596. (510) 939-2940

WANTED: Collins 70E8A, any condx or parts; 310B-3; CMS-2, 500-W mod xfmr; pair of 810's. Jerry, W8EGD (303) 979-2323

FOR SALE: FB7 rcvr, w/ 5897 AB pwr sply, coils set A-B-C-D-E-F, 500 kHz - 19 MHz, manual, VG condx. Bob, KK4GO, (404) 945-8642

WANTED: TCS xmtr and rcvr in clean condx. I would also like manuals for same. Thanks! Tom Smith, N5AMA, 13034 Elmington Dr., Cypress, TX 77429-2062. (713) 376-3436 (h)

FOR SALE: Antique mics: Shure Tri Polar model 720A broadcast - $70, Shure model 3B - $40, T-17 military - $20; WRL LA-1 amp - $50. Cliff Fleury, 64174 Tumalo Rim Dr., Bend, OR 97701. (503) 382-1697

FOR SALE: Hallicrafters SX-16 - $100; Drake T-4XB & AC-4 - $150; T-4XC & AC-4 - $200; BW RF clipper for Heath SB-401, new - $50; Zenith Wave-Magnet Transoceanic, leather case - BO; Gonset GSB-201 - $250. **WANTED:** Ranger or Navigator meter; HRO-50/60 coil boxes for parts; cabinet for NC-400. Jim Jorgensen, K9RJ, 1709 Oxnard, Downers Grove, IL 60516. (708) 852-4704

WANTED: Absolute top price for clean Collins 30K-5, 30J, 30FX xmtrs and SC-101 control; RCA CR88 and pre-war National HRO rcvrs; need HT-32B VOX relay and manual for same. Gary Lee, KE6MS, POB 5786, Beverly Hills, CA 90209. (818) 774-9497, (310) 696-0177

WANTED: Coils for HT-17. Need 40M-10M. Harry Blesy, N9CQX, 2409 Northgate, No. Riverside, IL 60546. (708) 442-8855

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

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

FOR SALE: Heath Apache TX-1, good condx _ $150, PU only. **WANTED:** E.F. Johnson Viking Courier amp and Viking 500 xmtr. Bert, N8NN, 2150 Silentree Dr., Vienna, VA 22182. (703) 448-8016

WANTED: Copy of manual or schematic for Breting model 40 rcvr. Someone out there can help. Joe Watson, N5ZYA, 3005 Broken Bow Rd., Edmond, OK 73013. (405) 359-8084

FOR SALE: Brand new, in the box, Knight pwr xfmrs for HRO-7, NC-173, NC-183, NC-183D, SX-99 and others - $30 shpd U.S. Charlie Svoboda, WBØUTC, 1501 West 'S' St., Lincoln, NE 68528. (402) 474-4272

WANTED: RC73-BC-7098 interphone amp, must work; also extra output xfmr for same. E.P. Renstrom Jr., 2105 E. Maples St., Crete, IL 60417.

WANTED: Schematic and manual (or copies) for a Tektronix 503 scope and a 75A-3/4 spkr. Mike, KE8QG, (419) 669-3550

WANTED: Clegg 66'er operating or not but mechanically and cosmetically OK. Consider parts unit. Gerry, WA1VWL, (603) 669-0940, X 114 (d)

WANTED: Hammarlund clock, w/cover & S-meter. **FOR SALE:** Johnson Directional Coupler, w/meter - $50; Signal Sentry - $45; Viking II and Ranger I parts; S-38D - $40; National NC-183D rack mount - $200. W7FG, (918) 333-7893

FOR SALE: They're beautiful! Replacement VFO dial numeral bezels for Collins 51J, 75A and B&W 5100 units. Easy to install - not an adhesive decal. $10 postpaid. Marcus Frisch, WA9IXP, Box 28803, Greenfield, WI 53228-0803.

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

FOR SALE: S22R; HT-37; HT-30; SX-110; SX-28s; S38-E; NC-108; Collins 388, 390-A; SB-10; SB-401; SB-301; HW-7; HW-8; HG-10; DX-40; VF-1; KWM2/ps; Johnson Mobile, VFO; Invader 2000; BC-779; BC-312; Harvey-Wells AR-5A; Eico 753s; Meissner Signal Shifters; 20A; AF-67s; PMR6As; PMR-7; RME-22A. Call Don, W6TVW, (702) 475-0211

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

FOR SALE: Crystal radio kits, complete with face panel, base board, variable capacitor, prewound coil and many parts for old style radio. Remit $22.50. Carl & Grace Ent., 5636 Romeyn, Detroit, MI 48209.

WANTED: HQ-170 ON/OFF switch w/dual attached pots; S3/R6/R15. Hank, W2IQ, 635 Chestnut Grove Rd., Dandridge, TN 37725.

FOR SALE: Heath HR-10B - $50 plus shpg. **WANTED:** 32V-3/75A-4. Bill, N2WXJ, (914) 356-6553

FOR SALE: Vintage WW II aircraft electronics used in L-2, L-3, L-4 and L-5 "Grasshopper". All RCA units, AVR-15 rcvr, new in orig. box; AVA-126 pwr sply, new in orig. box; AVA-127 pwr sply, as new; AVT-114 emergency interphone, as new, cables and mounting hardware for all of above. Best offer. John Snow, 4539 Bartlett, Shorewood, WI 53211. (414) 964-0194

TRADE: NIB xfmrs - Merit A-3126 and Stancor A-4752 drivers and Stancor A-3845 modulation. Need Riders #22 & 23. A. Bruno, 24 Butternut Dr., New City, NY 10956. (914) 354-8899

FOR SALE or TRADE: Kenwood Twins, R-599 & T-599; rare Hallicrafters FPM-200 xcvr. WANTED: KWM-2/2A; manual for Heath HR1680/HX/1690 CW rig, copy OK. Joe Perratto, K2QPR, 1341 SW Evergreen Lane, Palm City, FL 34990. (407) 220-7362

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

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

FOR SALE: Heathkit SB-401 and SB-303; two Lafayette 6-M xcvrs HE-45B. Manuals/extra tubes. BO plus shpg. Jerry Meyer, KB4VR, 415 NW 96th St., Miami, FL 33150-1941. (305) 751-3611

Help: Does anyone know where I can purchase 'Oryx' sub-miniature soldering bits? (They moved from Chesham, UK.) Harry Blesy, N9CQX, 2409 Northgate, No. Riverside, IL 60546. (708) 442-8855

WANTED: Electro-Voice model 951 xtal mic technical data and replacement cartridge; 80 and 40-M type FT-243 CW xtals. Carl Gottsmann, KN6AL, POB 5133, Arcata, CA 95521. (707) 668-4084

FOR SALE: TV-7D/U electron tube tester, w/ orig. manual; HP 5245L freq. converter, w/ 5252A module; more. SASE for boneyard list. M.D. Simpkins, 2030 Oak Grove Rd., Carrollton, GA 30117. (404) 854-8628

WANTED: Hammarlund SPC-10 SSB converter. H.A. Weber, 4845 W. 107th St., Oak Lawn, IL 60453-5252.

FOR SALE: Heath CS-1 condenser substitution box and RS-1 resistance substitution box, like new w/manuals. Both together - $25 ppd. Ken Greenberg, 4858 Lee, Skokie, IL 60077. (708) 679-8641

FOR SALE: Parting out Heath TX-1 Apache. John Maver, W6MQK, 1049 N. Holliston Ave., Pasadena, CA 91104. (818) 798-9345

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

WANTED: Help! I need 2 (preferably 4) face plates for rack-mount Marantz model 9 amp. Also an access door or two. Does anyone have some or is anybody making them? Larry Dupon, 2638 W. Albion Ave., Chicago, IL 60645. (312) 338-1042 (n)

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

FOR SALE: EAC R-390A, w/orig. meters - $175; T-416/GR, TX tube gone - $15; two Johnson Mess. 10s parts units, one w/tubes, both - $20; Radiola 17, w/pwr sply, checked tubes, needs refinishing - $30; Zenith 5L41 battery/AC portable, wrks FB except scratchy spkr, no battery box - $45; Crosley 628B BCB/SW (2.5 - 6.5 Mc) 6-tube table set, VG - $50; Silvertone model 8070 BCB/fono, VG - $20; early Swan 240 w/HB pwr sply & repo manual, VG - $75 + $20 + $10 respectively; common # used tubes - 4-1000A, w/socket - $85, $15; 6146s - $10; 2E26s - $5; octal rectifiers - $3. Ass't manuals - $10 up, repros - $.20 per page, query. Heath V-5 VTVM, needs calib. - $12.50; IM-10, wrks FB - $15; Hewlett-Packard 5008 freq. meter, 10 Hz to 100 kHz, wrks, no leads - $50. All units unchecked unless noted. Shpg prepaid (R-390A in 2 boxes, to business address only). Eric Jones, N4TGC, Rt 11, Box 492J, Florence, AL 35630. (205) 764-0675

FOR SALE: Collins 312A-1 grills & lamp hoods; S-Line/St. James gray painting. Butch, KØBS, (507) 288-0044

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

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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: Collins - 32S3 (R); 75S3B (R); 32S3 (W); 75S3 (W); 312B4 (W); 516F2 (W); one rack panel for S-Line; SM-3 mic; DX Eng. speech processor for 32S3; CP-1 xtal pack; 800 and 500 cycle filters for S-Line; tubesters for 75S3B/C. Hallicrafters antiques - S9, S11, SX-28; Harvey-Wells TBS-50 AM/CW xmtr; Philco 1937 wooden radio (covers 5 to 18 MHz); URM 25D sig. gen.; Hewlett-Packard 608F sig. gen.; spare parts for KWS-1 pwr sply and 32V-3. Large ass't of ARRL Handbooks for sale. WANTED: Four binders for QST magazine, 1960's and early '70's. Mike Palmer, K5FZ, 16707 Creeksouth, Houston, TX 77068. (713) 444-7737

WANTED: List, indexes or directories of WW II Navy tech. manuals or equipment. Willing to help to identify WW II Navy 5-digit type numbers. Send SASE. Ray, W6RIC, (805) 985-6048

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

FOR SALE: Tubes - 826, 866A, 8005, 2826, 8A5, 807, 815, 866Jr, EL-34, 19BG6, HY615, RK34, VR150, VR90-30, VT287. Larry, (203) 272-6030, Cheshire, Conn.

WANTED: Tube type audio equalizers, compressors/limiters; any nice old recording mics. Gary, WA5NCX, (405) 255-1886

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

WANTED: Vibroplex gold presentation bug; R-390 4-pin AC pwr plug; RCA mics. FOR SALE: Rare Collins 212S-1 broadcast console, 2-channel stereo, 15 input, complete - $495. Gary, KE6MS, (310) 696-0177

FOR SALE: Hallicrafters HT-32 xmtr, good condx, fresh alignment - $200, U-ship; R-1051/URR rcvr, good condx - $395, U-ship. Dennis, WAØWAB, (316) 225-3736 (d), 225-2961 (n).

FOR SALE: Racal RA-17 gen. coverage rcvr, exc. condx, checked out - $400; Collins CP-1 - $110. Gary Gleicher, Box 427, Little Neck, NY 11363. (718) 423-1911 (n)

WANTED: 250TH tubes, preferably Eimac, no GE's. Bob, W5PYT, (915) 392-2585

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

WANTED: McIntosh and Thordarson amplifiers any condx. Marcus Frisch, WA9IXP, Box 28803, Greenfield, WI 53228-0803. (414) 545-5237

FOR SALE: Drake T4X xmtr (has WARC bands when used with matching rcvr), very clean, copper chassis has very little spotting, no wear marks, no paint scratches, no mods (as close to mint as can be, but has been used) - $550 + shpg; Drake R4A rcvr (has WARC bands), very clean (same condx as above xmtr) - $550 + shpg. Dan Rupe, 1302 S. Uplands, Camano, WA 98292. (206) 387-3558

WANTED: Hallicrafters HT-33B linear amp in exc. or mint condx, w/good tube. Also need mech. filters for 51J4. Tom, WA4FJQ, (910) 887-0705

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

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

FOR SALE: USSR issue radio sets for collecting: (not to be operated): R-105M, R-105D, R109M, all exc. condx, w/accessories in transit cases - $280 ea., 3 for $750. Mike Murhpy, (609) 444-7717

WANTED: Waters rejection tuning kit for KWM-2A; Collins cabinets for S-Line, KWM-2A, 30L-1, etc. Will pay top $ for very clean cabinets. N5CET, (800) 776-4976 (d), (214) 271-0017 (n)

FOR SALE: G-186B panadaptor for G-133/51S-1 rcvr - $275; Collins PM-2 pwr sply - $80; Pioneer AFT-14 tube-type tuner (1963) - $40. J. Orgnero, Box 32, Site 7, SS 1, Calgary, AB T2M-4N3, Canada. phone/FAX (403) 239-0489

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

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. 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. (909) 985-6250

FOR SALE: Heath antenna coupler model AC-1 for early xmtrs - $20 + shpg. **WANTED:** SX-130 manual, copy OK. Tom Mackie, WB2ILA, 807A Bristol Ferry Rd., Portsmouth, RI 02871. (401) 683-9504

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

WANTED: Hammarlund clock & plastic cover; BFO knob for SX-101A; T-195 xmtr & cables; HQ-180AC rcvr; meter for EFJ Viking I xmtr. Dennis, WAØWAB, (316) 225-3736 (d), 225-2961 (n)

WANTED: Swan, anything! Especially monobanders, 240, 600T/R, 160X, 2mtr, solid-state, accessories, ST3 tuner, VFO's, filters, parts, non-working OK. Eric Kutzli, KBØXP, Box 98, Stanton, IA 51573. (712) 829-2446

FOR SALE: Drake TR4 xcvr, w/mic, manual, pwr sply and almost complete backup set of tubes, almost new finals installed - $200 including shpg or will negotiate a trade for above Hallicrafters rigs. Don, WB5UIA, 903 Madison, Minden, LA 71055.

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: Collins R-390, w/meters; HQ-180A, w/spkr, other goodies. SASE for list. Tim Walker, N2GIG, 19 Woodside Ave., Westport, CT 06880.

FOR SALE: Transmitting/Receiving tubes, new and used. LSASE for list. I collect old and unique tubes of any type. **WANTED:** Taylor and Heintz-Kaufman types and large tubes from the old Eimac line; 152T through 2000T for display. John H. Walker Jr., 16112 W. 125th St., Olathe, KS 66062. (913) 782-6455

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 TRADE: Disassembled Heath AT-1. All parts, chassis and cabinet, cleaned but not refurbished. Some new parts. The AT-1 is ready to be reassembled w/orig. construction manual. Will trade the AT-1 kit for unmodified or only slightly modified GO-9 military xmtr. I will pay all shpg. Ted Bracco, Quincy University, 1800 College Ave., Quincy, IL 62301. (217) 228-5213

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

WANTED: Hallicrafters SX-101A; BC-348L, w/pwr sply; German WW II radios. William Brudi, KA9HTM, 334A E. Shaver St., San Jacinto, CA 92583. (909) 654-4272

FOR SALE: Collins: Rare RF deck only from Collins FRT-24 xmtr, circa 1958. Exciter 4-65 driver, and 4-1000 final. 2-30 MHz with 10 autotune channels. All controls motor driven or manual operation, vacuum variable plate tuning. Trade for TS-940SAT or sell for $1195 or best offer. Pickup only in Fresno, Calif. Jeff, WB6ZBX, (209) 268-3311

WANTED: Hallicrafters HT-32 or HT-37 xmtr and SX-111 or SX-101A rcvr. Don, WB5UIA, 903 Madison, Minden, LA 71055.

ELECTRIC RADIO PARTS UNIT DIRECTORY

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

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

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

WANTED: Heath Apache TX-1, w/bright chrome knobs and matching Mohawk RX-1 rcvr; also Viking Ranger II. Will pay top $ for clean equip. N5CET, (800-776-4976 (d), (214) 271-0017 (n)

WANTED: Manual for Jackson Electrical Instrument Co. model 115 tube tester. Jerry, (318) 640-3510

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

WANTED: Eico 730 modulator w/manual in operating condx. Thanks! Don Chesley, WA1HVS, 240 Hope St., Mansfield, MA 02048. (508) 339-8264

WANTED: Riders Manuals 18 & 19. FOR SALE: Antique radio schematics - Sams, Riders, Beitman, Gernsback - $2.50 each, postpaid USA. Joseph R. Forth, WA2TRT, 321 Long Vue Acres, Wheeling, WV 26003. (304) 277-3154

FOR SALE: NC-100 pwr xfmr, (2) 810's, RCA; (2) 810's, GE; (2) 4-125's, GE. All NIB, late mfr. Jack Iverson, N9KYT, 1110 Old Mill Dr., Palatine, IL 60067.

WANTED: BC-610E or earlier, complete, orig. and in good condx preferred. I will pay well for the right one. I'm willing to travel anywhere in Calif. to collect, or perhaps arrangements can be made. Andy Miller, KD6TKX, (408) 484-2389

FOR SALE: (2) Pyranol caps, 4 mFd @ 5000V, new - $35 each; Jennings vac-var, max - 302, min - 9, new - $50; knobs (ER 42-23) - $2.50; also many other knobs and parts. Joe, W6CAS, (916) 731-8261

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

FOR SALE: ARRL Handbooks, near mint - 1932, 1934, 1935, 1936 - $25 each. Tube testers - TV-2A/U, near mint - $200; TV-7A/U, VG - $65. HP 606A high freq. sig. gen., exc., w/manual - $250; USM281A/HP 180A solid-state scope - $200; HP 5255A 12.4 Gig. plug-in - $125; large Sola line conditioner, exc. - $75; weather balloons - $7; new ME-26 (mil. spec. HP 410B) probes - $25; new 6S57 tubes - $4; 6LQ6 pulls, checked good - $2. Shpg additional. Joe Bunyard, 1601 Lexington St., Waco, TX 76711-1701. (817) 753-1605

WANTED: WW II radar stuff, big or small. Also RCA electron microscopes; pre-1900 motors and generators. Allan H. Weiner, 14 Prospect Dr., Yonkers, NY 10705. (914) 423-6638

FOR SALE: Heath TX-1 Apache, RX-1 Mohawk w/SB-10 sideband adaptor, (1) TX-1 for parts and (2) SB-10's for parts, all manuals and cables. TX-1 and RX-1 are in VG condx, all - $500, PU only. Ken Burrough, NEOC, 70260 Morristown-Flushing Rd., Flushing, OH 43977. (614) 968-3067

WANTED: British and Canadian military radio equipment, WW II and later. Leroy E. Sparks, W6SYC, 924 W. McFadden Ave., Santa Ana, CA 92707-1114. (714) 540-8123

FOR SALE: Exc. & working R4B, T4XC, AC-4, MS-4 - $450; HBT tuner, w/28 uH roller inductor - $50; MFJ 948 ant. tuner - $60; 2 sets of WARC xtals for S-Line - $30 for both; Heath VTVM IM-18 - $25; Heath HD-15 phone patch - $20; SX-101A S-meter - $20. U-ship. Gary, NO5H, 808 Clarice St., Delhi, LA 71232. (318) 878-8032

WANTED: Repairable HQ-120X. **FOR SALE:** Kaar Conelrad monitor - $35; early Heath O6 scope - $75; S-38C - $35. Don Winfield, K5DUT, 6080 Anahuac Ave., Fort Worth, TX 76114. (817) 732-3976

WANTED: Heath AT-1; Johnson 122 VFO; Turner model 99 mic. Bill Brossman, K9IUF, 547 Lake Connie Rd., Carrollton, GA 30116. (404) 834-0460

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

FOR SALE: Westinghouse H204 - $50; Philco 50-922 - $50; Philco PT44 - $75; Philco 39-7 - $50; Emerson Port 523 - $35; Federal R-P101 - $40; RCA 6BX63 - $40; Truetone D2919 - $25; Bulova 350 - $30; Bulova clock 190 - $20; Truetone D1002 - $100; RCA 2X62 - $40; Dunlop 500 500 - $50; Philco 46-250 - $40; Zenith H723 - $30; Philco 53-560 - $25; Zenith 6D030E - $40; Silvertone 2421 - $50; GE 40B - $40; Zenith 4K035 - $45; Lafayette HE51 - $50; RCA 4X641 - $35; Stromberg Carlson 1101H - $100; RCA 95T5 - $75; GE 123 - $60; Motorola 63L1 - $45. Polaroids $1. Bud Santoro, 3715 Bower Rd., Roanoke, VA 24018. (703) 774-9153

WANTED: 812-(A) tubes, no junk, state make, origin and price. Phil Burton, K8EGU, 3939 Hall St., S.W., Grand Rapids, MI 49504

FOR SALE: HRO-50T - $350, PU only. WANTED: Drake TR-6; Hallicrafters SX-115. Steve Barnes, K6PFW, 848 N. Silverwood, Upland, CA 91786. (909) 985-1062

WANTED: T-60 xmtr; Hallicrafters S-38, S-53A rcvrs; Johnson Adventurer; Heath HM-102 SWR & Pwr meter; Knight Span Master. Bob Braeger, WA6KER, 6634 Navel Ct., Riverside, CA 92506. (909) 682-5084

FOR SALE: TR4 (w/NB), AC-4, MS-4 - $325; 7553B (RE), 3 filters, no spkr - $450; R4C not working - $100. U-ship. Gary Elliott, NO5H, 808 Clarice St., Delhi, CA 71232. (318) 878-8032

FOR SALE: Drake W-4 - $60; Clegg 22'er - $50; Johnson 80-10-M Thunderbolt amp - $475. Clem, W8VO, (810) 795-4670

WANTED: HW-8 or HW-9; manual (copy OK) for Webcor wire recorder. **FOR SALE:** 1916 DeForrest Audiotron tube - best offer. Ros Hawks, WBØGKL, 355 Animosa Dr., Durango, CO 81301. (303) 259-0785

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

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

FOR SALE: KWS-1 pwr sply cabinet w/door, filament tap switch and pilot lights, no back cover l- $65 OBO, U-ship. WA7HDL, (208) 756-4147

WANTED: R274/FRR rcvr, top, bottom, rear covers and S-meter. Bill Crawford, Cushman Rd., Patterson, NY 12563. (914) 878-4653

WANTED: Volume one of Ryders manual. Advise condx and price. Bill Goodrich, W8LNL, 1417 Covedale Ave., Cincinnati, OH 45238. (513) 251-3004

FOR SALE: 455 kHz Collins mech. filters - 0.4, 1.5 and 6.0 kHz bandwidths, part no's 526-0705-010, 526-9635-010 and 526-9637-010. Similar to S-line filters (not 75A type), used filters removed from equipment - $40 each ppd. James Owens, NWØO, 1363 Tipperary St., Boulder, CO 80303. (303) 673-9019

WANTED: Knight T-150, must be working condx. Larry Wolf, 2320 E. Central Ave., #19, Duarte, CA 91010. (818) 334-8600

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

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

FOR SALE: AN/SRR-13A HF rcvr, works, case scratched - $229; AN/SRR-11 VLF rcvr, works, case scratched - $229; AN/URR-13A VHF/UHF FM rcvr, very good - $179. Don, (412) 234-8819 (weekdays EST)

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

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

FOR SALE: Command sets - 13 xmtrs - $10-$20 each; double xmtr rack - $15; RE-2/ARC-5 relay - $15; 3 rcvrs w/dynamotors - $30 each; triple rcvr rack, w/shock mount - $20; BC-456-B/E modulators - $5-$15; rcvr local tuning crank - $8. Trade for IC-22A, TCS gear, BC-348, ART-13 or ??. U-ship. WA7HDL, (208) 756-4147

WANTED: Any type Gonset, Hallicrafters, Regency, Seco, Eico, Sonar, Precision, Paco or Hickok manuals to buy, swap or loan. Pete Markavage, WA2CWA, 27 Walling St., Sayreville, NJ 08872. (908) 238-8964

FOR SALE: BC-348P - $110; BC-620A, w/PE-120A - $150. All VGC, no mods. Bud desk top rack cabinets, 8-3/4" x 19" opening - $35ea/$50pair; R-390 Twinax antenna lead in cables, w/connector - .50/ft., various lengths. Shpg xtra. Bob Bakinowski, 1524 Saint Tropaz, Tucson, AZ 85713. (602) 624-8029

WANTED: TMC GPR-90 rcvr. Rich Smith, AB6MM, 1122 Via La Cuesta, Escondido, CA 92029. (619) 739-1835

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

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FOR SALE: Meissner 150B xmtr. 1941-vintage 150 W, plate modulated AM xmtr. Covers 1500 kHz (upper 100 kHz of AM broadcast band) thru 12 MHz. Uses Meissner Signal Shifter as VFO/exciter. Includes 2 Signal Shifters and 1 complete set of coils. With manual. A genuine, working museum piece. Several small unoriginal holes are the only mods. PU only in Pittsburgh, PA. Best offer over $900 or equal value in trade. Don, (412) 234-8819 (weekdays, EST)

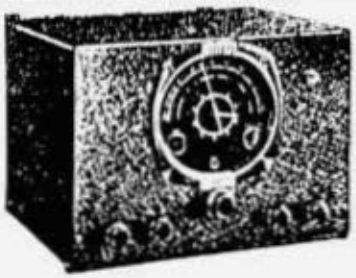
WANTED: WRL-70 xmtr; HB xmtrs for display, must be museum quality; thousands of QSL cards to paper walls of Amateur display. Call Leo, (402) 392-1708, Western Heritage Museum, Omaha.

WANTED: Collins mics SM-1, SM-2, SM-3, MM-1, MM-2; also Electro-Voice 664 w/deskstand. N5CET, (800) 776-4976 (d), (214) 271-0017

FOR SALE: Collins 30L-1 amp and HB 572B (4). John King, K5CDV, 14222 Shoredale, Dallas, TX 75234.

WANTED: SX-28 or 28A; clean R-648/ARR-41; tubes - VT-52/VT-25/801A/842. Joe, N4WQC, Box 180562, Austin, TX 78718. (512) 339-6229 voice/FAX

WANTED: RCA broadcast equipment, mics, spkrs, studio, transmitter etc. Jim Phillips 414 Washington Ave., Defiance, OH 43512.



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

WANTED: Sargent WAC-44 manual or schematic; Millen 43XXX coils; Hallicrafters HT-17 coils; Military TBY key, whip and canvas bag; TBX radio. Don, (412) 234-8819 (weekdays)

FOR SALE: National FB-7 and FBXA with pwr supplies and lots of coils - $1200; old QSTs, bound, July 1923 thru December 1935 - $300; Heath Q-multipliers; R-90 cabinet, meters, no mods, VG - $250; BC-453, pwr - $30; BC-733, dynamotor - $35; dynamotor for BC-348 - $40. Tom Raymond, W5JM, 2320 S. "O" St., Fort Smith, AR 72901. (501) 783-8848

WANTED: QST, Dec. 1942; CQ Anthology volumes 1, 2; Surplus Conversion, Editors Engineers, all volumes. Alan Mark, P.O. Box 372, Pembroke, MA 02359.

FOR SALE: Three Nems-Clark rcvrs, 105-500 MHz - $150; TCS-12, complete works - $150, U-ship. New model 19 MK II, complete - $200. Paul Zamora, WB7SWR, 3103 Arrow Pl., Las Vegas, NV 89108. (702) 646-9041

WANTED: HQ-170 junk chassis or slot filter coil no. K42034-1 for replacement. Gerald Liccoine, W2TPL, 118 Hiawatha Trail, Liverpool, NY 13088.

FOR SALE: Drake TR4C, MS4, PS4, very good to exc. conds, orig. boxes, manuals and stickers, unmodified - $350 plus shpg. Seth, N2UCQ, (908) 580-4633 (EST, weekdays).

WANTED: Junker SP-600 for parts and Eddystone rcvr. W7RBF, (602) 864-9987

WANTED: Collins mech. filters for S-Line: F455FA-05-500 Hz, X455Q200-200 Hz, F455FA-31-3.1 kHz, F455FA-60-6.1 kHz. N5CET, (800) 776-4976, (214) 271-0017 (o)

WANTED: Western Electric tubes - 101D/F, 102D/F/G, 205B/D/E/F, 262A/B, 252A, 274A/B, 275, 300A/B, 350B, 212/E. Ed Billeci, 2310 SE 113th, Portland, OR 97216. (503) 249-1079

WANTED: Info on mods to Clegg 99'er 6-M AM xcvr. Have a working one, but someone made a mess inside. Can you refer me to any good mod articles, especially a squelch add-on using 6AL5 and 12AX7. Want to figure out what I've got. Thanks! Wayne Arnett, AI7C, 2699 Mazatlan Dr., Grand Junction, CO 81506.

WANTED: Collins equipment cabinet for A-line; speaker for older HRO and RME-69; S-meter for RME-69. Jim Wilson, NU6H, 3540 Carnation Cir., Seal Beach, CA 90740. (310) 430-5164

FOR SALE: SCR-506A manual - $22; Meissner 9 - 1073 freq. standard - $25. **WANTED:** Any European tube handbooks - Philips, Valvo, etc. Geoff Fors, WB6NVH, POB 342, Monterey, CA 93942. (408) 373-7636

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

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

FOR SALE: Navy goodies! CJB-26003A "flameproof" keys NIB - $40; TBW-3 xmtr, w/ cables, w/o cabinet - $225 OBO; GP-7 tuning units w/cases and covers, A,B,C,D - $15 each; E,F - $35 each; GP-7 control boxes - $5; LM-18, LM-21 - $15 each; LP-5 sig. gen. - $25. Looking for clean TCS rcvr/xmtr, BC-348, ART-13 or ?? U-ship. WA7HDL, (208) 756-4147

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

WANTED: Straight keys, Mac keys (bugs),empty key boxes, Chart of Codes and other McElroy artifacts. Tom French, W1IMQ, "The McElroy Collector", 120 Great Rd., Maynard, MA 01754.

WANTED: Collins 312B-5 station consoles, need 1 WE & 2 RE; need (2) 75S-3A rcvrs; 30S-1, RE; 32S-3A, RE; 32S-3, RE; 312B-4, RE; 136B-2; DL-1 for personal station. N5CET, (800) 776-4976 (d), (214) 271-0017

WANTED: Complete spark xmtrs and rcvrs; WW II Japanese military radios. Takashi doi 1-21-4 Minamidai Seyaku, Yokohama, Japan.

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

FOR SALE: Military aircraft rcvr ESL model R902A/L. This late 1960's vintage solid-state unit covers 1.4 thru 8.0 MHz in 100 Hz steps. AM-CW-MCW. Double conversion superhet has first IF at 2.2 MHz and second IF at 455 kHz. Three selectable IF bandwidths - 0.4 kHz, 1.5 kHz and 6.0 kHz using Collins mech. filters. Requires remote control box (not available) using serial control. Weight: 14-1/2 lbs - $175 plus shpg. Tech manual (182 page photocopy) - $15. James Owens, NW0O, 1363 Tipperary St., Boulder, CO 80303. (303) 673-9019

FOR SALE: Collins URC32; WRT2; URR13A; National R1230/FLR; O1187FLR; O928FLR; T336D/TED3; URC7; URC34; APN180 Loran; CME SRC502A; Bendix RDFs; antenna tuners; FSK converters; parts for R1051, RT618, T827, AM3007; unused WE and RCA tubes; used pwr tubes. SASE for list. Dave Morgan, WO4S, 117 West City Hall Ave., Suite 701, Norfolk, VA 23510. (804) 552-8626

WANTED: S-meter for SX-28 or someone who can repair mine. Tom Henderson, (615) 781-7223

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

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

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

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

WANTED: Fluted ceramic coil forms approx. 2-1/2" dia. by 6" long. May be scored for windings. Bob, KD9B, 1025 N. Vine St., W. Lafayette, IN 47906. (317) 743-4053

FOR SALE: RME 45 rcvr, spkr DB-22A, VHF 152A; MS-4 spkr. **WANTED:** Plate xfmr for T599-D. Ray, (314) 428-1963

FOR SALE: Collins 75A-4 rcvr, w/2 filters, exc. condx, SN 42XX - $600; Scott Phantom Deluxe, w/pwr sply & orig. spkr - BO; Hammarlund HQ-170 AC, w/clock - $175; Thordarson T-20C61 splatter suppression choke, .2 to 1.5 Hys @ 500 mA DC, 9 KV R.M.S., NIB - $20. All plus shpg. Ron, KC6WTG, POB 783, Santa Rosa, CA 95402. (707) 539-8319

WANTED: Collins 32V2/3, working, VG to exc.; 51J4 nameplate; military 51J4 tech manual. Robert Harding, 1321 Monte Largo Dr., NE, Albuquerque, NM 87112. (505) 291-0950 eves.

WANTED: Manuals for AN/PRC-36, LTV-186B, TMC AMC-6; need PRC-74 modules; PRC-64; URA-17; PRC-68. Joseph Pinner, 201 Ruthwood Dr., Lafayette, LA 70503. (318) 981-7766

FOR SALE: Vintage WW II aircraft electronics used in L-2, L-3, L-4 and L-5 "Grasshoppers". All RCA units, AVR-15 rcvr new in orig. box; AVA-126 pwr sply new in orig. box; AVA-127 pwr sply as new; AVT-114 emergency interphone as new. Cables and mounting hardware for all the above. Best offer. John Snow, 4539 N. Bartlett Ave., Shorewood, WI 53211. (414) 964-0194

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

FOR SALE: 75A-4, SN 5230, w/Collins noise blanker #136C-1 - $495. Bud, (208) 466-2803 after 8 PM, MST

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: Dynamotor, connectors, mounting rack for SCR-522 xcvr. Steve Kalista, 9 Maple Dr., Jim Thorpe, PA 18229. (717) 325-4120

FOR SALE: Drake TR4, w/pwr sply, nice - $225; Hallicrafters S-120 - $30; Central Electronics 10B, w/slicer - $50. Thank you! Dave Mantor, W9OCM, 2308 So. Fairlawn Way, Anderson, IN 46011. (317) 642-1103

WANTED: Collins Collectors - To complete 75S3-C upgrade require 75S3-C black plastic overlay that glues on escutcheon on rcvr. Al, RR, S7A C13, Peachland, BC V0H 1X0, Canada. (604) 767-6447.

FOR SALE: HB 500-W linear w/(2) 811A's in grounded grid. Amplifier is complete with pwr sply and control circuitry in 36" Bud rack cabinet, w/3" casters (39" overall), very heavy - $125; converted ARC-5 rcvr in 12" x 19" cabinet, complete with VHF converters - $60; ARC-5 xmtr set up as VFO (no finals or tank circuit) - $20; Aerotron 600 VHF/FM xcvr, w/mic - $50; LM-21 xtal calibrator - $20. Equipment is as bought, prices plus shpg. **WANTED:** Data on Sansui stereo amp AU2200; very old RCA test equipment; cable operated car radios. B.A. Hodgson, 14 Evergreen Dr., Voorhees, NJ 08043. (609) 424-0312

WANTED: Navy ARB WW II rcvr, not heavily modified preferred. Pete Hamersma, WB2JWU, 87 Philip Ave., Elmwood Park, NJ 07407.

WANTED: Hallicrafters CRX-1, CRX-2, CRX-3 tunable VHF monitor rcvrs. Gene Peroni, KA6NNR, Box 58003, Philadelphia, PA 19102. (215) 665-6182 (d)

FOR SALE: Collins 75A-4, w/matching spkr in exc. condx, needs work on AGC circuit, SN 790 - asking $350, PU only. James T. Schliestett, W4IMQ, POB 93, Cedartown, GA 30125. FAX/phone (404) 748-5968

WANTED: Johnson 122 VFO; Heath VF-1 VFO; AT-1 front panel; Globe Chief 90 front panel and parts. Jack C. Shutt, N9GT, 1820 Dawn Ave., Fort Wayne, IN 46815. (219) 493-3901

WANTED: R-390A parts - A.F. modules, I.F. decks and PTO's; maintenance manual for RT-618/UR3-35. Walter Chambers, K5OP, POB 241371, Memphis, TN 38124-1371. (901) 761-9381

FOR SALE: Manuals - Heath, Hickok, Hewlett Packard, Tektronix, many more. No list. SASE wants. Reasonable. S.T. Carter II, W4NHC, POB 033177, Indialantic, FL 32903-0177.

WANTED: WW II Japanese three-tube RX for companion TX now on 1811 kHz and 80 meters CW, and similar equipment. Ken Lakin, KD6B, Box 310, Redmond, OR 97756. (503) 923-1013

FOR SALE: Hallicrafters HA-5 VFO,VG orig. condx, w/manual - $55 ppd. Jim, WA1FFL, 64 Nonquit Lane, Tiverton, RI 02878. (401) 624-4739

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

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

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

WANTED: Eico, Fisher, etc. tube-type audio amps. Franklin Albanese, 1610 Prince St., #7, Berkeley, CA 94703. (510) 845-2625

WANTED: Old panel meters, books on meters. **FREE:** Catalog with classifieds section. Chris Cross, POB 94, McConnell, IL 61050.

FOR SALE: UX-852 amateur triode circa 1930's, 3-1/2" dia., wire leads - $25; S-38, very good - $30; NC-121 gen. coverage rcvr, mint, manual, orig. box - $65; vacuum caps, 50pF, 5 KV, 30 amp - $10 each; RK-707B reflex Klystron w/silvered cavity, 1500-3750 MHz - $20; O1A's, tested good - $10 each. Mel, WØMLT, 67750 Ridge View Dr., Montrose, CO 81401. (303) 249-1544

FOR SALE: National 183D, w/spkr & orig. manual, good condx - $250. Joe, KC6TXU, (408) 374-7645

FOR SALE: Rycom R-1307A/GR radio rcvrs. 3 kHz to 810 kHz, AM, CW, MCW, FM and FSK. 19" rack mount, built-in spkr and voltmeter, with manual copy - $175, plus $25 S&H. Steve Haney, (817) 496-3346, leave message.

FOR SALE: Going - Going. 219 sold and now liquidating all equip. remaining. What do you need? Glenn W. Ritchey, USN Ret., W7SAB, 219 Naval Ave., Bremerton, WA 98310. (206) 373-9631

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

FOR SALE: 50 page illustrated catalog of WW II military radio sets - $2 US, $5 foreign. Sam Hevener, W8KBF, "The Signal Corps" 3583 Everett Rd., Richfield, OH 44286-9723. (216) 659-3244

FOR SALE: Collins R-388; RME 4350A, spkr available; Hallicrafters SX-130,spkr available. **WANTED:** DB22A cabinet. Doug, (206) 472-3478

FOR SALE: Hallicrafters manuals. Copies - $5 postpaid for most models. Some Johnson, Hammarlund, others. SASE for list. Miller Radio, 909 Walnut St., Erie, PA 16502.

FOR SALE: Johnson Ranger; Johnson TR switch; Collins R-388; Collins R-390A; SB-301; SB-401; SB-10; HG-10; SB-630; HW-7's; HW-8's; HW-104; Eico 753's; KWM-2; HO-13; Galaxy Mark 3; Galaxy 550; HR-160; Meissner Signal Shifters (3); HT-37 parts; S-38E; Globe HG-303; V-10 VFO; Globe VOX unit; parts for amps, tubes, ask. Don, W6TVW, (702) 475-0211 (d/n)

FOR SALE: Heath SB-401, SB-303 - $175; Heath HR-10B - $50; Drake R4, T4X, MS-4, AC-3, exc. - $275; Drake R4, MS4 - $75. Richard Lucchesi, WA2RQY, 941 N. Park Ave., N. Massapequa, NY 11758. (516) 798-1230

FOR SALE: NOS parts, Drake 2/A/B/C main tuning knobs - $8.50; Astatic HiZ ceramic hand mics - $14.50 plus shpg. Bill, KE7KK, 6712 Lake Dr., Grand Forks, ND 58201. (701) 772-6531

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

FOR SALE: W7GBU estate. C.A. Dow, rotary spark gap - $175; Collins plugin mech. filter adapter 353C-31 for 75A-1 - $75; B&W 600 GDM; books, much more. SASE for list. Mike, KK7F, 1117 S. Fiske, Spokane, WA 99202. (509) 535-5548

WANTED: Johnson 122 VFO and Hallicrafters pwr sply PS-150-120. Ron Eveland, W6HFZ, 13169 Briarwood St., Cerritos, CA 90701-7367. (310) 860-3623, FAX 809-2203

FOR SALE: Heath test equipment - VTVM - $35; IM-25 VOM - $35; IT-18 transistor checker - $25; HM-15 VSWR meter - $20; sig. gen. - $45; O'scope calibrator - $25; capacitance sub. box - $15; HW-32A 20-M rig, set up for mobile use w/mobile sply, spkr, hand mic, mobile mounts, books - $135; (3) 4CX300's, pulls, one new 4X150 still in orig. Eimac bag, all for $125; Butternut HF6V HF vertical - $95; used 4CX1000 - $125; Yaesu VFO FV-101B - $135; (4) sets of 6146's including one new set - $95; URM-144 two-tone gen. - $65. Lane, KM3G, (505) 526-0910

WANTED: High voltage ceramic switches for amp project,panel meters, oil filled caps, also want a good used 3CX1200A7 or D7. Lane, KM3G, (505) 526-0910

WANTED: Mics, dead or alive: RCA BK-5 pay up to $300; RCA 88-A, $250; EV 676, $250; Turner H500's, $300; RCA 77D, $200; RCA 44DX, $250; EV-630, $200. Also any other amateur or broadcast pre-1970 and Collins audio devises. Al, IK1CXJ, c/o Kurt Keller, 68 Bishop Rd., Ridgefield, CT 06877. (203) 431-6850

WANTED: Manuals for Gonset Communicator IV and Knight TR-108 2M AM xcvrs. Jerry Kethcart, 16620 Robinhood Dr., Orland Park, IL 60462. (708) 532-9245

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

FOR SALE: R-1051's and R-1051B's, checked, good electrically and physically - $295 plus shpg; also spare parts for above rigs. Tony Snider, 512 Princess Ann Rd., Virginia Beach, VA 23457. (804) 721-7129

FOR SALE: HX-500 - $150. **WANTED:** NC-300; manuals for NC-400 and HRO-500. Gary, W7FG, (918) 333-7893

FOR SALE: Harvey-Wells and friends. SASE for 4 page list. AB5L, Box 226841, Dallas, TX 75222.

FOR SALE: Heath 2-M xcvr, model HW 2036, mint condx, w/mic, solid-state - $110. Bill Riley, 863 W. 38th Ave., Eugene, OR 97405. (503) 345-2169

WANTED: 51J-1, 51J-2, 51J-3 or R-388. Must be clean and working well on all bands. No garage queens please. Tom, N5OFF, 111 Destiny, Lafayette, LA 70506. (318) 989-3430

WANTED: AX9909 or 6083 pwr amp. tubes for Globe Champion 300-A. Also need a 2EZ6. Ed, WA7DAX, 1649 E. Stratford Ave., Salt Lake City, UT 84106. (801) 484-5853

FOR SALE: Tested tubes w/warranty! TX and RX tubes: recent acquisition has increased my stock. Buy those spare tubes for your tube radio, audio and electronic gear. Prices are about 35% of new for tubes with a warranty. I have bunches of octal, older, 7 and 9 pin tubes. All tested on TV/7 tester and boxed. I give a 30 day warranty. Send wants or SASE with TWO stamps for list. Daniel Nelson, 1025 E. Desert Lane, Phoenix, AZ 85040. (602) 243-7421

FOR SALE: Collins 312B4 - $100; Drake 1A - $250; SPR-4 - $295; KWM2A - $395; 75S1, 32S1, 516F2 - $600; Collins parts. Ron Follmar, 1409 W. Willis, Alvin, TX 77511. (713) 331-1074

WANTED: Clegg 99'er pwr xfmr; Viking 500 key switch; SM-40. FOR SALE: 810's - $70 each; Lafayette pwr/SWR meter - $15; NC-173, as-is - $75. Joe Sloss, K7MKS, (206) 747-5349

WANTED: Morrowtwins, MBR-5 & MB560, pwr sply, spkr; TBS-50 A-B or C model, VFO & pwr sply. W7MXM, (208) 522-5854

FOR SALE or TRADE: Knight KG 686, Hickok 288-X RF sig. gens; B&K #290 FET VOM. All exc. w/manuals. Al Bernard, POB 690098, Orlando, FL 32869-0098. (407) 351-5536

WANTED: Will pay top $ for PRC-64 NIB or mint condx; also looking for Delco 5300. Steve Bartkowski, 4923 W. 28th St., Cicero, IL 60650. (708) 863-3090

WANTED: Collins broadcast catalogs, 26-U compressors, or other Collins broadcast compressors. R. Robinson, 868 South Main, St. Plantsvile, CT 06479. (203) 621-7445

FOR SALE: Vintage CIA spook set, Mason type A-2, nice condx, DC - 1.2 GHz - $2800 plus shpg. Steve Bartkowski, 4923 W. 28 St., Cicero, IL 60650. (708) 863-3090

WANTED: Schematic / manual (copies OK) for model NF-105 noise and field intensity meter - Empire Devises Products Corp. Marty Sagendorf, K1CVF, Box 21, Bridgewater, CT 06752. (203) 354-9035

WANTED: Collins 310 exciter; 8R1 calibrator; 148C-1 & 148B-1 NBFM adaptors. Joel Thurtell, K8PSV, 11803 Priscilla, Plymouth, MI 48170. (313) 453-8303

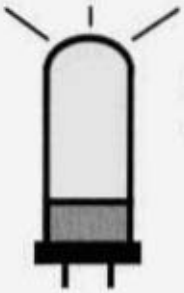
WANTED: Coils for HRO-50 - AB,AC, H, J; manual for TV-3B/U; manual for JRC sig. gen. 5025A; dust covers for S-Line. Dan Mason, R.R.T 1, Box 204F, Santa Fe, NM 87501. (505) 455-3416

FOR SALE: Teletype model 14, VGC - $75; AN/TXC1 FAX, RX/TX - $50. U pay UPS or freight. Ted Stewart, W6NPB, 2157 Braemar Rd., Oakland, CA 94602. (510) 531-7042

FOR SALE: Collins 312-B4, RE - $135, WE - $115; KWT-6 modules - call; 75A-4 filters, 500 Hz & 1.5 kHz - $150 each; Knight Ocean Hopper, w/coils - $95; Spacespanner & Spanmaster - $65 each; Lafayette Explorair - $60; Dak Mark 9 CB, w/Silver Eagle D-104 - $450; Johnson Ranger - $250; National HRO-500, series 140 - $900; Hallicrafters R42 spkr - $150. Pick up only: Johnson Valiant - $425; Gonset GSB-101 linear - $350; HB kilowatt, 6' rack - $400. Other stuff available. Most equipment excellent or like new. Jim Weil, 15915 Armada Center, Armada, MI 48005-2203. (810) 784-9860

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

FOR SALE: Meissner Signal Booster model 9-1008, good condx - $35 . Buyer pays shipping and handeling. James Burrows, W7BCT, 15121 41st Ave., S.E., Bothell, WA 98012-6113. (206) 337-4880



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